THIKA WATER AND SEWERAGE COMPANY LIMITED (THIWASCO)

TENDER NO: THIWASCO/041/ALNK/2022-2023

CONSTRUCTION OF ADDITIONAL LATERALS IN NAMSIP AREAS IN KIGANJO-PHASE II

MANAGING DIRECTOR
THIKA WATER AND SEWERAGE COMPANY LTD,
P.O. BOX 6103 - 00100, THIKA – KENYA.

(2022-2023)

CLOSING DATE
Tuesday, January 24, 2023 at 10.00am

INVITATION TO TENDER

PROCURING ENTITY: *[Thika Water and Sewerage Company Ltd, P.O Box 6103-01000, Thika]*

CONTRACT NAME AND DESCRIPTION: Construction of Additional laterals in NAMSIP areas in Kiganjo Phase II *[THIWASCO/041/ALNK/2022-2023]*

The *(Thika Water and Sewerage Company Ltd*) invites sealed tenders for the construction of (*Construction of Additional laterals in NAMSIP areas in Kiganjo Phase II, six months construction period at Kiganjo.]*

Tendering will be conducted under open competitive method National using a standardized tender document. Tendering is open to open to all Small and Medium Enterprises registered appropriately with the relevant body i.e. **AGPO (Access to Government Procurement Opportunities)**

Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours *[0800 to 1600 hours]* at the address given below.

A complete set of tender documents may be purchased or obtained by interested tenders upon payment of a non- refundable fees of (*kshs.1,000.00*) to the following account n:
Account Name: **Thika Water and Sewerage Company Ltd**
Bank: Equity
Account No. 0090294932028 Code 027

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

Tenders shall be quoted be in Kenya Shillings and shall include all taxes. Tenders shall remain valid for **182** days from the date of opening of tenders.

All Tenders must be accompanied by a **Tender-Securing Declaration**

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

Completed tenders must be delivered to the address below on or before ***[Tuesday, January 24, 2023 at 10.00am]. Electronic Tenders [will not] be permitted.***

Tenders will be opened immediately after the deadline date and time specified above or any dead line 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.

Late tenders will be rejected.

The addresses referred to above are:

Address for obtaining further information and for purchasing tender documents

Name of Procuring Entity: **Thika Water and Sewerage Company Ltd**

Physical address for hand Courier Delivery to an office or Tender Box: **Thika Head Office Near Bluepost Hotel, Along Haile Sellasie Road**

Postal Address: **P.O. Box 6103-01000 Thika**

Name, telephone number and e-mail address of the officer to be contacted.: **Procurement Office, 0720-418444, Procurement@thikawater.co.ke**

Address for Submission of Tenders.

Name of Procuring Entity: **Thika Water & Sewerage Company Ltd**

Postal Address **P.O. Box 6103-01000 Thika**

Physical address for hand Courier Delivery to an office or Tender Box: **Thika Head Office Near Bluepost Hotel, Along Haile Sellasie Road**

Address for Opening of Tenders.
Name of Procuring Entity: **Thika Water & Sewerage Company Ltd**

Physical address for the location: **Thika Head Office Near Bluepost Hotel, Along Haile Sellasie Road**

[Authorized Official (name, designation, Signature and date)]

Name: Dr. Moses Kinya

Designation: Managing Director

Signature _____

Date _____

PART 1 - TENDERING PROCEDURES

SECTION I: INSTRUCTIONS TO TENDERERS

A General Provisions

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 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.

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 being tendered for. The Procuring Entity shall indicate in the **TDS** firms (if any) that provided consulting services for the contract being tendered for. The Procuring Entity shall check whether the owners or controllers of the Tenderer are same as those that provided consulting services. The Procuring Entity shall, upon request, make available to any tenderer information that would give such firm 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 3.7 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. Public employees and their close relatives *(spouses, children, brothers, sisters and uncles and aunts)* are not eligible to participate in the tender. 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. 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 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 Engineer for the 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 family relationship with a professional staff of the Procuring Entity who:

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) would be involved in the implementation or supervision of such Contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Procuring Entity throughout the tendering process and execution of the Contract.

3.4 A tenderer shall not be involved in corrupt, coercive, obstructive, collusive or fraudulent practice. A tenderer that is proven to have been involved 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. A firm that is not a tenderer or a JV member may participate as a subcontractor in more than one tender. 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.

3.6 A Tenderer may have the nationality of any country, subject to the restrictions pursuant to ITT 4.8.A Tenderer shall be deemed to have the nationality of a country if the Tenderer is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed subcontractors or sub-consultants for any part of the Contract including related Services.

3.7 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 Tenderers that are state-owned enterprises or institutions may be eligible to compete and be awarded a Contract(s) only if they are accredited by PPRA to be (i) a legal public entity of the state 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 A Firms and individuals may be ineligible if their countries of origin (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, subcontracts and labor) from national suppliers and contractors. To this end, a foreign tenderer shall provide in its tender documentary evidence that this requirement is met. Foreign tenderers not meeting this criterion will be automatically disqualified. Information required to enable the Procuring Entity determine if this condition is met shall be provided in for this purpose is be provided in *"SECTION III - EVALUATION AND QUALIFICATION CRITERIA, Item 9"*.

3.11 Pursuant to the eligibility requirements of ITT 4.10, a tender is considered a foreign tenderer, if the tenderer is not registered in Kenya or if the tenderer is registered in Kenya and has less than 51 percent ownership by Kenyan

Citizens. JVs are considered as foreign tenderers if the individual member firms are not registered in Kenya or if are registered in Kenya and have less than 51 percent ownership by Kenyan citizens. The JV shall not subcontract to foreign firms more than 10 percent of the contract price, excluding provisional sums.

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

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

3.14 A Kenyan tenderer shall provide evidence of having fulfilled his/her tax obligations by producing a valid tax clearance certificate or tax exemption 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 eligible under ITT 3.9. 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 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 upon 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 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 ITT 8.

PART 1 Tendering Procedures

i) Section I - Instructions to Tenderers (ITT)
ii) Section II - Tender Data Sheet (TDS)
iii) Section III - Evaluation and Qualification Criteria
iv) Section IV - Tendering Forms

PART 2 Works Requirements

i) Section V - Drawings
ii) Section VI - Specifications
iii) Section VII - Bills of Quantities

PART 3 Conditions of Contract and Contract Forms

i) Section VIII - General Conditions of Contract (GCC)
ii) Section IX - Special Conditions of Contract (SC)
iii) Section X - Contract Forms

6.2 The Invitation to Tender Document (ITT) 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 the pre-Tender meeting (if any), or Addenda to the Tender document in accordance with ITT 8. In case of any contradiction, documents obtained directly from the Procuring Entity shall prevail.

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. Site Visit

7.1 The Tenderer, at the Tenderer's own responsibility and risk, is encouraged to visit and examine and inspect the Site of the Required Services and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for the Services. The costs of visiting the Site shall be at the Tenderer's own expense.

8. Pre-Tender Meeting

8.1 The Procuring Entity shall specify in the **TDS** if a pre-tender meeting will be held, when and where. The Procuring Entity shall also specify in the **TDS** if a pre-arranged pretender site visit will be held and when. The Tenderer's designated representative is invited to attend a pre-arranged pretender visit of the site of the works. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

8.2 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.

8.3 Minutes of the pre-Tender meeting and the pre-arranged pretender site visit of the site of the works, 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 in accordance with ITT 6.3. Minutes shall not identify the source of the questions asked.

8.4 The Procuring Entity shall also promptly publish anonym zed (*no names*) Minutes of the pre-Tender meeting and the pre-arranged pretender visit of the site of the works at the web page identified in the **TDS**. Any modification to the Tender Documents that may become necessary as a result of the pre-tender meeting and the pre-arranged pretender site visit, 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. Nonattendance at the pre-Tender meeting will not be a cause for disqualification of a Tenderer.

9. Clarification and amendments of Tender Documents

9.1 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 and the pre-

arranged pretender visit of the site of the works if provided for in accordance with ITT 8.4. 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** prior to the deadline for submission of tenders. The Procuring Entity shall forward copies of its response to all tenderers who have acquired the Tender Documents in accordance with ITT 6.3, including a description of the inquiry but without identifying its source. If 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 appropriately following the procedure under ITT 8.4.

10. Amendment of Tendering Document

10.1 At any time prior to the deadline for submission of Tenders, the Procuring Entity may amend the Tendering document by issuing addenda.

10.2 Any addendum issued shall be part of the tendering document and shall be communicated in writing to all who have obtained the tendering document from the Procuring Entity in accordance with ITT 6.3. The Procuring Entity shall also promptly publish the addendum on the Procuring Entity's web page in accordance with ITT 8.4.

10.3 To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their Tenders, the Procuring Entity shall extend, as necessary, the deadline for submission of Tenders, in accordance with ITT 25.2 below**.**

C. Preparation of Tenders

11. Cost of Tendering

11.1 The Tenderer shall bear 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.

12. Language of Tender

12.1 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.

13. Documents Comprising the Tender

13.1 The Tender shall comprise the following:

a) Form of Tender prepared in accordance with ITT 14;
b) Schedules including priced Bill of Quantities, completed in accordance with ITT 14 and ITT 16;
c) Tender Security or Tender-Securing Declaration, in accordance with ITT 21.1;
d) Alternative Tender, if permissible, in accordance with ITT 15;
e) Authorization: written confirmation authorizing the signatory of the Tender to commit the Tenderer, in accordance with ITT 22.3;
f) Qualifications: documentary evidence in accordance with ITT 19establishing the Tenderer's qualifications to perform the Contract if its Tender is accepted;
g) Conformity: a technical proposal in accordance with ITT 18;
h) Any other document required in the **TDS**.

13.2 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 Agreement. The Tenderer shall chronologically serialize pages of all tender documents submitted.

13.3 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.

14. Form of Tender and Schedules

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

15. Alternative Tenders

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

15.2 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.

15.3 Except as provided under ITT 13.4 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. 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.

16. Tender Prices and Discounts

16.1 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.

16.2 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.

16.3 The price to be quoted in the Form of Tender, in accordance with ITT 14.1, shall be the total price of the Tender, including any discounts offered.

16.4 The Tenderer shall quote any discounts and the methodology for their application in the Form of Tender, in accordance with ITT 14.1.

16.5 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, except in 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.

16.6 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 16.4, provided the Tenders for all lots (contracts) are opened at the same time.

16.7 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.

17. Currencies of Tender and Payment

17.1 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 Tenderer expecting to incur expenditures in other currencies for inputs to the Works supplied from outside Kenya shall device own ways of getting foreign currency to meet those expenditures.

18. Documents Comprising the Technical Proposal

18.1 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.

19. Documents Establishing the Eligibility and Qualifications of the Tenderer

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

19.2 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.

19.3 A margin of preference will not be allowed. Preference and reservations will be allowed, individually or in joint ventures. Applying for eligibility for Preference and reservations shall supply all information required to satisfy the criteria for eligibility specified in accordance with ITT 33.1.

19.4 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 contractor 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 thereby help to prevent any corrupt influence in relation to the procurement process or contract management.

19.5 The purpose of the information described in ITT 19.4 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.

19.6 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 6.3. 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.

19.7 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.

19.8 If a tenderer fails to submit the information required by these requirements, its tender 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.

19.9 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 ongoing, 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.

19.10 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 6.7 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 tenderer.

20. Period of Validity of Tenders

20.1 Tenders shall remain valid for the Tender Validity period specified in the **TDS**. The Tender Validity period starts from the date fixed for the Tender submission deadline (as prescribed by the Procuring Entity in accordance with ITT 24). A Tender valid for a shorter period shall be rejected by the Procuring Entity as non-responsive.

20.2 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 21.1, 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 the request shall not be required or permitted to modify its Tender, except as provided in ITT 20.3.

20.3 If the award is delayed by a period exceeding the number of days to be specified in the **TDS** days beyond the expiry of the initial tender validity period, the Contract price shall be determined as follows**:**

a) in the case of **fixed price** contracts, the Contract price shall be the tender price adjusted by the factor specified in the **TDS**;
b) in the case of **adjustable price** contracts, no adjustment shall be made; or in any case, tender evaluation shall be based on the tender price without taking into consideration the applicable correction from those indicated above.

21. Tender Security

21.1 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**.**

21.2 If a Tender Security is specified pursuant to ITT 19.1, the Tender Security shall be a demand guarantee in any of the following forms at the Tenderer's option:

a) an unconditional Bank Guarantee issued by reputable commercial bank); or
b) an irrevocable letter of credit;
c) a Banker's cheque issued by a reputable commercial bank; or
d) another security specified **in the TDS**,

21.3 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 20.2.

21.4 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.

21.5 If a Tender Security is specified pursuant to ITT 21.1, 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 nonresponsive or a bidder declines to extend tender validity period.

21.6 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**.

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

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

f) if the successful Tenderer fails to:

i) sign the Contract in accordance with ITT 50; or

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

21.8 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.

21.9 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.

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

22. Format and Signing of Tender

22.1 The Tenderer shall prepare one original of the documents comprising the Tender as described in ITT 13 and clearly mark it "ORIGINAL." Alternative Tenders, if permitted in accordance with ITT 15, 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.

22.2 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.

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

22.4 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 to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

22.5 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

23. Sealing and Marking of Tenders

23.1 Depending on the sizes or quantities or weight of the tender documents, a tenderer may use an envelope, package or container. 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 described in ITT 11; 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 15, 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- ALTERNATIVE TENDER", 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.

23.2 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 are misplaced or opened prematurely will not be accepted.

24. Deadline for Submission of Tenders

24.1 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**.

24.2 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.

25. Late Tenders

25.1 The Procuring Entity shall not consider any Tender that arrives after the deadline for submission of tenders, in accordance with ITT 24. 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.

26. Withdrawal, Substitution, and Modification of Tenders

26.1 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 22.3, (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 22 and ITT 23 (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 24.

26.2 Tenders requested to be withdrawn in accordance with ITT 26.1 shall be returned unopened to the Tenderers.

26.3 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.

27. Tender Opening

27.1 Except in the cases specified in ITT 23 and ITT 26.2, 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 who chooses to attend. Any specific electronic Tender opening procedures required if electronic Tendering is permitted in accordance with ITT 24.1, shall be as specified in the **TDS**.

27.2 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 at Tender opening.

27.3 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.

27.4 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.

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

27.6 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 Bills of Quantities are to be initialed by the members of the tender opening committee attending the opening. The number of representatives of the Procuring Entity to sign shall be specified in the **TDS**.

27.7 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 25.1).

27.8 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.

27.9 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 the tender opening register shall be distributed to all Tenderers upon request.

E. Evaluation and Comparison of Tenders

28. Confidentiality

28.1 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 46.

28.2 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.

28.3 Notwithstanding ITT 28.2, 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.**

29. Clarification of Tenders

29.1 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 33.

29.2 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.

30. Deviations, Reservations, and Omissions

30.1 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.

31. Determination of Responsiveness

31.1 The Procuring Entity's determination of a Tender's responsiveness is to be based on the contents of the tender itself, as defined in ITT 13.

31.2 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.

31.3 The Procuring Entity shall examine the technical aspects of the tender submitted in accordance with ITT 18, to confirm that all requirements of Section VII, Works' Requirements have been met without any material deviation, reservation or omission.

31.4 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.

32. Non-material Non-conformities

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

32.2 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, to rectify nonmaterial non-conformities in the tender related to documentation requirements. Requesting information or documentation on such non-conformities shall not be related to any aspect of the price of the tender. Failure of the tenderer to comply with the request may result in the rejection of its tender.

32.3 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.**

33. Arithmetical Errors

33.1 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 any way by any person or entity.

33.2 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, and subtotal and total bid price shall be considered as a major deviation that affects the substance of the tender and shall lead to disqualification of the tender as non-responsive. and

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

33.3 Tenderers shall be notified of any error detected in their bid during the notification of a ward.

34. Currency provisions

34.1 Tenders will priced be in Kenya Shillings only. Tenderers quoting in currencies other than in Kenya shillings will be determined non-responsive and rejected.

35. Margin of Preference and Reservations

35.1 No margin of preference shall be allowed on contracts for small works.

35.2 Where it is intended to reserve the contract to specific groups under Small and Medium Enterprises, or enterprise of women, youth and/or persons living with disability, 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/firms belonging to those specified groups are the only ones eligible to tender. Otherwise if no so stated, the invitation will be open to all tenderers.

36. Nominated Subcontractors

36.1 Unless otherwise stated in the **TDS**, the Procuring Entity does not intend to execute any specific elements of the Works by subcontractors selected in advance by the Procuring Entity.

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

36.3 The 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 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.

37. Evaluation of Tenders

37.1 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 Best Evaluated Tender in accordance with ITT 40.

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

a) price adjustment due to discounts offered in accordance with ITT 16;
b) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with ITT39;
c) price adjustment due to quantifiable nonmaterial non-conformities in accordance with ITT 30.3; and
d) any additional evaluation factors specified **in the TDS** and Section III, Evaluation and Qualification Criteria.

37.3 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 in Tender evaluation.

37.4 In the case of multiple contracts or lots, Tenderers shall be allowed to tender for one or more lots and the methodology to determine the lowest evaluated cost of the lot (contract) combinations, including any discounts offered in the **Form of Tender, is specified in Section III, Evaluation and Qualification Criteria.**

38. Comparison of Tenders

38.1 The Procuring Entity shall compare the evaluated costs of all substantially responsive Tenders established in accordance with ITT 38.2 to determine the Tender that has the lowest evaluated cost.

39. Abnormally Low Tenders

39.1 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.

39.2 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.

39.3 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.

40. Abnormally High Tenders

40.1 An abnormally high 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.

40.2 In case of an abnormally high tender 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.

40.3 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.

41. Unbalanced and/or Front-Loaded Tenders

41.1 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.

41.2 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 30% 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,

42. Qualifications of the Tenderer

42.1 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.

42.2 The determination shall be based upon an examination of the documentary evidence of the Tenderer's qualifications submitted by the Tenderer, pursuant to ITT 19. 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.

42.3 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.

42.4 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.

42.5 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.

42.6 After evaluation of the price analyses, if 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.

43. Best Evaluated Tender

43.1 Having compared the evaluated prices of Tenders, the Procuring Entity shall determine the Best Evaluated Tender. The Best 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.

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

44.1 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 thereby incurring any liability to Tenderers. In case of annulment, all Tenderers shall be notified with reasons and all Tenders submitted and specifically, Tender securities, shall be promptly returned to the Tenderers.

F. Award of Contract

45. Award Criteria

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

46. Notice of Intention to enter into a Contract

46.1 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 standstill period;

47. Standstill Period

47.1 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.

47.2 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.**

48. Debriefing by the Procuring Entity

48.1 On receipt of the Procuring Entity's Notification of Intention to Enter into a Contract referred to in ITT 46, an unsuccessful tenderer may make a written request to the Procuring Entity for a debriefing on specific issues or concerns regarding their tender. The Procuring Entity shall provide the debriefing within five days of receipt of the request.

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

49. Letter of Award

49.1 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 21days of the date of the letter.

50. Signing of Contract

50.1 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.

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

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

51. Appointment of Adjudicator

51.1 The Procuring Entity proposes the person named in the **TDS** to be appointed as Adjudicator under the Contract, at the hourly fee specified in the **TDS**, plus reimbursable expenses. If the Tenderer disagrees with this proposal, the Tenderer should so state in his Tender. If, in the Letter of Acceptance, the Procuring Entity does not agree on the appointment of the Adjudicator, the Procuring Entity will request the Appointing Authority designated in the Special Conditions of Contract (SCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.

52. Performance Security

52.1 Within twenty-one (21) days of the receipt of the Letter of Acceptance 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 40.2 (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.

52.2 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.

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

53. Publication of Procurement Contract

53.1 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.

54. Procurement Related Complaints and Administrative Review

54.1 The procedures for making Procurement-related Complaints are as specified in the **TDS**.

54.2 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.

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	A. General
ITT 1.1	The name of the contract is: ***construction of additional laterals in NAMSIP areas in Kiganjo phase II*** The reference number of the Contract is: ***THIWASCO/041/ALNK/2022-2023***
ITT 2.3	The Information made available on competing firms is as follows: ***not available***
ITT 2.4	The firms that provided consulting services for the contract being tendered for are: ***Not available_***
ITT 3.1	Maximum number of members in the Joint Venture (JV) shall be: ***[two].***
B. Contents of Tender Document	
8.1	(A) A pre-arranged pretender site visit **shall** take place. Date: **Monday, January 16, 2023** Time: **10:00am** Place: **Members to meet at head office, then proceed to site.** (B) Pre-Tender meeting **shall not** take place.
ITT 8.2	The Tenderer will submit any questions in writing, to reach the Procuring Entity not later than ***19th January 2023 at 5.00pm***
ITT 8.4	The Procuring Entity's website where Minutes of the pre-Tender meeting and the pre-arranged pretender site visit will be published is: ***not available***
ITT 9.1	For Clarification of Tender purposes, for obtaining further information and for purchasing tender documents, the Procuring Entity's address is: Name of Procuring Entity: **Thika Water and Sewerage Company Ltd** Physical address for hand Courier Delivery to an office or Tender Box (City, Street, Building, Floor Number and Room) **THIWASCO** **Head Office, Haile Sellasie Road Near BluePost Hotel Room No.1** Postal Address: **P.O. Box 6103-01000 Thika.** **Procurement Department, 0720-418444, procurement@thikawater.co.ke**
C. Preparation of Tenders	
ITP 13.1 (h)	The Tenderer shall submit the following additional documents in its Tender: **No other additional documents required.**
ITT 15.1	Alternative Tenders *["**shall not be**"]* considered.
ITT 15.2	Alternative times for completion *["**shall not be**"]* permitted.
ITT 15.4	Alternative technical solutions shall be permitted for the following parts of the Works: ***not permitted.***
ITT 16.5	The prices quoted by the Tenderer shall be: ***["fixed"]***
ITT 20.1	The Tender validity period shall be *[182]* days.
ITT 20.3 (a)	(a) The delayed to exceeding _none number of days. (b) The Tender price shall be adjusted by the following percentages of the tender price:

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	(i) By none % of *the local currency portion of the Contract price adjusted to reflect local inflation during the period of extension,* *and* *(ii) By_ none % the foreign currency portion of the Contract price adjusted to reflect the international inflation during the period of extension.*
ITT 21.1	A Tender Security ***[“shall not be”***] required. A Tender-Securing Declaration [*“**shall be**”*] required.
ITT 21.2 (d)	The other Tender Security shall be ***none***
ITT 21.5	On the Performance Security, other documents required shall be **Program of works, insurance policies.** Performance security shall be 1% of the total quoted amount.
ITT 22.1	In addition to the original of the tender, the number of copies is:*[***two copies](original and a copy)**
ITT 22.3	**Confidential business questionnaire duly completed detailing directors/partners/sole proprietorship, MUST disclose power of attorney of the signatory.**
D. Submission and Opening of Tenders	
ITT 24.1	(A) For Tender submission purposes only, the Procuring Entity’s address is: (1) Name of Procuring Entity: **Thika Water & Sewerage Company Ltd** (A) For Tender submission purposes only, the Procuring Entity’s address is: (1)Name of Procuring Entity: **Thika Water & Sewerage Company Ltd** (2)Postal Address **Managing Director, P.O. Box 6103-01000 Thika,** (3Physical address for hand Courier Delivery to an office or Tender Box: **THIWASCO Main Offices, haileSellasie Road near BluePost Hotel, Procurement Office, Room No. 1** (4) Date and time for submission of Tenders: **Tuesday, January 24, 2023 at 10.00am** (5) Tenders **shall not submit** tenders electronically
ITT 27.1	The Tender opening shall take place at the time and the address for Opening of Tenders provided below: (1) Name of Procuring Entity: **Thika Water & Sewerage Company Ltd** (2) Physical address for the location **THIWASCO Main Offices, haile Sellasie Road near Blue Post Hotel.** (3) State date and time of tender opening: **Tuesday, January 24, 2023 at 10.00am**
ITT 27.1	If Tenderers are allowed to submit Tenders electronically, they shall follow the electronic tender submission procedures**: Not permitted**
ITT 27.6	The number of representatives of the Procuring Entity to sign is **Four**
E. Evaluation, and Comparison of Tenders	
ITT 32.3	The adjustment shall be based on the *“**average**”* price of the item or component as

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	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 best estimate.
ITT 32.3	The adjustment shall be based on the **average** price of the item or component as quoted in other substantially responsive Tenders. If the price of the item or component cannot be derived from the price of other substantially responsive Tenders, the Procuring Entity shall use its best estimate.
ITT 33.2	Any errors in the submitted tender arising from a miscalculation of unit price, quantity, and subtotal and total bid price shall be considered as a major deviation that affects the substance of the tender and shall lead to disqualification of the tender as non-responsive
;ITT 35.2	The invitation to tender is extended to the following groups that qualify for **Reservations Small and Medium Enterprises, Women Enterprises, Youth Enterprises and Enterprises of persons living with disability.**
ITT 36.1	At this time, the Procuring Entity ***[“does not intend”]*** to execute certain specific parts of the Works by subcontractors selected in advance.
ITT 36.2	Contractor’s may propose subcontracting: Maximum percentage of subcontracting permitted is: ***not permitted*** *% 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 36.3	***[not applicable]*** The parts of the Works for which the Procuring Entity permits Tenderers to propose Specialized Subcontractors are designated as follows: 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 37.2 (d)	Additional requirements apply. These are detailed in the evaluation criteria in Section III, Evaluation and Qualification Criteria.
ITT 51.1	The person named to be appointed as Adjudicator **-National Centre for International Arbitration**
ITT 52.2	Other documents required are __***none***_____
ITT 54.1	The procedures for making a Procurement-related Complaints are detailed in the “Regulations” available from the PPRA Website www.ppra.go.ke or email complaints@ppra.go.ke. If a Tenderer wishes to make a Procurement-related Complaint, the Tenderer should submit its complaint following these procedures, in writing (by the quickest means available, that is either by hand delivery or email to: For the attention: *[Dr. Moses Kinya]* Title/position: *[Managing Director]* Procuring Entity: *[Thika Water & Sewerage Company Ltd]* Email address*: [info@thikawater.co.ke or procurement@thikawater.co.ke]* In summary, a Procurement-related Complaint may challenge any of the following: (i) the terms of the Tender Documents; and (ii) the Procuring Entity’s decision to award the contract.

SECTION III - EVALUATION AND QUALIFICATION CRITERIA

General Provisions

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

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 should use **the Standard Tender Evaluation Document for Goods and Works** for evaluating Tenders.

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.

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 Document for Goods and Works for evaluating Tenders provides very clear guide 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.

[The Procuring Entity will provide the preliminary evaluation criteria. To facilitate, a template may be attached or clearly described all information and list of documentation to be submitted by Tenderers to enable preliminary evaluation of the Tender]

Tender Evaluation (ITT 35) Price evaluation: in addition to the criteria listed in ITT 35.2 (a) – (c) the following criteria

shall apply:
Alternative Completion Times, if permitted under ITT 13.2, will be evaluated as follows:
……

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

Other Criteria; if permitted under ITT 35.2(d):
……

Multiple Contracts

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
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.

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

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.

Alternative Tenders (ITT 13.1)

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 Part 2- Works Requirements. Only the technical alternatives, if any, of the Tenderer with the Best Evaluated Tender conforming to the basic technical requirements shall be considered by the Procuring Entity.

Margin of Preference is not applicable

Post qualification and Contract ward (ITT 39), more specifically,
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.
In case 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.
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
_____.
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.
At least_____(*insert number)* 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_____equivalent.
Contractor's Representative and Key Personnel, which are specified as _____
Contractors key equipment listed on the table "Contractor's Equipment" below and more specifically listed as *[specify requirements for each lot as applicable]* _____
Other conditions depending on their seriousness.

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

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.

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

QUALIFICATION FORM SUMMARY

1	2	3	*4*	*5*
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 the the Kenya Revenue Authority in accordance with ITT 3.14.	Form of Tender	
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 3.8	Form of Tender	
5	State- owned Enterprise	Meets conditions of ITT 3.7	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 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. (ii) The Tenderers shall also demonstrate, to the satisfaction of the Procuring Entity, that it has adequate sources of	Form FIN – 3.1, with attachments	

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)***
		finance to meet the cash flow requirements on works currently in progress and for future contract commitments. (iii) The audited balance sheets or, if not required by the laws of the Tenderer's country, other financial statements acceptable to the Procuring Entity, for the last *[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.		
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	
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	
	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. [*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]* 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*	Form EXP 4.2(a)	

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)***
		be met by specialized subcontractors, if permitted in accordance with ITT 34.3]		

APPENDIX TO SECTION III - EVALUATION AND QUALIFICATION CRITERIA

Particulars to the appendix of evaluation and qualification criteria below shall be used to determine the lowest evaluated responsive bidder who shall be awarded the contract;

Particulars of appendix to evaluation and qualification criteria

1.0

	Mandatory Eligibility criteria	Responsiveness	Not responsive	Indicate reference no.where evidence is provided
1.	Attach certified copies of incorporation or certificate of registration certificate			
2.	Dully filled,signed and stamped form of tender and price schedule in the format provided for in the tender document.			
3.	Duly filled, signed and stamped confidential business questionnaire in the format provided for in the tender document			
4.	Provide certified copy of Proof of NCA5 and above registration and a valid practicing License (for ,roads, water and other civil works)			
5.	Attach certified Valid copy of AGPO Certificate			
6.	Attach certified Valid copy of Tax Compliance certificate			
7.	Attach certified copy of valid business permit			
8.	Attach certified copy of CR12 /Partnership deed			
9.	Attach certified Copies of IDs of Directors			
10.	Provide proof of physical address (attach copy of rental or lease agreement			

11.	Duly filled, signed and stamped Tender-Securing Declaration form in the format provided for in the tender document			
12.	Bidders must serialize every page of the bid document submitted from page one to the last page			
13.	Bidders shall prepare and submit two copies of bid documents marked clearly "ORIGINAL and COPY bid"			
	Note: Noncompliance with any MANDATORY requirement willautomatically result in disqualification			

2.0

B. PRELIMINARY TECHNICAL EVALUATION CRITERIA

		Met	Not met	Indicate reference no. where evidence is provided.
1.	Provide a minimum number of three (3) similar certified copies of contracts for sewer pipeline of at least 1.5 km that have been substantially completed in the last five (5) years. Attach certified prove copies of completion certificates, letters of awards, LPOs/LSOs, recommendation letters, signed contracts e.t.c.			
2.	Submission of certified audited financial statements for the last three years (2019,2020,2021) to demonstrate the current soundness of the tenderers financial position and its long-term profitability evidenced with attachments			
3.	Minimum average annual construction turnover of Kenya Shillings 10,000,000.00 equivalent calculated as total certified payments received for contracts in progress and/or completed within the last five (5) years, divided by five (5) years			
4.	Provide evidence that you have experience under construction contracts of similar works for at least the last three (3) years.			
5.	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 supply cash flow requirements estimated as Kenya shillings (10,000,000)- provide proof			

	6.	Key Technical staff Provide detailed proposal of key technical members for the proposed project, copies and CV of the proposed team, Enclose detailed certificate Project Manager Degree in Quantity Surveying/Construction Management/ Civil Engineering with 5years minimum relevant experience Site Agent (Minimum qualification Higher Diploma in Quantity Surveying/Construction Management/ Civil Engineering with 5 years minimum relevant experience. Civil Engineering Foreman 1No. (Minimum qualification is diploma in Civil Engineering) with 3 years relevant experience in building works			
	7.	Equipment (proof of valid ownership / lease agreement) Backhoe excavator complete with rock breaker 1 No. Concrete mixer 350 litres 1 No. Plate compactor 2 No. Concrete poker vibrators 1 No. Truck			
	8	Submit a draft methodology of specific to construction in built up urban areas and a 6 month program of works which shall form part of the contract if the bid is accepted. Any change in the program or schedule shall be subjected to the approval of the Client			
	9.	provide evidence that non-performance of a contract did not occur as a result of contractor default since 1st January 2022-provide proof-fill form CON-2			
	10.	Provide evidence that there is no pending litigation			
	11.	Provide evidence that there is no consistent history of court/arbitral award decisions against the Tenderer since 1st January 2022-fill form CON-2			
	To note: Tenders that pass the preliminary technical examination will be further subjected to arithmetic check				
3. Tender Evaluation (ITT 35) Price evaluation	Alternative completion: **Not permitted** Alternative Technical Solutions: **Not Permitted** Other Criteria: **Not Permitted**				

4. Multiple Contracts	Multiple contracts: **Not Permitted**
5. Alternative Tenders	Alternative Tenders: **Not Permitted**
6. Margin of preference	Margin of preference: **AGPO group**
7. Post qualification and Contract ward more specifically,	**Tender will be subjected to post qualification criteria**
a	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 p a y m e n t) sufficient to meet t h e construction c a s h fl o w o f K e n y a Shillings 10,000,00.00
b	Minimum average annual construction turnover of Kenya Shillings [10,000,000.00], equivalent calculated as total certified payments received for contracts in progress and/or completed within the last [5] years.
c	Confirm at least (two) 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 equivalent
d	Confirm history of non-performance of the previous works awarded.
Qualification form summary	Stick to evaluation criteria referenced 2.0 above.

QUALIFICATION FORMS

FORM EQU: EQUIPMENT

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

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

Omit the following information for equipment owned by the Tenderer.

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

FORM PER -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*]

FORM PER-2:

Resume and Declaration - Contractor's Representative and Key Personnel.

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

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

I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the 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:
be taken into consideration during Tender evaluation;
result in my disqualification from participating in the Tender;
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): _____

TENDERER'S 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.

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

FORM ELI -1.2

Tenderer's JV Information Form
(to be completed for each member of Tenderer's JV)
Date: _____

ITT No. and title: _____

Tenderer's JV name:
JV member's name:
JV member's country of registration:
JV member's year of constitution:
JV member's legal address in country of constitution:
JV member's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITT 3.6. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Procuring Entity, in accordance with ITT 3.8. 2. Included are the organizational chart and a list of Board of Directors.

FORM CON – 2

Historical Contract Non-Performance, Pending Litigation and Litigation History

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

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

Year of dispute	**Amount in dispute (currency)**	**Contract Identification**	**Total Contract Amount (currency), Kenya Shilling Equivalent (exchange rate)**
		Contract Identification: _____ Name of Procuring Entity: _____ Address of Procuring Entity: _____ Matter in dispute: _____ Party who initiated the dispute: ____ Status of dispute: _____	
		Contract Identification: Name of Procuring Entity: Address of Procuring Entity: Matter in dispute: Party who initiated the dispute: Status of dispute:	
Litigation History in accordance with Section III, Evaluation and Qualification Criteria			
☐ No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4. ☐ Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.			

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

FORM FIN – 3.1:

Financial Situation and Performance

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

4.4.1. 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)					

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**
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

*Refer to ITT 15 for the exchange rate

4.4.2 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		

4.4.3 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 in case of JV member, and not an affiliated entity (such as parent company or group member).

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

(c) be complete, including all notes to the financial statements.

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

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

[1] If the most recent set of financial statements is for a period earlier than 12 months from the date of Tender, the reason for this should be justified.

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.

FORM FIN – 3.3:

Financial Resources

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

Financial Resources		
No.	**Source of financing**	**Amount (Kenya Shilling equivalent)**
1		
2		
3		

FORM FIN – 3.4:

Current Contract Commitments / Works in Progress

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

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

FORM EXP - 4.1

General Construction Experience

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

Page _____of _____pages

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

FORM EXP - 4.2(a)

Specific Construction and Contract Management Experience

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

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

FORM EXP - 4.2 (a) (cont.)

Specific Construction and Contract Management Experience (cont.)

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	

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 per ITT 34): _____
ITT No. and title: _____

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

1. Key Activity No One: _ _____

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

[2] If applicable

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

2. Activity No. Two
3. ……

OTHER FORMS

FORM OF TENDER
(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)

INSTRUCTIONS TO TENDERERS

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

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.

Tenderer must complete and sign CERTIFICATE OF INDEPENDENT TENDER DETERMINATION and the SELF DECLARATION FORMS OF THE TENDERER as listed under (s) 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,

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.

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

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.

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.

We, the undersigned, further declare that:
No reservations: We have examined and have no reservations to the tender document, including Addenda issued in accordance with ITT 28;
Eligibility: We meet the eligibility requirements and have no conflict of interest in accordance with ITT 3 and 4;
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;
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];*

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 Option 1, in case of one lot: Total price is: [*insert the total price of the Tender in words and figures, indicating the various amounts and the respective currencies*]; Or

Option 2, in case of multiple lots:

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

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*];

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

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

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*];

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;

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

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 ITT 3.4, other than alternative Tenders submitted in accordance with ITT 13.3;

Suspension and Debarment: We, along with any of our subcontractors, suppliers, Project Manager, 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.

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 3.8*];

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.")

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;

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;

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;

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.

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.

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.

We, the Tenderer, have duly completed, signed and stamped the following Forms as part of our Tender:
Tenderer's Eligibility; Confidential Business Questionnaire – to establish we are not in any conflict to interest.
Certificate of Independent Tender Determination – to declare that we completed the tender without colluding with other tenderers.
Self-Declaration of the Tenderer – to declare that we will, if awarded a contract, not engage in any form of fraud and corruption.
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.*

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.

(a) **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.	Country City Location Building Floor Postal Address 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

Sole Proprietor, provide the following details.

Name in full_____Age_____ Nationality_ _____Country of Origin_____ Citizenship __ _____

Partnership, provide the following details.

	Names of Partners	Nationality	Citizenship	% Shares owned
1				
2				
3				

Registered Company, provide the following details.

Private or public Company_____

State the nominal and issued capital of the Company_____

Nominal Kenya Shillings (Equivalent)..... Issued Kenya Shillings

(Equivalent).....

Give details of Directors as follows.

	Names of Director	Nationality	Citizenship	% Shares owned
1				
2				
3				

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

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			

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.		

	Type of Conflict	Disclosure YES OR NO	If YES provide details of the relationship with Tenderer
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 the 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.		

f) 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)*

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:

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

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

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

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:
has been requested to submit a Tender in response to this request for tenders;
could potentially submit a tender in response to this request for tenders, based on their qualifications, abilities or experience;

The Tenderer discloses that [check one of the following, as applicable:
The Tenderer has arrived at the Tender independently from, and without consultation, communication, agreement or arrangement with, any competitor;
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;

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:
prices;
methods, factors or formulas used to calculate prices;
the intention or decision to submit, or not to submit, a tender; or
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;

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;

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 PROCUREMENTAND ASSET DISPOSALACT 2015.

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

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.

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

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 PERSON/TENDERER WILL NOT ENGAGE IN ANY CORRUPT OR FRAUDULENT PRACTICE

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

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.

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.

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)

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

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……

APPENDIX 1- FRAUD AND CORRUPTION

(Appendix 1 shall not be modified)

Purpose

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.

Requirements

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.

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: -

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;

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

Without limiting the generality of the subsection (1) and (2), the person shall be: -

disqualified from entering into a contract for a procurement or asset disposal proceeding; or

if a contract has already been entered into with the person, the contract shall be voidable;

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

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: -

shall not take part in the procurement proceedings;

shall not, after a procurement contract has been entered into, take part in any decision relating to the procurement or contract; and

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.

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;

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

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

Defines broadly, for the purposes of the above provisions, the terms set forth below as follows:

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

"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;

“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;
“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;
“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.

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.

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;

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;

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

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

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

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

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

Beneficiary:_____

Request forTenders No:

_____

Date:_____

TENDER GUARANTEE No.:_____

Guarantor: _____

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

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

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of_____(_____) 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.

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.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above onor 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.: _____

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").

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 __.

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

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

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.

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.

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.

TENDER-SECURING DECLARATION FORM

[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:

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

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.

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

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

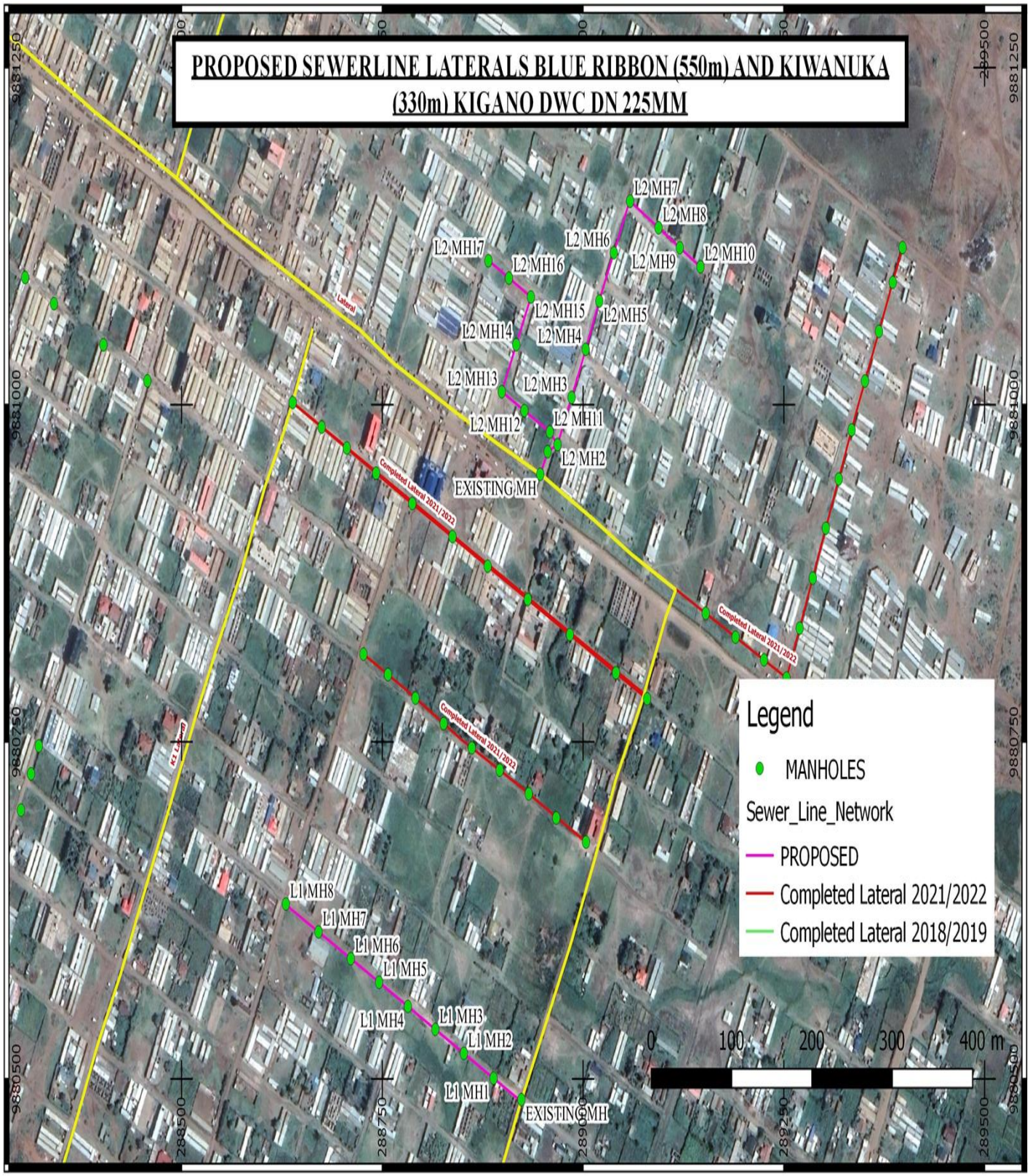
Summary of currencies of the Tender for_____*[insert name of Section of the Works]*

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]

PART II - WORK REQUIREMENTS

SECTION V – DRAWINGS

Attached to this tender document as annex 1


PROPOSED SEWERLINE LATERALS BLUE RIBBON (550m) AND KIWANUKA (330m) KIGANO DWC DN 225MM
L2 MH7
L2 MH8
L2 MH6
L2 MH9
L2 MH10
L2 MH17
L2 MH16
L2 MH15
L2 MH5
L2 MH14
L2 MH4
L2 MH13
L2 MH3
L2 MH12
L2 MH11
L2 MH2
EXISTING MH
Lateral
Completed Lateral 2021/2022
Completed Lateral 2021/2022
Completed Lateral 2021/2022
Completed Lateral 2021/2022
L1 MH8
L1 MH7
L1 MH6
L1 MH5
L1 MH4
L1 MH3
L1 MH2
L1 MH1
EXISTING MH
Legend
MANHOLES
Sewer_Line_Network
PROPOSED
Completed Lateral 2021/2022
Completed Lateral 2018/2019
0
100
200
300
400 m
9881250
9881000
9880750
9880500
288500
288750
289000
289250
289500

SECTION VI - SPECIFICATIONS

CONTENTS

CHAPTER 1 GENERAL

CHAPTER 2 EARTHWORKS

CHAPTER 3 CONCRETE, REINFORCEMENT AND SHUTTERING

CHAPTER 4 PIPEWORK

CHAPTER 5 SEWERAGE, DRAINAGE AND ROAD PAVEMENT WORKS

CHAPTER 6 STANDARD SPECIFICATION REFERENCE NUMBERS

CHAPTER 1GENERAL

TABLE OF CONTENTS

CLAUSE NO.	DESCRIPTION	PAGE NO.
	DRAWINGS	1
	BENCH MARKS	1
	LEVELS AND DIMENSIONS	1
	PROGRAMME AND WORK SEQUENCE	1
	PROVISION OF FACILITIES FOR ENGINEER'S INSPECTION	2
	PROVISION OF LABOUR FOR ENGINEER'S REPRESENTATIVE	2
	FACILITIES FOR THE ENGINEER'S REPRESENTATIVE TO TAKE SAMPLES	2
	CONTRACTOR'S OFFICE	2
	WORKING HOURS	2
	ACCOMMODATION FOR EMPLOYEES	3
	PRECAUTIONS AGAINST CONTAMINATION OF THE WORKS	3
	SUPPLY OF ELECTRICITY	3
	SUPPLY OF WATER	3
	TELEPHONE	3
	FIRST AID OUTFITS.	4
	ACCESS ROADS	4
	FLAGGING, LIGHTING AND WATCHING	4
	TEMPORARY WORKS	4
	SURVEY BEACONS	5
	DAMAGE TO LANDS	5
	REINSTATEMENT OF ROADS AND FOOTWAYS	5
	PRIVATELY OWNED SERVICES	5
	ADDITIONAL LAND	5
	SUBMISSION OF SAMPLES	6
	PROCUREMENT OF MATERIALS AND MANUFACTURED ARTICLES	6
	TESTING OF MATERIALS AND MANUFACTURED ARTICLES BEFORE USE	6
	REJECTED MATERIALS	6
	QUALITY OF MATERIALS AND WORKMANSHIP	7
	STANDARDS	7
	INSPECTION BY ENGINEER DURING DEFECTS NOTIFICATION PERIOD	7
	OFFICE ACCOMMODATION FOR ENGINEER'S REPRESENTATIVE	7
	HOUSING FOR RESIDENT ENGINEER	8
	INSURANCE OF RESIDENT ENGINEER'S OFFICE, FURNITURE AND EQUIPMENT	9
	TRANSPORTATION FOR THE RESIDENT ENGINEER AND HIS STAFF	9
	SURVEY INSTRUMENTS AND EQUIPMENT	9
	GPS SURVEY SYSTEM	9
	CLEANING UP OF SITE	10
	BLASTING	10
	SIGN BOARDS	10
	COMPENSATION FOR LAND AND ENTRY UPON LAND	10
	ALTERATION AND PRESERVATION OF SERVICES	11
	CLOSURE OF ROADS	11
	LIAISON WITH GOVERNMENT AND POLICE OFFICIALS	11
	REGULATIONS OF LOCAL AUTHORITIES	11
	BUILDING REGULATIONS	12
	PHOTOGRAPHS	12

OPERATION AND MAINTENANCE MANUAL 12
TRAINING FOR THE EMPLOYER'S PERSONNEL 12
MISCELLANEOUS ACCOUNTS 12
ADVERTISEMENTS 12
ACCESS TO EXISTING FACILITIES 13
REMOVAL OF GOODS FROM EMPLOYER'S PREMISES 13
INTERRUPTION OF WATER SUPPLY 13
COPIES OF STANDARDS 14
SITE HEALTH AND SAFETY 14
COUNTERPART CONTRIBUTIONS 15
LOCAL TECHNICAL AGENCY 15
ENVIRONMENTAL PROTECTION 15
HIV-AIDS PREVENTION 19

CHAPTER 1 - GENERAL

DRAWINGS

The Drawings for this Contract are listed in Volume 1 of the Contract Document. The Bookof Drawings form Volume 3 of the Contract Documents. Where the Contractor is requiredto furnish drawings, they shall be provided in accordance with the Conditions of Contract and Contract Data.

The Contractor shall be responsible to supply as built drawings of the constructed works.To this extent he will be required to provide the necessary survey and other data to mark-up the drawings and will provide one draughtsman (proficient in the use of AutoCAD) on acontinuous basis throughout the contract period to update the electronic copy drawings, under the direction of the Engineer's Representative.

BENCH MARKS

Benchmarks and points or origin for survey will on request be indicated to the Contractor on site by the Engineer's Representative. Where deemed appropriate or necessary the Engineer or Engineer's Representative may place Temporary Bench Marks (TBMs) to direct the Contractor in setting out the works. Upon the Contractor being shown the location on site of any TBM, the responsibility of protecting and preserving the same shallfrom that time onwards rest with the Contractor and the Contractor shall at his own expense re-locate and replace any such TBM which shall for any reason be displaced or removed from its original location.

LEVELS AND DIMENSIONS

The levels of the ground and the levels and dimensions of the natural features are believed but are not guaranteed to be correct. Wherever dimensions or levels are markedon the Drawings, such dimensions or levels shall take precedence over dimensions scaled from Drawings and scaled dimensions shall be used only in the absence from the Drawings and/or elsewhere of other information and then only on the written instruction todo so from the Engineer or Engineer's Representative. Large scale Drawings shall be taken in preference to Drawings of a smaller scale.

PROGRAMME AND WORK SEQUENCE

The Programme shall be drawn up in accordance with the Conditions of Contract using the Programme Evaluation and Review Technique (PERT) or the Critical Path Method (CPM). No other form of Programme shall be allowed or approved.

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 sameheads of items of work as are used in the Programme.

The Programme shall include as a minimum the following activities:

Confirmation of Quantities and Placing of Orders

Erection of materials storage facilities

Local procurement of major materials

Offshore procurement of major materials

Manufacture/Preparation for shipping

Shipping

Clearing at Port, transport to site and offloading to appropriate storagefacilities.

Mobilisation to commence Works on Site

Sequence of work

Major elements of work on Site, in sufficient itemisation to allow for continuousmonitoring of progress of Works

Tests on Completion

The Contractor shall construct the works as summarised in the Invitation to Tender and asdetailed in the drawings, Bill of Quantities and Technical Specifications upon mobilisation on site.

Those works that do not interfere with the existing operations shall be executed with maximum expedition, to the satisfaction of the Engineer, utilising such levels of Contractor's Equipment and labour as shall be necessary for the most rapid completion. Those works that interfere with the existing operations or require temporary closure of theexisting supply will only commence once the final extent is agreed between the Engineerand the Contractor and all necessary materials have been received on site. In this regard attention is drawn to Clause 552 of these Technical Specifications with regard to interconnections between existing and new pipework.

The Contractor shall be deemed to have allowed for the above in all aspects of the tender.

PROVISION OF FACILITIES FOR ENGINEER'S INSPECTION

The Contractor shall provide the necessary tackle, access and labour to enable the Engineer and/or the Engineer's Representative conveniently to carry out such inspectionsas they deem necessary at all times during the currency of the Contract.

PROVISION OF LABOUR FOR ENGINEER'S REPRESENTATIVE

The Contractor shall provide all such labour and assistance as required by the Engineer or the Engineer's Representative and his staff and payment of the same shall be made through the appropriate items in the Bills of Quantities.

FACILITIES FOR THE ENGINEER'S REPRESENTATIVE TO TAKE SAMPLES

The Contractor shall provide all facilities and equipment for the Engineer's Representativeto take samples for testing of any of the materials. Such samples may be taken before incorporation into the works or at any time during Construction, at the discretion of the Engineer's Representative.

No claims for delays due to the taking of samples by the Engineer's Representative will beallowed.

The taking of any samples by the Engineer's Representative shall not relieve the Contractor of his responsibility that all materials and workmanship comply with thespecification, nor shall it relieve the Contractor for any of his duties under the Contract.

CONTRACTOR'S OFFICE

The Contractor shall provide and maintain an office on or near the Works on Site approved by the Engineer for the use of his Agent, where written instructions may be delivered by the Engineer's Representative and in such cases, will be deemed to have been delivered to the Contractor. This office shall be open during the Contractors workinghours and shall when open have at least one person present whom the Contractor has authorised to receive on his behalf correspondence or written messages.

WORKING HOURS

The Engineer’s normal working hours shall be defined as 7.00 to 17.00 on weekdays and 8.00 to 12.00 on Saturdays. Sundays shall be set aside for rest. If the Contractor wishes to execute permanent works outside these hours, he shall obtain written permission fromthe Engineer at least one full working day in advance to enable the Engineer to make provision for supervision of such work. Payment for the overtime of the Engineer’s staff

shall then be reimbursed in full by the Contractor to the Engineer, including the approved percentage for administrative overheads.

If the Contractor wishes to execute works on a regular basis outside the Engineer's normal working hours over a prolonged period, the Engineer may, if he deems necessary, employ additional supervisory staff for which the required salaries including the approved percentage for administrative overheads shall be reimbursed in full by the Contractor to the Engineer and the Contractor shall provide the required adequate accommodation facilities for such staff at his own cost.

The Contractor shall not be reimbursed any of these costs.

ACCOMMODATION FOR EMPLOYEES

The Contractor shall provide and maintain sufficient suitable adequately ventilated and weather-proof shelters and mess rooms for his workmen, together with a sufficient number of proper latrines which shall be properly and regularly cleansed and kept in thoroughly sanitary conditions and adequately screened from public view.

Camps for workmen, if provided, shall comply with all relevant Government Regulations and shall be laid out in an approved and orderly manner.

Proper provision shall be made for the disposal of all waste and refuse, and there shall be an adequate supply of water for washing, cooking and drinking purposes. Quarters shall be properly ventilated and lighted, and the whole camp shall be maintained and cleansed at all times to the satisfaction of the Government Medical Officer of Health and the Employer.

PRECAUTIONS AGAINST CONTAMINATION OF THE WORKS

The Contractor shall at all times take every precaution against contamination of the Works. He shall give strict instructions to all persons employed by him to use the sanitary accommodation provided. the Conditions of Contract will be rigidly enforced in any case where these instructions are disobeyed.

SUPPLY OF ELECTRICITY

The Contractor shall supply and maintain an adequate and permanent (continuous) source of electricity to the offices, laboratories and accommodation to be provided for the Engineer's staff under this Contract.

Save as is otherwise provided for in the Contract, the Contractor shall make his own arrangements for the provision of electricity for use in the execution of the Works, both Temporary and Permanent, for the work of any Sub-Contractors.

SUPPLY OF WATER

The Contractor shall supply and maintain an adequate and permanent (continuous) source of potable water to the offices, laboratories and accommodation to be provided for the Engineer's staff under this Contract.

Save as is otherwise provided for in the Contract, the Contractor shall provide at his cost and arrange for all water required for the execution of the Works and ensure that is of a quality such that it will have no deleterious effects on the Works.

The Contractor shall submit proposals to the Engineer for the provision and maintenance of the supply of potable water and these proposals shall be approved by the Engineer before any Works are commenced.

TELEPHONE

The Contractor shall provide and maintain on the Site for the duration of the Contract a telephone for the exclusive use of the Engineer's Representative and his staff.

The Contractor shall pay the cost of all incurred expenses through installations, hire or purchase, and usage by the Engineer or his staff for the duration of the Contract period, and four weeks thereafter, and for the subsequent removal or reinstallation, and all of these costs shall be reimbursed to the Contractor, together with the percentage adjust- ment applicable, under the relevant Bill of Quantities Items.

FIRST AID OUTFITS

During the progress of the Works the Contractor shall at each place of work provide an adequate First Aid Outfit which shall be easily accessible at all times, and which shall include the following:-

Range of bandage sizes	plasters
Antiseptic ointment	thermometers
Scissors	cotton wool
Aspirins	safety pins
Anti-malaria tablets	sticking plasters.

and shall replenish and maintain as use demands, at his own cost. The provision of thesekits shall be considered part of the Contractor's obligations in setting up his camp. The first aid kits shall be available for use by the Engineer's staff as well as the Contractor's staff on site of the works, at camps and wherever the Contractor's staff may regularly liveand work. The Contractor shall ensure that there are persons available to all such placeswith knowledge of simple first aid procedures.

ACCESS ROADS

Having regard to the Conditions of Contract, the Contractor shall at his own cost undertake such improvements to or construction of drainage culverts on the unsurfaced roads and shall be responsible for maintaining these roads for the duration of the Contract in so far as these improvements or the maintenance is necessary for compliance with therelevant Clause.

All such improvements, constructions and maintenance shall be to the satisfaction of the Engineer's Representative and the relevant authorities, and no improvement or construction shall be carried out without prior approval by the Engineer's Representative of the Contractor's proposals. At the end of the Contract, the unsurfaced roads shall be brought back to a standard not less than that existing at the beginning of the Contract.

The Contractor shall construct and maintain such additional temporary access roads andshall make any improvements to the standards of existing roads (subject to the approval of the relevant authorities) as may be necessary for carrying out the Works, the cost of which is to be included in his rates.

FLAGGING, LIGHTING AND WATCHING

The Contractor shall be responsible for properly watching and lighting the Works even where they are on enclosed land, and shall allow for the same within his rates.

In this matter and as to flagging and traffic control he shall comply with the requirements of the Employer, the Police and/or the competent Authority. Prior to the commencement ofany works across or alongside public roads the Contractor shall obtain the approval of theEngineer's Representative of his plans for flagging and traffic control.

TEMPORARY WORKS

The Contractor shall provide, maintain and remove on completion of the Works alltemporary Works including roadways, sleeper tracks and staging, etc. over roads, footpaths, streams or unstable ground and he shall make them safe and suitable in everyrespect 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 hisapproval, which when approved, shall not relieve the Contractor of complete responsibility for their safety and satisfactory operation.

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 Engineerof the need to interfere with any beacon. The Engineer shall be responsible for 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 by the Contractor he shall forthwith report the damage to the Engineer and the relevant authorities and shall be held liable for the cost of reinstatement thereof.

DAMAGE TO LANDS

Except where necessary 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 ofthe Site, or elsewhere. In the event the Contractor encounters conditions under which heconsiders such interference necessary, he shall forthwith notify the Engineer'sRepresentative who shall direct the Contractor either on the manner of execution of the Works such as to avoid or render negligible such interference, or otherwise make the necessary arrangements with the owners of the property in question and thereafter give approval to the Contractor to proceed with the interference but to the minimum extent possible given the nature of the works and the usual or customary methods of executing such works.

Where damage or interference as above is occasioned to crops, trees, buildings or shelters, or other things and improvements to the land of economic value and not readily reinstated, the Engineer shall liaise with the relevant authorities for evaluation of the damage and thereafter, the owner shall be compensated by the Contractor, and the Contractor reimbursed under the relevant item in the Bills of Quantities. However interference with fences, grass, unlined channels etc. shall be made good with due dispatch and to the satisfaction of the owner and the Engineer and the Contractor shall allow for the same within his rates.

REINSTATEMENT OF ROADS AND FOOTWAYS

The opening up of public roads and reinstatement of the same shall in all respects be carried out to the requirements of the relevant authority. The Contractor shall beresponsible for liaison, co-ordination and arrangements with the relevant authority in the obtaining of consents, payment of fees and all manner of things necessary to comply withthe lawful orders of the relevant authorities and the Contractor shall allow for the same within his rates.

PRIVATELY OWNED SERVICES

If any privately owned service, on, about or through the Site will be affected by the Works,the Contractor shall provide a satisfactory alternative service in full working order to the satisfaction of the owner of the service and the Engineer, before the cutting off of the existing services.

ADDITIONAL LAND

The Contractor shall select and arrange at his own expense for any temporary occupationof land outside the Site which he requires for the efficient execution of the Works. The Contractor must comply fully with all Bye-Laws and Regulations currently in force in the area.

SUBMISSION OF SAMPLES

Before the supply of any materials or articles which he intends to incorporate into the Permanent Works, the Contractor shall submit to the Engineers Representative for his approval a sample of each respective material or article, and such samples shall be delivered to and kept at his Office for reference. Should the samples be considered by theEngineer's Representative to be unsuitable for the purpose intended, or not to comply withthe Specification or the nominated Standard Specification the Contractor shall submit samples of the materials or articles from a different source for approval. All the respectivekinds 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 it represents. The Engineer's Representative may decide themethod by which each sample to be taken from the bulk shall be obtained and the numberof such samples. The Contractor shall allow for complying with the provisions of this Clause within his rates.

PROCUREMENT OF MATERIALS AND MANUFACTURED ARTICLES

The responsibility for so ordering and delivering materials and manufactured articles and samples so that they may be tested sufficiently far in advance of the Work so 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 payment of anycosts he may incur as the result thereof.

With regard to any item in the Bills of Quantities which is the subject of a Provisional Sum,the Engineer shall notify the Contractor of his requirements in ample time for the Contractor to make any necessary arrangements so that no delay occurs in the progressof the Works. The Contractor shall be deemed to have allowed for compliance with the provisions of this clause within his Tender.

TESTING OF MATERIALS AND MANUFACTURED ARTICLES BEFORE USE

Any or all of the materials and manufactured articles supplied by the Contractor for use onany of the Works shall be subject in advance to such tests as may be specified in the relevant Specification or as may from time to time be deemed necessary by the Engineerwho may choose to witness the same. All costs (incl. business class flights for 3 persons,accommodation, transport, subsistence allowance) incurred during witness testing shall be borne by the Contractor and paid for under the relevant bill item.

Samples of materials and manufactured articles together with all the necessary labour, materials, equipment and apparatus for sampling and carrying out of tests on the Site shall be supplied by the Contractor at his own expense. The cost of special tests orderedby the Engineer to be carried out by an independent person at a place other than the Siteor place of manufacture or fabrication shall be borne by the Employer, provided the tests show that the materials, articles or workmanship are in accordance with the Specification,otherwise the cost of such special tests shall be borne by the Contractor.

REJECTED MATERIALS

Should any materials or manufactured articles be brought on to the Site of the Works by the Contractor which are in the judgement of the Engineer unsound or of inferior quality including defects or damage sustained in transit or in any way unsuited for the Works in which it is proposed to employ them, such materials or manufactured articles shall not beused 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.

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 word "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.

STANDARDS

The Contractor shall observe these Specifications and shall carry out all work in a skilled and workmanlike manner in keeping with the customs of the trade, and modern methods of construction engineering. In addition, the Contractor shall conform with all conditions, regulations, laws and by-laws currently in force in the country with regard to the execution of construction work and shall follow all instructions issued by the competent Authorities and the Engineer.

The Tenderer shall at his discretion base his tender on Standard Specifications generally used or approved save that where a relevant Standard Specification issued by the local Bureau of Standard exists at the date of submission of tenders such a Standard should as a minimum be complied with. Where no local Standard Specification exists, then the relevant standard specification issued by the International Standard Organisation (ISO), if any, shall be the minimum to be complied with. Where a national standard other than a local Standard is referred to in addition to ISO this indicates that such national standard may expand or strengthen further the requirements of ISO. Where Standard Specifications are referred to in the Text of this Specification this is done by reference to a Standard Specification Reference Number (SSRN).

A table of comparison is provided in Chapter 10 of this Section where the SSRN is cross-referenced to ISO and to national standards that will be accepted in their English version by the Employer as providing for the quality of workmanship etc. required.

The Contractor shall have indicated in his tender the Standard Specification to which the particular item to be supplied complies, or where it meets the requirements of a national standard not so specified, this standard shall be indicated. In this event two copies in English of the alternative standard offered should have accompanied the tender and shall be subject to the approval of the Engineer.

In the event that at the time of tender the Contractor had neglected to nominate the Standard Specification to which any particular item to be supplied shall comply, and there is no relevant local standard or ISO standard for the item, then the Engineer may at his sole discretion and without extra cost to the Employer instruct the Contractor on the national standard to be adopted in the manufacture supply and erection etc. of the item and the works associated with the item.

INSPECTION BY ENGINEER DURING DEFECTS NOTIFICATION PERIOD

The Engineer will give the Contractor due notice of his intention to carry out any inspection during the Defects Notification 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. Provided however that no notice shall be required in the event that at the time of the inspection there shall be any part of the Works that have yet to be Taken Over.

OFFICE ACCOMMODATION FOR ENGINEER'S REPRESENTATIVE

The Contractor shall, if so required, provide suitable office accommodation in an approved position on the Site, for the sole use of the Engineer's Representative and his

Staff. The offices shall be established at the commencement of the Works and shall be occupied by the Engineer's Representative until one month after issue of the Taking-OverCertificate.

The office shall be constructed as per the drawing and/or bill item description, and shall beready for occupation within 9 weeks of the order to commence issued by the Engineer.

The Contractor shall provide within the office in the appropriate rooms a water closet complete, wash hand basin, towel and toilet roll holder, kitchen sink and formica topped working surface. The facilities shall be connected to a potable supply of piped water and suitable sewerage collection of disposal facility.

All doors shall be lockable and supplied with at least two keys. The external main door shall be fitted with a "Yale" type lock.

The whole of the accommodation shall be water tight and weather- proof and shall be adequately ventilated, insulated, lighted, painted, burglar-proof and fitted with secure doors and window fastenings. It shall be adequately wired for electric light and power. Suitable access for vehicles shall be provided, including a parking space with a light roof to hold not less than two cars.

All of the facilities provided as herein above described shall be paid for under the item in the Bills of Quantity for provision of office accommodation for the Engineer’s staff.

The Contractor shall ensure the regular supply of water and electricity services to the office. The office, including lavatory, shall be cleaned daily and shall be provided and maintained for the duration of the Contract. A supply of lavatory paper, soap and towels isto be provided and maintained, clean towels to be supplied each day. Two portable fire extinguishers (5 litres) and two first aid kits shall be provided and maintained. Day and night security shall be provided for the office as well as a secretary who can speak and write English and use MS Office software. The Contractor will be paid for these services under the item for maintenance of offices in the Bills of Quantities.

The Contractor is also to provide the office furniture and equipment as directed by the Engineer’s Representative. These items shall be reimbursed at cost together with the appropriate adjustment in the Bills of Quantities.

The Contractor shall also supply stationery as required by the Engineer’s Representative,and be reimbursed the costs in this respect together with the appropriate adjustment in the Bills of Quantities.

The site office, furniture and equipment shall revert to the Employer one month after completion of the Works, unless stated otherwise in the relevant bill items.

HOUSING FOR RESIDENT ENGINEER

If so required, the Contractor shall rent approved furnished accommodation, and acquire,refurbish and furnish houses, for the exclusive use of the Resident Engineer and his staff,which shall be ready for occupation within 4 weeks of the order to commence work by theEngineer.

Alternatively if so required the Contractor shall construct accommodation to the dimensions shown on the drawings which shall be ready for occupation within 12 weeks ofthe order to commence work by the Engineer.

Prior to completion of such accommodation the Contractor shall rent approved furnished accommodation the cost of which shall be paid for from the Contract up until the due occupation date calculated as above.

The Contractor shall, if called upon to do so, provide security for the houses by night anda day servant and shall pay all costs of water, telephone, electricity and cooking gas for the houses. All minor maintenance to such of the Employer's houses as shall be in such use shall be carried out by the Contractor.

If so required, the Contractor shall provide field allowances to employees of the Employerseconded to the Resident Engineer's staff, at rates determined by the Engineer.

The above accommodation, services and allowances shall be provided up to one month after Taking-Over of the Works and the costs thereof shall be reimbursed to the Contractor, together with the appropriate adjustment, under the relevant items in the Billsof Quantities.

INSURANCE OF RESIDENT ENGINEER'S OFFICE, FURNITURE AND EQUIP-MENT

The buildings, furniture and equipment provided by the Contractor for the Resident Engineer's offices and accommodation shall be insured by the Contractor against loss or damage by accident, fire, and theft, for the duration of the Contract. Such insurance will be part of the "Insurance of the Works" provided for in the Conditions of Contract.

TRANSPORTATION FOR THE RESIDENT ENGINEER AND HIS STAFF

If so instructed, the Contractor shall procure vehicles for the use of the Resident Engineerand his staff. The Contractor shall pay all costs arising out of the running and main- tenance of the vehicles until one month after completion of the Works, and as directed bythe Engineer.

The costs of complying with this clause shall be reimbursed under the relevant Prime CostItem.

If so instructed, the Contractor shall also provide qualified drivers exclusively for the Resident Engineer, and the rate for this service shall include for payment of all overtime, allowances, etc. to the drivers.

SURVEY INSTRUMENTS AND EQUIPMENT

If so instructed, the Contractor shall provide for the exclusive use of the Engineer and hisstaff the following equipment:

	Item	No
(a)	Total Station c/w Tripod	1
(b)	Automatic Level and Tripod	1
(c)	Steel tapes, 100 m. long	2
(d)	Steel tapes, 50 m. long	2
(e)	Spirit Levels	1
(f)	Plumb bobs	1
(g)	Pocket tapes	2
(h)	Survey staff and ranging rods	2 each
(i)	Survey umbrellas	2

Other or additional equipment shall be provided by the Contractor if so requested for the occasional use of the Engineer without additional payment. In addition, experienced chainmen and if necessary labour for clearance of survey lines shall be provided by the Contractor when requested by the Engineer, at no extra cost.

The equipment shall revert to the Employer on completion of the Works and shall be properly maintained and replaced as necessary, by the Contractor.

GPS SURVEY SYSTEM

If required and indicated in the bills of quantities, the Contractor is to provide a compact, lightweight, and entry-level GPS survey system providing centimetre-level accuracy plus real-time navigation tools for job-site location and point reconnaissance (ProMark3 or similar approved) for use by the Engineer. The system should be capable of GPS SatelliteTracking with 10 Independent Channels, L1 C/A code and full wavelength carrier, WAAS/EGNOS Satellite Tracking, and 2 Additional independent channels. The system

should be supplied complete with post-processing software with a user-friendly Windowsinterface capable of survey mission planning, automatic vector processing, coordinate transformations and reporting. The static configuration will comprise two number receiver units and post processing software together with necessary tripods, survey rods, clamps and accessories.

CLEANING UP OF SITE

The Sites of all permanent and temporary works, including borrow areas and tips in connection with this Contract, are to be carefully cleaned up, and trimmed, and the Site isto be handed over to the Employer in a neat and clean condition to the satisfaction of theEngineer. Compliance with this Clause shall be a prerequisite condition for the issue of aTaking-Over Certificate.

BLASTING

Where the Contractor removes rock by blasting, the prior approval of the Engineer shall be obtained. In using explosives the Contractor shall abide by and conform to all the requirements of the Explosives Act of the country. He shall employ personnel licensed tohandle explosives. He shall take all practical precautions for the protection of person's properties and the Works.

If, in the opinion of the Engineer, further blasting will cause damage to natural strata or in situ material, or otherwise be detrimental to the works, blasting shall be stopped and excavation shall be completed by other suitable means. Great care shall be taken to seethan any surrounding rock is not shattered, particularly in the bottoms of trenches and foundations. All loose and shaken pieces of rock shall be removed.

In the event of explosives being required for the Work, the Contractor shall provide suitable magazines for the storage of all explosives, and in compliance with the relevant Explosives Act.

SIGN BOARDS

The Contractor shall provide, sign-write, erect and maintain until the expiry of the DefectsNotification Period sign boards of sound steel construction and hollow section steel uprights to the dimensions, sign-written and painted in durable colours, as directed by theEngineer. Such signboards shall be removed upon expiry of the Defects Notification Period, such removal being a pre-requisite for release of final retention money.

The signboards shall be as per the relevant standard drawing. The steel uprights shall beimbedded in Class 20 concrete of sufficient volume to give the whole assembly adequatestability.

COMPENSATION FOR LAND AND ENTRY UPON LAND

All land permanently used or occupied by the Works, as shown on the Drawings will be provided by the Employer, save that working width for pipe laying may be restricted to such areas as the Engineer may direct to minimise disruption of existing services and facilities.

The Contractors shall, subject to the approval of the Engineer, make his own arrangements for the acquisition of the land required for provision of his own offices, and for camp houses, workshops, stores, borrow pits, etc.

The Contractor shall not enter onto any land or commence any operations until such timethat all necessary compensation formalities have been completed and permission has been obtained from the landowner to enter the land and commence operations. Should the Contractor enter into any land or commence any operations without first obtaining thisconfirmation, he shall be liable in whole or in part at the sole discretion of the Engineer, forall additional costs and/or legal charges which might arise therefrom.

ALTERATION AND PRESERVATION OF SERVICES

The Contractor shall acquaint himself with the position of all existing works, such as sewers, water drains, cables for electricity and telephone line, telephone and lighting poles, water mains, etc. before any excavation or other work likely to affect the existing services is commenced.

Where work is being carried in the vicinity of overhead power lines, the Contractor is responsible for ensuring that all persons working in such areas are aware of the relativelylarge distance that high voltage can "short" to earth when cranes or other large masses ofsteel are in the vicinity of the power line. The Contractor's attention is drawn to SSRN 027which gives safe clearance to the various voltages.

The Contractor shall be held responsible for injury to existing works or services, and shallindemnify the Employer against any claims in this respect (including consequentialdamages).

In all cases where such existing works are exposed, they shall be properly shored or hungup. Special care must be exercised in re-filling to consolidate the ground under any maincables, etc. exposed and not to cover up water meters and surface boxes, etc. Poles supporting cables, adjacent to the Works, shall be kept securely in place until the work iscompleted, and shall then be made as safe and as permanent as before.

Notwithstanding the foregoing requirements, and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer immediately of any existing worksthat are exposed.

The Contractor shall be responsible for arranging for the moving of services, subject to theagreement of the Engineer, where necessitated by the Works, and shall pay for the moving of services or alteration to services such as power lines, telephone lines, water pipes, etc. A Provisional Sum for this work has been allowed for in the Bills of Quantities.The utilisation of that item shall be at the discretion of the Engineer who may direct that the work be done by others, or that the Contractor shall execute the work and be compensated on a daywork basis. Where the Contractor encounters conditions where thealteration and preservation of existing services is necessary, he shall at once inform the Engineer's Representative who shall then direct the Contractor on the means and methods of so doing.

CLOSURE OF ROADS

Where a road used by the Contractor for delivery of any material to be used in the Worksis closed by order of the Traffic Authorities, the Contractor shall obey such closure order and shall suspend operations or use an alternative route. The fact that the Contractor is performing work for the Government, will not give him any special privileges in this respect.

LIAISON WITH GOVERNMENT AND POLICE OFFICIALS

The Contractor shall keep in close contact with the Police and other Government officialsof the area regarding their requirements in the control of traffic and other matters and shallprovide all assistance or facilities which may be required by such officials in the executionof their duties, and shall provide in the unit rates or elsewhere in the Bills of Quantities forany expenses arising out of compliance with this Clause.

REGULATIONS OF LOCAL AUTHORITIES

The Contractor shall at all times conform to the lawful provisions of any ordinance and of any order, proclamation, rule or notice made under any ordinance relating to the Works, employment of labour, etc., and to any regulation and/or by-law of any local authority andof the water or electricity undertaker within whose area and jurisdiction the Works are to be executed.

BUILDING REGULATIONS

All buildings erected by the Contractor upon the Site and campsite or sites, and the layoutof the buildings and Sites shall comply with Laws of the country, and with all local by-lawsin so far as they are applicable.

PHOTOGRAPHS

The Contractor shall, if required, provide a digital camera and portable data transfer devices (flash disks) to the Engineer, and shall further bear the cost of printing the photographs. The costs to the Contractor of complying with this clause shall be paid through the relevant Bills of Quantity items.

OPERATION AND MAINTENANCE MANUAL

The Engineer will be compiling changes, alterations and additions to existing operation and maintenance manuals for use of the Employer's staff. To this end, the Contractor is required to provide in triplicate and in English details of all the different manufactured newPlant, materials and components incorporated in the Works including but not limited to all pertinent manufacturers' brochures. Reference is to be made to the relevant clauses in the Conditions of Contract and the E&M Specifications.

Taking-Over will not be considered until such detailed information as is required has beensubmitted to and accepted by the Engineer.

TRAINING FOR THE EMPLOYER'S PERSONNEL

The Contractor shall, if required, provide training to a number of the Employer's personnel,nominated by the Engineer during the construction of the Works. This shall include but not necessarily be limited to:- provision of a work gang or gangs with gangers or foremanto work alongside the Contractors staff in the fields of pipeline repair and the installation ofvalves, replacement consumer connections.

The Contractor shall also train the Employer's nominated personnel, as well as supervise the operation of the Works until the operators are fully conversant with the Plant. This training phase shall be conducted by a competent instructor(s) and shall include instructions in the operations and maintenance of the Works in accordance with aprogramme previously submitted to and approved by the Engineer. Refer also to the relevant E&M Specification.

MISCELLANEOUS ACCOUNTS

The Contractor may be instructed by the Engineer to purchase and supply to theEngineer, or pay on his behalf for miscellaneous items including but not limited to stores,equipment, computer wares and training, hotel accommodation, services and the like. TheContractor shall submit, once a month, a miscellaneous account including receipts for all such items purchased or paid for, whose reimbursement is to be included in the Interim Certificate.

ADVERTISEMENTS

The Contractor shall not erect, cause to be erected or allow to be erected any plaque, sign, poster, banner or the like, intended to or having the effect of advertising the identity of the Contractor, his Subcontractors, or the manufacturers of Plant or materials for the Works on or about the site, without the authority of the Employer.

The provisions of this Clause shall not however apply to:
Plaques affixed to Plant; or
Inscriptions on Plant and materials

which are affixed and inscribed during manufacture in order to provide a means of identification of the brand and make of manufactured articles.

ACCESS TO EXISTING FACILITIES

Where necessary for the execution of the Works, the Contractor and his employees shall be granted access to enclosed and fenced off areas which belong to the Employer and are in use for the abstraction, treatment, storage and conveyance of water.

Such access shall be limited to the strict requirements for carrying out of the Works without delay, but shall not constitute free and unhindered access to any and all parts of such premises, nor shall it constitute authority for access at any and all times.

Access to such premises shall be limited to:-

The Contractor's senior and responsible staff not normally engaged upon the Workson site but who are employed by the Contractor in a capacity related to the Works;

A reasonable number of site supervisory staff who shall oversee erection and construction work;

Organised gangs of technicians, artisans, workmen and labour, who shall enter thepremises, work therein and leave as a group or groups, each group being under thesupervision of a previously nominated person; and

Crews operating Contractor's Equipment who shall remain with their piece ofequipment whilst upon such premises.

Unless otherwise specified, any authorities provided for access to such premises shall bedeemed to be restricted to the Contractor's normal working hours, with the addition of reasonable times for entering the premises to prepare to start work, leaving the premises on close of work for the day, and for work which may continue during normal meal or recess breaks. Access at other times shall not however be unreasonably denied.

The Contractor shall apply for access during normal working hours (and such extensionsthereto as shall not require specific approval as specified above) at least seven days before work commences on such premises, and provide in his application:-

The estimated duration of the need for such access, in weeks;

The normal working hours which shall be in effect;

The names of the supervisory staff who shall be responsible for and who shall enterand leave with the working gangs;

The areas in which work shall be carried out; and

The approximate numbers of workmen in such working gangs.

Applications for access outside the above times shall be by at least three days notice, which notice shall be deemed to be approved if it is not rejected within two days of submission.

REMOVAL OF GOODS FROM EMPLOYER'S PREMISES

The Employer's staff at any of the Employer's premises shall be entitled to demand and tobe provided with written descriptions of any goods removed from within the Employer's premises, whether the goods belong to the Employer or not.

The Employer's staff shall be permitted and assisted by the Contractor and his employees to determine that the description of such goods is true and accurate including theinspection of vehicles and the opening up of any containers, parcels or wrappings.

INTERRUPTION OF WATER SUPPLY

Where it is necessary for the supply of water by the Employer using existing facilities in and about the site to be reduced or interrupted in order for the Contractor to replace or repair existing facilities, or install new Plant or material, hereinafter called "Disruption", then the Contractor shall only be permitted to use methods of work, types and numbers ofEquipment and levels of staff and labour which will result in minimum Disruption.

The Contractor's proposals for the execution of such works shall be subject to the Engineer's approval, and the Engineer shall not be required to consider the costs to the Contractor, (including payments for overtime to the Contractor's personnel) or the convenience to the Contractor of particular sequencing of work, where such considerations conflict with the Employer's need to limit the extent of Disruption.

The Contractor shall indicate in the Programme submitted pursuant to Conditions of Contract Clause 27 the approximate dates and durations of Disruption, and shall, during the execution of the Works, notify the Engineer forthwith of any circumstances which arisewhich may affect the expected dates of such Disruptions.

At least 14 days before any Disruption proposed by the Contractor, the Contractor shall submit to the Engineer for his approval his plan for works associated with the Disruption and details of the dates and times intended for such Disruption. The Engineer shall within7 days of such submissions:

Inform the Contractor of the dates and times when such Disruption will be permitted,which shall be not more than 3 days before or 7 days after the dates proposed by the Contractor;

Instruct the Contractor on the methods of work and types and numbers of Equipment and labour to be employed on such works, or otherwise grant approval for the Contractor's plan; and

Provide the Contractor with the text of a notice by the Employer to the public of the intended Disruption.

The Engineer may otherwise instruct the Contractor that the Disruption shall be on dates more than 7 days after the dates proposed by the Contractor in which case the period in excess of 7 days shall be deemed to be a Suspension.

Approval for Disruption may be withheld at the Contractors responsibility, if in the opinion of the Engineer the Contractor cannot execute the works associated with the Disruption inaccordance with the Engineer's requirements. Notification of such withholding of approvalsuch be accompanied with a description of the reasons therefore, and instructions on the action to be taken by the Contractor before approval is given.

The Contractor shall publish the Employer’s notice to the public on the dates one and twodays before the commencement of the Disruption in three national newspapers at a minimum of quarter page size.

The costs and effects of compliance with this Clause (save for any Suspensions) shall bedeemed to have been allowed for in the Contractor's rates and prices, and in the time for completion.

COPIES OF STANDARDS

Within 60 days of the acceptance of the Tender, the Contractor shall provide to the Engineer copies of all National and International Standards which are to apply to the Plant, materials and workmanship under the Contract, together with an Index cross- referencing these standards with the applicable aspects of the Works.

Three sets of such standards securely bound are to be provided.

SITE HEALTH AND SAFETY

The Contractor shall observe and cause his employees to observe health and safety standards commensurate with the nature of the Works and in accordance to health and safety regulations of the country. To this end the Contractor shall appoint as Safety Officerone of his senior staff who shall have specific knowledge of safety regulations and have had experience of safety precautions on similar works and who shall advise the Contractor on all aspects of safety and health on Site.

The Contractor shall provide his employees with:

overalls, boots or shoes with reinforced toe caps

hard hats suitable for a construction site

other protective equipment such as gloves, earmuffs, goggles, etc. as are necessaryfor particular work

adequate sanitary facilities and maintenance of these in a clean and hygienic state for use by all persons employed by the Employer, Engineer, Contractor or other contractors on the Site

reporting details of any accident to the Engineer as soon as possible after its occurrence

reasonable prevention of non-site personnel from entering the work areas.

The Contractor shall further provide hard hats for the Resident Engineer and his staff, andfor the use of site visitors up to ten in number.

The Contractor is required to produce a Health and Safety Plan covering the hazards thatmay apply during the Contract, the rules and standards to be used in assessing risk and inundertaking work and the methods that he will employ to ensure compliance with his plan.

The Health and Safety Plan shall include details of the following:

Details of all potential risks and the proposals for dealing with such hazards

Controls to regulate risks which occur during all construction, testing andcommissioning activities

Measures to avoid health risk in connection with the use, handling, storage andtransportation of hazardous and harmful substances

Safety equipment and training proposals in respect of equipment referred to above

No work shall be permitted to be executed unless the Engineer is satisfied that appropriate safety measures are in place and that the Contractor's employees are wearingsuitable safety gear. The costs and effects of compliance with this Clause shall be deemed to have been allowed for in the Contractors rates and prices.

COUNTERPART CONTRIBUTIONS

The Employer may provide certain counterpart contributions to the Works but shall where the contributions would affect the progress of the Works receive from the Contractor ample notice in this regard. Such counterpart contributions may include the obtaining of way leaves and rights of way, and purchases of land.

LOCAL TECHNICAL AGENCY

The Manufacturer of the Pumps and Motors and of the Electrical Switchgear supplied under this contract will be expected to have, or shall prior to award undertake to appoint alocal (based in the project country) representative with proven technical competence in the electro-mechanical field. The level of competence shall be such that if the Employer should decide to enter into a service or service/training contract for the maintenance of the equipment indicated here, then it would be practicable to do so. The Local Agents will beexpected to have in their stores and workshop a sufficient quantity of the relevant spare parts, the necessary equipment and tools to service/ maintain the proposed Mechanical and Electrical Plant and suitably qualified and trained personnel to perform the required service/ maintenance works.

ENVIRONMENTAL PROTECTION

With reference to the Conditions of Contract and in order to mitigate the potentially adverse environmental impacts of the proposed rehabilitation works, the Contractor shallexecute the Works in accordance with the Kenya National Environmental Management Agency (NEMA) requirements and the following technical and operational guidelines:

Waste Management, Health and Safety

The relevant national and local authority's approved disposal methods forwastes shall be used.

Waste dumping sites shall not be located in wildlife areas, wetlands, settledareas, cultural heritage and scenic sites

Waste in abandoned mobile camps shall be buried or incinerated

Training in the proper operation and maintenance of the extended andrehabilitated network facilities shall be an integral part of the programme

Water Resources Management

The Contractor shall at all costs avoid conflict with water demands of local communities

Abstraction of both surface and groundwater shall only be done in consultation with the local community and after obtaining a permit from the relevant water authority

Abstraction of water from wetlands shall be avoided

No construction water containing spills or site effluents especially cement and oil shall be allowed to flow into natural water draining courses

Wash water from washing out equipment shall not be discharged into water-course or road drains

Site spoils and temporary stockpiles shall be located away from drainage systems and surface runoff shall be directed away from stockpiles to preventerosion

Site Installation

Location

Work camp sites shall be located no less than 2.5 km from any surface water sources

The location of work camp sites within the boundaries of local authorities shall be done with permission from the authority and/or the local communities

Work camp sites shall not be located in cultural heritage sites. A management plan for restoration when abandoning the site shall be outlined

Drainage

Work camp sites shall have perimeter drains. The perimeter drains shallbe excavated outside the site fence

All drainage channels inside the site shall discharge the effluent into oilinterceptors

All buildings shall be surrounded by spoon drains

All sheds shall have spoon drains

Buildings

Buildings (which are to remain) shall be architectured and constructed ina manner that will facilitate conversion to social service facilities such asschools, clinics, etc. at the end of the works.

All Buildings in work and camp sites shall be approved by the Buildings Department

All sheds shall have concrete floors

Labour Camp Facilities

Labour camps shall have approved rubbish bays

Labour camps shall have toilet facilities approved by the Local Council Health Authorities

Labour camps shall have one toilet for every 10-15 persons

Pit Latrines shall be located no less than 250m in clay soils and 500m inloam soils and no less than 1000m in sandy soils from any wetland or water source.

Community Education

The Contractor shall provide awareness education on STDs and HIV/AIDS to local communities where significant social interaction between project workers and local communities is envisaged (see separate clause).

The Contractor shall provide information about his activities to local communities

Petroleum Products Handling

Transportation

Fuels shall be delivered to the sites by certified petroleum tankers

All petroleum tankers shall observe the regulations for transportation of petroleum products and the Traffic Act

Storage

Petrol shall only be stored in underground tanks

Diesel may be stored in skid tanks positioned in a bund wall

Underground tanks shall undergo regular pressure checks

Oils shall be stored in oil sheds with concrete floors

Dispensing and disposal

Petroleum kerb sites shall be located on concrete platforms andsurrounded by spoon drains

Approved dispensing equipment shall be used for dispensing petroleumproducts

Used oil shall be reused, recycled or incinerated

Empty PVC containers of petroleum products shall be reused, recycled,or incinerated

Sludge from petroleum storage tanks shall be incinerated

Material Mobilisation

Haulage

Haulage trucks carrying laterite or stone aggregate shall not exceed the speed limit of 60 km per hour on paved roads and 40 km per hour on gravel roads

The height of the loaded laterite or stone aggregate shall not exceed haulage truck sides

Haulage trucks carrying cement or lime shall be covered

Storage

Stock piles of materials exceeding 10 tons and which are potentially polluting/ contaminating shall stand for no longer than 30 days

The distance from the stock pile to the nearest community shall not be less than 2.5 km

The stock piles shall be located no less than 5 km from any surface water sources. The distance from the stockpile to the nearest wetland shall not be less than 5 km.

Stockpiles shall not be located on cultural heritage sites. The distance from the stock pile to the nearest cultural heritage site shall not be less than 5 km

Stock piles shall have perimeter drains and buffer vegetation

Cement and lime shall be stored in enclosed sheds

Material Handling

Appropriate equipment shall be used in handling of materials

The Contractor shall provide appropriate protective clothing to the workers handling hazardous and corrosive materials

Safety techniques and accident emergency measures shall be outlined to all workers

Plant/Equipment Operations

Noise Control

Noise from plant and equipment operations shall be limited to no more than 90 db in human settlements

Stationery Plant (generator) shall be noise masked

No plant and equipment (with noise levels exceeding 45 db) shall beoperated after 18:00 hrs near human settlements (i.e. within 1 km)

No plant and equipment shall operate without exhaust silencers

Plant and equipment speeds shall be limited to 60 km per hour

Emission Control

Plant and equipment exhaust pipes shall be fitted with catalytic conver-ters

Plant and equipment shall meet the national emission standards

Safety Control

Carrying of abnormal loads of plant and equipment shall be done whenthere is less traffic on the roads

All abnormal load carrying regulations shall be observed (Road TrafficRegulations)

Drainage, Excavations and Construction

All public water points shall be provided with appropriate drainage

No major drainage excavations shall be done in the rainy season

No excavations shall be done in gazetted cultural heritage sites

Borrow Pits (where applicable)

Borrow pits shall not be located near wetlands. The distance from the borrow pit to the nearest wetland shall not be less than 5 km

Contractors shall obtain licenses from the relevant authority to operate borrow pits

The location of borrow pits shall be subject to approval by relevant govern- ment departments and local communities in the areas in which they are located

Borrow pits shall preferably be located in less vegetated areas

Borrow pits shall be surrounded by perimeter drains

Borrow pit restoration plans shall be provided and approved by relevant government departments and local communities affected

Energy Acquisition

Firewood will be collected from dead wood

Permits for large quantities of firewood shall be obtained from the Forestry Department

Excess Materials

Excess materials of laterite, stone aggregate, concrete blocks, etc shall be removed from the work sites no longer than 2 weeks after completion of rehabilitation

Drainage Systems

Drainage systems shall not discharge into settled and cultivated areas

Drainage systems shall not discharge onto gazetted cultural heritage sites

De-vegetated Areas

All de-vegetated areas shall be replanted by the Contractor at the end of theworks

There shall be no vegetation clearing near surface water sources, catch- ment areas, wildlife habitats, cultural heritage and scenic sites. All relevant legislation to this effect shall be observed

Post Excavation Works

Borrow pits shall be restored at the end of rehabilitation and construction works

Permanent borrow pits shall have embankments turfed

Borrow pits in wildlife areas shall be restored at the end of the works unlessrequired as water reservoirs for wildlife

Restoration of borrow pits in settled areas shall be done only afterconsultations with local communities

Borrow pits left as community water reservoirs shall be drainable

Excavated and graded areas in cultural heritage and scenic sites shall berestored at the end of the works.

Abandoned Structures

Permanent works buildings in settled areas shall be handed over to local communities for conversion into social service facilities such as schools, clinics, etc.

The above notwithstanding, the Contractor shall comply with all require- ments of the national environmental laws.

No separate measurement and payment shall be made for complying with the environmental protection clauses. The cost of all work required by these clauses shall beincluded in the Contractor's rates for other items of work under this Contract.

HIV-AIDS PREVENTION

With reference to the Conditions of Contract HIV-AIDS Prevention the Contractor shall conduct an HIV-AIDS awareness programme via an approved service provider, and shallundertake such other measures to reduce the risk of the transfer of the HIV virus betweenand among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

The Contractor shall throughout the contract (including the Defects Notification Period):

conduct Information, Education and Consultation Communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labour (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers and crew making deliveries to Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behaviour with respect to of Sexually Transmitted Diseases (STD)—orSexually Transmitted Infections (STI) in general and HIV/AIDS in particular;

provide male or female condoms for all Site staff and labour as appropriate;and

provide for STI and HIV/AIDS screening, diagnosis, counselling and referralto a dedicated national STI and HIV/AIDS program, (unless otherwise agreed) of all Site staff and labour.

The Contractor shall include in the program to be submitted for the execution of the Worksunder Sub-Clause 8.3 of the Conditions of Contract an alleviation program for Site staff and labour and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI, STD and HIV/AIDS alleviation program shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For eachcomponent, the program shall detail the resources to be provided or utilized and any related sub-contracting proposed. The program shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this program shall not exceed the Provisional Sum dedicated for thispurpose.

CHAPTER 2 EARTHWORKS

TABLE OF CONTENTS

CLAUSE NO. DESCRIPTION PAGE NO.

CLEARING OF THE SITE 1
TRIAL HOLES 1
FORMATION LEVEL 1
SURFACE SOIL 1
SOILING OF SIDE SLOPES AND VERGES 2
CLASSIFICATION OF EXCAVATION 2
EXCAVATION - GENERAL 5
MECHANICAL EXCAVATION 5
BLASTING 5
EXCAVATION OF CUTTINGS 7
EXCAVATION FOR PIPE LAYING 8
EXCAVATION FOR FOUNDATIONS 9
EXCAVATION IN EXCESS 10
SITE CONCRETE 10
FORMING OF EMBANKMENTS 10
SIDE SLOPES 11
COMPACTION OF EARTHWORKS 11
EXCAVATION BELOW EMBANKMENT IN MATERIALS UNSUITABLE FOR CONSTRUCTION. 12
BENCHING 12
EXCAVATION BELOW FORMATION IN CUTTINGS IN MATERIALS UNSUITABLE
FOR CONSTRUCTIO EXCAVATIONS FOR FOUNDATION PITS AND TRENCHES 12
EXCAVATION FOR FOUNDATION BELOW OPEN WATER 13
FOUNDATION PITS AND TRENCHES OF GREATER WIDTH AND DEPTH THAN NECESSARY 13
COMPLETION OF EARTHWORKS 13
OPEN DITCHES 13
DISPOSAL AND STORING OF EXCAVATED MATERIAL 13
BORROW CUTTINGS AND PITS 13
ROAD APPROACHES AND ACCESS ROADS 13
REFILLING OF PIPE TRENCHES 14
MAKING GOOD SUBSIDENCES AFTER REFILLING 15
REINSTATEMENT OF SURFACES 15
FORMING BANKS AND FILLED AREAS 16
EARTHWORKS TO BE KEPT FREE OF WATER 16
SUPPORTS FOR FOUNDATION PITS AND TRENCHES 17
REFILLING OF FOUNDATION PITS AND TRENCHES AND REMOVAL OF
EXCAVATION SUPPORTS 17
USE OF VIBRATORY COMPACTION PLANT 17
PROVISION OF SPOIL HEAPS 17
TOPSOILING 17
GRASSING 17
MEASUREMENT OF TOPSOILING AND GRASSING 18
FORMATION OF FOOTPATHS 18
HARDCORE 18
RUBBLE 18

GEOTEXTILE.....18
GEOGRID.....18
POLYETHYLENE PAVING.....19
BAG WORK.....19

CHAPTER 2 - EARTHWORKS

CLEARING OF THE SITE

Trees, hedges and undergrowth shall be taken down and grubbed up, together with all other obstructions on the Sites of the landfill, roads, sewers, ponds, drains, water mains and structures and disposed of as directed.

The limits of clearing on this project shall extend a distance of three metres from the centreline of pipelines and for a distance of three metres in plan from any foundations. Roots are to be destroyed or removed within this width. All timber removed remains the property of the Employer and the Contractor shall dispose of timber in a manner as instructed by the Engineer.

Brushwood, roots and refuse and other combustible material cleared shall be disposed of by strictly controlled burning which shall be approved in each instance by the Engineer provided care is taken to prevent contamination of trench bottoms or backfill material with charcoal or other products of combustion. Alternatively, the waste matter could be removed from the site of the works to a tip to be provided by the Contractor.

Trees, bushes and hedges at the Site shall not be cut down, damaged or destroyed without approval of the Engineer. Trees shall be defined as having a girth exceeding 500 mm measured 600 mm above ground level except where a tree has buttresses when measurement shall be taken immediately above the buttresses.

The Contractor shall carefully strip top soil over the width of pipe trenches, set it aside for bringing back after backfilling of trenches and replacing over the top of trenches to restore the ground to its near as possible original condition.

If, owing to excessive cross-falls, the Contractor requires to carry out general levelling to facilitate use of Contractor's Equipment, such levelling may only be carried out after stripping and setting aside of top soil over the full width of the area to be levelled

Where trees are felled, the roots shall be grubbed up and all removed from the Site by the Contractor. The holes shall be backfilled with approved materials and rammed in 30 cm layers.

TRIAL HOLES

The Contractor shall excavate, refill and restore in advance of his programme all such trial holes as he may require for the location of existing services (sewers, water supply pipes and cables, etc). The cost of these trial holes shall be included in his excavation rates.

FORMATION LEVEL

Formation level on embankments and in cutting shall be the surface level of the ground obtained after completion of the earthworks. Any excess depth unnecessarily excavated below formation level shall be backfilled with material acceptable for Construction and compacted as directed by the Engineer and no payment shall be made for the excess excavation or for its filling and compacting.

SURFACE SOIL

Unless otherwise directed by the Engineer all surface soil shall be removed from the area to be used for roads, structures, cuttings and embankments and stockpiled for re-use for any purposes such as the soiling of slopes of cuttings and embankments and the preparation of beds for the cultivation of trees and shrubs.

Surface soil shall be regarded as soil which on visual examination can be seen to have been broken down by natural processes, agricultural cultivation and/or is seen to be capable of supporting vegetation growth.

Surface soil shall be removed to an average depth as shown on the Drawings or as specified in the Bills of Quantities.

The Contractor shall make his own arrangements for temporary storage sites for heaps of surface soil either inside or outside the site of the Works to suit his convenience. The cost of all operations needed in excavation, loading, carting, depositing and stacking together with arranging for the storage Sites, the hire or purchase of land therefore and all necessary access roads for this purpose is to be included in the item in the Bills of Quantities for stripping surface soil and is to be quoted whatever the nature of theunderlying sub-soil.

All unsuitable soil comprising of underlying surface soil shall be excavated and run to spoil in accordance with the appropriate Clause.

SOILING OF SIDE SLOPES AND VERGES

Soiling and compacting of side slopes to cuttings and embankments shall be carried out toan even surface with a thickness within the range of 10 cm - 20 cm, or in the case of vergesas stated in the Bill of Quantities with surface soil as previously stockpiled or from an approved source.

CLASSIFICATION OF EXCAVATION

Excavation shall be paid for separately for the following three Classes of material:Class I:

"Rock" or "Hard Material" shall include all material which, in the opinion of the Engineer, requires blasting or the use of metal wedges and sledge hammers or theuse of compressed air drilling for its removal or cannot be extracted by ripping with atractor of at least 180 h.p. and rear-mounted heavy-duty ripper. Individual boulders greater than 0.2 m^3 in volume shall be included in this class when their nature and size are such that they cannot be removed without recourse to one of these methods.

Where a portion of excavation contains 50% or more by volume of boulders of this order, such portion shall be considered as Class 1 material throughout.

Class II:

"Compacted Gravel", "Slightly Decomposed" or "Altered Rock" shall include all material such as hard ferricrete and altered or stratified rock, stones, or boulders less than 0.2 m^3 in volume, which are harder than "normal" or "soft" material in thatthey may be extracted by ripping, as defined in Class 1, or in confined spaces, by hand excavation by using compressor tools, providing all reasonable steps to the satisfaction of the Engineer, have been taken to facilitate the removal of the materialby other methods.

Class III:

"Normal" or "Soft Material" shall include weathered or decomposed rock (incl. murram) and all material which, in the opinion of the Engineer, does not require blasting or metal wedges and sledge hammers or compressed air drilling, ripping orrooting.

A detailed summary to aid this classification is given in Table 2 - 1.

No additional allowances will be made for any material being wet or dry.

The Engineer or his representative and the Contractor or his representative shall be present during classification of material in question for excavation.

All necessary precautions shall be taken to preserve the excavation material below and beyond the lines of all excavation in the soundest possible condition.

All damages to the Works due to the Contractors operations shall be repaired by and at theexpense of the Contractor except when over excavation is ordered in writing by the Engineer.

In excavation of Class 1 (hard) material isolated edges of undisturbed material may extendup to 15 cm within the prescribed lines.

Excavation of Class 1 - Material beyond the established lines shall be re-filled with concrete(Class 10) at the expense of the Contractor.

All excavation shall be classified either as unsuitable material or as suitable material. Unsuitable material shall comprise:-

Material from swamps or marshes, silt, perishable material, slurry or mud, or

Any Material:
which is a highly organic clay or silt,
which is clay having a liquid limit exceeding 80 and or a plasticity index exceeding 55;
which is outside the limits of moisture content specified in the earthworks series of Clauses either when excavated or thereafter;
which is susceptible to spontaneous combustion;
consisting of such domestic refuse which by virtue of its physical or chemicalcomposition or moisture content will not compact to form a stable fill.

Suitable material shall comprise all that are acceptable in accordance with the requirementsof the Specification for use in the Works, whether obtained from within or without the Site. Any reference in this Specification to suitable material and unsuitable material shall have the meanings defined above.

For the purpose of selection for use in earthworks all common excavation shall be classifiedas either plastic or non-plastic. Non-plastic materials shall be those on which it is impossible to carry out a plasticity index test and shall include "coarse grained non- cohesive material" shown in Table 2 - 2, and in accordance with SSRN 650 and such shales, silts and other materials which in the opinion of the Engineer are readily self- draining.

Plastic materials shall be all other materials included in the above-mentioned Table as "finegrained cohesive materials", as defined in SSRN 650.

TABLE 2 - 1 : MATERIAL CLASSIFICATION

	Class I	Class II	Class III
Typical Material	Black Volcanic Rocks Trachyte, Phonolyte and Igmnibrite	Altered Rocks Agglo-merate and Tuff	Weathered Rock and Soils (incl. murram)
Hammer Blow	Solid note from Ringing to a Dully sound	Drummy Noise or crushes pieces	Dents Sample
Pliers Crushing	Not possible for Grani Fracture	Fractures or Crushes small piece	
50 mm dia. Core in Hand	Cannot break 500 mm long piece	Can break 300 mm piece	Can be crushed into pieces
Soaked in water for One hour	No change	Some change on weaker pieces	Disintegrates in the hand after soaking
Expected CrushingStrength	Above 40N/mm^2	1.5 to 40N/mm^2	Below 1.5 N/mm^3

TABLE 2 - 2: IDENTIFICATION OF SOIL TYPES

	Basic Soil Type	Particle size (mm)	Visual Identification	Nature and Plasticity	Composite Soil Types (mixture of basic soil types)		
Very coarse soil	BOULDERS	200	Only seen complete in pits or exposure		Scale of Secondary Constituents with coarse soils		
	COBBLES	60	Often difficult to recover from boreholes	Particle shape:	Term		% of clay or silt
Coarse Soils Over 65% sand and gravel sizes	GRAVELS	coarse 20	Easily visible to naked eye; particle shape can be described; grading can be described	Angular Subangular Subrounded Rounded Flat Elongate	slightly clayey slightly silty	GRAVEL or SAND	under 5%
		medium 6	Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented)		clayey silty	GRAVEL or SAND	5 to 15%
		fine 2		Texture:	very clayey very silty	GRAVEL or SAND	15 to 35%
	SANDS	coarse 0.6	Visible to the naked eye; very little or no cohesion when dry; grading can be described	Rough Smooth Polished	Sandy GRAVEL Gravelly SAND	Sand or Gravel and Important second constituent of the coarse fraction	
		medium 0.2	Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented)				
		fine 0.06					
Fine Soils Over 35% sand and clay sizes.	SILTS	coarse 0.02	Only coarse silt barely visible to naked eye; exhibits little plasticity and marked dilatancy; slightly granular or silky to the touch. Disintegrates in water; lumps dry quikly; looses cohesion but can be powdered easily between fingers.	Non plastic or low plasticity	Scale of secondary constituents with fine soils		
		medium 0.006			Term		% of sand or gravel
		fine 0.002			sandy gravelly	CLAY or SILT	35 to 65%
	CLAYS		Dry lumps can be broken but not powdered between the fingers; they can also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingures and dries slowly; shrinks appreciably on drying usually shows cracks. Intermediate and high plasticity clays show these properties to a moderate to high degree respectively.	Intermediate plasticity (Lean clay) High plasticity (Fat clay)	- CLAY SILT		under 35%
					Examples of composite types		
					Loose, brown, subangular very sandy, fine to coarse GRAVEL with small pockets of soft clay.		
					Medium dense, light brown, clayey, fine and medium sand.		
Organic Soils	ORGANIC CLAY-SILT or SAND	Varies	Contains substantial amounts of organic vegetable matter.		Stiff, orange brown, fissured sandy CLAY.		
	PEATS	Varies	Predominantly plant remains usually dark brown or black in colour, often with distinctive smell; low bulk density.		Firm, brown, thinly laminated SILT and CLAY		
					Plastic, brown, amorphous PEAT		

EXCAVATION - GENERAL

The excavation shall be taken out as nearly as possible to exact dimensions and shape so that the minimum of filling in will afterwards be necessary. The Contractor shall keep the sides of excavation true by struts, walings, poling-boards, sheeting, bracing or otherwise and the supporting timbering shall be of sound construction and be sufficiently watertight topermit the excavation, concreting, etc. being carried out satisfactorily. Water shall be removed by pumping and all temporary expedients required for dealing with water shall bethe Contractor's liability. The Contractor shall be responsible for the stability of all exca- vations and trenches.

Excavated material shall be deposited in spoil heaps confined to areas approved by the Engineer, and shall be neatly finished off to the approval of the Engineer and other relevantauthorities.

Top soil shall be stored separately from the main excavated material and on no account disposed of without the approval of the Engineer.

The Contractor shall at his own expense maintain the flow in all drains and water courses which may be encountered during the construction of works. Sewage shall not be allowed to flow onto open ground or into any watercourses, trench or sewers constructed under this contract except by permission of the Engineer’s representative.

MECHANICAL EXCAVATION

A mechanical excavator shall be employed by the Contractor only if the sub-soil is suitable and will allow the timbering of the trenches or other excavations to be kept sufficiently closed up to ensure that no slips fall or disturbance of the ground takes place or there are no pipes, cables, mains or other services or property which may be disturbed or damaged by its use.

When mechanical excavators are used, a sufficient depth of materials shall be left over the bottom of the excavations to ensure that the ground at finished excavation level is not damaged or disturbed in any way. The excavations shall then be completed by hand to the finished levels required.

BLASTING

The Contractor shall keep in his office at the Site copies of Laws applying to the transport, storage and use of explosives and shall supply one copy of each Law to the Engineer. TheContractor shall also submit to the Engineer a copy of any instructions or notices that the Contractor may issue to his staff or workmen or post about the Site in compliance with suchLaws.

The Contractor shall submit to the Engineer details of the explosives that he proposes to use and of his proposals for the storage and transport of explosives to the Sites.

Explosives shall be used in accordance with the recommendations of SSRN 680.

The Contractor shall use explosives for blasting in connection with the work only at such times and places and in such a manner as the Engineer may approve, but such approval shall not relieve the Contractor from his responsibility for injury, loss, inconvenience and annoyance to persons, damage to the work and adjoining structures, consequent to the useof such explosives. The Contractor shall be entirely liable for any accident which may occur and shall hold the Employer harmless and indemnified from all claims arising from such. Where loss, inconvenience, injury or accident is likely to be caused to persons, animals, works, property, places or objects the Engineer shall have power to regulate or prohibit theblasting and in the event of such regulation or prohibition the Contractor shall have no claimagainst the Employer.

The Contractor shall give warning each time of his intention to blast and shall station men on the roads and elsewhere with flags, horns and whistles and prevent persons, animals and traffic going into or remaining within the danger zone. He shall arrange for control of

traffic on the main roads by the police during all blasting operations within 400 m of such main roads.

The Contractor's Personnel in charge of blasting operations shall have valid licences for alltypes of blasting required including restricted blasting, copies of which shall be made available to the Engineer.

The Contractor shall provide proper buildings in suitable positions for the storage of explosives to the satisfaction of the Engineer and the relevant Authority. The Contractor shall take all possible precautions and comply with all Laws or other regulations governing the handling and use of explosives including the display on the site of warning notices explaining the procedure to be used in blasting operations, such notices are to be displayed in all languages normally spoken by the personnel working on the Site.

In carrying out blasting the Contractor shall drill holes to the extent approved and in such number, position and direction and to such lengths and with loading of explosives of such quantity and power and means of detonating as will ensure that the excavation is taken outas neatly as possible to the required profile without shattering the rock remaining or causing injury to concrete or fill already deposited in the vicinity.

In certain areas it is necessary to restrict blasting in order to protect installations of major significance.

The Contractor shall, whenever he wishes to blast within 400 m of any public road, railway line, overhead power line or telephone line, draw this to the attention of the relevant authority concerned and ensure that all conditions imposed by them including attendance by the representatives of such authority are met. In all such cases, he will be required to provide cover to the area to be blasted, to the approval of the Engineer, to prevent damageto these services by flying debris.

The Contractor shall ensure, by limiting the amount of charge/delay or by the use of controlled detonations used at any blasting site, that the peak particle velocity at any existing building, structure or service, does not exceed 50 mm/s. The Contractor shall provide a suitable seismometer and whenever called upon to do so by the Engineer, demonstrate by the use of the seismometer that the charges he proposes to use comply with these Specifications.

Compliance with the restrictions will not, however, limit the Contractor's liability in the eventof any damage to any existing building, structure or services.

Notwithstanding any of the above, the Contractor shall cease blasting and continue to excavate in rock by barring, wedging or other approved methods, whenever called upon to do so by the Engineer.

If firing is done electrically, all precautions shall be taken to prevent premature explosions. All men other than the responsible foreman and one skilled man shall be withdrawn to a safe distance before firing wires are connected to the firing cable. The connection of the firing cable to die firing battery shall be the last operation. No charging or firing will be permitted when there are electrical storms or thunder conditions at or near the Site, when the time delay between the flash of lightning and the thunder clap is less than 10s.

After blasting, no personnel shall approach the area until it has been examined by the foreman or other responsible person and in the case of misfires the proper precautions shall be taken.

The Contractor shall be deemed to have included in his rates for items covering excavationfor the supply of all explosives, transport, storage, supervision and compliance with the conditions and restrictions set out above.

Prior to the initiation of blasting operations, the Contractor shall comply with the following:

The Contractor will obtain all required state and local permits relating to thetransportation, storage, handling, loading, and detonation of explosives

Before performing any work on, or accessing the right-of-way, the Contractor shall verify to the Employer and Engineer that all property owners have been notified of the impending construction and blasting activities

The Contractor shall submit to the Engineer's Representative his site-specific Blasting Plan for approval prior to execution of any blasting activity

For each area determined to require blasting, a site-specific blasting plan will be submitted. The Contractor's site-specific blasting plan shall include at a minimum the following information:

Blaster's name, company, copy of license, and statement of qualifications; seismograph equipment and sensor location

Site location, applicable drawing numbers, and associated rock type and geological structure (solid, layered, or fractured)

Copies of all required permits

Methods and materials including explosive type, product name and size, weight per unit, and density; stemming material; tamping method; blasting sequence; use of non-electrical initiation systems for all blasting operations; magazine type and locations and security for storage of explosives and detonating caps

Site dimensions including explosive depth, distribution, and maximum charge and weight per delay; hole depth, diameter, pattern, and number of holes per delay

Dates and hours of conducting blasting, distance and orientation to nearest aboveground and underground structures; schedule identifying when blasting would occur within each water body greater than 3 m wide

Blasting procedures for:

Storing, handling, transporting, loading, and firing explosives

Prevention of misfires, flyrock, fire prevention, noise, and stray current accidental-detonation

Signs, flagmen, and warning signals prior to each blast

Those locations where the pipeline route parallels or crosses an electrical transmission corridor, cable or pipeline; parallels or crosses a highway or road; is within or adjacent to forested areas; approaches within 300 m of any residence, building or occupied structure

Local notification

Inspections after each blast

Disposal of waste blasting material

EXCAVATION OF CUTTINGS

The Contractor shall carry out the excavation of cuttings in accordance with the Drawings and shall adhere to the slopes, levels, depths and heights shown thereon.

The sloping sides of all cuttings shall be cleared off all rock fragments which move when pressed with a crowbar and are therefore, liable to cause injury or damage through falling.

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 excavated 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 (i.e. as material for pavement courses) and

not in consequence for the forming of embankment, or soiling of slopes of cuttings and embankments or verges, sufficient suitable filling material to occupy, after full compaction, avolume corresponding to that which the excavated material occupied, shall, unless otherwise directed by the Engineer, be provided by the Contractor from his own resources.

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 onSite. Materials used for haul roads shall not be re-used in embankment, or elsewhere without the permission of the Engineer.

The completion of cuttings shall, unless otherwise permitted by the Engineer, be undertaken in two stages. First the area including verges shall be excavated to a level 30 cm above formation level whereupon constructional traffic may continue to be allowed to use the surface so formed.

Secondly, when it is necessary to complete to formation level, this excess of material shall be trimmed off as a single operation and disposed off either elsewhere in the Works if regarded by the Engineer as suitable material or if not run to spoil. When the height aboveformation level has been reduced below 30 cm, the movement and use of Constructional Plant other than that used to complete this operation shall be in accordance with the requirements of the Engineer. This trimming operation shall be regarded (for access roads) as the commencement of Construction of the pavement.

EXCAVATION FOR PIPE LAYING

The excavation shall be made in open cutting unless tunnelling or heading is specified or approved by the Engineer.

Trenches for pipes shall be excavated to the lines and depths shown on the Drawings, or as directed by the Engineer, and shall be of sufficient width to give an equal clearance on both sides of the barrel of the pipe or pipes such that the total trench width is 3/2 'D' where 'D' is the outside diameter of the pipe or the average outside diameter of the group of pipes or will be equal to the outside diameter or the pipe plus 30 cm on each side. For pipes bedded in concrete sections, the breadth of concrete bedding for the pipes will be equal to the width of the trench. Excavation forfire hydrants, valve chambers or any other water works structure shall be carried outto the levels and outlines of such structures, and the rates shall include for any additional excavation or other temporary Works required.

If in the opinion of the Engineer due to the fault of the Contractor the ground becomesweathered prior to the laying of the pipes, the Contractor shall remove the weatheredsoil and replace it with suitable compacted material to the original formation level at his own expense.

Where pipes are not laid on concrete the bottoms of the trenches as excavated, shallbe smooth and shall be free from stones or other projections. Holes cut out at the joints shall be of as small a size as possible throughout their entire length. The trenchshall be dug to within 15 cm of its formation and proper grade pegs shall then be set in the bottom of the trench by the Contractor for the accurate taking out of the rest ofthe excavation. Grooves about two inches deep shall be cut across the trench at the required positions to enable the easy removal of pipe slings.

If instructed to do so by the Engineer, the pipe trench shall be excavated to a depth of10 cm below the invert of the pipe and be refilled with suitable material free from stones and well rammed in order to provide a smooth bed for the pipes.

The materials excavated from trenches shall be laid completely and neatly on the sides of the trench except where in the opinion of the Engineer this would so obstructa road or footpath as to prevent the passage of traffic or pedestrians. In such cases the Contractor must dig out the pipe trench in such lengths as directed and keep his

excavated material at such a distance as may seem advisable, and the rates shall bedeemed to cover for this.

During excavation, the Contractor shall ensure that all material suitable for re-use andwhich he intends for re-use are kept separate and set aside and protected as necessary to prevent loss or deterioration. Materials forming the surface and foundations of roads shall when excavated and if required for further use, be carefullyseparated. Paving slabs, bricks and similar surfaces shall be carefully removed and stacked for re-use, or as otherwise instructed by the Engineer.

No pipes shall be laid and no excavation filled in or covered with concrete until the formation has been inspected and the permission to proceed with the Work obtained.

Where pipes are to be laid under a road formation or in open country, or in cutting, trenches shall generally be excavated after the earthwork is completed. The Engineermay permit these pipe trenches to be excavated before the earthwork is complete, but payment for the excavation of the trench will only be made upon the volume excavated below the road formation.

The unit of measurement for the excavation of trenches shall be per linear metre or per m^3 of void calculated from the deemed width of the trench, and the average depthof excavation as mentioned in the Bills of Quantities. No allowance will be made for bulking. Unless otherwise indicated, for valve chambers and other water works structures, the unit of excavation will be per number or per m^3 of excavated material calculated to the exact outer dimensions and depths of the Permanent Works. No allowance will be made for bulking.

The rates for excavation of trenches in "normal" material shall include removal of all material except "rock", selecting and segregating material to be backfilled in special layers, supporting or sheeting, shoring and strutting, any additional working space orroom for timbering or sheeting required, dealing with water, maintenance of the trench, and all labour, tools, materials, plants, supervision, overheads and profit.

The provisions of above Clause shall apply to the rates of excavation in "rock" and inaddition the Contractor shall also allow in his rates for backfilling the invert with Class15 concrete or other materials as directed by the Engineer and removing to a spoil dump all "rock" excavated.

EXCAVATION FOR FOUNDATIONS

Foundations shall be excavated to such depths as the Engineer may direct and no concrete or other material shall be placed until the foundations have been examined and approved. Due notice shall be given to the Engineer to enable him to examine foundations well in advance.

The Engineer may direct that a layer of excavation of not less than 75 mm thickness shall be left undisturbed and subsequently taken out by hand immediately before theconcrete or other work is placed.

If in the opinion of the Engineer due to the fault of the Contractor the ground becomesweathered prior to the placing of concrete or other material the Contractor shall remove the weathered soil and replace it with concrete (Class 15) to the original formation level at his own expense.

The Contractor shall draw the attention of the Engineer to any patches of soft groundin the excavations and he shall excavate to such extra depth as the Engineer may direct and fill up with concrete Class 15. Payment for this Work will be made at the rates tendered.

EXCAVATION IN EXCESS

If any part of a trench or foundation is by Contractor's error excavated deeper and/or wider than is required, the extra depth and/or width shall be made good at the Contractor's expense with Class 15 concrete or otherwise as the Engineer may require.

SITE CONCRETE

Areas of excavation which are to receive a layer of Site concrete as a screeding under the structural concrete or which are to form foundations to thrust and anchor blocks shall be covered with the screeding immediately the excavation has been completed.

FORMING OF EMBANKMENTS

The Contractor shall carry out the forming of embankments in accordance with the Drawings and shall adhere to the slopes, level, depths and heights shown thereon.

Unless otherwise directed or permitted by the Engineer, all suitable excavated materials shall be used to form embankments. All such excavated material which is surplus to this requirement, shall be disposed off in tips to be provided in accordance with appropriate Clause. Any material which according to the Specification requirements is unsuitable for forming embankments shall be similarly disposed off.

All filling material other than rock in embankments or below formation level in cuttings shall be deposited in layers not exceeding 25 cm loose depth unless as a result of compaction trials the Engineer approves spreading to a greater depth up to a maximum of 35 cm loose depth. Each layer shall extend over the full width of the embankment and shall be completed in accordance with the requirements of this Specification.

Rock used in rock-fill embankment shall be of such size that it can be deposited in horizontal layers each not exceeding 45 cm loose depth and extending over the full width of the embankment except for any specified external cover to slopes or new formation level. The materials shall be spread and levelled by a crawler tractor weighing not less than 15 tons. Each layer shall consist of reasonably well graded rock and all large voids shall be filled with broken fragments before the next layer is placed. The top surface and side slopes of embankments formed shall be thoroughly blinded with approved fine graded material to seal the surface. Such material may be surface soil on side slopes. Isolated boulders each within the range 0.05 cu. metres to 0.3 cu. metres in size may be incorporated more than
60 cm below formation level in embankments not of rock-fill at the discretion of the Engineer, provided that the specified compaction requirements are met. No stone exceeding 0.05 m3 should be placed less than 60 cm below formation level.

During the construction of embankments the Contractor shall control and direct constructional traffic uniformly over their full width. Fill material shall not be stockpiled on embankments, unless this is permitted by the Engineer. Should the quantity of excavation from the Works, including that from any widened cuttings, be insufficient to make up the embankments, the deficiency shall be made good by approved imported suitable material and the Contractor shall be responsible for locating and obtaining such material. Where materials of different characteristics are readily available those of relatively high-bearing capacity shall be placed in the top-most (60 cm) below formation level.

The completion of embankments shall unless otherwise permitted by the Engineer, be undertaken in two stages. First the area shall be brought up to a level of 15 cm above formation level whereupon constructional traffic may continue to be allowed to use the surface so formed. Secondly, when it is necessary to complete to formation level, this excess of material shall be trimmed off as a single operation and disposed off either elsewhere in the Works if regarded by the Engineer as suitable material or if not, run to spoil. When the height above formation level has been reduced below 15 cm the movement and use of construction Plant other than that used to complete this operation, shall be in accordance with the requirements of the Engineer. This trimming operation shall be regarded for access roads as the commencement of construction of the pavement.

SIDE SLOPES

Should the slopes of any cutting be excavated beyond the widths shown on the Drawings or directed by the Engineer, the Contractor shall make good each affected area in a manner satisfactory to the Engineer.

COMPACTION OF EARTHWORKS

All filling material used in earthworks shall be compacted to specification by Plant approvedby the Engineer for that purpose.

The Contractor shall submit to the Engineer for approval his proposals for the compaction of each main type of material to be used in the embankments, including those in relation tothe types of Plant, the number of passes and the loose depth of layer. The Contractor shallcarry out compaction trials, supplemented by any necessary laboratory investigations as required by the Engineer, using the procedure proposed by the Contractor for the earthworks, and shall satisfy the Engineer that all the specified requirements regarding compaction can be achieved. Compaction trial with the main types of material likely to be encountered shall be completed before the Works with the corresponding materials will beallowed to commence.

Work on the compaction of plastic materials in embankments 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 contentof plastic material as excavated is higher than this value the material shall, unless otherwise directed by the Engineer, be run to spoil. If the Contractor allows the moisture content of suitable plastic materials to increase to a value which is unacceptable for compaction he shall, unless he prefers at his own expense to wait until the material has dried sufficiently for acceptance again as suitable material, run such material to spoil and provide an equal volume of material suitable for filling, both without extra charge.

Work on the compaction of non-plastic materials in embankments shall be carried out onlywhen the material has such a moisture content as is within the range from 1 per cent, wetter to 2 per cent drier than the moisture content of the material in cuttings or borrow pitswhen measured on samples obtained from at least 30 cm above the level of the water tableas indicated by the presence of free water in the excavation. Nevertheless, if with any material the Engineer doubts whether satisfaction 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 as determined by the laboratory compaction test method described in SSRN 601. Method of Test for Soil Classification and Compaction.

If any such non-plastic material on excavation is too wet for satisfactory compaction and theEngineer 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.

If the Contractor allows the moisture content of suitable non-plastic materials to change after excavation to a value unsuitable for compaction, he shall raise or lower the moisture content as required above, or the Contractor shall, if so directed by the Engineer, run the material to spoil and replace it with an equal quantity of material suitable for compaction.

Work shall be continued until a state of compaction is reached throughout the embanments,including especially the slopes of embankments (and the immediate approaches to bridge abutments) such that at least 9 out of every 10 consecutive samples taken of the compacted material have a relative compaction determined according to SSRN 601 of at least the following percentage of the maximum density of optimum moisture content:

For the topmost 15 cm below formation level a maximum density of 100 per cent.

For the remainder below formation a density of at least 95 as mentioned in the Billsof Quantities and as directed by the Engineer.

If with non-plastic material, the compacted material has become dry 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.

Each layer of rock used as rock-fill in embankments shall be systematically compacted by at least 8 passes of towed vibrating roller weighing not less than 3 tons or a grid roller weighing not less than 13 tons dead weight or other approved plant. Where however, it is established that rock can be compacted to the requirements for common excavation, the rock shall be compacted to such latter requirements.

EXCAVATION BELOW EMBANKMENT IN MATERIALS UNSUITABLE FOR CONSTRUCTION

Before forming the embankment any unsuitable material naturally occurring on the Site shall be removed to such depths and over such area as may be directed by the Engineer and shall be run to spoil. The resultant excavation shall be backfilled with suitable material deposited and compacted as specified for the forming of embankments. Nevertheless, where in these circumstances such backfill has to be deposited below standing water, compaction may be omitted provided that the material used is completely free draining.

If ordered by the Engineer as an alternative method of construction, approved rock-fill material shall be placed directly on the naturally occurring unsuitable material to such total depth that on completion of compaction negligible deflection of the surface occurs due to the passage of vehicles hauling in the rock. The rock-fill material shall be deposited, and compacted so as to comply with the requirements of this Specification for the compaction of rock. Such work will be dealt with as a Variation of the Works.

BENCHING

Where an embankment is to be placed on appreciably sloping ground, the surface of the ground shall be benched in steps or trenches, as shown on the Drawings or directed by the Engineer including, if necessary, any under-draining of the Site.

EXCAVATION BELOW FORMATION IN CUTTINGS IN MATERIALS UNSUITABLE FOR CONSTRUCTION

Where unsuitable material is encountered in the sub-grade it shall be excavated to such depths and over such area as the Engineer shall direct and be run to spoil. The resultant excavation shall be backfilled with suitable material deposited in layers each not exceeding
25 cm loose depth and compacted in the manner specified for the forming of embankments. Nevertheless, where in these circumstances such backfill has to be deposited below standing water, compaction may be carried out if the material used is completely free draining.

If ordered by the Engineer as an alternative method of construction, approved rock-fill material shall be placed directly on the naturally occurring unsuitable material to such total depth that on completion of compaction negligible deflection of the surface occurs due to the passage of vehicles hauling in the rock. The rock-fill material shall be deposited and compacted so as to comply with the requirements of this Specification for the compaction of rock. Such work will be dealt with as a Variation of the Works.

EXCAVATIONS FOR FOUNDATION PITS AND TRENCHES

Pits and trenches for foundations shall be taken out to the levels and dimensions shown on the Drawings or to such other levels and dimensions as the Engineer may direct. The bottoms of all excavations shall be carefully levelled and if necessary stepped or benched horizontally. Any pockets of soft material or loose rock and fissures in the bottoms of pits and trenches shall be removed and the cavities so formed, filled with concrete of the appropriate Class. When any excavation has been taken out and trimmed to the levels and dimensions shown on the Drawings or directed by the Engineer, the Engineer shall be informed accordingly so that he may inspect the completed pit or trench and no excavation

shall be filled in or covered with concrete until it has been authorised to proceed with the work. All surplus excavated materials from such excavations not required for refilling shall be deposited in embankments, or otherwise disposed off, as directed. All excavations shallbe kept dry, and all bailing and pumping, timbering, shoring and supporting of sides that may be required, and any refilling, ramming and disposal of surplus materials necessary incarrying out the excavations for foundation pits and trenches shall be included in the pricesfor excavation.

EXCAVATION FOR FOUNDATION BELOW OPEN WATER

The rates for excavation for foundations below the agreed water level shall include for the cost of all temporary loose timbering and shoring, sheet piling, cofferdams, caissons, pumps and other special appliances required.

FOUNDATION PITS AND TRENCHES OF GREATER WIDTH AND DEPTH THANNECESSARY

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 is directed shall be made good with concrete of the appropriate Class as determined by the Engineer who may allow excavation to a greater width than is necessary to be filled and tightly packed with suitable material.

COMPLETION OF EARTHWORKS

The formation shall be properly shaped and regulated and compacted. When completed the formation shall be at the required level and generally parallel to the required finished surface.

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 begun. The sides shall be dressed fair throughoutand the bottoms accurately graded so as to carry off the water to the outlet to be provided.The material excavated from the ditches shall be disposed off as directed by the Engineer.

DISPOSAL AND STORING OF EXCAVATED MATERIAL

All surplus material arising from excavation shall be disposed off to a tip or tips to be provided by the Contractor unless otherwise stated. The disposal tip and manner of disposal shall be to the approval of the Engineer.

Where spoil from excavation is required for re-use as refill or for the formation of embankments, the various types of material shall be kept separately and stored in convenient and approved places.

BORROW CUTTINGS AND PITS

Where for any reason, it becomes necessary to form borrow cuttings or borrow pits, these shall be located by the Contractor and approved by the Engineer and the Work executed inall respects to the instructions of the Engineer. They shall be properly graded and drained and finished with neatly trimmed slopes.

ROAD APPROACHES AND ACCESS ROADS

The excavations and embankments in road approaches, junctions, access roads and fringelands, shall be of such form and dimensions as the Engineer may direct, and in all respectsfinished as specified for those of the main carriageway. The materials arising from such excavation shall be disposed off as directed by the Engineer.

REFILLING OF PIPE TRENCHES

Pipe bedding and surround material comprises backfill placed and compacted in trench bottoms up to a level above the pipe crown such that pipes are uniformly supported, centred on the pipe centreline, for their full length.

Placing and compaction of the pipe bedding shall be regarded as the most critical phase ofthe backfilling operation. Backfilling beyond this point shall only proceed after inspection and approval of the completed bedding and surround by the Engineer.

The soil filled around and for 300 mm over the top of the pipes shall be free from stones, tree roots or similar objects which through impact or by concentrating imposed loads might damage the pipes, and not of black cotton soil type. The filling shall be carried out with utmost care, special attention being paid to tamping or material around the pipes and to joint holes so as to obtain the greatest possible compactness and solidity. The soil shall if necessary, be screened to exclude material which would damage the pipes. The soil shall be in accordance with the relevant pipe bedding drawing and shall be approved by the Engineer before backfilling commences.

The bedding for the pipes shall have a minimum thickness of 100 mm in normal trenches, and 150 mm where rock/stones are present and at designated road crossings. In trencheswhere there is a continuous accumulation of groundwater, the trench shall after obtaining the approval of the Engineer, be over-excavated by 150 mm and shall be backfilled using compacted granular material. Bedding material shall be compacted in layers not exceeding
50 mm thickness. Compaction of fill around the pipe shall be in layer thickness not exceeding half the pipe diameter or 75 mm whichever is the lesser. Layer thickness is however subject to achieving 90% MPD (Modified Proctor Density), failing which layers shall be reduced in depth as necessary to achieve the % compaction. The Contractor shallcontrol the field compaction densities with a fully registered nuclear surface moisture- density gauge that is in a proper working order. This density gauge with operator shall be made available to the Engineer for his use as and when required.

The backfill soil shall be placed in layers of not more than 150 mm thickness when compacted and where hand ramming is employed the number of men filling shall not be more than half the number of men ramming. Where mechanical-ramming of the fill is employed, the machines shall be to the approval of the Engineer and soil shall be replacedand well rammed down by hand for a depth of not less than 60 cm to give sufficient cover tothe pipes and obviate risk of damage to them before the mechanical rammer is brought intooperation. The rammer shall not cease to be used on any length of trench until thorough compaction has been obtained. The backfill soil shall be free from clay lumps, boulders androck fragments greater than 150 mm and as far as practicable 90 % MPD shall be attained,but this may be relaxed (e.g. in fields and open areas) by the Engineer.

The Contractor in excavating shall ensure that materials from strata containing no stones and suitable for filling around the pipes as described above, shall be kept separately and used for this purpose. The Contractor shall not be entitled to claim for any extra costs (as provided for below) for screening if this requirement is not complied with. If no such strata occurs in the excavation, the excavated material shall either be screened or suitable material transported to the Site from other excavations as the Engineer shall direct. The cost of such work shall be paid for according to the rates in the Bills of Quantities.

Before backfilling trenches, the Contractor shall obtain approval from the Engineer of the methods he proposes to use and he shall demonstrate by means of tests that the specifiedcompaction can be achieved (according to SSRN 601 using the “sand replacement”method). The method of compaction and the testing thereof shall be at all times to the approval of the Engineer.

Trenches shall be backfilled as soon as possible after pipe laying to curtail thermalmovements of the pipeline, damage to coatings and flotation of the pipeline should the trench fill with water. At no time shall backfilling lag more than 500 m behind the last pipe

laid. All specified tests on pipe barrels and joints shall therefore be carried out as soon as possible

The Contractor may use his discretion as whether to backfill around joints before the pipeline is hydrostatically tested. The Contractor shall be responsible for the location and repair of any leaks on the pipeline under hydrostatic test and no extra payment will be made for any re-excavation and subsequent reinstatement which may be necessary to locate and remedy leaks or for the installation of cathodic protection equipment. Should theContractor elect to leave joint holes open until after the hydrostatic test, he shall provide athis own expense effective and approved barricades and fences around each hole for the protection of persons and animals. In built-up areas, barricades shall be clearly marked atnight with red warning lights.

MAKING GOOD SUBSIDENCES AFTER REFILLING

All refilling whether over foundations or in pipe trenches shall be thoroughly compacted byramming and any subsidence due to consolidation shall be made up by the Contractor at his own expense with extra compacted material. Should subsidence occur after any topsoilhas been replaced, the topsoil shall first be removed before any hollows are made up before being re-laid.

REINSTATEMENT OF SURFACES

All surfaces of roads, fields, paths, gardens, verges, etc. whether public or private which are affected by the operations of the Contractor shall be temporarily restoredby him in the first instance and permanently reinstated in the second instance whenthe ground has consolidated fully. Separate payment for reinstatement shall be made only for surfaced roads (e.g. tarmac, concrete, paving bricks or similarmaterial), for official designated dirt roads of at least 6m width, grassland, cultivatedlands and sports fields. Any other reinstatements are deemed to be covered by the pipe installation rates.

The Contractor shall be responsible for the temporary reinstatement and permanentreinstatement of all surfaces whether or not the area requiring restoration is within the limits of his excavations if the necessity for the restoration arises from causes due to the operations of the Contractor. The Contractor's prices shall include for restoring all surfaces so damaged to their original condition as no extra payment willbe made for any such work. The Contractor shall take all necessary measures to ensure that no toxic materials which may cause damage to vegetation or livestock or pollute streams or watercourses are used in any temporary restoration or permanent reinstatement and shall indemnify the Employer against any claims arising out of the use of such materials.

Temporary restoration shall be carried out immediately after the excavations have been refilled by returning the excavated material to the position from which it was removed and adding such suitable materials as may be required and consolidating the various materials as the Work proceeds in order to provide a surface that is adequate for the purpose that the original surface fulfilled. Temporary surfaces shallbe maintained in a condition satisfactory to the Engineer and/or responsible Authority until the permanent reinstatement is made. In the case of roads and streets the surface shall be necessary to consolidate the filling and keep the surfacefit for traffic, suitable material being added to all placed which have sunk or becomerough.

Permanent reinstatement shall not be made until the ground has consolidated permanently and until sanction to do so is received from the Engineer. It shall be carried out with materials similar to those which were used in the original Work to the entire satisfaction of the Engineer and/or responsible Authority.

In verges and other grass surfaces the topsoil shall be removed, stored andreplaced after consolidation of the filling and planted or seeded with approved

grass. Should subsidence occur, it shall be made good with additional topsoil and be replanted with grass or re- seeded. New grass shall be planted if for any reasonthe grass fails to grow or is destroyed.

The trenches, channels, gutters and kerbs shall be reinstated to the condition in which they were before excavation was commenced. The final surface of the trenchshall be flush with the surrounding ground.

If the work of restoration or reinstatement as carried out by the Contractor is not to the satisfaction of the Engineer and/or the responsible Authority and should the Contractor not remedy the defect forthwith, any remedial work considered neces- sary may be undertaken by the Engineer and/or the responsible Authority and the cost thereof shall be borne by the Contractor.

If at any time any trench becomes dangerous, the Engineer shall be at liberty to callupon the Contractor to restore it to a proper condition at three hours' notice and should the Contractor fail to carry out the work, have it done at the Contractor's expense.

The Contractor shall include in his price for all materials and labour which he may have to employ in reinstating the trenches and surfaces to their original condition tothe satisfaction of the responsible Authority.

FORMING BANKS AND FILLED AREAS

Banks and filled areas shall be made and built up to the levels, dimensions and shapes shown on the Drawings or as may be subsequently directed by the Engi- neer.

Before any filling is started, the ground on which embankments are to be sited, shallbe stripped of all grass and topsoil and all roots, vegetable matters and other unsuit-able substances removed.

The soil to be used in the banks and fill areas as shown on drawings shall be approved material either borrowed or arising surplus from the excavations, the material being placed according to its nature as shall be directed. Usually, coarse hard material shall be placed at the bottom of the pile with the fine material and/or soil at the top or at the surface. Should there be insufficiency of such material arising from the Works, the Contractor shall supply other approved material for this purpose and shall be deemed to have included for such supply in his prices for filling. Any subsidence shall be the Contractor's liability and he shall forthwith makethem good to the satisfaction of the Engineer.

The filling shall be placed in layers not more than 15 cm thick, each layer being thoroughly compacted to the satisfaction of the Engineer.

EARTHWORKS TO BE KEPT FREE OF WATER

The Contractor shall arrange for the rapid dispersal of water shed onto or entering the earthworks from any source at any time during Construction, or of water which is shed ontothe completed subgrade. He shall provide within the Site where necessary, temporary watercourses, ditches, drains, pumping or other means of maintaining the earthworks free from standing water. Water discharged from the Site, shall not be run into a road but be carried direct to an approved sewer, ditch or river through troughs, chutes or pipes.

Such provision shall include carrying out the work of forming the cuttings and embankmentsin such a manner that their surfaces have at all times a sufficient minimum crossfall and where practicable, a sufficient longitudinal gradient to enable them to shed water and prevent ponding. In pumping out of water from excavations and in any lowering of the watertables, the Contractor shall pay due regard to the stability of all structures.

The cost of compliance with the requirements of this Clause shall be covered in the rates for earthworks. If the Engineer is dissatisfied with the measures taken by the Contractor to

keep the Works free of water, the Engineer shall be free to instruct the Contractor to adopt what measures the Engineer may require. The cost of this Work shall be deemed to have been included in the rates in the Bills of Quantities.

SUPPORTS FOR FOUNDATION PITS AND TRENCHES

The sides of pits and trenches shall where necessary, be adequately supported to the satisfaction of the Engineer by timber or other approved means. The costs of this work shallbe included in the rates inserted in the Bills of Quantities.

REFILLING OF FOUNDATION PITS AND TRENCHES AND REMOVAL OF EXCA-VATION SUPPORTS

Refilling of foundation pits and trenches shall be carried out only after the foundation and structural works within the excavation have been inspected and approved by the Engineer.Unless otherwise directed by the Engineer, all filling shall consist of approved excavated materials which shall be deposited and compacted, using approved Plant, in layers not exceeding 25 cm loose depth, to a dry density not less than that of the adjoining soil. Timber sheeting and other excavation supports, shall be carefully removed as the filling proceeds except as otherwise specified, but the removal of such supports will not relieve the Contractor of his responsibility for the stability of the Works. The number of separate layers deposited and compacted at any one time shall be subject to the approval of the Engineer.

USE OF VIBRATORY COMPACTION PLANT

Where vibratory rollers or other vibratory compaction Plant are used, the mechanism and vibration shall be kept working continuously during compaction operations, except during period when the Engineer permits or directs discontinuance of vibration.

Unless otherwise permitted by the Engineer, the frequency of vibration shall be maintainedwithin the range of amplitude and frequency recommended by the manufacturers of the Plant for the material to be compacted. The frequency shall be recorded by a tachometer indicating speed of rotation of any shaft producing vibration.

PROVISION OF SPOIL HEAPS

The Contractor shall provide spoil heaps at his own expense for the disposal of surplus materials and all rubbish collected when clearing the site and during the Construction of theWorks. The Sites for these shall be approved by the Engineer.

TOPSOILING

Topsoil for planting grass shall be selected topsoil from approved stockpiles or materials from excavation for embankment foundations or from stripping from borrow areas or other approved sources. The material shall contain the most fertile loam available and shall be free from excessive quantities of grass, roots, weeds, sticks, stones or other objectionablematerials.

Areas to receive the topsoil shall be brought to within 100 mm of the prescribed final cross-section at all points and finished smooth and uniform before topsoil is applied. Topsoil shallbe evenly placed and spread over the graded area in one layer and shall be placed at locations shown on the Drawings or designated by the Engineer.

GRASSING

It is expected that it will be necessary to water the areas with newly planted grass to ensure germination and establishment of plants. The Contractor shall provide for a temporary sprinkler irrigation system to the approval of the Engineer and shall irrigate the newly planted grass at such times as the Engineer instructs. The Contractor shall repair at his own expense any damage to the slopes or any part of the work caused by excessive or irregular application of irrigation water.

Planting shall consist of ground preparation, furnishing approved grass, planting and covering the planted grass and shall be completed on areas shown on the Drawings or as designated by the Engineer.

When the topsoil has been placed on the areas to be planted with grass, levelled and compacted to finished grade, it shall be brought to a friable condition by harrowing or otherwise loosening to a depth of maximum 100 mm. All lumps and clods shall bethoroughly broken by approved means.

MEASUREMENT OF TOPSOILING AND GRASSING

Measurement for topsoiling and grassing shall be made according to the amount of squaremetres of topsoiled areas measured in place to the lines and grades on the Drawings or asestablished by the Engineer, and paid for at the rates per m^2 tendered in the Bills of
Quantities, which rate shall include for all as specified, including supplying the grass seedsor sprigs.

FORMATION OF FOOTPATHS

The ground under footpaths shall be trimmed to formation level and 5 cm thick precast concrete paving slabs shall be bedded on 5 cm thick layer of fine sand unless the Engineerdirects otherwise.

HARDCORE

Hardcore, shall be sound hard stone, rock or broken concrete not less than 10 cm in size unless otherwise directed. Sufficient but not excessive blinding material of smaller sizes may be permitted at the discretion of the Engineer.

RUBBLE

Rubble for use in drains and backing to walls shall be of durable natural stone or large sized gravel. It shall be of a size that will pass a 5 cm mesh-sieve and retained on a 2.5 cmmesh-sieve and it shall be free from earth clay vegetation or other organic matter and shallcontain no rubbish.

GEOTEXTILE

Geotextile shall be placed where indicated on the drawings or as instructed by the Engineerin order to prevent sand from migrating outside their confined area, whilst allowing water todrain. The geotextile shall be a non-woven needle punched and thermally bonded polymer and be manufactured in accordance with SSRN 874.

The minimum tensile strength and maximum elongation at maximum tensile strength in accordance with SSRN 874 (a) shall be 9 kN/m and 40% respectively. Puncture resistancein accordance with SSRN 874 (b) shall be 1500 N, whilst the effective opening size and permeability shall be 125 micrometer and 190 l/m^2.sec respectively. Installation shall be inaccordance with the manufacturer's guidelines and the contractor's proposal in this regardshall be submitted for the Engineer's approval before installation commences.

GEOGRID

The reinforcing element in the reinforced earthworks shall be a geogrid manufactured in accordance with a quality management system which complies to SSRN 875 and shall be from high-density polyethylene sheet, oriented in one direction so that the resulting ribs shall have a high degree of molecular orientation which is continued through the transversebar.

The quality control strength in accordance with SSRN 875 shall not be below 52 kN/m at the 95% confidence limit, whilst the creep limited tensile strength for a design life of 120 years shall not be below 20 kN/m at 20 deg Celsius. The tensile strength at 2% and 5% strains in accordance with SSRN 875 shall be at least 12.5 kN/m and 24.5 kN/m respectively. The strength of the junctions between the longitudinal ribs and transverse bars

shall be not less than the quality control strength, whilst site joints shall be capable of carrying 90% of the quality control strength in accordance with SSRN 875 (c).

The geogrid shall be inert to all chemicals found in soils and shall have no solvents at ambient temperature. It shall not be susceptible to hydrolysis, shall be resistant to aqueoussolutions of slats, acids and alkalis (pH = 2 to 12.5), shall be non-biodegradable and shall have a minimum of 2% finely divided carbon black well dispersed in the polymer matrix to inhibit attack by ultraviolet light.

The geogrid shall have an appropriate partial factor for site installation and construction damage, determined by the particle size distribution of the reinforced fill and in accordancewith the values used in the design. This factor shall be based on full-scale tests carried outin accordance with SSRN 875 (d). Installation shall be in accordance with the manufacturer's guidelines and the contractor's proposal in this regard shall be submitted forthe Engineer's approval before installation commences.

POLYETHYLENE PAVING

The paving on top of the earthwork protection structure shall be able to withstand water flows of at least 5 m/s and shall be manufactured from polyethylene and be able to carry aload of 200 tonnes per m^2. The paving elements shall be flexible for laying on undulating surfaces and gradients and be interconnected by lugs and slots to form one continuous paving area. The cellular structure shall be filled with topsoil and grass and provide unrestricted root growth.

BAG WORK

Bag work protective construction shall be carried out in accordance with the drawings or asotherwise directed by the Engineer. The foundation shall be prepared to the satisfaction ofthe Engineer. Approved hessian sand bags shall be filled with a 1:6 cement : sand dry mix,properly sealed with placed dimensions of 660 mm long, 330 mm wide and 150 mm high.

The next course of bags shall be laid and secured to the previous layer with high-density polyethylene pegs (Tensar or similar approved) of a length of 280 mm and at intervals of 330 mm (i.e. 2 No. per bag). The pegs shall be stabilised with carbon black for UV resistance, shall have two sprung shafts at the head of the peg to hold down the top bag and have a cruciform barbed shaft for maximum adhesion. The pegs shall be manufactured in accordance with a quality management system which complies with the requirements ofISO 9001. The next layer of bags shall be placed so as to cover the pegs of the previous layer.

Approved fill material shall be placed behind the bags and compacted to 95% Modified Proctor Density. A geotextile shall be placed between the bags and the fill as indicated on the drawings.

The bag work face shall be wetted down at the end of each working day or as directed by the Engineer.

CHAPTER 3

CONCRETE, REINFORCEMENT AND SHUTTERING

TABLE OF CONTENTS

CLAUSE NO.	DESCRIPTION	PAGE NO.
	GENERAL	1
	STEEL REINFORCEMENT.	1
	WATER FOR USE IN CONCRETE	2
	CEMENT	2
	SAND 3	
	COARSE AND FINE AGGREGATES	3
	GRADING OF AGGREGATES	4
	COMPOSITION OF CONCRETE	4
	CLASS AND STRENGTH OF CONCRETE	5
	TESTS FOR CRUSHING STRENGTH	6
	CEMENT CONTENT AND WATER-CEMENT RATIOS	6
	DESIGN MIX	7
	TRIAL MIXES	7
	COMPACTION AND SLUMP TESTS	7
	MIXING OF CONCRETE	7
	WEIGHING, BATCHING AND MIXING	7
	CENTRAL BATCHING PLANT	8
	HAND MIXING	8
	READY MIXED CONCRETE	8
	TRANSPORTING AND PLACING OF CONCRETE	10
	COMPACTION OF CONCRETE	11
	HOT WEATHER CONCRETING	12
	WET WEATHER CONCRETING	12
	PROTECTION AND CURING OF CONCRETE	13
	LOADING	13
	PLACING OF CONCRETE IN FOUNDATIONS	13
	PLACING OF CONCRETE IN WATER	13
	JOINTS	14
	BENDING, PLACING AND FIXING OF STEEL REINFORCEMENT	15
	FORMS AND FORMWORK FOR CONCRETE: DEFINITIONS	16
	FORMS AND FORMWORK FOR CONCRETE: CONSTRUCTION	16
	FORMWORK FOR MOULD VIBRATED PRECAST CONCRETE	17
	PREPARATION OF FORMS BEFORE CONCRETING	17
	FORMS FOR CONSTRUCTION JOINTS	17
	SPECIAL METHODS OF WORKING	18
	FORMWORK LEFT IN	18
	MEASUREMENT AND PAYMENT FOR FORMWORK	18
	REMOVAL OF FORMS	19
	MAKING GOOD	19
	PROTECTION OF CONCRETE AFTER REMOVAL OF SHUTTERING	19
	REMOVAL AND REPLACEMENT OF UNSATISFACTORY CONCRETE	19
	CONSTRUCTION JOINTS.	20
	WATER TIGHTNESS	20
	FAULTY WORK	20
	RATES OF CONCRETE	20
	PRECAST CONCRETE	21

RATES FOR PRECAST CONCRETE 21
CONCRETE WORK - TOLERANCES 21
WATER BARS 22
ADMIXTURES TO MORTAR OR CONCRETE 22
SAMPLING AND TESTING. 22
TESTING OF CONCRETE DURING PRODUCTION 22
FREQUENCY OF TESTS 23
LOADING TESTS 24
REFERENCE AND RECORD BOOKS TO BE KEPT ON SITE 24
TESTING EQUIPMENT 24
REPAIR OF CONCRETE STRUCTURES 25
FINISHES ON UNFORMED SURFACES 27

CHAPTER 3 - CONCRETE, REINFORCEMENT & SHUTTERING

GENERAL

The standard of materials and of workmanship shall be not inferior to the recommen-dations of the current:-

A code of Practice dealing with the Structural Use of Reinforced Concrete inBuildings, SSRN 101 whichever is applicable to the particular structure,

OR -

A code of Practice dealing with the Design and Construction of Reinforced Concrete Structures for the storage of liquids, SSRN 102,

AND

Appropriate Standard Specifications herein referred to.

The requirements outlined in the above documents must be read with those of this section of the Specification and where any conflict exists between the recommend- ations of the above and of this Specification, the requirements of this Specification shall prevail.

As and when required by the Engineer, the Contractor shall prepare and submit, before commencing the work, a Time Chart (additional to the General Programme) detailing the various operations for concrete work.

No material shall be used in the work until prior approval for its use has been given bythe Engineer; neither shall any change in the nature, quality, kind, type, source of supply or manufacture be made without the Engineer's permission.

Names of manufacturers and test certificates, shall be supplied as soon as possible tothe Engineer.

The prices inserted in the Bill of Quantities shall include for the provision of all samples and for all costs incurred in the execution of the tests specified or referred toherein in accordance with the General Conditions of Contract; the prices shall includealso for transport of samples of cement, sand, concrete, aggregates, and similar materials to an approved materials testing laboratory. Results of laboratory and Sitetests shall be kept on Site and copies of all test Reports shall be forwarded in duplicate to the Engineer.

Frequency of tests and number of samples required will be governed by the results ofprevious tests, the quality of the materials revealed during the tests and the uniformityof that quality. Should it become evident that the quality of the concrete is deteriorating the Engineer may require additional samples to be taken and test cubesto be made and tested to determine the cause.

During the progress of the works, consignment notes shall be supplied to the Engineer giving details of each consignment of each concreting material.

The use of the word "approved" in this Specification refers to the approval by the Engineer.

STEEL REINFORCEMENT

The reinforcement shall be of the type specified and shall comply with the appropriateSSRN number as follows:

Mild Steel Bars	- SSRN 126
Cold-Twisted Steel Bars	- SSRN 127
Reinforcing Fabric	- SSRN 128

WATER FOR USE IN CONCRETE

All water used in mixing concrete shall be obtained by the Contractor and comply with SSRN 114.

The water for each batch shall be just sufficient to ensure the production of concrete of the required consistency and shall be measured in a small tank, and the quantity shall be varied from time to time as required by the Engineer.

CEMENT

All cement used (unless otherwise ordered) shall be ordinary Portland Cement or if required or allowed by the Engineer, rapid-hardening Portland Cement of the best quality and of a brand or brands to be approved by the Engineer and shall comply in every respect with the conditions, analyses and tests laid down in SSRN 103 for Portland Cement.

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

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

Bagged cement shall be delivered in sealed 50 kg paper sacks. Cement shall not be delivered in bags of less than 5 ply. Each bag shall be marked with the parcel number of the cement contained. Bagged cement shall be transported so that at no time is it exposed to damp and so that moisture cannot be absorbed from the atmosphere. Cement in bulk shall be transported in totally enclosed water tight and sealed containers.

Sulphate Resisting or High Alumina Cement

Where a sulphate-resisting cement or a high alumina cement is specified or ordered, it shall be of the best quality and of brand or brands approved by the Engineer. The cement shall comply in every respect with SSRN 104.

Cement Storage

The cement shall be delivered on the site of the works in such consignments as shall ensure satisfactory progress of the work, each bag or container being sealed to the satisfaction of the Engineer. The cement shall be stored on the Site in a dry store or in approved bulk containers, large enough to contain the required quantities. The store shall be provided by the Contractor and shall have sufficient sub-division of such sizes as the Engineer may approve, it shall be properly roofed and perfectly watertight, and it shall have a dry wooden floor above ground level with an air space at least 15 cm in depth below it. The cost of all work specified in this Clause shall be borne by the Contractor.

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

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

The Engineer may cause samples to be taken from any consignment of cement for testing by the Engineer's Representative at the Ministry of Works, Testing Station. If the results of these tests show that the samples do not conform to this Specification,

the whole consignment will be rejected as unfit for use, and must forthwith be removed from the Site by the Contractor at his own expense. The various consignments must be brought to the Site in ample time to allow the above tests to becarried out before the cement is required for use.

Later Tests

Although the Engineer may have passed any consignment of cement, he shall nevertheless, have the power at any subsequent time to reject such consignment if he finds that any deterioration in the quality thereof has taken place. Any package ofcement in which there are hardened lumps or cakes of cement, shall be rejected.

Cement Containing Hardening or Waterproofing Compounds

No cement containing hardening or waterproofing compounds shall be used nor shall calcium chloride or other chemicals be added to cements or to concrete except on theinstructions of the Engineer. Any cement so treated shall be stored separately and clearly marked and shall only be used in accordance with the requirements of the Engineer.

SAND

Sand used for mortar shall comply with SSRN 135 and sand for rendering with SSRN 136.

COARSE AND FINE AGGREGATES

Mixed ballast for mass concrete shall comply with the requirements for "all-in"aggregates of 40 mm maximum size in SSRN 108 unless otherwise specified by the Engineer.

All aggregates for graded concrete, except granolithic and fine concrete, shall complywith SSRN 108. Coarse aggregate shall be "graded aggregates" of 20 mm to 5 mm nominal size as specified in Table 3 - 1 unless otherwise ordered.

Fine aggregates shall be natural sand, in grading zone 2, as specified in Table 3-2.

Approved coarse and fine aggregates, mixed before the addition of cement, involumes to be approved by the Engineer, may be used in lieu of "all-in" aggregates for mass concrete.

They shall conform to the moisture absorption requirements of SSRN 112. Otherwisethe Contractor shall prove the durability of the finished concrete by approved tests when used for making concrete required for liquid retaining structures.

Aggregates of rounded shape or otherwise capable of procuring a concrete of good workability with the minimum addition of water, shall be preferred.

The Contractor shall ensure that the nature and grading of aggregates remainreasonably consistent, and shall, if necessary, stockpile and include different gradingto ensure that the overall grading remains constant for each section of the work.

Dust or flour resulting from crushing the aggregate shall not be allowed to con- taminate the stockpiles. When, in the opinion of the Engineer such contamination hastaken place to the detriment of the finished concrete, it shall be removed by an approved means, otherwise the aggregate shall be rejected.

For mass concrete, dust or flour resulting from crushing the aggregate may be included in controlled quantities to supplement the fine aggregate in order to improvethe consistency of the mix.

Aggregates for Fine Concrete

Coarse aggregate for fine concrete shall comply with SSRN 110, but shall have a grading which shall be 10 mm to No. 7 sieve size. Fine aggregates shall be as specified in (ii).

Source of Supply of aggregates

Aggregates shall be obtained from a source to be approved by the Engineer. Coarse and fine aggregates shall be delivered and stored separately on to a clean, hard base, in separate compartments or into approved hoppers.

Samples of Aggregates

Samples of aggregates and sand for use on the works shall be submitted to the Ministry of Works, Materials Branch, for approval and no materials will be accepted for use unless they comply with the requirements stated.

Defective Aggregates

If any aggregate is defective in grading or other respect, the Contractor shall remedy the defect at his own expense and to the satisfaction of the Engineer.

GRADING OF AGGREGATES

The combined grading of aggregates shall be a smooth curve approximately parallel to the grading envelope limits, given in the following Table, and to the approval of the Engineer.

TABLE 3.1: COMBINED GRADING CURVES FOR CONCRETE

SIEVESIZES	PERCENTAGE BY WEIGHT PASSING SIEVE NOMINAL MAXIMUM SIZE OF AGGREGATE (mm)		
	40	20	10
1½"	100		
¾"	50 – 75	100	
3/8"	36 – 60	45 – 75	100
3/16"	24 – 47	30 – 48	30 – 75
No. 7	18 – 38	23 – 42	20 – 60
No. 14	12 – 30	16 – 34	16 – 46
No. 25	7 – 23	9 – 27	4 – 20
No. 52	3 – 15	2 – 12	4 – 20
No. 100	0 – 5	0 – 2	0 – 6

COMPOSITION OF CONCRETE

All concrete shall be dense, impermeable, durable, consistent and cast accurately to the lines and dimensions shown on the drawings and shall present a uniform surface free from blemishes, cracks and honeycombing, resistant to wear and mild chemical attack. Concrete mixes are to be such as to enable the concrete to fill the formwork completely with intimate contact between concrete and reinforcement and the concrete is to be thoroughly and uniformly vibrated throughout.

The cement, aggregates and water for concrete shall be as specified. Samples of cement and aggregate shall be submitted to the Engineer for testing as early as possible prior to the commencement of concreting works.

Water for mixing concrete, mortar and cement grout and for use during curing, shall be taken form a source approved by the Engineer, shall be clean, fresh and free from matter in solution or suspension in such amounts that may impair the strength or appearance of the concrete, mortar, rendering or grout.

Seawater or brackish water containing more than 1000 milligrammes per litre of chloride ion or 2000 milligrammes per litre of sulphate ion shall not be used for mixing or curing concrete.

CLASS AND STRENGTH OF CONCRETE

The concrete shall be of the Classes shown on the Drawings, described in the Bills of Quantities or ordered by the Engineer, which will be one or more of the Classes described and tabulated below, with the appropriate specified maximum size of aggregate.

Description

The concrete mixes, as described, are "guaranteed strength" mixes in the sense that no proportions are given but the required concrete strength is shown and the Contractor will be required to design a suitable mix with the given grading to fulfil the requirements as laid down hereunder for relevant Classes shown.

The mixes will be composed of the following Classes: 10, 15, 20, 25 and 30. These figures represent the minimum 28-day strength in N/mm2 of the Works Cubes.

The maximum size of aggregate shall be as shown on the Drawings or as ordered by the Engineer, and may be indicated in brackets after the mix Class, for example 'Class 30(20)'.

All reinforced and graded concrete shall be composed of cement and fine and coarse aggregates gauged separately and in the following proportions:

TABLE 3.2: CLASSES OF CONCRETE

CHARACTERISTIC COMPRESSIVE STRENGTH AT 28 DAYS N/mm^2	NOMINAL MIX CEMENT, SAND & AGGREGATE	LIMIT OF COMBINED WEIGHT OF DRY AGGREGATE TO 50 KG CEMENT		MAX VALUE OF WATER CEMENT RATIO FOR VIBRATED CONCRETE (BY WEIGHT)
		MAX. KG	MIN. KG	
10	1:3:6	-	-	-
15	1:2½:5	450	-	-
20	1:2:4	400	230	0.55
25	1:1½:3	360	180	-
30	1:1:2	320	160	-

Before any concreting commences, trial mixes shall be made and cube tests performed as described in the Specification and these cubes shall obtain strengths at least 30% greater than the works cubes shown in Table 3.2 before the mix is approved by the Engineer.

If required or allowed by the Engineer, the relative proportions of fine and coarse aggregates shall be varied to obtain a denser mixer and to reduce shrinkage and such change shall not affect the price so long as the sum of the volumes of fine and coarse aggregates remain unchanged. Where sulphate-resisting cement is used, the water cementratio shall not exceed 0.55.

Aggregate shall be batched by weight and the weighing hopper shall be of an approved adjustable type. Volume batching will not be allowed for concrete work except under special circumstances such as for small pipe culvert headwalls, pipe surrounds, and other isolated minor works.

When aggregates are batched by volume, the approval of the Engineer shall first be obtained before the use of this method of batching. With volume batching, stout gauge boxes approved by the Engineer, shall be used.

When cement in bags is used, the total volume or weight of aggregate per batch shall be such that a whole number of bags of cement is used and the use of cement from broken bags will not be permitted.

Once the proportions of the mixes have been agreed by the Engineer, they shall not be amended without his consent.

TESTS FOR CRUSHING STRENGTH

The Contractor shall be held responsible for ensuring that the crushing strength for the respective classes of graded concrete is not less than the following for concrete made withordinary Portland Cement or sulphate-resisting cement.

TABLE 3.3: CRUSHING STRENGTHS

CLASS MIX	NOMINAL	MINIMUM CRUSHING STRENGTH ON 150 mm WORKS CUBES				MIX AVERAGE MINIMUMTRIAL STRENGTH			
		AT 7 DAYS		AT 28 DAYS		AT 7 DAYS		AT 28 DAYS	
		N/mm^2	Kg/cm^2	N/mm^2	Kg/cm^2	N/mm^2	Kg/cm^2	N/mm^2	Kg/cm^2
10	1:3:6	7.7	78	11.4	116	-	-	-	-
15	1:2½:5	10	102	15	153	13	133	19.5	200
20	1:2:4	15	153	20	204	20	204	26	265
25	1:1½:3	19	194	25	255	25	255	32.5	332
30	1:1:2	24	245	30	306	32	326	39	400

Cubes made with rapid-hardening Portland Cement must attain at 3 and 7 days after cast-ing a crushing strength equal to that specified for ordinary Portland Cement or sulphate- resisting cement at 7 and 28 days respectively after casting.

Test cubes shall be numbered and dated in a conspicuous manner and shall be delivered to the Ministry of Works, Materials Branch at least 24 hours before the date when they aredue to be tested. Four cubes shall be made at least 14- days before concreting is to be commenced, from a batch of concrete made on Site with the aggregates, cement and waterproposed to be used on the works and at least two additional cubes shall be made for each25 cubic metre of concrete mixed or when otherwise required by the Engineer. Should thecrushing strength fall below the figure specified, the Contractor shall, without extra charge,adopt a richer mix or make other changes in proportion or otherwise as the Engineer may direct or approve, so as to bring the concrete up to the required strength.

CEMENT CONTENT AND WATER-CEMENT RATIOS

Notwithstanding the strength requirements of this Specification, in order to ensure adequate durability of the finished concrete while at the same time limiting the shrinkage characteristics, the following limits shall not be exceeded:

TABLE 3.4: LIMITS TO WATER

CLASS OF CONCRETE	MAXIMUM TOTAL WATER / CEMENT RATIO BY WEIGHT	LITRES WATER PER 50 kg CEMENT	CEMENT IN kg/m^3 FINISHED CONCRETE	
			MAXIMUM	MINIMUM
15	0.60	29.60	356	252
20	0.55	27.30	415	296
25	0.50	25.00	475	341
30	0.45	22.75	534	385

In all cases of mix proportioning, the added water shall be included with due allowance for the moisture contained in the aggregates, and shall be the minimum consistent with the workability requirements.

Where aggregates do not conform to the moisture requirements of SSRN 102 but are permitted for use, the above maximum water cement ratios shall be reduced by 0.05 (or 2.25 litres of water per 50 kg of cement).

Where the concrete is to be used in structures, protected from the elements, or not exposed to constant wetting and drying, the above maximum water-cement ratios may be increased by 0.05 (or 2.25 litres of water per 50 kg of cement).

DESIGN MIX

The mix should be designed for a mean strength that exceeds the specified works Cube Strength plus 30%.

The mix design shall follow the method explained in SSRN 115.

For the purpose of determining the "design strength" of the concrete, an allowance shall beadded to the works Cube Strength indicated in Table 3 - 3 for the particular Class of concrete. This allowance shall be assessed on the degree of control reasonably to be expected in manufacturing the concrete and shall not be less than twice the Standard Deviation as defined in SSRN 117. Until such time as it has been determined, the StandardDeviation shall be assumed to be not less than 7 N/mm^2.

Details of the design mix shall be forwarded to the Engineer for his approval. However, such approval by the Engineer, shall not relieve the Contractor of his obligations.

TRIAL MIXES

COMPACTION AND SLUMP TESTS

The Contractor shall as and whenever required by the Engineer carry out slump or any other tests to determine the consistency of the mixed concrete and gauge, by measure, theamount of water prescribed by the Engineer for each mixing of concrete.

The tests of concrete shall not show a greater slump or compaction factor than the Engineer shall decide for each part of the work, but generally the slump for mass concretemust not exceed 25 mm and for reinforced concrete work 50 mm.

The compaction factor of vibrated concrete shall not exceed 0.91.

MIXING OF CONCRETE

The concrete shall only be mixed in approved power-driven concrete mixers for all Classes of Concrete, except that small batches of Class 15 and Class 10 may be mixed by hand with the approval of the Engineer.

The concrete shall be mixed continuously in the mixer for not less than 2 minutes after the whole of the ingredients are present in the drum. When a concrete mixer has been out of use for more than 20 minutes, or when the type of cement is changed, the mixer shall be thoroughly cleaned before a fresh batch of concrete is made in it.

The Engineer may prohibit concreting if in his opinion the number and/or sizes of the mixers available, or the quantity of materials in stock, is insufficient; or where he feels that the haulage of concrete from the mixer to the point of application of concrete is not near enough to guarantee quality.

WEIGHING, BATCHING AND MIXING

Aggregates and cement shall be proportioned by weigh-batching and water shall be proportioned by volume. Subject to the prior approval of the Engineer, volume-batching ofaggregates may be used when weigh-batching is not possible, but volume- batching of cement will in no case be accepted. The contractor may, however, so mix his concrete that

such batch shall use a whole bag or bags of cement, the weight of which is known precisely.

Gauge boxes for volume-batching shall be strongly constructed and where necessary due allowance shall be made for bulking of the aggregates.

The aggregates and the cement shall be thoroughly mixed in a clean mechanical mixer for a period of time agreed with the Engineer and the water added on the basis of the approved design.

The amount of water added shall conform to the requirements as given in Table 3 - 4.

Batch-mixing machines shall comply with the requirements of SSRN 118. They shall be provided in such numbers and of such capacity as to ensure a continuous supply of freshlymixed concrete at all times during construction.

Continuous mixing machines shall be used only with the written permission of the Engineer.

When small quantities of concrete are to be mixed the Engineer may approve hand-mixing.In such cases, the cement content for all mixes shall be increased by 10% and the Contractor shall allow for this in his rates and prices.

Where concrete is mixed by hand, the fine aggregate and the cement shall be thoroughly mixed first and the coarse aggregate added. Mixing in the dry shall be carried out at least twice then water be added and the concrete again thoroughly mixed.

CENTRAL BATCHING PLANT

If a central batching plant is used, the method of weighing or measuring the cement and aggregate shall be to the approval of the Engineer. Accommodation for a Concrete Inspector shall be provided at the batching plant, and shall include a dust-proof room and shall be so situated that the inspector has a visual check on the quantities of cement and aggregate used per batch. The Contractor shall include in his prices for the provision and maintenance of this accommodation.

HAND MIXING

If hand-mixing is permitted, the quantity of cement to be used shall be increased by 10 percent. Hand-mixing shall be carried out on an approved water-tight platform, the aggregateand cement being turned over three times in a dry state and thoroughly mixed by means ofshovels. The water shall then be added through approved hoses fitted to watering cans, and the mixture shall be worked together until a uniform consistency is obtained.

During windy weather, protection shall be provided by screens or otherwise as directed to prevent cement from being blown away.

READY MIXED CONCRETE

Approval has to be obtained from the Engineer if the Contractor intends to use ready-mixedconcrete, particularly at the tie-in sections shown on the drawings.

Ready-mixed concrete shall be mixed and delivered to the Site of the works by means of one of the following combinations of operations:

Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (known as central-mixed concrete).

Mixed partially in a stationary mixer, and the mixing completed in a truck mixer, (Known as shrink-mixed concrete).

Mixed completely in a truck mixer, (Known as transit- mixed concrete).

Mixers may be stationary mixers or truck mixers. Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto ina prominent place a metal plate or plates indicating the basis on which the equipment is

designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous registering non-resettable type, which accurately registers the number of revolutions and shall be mounted on the truck mixer so that the Engineer may safely and conveniently inspect them from alongside the truck.

Truck mixers shall be loaded not to exceed the manufacturers guaranteed capacity. They shall combine the ingredients of the concrete into a thoroughly mixed and uniform mass and discharge the concrete with a satisfactory degree of uniformity conforming with the above requirements.

When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the above requirements.

Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity. They shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of non-agitating hauling equipment shall be so constructed that leakage of the concrete mix, or any part thereof, will not occur at any time, and they shall be self- cleaning during discharge.

Concrete hauling in open-top vehicles shall be protected during hauling against access of rain, or exposure to the sun when the ambient temperature exceeds 24 degrees centigrade.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point unless the Engineer orders additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

The rate of discharge of mixed concrete from truck mixer agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

When a truck mixer or agitator is used for transporting concrete to a delivery point, discharge shall be completed within 1½ hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 29 degrees centigrade or above, a time less than 1½ hours will be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 29 degrees centigrade or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each batch of ready mixed concrete delivered at the job Site shall be accompanied by a ticket showing the volume of concrete, the weight of cement in kg and the total weight of all ingredients in kg unless they are otherwise ordered by the Engineer. The ticket shall also

show the time of day at which the materials were batched and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged.

The organisation supplying concrete shall have sufficient Plant capacity and transporting apparatus to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations, shall be such as to provide for the proper handling, placing and finishing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The method of delivering and handling the concreteshall be such as will facilitate placing with the minimum of re-handling and without damageto the structure or the concrete.

TRANSPORTING AND PLACING OF CONCRETE

No concrete shall be placed until the Engineer has approved the formwork and reinforcement. The Contractor shall provide all facilities for inspection.

The Contractor shall give at least 48-hours notice to the Engineer of the times he proposesto concrete and the Engineer may order that no concreting shall take place until either he or his Representative is present.

Concrete shall be transported in watertight containers in such a manner that will avoid the segregation of the constituent materials. The time elapsing between the initial mixing of theconcrete and finally placing in the works shall not exceed 30 minutes when Portland Cement is used. Where other cements are used, the Engineer will stipulate the maximumtime allowed. Concrete remaining unplaced at the end of this period shall not be placed inthe work, but shall be removed from the Site and disposed off at the Contractor's expense.Should there be need for the use of rapid hardening cement at tie-ins particularly for expediting the completion of the works thereby the Contractor shall inform the Engineer who will when he deems it necessary approve such use.

Concrete shall not be dropped through a height exceeding 1.5 m. For lowering concrete through heights in excess of 1.5 m, special methods shall be used, such as chutes, tremies, bottom dumping hoppers, or bagged placing, and then only with the approval of the Engineer. All containers, troughs and chutes and apparatus through and in which concrete is passed, shall be kept clean and entirely free from hardened concrete or cementand free from contamination by extraneous material.

The concrete shall be placed in position in lifts not exceeding the heights to be agreed by the Engineer, and the excessive heights which may cause segregation of the aggregate atthe working edge, shall be avoided.

Concreting of any unit or section of the work shall be carried out in one continuous operation, and no interruption will be allowed without the approval of the Engineer.

A competent steel fixer shall be in attendance the whole time concrete is being cast around reinforcement. Proper bridging arrangements for traffic over reinforcement shall be provided so that the reinforcement is not distorted, damaged or displaced.

Where approval is obtained for concrete to be conveyed by chutes, these shall have a slope (not exceeding 1 vertical to 2 horizontal) in order to ensure a continuous flow of concrete. Additional water shall not be introduced to assist the flow of concrete down the chute, deposition is to be intermittent and chutes shall be arranged to discharge into a storage hopper. Under no circumstances should a clear fall of more than 1.0 m be permitted at the discharge end of the chute.

The pumping of concrete shall be used only for such parts of the work as the Engineer considers suitable, and will be subject to the size, design, layout, and siting of the whole concreting plant including pumps, pipelines, water and air supply and all ancillary gear and apparatus and the conditions and methods of its operationand maintenance being to the entire satisfaction and approval of the Engineer.

Whenever transport of concrete is interrupted for any length of time (periods of over 30 minutes shall be treated as such), the chutes, pumps, pipes and any other means of distribution shall be thoroughly flushed out and cleaned. These shall also be flushed out immediately prior to resumption of concreting and shall be kept free from hardening concrete.

All wash water used shall be discharged outside the shuttering and clearing of any freshly placed concrete.

COMPACTION OF CONCRETE

All concrete shall be compacted mechanically, except when agreed by the Engineer that small areas may be otherwise compacted.

All vibrators shall be of a type approved by the Engineer. Mould vibrators shall not be usedfor in-situ concrete work and may only be used for the manufacture of small precast units, with the approval of the Engineer. Vibrators shall not be attached to the reinforcement andcare shall be taken to avoid contact with it.

Concrete shall be placed to uniform levels in layers not exceeding 450 mm deep in such manner as to avoid segregation, and each layer shall be compacted by means of approvedvibrators to form a dense material free from honeycombing and other blemishes. Compaction by hand may be used only with the prior approval of the Engineer.

Vibration time, the effectiveness, radius and other vibration characteristics shall be in accordance with the vibrator manufacturer's recommendations.

If internal vibrators are used, they shall be withdrawn immediately water or a thin film of mortar begins to appear on the surface of the concrete. Withdrawal shall be carried out slowly to avoid cavitation.

If shuttering vibrators are used, the shuttering shall be strong enough to withstand the forces of vibration.

Unless otherwise specified, before placing new concrete against concrete which has already hardened, the face of the older concrete shall be prepared by the removal of any laitance and loose aggregate, and shall be cleaned by a jet of compressed air.

When displacers are used they shall be so placed that no displacer is within 300 mm of anyfinished face or within 450 mm of any other displacer. On completion of any lift displacersshall be so arranged that they project for half their height above the surface.

In order to avoid as much as possible the effect on the structure of shrinkage, noconcreting of adjacent wall or slab panels will be allowed (except by special permission of the Engineer) unless a short intermediate section of not less than 0.45 m is left unconcreted. After the wall sections or slab panels have hardened for a period of not lessthan 5 days, the intermediates shall be concreted.

For reinforced concrete work in structures, the immersion type of vibrator shall be used. For carriageway and footpath construction, 150 mm thick or less, a vibrating screen may beused but for thickness in excess of 150 mm an immersion or plate-type of vibrator shall beused to compact the lower layers. Where a plate-vibrator is used, the thickness of each concrete lift shall be limited to 0.1 m.

In conjunction with each vibrator, one rammer consisting of either a pointed metal rod not less than 20 mm diameter and weight not less than 3 kg or a metal-shod tamper of size notexceeding 0.1 x 0.1 m and weight not less than 6 kg shall be used, together with a shovel or spade.

As the concrete flows under the action of the vibrator, it shall be shaped into position and thoroughly rammed, care being taken to fill the void left by the immersion vibrator. The concrete shall be compacted to produce a dense uniform mass and special care taken to

ensure that the concrete around the reinforcement and adjacent to the forms is free from voids.

Where agreed by the Engineer that a vibrator shall not be used, the concrete shall be compacted by rammers only, but otherwise as described above.

Concrete shall not be compacted by hand or machine to such an extent as in such a way that segregation takes place, and any concrete which, in the opinion of the Engineer, has been over-compacted, shall be removed, carted from the Site and replaced, all at the Contractor's expense.

HOT WEATHER CONCRETING

Concreting shall not be permitted if its temperature at placing is in excess of 38°C. In order to maintain the temperature of the concrete below this value the following precautions shall be taken wholly or in part as instructed by the Engineer.

All aggregates stockpiles, water lines and tanks as well as the mixer shall be protected from the direct rays of the sun.

Coarse aggregate shall be cooled by constant watering where possible.

Mixing water shall be cooled by the addition of ice to the storage tanks where necessary.

Rapid hardening cement shall not be used.

Where the above precautions are inadequate concreting shall be carried out during the cooler parts of the day or during the night as may be directed by the Engineer.

When the air temperature is above 20 degrees centigrade loss of mixing water by evaporation shall be considered in arriving at the amount of water to be added to the mix. In order to maintain the water/cement ratio within permissible limits an approved water-reducing agent shall be included in the mix.

The maximum water/cement ratios may be increased with the Engineer's permission by 0.05 (or 2.25 litres to 50 kilograms of cement) during mixing, but on no account shall water be added to concrete directly or indirectly once it has left the mixer.

In order to reduce premature drying of the concrete during transporting and placing, all chutes, shuttering and reinforcement shall be cooled by watering when possible, or shall otherwise be protected from the direct rays of the sun. Any water so used shall be removed by jetting with compressed air before placing the concrete in close contact.

As soon as possible after concreting, the shuttering shall be stripped and the surface of the concrete shall be kept moist for a period of 7 days by covering with wetted Hessian or sand, or shall otherwise be treated with an approved curing membrane.

Where drying winds are encountered, wind shields shall be positioned as directed by the Engineer to protect exposed surface of the curing concrete.

WET WEATHER CONCRETING

Concreting during periods of constant rain shall not be permitted unless aggregate stockpiles, mixers and transporting equipment and the areas to be concreted are adequately covered.

During showery weather, the Contractor shall ensure that work can be concluded at short notice by the provision of stop ends. On no account shall work be terminated before completion of each section, between one stop and another. Adequate covering shall be provided to protect newly placed concrete from the rain.

PROTECTION AND CURING OF CONCRETE

Immediately after placing, the surface of the finished concrete shall be protected from the harmful effects of sun, drying winds, rains, running or surface water and against any shocks. It shall be cured by keeping it covered with damp material for a minimum period ofseven days after placing. The formwork shall also be kept damp and if struck earlier than 7days, shall be replaced for the remaining period with some other approved damp material.

In the case of concrete made with high alumina cement, the whole of the concrete shall bekept thoroughly saturated with water for at least 24-hours after casting.

The Contractor shall protect and cure the concrete works as soon as practicable after completion by one or more of the following methods:

The concrete shall be covered with a layer of sacking, canvas, Hessian, straw mats, or similar absorbent material or a layer of sand and kept constantly wet for 7 days.

Except in the case of surfaces to which concrete has subsequently to be bonded, theconcrete shall be cured by application of an approved liquid-curing membrane. On horizontal surfaces, the curing membrane shall be applied immediately after placing the concrete, and on vertical surface immediately after removing the formwork.

No traffic or constructional loads shall be permitted on newly placed concrete until it has hardened sufficiently to take such traffic or load without surface damage or deformation.

If directed by the Engineer, the finished concrete works shall be fenced in such a manner as to prevent the access of traffic, unauthorized persons or animals on the surface of the newly paved concrete, until such time when the concrete will have hardened not to show any imprints or defects caused by any interference.

LOADING

No loads shall be placed on beams, slabs or walls without the permission of the Engineer.

PLACING OF CONCRETE IN FOUNDATIONS

Before placing concrete in foundations, the bottom shall be thoroughly rammed andcleaned up to a neat horizontal plane, or such profile as is shown on the Drawings. No steps or batters will be permitted unless shown on the Drawings or approved by the Engineer.

Where shown on the Drawings or ordered by the Engineer that the sides of the concrete shall be cast against the existing ground without using shuttering, the faces of the earth shall be trimmed neat and true to line. Where such a hole is over- excavated due to the Contractor's method of working, the void shall be filled with concrete, at the Contractor's expense of the same Class as specified for the foundation.

Where pumping from the foundation is necessary, sumps and drains shall be provided outside of the area to be concreted. Where it is likely that there will be standing water in the foundation after excavation, the final 0.1 to 0.15 m of the soil shall not be excavated until immediately before the concreting. Where, in the opinion of the Engineer, the bottom of the excavation has become unsuitable for bearing due to the Contractor's method of working, the soft material shall be excavated to such a level as the Engineer may direct, and replaced with concrete Class 15 at the Contractor's expense.

No concrete shall be placed in the foundation until the excavation has been approved by the Engineer.

PLACING OF CONCRETE IN WATER

As far as possible, all concrete shall be deposited on a dry bottom and the placing of concrete under water will not be permitted except with the written approval of the Engineer.Concrete placed under water shall not be dropped, but shall be carefully placed in positionby enclosing it in bags or by means of a bottom dumping-bucket or tremie, or by continuous

discharge through pipes leading from the mixer. Full details shall first be permitted to the Engineer, whose written approval shall be obtained before work is commenced.

The surface of the concrete deposited under water shall be kept as nearly as possible horizontal, and no concrete shall be placed in running water or water liable to disturbance or pumping. Placing shall be such as to require the minimum amount of spreading.

Tamping to such an extent or in such a way that segregation takes place shall be avoided. Sufficient time shall be allowed for the concrete to set before it is subjected to any form of loading, and also to ensure that it shall suffer no damage from subsequent pumping or dewatering operations.

JOINTS

Construction Joints

Except where indicated on the Drawings, the position of Construction Joints shall be determined on Site. The Contractor shall submit to the Engineer for approval his proposals for the positioning of all Construction Joints. They shall be positioned withregard to the capacity of plant, weather conditions, conditions of operation, curing facilities and the structural requirements. For suspended floors, Construction Joints shall be formed generally at mid-span in both beams and slabs. Horizontal joints in walls shall be positioned with regard to the depth of penetration of the vibrator and thesatisfactory compaction of the concrete. Unless otherwise indicated on the Drawingsor otherwise permitted by the Engineer for the construction of circular tanks, concreting shall be carried out continuously for the full circumference without verticaljoints. Where permission is thus granted, the Engineer may order at no extra cost theinclusion of an approved water bar.

Horizontal Construction Joints in walls shall be formed to present a clean straight lineto the exposed face by using a fillet set horizontally and fixed to the shuttering.

For inclined members, joints shall be formed normal to the surface

Construction Joint surfaces shall be formed by the "wash-off" method. The concretesurfaces shall be left straight, free from all irregularities of level and clean of all looseaggregate. As soon as possible after placing the concrete the joint shall be sprayed with a fine spray of water to prevent the formation of laitance. Subsequently all excess water shall be removed by means of a jet of compressed air and the surface left clean. New concrete shall be placed in contact with the clean surface without theapplication of grout and shall be well vibrated to ensure complete union of the new with the old concrete.

The face of horizontal joints shall preferably be brushed while wet to expose the aggregate.

The face of the joint already set shall be thoroughly roughened by bush-hammering orchiselling, or wire- brushing if the surface has only partially set. All loose pieces of aggregate shall be removed, and the face scrubbed clean with a stiff wire-brush, andthoroughly wetted. In the case of horizontal joints, the face shall be rendered with 10mm thick layer of cement/sand mortar proportioned to give at least the specified strength for that Class of concrete, and the new concrete laid immediately upon it andthoroughly punned in. Where joints will be permanently visible, the mortar shall be kept back at least 25 mm from the exposed face. In the case of vertical joints, the face shall be rendered with a coat of neat cement placed immediately before each fresh lift of new concrete.

Where due to accident or breakdown, it is impossible to continue concreting, the Engineer or his Representative shall be immediately notified, and his verbal instructions regarding either the making of a Construction Joint or the taking-out of the new concrete back to the last Construction Joint, shall be complied with

immediately. The cost of complying with these instructions and making good shall beentirely at the Contractor's expense.

Rubber, Polyvinyl-Chloride, or other approved waterstop not less than 125 mm wide, shall be used in Construction Joints as indicated in the Drawings or at additional or alternative positions to be agreed by the Engineer. Type and size of waterstop shall also be as indicated on the Drawings, and wall-to-wall foundation joints shall have anopen centre bulb type waterbar. They shall be supported during Concreting or shall have eyelets to enable them to be tied and held in place during concrete placing so as to prevent dislodgement and to ensure that the ends remain at right angles to the Construction Joints.

Joints and intersections of waterstops shall be sealed by vulcanizing or other approved means. Open centre-bulb type waterstops shall be accurately positioned as detailed in the Drawings. The cost of forming Construction Joints where shown onthe Drawings shall be paid for at the rates inserted in the Bills of Quantities, but Construction Joints required elsewhere shall be deemed to have been included for bythe Contractor in his general concrete rate.

Rubber Bitumen Joint SealerJoint sealers

shall:
Retain elasticity at low temperatures;
Maintain the ability to form a watertight seal;
Not bleed or flow at sun temperatures;
Not impart taste or odour to water

Other joint sealers having the above properties may be used with the approval of the Engineer.

Application of bituminous sealer shall be delayed where possible until all Constructionof the structure has been completed. Recommended time for caulking of floor joints is during wire-winding operations on the tank wall (if any) but under no circumstancesshall the joints subject to movement by stressing of adjacent sections be filled until such stressing operations have been completed.

The joints shall be filled exactly as detailed on Drawings and the handling and layingof bituminastic material, including priming, must be carried out exactly to the makers specifications. The practice of flooding the joint with primer is forbidden. Great caremust be exercised when cleaning not to injure any sealing aid such as waterbars which have been cast into the joint. The hot rubber bitumen filler should be heated tothe specified temperature in a purpose made heating unit and the temperature rigidlycontrolled with the aid of a suitable thermometer.

The practice of heating by use of a petrol drum over a wood-fire shall be avoided.

BENDING, PLACING AND FIXING OF STEEL REINFORCEMENT

The Contractor shall provide on Site, facilities for cutting and bending reinforcement whether he is ordering his reinforcement bent or not and shall ensure that a token amountof straight bar is available on Site for bending as and when directed by the Engineer.

Reinforcement shall be wire-brushed and cleaned at the Contractor's expense, before and/or after it is placed in position, if required by the Engineer.

The bars shall be cold bent in strict accordance with the bending schedules and the Contractor shall be responsible for the accuracy of bending. Bending dimensions shall beworked to the tolerance indicated in SSRN 129 except for binders and links which shall bebent to a tolerance of 1.5 mm. Bars in which any errors in bending are beyond the limits ofthe foregoing tolerances, shall be replaced at the Contractor's cost by correctly bent new bars, or, may be straightened and re-bent cold, subject to the Engineer's prior approval.

Steel reinforcement shall be bent accurately to the shape and dimensions shown on the Drawings. The Contractor shall satisfy himself as to the accuracy of any bar bending schedule supplied, and shall provide all steelwork in accordance with the detailed reinforcement Drawings.

Any discrepancy or inaccuracy found in the bending schedule shall be notified to the Engineer immediately.

After bending, reinforcement shall be securely bundled and labelled with weatherproof tagsor shall be marked with other approved signs by which it can readily be identified.

Before assembling or placing the reinforcement the dimensions to which it has been bent shall be checked with the bending schedules by the Contractor.

The reinforcement shall be fixed in strict accordance with the Drawings as regards cover, spacing and position and suitable precautions shall be taken by the Contractor to prevent the displacement of reinforcement during the placing and compaction of concrete.

Where required to support and retain the reinforcement in its correct position, the Contractor shall provide templates, stools and other supports at his own cost.

Precast concrete support blocks for reinforcement shall be manufactured from Class 25 fine concrete to ensure the correct thickness. They shall be well cured before use and carefully stored on Site to avoid contamination. Plastic and metal supports, chairs, etc, maybe used subject to the Engineer's prior approval.

A lap of not less than forty-four diameters of the large bar shall be provided at the junctionof two bars for which the lap is not specifically detailed on the Drawings.

Fabric reinforcement shall be lapped at least 40 diameters or two squares whichever is thegreater.

Additional splicers, other than those shown on the Drawings, may be permitted by the Engineer, but will not be paid for. All splices shall be staggered and the length shall be asdirected by the Engineer.

All intersection of bars in walls and slabs and all connections between binders and links and main bars in columns or beams shall be tied with soft iron wire ties or with fixing clips which shall not be allowed to make contact with the shuttering or to project into the specified cover

Unless permitted by the Engineer, welding of bar reinforcement at intersections or for the joining of bars is prohibited. Where permission is granted, welding shall be carried out in accordance with the recommendations "Welding of Mild and Cold-worked Steel Bars for Reinforced Concrete Construction" as issued by the Institute of Welding, UK.

FORMS AND FORMWORK FOR CONCRETE: DEFINITIONS

"Forms, formwork or shuttering" shall include all temporary moulds for forming the concreteto the required shape, together with all temporary construction such as falsework, props and struts required for the support of such moulds, together with any special lining that maybe required to produce a special concrete finish.

"Wrot" or "Wrought" formwork or shuttering shall mean formwork where the internal timberface in contact with the concrete is planed smooth, and the Contractor is to take particularcare with the surface of the shuttering, and with the floating of unshuttered surfaces, it being the intention that a very smooth face will result when the shuttering is struck.

"Unwrot" formwork or shuttering shall mean formwork when the internal timber face in contact with the concrete is left "as sawn".

FORMS AND FORMWORK FOR CONCRETE: CONSTRUCTION

All forms shall be constructed so as to facilitate the accurate placing and proper com- paction of the concrete. Timber forms shall be constructed of sound, well-seasoned timber

of such quality and strength as will ensure rigidity throughout the placing, ramming,vibration and setting of the concrete without visible deflection or warping. They shall be soconstructed that they can be removed without shock, vibration or damage to the concrete. All joints shall be tongued and grooved, unless otherwise required, and shall be made sufficiently tight to prevent any leakage of grout. Internal ties shall be avoided as far as possible, and if used, shall be metal. They shall be capable of removal without injury to theconcrete, but if permitted by the Engineer to be permanently embedded in the concrete, shall be cut back after the concrete is cast to at least 25 mm below the concrete.

Formwork for columns and small concrete sections, or where directed by the Engineer, shall be fitted with trap doors through which saw-dust, shaving and other debris can be removed.

Steel forms of other materials may be used with the approval of the Engineer. Travelling forms will only be permitted in special circumstances, and with the written approval of the Engineer.

Struts and props shall, where required by the Engineer, be fitted with double hardwood wedges or other approved devices, so that the moulds may be adjusted as required and eased gradually after casting the concrete. Wedges shall be spiked into position, and anyadjusting device locked before the concrete is cast.

All formwork shall be approved by the Engineer before concrete is placed within it. The Contractor shall, if required by the Engineer, provide the latter with copies of his calculations of the strength and stability of the formwork of falsework, but notwithstanding the Engineer's approval of these calculations, nothing shall relieve the Contractor of his responsibility for the safety or adequacy of the formwork.

Top shuttering shall be counter-weighed or otherwise anchored against floatation.

FORMWORK FOR MOULD VIBRATED PRECAST CONCRETE

Where precast concrete is to be cast in vibrating moulds, special care shall be taken to maintain the rigidity of the mould and supports against the action of the vibrators. Form vibrators shall be rigidly attached to the forms to ensure the transmission of the vibrations to the concrete, all wedges and clamps shall be fitted with locking devices to ensure they are kept tight during the vibrating operation.

PREPARATION OF FORMS BEFORE CONCRETING

Before the concrete is deposited, the forms shall be thoroughly cleaned of sawdust, shaving and other debris and hosed down with water. The face of the forms shall be coated with lime-wash or painted with an approved mould oil. Where reinforcement has been accidentally coated, it shall be cleaned with a wire brush, and a suitable solvent.

FORMS FOR CONSTRUCTION JOINTS

Where permanent or temporary joints are to be made in horizontal or inclined members, stout stopping off boards shall be securely fixed across the mould to form a watertight joint.Temporary contraction joints shall have blocks of timber at least 75 mm thick, slightly tapered to facilitate withdrawal and securely fixed to the face of the stopping off board. Thearea of the key or keys so formed shall be at least 30% the area of the member. The blockshall be kept back at least 50 mm from the exposed surface of the concrete.

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

SPECIAL METHODS OF WORKING

Should working. the Contractor propose to use special methods of working not included inthese Specifications, such as pumping concrete or using vacuum moulds, he shall obtain the Engineer's approval before commencing work, and comply with any subsequentspecification made by the Engineer for this special method of

FORMWORK LEFT IN

Where the striking of formwork would in the opinion of the Engineer, cause damage to or prejudice the safety of the structure, the formwork shall be left in. If, in the opinion of the Engineer, the necessity for leaving in the formwork arises from the Contractor's method ofworking, then that loss shall be borne by the Contractor but if it is due to circumstances beyond his control, the timber left in will be paid for at rates set out in the Dayworks Schedule of the Bills of Quantities.

MEASUREMENT AND PAYMENT FOR FORMWORK

Formwork shall be measured as the area of the concrete actually in contact with the mould,except that in the case of small fillets and chamfers of size 30 x 30 mm and less, the overall area of the concrete shall be taken as though the fillets and chamfers had been omitted. Formwork for Construction Joints will not be paid for and will be deemed to be included in the Contractor's rates for concreting.

The rates for formwork shall include for all timber or metal moulds inclusive of all necessarysupports and stagings, bolts, nuts, straps, clamps, wedges and other fittings, also all cut- ting and waste and the cost of all labour transport and materials in making, erecting and removing the formwork and for any other work required to construct the forms to the shapes and dimensions shown on the Drawings, or as directed by the Engineer.

The rates shall also include for all cut outs, rebates, slots, etc., trimming and sealing, cut- ting and shaping.

The formwork for in situ concrete will be paid for separately according to whether it is vertical, horizontal or inclined, and whether it is unwrot, wrot or special facing, as set out inthe Bill of Quantities. Formwork for precast units will not be paid for separately and the cost of the moulds will be deemed to be included in the cost of the concrete or completed product.

Where external shuttering is employed in excavations and is measured the cost of any additional excavation necessary for the shuttering shall be included in the rates for the shuttering.

Where an item for shuttering is given, the areas indicated are only approximate and the Contractor should check the areas before pricing the Tender. No formwork will be paid forwhere foundations are shown on the Drawings or are required by the Engineer to be cast against the existing ground.

The Contractor shall be responsible for the co-ordination of all requirements of his Sub- Contractor(s) (if any) as regards provision of holes, chases, cavities and fixings and shall, ifrequired by the Engineer, prepare Drawings giving details of his and his Sub-Contractors' requirements and shall send copies of such Drawings to the Engineer prior to Construction.

Holes, etc. shall be accurately marked and boxed-out for before concreting operations commence and without the Engineer's prior approval, no such holes, etc, shall be formed after the concrete has set.

Where bars, if placed to specified spacing would foul holes of size less than 230 x 230 mm,the full length of the bar shall be moved to one side, and in the case of holes exceeding 230 x 230 mm, the bars shall be cut on site and lapped with additional bars.

Wherever possible, the Contractor shall build in all pipework, ironwork, etc. which passes through walls and floors and the pipework, ironwork, etc. shall first be thoroughly cleaned

and freed from any deleterious matter, and every care shall be taken to ensure that it is thoroughly encased in concrete.

Bolts, hooks and other fixings shall be embedded in concrete, or holes shall be drilled and fitted with threaded expanding anchors to receive the bolts. The Contractor shall ensure that bolts, hooks, etc. are accurately positioned. Holding-down bolts for machinery shall beset to template.

Where brick or stonework is to form a facing to the concrete or where the end of a brick or stone wall butts against a concrete face, 16 gauge 25 mm x 230 mm galvanized metal ties of approved manufacture to SSRN 857 shall be incorporated. The distance between ties shall be gauged with due regard for the bonding of the Walls, at intervals required by the Engineer.

The rates for fixing pipes, manholes, covers, steelwork, ladders, etc and the associated bolts and lugs shall include for cutting the shuttering, building-in, grouting-up and making good adjacent concrete, blockwork or stone surfaces.

REMOVAL OF FORMS

Forms shall be removed in such a manner as will not injure the concrete, and no formwork shall be removed before the concrete has sufficiently set and hardened. The minimum periods which shall elapse between the placing and compacting of Ordinary Portland cement concrete for the various parts of the structure are given in the following schedule, but compliance with these requirements shall not relieve the Contractor of obligation to delay the removal of the forms if the concrete has not set sufficiently hard:

Beam sides, walls, unloaded columns	4 days
Soffit of secondary slabs (props left in)	7 days
Soffit of main slabs (props left in)	14 days
Removal of props - slabs	17 days
Bottom boards of piles (Intermediate support left in)	21 days
Soffit of beams under 6 m span	21 days
Soffit of beams over 6 m span plus 1 day per 0.6 m in excess of 6 m with maximum of 28 days.	21 days,

MAKING GOOD

Honeycombing or damaged surfaces of concrete which in the opinion of the Engineer are not such as to warrant cutting out and replacement of the Concrete shall be made good as soon as possible after removal of the shuttering as follows:-

A Portland Cement and sand mixture shall be worked into the pores over the whole surface with a fine Carborundum float in such a manner that no more material is left on the concrete face than is necessary completely to fill the pores so that a uniformly smooth and dense surface of uniform colour is finally presented.

PROTECTION OF CONCRETE AFTER REMOVAL OF SHUTTERING

Any concrete surfaces, rises and treads of stairways which might be damaged during the construction of the works, shall be adequately protected.

REMOVAL AND REPLACEMENT OF UNSATISFACTORY CONCRETE

The Contractor shall on the Engineer's instruction so to do, cut and replace any concrete in any part of the structure if in the Engineer's opinion:-

the concrete does not conform to the Specifications; or

deleterious materials or materials are likely to produce harmful effects have been included in the concrete; or

the honeycombed or damaged surfaces are too extensive; or

the finished concrete sizes are not in accordance with the Drawings within per-missible tolerances; or

the setting-out is incorrect; or

the steel cover has not been maintained; or

the protection, including curing of the concrete during the Construction was inade-quate, resulting in damage; or

the work of making or other remedial measures the Engineer may indicate are notcarried out to his satisfaction; or

undue deformation of or damage to the works has taken place due to inadequateshuttering, or to premature traffic and loading; or

any combination of the above points has taken place resulting in unsatisfactory work.

CONSTRUCTION JOINTS

The details of the Construction Joints and their positions shall be submitted by the Con- tractor for approval together with the order of concreting.

Joints shall be made at right angles to the member. Stop end shutters shall be removed assoon as practicable after the concrete has set, but without moving the main shuttering. Exposed horizontal or vertical concrete shall be thoroughly cleaned to expose the coarse aggregate, being hacked, well brushed and washed with high pressure air and water jettingor by other approved method. Before fresh concrete is placed against the joint, the surfaces shall be cleaned to remove any laitance, loose material or dirt. Horizontal surfaces shall be coated with 1 to 12/3 cement mortar 12 mm thick, moistened and of approved consistency, and the concrete shall be deposited and rammed hard against the existing concrete before the coating has set.

In Construction Joints of water-retaining structures, and elsewhere as may be ordered by the Engineer, 200 mm "Dumbbell" PVC water bars shall be provided. Unless otherwise ordered by the Engineer, Construction Joints shall be rebated to an approved form.

The cost of water stops required at Construction Joints is to be included in the rates for concrete and formwork if not specifically itemised in the Bills of Quantities.

WATER TIGHTNESS

The water tightness of all members subject to water pressure shall be ensured by the use of proper materials and good workmanship as specified above and all precautions shall betaken to ensure thorough and proper consolidation of the concrete forming such members.The Contractor shall carry out such tests for water tightness as the Engineer may order. The cost of such tests shall be borne by the Contractor, unless otherwise included for in theBills of Quantities.

FAULTY WORK

The Contractor shall on being requested in writing by the Engineer, remove and reconstructany structural members or portions of the work which gives evidence of any fault, or injury which may effect the strength, durability of water tightness of the Construction. No concrete or steel shall be cut in any way except on such request and with permission in writing.

RATES OF CONCRETE

The prices inserted in the Bills of Quantities shall include for all materials including water for weighting, gauging, mixing, conveying, placing, spreading, compacting, vibrating, finish-ing, and except where otherwise provided for in the Bills of Quantities, for joints with existing work or recently deposited concrete; for shuttering to Construction joints, skew- back, stunt ends, stepping, bonding chases and the like; for Constructing the work under the alternative bay system; for curing and surface finish as specified in Clause 324 for the

cost of strengthening and stiffening the shuttering to resist vibration and for handling the concrete at the specified water-cement ratio.

Unless items for shuttering are included in the Bills of Quantities the prices for all mass concrete shall include for any necessary shuttering, side forms and timber work.

Unless otherwise specified, separate items are included in the Bills of Quantities, for moulds and shuttering for reinforced and other graded cast-in-place concrete and for finishing concrete to a very smooth surface.

PRECAST CONCRETE

The foregoing requirements relating to ordinary and reinforced concrete generally shall be observed in the case of precast concrete so far as they are applicable as well as the following requirements relating to precast work in particular.

The precast concrete work shall comply with the requirements of SSRN 142

The Contractor shall submit for the approval of the Engineer samples of all aggregates for use in the precast concrete.

Where holes or recesses are required for bolts, covers, etc. they shall be cast in the units.

Where reinforcement is required, the requirements of the Specification regarding holding of the bars or fabric firmly in position shall be strictly adhered to.

RATES FOR PRECAST CONCRETE

The price for each description of precast concrete shall include for all shuttering, moulds, fillets, for forming the tops to proper shapes, for finishing all exposed surfaces to a very smooth face and for fixing and building in place complete.

CONCRETE WORK - TOLERANCES

Cover to Reinforcement

The cover to the reinforcement bars in concrete shall be as shown upon the drawings, or as ordered by the Engineer, with the following variations permitted:

Least Dimension on Concrete Structure -	Permitted variation
Less than 0.25 m	+ 4% to - 2%
Greater than 0.25 m	+10% to - 5 mm.

Shuttering

Shuttering shall be of such accuracy, strength and rigidity as to carry the weight and pressure from the concrete to be placed on or against it, together with all con- structional, wind or other loads likely to be imparted to it, without producing defor- mation of the finished concrete in excess of the tolerances outlined below:-

Overall dimensions and levels	+/- 5 mm
Column sizes	+/- 5 mm
Beam sizes	+ 5 mm
Slab thickness	+ 5 mm
Wall thickness	+ 10 mm
Vertical lines out of plumb	+ 5 mm or
+ 12 mm in every 30 metres	

Except that in the case of "sawn" shuttering the dimensions of the finished concrete shall be no less than those shown on the Drawings.

Beam soffit shall be erected with an upward chamfer of 6 mm per 3 metre span.

WATER BARS

Waterbars shall be of PVC and of approved manufacture and securely fixed in place beforeconcreting is commenced. All joints and junctions shall be welded in an approved manner,the cost of welding and jointing being included in the rate per linear meter entered in the Bills of Quantities.

ADMIXTURES TO MORTAR OR CONCRETE

The use of any admixtures to mortar or concrete shall be subject to the written approval ofthe Engineer.

SAMPLING AND TESTING

The Contractor shall provide on the site equipment, staff and labour for carrying out the sampling and testing, and he shall carry out any or all of these tests at such times and withsuch frequency as may be requested by the Engineer.

All equipment shall be calibrated and checked from time to time as the Engineer may require.

The Contractor shall provide all samples required by the Engineer. Those samples to be tested in a laboratory shall be carefully forwarded by the Contractor to an approved laboratory. Results of laboratory and Site tests shall be kept on Site and copies of all test Reports shall be forwarded in duplicate to the Engineer's Representative.

The provision on site of all instruments and apparatus and the expenses and costs (including laboratory fees and carriages) of all checking, calibrating, provision or making and of handling and testing materials and concrete either by a laboratory or on Site as

described herein shall be allowed for by the Contractor in his rates and prices together withthe cost of preparing all test records and supplying copies to the Engineer.

TESTING OF CONCRETE DURING PRODUCTION

Consistency

The consistency of concrete shall be frequently checked by means of a slump test performed by the Engineer or his Representative. The maximum and minimum slumpfor each Class of concrete used shall be as directed by the Engineer, and any concrete represented by the slump test which fails to comply with these specifications, shall be removed from the Site and disposed off at the Contractor's expense.

Slump Test

Slump tests shall be performed in accordance with SSRN 116, during the progress ofthe work to ensure consistency of the concrete and carried out at such frequency andon such concrete as the Engineer shall direct.

The Contractor shall keep a record of slump tests showing:-

Date and time of test;
Class of concrete and position of batch in the Works;
Amount of slump;
Remedial measures taken to correct mix.

A copy of this record shall be given to the Engineer at the end of each day's work.

Method of Making Test Cubes

Test cubes shall be made by or under the supervision of the Engineer or hisRepresentative from concrete placed in or about to be placed in the works.

Test cubes shall be made, stored and cured and tested in accordance with SSRN 117'Method of Testing Concrete', except that no 100 mm cubes will be permitted. The method of compaction (by hand or vibrator) will be at the Engineer's discretion.

Test cubes shall be marked with the date of casting and a reference number, and theContractor shall keep a record and provide the Engineer with a duplicate copy showing the date cast, reference number of cube, Class of concrete and position in the works of the concrete tested.

After approval of the trial mix by the Engineer, production of concrete for the works may commence.

The proportions of materials used in the works shall follow the proportions found to beacceptable in the trial mixes. The concrete shall be prepared under the control of a competent person, and close control kept over quantities and water content, care being taken to make due allowances for variations in the moisture content of the materials. Regular testing of the moisture content of the aggregates shall be carried out. All measurements of materials (except water) must be done by weight.

Immediately on starting production on Site, samples of concrete shall be taken as follows:-

On each of the first 4 days of concreting, for each Class of Concrete shall be made6 No. test cubes from 2 No. separate samples. Three test cubes from each sample tobe tested at 7 days, the other 3 at 28 days.

One test result shall be the average crushing strength from the three cubes in the sample tested either at 7 days or at 28 days.

For the concrete to be acceptable the following conditions must be satisfied:

No more than one individual result in the same test shall fall below the specifiedworks Cube Strength.
No individual result to fall below 0.9 x the specified works Cube Strength.
No test result (average of three cubes in one sample) to fall below the specifiedworks Cube Strength.

When at least 4 consecutive working days concrete production has been proved satisfactory, the frequency of testing may be reduced at the Engineer's discretion.

Transport of Test Cubes

Test cubes shall if required by the Engineer, be transported by the Contractor to a testing laboratory nominated by the Engineer so as to arrive not later than 6 days after casting but shall not be despatched earlier than 72-hours after casting.

FREQUENCY OF TESTS

Frequency of tests and the number of samples required will be governed by the results of previous test, the quality of the materials revealed during the tests and the uniformity of thatquality.

In case of crushing tests to be made on concrete when Construction commences, the Engineer may require up to 12 test cubes to be cast each day for each Class of concrete (6cubes to be tested at 7 days and 6 cubes at 28 days) until he is satisfied that the materialsand the method of mixing used are such as to produce a concrete which complies with therequirements of SSRN 117 in the case of "Mix Design" and in the case of "Nominal" and "Standard" Mixes. The number of test cubes to be made for routine testing shall be 3 for each and every 38 m3 or part thereof per working day or as otherwise required by the Engineer. These cubes shall normally be tested 7 and 28 days after casting.

Should it become evident that quality of the concrete is deteriorating, the Engineer may require additional samples to be made and tested to determine the cause.

LOADING TESTS

The Engineer may direct that a loading test be made on the works or any part thereof if he deems such test to be necessary for one or more of the following reasons:-

Failure of "Site Cubes" to attain the specified minimum strength requirements.

Premature removal of shuttering

Overloading of structure during construction

Any other circumstances attributable to alleged negligence on the part of the Contractor, which in the opinion of the Engineer, may result in a structure being of less than the required strength.

If the loading test be ordered to be made solely or in part for reasons (a) to (c), the testshall be made at the Contractor's own cost.

If the loading test be ordered to be made for reason (d) the Contractor shall be reimbursedfor the cost of the test if the result is satisfactory.

Loading tests shall be carried out in accordance with SSRN 117 as required.

If the results of the test are not satisfactory, the Engineer will direct that the part of the workconcerned be taken down or removed and reconstructed to comply with the Specification, or that such other remedial measures as he may think fit be taken to make the work acceptable and the Contractor shall carry out such work at his own cost.

The Engineer may also instruct the Contractor before a loading test takes place to take outcylindrical core specimens from the structures concerned and have them tested. The cutting equipment and the method of doing the work shall be to the Engineer's approval. The specimen shall be dealt with in accordance with SSRN 117. Prior to testing, the specimens shall be made available for examination by the Engineer. If the cores are ordered to be taken solely or in part for reasons (a) and (b) above, the work involved and the testing shall be made at the Contractor's own cost. If the costs are to be taken for reasons (c) and (d) above, the Contractor will be reimbursed the cost if the loading test described in the previous paragraphs proves satisfactory.

REFERENCE AND RECORD BOOKS TO BE KEPT ON SITE

A triplicate book shall be provided by the Contractor wherein all instructions on concrete work given by the Engineer shall be entered. This book shall be kept on the Site and one copy of all entries shall be forwarded to the Engineer.

A continuous entry diary shall be kept permanently on Site by the Contractor wherein he shall record details of shuttering, construction, placing or reinforcement, concreting and curing operations, striking or shuttering, making good, daily temperature and weather conditions. The diary shall always be available for the Engineer's inspection.

The Contractor shall provide and keep permanently on Site all the Standard Specificationsreferred to herein.

TESTING EQUIPMENT

The Contractor shall provide the following equipment for carrying out control tests on theSite:-

Straight edges (3.00 metres and 1.25 metres long) for testing the accuracy of thefinished concrete.

A glass graduated cylinder for use in the silt test for organic impurities in the sand.

Slump test apparatus

A sufficient number of 152.4 mm steel cube moulds with base plates and tampingrods to SSRN 117.

REPAIR OF CONCRETE STRUCTURES

General

All materials for use in concrete repairs shall be obtained from an approved manufacturer. The application tools and equipment, methods, climatic conditions (such as temperature and humidity) and surface preparation shall be strictly in accordance with the manufacturer's specifications and instructions and these shall besubject to approval by the Engineer. The supply source shall not be altered without the Engineer's approval.

Generally before any repair is done, the surfaces shall be thoroughly cleaned and freed from any oil, grease, cement laitance or loosely adhering particles. Upon application of final layer, the surface shall be suitably finished to give the appearanceof a smooth surface.

For surfaces in contact with potable water, the chemicals shall have been certified assuitable for use in potable water retaining structures by competent and internationally recognised authorities. Products acceptable include waterproofing chemicalsconsisting of rapid hardening Portland cement, oven-dried quartz sand and active inorganic chemicals of a type that upon application to a concrete surface a crystal chain reaction starts as the active chemical ingredients react with the free lime and water in the concrete capillaries resulting in the formation of insoluble crystals which drive out the surplus capillary water ensuring a permanently water tight concrete but which however at the same time allow the concrete to breath.

For application on all water retaining surfaces, the objective shall be to achieve complete water tightness, by forming an effective barrier against water infiltration and bond concrete sections together, thereby restoring original structural strength. Not withstanding the manufacturer's instructions, the contractor shall be fully responsible for the water-tightness of water retaining structures and any remedial measures necessary.

Sealing of cracks and surfaces with epoxy mortar

For repair of cracks, each shall first be widened by cutting a 'V' groove 20mm x 20mm, along its entire length. The crack surface shall be cleaned thoroughly and wire-brushed to remove any loose chippings, grease or dirt. The groove shall then befilled with an approved epoxy resin mortar (a solvent free 3-component repair and filling mortar based on a combination of epoxy resins and selected high strength aggregates e.g. Sikadur 43) in accordance with the manufacturer's instructions.

For application on other surfaces as indicated in the Bill of Quantities, the surfaces shall be prepared in accordance with the manufacturer's instructions, before application of the epoxy mortar. In floors this will also involve hacking away all spalledconcrete and cleaning off loosely adhering particles and cement laitance. In the internal surfaces of tanks the surface preparation shall involve water-jetting or as specified by the manufacturer.

Sealing of Cracks in Horizontal Construction Joints with Polyurethane Sealant

The joint shall be cleaned thoroughly along its length to remove any loose substrate,grease and dirt. It shall be repaired by sealing with 1-component polyurethane sealant(e.g. Sikaflex PRO 2HP or 1A) that cures on exposure to moisture to form a tough and permanent elastic seal followed by a high performance joint sealing system for irregular and high movement joint (e.g. Sikadur Combiflex).

Sealing of Cracks on Walls with injection liquid

The joints shall be cleaned thoroughly to remove any loose substrate, grease and dirt.They shall then be repaired by injecting a 2-component solvent free, low viscosity injection liquid, based on high strength epoxy resins (e.g. Sikadur 52). After mixing,

the liquid shall be injected into cavities and cracks in concrete where it cures to a rigidhigh strength material.

Water Proofing Slurry Walls

The wall surfaces shall be cleaned by water jetting to the satisfaction of the Engineer.A water proofing slurry, such as synthetic rubber based, water resistance bonding agent for mortar (e.g. Sikar Latex), shall then be applied in accordance to the manufacturer's instructions.

Wall Roof Joints

Where indicated for repair, the joint at the interface between the wall and the roof should be cleared off by removing existing sealant and any loose mortar. The joint shall then be sealed with an approved bitumastic sealant (e.g. Igas Black) according to the manufacturer's instructions.

Replacement of Ground Floor Screed

The floor surface shall be chiselled, to remove all the damaged floor screed, cement laitance or loosely adhering particles and the surface thoroughly wetted. A new 1:3 cement sand screed floor shall then be placed and finished off appropriately to matchexisting or adjacent surfaces.

Repair of Floor Slabs Joints with bitumastic sealant

Where indicated in the Bill Of Quantities, the joint shall be cleaned off by removing existing joint sealant and any loosely adhering particles. The joint shall then be sealedwith an approved bitumastic sealant (e.g. Igas Black) in accordance with the manufacturer's instructions.

Repair of Cracks in Walls or floors Using Cement Mortar

The cracks should be enlarged into wedge shaped grooves at least 20 mm wide at the top. They should be cleaned thoroughly, wetted and filled with 1:3 cement sand mortar. Such repaired surface shall be adequately cured for at least 3 continuous days or as directed by the Engineer.

Protection of Concrete Columns at Intake

Where indicated in the Bill of Quantities, columns above water level should be plastered with an approved epoxy mortar (a solvent free 3-component repair and filling mortar based on a combination of epoxy resins and selected high strength aggregates e.g. Sikadur 43). The surfaces shall be prepared in accordance with the manufacturer's instructions. For column surfaces below the water level, gabion boxesshall be installed around them to prevent further wearing off of the concrete as directed by the Engineer.

Repair of Stone Pitching

Where it has worn off, stone pitching shall be replaced by jointing using 1:3 cement sand mortar after replacing and compacting any lost fill material beneath as directed by the Engineer. In locations where the jointing has become loose, repair shall be carried out using pressure grouting. The grout shall be 1:3 cement sand mortar madeto a sufficient consistency to allow pressing into the cavities with a steel trowel.

Pressure Grouting into Blockwork Bases and Retaining Walls

Pressure grouting where indicated in the Bill of Quantities shall be done using approved equipment and the mortar shall be 1:3 (cement sand mortar) mortar made to a sufficient consistency to allow injection into the cavities.

Replacement of Concrete Paving Slabs

Damaged concrete paving slabs shall be removed and any lost fill replaced and compacted to the Engineer's satisfaction. They shall then be re-laid and jointed using

1:3 cement sand mortar made to a sufficient consistency to allow pressing into the cavities with a steel trowel.

Reflective Gravel on Tank Roof Slabs

The existing gravel that has become discoloured over the years should be replaced with a fresh supply of reflective gravel uniform size 20 mm to a uniform thickness of 100 mm to the approval of the Engineer.

Repair of Scoured Holes in Access Road

The scoured holes shall be filled with suitable stone base and compacted to Engineer's approval and surface reinstated by appropriate double surface dressing. To avoid ponding, openings should be created in existing kerb and stone pitching as directed by the Engineer. Where necessary, the road shall be reshaped to enable water to flow away.

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 3.5: 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:

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

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.

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 3.5.

CHAPTER 4PIPEWORK

TABLE OF CONTENTS

CLAUSE NO. DESCRIPTION PAGE NO.

PART I – ALL PIPES, VALVES & FITTINGS DURING DESIGN, MANUFACTURE, WORKS TESTING AND SUPPLY 1

PREFACE 1
GENERAL 2
CERTIFICATE AND SAMPLES FROM PIPE MANUFACTURERS 4
INSPECTION AND TESTING DURING MANUFACTURE, SUPERVISION BY ENGINEER'S AND EMPLOYER'S REPRESENTATIVES 5
THIRD PARTY INSPECTION DURING MANUFACTURE OF FIRMS WITH OR WITHOUT ISO QUALITY ASSURANCE ACCREDITATION 6
ACCEPTANCE OF PIPES, VALVES AND FITTINGS 6
MANUFACTURER'S WARRANTY AND MANUALS 6

PART II – FERROUS PIPES DURING MANUFACTURE, SUPPLY, INSTALLATION COMMISSIONING & TESTING 7

DUCTILE IRON PIPES AND FITTINGS - MATERIALS AND STANDARDS, ... 7
BARRIER COATED STEEL PIPES AND FITTINGS - MATERIALS AND STANDARDS 10
HOT DIPPED ZINC (GALVANISED) COATED STEEL PIPES AND FITTINGS (GS / GI)- MATERIALS AND STANDARDS 14
JOINING TO STEEL PIPES WITH BARE STEEL ENDS, ABOVE GROUND PIPELINES AND FITTINGS AND PIPELINES IN BACKFILLED TRENCHES BOLTED BY FLEXIBLE COUPLINGS (MOULDING METHOD) 14
PACKING FOR TRANSPORT – FERROUS PIPES 15
IN-COUNTRY STORAGE, HANDLING AND TRANSPORTATION OF FERROUS PIPES.16514
DISTRIBUTION OF FERROUS PIPES FROM STORAGE 17
FLANGED JOINTS FOR FERROUS PIPES AND FITTINGS 17
FLEXIBLE JOINTS 17
COMPLETION OF EXTERNAL PROTECTION AT FLEXIBLE JOINTS ON FERROUS PIPELINES 17
BUTT WELDING OF STEEL PIPES 19
COATING REPAIR 21
TRENCH EXCAVATION AND EARTHWORKS FOR FERROUS PIPES 21
PIPE LAYING FOR FERROUS PIPES 23
BACKFILLING OF PIPE TRENCHES- FERROUS PIPES 25
MAKING GOOD SUBSIDENCE AFTER REFILLING 28
REINSTATEMENT OF SURFACES 28

PART III – THERMOPLASTIC PIPES DURING MANUFACTURE, SUPPLY, INSTALLATION, COMMISSIONING & TESTING 29

MATERIALS AND STANDARDS, UNPLASTICISED PVC PIPES AND JOINTS 29
MATERIALS & STANDARDS, HIGH DENSITY POLYETHYLENE PIPES AND FITTINGS 35
MATERIALS & STANDARDS, GLASS REINFORCED POLYESTER (GRP) PIPE 38
TRENCH EXCAVATION AND EARTHWORKS FOR THERMOPLASTIC PIPES 42
PIPE LAYING FOR THERMOPLASTIC PIPES 44
BACKFILLING OF PIPE TRENCHES FOR THERMOPLASTIC PIPES 46

MAKING GOOD SUBSIDENCE AFTER REFILLING 49
REINSTATEMENT OF SURFACES 49

PART IV - ALL PIPELINES DURING DELIVERY, INSTALLATION, TESTING AND COMMISSIONING 50

ON-SITE INSPECTION 50
HANDLING FROM STORAGE TO TRENCH 50
MEASUREMENT FOR PIPE LAYING 51
WORKING WIDTH 51
LOCATION OF UNDERGROUND SERVICES ETC. 51
CONCRETE PROTECTION 51
ANCHOR BLOCKS 51
INDICATOR PLATES AND MARKER POSTS 52
ADDITIONAL PROTECTION TO FLEXIBLE COUPLINGS AND FLANGE ADAPTORS IN CHAMBERS AND/OR ABOVE GROUND 52
PROTECTION TO FLEXIBLE COUPLINGS AND FLANGED ADAPTORS FITTED TO EPOXY COATED PIPE SPIGOTS. 52
BURSTING DISCS AND BURSTING DISCS DEVICES 52
IN-SITU WELDING OF STEEL FITTINGS AND FLANGES 52
PIPE SUPPORTS 53
SERVICE PIPE CONNECTIONS 53
HYDROSTATIC TESTING OF PIPELINES 53
FLUSHING AND STERILISATION 54
HORIZONTAL DIRECTIONAL DRILLING (HDD) FOR ROAD AND RAIL CROSSINGS 54
TIE-IN WORKS BETWEEN EXISTING AND NEW PIPELINES 59

PART V – VALVES, METERS, FITTINGS AND OTHER RELATED ITEMS 63

VALVES - GENERAL 63
GATE VALVES 63
BUTTERFLY VALVES 64
HANDWHEELS AND VALVE CAPS AND VALVES 65
VALVE KEYS 65
NON-RETURN VALVES 65
AIR RELEASE AND VACUUM BREAK VALVES 65
SURFACE BOXES 66
VALVE CHAMBERS 66
VALVES CHAMBER COVERS 67
RESERVOIR INLET VALVES 67
TWO-POINT TIME-MODULATED PRESSURE REDUCING VALVES 67
BULK METERS ELECTRO-MAGNETIC TYPE 68
BULK WATER (WOLTMAN) METER (HELICAL VANE TYPE) 68
CONSUMER WATER METERS 72
PREPAID CONSUMER WATER METER 77
CATHODIC PROTECTION AND TEST STATIONS 80

CHAPTER 5 – PIPEWORK

PART I – ALL PIPES, VALVES & FITTINGS DURING DESIGN, MANUFACTURE, WORKS TESTING AND SUPPLY

PREFACE

This specification applies in particular to water supply pipework. Pipes, valves and fittings shall comply with the relevant Standard Specifications as stated hereinafter.

The pipe materials and installation methods specified are aimed at balancing capital investment cost, the operation and maintenance cost, the social implications and the environmental health implications in the supply and installation of water pipelines.

The specifications have been prepared with the intention of ensuring that adherence to the specifications meet the following criteria:

Unless specifically prohibited, or constrained by socio-environmental consequences as hereinafter indicated, manufacturers and contractors are free to bid for any of the four pipe material against all pipeline diameters and the market price at the time of bidding shall be allowed to determine what material is used;

The specifications should be performance based with guidance given to design requirements, acceptable grade, trenching conditions, etc. for each material likely to be bid;

There should be one general approach to specifying pipeline materials and this should only be varied for specific design situations such as a major transmission main, unusually high working pressures, etc.;

Specifications should not unduly prejudice local manufacturers but neither should they ignore international best practice in regards to the standards of design and construction

Unless specifically indicated or allowed otherwise, e.g. hot dipped zinc(galvanised) steel pipes of diameter less than DN 80, the minimum design workinglife shall be 40 years and pipe manufacturers shall provide a written guarantee to this effect which shall nevertheless be conditional upon the installationrequirements of this specification being complied with.

As far as it has been possible, these specifications balance the rigorous requirements across the board for all pipe materials in conformance to their international standard and best practice. This also takes account of the issue of equivalent pressure rating for thermoplastic pipes to meet both hydraulic and area specific conditions such as temperature, loading, impact fatigue and the like and the issue of durable and long lastingcoating and lining for ferrous pipes. In case of any doubts, respective international standards shall apply, strengthened where indicated by National Standards.

The specifications on pipe materials presented in this section shall therefore have precedence over other clauses that discuss the same issues elsewhere in this Specification Volume. The preferred standard specification is clearly indicated in every case. However, possible alternatives known to be available in certified English translationare acceptable. For these Standard Specification Reference Numbers, (SSRN), please refer to chapter 11. Whilst every effort has been made to quote the latest available versionof the Standard Specifications mentioned herein as at the date of this edition (January 2013), due to continuous research and development on enhancing asset useful life, these standards are frequently being updated, revised or replaced, and in all cases, the editionscurrent at the time of bidding shall be applicable.

Design, whether it be prior to bidding or for variations or additions during construction shall meet the requirements of the design standards as indicated herein.

The recommendations contained in SSRN 651 with regards to pipework and its installation shall be followed, in so far as they are relevant to the prevailing soil and climatic conditions.

GENERAL

In general the recommendations contained in SSRN 679 with regards to pipe design), andSSRN 269,SSRN 219 and SSRN 253, or their equal (with regards to general pipe work and its installation) shall be followed in so far as they are relevant to the prevailing conditions. For design recommendations not covered by SSRN 679, reference should bemade to SSRN 202 for ductile iron pipes; SSRN 24 and SSRN 201for steel pipes; SSRN 300, SSRN 305 and SSRN 306, for PVCu (uPVC); and SSRN 307 for HDPE (PE100)
pipes. Other related standards listed in Chapter 11 of these specifications are also relevant and pipe materials and their installation shall conform to them as well. At all timeslatest editions and updated standards and procedures for design and installation shall beused and adopted. This will ensure that the employer benefits from superior materials withenhanced useful life. In the same context the Contractor may provide, with the approval ofthe Engineer, superior materials using other standards not listed here provided they can demonstrate this to be the case through tests, examples and guarantee certifications.

Except where otherwise specifically indicated, all ferrous pipes of DN 80 and above shallbe barrier coated.

The Contractor shall be wary of the worst case scenarios making their pipes unsuitable and these can be caused by such things as unsuitable soils, shallow depths, bedding types and extraordinary traffic loads among other things and the Contractor shall inform the Engineer when they occur. Such incidences shall be remedied by using a higher classof pipe (wall thickness and/or yield stress) and / or bedding as shall be directed.
As a general guidance, the pipes proposed for the Contract shall conform to the following international and national standards unless a superior quality is demonstrated.

Standards for Pipes and Pipelines

Pipeline general SSRN 267 – Structural Design of Buried Pipelines, saving that where the Specification is silent on any pertinent matter, then the alternative relevant part of the SSRN indicated shall be complied with
SSRN 268 British Standard Code of Practice for Pipelines SSRN 268 Pipeline on land: Design, construction andinstallation
SSRN 267 – Ductile Iron
SSRN 653 (d) - Glass reinforced and thermosetting plastics SSRN 270 – Pipelines subsea – design, construction andinstallation
SSRN 653 (f) – Design and Construction of Steel PipelineInland
Steel pipes & fittings Pipes SSRN 213
Standard steel grades, SSRN 228 (c) (higher grades may be specified or allowed only with the written authorisation of the Engineer.
Wall thickness SSRN 228 (c) as a minimum, unless otherwiseindicated or specifically authorised following a design certifiedby the manufacturer
Flanges SSRN 207 (a)
Coating and Lining SSRN 271 for Type III soils (unless detailed field tests have proven Type I and II soils to be exclusively present).

Ductile Iron pipes Pipes and joints SSRN 202
and Fittings Flanges SSRN 207

Coating and Lining SSRN 272 for Type III soil (unless detailed field tests have proven Type I and II soils to be exclusively present), and SSRN 258

PVC pipes SSRN 300

Fittings shall in general be steel or ductile iron. Injectionmoulded PVCu bends and tees shall be allowed.

HDPE pipes & fittings SSRN 307

Fittings shall in general be steel or ductile iron whilst electro- fusion jointed bends and tees shall be allowed providingthese are not formed by bending straight pipe below the minimum radius specified.

These and other specific standard specifications are listed in Chapter 10 –SSRN

Design Criteria for All Pipelines

Ductile iron pipes are classified as semi-rigid pipes whilst steel and thermoplastic pipes are classified as flexible and any design must take the different requirements between thetwo into account.

Materials data for all pipes is required to enable structural design to proceed. Common to all is the internal diameter, excluding lining (if any) and where applicable including lining as well as the wall thickness being considered. All flexible pipes also require the stiffness,[S=E × I/D3] to be taken into account.

In addition, steel requires knowledge of the maximum allowable working pressure, the maximum allowable surge pressure, the allowable stress and the allowable deflection, whilst PVCu and pipes comprising PE require knowledge of long term ring bending modulus of elasticity, the allowable deflection, cyclic fatigue and the allowable long term combined stress.

In all cases, hydraulic design shall be based on the actual internal diameter and NOT the Nominal Diameter (DN) as well as the appropriate roughness (k) in mm.

Except where otherwise indicated, pipes have been designed to allow for the conditions listed in the Table below (these shall be changed to suit the actual situation). Where in theopinion of the Engineer, actual site conditions result in loads and stresses greater than allowed for, the Engineer may require the pipe design to be modified to account for such changes in design assumptions. Unless authorised otherwise in writing by the Engineer, these criteria shall also be used for any design undertaken during the construction stage.

Criteria	Units	Value	Specific Design Necessary
Minimum Pipe Cover Thermoplastic pipes Ferrous Pipes Transmission Mains (all)	mm mm mm	900 600 900	May be increased for road crossings
Minimum Trench Width DN < 125 DN 125 to < 300 DN 300 to < 600 Diameter > 600	mm mm mm mm mm	600	General minimum trench widths OD + 450 OD + 600 OD + 900 OD + 1200
Soil Type Expected Native Soil Modulus E’ 3	MPa	2.5	Clayey silty sand, loose condition

Cont’d

Criteria	Units	Value	Specific Design Necessary
Trench Type for Pipe Material Thermoplastic Steel cement mortar lined Steel other linings Ductile Iron	 Class Class Class Class	 **S1** / S2S3 / **S4S3** / S4 S3 / **S4**	With Project Engineer's approval or direction S2 S3S4S3
Minimum Surround Compaction	% MPD	90	MPD
Operating Temperature Secondary and Tertiary Primary Transmission	^{o}C ^{o}C ^{o}C		 27 29 29
Operating Pressures Secondary & Tertiary Distribution Primary Distribution Transmission Mains	 Bars Bars Bars	 7 7 10, 12, 16 or 25	 So as to suit operating pressure
Traffic Loading Vehicle Axle Load Vehicle Overload Risk Factor Vehicle Impact Factor	 kPa %	 73 25 1.5	May be increased for field & major road conditions and designs adjusted at the Engineer's discretion.
Partial Vacuum in Pipes Secondary & Tertiary Primary Distribution Transmission Mains		 No Yes Yes	 NoYesYes

Specific design (supported by properly documented calculations) and Engineer's written approval will be required for the following situations: -

Thermoplastic pipes with nominal diameter greater than 250mm for which, apart from soil and surcharge loads, loads due to partial vacuum and cyclic fatigue shall be taken into account.

Road crossings for which, apart from soil and surcharge loads, loads due to cyclic fatigue shall be taken into account.

Transmission mains for which specific conditions may apply. The use of PVCu

pipes in Pumping Mains is strictly forbidden.

Thermoplastic pipes less than OD 110 may be affected if the native soil modulus is less than the MPa value indicated above and the Engineer may require the pipe grade to be increased. Trench widths for pipes greater than DN 300 may be varied with the approval of the Engineer to suit actual site conditions and approved working methods provided thatthe Contractor has proven that the minimum compaction specified is being continually bettered.

For ferrous pipes of diameter less than DN 80and where a non-barrier, (that is a metallic type coating) such as zinc has been specified or approved as part of the protection system, additional on-site protection as indicated herein for buried screwed joints and joints incorporating bolts must be strictly complied with and no exceptions whatsoever willbe allowed.

CERTIFICATE AND SAMPLES FROM PIPE MANUFACTURERS

Where specifically required by the Bidding Document, samples shall have been provided by the Contractor at the time of Bidding and these, if accepted, shall be used for the purpose of comparison with all components of a similar nature delivered subsequently.

Any subsequent goods supplied that do not meet the standards of the sample shall be liable to rejection with all consequences to the cost of the Contractor.

The Contractor shall within 42 days of award, supply to the Engineer a signed certificate from the pipe manufacturer(s) stating that the pipes and fittings comply in all respects withthe provisions of these Specification and the indicated National or International Standards,and that the material(s) from which they are to be manufactured conform to the required standards for all raw materials, processes, quality control, manufacturing, while for fully manufactured products this includes where appropriate, the handling to shipment. The pipe and fittings manufacturer's key personnel shall have at least three (3) years relevant manufacturing experience especially in regards to plant management, quality control / quality assurance, application of the coating and lining systems offered in the bid, and selection / batching / mixing of raw materials, and in the case of thermoplastic pipes, the manufacturer (or licensor in the case of local manufacture under license) shall certify that the requirements of SSRN 319 have been complied with. The Contractor shall have submitted reasonable documentary evidence with its bid to support statements made in the bid documents in this regard. The manufacturer shall also state that they have the ability to carry out the necessary tests during the manufacturing process and tests on the finished products as required by the respective standards.

If the manufacturer of any pipe, valve or fitting supplied under this Contract has a Quality Assurance (QA) System complying with ISO 9000/9001/9002, he shall submit a notarised copy of a fully independent 3rd Party certification to that effect together with sufficient information from his Quality Assurance Plan (in English) to enable the Engineer and the Employer to understand the levels of performance he has undertaken to honour. Where amanufacturer is not ISO QA certified, then a full copy of his Quality Assurance Plan (in English), shall be submitted.

The Contractor shall furnish the Engineer with a manufacturer's certificate in respect of every consignment of the pipeline materials, confirming that all the items of the consignment comply in all respects with the requirement of the specified standards and ofthis specification. The original and one copy of such manufacturer's certificate shall be delivered to the Engineer prior to shipment in the case of imported pipes and prior to despatch from the factory in the case of local manufacture.

INSPECTION AND TESTING DURING MANUFACTURE, SUPERVISION BY ENGINEER'S AND EMPLOYER'S REPRESENTATIVES

In addition to Clause 503 during manufacture and before despatch of pipes and fittings from the place of manufacture the Contractor shall allow for inspection by the Engineer orhis representative and the Employer of all the manufacturing processes and tests on raw materials and finished products. The inspection may include attendance at all pressure and material tests, execution of dimensional checks and inspection of the workmanship and standard of manufacture with scrutiny of evidence of the materials used in the fabrication of the Pipeline Materials.

The Engineer and the Employer's representative 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 desiresrespecting the character of material in use and the progress and manner of the work.

The Contractor shall arrange for such testing at his cost 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 or avail an acceptable third party institution to carry out such tests.

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.

During the duration of the Contract, the Contractor shall propose a schedule and meet all costs for two inspection visits to the yard of each manufacturer by a total of three representatives of the Employer and the Engineer during the manufacturing and pre- shipment stages.

THIRD PARTY INSPECTION DURING MANUFACTURE OF FIRMS WITH ORWITHOUT ISO QUALITY ASSURANCE ACCREDITATION

As quality assurance is considered to be of the utmost importance to ensure the required asset lives, all manufacturers of pipes and fittings shall have facilities that conform to international standards and also carry out tests related to manufacturing process, finished products and handling to shipment.

Where Third Party inspection is specified or in the Engineer or Employer's view becomes necessary, this shall be provided by an independent, non-governmental body acceptable to the Employer. Failure of a manufacturer to avail this in its home country shall require that the manufacturer provide the necessary samples as required by the Engineer for such Third Party inspection in a country where this can be carried out and at its own cost.

In the event, during inspections and tests carried out in the presence of the Employer and Engineer's representatives as stated in Clause 504 if any inadequacies in the manufacturing process are shown resulting in non-conformance in finished products to a level considered unacceptable to the Employer, solely at his own discretion, the Employer will deploy his agent or third party inspector to carry out independent third party inspection. Where such inspections or tests show that there is conformance, the costs shall then be borne by the Employer, but otherwise by the Contractor. In the event of non-conformance, the supply and incorporation of materials from such a source shall be stopped immediately until further notice and the Contractor shall instead provide materials from another approved source. The Contractor shall be required to replace at his cost all the rejected non-conforming materials including the cost of this inspection in the event such third party inspection reveal non-conformance in manufacturing and quality standards. The inspectors from the independent inspectorate shall be provided with full access to carry out third party inspection including the use of the in-house testing processes, failing which all manufacturing at the specific manufacturers premises will be rejected forthwith and all costs of whatsoever a nature, both direct and indirect shall be borne by the contractor.

Contractors are advised to take out the necessary insurances to cover such a possible eventuality, or to have covered these risks in the contract with their manufacturer(s).

ACCEPTANCE OF PIPES, VALVES AND FITTINGS

Only pipes, valves and fittings that are manufactured using acceptable materials, tested and delivered by firms which had been proven at the time of tender to be listed under the ISO standards hereinabove provided for, or alternatively, pipes, valves and fittings, which have been certified as acceptable subsequent to Third Party Inspection as herein provided for, shall be accepted as conforming to the Contract. Any other pipes, valves and fittings, shall be liable for rejection at the Contractor's risk, cost and responsibility.

Compliance with the provision of this Clause shall be separate and additional to the Contractor's compliance with the requirements of local customs authorities for pre- or post- shipment inspection of imports into the country. The costs for such inspection shall also be fully borne by the Contractor.

MANUFACTURER'S WARRANTY AND MANUALS

The Manufacturer shall specify the warranty period for the various supply items.

Valves and meters shall be guaranteed against faulty design, materials and workmanshipfor a period of at least 2 years from the date of acceptance subject to their being used only under normal conditions of flow, pressure and temperature specified in this tender forthe type and size of meters and also as recommended by the manufacturer. In the event of failure within the guaranteed period, replacement component parts shall be supplied free of charge, including specialised fitment, or the item shall be replaced free of charge.

The Supplier shall state the manufacturer's warranty for replacement of meters due to poor material or bad workmanshipor failure to meet the accuracy levels as specified for the class of meter specified.

The Manufacturer shall at his own expenses replace or adjust all meters and valves rejected which can be shown to fail to comply with the specifications or with technical characteristics claimed by the manufacturer.

The Supplier being the Manufacturer's agent shall be held responsible to initiate the necessary claims with the Manufacturer for any meters and valves found defective by the Employer.

Three complete sets of maintenance manuals, spare parts lists, drawings wall charts etc.(in English) required in carrying out tests are to be provided with the valves and meters.

PART II –FERROUS PIPES DURING MANUFACTURE, SUPPLY, INSTALLATION COMMISSIONING & TESTING

For ferrous pipes, emphasis is laid on corrosion protection and therefore no compromise will be accepted in pipe wall thickness, lining and coating, such that as far as possible theasset life is at least 40 years. Unlike thermoplastic pipes, ferrous pipes can withstand higher external pressure and therefore the bedding class requirements are less stringent provided they do not negatively affect the coating. It is pertinently important therefore for the Contractor to ensure that their ferrous pipe manufacturers are able to supply pipes and fittings with the specified lining and coating materials in compliance with the requiredrecognised national or international standards. The manufacturer shall also be able to demonstrate that the lining and coating materials and application provided withstand all the necessary tests as detailed in this specification.

In lieu of this emphasis, it is important that all international and latest updated standards are applicable for ferrous pipes so that the asset useful lives are enhanced by providing more robustness and superior lining and coating materials. Standards that provide superior materials shall therefore apply.

DUCTILE IRON PIPES AND FITTINGS- MATERIALS AND STANDARDS,

Ductile iron pipes and fittings shall generally comply with SSRN 202 and other international standards that specify superior pipe thickness and lining / coating materials.

<u>Socketted Pipes</u>

Ductile Iron Socketed pipes shall be centrifugally cast in accordance with SSRN 202.The minimum tensile strength shall be 420 N/mm² and the minimum 0.2% proof stress shall be 300 N/mm².The minimum elongation after fracture shall be 10% for nominal diameters DN 60 to 1,000 and 7% for nominal diametersDN 1,200 to 2,000.

Centrifugally cast ductile iron pipes shall be individually subjected to a workshydrostatic test of not less than 10 seconds duration. For class K9 pipes whose thickness shall be in accordance with SSRN 202, these shall be:

DN	Minimum Works Hydrostatic Test Pressure for K9 (bar)
60 – 300	50
350 – 600	40
700 – 1,000	32
1,100 – 2,000	25

All pipes supplied shall conform to class K9 and fittings to class K12 unlessspecifically indicated otherwise on drawings or in the bills of quantities.

If specifically called for elsewhere in this Bid Document, for pipe sizes DN 300 and above, the Contractor shall excavate trial pits along the proposed pipe alignment atnot more than 500 metre intervals to a depth of not less than 2.0 metres and describe in detail or determine the appropriate native soil modulus for each section of pipe, and manufacturers/ contractors will have been required to submit, detailed calculations for the design of the pipe based on these findings. For pipe sizes DN 300 and greater, the Contractor shall (if required) determine the native soil corrosioncharacteristics in accordance with SSRN 279 to confirm whether the specified pipe coatings provide adequate protection in keeping with an expected life of 40 years.

Socketted Joints

Socketted joints shall be of the push-on type to SSRN 219 unless otherwisespecified on drawings or in bills of quantities. The material used for the rubber gaskets shall be either natural rubber or synthetic elastomer to SSRN 237, and theyshall be stored in accordance with SSRN 238.

Flanged Pipes

Ductile Iron Flanged Pipes shall be centrifugally cast to SSRN 202.

They shall be joined using a rubber gasket of minimum thickness of 3 mm which shall be reinforced unless otherwise indicated on drawings or in bills of quantities. The material used shall be either natural rubber or synthetic elastomer in accordance with SSRN 237, which shall be stored in accordance with SSRN 238. Pipe thickness shall conform to SSRN 202 class K9 unless otherwise indicated on drawings or in the bills of quantities.

Internal and External Protections to PipesPIPES

Coatings:

All coating for ductile iron pipes shall be barrier coatings and conform to SSRN 272for Type III soil or equal unless specifically indicated otherwise in the Bills of Quantities.

The coating for urban environments and coastal areas for Ductile Iron Pipes shall bea factory applied heat fused Polyethylene Coating to SSRN 258 either by extrusionor sintering, or by any other similar material of superior coating.

For rural environments and non-coastal areas, Ductile Iron Pipes, as a minimum requirement, may be externally protected by a metallic zinc spray coating to SSRN 220 applied directly to the warm film after annealing and covered by a layer of bituminous varnish to SSRN 239 but this shall only be used with an anodic embedment backfill material. The mass of sprayed zinc metal shall be not less than130 g/m^2 and the thickness of the bituminous varnish not less than 70 microns. Sucha coating shall not be offered for urban environments and coastal areas, or for soilswith a pH value under 6, nor for peaty, boggy, silty or marshy soils.

Where the coating offered comprises zinc and bituminous varnish, a final coat of whitewash shall be applied generally in accordance to SSRN 221(a) to reduce heat absorption. The pipe manufacturer shall also provide a polythene sleeve for site protection purposes. The sleeve shall conform to SSRN 227 and be of minimum thickness of 200 microns.

In the event that corrosive soils are encountered in rural areas, then the pipes shall be externally protected by a factory heat applied fused polythene coating by extrusion or sintering, to SSRN 258 or equal.

In the case of Ductile Iron pipes supplied with a zinc coating and bituminous layer together with polyethylene sleeving in accordance with SSRN 272 or equal, the Contractor shall also supply and install anodic embedment material in accordance with SSRN 272 for Type III soils to the approval of the Engineer and his price will bedeemed to have included for the cost of this.

For pipe sizes less than DN 300, if in the opinion of the Engineer native soil corrosion characteristics are worse than allowed for, the Engineer may require additional protection in addition to anodic backfill materials, pipe sleeving, or pipe wrapping. For pipe sizes DN 300 or greater, the Contractor shall (if called for) determine the native soil corrosion characteristics in accordance to SSRN 279 to confirm whether the specified pipe coatings provide adequate protection in keeping with an expected life of 40 years. The Contractor shall test along the alignment of the pipeline at intervals not exceeding 500m and to a depth not less than the depth of the required trench. Where in the opinion of the Engineer, native soil corrosion characteristics are worse than the expected, the Engineer may require additional protection to be provided involving measures such as anodic backfill material, increased standard of pipe coatings, pipe sleeving, pipe wrapping or cathodic protection complete with the provision for electrical continuity between pipes where necessary. The Contractor shall be compensated for additional protection against corrosion required by the Engineer.

Linings:

Ductile Iron Pipes shall be internally lined with a cement mortar, centrifugally applied and conforming to SSRN 211.

Where the water being carried is specified as being aggressive, the internal face of the cement mortar shall be further protected by a factory applied epoxy coating.

Coating and Lining Tests:

Tests indicating the durability and robustness of the lining and coating shall be carried as specified in SSRN 251 and 272 or equal, and in accordance with the coating and lining specifications.

The supplier shall certify that their lining and coating materials conform to these tests and shall provide the Contractor testing instruments and train technician to operate the instruments for carrying out these tests on site. Visual inspection for damage and holiday testing of barrier coatings at trench side shall be done before laying.

Fittings

Ductile Iron Fittings shall be sand cast in accordance with SSRN 202. The minimum tensile strength shall be 400 N/mm^2 and the minimum 0.2% proof stress shall be 300 N/mm^2. The minimum elongation after fracture shall be 5%. All fittings shall be subjected to a works leak-tightness test using water to a pressure as given in SSRN 202.

Fittings shall be to thickness class K12 except for tees that shall be to thickness class K14 unless otherwise indicated in drawings or in bills of quantities. They shall

be protected with a fusion-bonded epoxy, thickness range 305 minimum to 406 micron maximum.

Joints to Fittings

Socketed fittings, except collars, shall be supplied with push-on joints unless otherwise called for on drawings or in bills of quantities. Collars shall be supplied with mechanical joint.Flange fittings shall be fixed by rubber gaskets as indicated above for flanged pipes.

Assistance by Pipe Manufacturer

The Contractor shall utilise the technical services of the pipe manufacturer, unless he already has in his proposed site team a person or persons of appropriate competence with proven experience in the laying of pipes of the type and magnitudeto be provided.

The Contractor shall therefore either have clearly stated in his Tender that he has such a person or persons who shall be named and their CV's provided or he shall indicate the extent, nature and duration of the technical assistance he proposes to obtain from the pipe supplier. This shall include details of the personnel to be provided, and the time when such shall be available during the laying and jointing, external pipe protection work, trench backfilling and testing periodsand the cost of the above shall be deemed to have been included by the Contractor in his Tender.

Provision of Laying Tools

The Contractor will be deemed to have allowed in his Tender for tools and equipment for use in the laying and jointing of the pipes and specials. TheContractor will also be required to provide a number of cutting devices and spare cutting discs.

Marking

Each pipe, fitting or accessory shall bear the mark of the manufacturer, andindication of its casting and be marked with its nominal diameter. As appropriate, each fitting shall bear an indication of its main characteristics. Pipes, fittings and accessories with a nominal diameter of 300 mm or more shall also bear the year of manufacture. In addition, a referencing system shall be employed by the manufacturer denoting where pipes and fittings are to be stored and located along the route of the pipeline.

Flexible joints for Ductile Iron Pipes

Ductile Iron pipes and fittings between sizes 65 mm diameter and 600 mm diametershall have sockets suitable for joints to SSRN 219 and DIN 28603 except that from DN 300 to DN 600 mm they may have, as an alternative, sockets suitable for boltedgland joints to EN 545. Rubber rings for flexible joints to Ductile Iron pipes shall comply with EN 681 and EN 682.

BARRIER COATED STEEL PIPES AND FITTINGS - MATERIALS AND STANDARDS

Steel pipes and fittings shall generally comply with SSRN 228 (a), SSRN 230, and other national and international standards that specify superior pipe thickness and lining/coating materials. All latest and updated international standards pertaining to steel pipes and fittings shall apply.

Standard Pipes and Fittings

Specifically steel pipes shall dimensionally conform to SSRN 210 and SSRN 228 and in terms of materials, properties and tests to SSRN 213, and where appropriateSSRN 203. Fittings shall in general conform dimensionally to SSRN10, and SSRN216 however where specifically required the lengths of straight barrel sectionsmay exceed or be less than standard dimensions. They shall be manufactured frompipes that have been manufactured to SSRN 210, SSRN 228, and SSRN 213, and successfully passed all mechanical, dimensional visual, pressure and non-

destructive testing. All new welds made during the fabrication of the fitting shall be subject to non-destructive testing using either radiological, ultrasonic or dye penetrants dependent upon the geometry of the weld. Where necessary fittings shallbe reinforced in accordance with SSRN 216.

Flanges will be to SSRN 207. Flexible joints shall be by the use of bolted sleeve couplings to SSRN 244 or flexible grooved joints, with a tapping boss to SSRN 243-where specified in the Bills of Quantities, and of approved pattern. Alternatively, socket and spigot joints may be offered subject to SSRN 230 in which case saddle clamps in accordance with size equivalent to that indicated in the Bills of Quantitiesfor tapping bosses shall be provided at no extra charge.

Fitting ends for use with flexible couplings shall be true ended with the ends appropriately prepared for the type of coupling required.

Joints for site welding shall comprise a socket and special spigot (bell joint with air chamber) to SSRN 244 such that the lining of the spigot shall be undamaged duringthe welding.

All bolts shall be hot dipped zinc coated and those for bolted sleeve couplings further protected with a topcoat of aluminium pigmented organic epoxy to their respective standards, unless otherwise indicated on the drawings or in the Bills of Quantities.

The Contractor shall demonstrate that the thickness and steel grade provided in accordance with SSRN 228 gives a thickness adequate for the pressure calculatedin accordance with SSRN 267. The thickness calculation shall take into consideration the following: the operating pressure, test pressures, pressure transients or surges if applicable, external pressures, steel pipe strength characteristics, temperature, soil condition, trench width and depth and appropriatetraffic loads.

If specifically called for elsewhere in this Bid Document, for pipe sizes DN 300 and above, the Contractor shall excavate trial pits along the proposed pipe alignment atnot more than 500 metre intervals to a depth of not less than 2.0 metres and describe in detail or determine the appropriate native soil modulus for each section of pipe, and manufacturers/ contractors will have been required to submit, detailed calculations for the design of the pipe based on these findings.

Manufacture of Steel Pipes

The manufacturer shall operate a quality system relating to the manufacture of pipes, and integral joints to the required specification that shall be no less rigorous than that of SSRN 673 to ensure that products consistently meet the required level of quality.

Internal and External Works ProtectionPIPES

Coatings:

All coatings shall conform to SSRN 271 for Type III soil or equal and coating thickness shall conform to SSRN 251 (a) or equal unless a less rigorous type soil isindicated.

All coatings for DN 80 and above shall be of the factory applied barrier type.

The preferred coating for buried steel pipes shall be factory applied external protection with triple layer polythene coating (3LPE) to SSRN 241 and SSRN 271 forType III soil comprising triple wrap system of fusion bonded or sprayed epoxy primer, an intermediate polymer adhesive layer and an extruded polyethylenecoating providing an overall total film thickness shall not be less than that specified in SSRN 241(c)) or its equal unless single layer fusion bonded epoxy to SSRN 256

is indicated in the Bill of Quantities. The epoxy thickness should be sufficient to provide a holiday free surface.

For above ground steel pipes a triple layer polypropylene coating (3LPP) with polypropylene to SSRN 241 and SSRN 251shall be used unless single layer fusionbonded epoxy is indicated in the Bills of Quantities.

Where a 3LPE or 3LPP coating is specified, the manufacturer shall demonstrate thatthe adhesion of the coating to the substrate does not lessen to the extent that the PE coating could be easily cut or removed with time underground. The manufacturer shall carry out abrasive blast cleaning immediately before applying epoxy primer during the same work shift. In the case where steel plate or bare steel pipe is transported by sea to the place where coatings are applied, the steel or bare steel pipe as the case may be shall be subject to abrasive blast cleaning as well as phosphoric acid washing or chromate treatment immediately before applying epoxyprimer during the same work shift.

The polyethylene offered shall be HDPE.

For the pipe sizes less than DN 300, if in the opinion of the Engineer the soils encountered are excessively corrosive, the pipe shall be provided with additional protection such as sleeving, wrapping or cathodic protection as instructed by the Engineer. The Contractor shall be compensated for such additional protectionagainst corrosion.

For pipe sizes DN 300 and greater, the Contractor shall (if required) determine the native soil corrosion characteristics in accordance with SSRN 279to confirm whetherthe specified pipe coatings provide adequate protection in keeping with an expectedlife of 40 years. The Contractor shall test along the alignment of the pipeline at intervals not exceeding 500m and to a depth not less than a depth of the required trench. Where in the opinion of the Engineer, native soil corrosion characteristics areworse than expected, the Engineer may require additional protection to be providedinvolving such measures as increased standard pipe coatings, pipe sleeving, pipe wrapping, or cathodic protection. The Contractor shall be compensated for additional protection against corrosion required by the Engineer.

Protection to site welded joints shall be by a solvent free epoxy coating to SSRN 215 or a tape wrap to SSRN 216 as indicated in the Bills of Quantities or offered bythe manufacturer.

For sizes less than DN 80, pipes may be protected by hot dipped zinc (galvanised) coating to SSRN 225, and all buried pipes shall in addition be protected by an organic coatings such or a factory applied extruded polyethylene or by bituminous orepoxy paint in at least two coats, or alternatively in rural areas only if the risk of subsequent damage is regarded as very low, by a tight fitting and strapped polythene wrap. In addition all threaded joints and any exposed threads as well as joints incorporating bolts shall be further protected after jointing, and should first bethoroughly cleaned, prepared and then wrapped in a suitable adhesive tape.

<u>Linings:</u>

For sizes DN 80 up to and including DN 300, pipes shall either be protected internally in cement mortar or epoxy at the manufacturers stated option. Cement mortar lining shall conform to SSRN 244, SSRN 211 and SSRN 212. Where the water being carried is specified as being aggressive, the internal face of the cementmortar shall be further protected by a factory applied epoxy coating.

If specifically called for elsewhere in this Bid Document, for pipe sizes DN 300 and above, the Contractor shall excavate trial pits along the proposed pipe alignment atnot more than 500 metre intervals to a depth of not less than 2.0 metres and describe in detail or determine the appropriate native soil modulus for each section of pipe, and manufacturers/ contractors will have been required to submit, detailed

calculations for the design of the pipe based on these findings. For sizes aboveDN 300 pipes and fittings shall be lined in fusion-bonded epoxy conforming to SSRN
241 (b) unless otherwise indicated in the Bills of Quantities or directed by theEngineer.

FITTINGS

Coating and Linings:

Fittings shall be protected externally and internally by fusion-bonded epoxy to SSRN 241 (a) as specified by the manufacturer or required in the Bills of Quantities.

Flexible couplings and self-sealing (grooved) couplings shall be protected externallyand internally by fusion-bonded epoxy to SSRN 214 (a).

Self-sealing (grooved) coupling shall, where specified or otherwise allowed, conformto SSRN 210 (d). Bolts and nuts for such couplings shall be hot dipped zinc coatedand capped nuts shall be provided. Bolts shall be an exact pre-determined length sothat no bolt thread is exposed but so that the capped nut fully tightens without bearing down on the top of the bolt.

If specifically called for, a polythene sleeve to SSRN 227 (a) protruding not less than500 mm on each side of the joint shall be provided around all flexible couplings outside chambers during underground laying so as to further enhance joint protection, and shall be of minimum thickness of 200 microns. Such sleeves shall betightly double-strapped at either end using a non-metallic strap.

Coating and Lining Tests:

Tests indicating the durability and robustness of the lining and coating shall be carried out as specified in SSRN 251 and SSRN 271 or equal and where relevant tothe coating or lining in accordance with the requirements of the coating and lining specifications.

The supplier shall certify that their lining and coating materials conform to these tests and shall provide the Contractor testing instruments and train technicians to operate the instruments for carrying out these tests on site, or if agreed at the manufacturer's premises elsewhere.

All coating and lining shall be on site visually inspected and tested for holiday free surfaces using the holiday testers. No pipe shall be laid having failed the holiday tests.

The Contractor shall be compensated for additional protection against corrosion required by the Engineer.

Flexible joints for Steel Pipes

Steel pipes from DN 65 to DN 500, outside chambers, may be plain ended suitable for jointing with flexible couplings and flange adapters or grooved for thrust- transmitting self-sealing joints, or with socket and spigot with rubber gaskets as described herein and as indicated in the Bills of Quantities. Steel pipes from DN 550upwards shall be plain ended suitable for jointing with flexible couplings and flange adaptors or with socket and spigot with rubber gaskets where the joint is specificallyapproved in advance. Steel pipes within chambers shall be suitable for jointing as shown on Tender Drawings.

Where a manufacturer opts for steel pipes with socket and spigot joints, or such joints are specifically called for, such joints shall in general conform to SSRN 210 (d) and SSRN 210 (a), and the manufacturer shall submit calculations that the natural sag under 1.5 m of soil load with 90% compaction and a parked vehicle (wheel loadand overload as defined above) will not exceed 2.0% on the spigot end of the pipe with the coating and lining as specified. The socket and spigot assembly shall be capable of withstanding a works test pressure of not less than 1.5 times the nominalpressure of the pipeline unless indicated otherwise on the Tender Drawings or in the

Bills of Quantities. Sockets shall be produced integral with the pipe and be hot formed. Rubber gaskets shall conform to SSRN 222 (a) and (b). Unless a high pressure seal, they shall have a front lip for dirt removal and a back lip for pressure sealing. Unless otherwise indicated on Tender Drawings or Bills of Quantities, the internal faces of the sockets shall be coated in fusion bonded or liquid epoxy. A tightclearance shall be maintained between socket and spigot and should be in the range 1.6 mm +/- 0.8 mm.

Assistance by Pipe Manufacturer

The Contractor shall utilise the technical services of the pipe manufacturer, unless he already has in his proposed site team a person or persons of appropriate competence with proven experience in the laying of pipes of the type and magnitudeto be provided.

The Contractor shall therefore either have clearly stated in his Tender that he has such a person or persons who shall be named and their CV.'s provided or he shall indicate the extent, nature and duration of the technical assistance he proposes to obtain from the pipe supplier. This shall include details of the personnel to be provided, and the time when such shall be available during the laying and jointing, external pipe protection work, trench backfilling and testing periods.

The cost of the above shall be deemed to have been included by the Contractor in his Tender.

HOT DIPPED ZINC (GALVANISED) COATED STEEL PIPES AND FITTINGS (GS / GI)- MATERIALS AND STANDARDS

Hot dipped zinc (galvanised) steel pipes shall only be provided where specifically allowedfor in the Bills of Quantities and then only in diameters less than DN 80. An acceptable alternative to GS pipes in the diameter range DN15 to DN65 is to replace the zinc coatingby either a coating of FBE or PE (if necessary after grit blasting off the zinc), with jointingthen made using either similarly protected flexible couplings or flexible grooved joints. Cold applied zinc is specifically excluded.

Only heavy or medium duty pipes that as a minimum meet the requirements of SSRN 203 (a) shall be supplied and all buried pipes shall be wrapped in a polyethylene sleeve. Where threaded joints are included, the maximum working pressures for GS pipes as given in SSRN 203 (a) shall be reduced by 40%. Because threaded joints are also the weakest point of such pipes both in terms of pressure and corrosion risk, especial care shall be taken after laying at all such joints.

SSRN 278 (a), on protection of metallic materials against corrosion, shall be consulted during design and if necessary, the minimum thickness of galvanising increased accordingly.

In addition joints, and any exposed threads, should be cleaned, prepared and wrapped in a suitable approved adhesive tape in accordance with the tape manufacturer’s instructions. In preparing the joint for wrapping and after cleaning this shall include the application of proprietary mastic adjacent to each side of the socket, tapered up from the pipe to the socket so as to present a smooth transition between diameters of pipe and socket and facilitate the application of the wrapping.

JOINING TO STEEL PIPES WITH BARE STEEL ENDS, ABOVE GROUND PIPELINESAND FITTINGS AND PIPELINES IN BACKFILLED TRENCHES BOLTED BY FLEXIBLECOUPLINGS (MOULDING METHOD)

Where exposed ends of existing sheathed steel pipes have not been factory coated with epoxy as indicated in Clause 509then the external protection to sheathed pipes and fittings jointed by mechanical couplings shall be completed by moulding the couplings withan enamel composition compatible with the enamel used for the pipe sheathing i.e. a bituminous composition shall be used on pipes and fittings sheathed with bitumen

(asphalt) enamel, and a coal tar composition shall be used on pipes and fittings sheathedwith coal tar enamel.

The exposed end of the pipe shall be thoroughly cleaned (including removing whitewash from that portion of the sheathing adjacent to the joint) and dried together with that portionof the pipe that will come within the moulding box and the whole shall be painted with thequick drying primer supplied.

The inside of the moulding box and externally around the pouring gate shall be coated with a thick wash of lime of similar material to prevent any possibility of the moulding boxsticking, and shall be dried thoroughly before use.

The moulding box shall be fitted around the coupling so that the pouring gate is at the topand the flanges and bolts of the coupling sit centrally in the recesses provided for them inthe moulding box. The clip or bolts of the box shall be fitted and tightened and all joints sealed, including the joints between the box and pipes, with clay or similar material to prevent the hot composition from running out.

The enamel composition shall be heated in an approved boiler (to be provided by the Contractor complete with an accurate thermometer) to the temperature recommended bythe supplier, and stirred during melting to prevent overheating and the filler settling to thebottom.

The fluid enamel composition shall be slowly poured (at the temperature recommended bythe supplier), taking care to prevent air- locks, until the gate is filled. The gate shall be kept filled by toppling up as necessary to allow for cooling shrinkage.

The moulding box shall be removed as soon as it is cool enough to handle by which timethe enamel will have set. The moulding may be cooled with water to make the enamel setmore quickly.

Any defective part of the moulding shall be immediately repaired by applying hot enamel composition with a trowel.

It may be necessary to support the moulding box on larger diameter sheathing pipes to avoid the box from sinking into the pipe sheathing which may have become softened by the hot enamel in the box. The moulding box must be re-coated with lime wash before being re-used.

The Contractor shall provide all other materials required for completion of externalprotection by the moulding method, and if the pipes and fittings are supplied under this contract, then the full costs of meeting these requirements shall be at the cost of the contractor

PACKING FOR TRANSPORT– FERROUS PIPES

Pipes up to DN 300 may be bundled; with larger sizes packed loose. Containerised packing and transportation is also acceptable and if proposed shall be so indicated by the Tenderer. Notwithstanding any intention to utilise containers, all nuts, bolts, rubbergaskets etc. shall be packed in wooden boxes and protected against the elements. Nesting of pipes is not permitted. Fittings up to and including DN 200 and flanged pipe pieces up to DN 200 and length not exceeding 1 metre shall also be packed and suppliedin wooden boxes. All other fittings and flanged pipes may be packed loose. All flanges shall be protected with discs of wood, wool, fibre or timber. Bolted gland joints and flexible couplings shall be bundled if not containerised. Pipe sockets, spigots, plain ends shall be protected by suitable wrapping prior to transportation

The Contractor shall further have described in his Tender in full detail the method(s) of offloading for imported items or on- loading for locally manufactured ex-works items, the methods of road/rail transportation and of site off-loading including the lifting methods intended.He shall further have described in his Tender in full detail the method(s) of stacking and storage. His Tender shall also be deemed to have included for the

transportation as described and for the provision of all the necessary facilities for off- loading at the storage sites, and for proper stacking and storage.

At the time of tendering the Contractor shall also have stated the approximate areas of land required for the off- loading, and stacking of the pipes and for the storage of the fittings and of any special protection/storage facilities needed for any particular item(s) of his goods The following table indicates the maximum stacking height allowable:

Nominal Pipe. Diameter in mm	Maximum number of layersin stack, ferrous pipes
Up to 100	16
150	14
200	12
250	10
300	8
350	7
400 - 450	6
500 - 600	4
700 - 800	3
900 - 1400	2

Distribution of Materials from Storage

The Contractor shall make his own arrangement for storage including for temporary occupation of the necessary land, provision of suitable fencing, preparation of site and security.

The selected storage areas shall be suitably close to the final pipeline alignment.

When pipes are being loaded into vehicles care shall be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail heads, etc. Whilst in transit,pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry.Pipes may not be offloaded from lorries by rolling them.Pipes shall not be rolled or dragged along the ground.

IN-COUNTRY STORAGE, HANDLING AND TRANSPORTATION OF FERROUS PIPES

Storage Areas

The Contractor shall provide storage of pipes in a manner and in facilities approved by theEngineer. At the Engineers discretion, ferrous pipes in diameters greater than 200 mm forlaying in rural and peri-urban areas may be offloaded directly in the vicinity of the pipe trench provided the conditions and stacking method meet the requirements indicated below

Pipe Stacking and Storage

Pipes shall be stacked at the pipe storage areas using one or all of the following methods.

square stacking for small diameter pipes
parallel stacking using wooden roller boards
pyramidal stacking

All pipes shall be stacked on raised wooden battens at least 100 mm thick and 225 mm wide. A minimum of three battens per pipe for ferrous pipe lengths not exceeding 6 metres should be used with the outer battens laid 600 mm in from both pipe end and the middle batten placed equidistant between them. For ferrous pipe lengths greater than 6 metres, four battens shall be used. Pipe stacks shall be suitably wedged and the Tenderershall be deemed to have included for an adequate number of timber, wedges, etc., in his Tender.

Where socket and spigot pipes are stacked, the sockets should be placed at alternate ends of the stack with the sockets protruding.

DISTRIBUTION OF FERROUS PIPES FROM STORAGE

Ferrous pipes of DN 200 and less may be distributed from storage to the trench side no more than 7 days prior to laying whilst ferrous pipes above DN 200 may be strung out upto 15 days prior to laying. Stacking of pipes at trench side shall not be allowed.

In all instances when along trench sides, ferrous pipes shall be supported within 1 metre of either end on sand filled bags such that no part of the wall of the pipe touches the ground, and in the case of pipes over 6 metres long with additional central sand bags.

When pipes are being loaded into vehicles care shall be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail heads, etc. Whilst in transit,pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry.

Pipes may not be offloaded from lorries by rolling them. Pipes shall not be rolled or dragged along the ground.

FLANGED JOINTS FOR FERROUS PIPES AND FITTINGS

Where specifically called for or deemed appropriate, flanged joints shall be utilised. Theyshall conform to SSRN 207, drilled to NP 10 except where otherwise indicated on drawings or bills of quantities, with gaskets made of reinforced elastomer rubber toSSRN 208 and of minimum thickness of 3 mm. They shall be stored in accordance with SSRN 238.

Bolts for flanged joints shall be SSRN 938 threaded to SSRN 923, nuts to SSRN 939 andwashers to SSRN 925. Bolts, nuts and washers shall be protected to SSRN 921 for aboveground installation and to SSRN 922 for below ground installation and in chambers. Nutsfor use with self-sealing joints for steel pipes shall be as described under the section for service connections. Exposed threads of all bolts shall be fitted with a tight plastic cap after flange assemblyalong the full exposed length.

FLEXIBLE JOINTS

Where specifically called for or deemed appropriate flexible couplings shall be used and shall be coated with fusion bonded epoxy layer 350 microns thick. Flexible couplings shallbe 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 galvanised nuts and bolts.The main components shall be made from hot rolled steel for larger diameters and malleable cast iron to SSRN 911 or ductile iron for smaller diameters. If specifically calledfor, 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. Themanufacturer 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 unless capped nuts are used.

COMPLETION OF EXTERNAL PROTECTION AT FLEXIBLE JOINTS ON FERROUS PIPELINES

The completion of the external protection at flexible joints on ferrous pipes and fittings (other than hot dipped zinc steel pipes) shall be carried out as detailed below asappropriate and shall be to the satisfaction of the Engineer's Representative. The costs thereof shall be deemed to be allowed for within the Tender.

<u>Above ground pipelines and fittings and in backfilled trenches Bolted by Flexible Joints</u>

In all cases where the pipe joint has involved the use of nuts and bolts, the exposedthreads of every bolt shall first be thoroughly cleaned and then coated with an approved zinc-rich paint allowed to dry for not less than 24 hours before proceedingwith further protection as indicated below.

Above ground pipelines and fitting and in backfilled trenches Bolted by Flexible Couplings for Coal Tar or Bitumen coated Pipes and fittings supplied without epoxycoating (Moulding Method)

Where for whatever reason, any such flexible couplings have not been factory epoxycoated then the external protection to such mechanical couplings shall be completedby moulding the couplings with an enamel composition compatible with the enamelused for the pipe sheathing; i.e. a bituminous composition shall be used on pipes and fittings sheathed with bitumen (asphalt) enamel, and a coal tar composition shall be used on pipes and fittings sheathed with coal tar enamel.

The assembled coupling shall be thoroughly cleaned (including removing whitewashfrom that portion of the sheathing adjacent to the joint) and dried together with that portion of the pipe that will come within the moulding box and the whole shall be painted with the quick drying primer supplied.

The inside of the moulding box and externally around the pouring gate shall be coated with a thick wash of lime of similar material to prevent any possibility of the moulding box sticking, and shall be dried thoroughly before use.

The moulding box shall be fitted around the coupling so that the pouring gate is at the top and the flanges and bolts of the coupling sit centrally in the recesses provided for them in the moulding box. The clip or bolts of the box shall be fitted andtightened and all joints sealed, including the joints between the box and pipes, with clay or similar material to prevent the hot composition from running out.

The enamel composition shall be heated in an approved boiler (to be provided by the Contractor complete with an accurate thermometer) to the temperature recommended by the supplier, and stirred during melting to prevent overheating andthe filler settling to the bottom.

The fluid enamel composition shall be slowly poured (at the temperature recommended by the supplier), taking care to prevent air-locks, until the gate is filled. The gate shall be kept filled by toppling up as necessary to allow for cooling shrinkage.

The moulding box shall be removed as soon as it is cool enough to handle by whichtime the enamel will have set. The moulding may be cooled with water to make the enamel set more quickly.

Any defective part of the moulding shall be immediately repaired by applying hot enamel composition with a trowel.

It may be necessary to support the moulding box on larger diameter sheathing pipesto avoid the box from sinking into the pipe sheathing which may have become softened by the hot enamel in the box. The moulding box must be re-coated with lime wash before being re-used.

The Contractor shall provide all other materials required for completion of external protection by the moulding method.

Where pipes and fittings are to be concreted in (Wrapping Method)

The external protection to pipes and fittings jointed by mechanical couplings, flangedjoints, "Tyton", type or Bolted Gland joint, or similar shall be completed by wrapping the joint with approved petrolatum tape prior to which the area shall have been cleaned by an approved proprietary paste and the area protected by an approved proprietary mastic. It shall then be wrapped in PVC 'outerwrap' or similar material.

The whole joint shall be thoroughly cleaned removing all loose rust and extraneousmatter and the approved paste rubbed well over the whole of the joint and for a fewcentimetres either side of the joint over the pipe sheathing. A liberal amount of pasteshall be left around all bolt heads, narrow cavities, etc.

The approved mastic shall be applied to cover all bolt heads and nuts, forced into the annular gap between the spigot and socket in the case of 'Tyton' type or bolted gland joints, formed as a triangular fillet against the face of socket or flanges and filled in all gaps and abrupt change in contour to provide an even contour for wrapping.

The approved tape shall be applied circumferentially, starting and finishing at the topof the joint care being taken to smooth and eliminate any air pockets and to form thetape well into all angles and changes in contour. The tape should extend on to the pipe sheathing on either side of the joint by at least 50 mm and the tape should be applied with a minimum overlap of 25 mm.

An outer wrapping of 'PVC Outerwrap' shall be finally applied over the approved tape'. This wrapping should extend at least 500mm on to the pipe sheathing and should be applied with a minimum lap of 50 mm.

All the above mentioned materials shall be provided by the Contractor and deemedcovered in his rates.

BUTT WELDING OF STEEL PIPES

Welding of joints, where required or directed, shall be carried in accordance with SSRN 210 and SSRN 670 (butt welding).

The Contractor shall demonstrate his experience in large diameter welded steel pipe construction by example of completed works of similar size and nature. All field welding shall only be done by welders who satisfy the requirements of SSRN 671 and who have been tested by an independent testing authority.

Before any welding of pipeline materials commences, the qualification of welders shall have been approved, all detailed welding procedure specifications with weld diagrams required for their completion shall have been submitted for approval by the Engineer, andthe welding procedure qualification tests shall have been successfully concluded all in accordance with the relevant standard specifications. Sufficient records shall be kept by the Contractor to ensure that all field welds can be subsequently identified with the welderconcerned.

No welding shall be carried out during rain or high wind or under dusty conditions unless the welder, the weld area and the weld are adequately protected and sheltered.

Only welding rods which have been kept dry and uncontaminated shall be used. Weldingrods shall be of a grade and quality such that the chemical composition of weld metal andparent metal is similar. Preheating of the rods and base metal is not usually necessary where temperature exceed 70°F (21°C) to avoid condensation of moisture which could produce porosity in the weld.

The Contractor shall submit to the Engineer a detailed method statement for constructingthe pipeline using welded joints which shall include, but not be limited, to:

details of the Contractor's skilled labour and supervision staff who shall have directexperience in the construction of large diameter welded steel pipe

details of the Contractor's plant to be deployed

design details for the welded steel pipeline to include proposals to allow for pipe movement, thrusts, expansion and earthquake loading

quality assurance proposals for testing the integrity of the welds

These details shall be submitted to the Engineer for his approval not later than 84 days before the Contractor wishes to commence pipe laying. The Engineer shall inform the Contractor of his approval or otherwise within 28 days of receiving all necessary information.

Where the Engineer approves the use of site welded joints the Contractor shall submit forapproval all details, designs and drawings necessary to modify the design at least 28 days before the commencement of pipe laying.

Welded pipe joints shall not be considered as an alternative to flanged or other flexible flanged adaptors or tied flexible joints where specifically detailed on the drawings.

Pipes and specials to be joined by field welding shall be supplied with ends bevelled for welding. A holdback band that is free of lining and coating shall be left on the inside and outside surfaces at the ends of the sections. This band shall be of sufficient width to permit the making of field joints without damage to the lining and coating. The holdback band shall be protected by material that can easily be removed, but provide protection of the steel up to the time it is joined (factory/ transportation/ period delivered on site until welded). Before welding, the joints are to be cleaned free from any impurities and protections.

Field butt welding shall be carried out in accordance with SSRN 670.

Before welding of joints proceeds, pipe ends shall be completely circular (cut end should be perpendicular to the pipe axis with zero tolerance to ensure straight portions of the jointpipes unless where deflection horizontal/vertical is specified) and properly mated up by means of backing rings (with a 2 mm gap). At least 4 tack (depending on pipe size) weldsequally spaced around the pipe perimeter shall be applied to maintain the root gap and position of the pipe for completion of welding.

A protective plastic or rubber sheet shall furthermore be placed over the coating adjacentto the joints to protect same from damage caused by (welding spatter/corrosion before jointing).

Root welds shall thereafter be carried out followed by successive filler passes, and capperpasses, all in accordance with the approved welding procedure. The inside weld bead shall not extend more than 1 mm into the bore of a pipe or special, or must be ground off.

Horizontal weld seams or spiral weld seams at pipe ends shall be placed near the horizontal diameter of the pipe or special and shall be staggered so that the circumferential distance between longitudinal or spiral welds intersecting the same circumferential butt weld, is not less than 90 mm nor more than 130 mm apart.

Defects caused by stray welding arc flashes, weld spatter etc. shall be removed by grinding provided that pipe wall thickness are not reduced to less than the specified minimum thickness, otherwise the portion containing the defect shall be cut out and repaired.

During welding of pipes with organic linings, mats of thick rubber felt or other suitable material shall be placed along the pipe invert to protect the pipe lining for the full distancefrom the point of access up to the point of weld or weld inspection. The mats shall be of sufficient width and shall cover a sufficiently wide area of pipe invert to protect the lining against damage due to access by staff, equipment, inspectors or fall out from arc weld. Workmen shall wear soft, rubber-soled shoes before entering lined pipes.

Care shall be taken not to stroke arcs on epoxy-lined areas and protective tapes, if any, atends of epoxy lined pipes shall only be removed immediately prior to welding.

Pipes may be welded together alongside the edge of the trench. For factory lined and coated pipes, the maximum length so welded together shall be such that:

the pipe can be subsequently stored, lifted or handled without damage to linings orcoatings

the out of roundness at a plane perpendicular to the pipe axis at any point along the pipe length during storage, lifting or handling does not exceed 4% of the minimum inside diameter (out of roundness being measured as the difference between the minimum and maximum inside diameter of the plane at the point)

safe and easy access to internal tie-in welds are assured for staff and inspectoratewith equipment

the maximum length does not exceed 24 m

All field welds shall be inspected visually with special attention given to the line-up and theroot run or stringer bends. Non-destructive (ultrasonic) testing of each completed weld shall be carried out immediately after the welding has been completed. Randomly selected welds (about every 10th) shall be tested using radiographic methods withprocedures in accordance with SSRN 670.

On completion and inspection of joint welding, remedial works shall be carried out on theinternal lining and external coating as specified below. Not more than 2 pipe joints (24 m joint section) for pipe diameter DN 600-1200 shall be welded without completion of internal remedial works to joints.

COATING REPAIR

Repair of damage to coating and final coating to welded joints shall be done in accordance with SSRN 215 and the manufacturer's instructions, but shall as a minimum comply with the following:

Area requiring repair shall be cleaned to be free from mud, oil, grease, welding flux, weld spatter or other foreign contaminants.

The surface shall be abrasive blasted, vacuum blasted or abraded using surface grinders to provide an acceptable surface. The adjacent epoxy coating shall be feathered by abrading the surface for a distance of 25 mm.

The liquid epoxy coating shall be applied to the prepared areas as recommended by the manufacturer. If more than one coat is applied, the second coat shall be applied within the recommended time limits, surface conditions and temperature.

After curing, the coating shall be tested by a holiday detector. Any holidays detected shall be marked and repaired.

TRENCH EXCAVATION AND EARTHWORKS FOR FERROUS PIPES

This clause for excavation shall apply except for thrust boring as specified in Clause 549 below.

All trench excavation will as a minimum precaution be taped off to alert members ofthe public to its existence.

The excavation shall be made in open cutting unless tunnelling or heading is specified by the Engineer's Representative or it is specified in the Bills of Quantities.

Trenches for pipes shall be excavated to the lines and depths shown on the Drawings, or as directed by the Engineer's Representative, and shall be of sufficientwidth to give an equal clearance on both sides of the barrel of the pipe or pipes suchthat in general the total trench width is 3/2 'D' where 'D' is the outside diameter of the pipe or the average outside diameter of the group of pipes or will be equal to theoutside diameter or the pipe plus 300mm on each side whichever is greater. For pipes bedded in concrete sections, the breadth ofconcrete bedding for the pipes willbe equal to the width of the trench. Excavation for fire hydrants, valve chambers or any other water works structures, shall be carried out to the levels and outlines of such structures, and the rates shall include for any additional excavation or other temporary Works required.

If in the opinion of the Engineer's Representative delays in laying are due to the faultof the Contractor and the ground becomes weathered prior to the laying of the pipes, the Contractor shall remove the weathered soil and replace it with suitable compacted material to the original formation level at his own expense.

Where pipes are not laid on concrete, the bottoms of the trenches as excavated, shall be smooth and shall be free from stones or other projections. Holes cut out at the joints in the lower bedding shall be of as small a size as possible throughout their entire length. The trench shall be dug to within 150mm of its formation and proper grade pegs shall then be set in the bottom of the trench by the Contractor forthe accurate taking out of the rest of the excavation. Grooves about 50mm deep shall be cut across the trench in the lower bedding at the required positions to enable the easy removal of pipe slings.

Where an imported lower bedding layer is not included and if instructed to do so bythe Engineer's Representative, the pipe trench shall be excavated to a depth of100 mm below the invert of the pipe and be refilled with suitable 'as-dug' material free from stones greater than 20 mm dia. and foreign matter and compacted to a minimum 90% MPD in order to provide a smooth bed for the pipes.

The materials excavated from trenches shall be laid completely and neatly on the sides of the trench except where in the opinion of the Engineer's Representative thiswould so obstruct a road or footpath as to prevent the passage of traffic orpedestrians. In such cases the Contractor must dig out the pipe trench in such lengths as directed and keep his excavated material at such a distance as may seem advisable, and the rates shall be deemed to cover for this.

During excavation, the Contractor shall ensure that all material suitable for re-use and which he intends for re-use are kept separate and set aside and protected as necessary to prevent loss or deterioration. Materials forming the surface and foundations of roads shall when excavated and if required for further use, be carefully separated. Paving slabs, bricks and similar surfaces shall be carefully removed and stacked for re-use, or as otherwise instructed by the Engineer's Representative.

No pipes shall be laid nor lower bedding introduced and no excavation filled in or covered with concrete until the formation has been inspected and permission to proceed with the Work obtained. The Contractor shall provide to the Engineer, a weekly schedule in advance indicating the dates and approximate times he expectsto request such inspections.

Where pipes are to be laid under a road formation or in open country, or in cutting, trenches shall generally be excavated after the earthwork is completed. The Engineer's Representative may permit these pipe trenches to be excavated before the earthwork is complete, but payment for the excavation of the trench will only bemade upon the volume excavated below the road formation.

The unit of measurement for the excavation of trenches shall be per linear metre or per cubic metre of void calculated from the deemed width of the trench, and the average depth of excavation as mentioned in the Bills of Quantities. Unless otherwise indicated, for valve chambers and other water works structures, the unit ofexcavation will be per number or per cubic metre of excavated material calculated tothe exact outer dimensions and depths of the Permanent Works. In neither case willallowance be made for bulking.

The rates for excavation of trenches in "normal" material shall include removal of allmaterial except "rock", selecting and segregating material to be backfilled in speciallayers, supporting or sheeting, shoring and strutting, any additional working space orroom for timbering or sheeting required, dealing with water, maintenance of the trench, and all labour, tools, materials, plants, supervision, overheads and profit.

The provisions of the above Clause shall apply to the rates of excavation in "rock" and in addition the Contractor shall also allow in his rates for back-filling the invert with Class 15 concrete or other materials as directed by the Engineer's Representative and removing to a spoil dump all "rock" excavated.

Where rock is encountered and should the Contractor wish to excavate the rock in advance and temporarily to refill the excavated trench with the excavated material until he is ready to proceed with the laying of the pipe, he shall be permitted to do so, which permission must be given in writing by the Engineer. Such work shall normally be included in the Contractors rates unless he can show that the amount ofrock is in excess of the amount billed to an extent that his work programme will be unduly delayed if he does not do so. In such a case he may seek to be paid both the
E.O. item rate for the rock and twice the rate quoted for excavation in class III material.

PIPE LAYING FOR FERROUS PIPES

Pipes shall only be laid in the presence of anEngineer'sRepresentative unless written authority from the Engineer has been granted.

Pipes generally shall be laid and jointed in accordance with the manufacturer's instructions. Extra excavation must not be carried out so as to avoid backfill,excessive deviation in joints and other irregularities. Otherwise, the pipe grade will follow the Drawings, with a continuous (but not necessarily uniform) fall towards washout-valves and rise towards air-valves.

Prior to laying, damage to linings or coatings shall be repaired in accordance with the manufacturer's instructions and this will be the Contractor's liability. Where, in the opinion of the Engineer or his representative, the damage to a pipe coating is significant and notwithstanding the repairs made in accordance with themanufacturer's instructions, the complete pipe shall be further protected by apolythene sleeve. The sleeve shall conform to SSRN 227 (a) for steel pipes and SSRN 227 (b) for DI pipes and be of minimum thickness of 200 microns. It shall be strapped beyond the joints of adjoining pipes using a non-metallic strap around the pipe. All costs of supply and installation of such additional protection shall be to theContractors account.

Every pipe shall be laid separately and shall bear evenly upon the lower bedding orconcrete for its full length, holes to receive sockets, couplings or flanges being cut inthe bottom of the trench of such size and depth as to allow the joints to be properly made. The pipes shall be laid to true inverts, straight lines and falls, each pipe beingseparately boned between sight rails. Before lowering into the trench or placing in position each ductile iron pipe or casting shall be slung and sounded with a mallet totest for hair cracks. Pipes that do not ring true will be discarded. For ferrous pipes with barrier coatings, the coating, and where appropriate the lining of every pipe shall be inspected by use of holiday detectors in accordance with SSRN 280 and SSRN 281. Unless otherwise authorised in writing by the Engineer to carry out suchinspections in a nearby storage yard, such inspections shall be carried out at the trench side immediately prior to lowering into the trench. Each pipe shall be thoroughly brushed inside and outside prior to laying and no foreign matter shall beallowed to enter the pipe during or after laying.At the end of each working day the exposed pipe end shall be stoppered up with a stopper plug of appropriate diameterand not merely covered in polythene sheet tied around the end.

Trenches shall be bottomed up only immediately in advance of pipe laying, althoughat least 15 metres shall be prepared in advance of any given pipe. Trenches and joint holes shall be kept free from water, until the pipes are laid and the joints completed and no ground water shall be allowed to enter the new pipes.

Prior to laying in trench, the lower bedding in the trench must provide support throughout the entire length of the pipe. The pipe shall never be laid directly on cohesive, rocky or stony material. Where the natural trench bottom meets the bedding class required, this shall initially be loosened to a depth of 100mm and thenre-compacted to at least 90% MPD and then the surface loosened on the day of andprior to laying

In rock excavation, the pipes shall be bedded on concrete or selected granular fill, e.g. sand, to a minimum thickness of 150 mm and the exclusion of rocks and other hard material to at least 300 mm around the pipe, leaving proper joint holes and subsequently making good with selected materials to the Engineer'sRepresentative's approval.

All flanged joints shall be made with jointing rings, which shall be carefully inserted concentric to the bore of the pipe, so that undue stresses shall not be caused in anyof the bolts or on the flanges when bolting up. The joint ring shall be compressed gradually and evenly by taking a few turns on each diagonal bolt in succession. Over-tightening shall be avoided. If the Engineer is dissatisfied with the degree of care being taken, the Contractor shall provide and use torque-wrenches for this purpose at no extra cost.

Mechanical joints shall be made in accordance with the manufacturer's instructions.After successful testing of pipelines, the joints will receive external protection as specified or to the Engineer's Representative's approval.

The threads of any screw connections shall be coated with red lead before the jointis made.

Concrete anchor blocks shall be provided at bends, tees, stopped ends, etc. as shown on the drawings or as directed by the Engineer's Representative.

Where a pipeline crosses under roads or railway lines, and if required by the relevant authority, the pipe shall be sleeved or surrounded with concrete or protected by reinforced concrete slabs as instructed by the Engineer's Representative, and Contractors shall have been deemed to have made allowancein their rates at the time of tender for compliance with the requirements of the relevant authority.

For the insertion of valves and other fittings into existing pipelines, pipes may need to be cut. Approved tools and machines specially made for the purpose, shall be provided and used by the Contractor.

The Contractor shall provide and fix wooden drumheads to the open ends of the mains, and similar drumheads shall be used to close the ends of any pipes to exclude dirt and stones, etc., when the pipe laying is not actually in progress. Wooden markers properly inscribed, shall be left projecting out of the ground to indicate the ends of all pipes, where these are buried in the ground in open country.In public highways, a danger sign or other suitable means as approved by the Engineer's Representative shall be adopted.

At every point of loading or unloading, pipes must be handled by approved lifting tackle. (Unloading by rolling them down planks of any form or including ramp will notbe allowed except with the special consent of the Engineer's Representative).

The stacking of pipes shall be used such as to prevent damage during storage. Timber runners shall be laid to keep the upper row separated from the lower and thebottom row shall be staked to prevent any rolling. The whole arrangement shall be subject to the approval of the Engineer's Representative.

Care should be taken to minimise the risk of bush fires damaging any pipes, their coatings and linings laid out along the line of the mains.

Refilling of pipe trenches shall conform to the specifications provided in Clause 522.

The requirements for making good any ground subsidence after refilling are provided for in Clause 523.

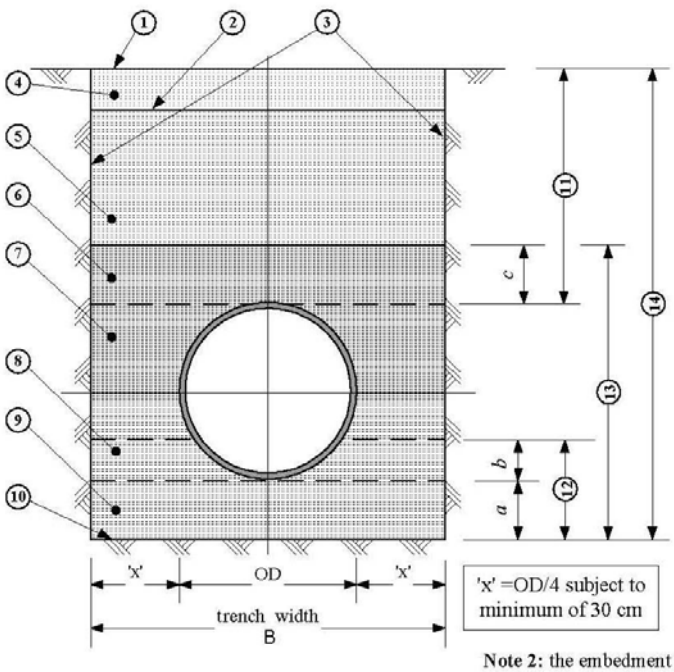
Reinstatement of surfaces shall conform to the specifications provided for in Clause524.

For Ferrous Pipes Laid in Trenches the soil cover shall be a minimum of 600 mm. and the embedment material required is S3 (sand and coarse grained soil with lessthan 12% fines) for epoxy lined steel pipes and class S4 and for ferrous cement mortar lined pipes in all cases with a minimum of 90% compaction. For details of thetrench specifications, and backfill material sizes refer to Clause 522 Contractors shall be deemed to have made full allowance in their Tender for the price of such trenching and importation of necessary backfill material and compaction as part of the pipe installation price.

BACKFILLING OF PIPE TRENCHES- FERROUS PIPES

All excavation of pipe trenches shall be of such form and to dimension as shown on the drawings or as the Engineer's Representative may direct, and in all respects provide with embedment configurations and minimum covers as detailed here below. As a general ruletrench width shall be not less than 1½ times the OD of the pipe but subject to the followingfigure and tables.

Typical Trench for Ferrous Pipes



1 Surface
2 Bottom of road or railway construction (if any)
3 Trench walls
4 Top soil
5 Main backfill
6 Initial backfill
7 Sidefill
8 Upper bedding
9 Lower bedding
10 Trench bottom
11 Depth of cover (600 mm minimum *)
12 Depth of bedding
13 Depth of embedment
14 Trench depth
a *Depth of lower bedding*
b *Depth of upper bedding*
c *Depth of initial backfill*

Note 1: compaction is the deliberate densification of soil during the construction process, whereas consolidation is the subsequent time-dependant densification after construction. Attaining cited minimum compaction requirements is at the supervisors disgression.

Note 2: the embedment is the arrangement and type(s) of material(s) around a buried pipeline which contribute to its structural performance. Attaining cited minimum compaction requirements is mandatory for embedment.

Figure: Trench Installation

* Minimum cover 600mm, except for Transmission mains, where minimum cover shall be 900mm.

Minimum Trench Width

Pipe Size DN	Trench Width
General	Minimum 600 mm
≤125 mm	D + 450
150 – 300	D + 600
> 300	To suit site condition and to the approval of the Engineer

Lesser trench widths may only be authorised if the Contractor can prove to the satisfactionof the Engineer that he can consistently achieve the required compaction for a lesser width in which case an absolute minimum of OD + 450 mm may be permitted.

In areas prone to waterlogging or where specifically called for on the Drawings or in the Bills of Quantities class S1 or S2 material shall be used for lower bedding in accordance with the following gradings:

Embedment for Flexible and Semi Rigid Pipes Ferrous

Embedment Class	Embedment Material Allowed	Notes
S1 and S2	Class S1: Gravel – single size Class S2: Gravel – graded	Normally processed granular materials where specified as bedding for ferrous pipes
S3 –S4	Class S3: Sand and coarse grained soil with less than 12% fines; Class S4: Coarse grained soil with more than 12% fines OR Fine grained soil, liquid limit less then 50%, medium to no plasticity and more than25% coarse grained material	These represent “as dug” soils but require particularly close control when used with low stiffness pipes. Class S3 shall be used for epoxy lined steel pipes whilst class S4 is suitable for cement mortar lined ferrous pipes

S1 and S2 Material for Lower Bedding of Ferrous pipes where specified

Nominal Pipe Diameter (mm)	Grading [to ASTM Sieve Sizes]	
	S1 Embedment	S2 Embedment
80	10 single-size gravel	10 single-size gravel
100	10 single-size gravel	10 single-size gravel
150	10 or 14 single-size gravel	14 to 5 graded
200 to 500	10, 14 or 20 single-size gravel	14 to 5 graded or 20 to 5 graded
> 500	10, 14, 20 single-size crushed rock, or gravel	14 to 5 graded or 20 to 5 graded

The placing and compaction of pipe embedment shall only be undertaken in the presence of anEngineer’s representative unless written authority from theEngineer has been granted.

No pipes shall be laid nor lower bedding introduced and no excavation filled in or covered with concrete until the formation has been inspected and the permission toproceed with the Work obtained.

In every instance, embedment material (consisting of bedding, side fill and initial backfill) filled around the pipe and for 300 mm over the top of the pipes shall be freefrom stones, tree roots or similar objects which through impact or by concentrating

imposed loads might damage the pipes, and shall not include black cotton type soil.The filling shall be carried out with utmost care, special attention being paid to tamping of material around the pipes and to joint holes so as to obtain the greatest possible compactness and solidity. The material shall if necessary, be screened to exclude material which would damage the pipes. The material shall be in accordance with the relevant pipe bedding drawing but no worse than a class S3 material for epoxy lined steel pipes (sand and coarse grained soil with not more than12% fines) or an S4 material for cement-mortar lined ferrous pipes and the source and material shall be approved by the Engineer's Representative before excavationcommences. Any delays as a result of not seeking this approval in good time shall be entirely to the Contractor's account.

Where the 'as-dug' trench material contains material which meets the bedding classrequirements as specified and providing that this is carefully screened to the sizes indicated above, and segregated from material that does not, the Contractor may, athis discretion, use it as such or incorporate such material into the imported embedment material being used.

The lower bedding for the pipes shall have a minimum thickness of 75 mm in normaltrenches, and 125 mm where rock/stones are present and at designated road crossings. In trenches where there is a continuous accumulation of groundwater, thetrench shall after obtaining the approval of the Engineer's Representative, be over- excavated by 150 mm and shall be backfilled using compacted granular material. Bedding material shall be compacted in layers not exceeding 50 mm thickness. Compaction of fill around the pipe shall be in layer thickness not exceeding half thepipe diameter or 75 mm whichever is the lesser. Layer thickness is however subjectto consistently achieving 90% MPD (Modified Proctor Density) or better, failing which layers shall be reduced in depth as necessary to achieve the % compaction.

The upper bedding shall be introduced as carefully and thoroughly as practicable tothe underside or haunch of the pipe such that no large spaces remain before it is compacted.

The sidefill and backfill material within the embedment shall be placed in layers of not more than 150 mm thickness when compacted and where hand ramming is employed the number of men filling shall not be more than half the number of men ramming. Sidefill shall be placed simultaneously on both sides of the pipe. Where mechanical-ramming of the remaining backfill is employed, the machines shall be tothe approval of the Engineer's Representative and soil shall be replaced and well rammed down by hand for a depth of not less than 500mm to give sufficient cover tothe pipes and obviate risk of damage to them before the mechanical rammer is brought into operation. The rammer shall not cease to be used on any length of trench until thorough compaction has been obtained. All backfill soil shall be free from clay lumps, boulders stones and rock fragments greater than 20 mm and 90%MPD shall be attained in all instances. All backfill soil above the embedment shall befree from clay lumps, boulders and rock fragments greater than 50 mm and as far aspracticable 90% MPD shall be attained, but this may be relaxed (e.g. in fields and open areas) by the Engineer's Representative.

The Contractor in excavating shall ensure that materials from strata containing no stones and suitable for filling around the pipes as described above, shall be kept separately and used for this purpose. The Contractor shall not be entitled to claim for any extra costs (as provided for below) for screening if this requirement is not complied with. If no such strata occur in the excavation, the excavated material shalleither be screened or suitable material transported to the Site from other excavations as the Engineer's Representative shall direct. The cost of such work shall be paid for according to the rates in the Bills of Quantities.

Before commencing the placing of embedment in the trenches, the Contractor shallobtain approval from the Engineer's Representative as to the methods he proposes

to use and he shalldemonstrate by means of tests that the specified compaction canbe achieved (according to SSRN 601 using the “sand replacement” method). The method of compaction and the testing thereof shall be at all times to the approval ofthe Project Engineer’s Representative and in general at a frequency of once every 30 metres unless this is specifically relaxed based on continuously good in-situ testresults.

Where pipes are joined by rigid joist (flanges or welded), the pipe trench shall be backfilled entirely without leaving out areas around and at pipe joints uncovered, forsubsequent filling. To facilitate the subsequent location of any suspected leaking joints during pipe testing, should this become necessary, the Contractor shallprovide marker pegs at regular intervals and/or use a handheld GPS to be able to relocate joint positions.

Where for pipes a minimum cover of 600 mm (or 900 mm for transmission lines) cannot be maintained, including highways and trafficked areas then the pipe must either be laid in a protective ferrous sleeve or be protected by a 150 mm thick reinforced concrete slab above the pipe. A minimum of a 150 mm layer of appropriate grade bedding material must first be placed and lightly compacted as acushion above the crown of the pipe before the slab is laid, and the slab must extend at least 150 mm out beyond either side of the trench.

MAKING GOOD SUBSIDENCE AFTER REFILLING

Should any but very localised subsidence occur of the pipe trench after refilling and beforethe expiry of the maintenance period, the Contractor shall first demonstrate that such subsidence is only to the backfilling above the pipe and not to the pipe, embedment, bedding or sub-soil itself.

Should this not be so demonstrated then the Contractor at his own expense shall, excavate and remove the pipe or pipes affected and return the bottom of the trench to grade through a process of over-excavation, re-compaction or use of a lean concrete mix as determined by the Engineer’s Representative, who shall also determine whether or notthe affected pipes may be re-used or replaced.

The affected section or sections will in any event be liable for a further twelve months maintenance period.

All refilling necessary due to subsidence in pipe trench backfill shall be thoroughlycompacted by ramming. Any subsidence due to consolidation shall be made up by the Contractor at his own expense with extra compacted material. Should subsidence occur after any topsoil has been replaced, the topsoil shall first be removed before any hollows are made up before being replaced.

REINSTATEMENT OF SURFACES

All surfaces of roads, fields, paths, gardens, verges, etc. whether public or private which are affected by the operations of the Contractor shall be temporarily restoredby him in the first instance and permanently reinstated in the second instance whenthe ground has consolidated fully. Separate payment for reinstatement shall be made only for surfaced roads (e.g. tarmac, concrete, paving bricks or similarmaterial), and for official designated dirt roads of at least 6m width, grassland, cultivated lands and sports fields. Any other reinstatements are deemed to be covered by the pipe installation rates.

The Contractor shall be responsible for the temporary reinstatement and permanentreinstatement of all surfaces whether or not the area requiring restoration is within the limits of his excavations if the necessity for the restoration arises from causes due to the operations of the Contractor. The Contractor's prices shall include for restoring all surfaces so damaged to their original condition, as no extra payment will be made for any such work. The Contractor shall take all necessary measures toensure that no toxic materials that may cause damage to vegetation or livestock

orpollute streams or water-courses are used in any temporary restoration or permanent reinstatement and shall indemnify the Employer against any claims arising out of the use of such materials.

Temporary restoration shall be carried out immediately after the excavations have been refilled by returning the excavated material to the position from which it was removed and adding such suitable materials as may be required and consolidating the various materials as the Work proceeds in order to provide a surface that is adequate for the purpose that the original surface fulfilled. Temporary surfaces shallbe maintained in a condition satisfactory to the Engineer's Representative and/or responsible Authority until the permanent reinstatement is made. In the case of roads and streets the surface shall be necessary to consolidate the filling and keep the surface fit for traffic, suitable material being added to all placed which have sunkor become rough.

Permanent reinstatement shall not be made until the ground has consolidated permanently and until sanction to do so is received from the Engineer's Representative. It shall be carried out with materials similar to those that were usedin the original Work to the entire satisfaction of the Engineer's Representative and/orresponsible Authority.

In verges and other grass surfaces the topsoil shall be removed, stored andreplaced after consolidation of the filling and planted or seeded with approved grass.Should subsidence occur, it shall be made good with additional topsoil and be replanted with grass or re- seeded. New grass shall be planted if for any reason thegrass fails to grow or is destroyed.

The trenches, channels, gutters and kerbs shall be reinstated to the condition in which they were before excavation was commenced. The final surface of the trenchshall be flush with the surrounding ground.

If the work of restoration or reinstatement as carried out by the Contractor is not to the satisfaction of the Engineer's Representative and/or the responsible Authority and should the Contractor not remedy the defect forthwith, any remedial work considered necessary may be undertaken by the Engineer's Representative and/orthe responsible Authority and the cost thereof shall be borne by the Contractor.

If at any time any trench becomes dangerous, the Engineer's Representative shall be at liberty to call upon the Contractor to restore it to a proper condition at three hours' notice and should the Contractor fail to carry out the work, have it done at theContractor's expense.

PART III – THERMOPLASTIC PIPES DURING MANUFACTURE, SUPPLY, INSTALLATION, COMMISSIONING & TESTING

MATERIALS AND STANDARDS, UNPLASTICISED PVC PIPES AND JOINTS

PVC pipes and fittings shall be manufactured and installed in accordance to SSRN 300 and SSRN 301. Preference shall be given to PVCu pipes that are not stabilised by lead, tin or other heavy metals. However, where they are then testedin accordance with SSRN305, and SSRN 301 (c)they must produce acceptable results.

Other related standards for pipes and joints of PVCu are given in SSRN 304 and SSRN 310,311 and SSRN 312. For laying, jointing and pressure testing they shall conform to therelevant sections of SSRN 302, and for quality control to SSRN 305 (c) and SSRN 313 (b)They shall be transported, laid, jointed and backfilled in accordance with the manufacturers written instructions except where this specification is more rigorous in which case this shall be followed.

To ensure that the Employer benefits from superior materials with enhanced useful life, atall times, latest and updated standards and procedures for design and installation shall beused and adopted but governed by cost effectiveness. In the same context the Contractor may provide, with the approval of the Engineer, superior materials using other standards

not listed here provided that they donot affect costs or programme and that they can demonstrate the superiority of the materials throughtests and guarantee certifications.

All PVCu joints shall be of the spigot and integral socket type whilst solvent weld joints orjoints with adhesives are not permitted. Fittings for use with PVCu pipes shall be either ofsteel or ductile iron and shall have socketed joints, save that injection moulded plastic bends and tees will be permitted with the approval of the Engineer. Aluminium alloy fittings are not permitted.

“Bulking up” with Chalk or use of any rework material during manufacture of PVCu pipes is however strictly forbidden and the Manufacturer shall provide certification to this effect.

The Contractor shall supply pipeline materials to the pressure classes referred to on the Drawings and in the Bills of Quantities, which classes are design and NOT solelyhydraulic pressure classes. In all cases minimum cover shall be 900mm and the beddingshall be restricted to S1, save that S2 bedding may be used with the approval of the Engineer, but only if he is fully satisfied with the Contractors initial performance in regardsto excavation, embedment, compaction and backfilling.

The maximum allowable deflection after laying of thermoplastic pipes shall be 2% at a joint.

Where specific design is carried out during construction, the equivalent pressure rating shall be calculated taking into consideration: the operating and test pressures, surges if applicable, external pressures, PVCu pipe strength characteristics, temperature, soilconditions, trench width, depth, appropriate traffic loads and impact fatigue.

Minimum pressure ratings and cover for PVCu pipes shall be as follows:

Nom. Diameter (mm)	**Minimum Pressure Rating (bars)**	**Minimum Cover (m)**	**Pipe Bedding**
≤125	10	0.9	S1, (or S2 if approved by the Engineer)
150 – 275	12.5	0.9	
≥300	To suit specific design calculations, agreed design criteria, using SSRN 267 design code of practice, and with the approval of the Engineer		
Transmission Mains and off-takes			
All pumping mains	Not Permitted		

The following subsections are related to manufacturing, handling, transportation and storage of PVCu pipes and fittings and shall be in conformance to SSRN 300, SSRN 301and SSRN 305.

Manufacture of PVCu Pipes and Fittings

All the fittings to be used with PVCu pipes shall generally be of ferrous material as specified for steel and ductile iron fittings. Injection moulded PVCu bends and tees shall be allowed with prior approval of the Engineer. Steel fittings shall meet the requirements of SSRN 213 (a), (b) and (c) and SSRN 228 (a)

Suitability of Production Process to meet Long Term Minimum Required Stress

The Contractor shall ensure that his pipe manufacturer is capable of meeting the minimum required stress (MRS) in Long Term Hydrostatic Tests and shall have carried out such a test in the past 36 months in accordance withappropriatestandards. Such tests shall also have been carried out by the manufacturer at 20

deg. C over at least 10,000 hours with 18 data points, and the minimum required stress for 50 years at 20 deg C by extrapolation shall be 25MPa.

Quality Control Records

The Contractor shall ensure that the manufacturer keeps accurate records of all types of component raw materials such as polymer powder, additives, stabilizers, lubricants, etc. used in the manufacture of PVCu pipes, together with detailed manufacturer's test reports carried out on the raw materials, date produced and datereceived, and batch or lot numbers.

During production, records shall be kept for mixing ratios of all the components usedin the PVCu blend and these mixing ratios shall not be changed without the prior approval of the Engineer.

PVC material silos shall be equipped with appropriate sized sieves.

Pipes shall each be identified individually by a unique number. Such numbers shall be recorded along with the Blend and Lot number they were manufactured from.

The pipe lot shall be the pipes manufactured during a single work shift. TheContractor shall state in its bid the length of shift the manufacturer intends to use. The number of pipes in a lot shall be the number of pipes manufactured during the specified shift period.

Polymer Certification

The manufacturer shall state for each batch and lot of pipes and fittings manufactured the K value of the polymer which shall have certifications from the polymer supplier. If required by the Engineer, tests will be carried out to determine that the K value is in accordance with the relevant standards.

Inspection and Testing during Production

The manufacturer shall carry out the necessary inspections and tests during production in accordance withthe relevant standards and such tests shall include alltests relevant for PVCu pipes and fittings as required by SSRN 313 (b).

The number of pipes to be tested and the frequency of testing shall be in accordance with SSRN 319.

Inspection of pipes and pipe fittings

The inspection will consists of visual examining the external surfaces of the pipe thatmust smooth and free of the following defects:

grooving

blistering

scoring (scratches)

cavities

impurities

other surface defects which will be deleterious defects

In addition the pipes will be inspected for correct chamfering at 15 degrees to half the wall thickness on the spigot end and squareness of both ends to the pipe longitudinal axis.

The numbers of samples that do not comply with the above requirements during inspection shall not exceed the quantities given in the relevant standards.

Testing of Pipes and Fittings

For each Lot, the pipes and fittings shall be tested at the factory before shipment inaccordance withthe relevant standards such as SSRN 310, SSRN 311, SSRN 313, SSRN 315 (a) and 316 (c) among others for softening temperature, resistance to creep, pipe dimensions, ovality, thermal reversion, resistance to dichloromethane, freedom from toxicity, hydrostatic pressures, vacuum, fracture toughness and resistance to impact etc. The wholeLot will be rejected if the quantity of non-compliant pipes exceeds the acceptable level.

Marking of Pipes and Fittings

Each Pipe or Fitting shall be marked clearly with indelible ink with the following data:

the manufacturers trade name or trade mark

the designation PVC-U

the pressure class and/or SDR ratio of the pipe

the nominal diameter of the pipe

the individual pipe number or fitting number

the week number of manufacture

the Lot Number the pipe belongs to

the Blend Number the pipe belongs to

Release from manufacturers works

No PVCu pipes and fittings shall be released from the manufacturer's works until alltests results on the particular Blend and Lot it belongs are in conformance with requirements. In addition no pipe shall be delivered from the manufacturers premises before a full lapse of 6 weeks from its production to allow for positive results of accelerated resistance hydrostatic test pressure testing.

Determination of pipe and socket wall thickness

All pipes shall be manufactured in accordance to SSRN 300 and SSRN 301 and thedesign pressure rating stated or based on specific design using the internationally acceptable design code of practice for PVCu pipes.

The Contractor shall demonstrate and obtain approval from the Engineer that the pipe thicknesses proposed achieve the necessary operating and test pressures, and can withstand the external pressures and that they are in conformance with the acceptable international standards for the purpose of its use in this project

Pipe Lengths

Pipes shall be in effective lengths (i.e. overall length minus the depth of engagementin the socket) not exceeding 6.0 m length.

Pressure Classification

All PVCu Pipes supplied shall be classified by their PN operating pressure rating and their SDR ratio as required under this contract.

Protection of Fittings used with PVCu Pipes

All types of fittings shall be protected in conformance withtheir respective requiredstandards.

Protection of extruded PVCu fittings - Protection shall be in conformancewithSSRN 301and their other respective standards.

Protection of Steel Fittings: - Steel fittings shall be coated and lined with fusionbonded epoxy to SSRN 241(a) with a thickness of between 305 to 406 microns.

In addition, for transport, fittings shall be shrink wrapped in 0.2 mm polythene packing to reduce the risk of transport damage.

Protection of DI fittings: - DI fittings shall be coated and lined with fusion bondedepoxy to a thickness as for the steel fittings above and shall similarly be shrink wrapped in 0.2 mm polythene packing for transport.

Packing for Shipment – PVCu Pipes

Pipes up to 300 mm diameter may be bundled; with larger sizes packed loose. Containerised packing and transportation is also acceptable and if proposed shall beso indicated by the Tenderer. Notwithstanding any intention to utilise containers, allnuts, bolts, rubber gaskets etc. shall be packed in wooden boxes and protected against the elements. Nesting of pipes is not permitted. Fittings up to and including DN 200 mm and flanged pipe pieces up to DN 200 mm and length not exceeding 1 metre shall also be packed and supplied in wooden boxes. All other fittings,protected for shipment as described above may be packed loose. All flanges shall be protected with discs of wood, wool, fibre or timber. Flexible couplings shall be bundled if not containerised. Pipe sockets, spigots, and plain ends shall be protected by suitable wrapping prior to transportation.

The Contractor shall further have described in his Tender in full detail the method(s)of offloading for imported items or on-loading for locally manufactured ex-works items, the methods of road/rail transportation and of site off-loading including the lifting methods intended.

He shall further have described in his Tender in full detail the method(s) of stackingand storage. His Tender rates shall also be deemed to have included for the transportation as described and for the provision of all the necessary facilities for off-loading at the storage sites, and for proper stacking and storage.

At the time of tendering the Contractor shall also have stated the approximate areasof land required for the off- loading, and stacking of the pipes and for the storage ofthe fittings and of any special protection/storage facilities needed for any particular item(s) of his goods

In-country Storage, Handling and Transportation of PVCu Pipes

Storage Areas

The Contractor shall provide storage for PVCu pipes in a manner and in facilitiesapproved by the Engineer's Representative. For pipes of local manufacture, thismay include a temporary fenced-off area at the manufacturers premises, provided a Contractor in his Tender has so indicated his intention to dothis and the area to be fenced off is shown to be sufficient for the purpose.

Pipe Stacking and Storage

Upon arrival at the pipe storage area, all pipes delivered in containers shall be immediately removed therefrom and stacked in properly protected pipe storage sheds.

Pipes shall be stacked at the pipe storage areas using one or all of the followingmethods.

square stacking for small diameter pipes

parallel stacking using wooden roller boards

pyramidal stacking

All pipes shall be stacked on raised wooden battens at least 100 mm thick and 225 mm wide. The PVCu pipes should be uniformly supported throughout their length or at not more than 1 m centres. Pipe stacks shall be suitably wedged and

the Contractor shall be deemed to have included for an adequate number of timber, wedges, etc., in his Tender.

Where socket and spigot pipes are stacked, the sockets should be placed at alternate ends of the stack with the sockets protruding.

The Contractor shall further have described in his Tender in full detail the method(s) of offloading for imported items or on- loading for locally manufactured ex-works items, the methods of road/rail transportation and of site off-loading including the liftingmethods intended. He shall further have describedin his Tender in full detail the method(s) of stacking and storage. His Tender shall also be deemed to have included for the transportation as described and for the provision of all the necessary facilities for off- loading at the storage sites,and for proper stacking and storage.

At the time of tendering the Contractor shall also have stated the approximate areas of land required for the off-loading, and stacking of the pipes and for the storage of the fittings and of any special protection/storage facilities needed for any particular item(s) of his goods

The following table indicates the maximum stacking heights allowable:

Pipe Outside Diameter (OD) in mm	Maximum number of layers in stack, PVCu pipes
Up to 100	7
150	7
200	5
250	5
300	4

In addition PVCu pipes shall not be stored out in the sun unless they are fully protected by a free-venting, opaque cover (tarpaulin or black polyethylene). Except immediately prior to transfer to trench side, PVCu pipes shall not be stored at temperatures exceeding 25 deg. C at anytime, whilst the requirementsof SSRN 302 shall be met with regards to storage, handling and transport.

Vehicle used to transport PVCu pipes shall have flat beds free from projections. Pipes shall be uniformly supported along their entire length and shall notoverhang the end of the vehicle. Upright side supports on vehicles shall be flat, at 2m spacing and free of sharp edges. Socket and spigot pipes shall be stackedon vehicles in alternate layers so that the socket carries no load. Thicker wall pipes shall always be loaded before thin wall pipes.

Where PVCu pipes are delivered from abroad in containers, such containers shall not be exposed to sunlight on their upper surface during either dockside storage or shipment and all pipes shall be immediately removed and stored as indicated in e(ii) above upon arrival on site. Site storage in the supply containersis not permitted, unless all pipes are first removed and then stored in accordance with e(ii) above.

Care shall be exercised in the transporting, handling, off-loading and loading of the pipes. For PVCu pipes, a minimum of two persons per pipe shall assist in theloading and offloading and pipes shall be neither thrown down nor dropped or rolled.

Distribution of PVCu Pipes from Storage

All PVCu pipes shall be distributed to the trench side and laid without being out in the sun for more than the day of installation unless they are to be protected from thesuns rays in which case this period may be extended at the discretion of the Engineer's Representative up to an absolute maximum of 5 days.

They shall then be supported at not less than three approximately equally spaced intervals so as to be fully clear of the ground.

When pipes are being loaded into vehicles, care shall be taken to avoid their cominginto contact with any sharp corners such as cope irons, loose nail heads, etc. Whilstin transit,pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry.

Pipes may not be offloaded from lorries by rolling them, nor shall pipes be rolled or dragged along the ground.Visual inspection shall be done along the whole length attrench side before laying.

MATERIALS & STANDARDS, HIGH DENSITY POLYETHYLENE PIPES AND FITTINGS

HDPE (PE100 and PE100 layer) pipes and fittings shall meet the requirements of SSRN 307 and SSRN 317 All manufacturing materials used shall be in conformance withSSRN 320.

HDPE pipes shall be transported, laid, jointed and backfilled in accordance with the manufacturers written instructions except where this specification is more rigorous in which case this shall be followed.

At all time, latest and updated confirmed standards and procedures for design and installation shall be used and adopted. This will help ensure that the Employer benefits from superior materials with enhanced useful life. In the same context the Contractor mayprovide with the approval of the Engineer superior materials using other standards not listed here provided they can demonstrate so through tests and guarantee certifications.

The polyethylene used shall be of a high molecular type with average to high density. Forthe manufacture of the pipes, not less than Third Generation polyethylene, known as PE 100 shall be used. Second Generation polyethylene (PE 80) shall not be offered. The polyethylene shall be stabilised against the effects of ultraviolet radiation by the addition ofcarbon black.

The Contractor shall provide pipeline materials to the pressure classes and SDR ratios referred to on the Drawings and in the Bills of Quantities. Unless otherwise indicated on Tender Drawings or in the Bills of Quantities, the pressure ratings shall not be lower thanPN 10.

In all cases minimum cover shall be 900mm and the bedding shall be restricted to S1 or S2 if specified by the Engineer. Where S2 material is permitted, it may comprise or include screened 'as-dug' materials that meet this requirement.

Where specific design is carried out, the pressure rating shall be calculated taking into consideration: the operating and test pressures, surges if applicable, external pressures, HDPE pipe strength characteristics, temperature, soil condition, trench width and depth, appropriate traffic loads and impact fatigue.

Maximum Allowable Deflection of HDPE (PE100) Thermoplastic Pipes

PE pipes with electrofusion joints	5%
PE pipes with mechanical joints	2%

Minimum pressure ratings and cover for HDPE pipes shall be as follows:

<table>
<tr><th>Nom. Diameter (mm)</th><th>Pipe thickness and SDR to suit following minimum Pressure Rating (bars)</th><th>Minimum Cover (m)</th><th>Pipe Bedding</th></tr>
<tr><td>0 – 125</td><td>10</td><td>0.9</td><td rowspan="4">S1, S2 if approved by the Engineer</td></tr>
<tr><td>150 – 275</td><td>12.5</td><td>0.9</td></tr>
<tr><td>>300 Transmission MainsAnd off-takes</td><td colspan="2" rowspan="2">To suit specific design calculations, agreed design criteria, using SSRN 267 design code of practice, and with the approval of the Engineer</td></tr>
<tr><td>All pumping mains</td></tr>
</table>

For diameters up to and including 110 mm, PE pipes can be supplied in coils of up to100 m long. For coils of diameters greater than 63 mm each layer shall be bound separately to facilitate safe unwinding. For diameters from 125 mm upwards they shall besupplied in lengths not exceeding 12 m. Installation – including fusion jointing work on HDPE pipelines – must be directed and supervised by suitably qualified and experiencedpersons and the Contractor shall have demonstrated his ability to provide this in his Tender, if necessary from his intended manufacturer.

Inspection and Testing during Production

The manufacturer shall be carrying out the necessary inspections and tests during production in accordance to the relevant standards and such tests shall include all tests relevant for HDPE pipes and fittings as required by SSRN 306(f). Steel fittingsshall meet the requirements of SSRN 213, SSRN 228 and SSRN 229.

The number of pipes to be tested and the testing frequency shall be in accordance with SSRN 319.

Electro-fusion Fittings

All HDPE fittings shall be injection moulded from recognised top quality PE 100 resin and will conform to SSRN 307. Where jointing or connection is not done by electro-fusion, joints shall be of the compression type, or alternatively ferrous fittingsconnected by flange assemblies shall be used. Jointing with adhesives, cement glueor threaded joints is not acceptable.

Fittings shall be suitable to be used in conjunction with pressure pipes from polyethylene manufactured to the appropriate international standards, and all fittingsmust be packed in such a way as to allow their use on site without additional cleaning.

The heating coils contained in each individual fitting and saddle should be so designed that only one complete process cycle is necessary to fully electro-fuse thefitting to the adjoining pipe or pipeline component as applicable. No heating elementmay be exposed and all coils are to be fully imbedded into the body of the fitting forprotection purposes.

The pipe fixation device shall be an integral part of the body for all fittings in the sizes up to and including nominal diameter 63 mm and on saddles up to 250mm.

An individual data carrier card in compliance with SSRN 321 and SSRN 322 containing a magnetic strip and an appropriate barcode or codes as well as manualsetting information for data transfer purposes must be supplied with each fitting.

All fittings must have moulded-in identification and appropriate product information.Fittings without such identification will be rejected.

Process voltage of all fittings must not exceed a maximum of 39.5 volts.

Insulated contact heads for the terminal pins are to be provided, and terminal pin size shall be 4 mm in diameter.

A limited path style fusion indicator acting for each fusion zone as visual recognitionof completed fusion cycle should be incorporated into the body of the fitting or saddle near or adjacent to the terminal.

The design of the fusion indicators must prevent the escape of fusion melt.

All couplers in the sizes up to and including nominal diameter 160 mm must have aneasily removable centre stop not requiring tools for removal.

All internal or externally threaded transition adaptors in the nominal sizes up to andincluding 63 mm diameter must be designed with an integrated polyethylene collar from PE 100 for jointing purposes not relying on rubber or synthetic seals for leak prevention.

Threaded adapter bodies may be from brass or stainless steel and should be of themodular principle, not being supplied moulded into an electrofusion fitting socket.

Product training and Technical Information

The manufacturer or the material supplier shall provide a specialised theoretical andactive practical product training given by qualified instructors to enable installers of the above mentioned products to be able to understand and use the products correctly and efficiently under site conditions. The courses are to be held on the purchaser's own premises upon demand.

The manufacturer is to provide accurate and easy-to-understand assembly instructions in English which can be used at any subsequent time for reference purposes.

Manufacturing, Testing, Handling, Transport and Storage

The quality control procedure in manufacturing, transporting, handling and storage of HDPE pipes and fittings shall be in accordance Clause 529 (a) to (o) where appropriate and in conformance to their respective standards if not covered in this section.

In-country Storage, Handling and Transportation of HDPE Pipes

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 edgeswhen loading and offloading. Pipes shall not be dragged along the ground.

Pipes, fittings and coils of HDPE pipes shall be stored in such a way that theyare completely protected from direct sunlight. When covered they must be wellventilated to avoid accumulation of heat and resultant deformation. Transparent coverings shall not be used. The storage location shall be flat andshall, for pipes, support the pipes throughout their length. Stones and sharp objects shall not be present. Pipes shall not be stacked to a height exceeding1 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 shallbe 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.

HDPE Pipes supplied in coils of up to 63 mm diameter may be unrolled with the coil in the vertical position. For larger diameters an unwinding device shallbe used. A turnstile can be used with the coil laid in a horizontal position on it or with the coil mounted vertically on a slow moving lorry. The pipe shall neverbe 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 thenuse an approved joint after laying. All costs of dealing with kinking shall be to the Contractors expense. A minimum bending radii of 35 x the diameter shall be observed.

Distribution of Materials from Storage

The Contractor shall make his own arrangement for storage including for temporaryoccupation of the necessary land, provision of suitable fencing, preparation of site and security, and the selected storage areas shall be suitably close to the final pipeline alignment to allow for speedy transfer to the installation location.

HDPE pipes shall be distributed to the trench side and laid without being out in the sun for more than the day of installation unless they are to be protected from the suns rays in which case this period may be extended at the discretion of the Engineer's Representative up to an absolute maximum of 5 days. Pipes not in coilsshall then be supported at not less than three approximately equally spaced intervals so as to be fully clear of the ground.

When pipes are being loaded into vehicles care shall be taken to avoid their cominginto contact with any sharp corners such as cope irons, loose nail heads, etc. Whilstin transit, pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry.

Pipes may not be offloaded from lorries by rolling them. Pipes shall not be rolled or dragged along the ground.

MATERIALS & STANDARDS, GLASS REINFORCED POLYESTER (GRP) PIPE

Scope

This specification applies to the furnishing of all labour, materials and services in connection with the manufacture, testing, delivery and installation of large diameterunderground glass reinforced plastic piping, joints, fittings and specials as specified in theengineering documents and drawings.

Codes and Standards

All pipes, joints and fittings supplied under this specification shall, as a minimum, meet the requirements of the AWWA C950, AWWA Standard for Fibreglass Pressure Pipe, and ASTM D3517, Standard Specification for "Fibreglass" (Glass-Fibre Reinforced Thermosetting-Resin) Pressure Pipe, for pressure pipes and ASTM D3262 Standard Specification for "Fibreglass" (Glass Fibre-Reinforced Thermosetting Resin) Sewer Pipe, in the case of gravity sewer pipes and ASTM D3754 Standard Specification for "Fibreglass" (Glass Fibre-Reinforced Thermosetting Resin) Sewer and Industrial PressurePipe for pressurised sewer and industrial waste pipes.

Test Methods

ASTM D638 Standard Test Method for Tensile Properties of Plastics.

ASTM D1586 Standard Method for Penetration Test and Split-Barrel Sampling ofSoils.

ASTM D2290 Standard Test Method for Apparent Tensile Strength of Ring orTubular Plastics and Reinforced Plastics by Split Disk Method.

ASTM D2412 Standard Test Method for External Loading Properties of Plastic Pipeby Parallel-Plate Loading.

ASTM D2487 Standard Test Method for Classification of Soils for EngineeringPurposes.

ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics byMeans of a Barcol Impressor

ASTM D2992 Standard Method for Obtaining Hydrostatic Design Basis for"Fibreglass" (Glass-Fibre Reinforced Thermosetting Resin) Pipe and Fittings.

ASTM D3567 Standard Method Determining Dimensions of "Fibreglass" (Glass-Fibre Reinforced Thermosetting Resin) Pipe and Fittings.

ASTM D3681 Standard Test Method for Chemical Resistance of "Fibreglass"(Glass-Fibre Reinforced Thermosetting Resin) Pipe in a Deflected Condition.

ASTM D3754 Standard Specification for "Fibreglass" (Glass Fibre-ReinforcedThermosetting Resin) Sewer and Industrial Pressure Pipe

ASTM D5365 Long- Term Ring Bending Strain of Fibre Glass (Glass-FibreReinforced Thermosetting Resin) Pipe.

Product Standards

ASTM D3754 Standard Specification for "Fibreglass" (Glass Fibre-ReinforcedThermosetting Resin) Sewer and Industrial Pressure Pipe

ASTM D4161 Standard Specification for "Fibreglass" (Glass-Fibre ReinforcedThermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals.

Product DescriptionMaterials:

Only approved polyester resin systems for which documented performance isavailable shall be used in this particular application. The data shall have been acquired from a composite material of similar construction and composition as the product proposed for this project.

The reinforcing glass fibres to be used to manufacture the components shall be of highest quality commercial grade of glass filaments suitably treated with binder and sizing compatible with impregnating resins.

Silica sand or other suitable materials may be used as fortifiers in the laminates.

Resin additives, such as pigments, dyes and other colouring agents, if used, shall inno way be detrimental to the performance of the product nor shall they impair visualinspection of the finished product.

Elastomeric sealing rings must be supplied by recognised, acceptable, qualitymanufacturers. The elastomeric compound used must be approved for use inpotable water systems.

Manufacture and Construction

The pipes shall be supplied in accordance with the diameters and tolerancesspecified in “Dimensions”. They shall be manufactured by a controlled, reproductionprocess using the materials described in the PGRP 3.1 to result in corrosionresistant, composite structure to meet the operating conditions for the pipe classes as specified on the drawings. Stiffening ribs may be used to increase the overall pipe stiffness.

Plain-ended pipes shall be field connected with glass reinforced plastic sleeve couplings that utilise elastomeric sealing rings as the sole means to maintain joint water- tightness. Spigot and socket pipes shall be field connected using the bell andspigot joint with double O-ring and pressurisation socket. The joints must meet the performance requirements of ASTM 3754 and ASTM D4161.

Flanges, bends, reducers, tees of various descriptions, wyes and other fittings shallbe Grade B mild steel. Couplings shall be GRP collars or VI couplings or acombination of the two with the ends fabricated to suit the contractor's requirements.

Dimensions

Pipes will be supplied in accordance with the nominal diameters as shown on thelongitudinal section drawings or in the Schedule of Quantities.

Pipes shall be supplied in accordance with an OD series.

Pipes shall be supplied in 12 metre lengths, + 25 mm.

Other section lengths may be supplied for special orders, subject to the Engineer's approval. A maximum of 10% of the pipe sections may be supplied in random lengths, again subject to the approval of the Engineer.

The minimum average wall thickness shall be the thickness as stated. The minimumsingle point thickness shall not be less that 87.5% of the stated thickness.

All pipe ends shall be square to the pipe axis + 6 mm or 0.5% of the nominal diameter, whichever is the greater.

The tolerance of the angle of a bend and the angle between the main and a leg of awye or tee shall be 2 degrees. The tolerance on the laying length of a fitting shall be50 mm.

Product

Pipes shall be supplied to the minimum initial specific stiffness of SN 5000. Pressure classshall be PN 25.

Qualification Testing

The physical properties and characteristics of the pipes shall be determined by prototypetesting of the manufactured product. These tests need not be conducted specifically for this project if prior tests on similar products have been previously completed. Testing maybe conducted on one diameter and extrapolated to other diameters if the pipes are of similar composition and material arrangement and are manufactured from the same materials specification using a similar process.

All prototype tests results must be retained by the manufacturer and be available for inspection by the purchaser or his representative upon request.

The Hydrostatic Design Basis (HBD) will be obtained in accordance with procedure B of ASTM D2992, being established at an extrapolated 50-year value.

The long-term ring bending strength (Sb) will be determined in accordance to ASTM D5365 for water projects. The ambient test temperature for maximum operating temperatures not to exceed 50 degrees C. Minimum values for Sb, expressed as relativepipe deflection, are 12% for SN 5000

Coupling joints shall be qualified per the tests of Section 7 of ASTM D4161.Product

Use

The maximum allowable operating temperature of the pipes shall be 50 degrees C.

The minimum allowable operating temperature of the pipes shall be -40 degrees C. Theactual operating temperature shall range between 0 and 20 degrees C.

Standard Installations

Glass Fibre Reinforced Pipes shall be installed in accordance with the Manufacturer's Installation Instructions. The minimum standard installation for each station and corresponding stiffness class based on this specification is SN 5000, 90SPD sand, full burial.

Unless otherwise noted, trenches shall be constructed in accordance with the dimensionsgiven in the Standard Specification or as shown on the drawings.

Quality Control Testing

Quality control testing on pipes shall be conducted in strict accordance with thisspecification. These tests will, as a minimum, cover:

Raw materials
Pipe stiffness
Hydrostatic testing (as agreed with the Engineer)
Load capacity
Barcol hardness
Critical dimensions
Visual appearance

Adequate records must be kept by the manufacturer; such reports must be readily available for inspection by the Contractor, the Engineer or the Engineer's Representative.Quality control tests may be witnessed by the Contractor, the Engineer or the Engineer's Representative.

Raw materials for use in pipes covered in this specification shall be sampled and tested by the manufacturer prior to their use to ensure that they comply with the specifications ineffect at the time of purchase. Any materials failing to meet the requisite standards shall immediately be rejected.

All materials shall be delivered with appropriate vendor certificates to demonstrate their compliance with the Manufacturer's specification.

Samples of pipe shall be tested for compliance with the pipe stiffness. The frequency of pipe ring samples shall be once per shift/machine or one per 100 pipes, whichever is the most frequent. If the one sample fails it should be retested. If it still fails, cut two (2) additional samples from the lot (from the preceding and following pipes). If they both pass,then the entire batch except the failed pipe is considered acceptable. If not as above, thepipes must be proven individually acceptable. Testing will be carried out in accordance with ASTM D2412, with the stiffness value rated at 5% deflection.

Hydrostatic Leak Testing Pipes shall be hydrostatically tested in accordance with section 3.1.1 of AWW A C950. The pressure class of pipes will be that specified. Any pipes failingto pass this test will be rejected. Rejected pipes may be repaired and retested; if they pass, they will be accepted

Tests shall be performed in accordance with the requirements of AWWA C950 and ASTMD3517 to check load capacity (or strength) in both the hoop and axial directions. One of each test shall be made per 100 pipes. Should samples fail to meet or exceed the stated values for each test, two additional samples shall be cut from the preceding and followingpipes. If they both pass and the average of all three sets also passes, then the entire lot isconsidered acceptable.

Barcol hardness tests will be conducted in accordance with ASTM D2583. Pipes failing toreach the required level of cure will be rejected. Rejected pipes may be retested in accordance with this specification. If their cure at this time has reached the required standard, they will be acceptable.

Pipes will be measured for compliance with critical dimensions as specified in PGRP 3.3 including diameter, thickness, end squareness and length. Measurements will be made inaccordance with ASTM D3567.

Checks on diameter will be made at each change of diameter manufactured. Tolerances will be such that joints meet the performance requirements of ASTM D3754 and ASTM D4161.

All pipes will be checked for compliance with thickness stated. The minimum average thickness must be greater than or equal to stated thickness. The minimum single point thickness must be greater than or equal to 87.5% of stated thickness.

Any pipes with stepped ends shall be checked to ensure compliance with tolerances.All pipes

will be measured to ensure compliance with the requirements.

The pipes shall be free from all defects, including delaminations, bubbles, pinholes, cracks, pits, blisters, foreign inclusions, and resin-starved areas that, due to their nature, degree or extent, detrimentally affect the strength and serviceability of the pipe.

The pipe shall be as uniform as commercially practicable in colour, opacity, density and other physical properties.

Submittals to be Given Before or at the Time of Tendering

At tender stage and in a covering letter, the Manufacturer, through the Contractor, shall, inaddition to the items specified, provide sufficient data for the broad evaluation of his proposed pipe. This data shall include, a minimum, the following specific information:

Details of the proposed pipe wall thickness and properties including Pressure Classand Stiffness Class.

Details of joints.

Hydrostatic testing plan.

Exceptions

Details for nesting and packaging of pipe together with methods for de- nesting andunpacking of pipes

Instruction for the storage and handling of pipes and couplings

Installation Instructions including inter-alia bedding requirements, backfillingprocedures and proposals for measuring initial diametrical deflections.

TRENCH EXCAVATION AND EARTHWORKS FOR THERMOPLASTIC PIPES

This clause for excavation shall apply except for thrust boring as specified in Clause 549below.

All trench excavation will as a minimum precaution be taped off to alert members ofthe public to its existence.

The excavation shall be made in open cutting unless tunnelling or heading is specified by the Engineer's Representative or it is specified in the Bills of Quantities.

Trenches for pipes shall be excavated to the lines and depths shown on the Drawings, or as directed by the Engineer's Representative, and shall be of sufficientwidth to give an equal clearance on both sides of the barrel of the pipe or pipes suchthat in general the total trench width is 3/2 'D' where 'D' is the outside diameter of the pipe or the average outside diameter of the group of pipes or will be equal to theoutside diameter or the pipe plus 300 mm whichever is greater. For pipes bedded inconcrete sections, the breadth of concrete bedding for the pipes will be equal to thewidth of the trench. Excavation for fire hydrants, valve chambers or any other waterworks structures shall be carried out to the levels and outlines of such structures, and the rates shall include for any additional excavation or other temporary Works required.

If in the opinion of the Engineer's Representative due to delays in laying which are the fault of the Contractor the ground becomes weathered prior to the laying of the pipes, the Contractor shall remove the weathered soil and replace it with suitable compacted material to the original formation level at his own expense.

Where pipes are not laid on concrete, the bottoms of the trenches as excavated shall be smooth and shall be free from stones or other projections. Holes cut out forjoints in the lower bedding shall be of as small a size as possible throughout their entire length. The trench shall be dug to within 150mm of its formation and proper grade pegs shall then be set in the bottom of the trench by the Contractor for the

accurate taking out of the rest of the excavation. Grooves about 50mm deep shall be cut across the trench in the lower bedding at the required positions to enable theeasy removal of pipe slings.

The materials excavated from trenches shall be laid completely and neatly on the sides of the trench except where in the opinion of the Engineer's Representative's Representative this would so obstruct a road or footpath as to prevent the passage of traffic or pedestrians. In such cases the Contractor must dig out the pipe trench insuch lengths as directed and keep his excavated material at such a distance as mayseem advisable, and the rates shall be deemed to cover for this.

During excavation, the Contractor shall ensure that all material suitable for re-use and which he intends for re-use are kept separate and set aside and protected as necessary to prevent loss or deterioration. Materials forming the surface and foundations of roads shall when excavated and if required for further use, be carefully separated. Paving slabs, bricks and similar surfaces shall be carefully removed and stacked for re-use, or as otherwise instructed by the Engineer's Representative.

No pipes shall be laid nor lower bedding introduced and no excavation filled in or covered with concrete until the formation has been inspected and writtenpermissionto proceed with the Work obtained. The Contractor shall provide to the Engineer, a weekly schedule in advance indicating the dates and approximate times he expectsto request such inspections.

Where pipes are to be laid under a road formation or in open country, or in cutting, trenches shall generally be excavated after the earthwork is completed. The Engineer's Representative may permit these pipe trenches to be excavated before the earthwork is complete, but payment for the excavation of the trench will only bemade upon the volume excavated below the road formation.

The unit of measurement for the excavation of trenches shall be per linear metre orper cubic metre of void calculated from the deemed width of the trench, and the average depth of excavation as mentioned in the Bills of Quantities. Unless otherwise indicated, for valve chambers and other water works structures, the unit ofexcavation will be per number or per cubic metre of excavated material calculated tothe exact outer dimensions and depths of the Permanent Works. In neither case willallowance will be made for bulking.

The rates for excavation of trenches in "normal" material shall include removal of allmaterial except "rock", selecting and segregating material to be backfilled in specillayers, supporting or sheeting, shoring and strutting, any additional working space orroom for timbering or sheeting required, dealing with water, maintenance of the trench, and all labour, tools, materials, plants, supervision, overheads and profit.

The provisions of the above Clause shall also apply to the rates of excavation in "rock" and in addition the Contractor shall allow in his rates for back-filling the invertwith Class 15 concrete or other materials as directed by the Engineer's Representative and removing to a spoil dump all "rock" excavated.

Where rock is encountered and should the Contractor wish to excavate the rock in advance and temporarily to refill the excavated trench with the excavated material until he is ready to proceed with the laying of the pipe, he shall be permitted to do so, which permission must be given in writing by the Engineer. Such work shall normally be included in the Contractors rates unless he can show that the amount ofrock is in excess of the amount billed to an extent that his work programme will be unduly delayed if he does not do so in which case he may seek to be paid both the
E.O. item rate for the rock and twice the rate quoted for excavation in class III material.

PIPE LAYING FOR THERMOPLASTIC PIPES

Individual Pipes not supplied in Coils

Pipes shall only be laid in the presence of the Engineer's Representative unless written authority from the Engineer has been granted.

Pipes generally shall be laid and jointed in accordance with the manufacturer's or his licensor's instructions. Extra excavation must not be carried out so as to avoid backfill, excessive deviation in joints and other irregularities. Otherwise, the pipe grade will follow the Drawings, with a continuous (but not necessarily uniform) fall towards washout-valves and rise towards air-valves.

Every pipe shall be laid separately and shall bear evenly upon the lower bedding or concrete for its full length, holes to receive sockets, couplings or flanges being cut inthe bottom of the trench of such size and depth as to allow the joints to be properly made. The pipes shall be laid to true inverts, straight lines and falls, each pipe beingseparately boned between sight rails. The pipes shall be thoroughly brushed insideinsofar as is practicable and outside prior to laying, and no foreign matter shall be allowed to enter the pipe during or after laying. At the end of each working day the exposed pipe end shall be stoppered up with a stopper plug of appropriate diameterand not merely covered in polythene sheet tied around the end.

Trenches shall be bottomed up only immediately in advance of pipe laying, althoughat least 15 metres shall be prepared in advance of any given pipe. Trenches and joint holes shall be kept free from water, until the pipes are laid and the joints completed and no ground water shall be allowed to enter the new pipes.

Prior to laying in trench the lower bedding in the trench must provide support throughout the entire length of the pipe. The pipe shall never be laid directly on cohesive, rocky or stony material. Where the natural trench bottom meets the bedding class required, this shall initially be loosened to a depth of 100mm and thenre-compacted to at least 90% MPD and then the surface loosened on the day of andprior to laying

In rock excavation, the pipes shall be bedded on concrete or selected granular fill, e.g. gravel, to a minimum thickness of 150 mm and the exclusion of rocks and otherhard material to at least 300 mm around the pipe, leaving proper joint holes and subsequently making good with selected materials to the Engineer'sRepresentative's approval.

All flanged joints shall be made with jointing rings, which shall be carefully inserted concentric to the bore of the pipe, so that undue stresses shall not be caused in anyof the bolts or on the flanges when bolting up. The joint ring shall be compressed gradually and evenly by taking a few turns on each diagonal bolt in succession. Manufacturers' recommendations on the maximum tightening torque shall be followed, and over-tightening shall be avoided. Where one or both of the flanges is itself of plastic, torque-wrenches shall always be used, and the bolts shall first be hand tightened and then diagonally tightened progressively to achieve 5%, 20%, 50%, 75% and finally 100% torque. For metal to metal flanges and if the Engineer isdissatisfied with the degree of care being taken, the Contractor shall provide and use torque-wrenches for this purpose at no extra cost.

Mechanical joints shall be made in accordance with the manufacturer's instructions.After successful testing of pipelines, the joints will receive external protection as specified or to the Engineer's Representative's approval.

The threads of any screw connections shall be coated with red lead before the jointis made.

Concrete anchor blocks shall be provided at bends, tees, stopped ends, etc as shown on the drawings or as directed by the Engineer's Representative.

Where a pipeline crosses under roads or railway lines, the pipe shall be sleeved or surrounded with concrete or protected by reinforced concrete slabs as instructed bythe Engineer's Representative, and Tenderers shall have been deemed to have made allowance in their rates for compliance with the requirements of the relevant authority. Where roadside verges are liable to receive traffic, this protection shall beextended under the areas concerned and Tenderers shall have been deemed to have made allowance in their rates for compliance with this requirement.

For the insertion of valves and other fittings into existing pipelines, pipes may need to be cut. Approved tools and machines specially made for the purpose, shall be provided and used by the Contractor.

The Contractor shall provide and fix wooden drumheads to the open ends of the mains, and similar drumheads shall be used to close the ends of any pipes to exclude dirt and stones, etc. when the pipe laying is not actually in progress. Wooden markers properly inscribed, shall be left projecting out of the ground to indicate the ends of all pipes, where these are buried in the ground in open country.In public highways, a danger sign or other suitable means as approved by the Engineer's Representative shall be adopted.

At every point of loading or unloading, pipes must be handled by approved lifting tackle. (Unloading by rolling them down planks of any form or including ramp will notbe allowed except with the special consent of the Engineer's Representative).

The stacking of pipes shall be used such as to prevent damage during storage. Timber runners shall be laid to keep the upper row separated from the lower and thebottom row shall be staked to prevent any rolling. The whole arrangement shall be subject to the approval of the Engineer's Representative.

Care should be taken to minimise the risk of bush fires damaging any pipes laid outalong the line of the mains.

Refilling of pipe trenches shall conform to the specifications provided in Clause 530.

The requirements for making good subsidence after refilling are provided for inClause 531.

Reinstatement of surfaces shall conform to the specifications provided for in Clause532.

For Thermoplastic Pipes Laid in Trenches:

The soil cover shall be a minimum of 900 mm. and the embedment material shall be S1 or S2 (single size or graded gravel). For details of the trench specifications, and backfill material sizes and grading refer to Clause 530 Tenderers shall allow for the price of such trenching and importation ofnecessary backfill material and compaction as part of the pipe installation price.

For all bedding classes, compaction shall be 90% MPD minimum.

Marker tapes made of a pigmented low density polyethylene and aluminium foil in a bright colour or other approved material not less than 100 mm wide and 0.15 mm thick shall be placed in the ground above the PVCu and HDPE pipelines laid underground as a measure to detect the pipe and at the same time to reduce the risk of accidental damage which may be caused by future excavations. The tape shall be laid about 300 mm above the crown of the pipe. The tape shall be continuously labelled with black printing "DANGER- PLASTIC PIPE. The price tape shall be deemed included in the price for the supply and installation of the pipe.

Pipes supplied in Coils

All sub-clauses of Clause 525 that are appropriate to pipe coils shall also apply and in case of any dispute, the Engineers ruling shall be final.

Pipe coils generally shall be laid and jointed in accordance with the manufacturer's written instructions. A re-rounding and straightening tool shall be used prior to making each joint. Extra excavation must not be carried out so as to avoid backfill, excessive deviation in joints and other irregularities. Otherwise, the pipe grade will follow the Drawings, with a continuous (but not necessarily uniform) fall towards washout-valves and rise towards air-valves. Horizontal alignment shall be as straightand central to the trench as is practicable, and if necessary, wooden pegs shall be used initially to ensure this until the upper bedding has been compacted at which juncture they shall be carefully withdrawn.

Electrofusion Control Units for HDPE Pipes

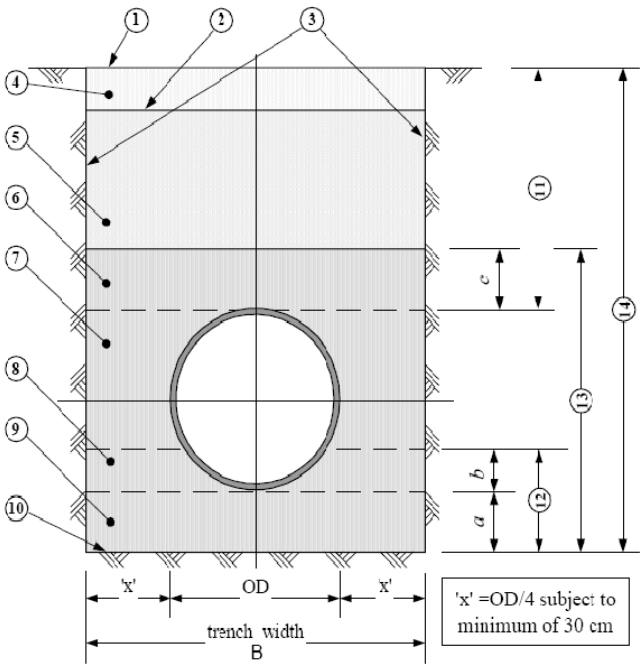
The Contractor shall provide electrofusion control units as recommended by the HDPE pipe manufacturer and confirming to EN 60335, EN 5008, EN 55014 and EN61000. The workmanship shall be in accordance to the manufacturer's recommended procedure and quality.

BACKFILLING OF PIPE TRENCHES FOR THERMOPLASTIC PIPES

All excavation of pipe trenches shall be of such form and to dimension as shown on the drawings or as the Engineer's Representative may direct, and in all respects provide with embedment configurations and minimum covers as detailed here below. As a general ruletrench width shall be not less than 1½ times the OD of the pipe but subject to the followingfigure and tables.

Lesser trench widths may only be authorised if the Contractor can prove to the satisfactionof the

Typical Trench for Thermoplastic Pipes



'x' =OD/4 subject to minimum of 30 cm

1 Surface
2 Bottom of road or railway construction (if any)
3 Trench walls
4 Top soil
5 Main backfill
6 Initial backfill
7 Sidefill
8 Upper bedding
9 Lower bedding
10 Trench bottom
11 Depth of cover (900 mm minimum)
12 Depth of bedding
13 Depth of embedment
14 Trench depth
a *Depth of lower bedding*
b *Depth of upper bedding*
c *Depth of initial backfill*

Note 1: compaction is the deliberate densification of soil during the construction process, whereas consolidation is the subsequent time-dependant densification after construction. Attaining cited minimum compaction requirements is at the supervisors disgression.

Note 2: the embedment is the arrangement and type(s) of material(s) around a buried pipeline which contribute to its structural performance. Attaining cited minimum compaction requirements is mandatory for embedment.

Figure: Trench Installation

Engineer that he can consistently achieve the required compaction for a lesser width in which case an absolute minimum of OD + 450 mm may be permitted.

Minimum Trench Width

Pipe Size	Trench Width
General	OD + minimum 600 mm
≤125 mm	OD + 450
150 – 300	OD + 600
> 300	To suit site condition and to the approval of the Engineer

If called for in the Bills of Quantities or if in the Engineer opinion, the risk of vandalism in aparticular area is higher than anticipated at the time of design, cover shall be increased toa minimum of 1.2m and the Contractor shall be paid for the removal and replacement of the additional materials at the same rates as quoted in the Bills of Quantities for the depthrange indicated.

Embedment for PVCu and HDPE (PE100) Thermoplastic Pipes

Embedment Class	Bedding, Sidefill & Initial Backfill Material Allowed	Notes
S1 and S2	Class S1: Gravel – single size Class S2: Gravel – graded	processed granular materials required for all plastic pipes

S1 and S2 Embedment Material for Thermoplastic Pipes

Nominal PipeDiameter (mm)	Grading [to ASTM Sieve Sizes]	
	S1 Embedment	**S2 Embedment**
80	10 single-size gravel	10 single-size gravel
100	10 single-size gravel	10 single-size gravel
150	10 or 14 single-size gravel	14 to 5 graded
200 to 500	10, 14 or 20 single-size gravel	14 to 5 graded or 20 to 5 graded
> 500	10, 14, 20 single-size crushed rock, or gravel	14 to 5 graded or 20 to 5 graded

The placing and compaction of pipe embedment shall only be undertaken in the presence of the Engineer's representative unless written authority from the Engineerhas been granted.

No pipes shall be laid nor lower bedding introduced and no excavation filled in or covered with concrete until the formation has been inspected and the permission toproceed with the Work obtained.

In every instance, embedment material (consisting of bedding, side fill and initial backfill) filled around the pipe and for 300 mm over the top of the pipes shall be totally free from stones, rock fragments, tree roots or similar objects which through impact or by concentrating imposed loads might damage the pipes and shall not include black cotton type soil. The filling shall be carried out with utmost care, special attention being paid to tamping of material around the pipes and to joint holes so as to obtain the greatest possible compactness and solidity. The material shall if necessary, be screened to exclude material which would damage the pipes. The embedment material shall be in accordance with the relevant pipe embedmentdrawing but shall be no less stringent than a class S2 material for thermoplastic pipes and the source and any material brought to the site from elsewhere shall be approved in writing by the Engineer's Representativebefore excavation commences.

Any delays as a result of not seeking this approval in good time shall be entirely to the Contractor's account.

Where the 'as-dug' trench material contains material which meets the bedding classrequirements as specified and providing that this is carefully screened to the sizes indicated above, and segregated from material that does not, the Contractor may, athis discretion, use it as such or incorporate such material into the imported embedment material being used.

The lower bedding for the pipes shall have a minimum thickness of 100 mm in normal trenches, and 150 mm where rock/stones are present and at designated road crossings. In trenches where there is a continuous accumulation of groundwater, the trench shall after obtaining the approval of the Engineer's Representative, be over-excavated by 150 mm and shall be backfilled using compacted granular material. Bedding material shall be compacted in layers not exceeding 50 mm thickness. Compaction of fill around the pipe shall be in layer thickness not exceeding half the pipe diameter or 75 mm whichever is the lesser. Layer thickness is however subject to consistently achieving 90% MPD (Modified Proctor Density) or better, failing which layers shall be reduced in depth as necessary to achieve the % compaction.

The upper bedding shall be introduced as carefully and thoroughly as practicable tothe underside or haunch of the pipe such that no large spaces remain before it is compacted.

The sidefill and backfill material within the embedment shall be placed in layers of not more than 150 mm thickness when compacted and where hand ramming is employed the number of men filling shall not be more than half the number of men ramming. Sidefill shall be placed simultaneously on both sides of the pipe. Where mechanical-ramming of the remaining backfill is employed, the machines shall be tothe approval of the Engineer's Representative and soil shall be replaced and well rammed down by hand for a depth of not less than 600mm to give sufficient cover tothe pipes and obviate risk of damage to them before the mechanical rammer is brought into operation. The rammer shall not cease to be used on any length of trench until thorough compaction has been obtained. All backfill soil shall be free from clay lumps, boulders stones and rock fragments greater than 20 mm and 90%MPD shall be attained in all instances. All backfill soil above the embedment shall befree from clay lumps, boulders and rock fragments greater than 50 mm and as far aspracticable 90% MPD shall be attained, but this may be relaxed (e.g. in fields and open areas) by the Engineer's Representative.

The Contractor in excavating the trench from which he wishes to use 'as-dug' material for bedding shall ensure that materials from strata containing no stones or rock-fragments and suitable for filling around the pipes as described above, shall bekept separately and used for this purpose. The Contractor shall not be entitled to claim for any extra costs (as provided for below) for screening if this requirement is not complied with. If no such strata occur in the excavation, the excavated material shall either be screened or suitable material transported to the Site from other excavations as the Engineer's Representative shall direct. The cost of such work shall be paid for according to the rates in the Bills of Quantities.

Before commencing the placing of embedment in the trenches, the Contractor shallobtain approval from the Engineer's Representative as to the methods he proposesto use and he shall demonstrate by means of tests that the specified compaction can be achieved (according to SSRN 601 using the "sand replacement" method). The method of compaction and the testing thereof shall be at all times to the approval of the Engineer's Representative and in general at a frequency of once every 30 metres unless this is specifically relaxed based on continuously good in- situ test results.

The pipe trench shall be backfilled entirely without leaving out areas around and at pipe joints uncovered, for subsequent filling. To facilitate the subsequent location of any suspected leakingjoints during pipe testing, should this become necessary, the Contractor shall provide marker pegs at regular intervals and/or use a handheld GPS to be able to relocate joint positions.

Where for pipes other than those used for service connections a minimum cover of 900 mm cannot be maintained, including highways and trafficked areas then the pipe must either be laid in a protective ferrous sleeve or be protected by a 150 mm thick reinforced concrete slab above the pipe. A minimum of a 150 mm layer of appropriate grade granular bedding material must first be placed and lightly compacted as a cushion above the crown of the pipe before the slab is laid, and theslab must extend at least 150 mm out beyond either side of the trench.

MAKING GOOD SUBSIDENCE AFTER REFILLING

Should any but very localised subsidence occur of the pipe trench after refilling and beforethe expiry of the maintenance period, the Contractor shall first demonstrate that such subsidence is only to the backfilling above the pipe and not to the pipe, embedment, bedding or sub-soil itself.

Should this not be so demonstrated then the Contractor at his own expense shall, excavate and remove the pipe or pipes affected and return the bottom of the trench to grade through a process of over-excavation, re-compaction or use of a lean concrete mix as determined by the Engineer's Representative, who shall also determine whether or not the affected pipes may be re-used or replaced.

The affected section or sections will in any event be liable for a further twelve months maintenance period.

All subsequent refilling shall be thoroughly compacted by ramming as with a newly completed trench. Any subsidence due to consolidation shall be made up by the Contractor at his own expense with extra compacted material. Should subsidence occur after any topsoil has been replaced, the topsoil shall first be removed before any hollows in the backfilling are made up before being replaced.

REINSTATEMENT OF SURFACES

All surfaces of roads, fields, paths, gardens, verges, etc. whether public or private which are affected by the operations of the Contractor shall be temporarily restoredby him in the first instance and permanently reinstated in the second instance whenthe ground has consolidated fully. Separate payment for reinstatement shall be made only for surfaced roads (e.g. tarmac, concrete, paving bricks or similarmaterial), and for officially designated dirt roads of at least 6m width, grassland, cultivated lands and sports fields. All other reinstatements both temporary and permanent are deemed to be covered by the pipe installation rates.

The Contractor shall be responsible for the temporary reinstatement and permanentreinstatement of all surfaces whether or not the area requiring restoration is within the limits of his excavations if the necessity for the restoration arises from causes due to the operations of the Contractor. The Contractor's prices shall include for restoring all surfaces so damaged to their original condition, as no extra payment will be made for any such work. The Contractor shall take all necessary measures toensure that no toxic materials that may cause damage to vegetation or livestock or pollute streams or water-courses are used in any temporary restoration or permanent reinstatement and shall indemnify the Employer against any claims arising out of the use of such materials.

Temporary restoration shall be carried out immediately after the excavations have been refilled by returning the excavated material to the position from which it was removed and adding such suitable materials as may be required and consolidating the various materials as the Work proceeds in order to provide a surface that is

adequate for the purpose that the original surface fulfilled. Temporary surfaces shallbe maintained in a condition satisfactory to the Engineer's Representative and/or responsible Authority until the permanent reinstatement is made. In the caseof roadsand streets the surface shall be necessary to consolidate the filling and keep the surface fit for traffic, suitable material being added to all placed which have sunk or become rough.

Permanent reinstatement shall not be made until the ground has consolidated permanently and until sanction to do so is received from the Engineer's Representative. It shall be carried out with materials similar to those that were usedin the original Work to the entire satisfaction of the Engineer's Representative and/orresponsible Authority.

In all verges and other, grassed surfaces, the topsoil shall be removed, stored and replaced after consolidation of the filling and planted or seeded with approved grass.Should subsidence occur, it shall be made good with additional topsoil and be replanted with grass or re- seeded. New grass shall be planted if for any reason thegrass fails to grow or is destroyed.

The trenches, channels, gutters and kerbs shall be reinstated to the condition in which they were before excavation was commenced. The final surface of the trenchshall be flush with the surrounding ground.

If the work of restoration or reinstatement as carried out by the Contractor is not to the satisfaction of the Engineer's Representative and/or the responsible Authority and should the Contractor not remedy the defect forthwith, any remedial work considered necessary may be undertaken by the Engineer's Representative and/orthe responsible Authority and the cost thereof shall be borne by the Contractor.

If at any time any trench becomes dangerous, the Engineer's Representative shall be at liberty to call upon the Contractor to restore it to a proper condition at three hours' notice and should the Contractor fail to carry out the work, have it done at theContractor's expense.

PART IV - ALL PIPELINES DURING DELIVERY, INSTALLATION, TESTING AND COMMISSIONING

ON-SITE INSPECTION

All pipes, valves and fittings shall be inspected upon arrival at the pipe storage areas fordamage to:

the pipe or fitting itself

external coatings (if any)

internal linings (if any)

jointing surfaces (incl. sockets if any)

The Contractor shall be responsible for and shall undertake any work required by the Third Party Inspector or by the Engineer's or his Representative as appropriate or where deemed necessary, replace defective pipes and fittings. All expenses in connection with such remedial works or replacements shall be deemed covered by the Tender.

HANDLING FROM STORAGE TO TRENCH

All pipes shall be handled from storage to trench in accordance with the manufacturer's recommendations.

The Contractor shall obtain and keep on Site copies of all the manufacturer's literature relating to the proper handling, storage, laying, installation and testing of their products and shall make them or copies thereof available to the Engineer's Representative on Site.

MEASUREMENT FOR PIPE LAYING

Pipe laying and jointing where in trench is included in the Bill of Quantities with excavation, backfilling, and temporary reinstatement, all as described in the Bills of Quantities. Measurement of the work done will be along the centre-line of junctions in thepipe network, and branches, unless otherwise indicated in the Bills of Quantities

WORKING WIDTH

Where pipelines are within 20 metres of a motorable track, or through light bush or thicketa wayleave clearance of 2 metres plus nominal bore of pipe will be allowed. Where pipelines are through dense bush, thicket or forest a wayleave clearance of five metres plus nominal bore of pipe will be allowed. Payment for Site Clearance will be based uponthis width except that the Engineer reserves the right to restrict this width due to the presence of obstructions, roads, houses and the like. Payments will then be according tothe actual area cleared. No claims for additional space nor for inconvenience and the likecaused by obstructions, will be allowed.

LOCATION OF UNDERGROUND SERVICES ETC.

It shall be the Contractors obligation when trenching, to locate and avoid the damaging ofany existing services, be they water, drainage, sewage, electricity or telecom. Notwithstanding this obligation and should damage occur, it will be the Contractor's furtherobligation at his own cost to urgently liaise with the utility organisation concerned and to bear the cost of the repair or replacement of the damaged article to the entire satisfactionof the utility concerned.

CONCRETE PROTECTION

Unless otherwise provided in the Special Specification or Bills of Quantities or directed bythe Engineer, a concrete surround of not less than 0.15 m shall be provided to water mains in the following circumstances:-

Water mains with less than 0.6 m or more than 6.0 m of soil cover over the pipes.

Water mains under carriageways if depth of soil cover is less than 1.30 m

In the places where shown on the Drawings or directed by the Engineer.All concrete for

beds and surrounds shall be class 15 concrete.

Alternatively under carriageways and where indicated on the drawings, the pipeline shall be laid in a stepped trench with the immediate surround backfilled with approved granularmaterial and then across the step shall be laid precast reinforced concrete slabs of class 25 concrete.

The unit of measurement shall be cubic metre or linear metre as indicated in the Bills of Quantities.

The rate shall include for the provision, transporting and placing of concrete, all strutting and formwork, protection and curing and all labour, tools, plant, supervision overheads and profit.

ANCHOR BLOCKS

Pipelines with mechanical (or flexible) joints shall be adequately anchored at bends, tees,sluice or butterfly valves, tapers, blank ends, etc. Anchor blocks shall be constructed fromClass 20 concrete to the dimensions indicated on Drawings unless otherwise directed bythe Engineer. Support blocks shall be constructed from Class 15 concrete and allowed tocure for 7 days. Soil around anchor blocks shall then be compacted thoroughly before thehydraulic testing of the pipeline. Payment for anchor blocks will be per unit volume of concrete in the blocks and shall include for all the earthwork, formwork and otheroperations required for their construction. No separable payment shall be made for any temporary or permanent anchor blocks constructed by the Contractor specifically for the testing of the pipeline.

Anchor and Thrust blocks at proposed tie-in points between old and new pipework will becast at least 7 days prior to the proposed tie-in works and post tie-in pipeline testing for the affected section. Where this is impracticable then a thrust wall shall be constructed similarly in advance first instead and the final connecting fitting propped initially from this thrust wall by means of a horizontal steel joist with the contact face with the fitting curvedto the outside diameter of the fitting and fitted with a protective rubber insert. Immediatelyafter re-commissioning, the space between the thrust wall and the propped fitting shall befilled with class 20 concrete, thereby permanently encapsulating the steel joist. The proposed tie-in works described in Clause 550 will therefore be preceded by the required anchor/thrust block casting.

INDICATOR PLATES AND MARKER POSTS

Precast concrete indicator plates to the dimensions indicated on the Drawing shall be installed at all sluice valves, single-air valves, double air valves, fire hydrants andwashouts, with letters SV, AV, FH, WO, respectively, indented in them. The plates shall be painted with at least two coats of all-weather plastic emulsion paint of approved colour.

Marker posts to the dimensions indicated on Drawings shall be installed at 100 m spacingalong the pipelines installed in open country or as directed by the Engineer. Marker postsshall be painted with at least two coats of all weather plastic emulsion paint of approved colour.

ADDITIONAL PROTECTION TO FLEXIBLE COUPLINGS AND FLANGE ADAPTORSIN CHAMBERS AND/OR ABOVE GROUND

Such mechanical joints e.g. flexible couplings, flange adaptors, etc. in chambers and/or above ground shall have been factory epoxy coated and where indicated on drawings or in the Bill of Quantities shall after installation be cleansed by brushing away soil and thenshall have an approved mastic blanket moulded around them so as to provide a contour suitable for wrapping the component with an approved petrolatum anti-corrosion tape suitable for tropical climates which shall then be done so as to achieve a clean and neat good tape finish..

PROTECTION TO FLEXIBLE COUPLINGS AND FLANGED ADAPTORS FITTED TOEPOXY COATED PIPE SPIGOTS.

Where factory coated flexible couplings have been used on pipes whose exposedsurfaces beyond other protection materials have been factory protected using epoxy, thensuch joints shall be site protected by a polythene outer wrap sheathing of minimum thickness 200 microns that shall extend beyond the pipe epoxy coating by at least500 mm. This outer wrap shall be double strapped using a non-metallic strap to each pipeend beyond and not to the epoxy coating.

BURSTING DISCS AND BURSTING DISCS DEVICES

Bursting discs and bursting disc devices shall be in general accordance with SSRN 233. A minimum pack of 5 such bursting discs shall be provided with each bursting disc device.

IN-SITU WELDING OF STEEL FITTINGS AND FLANGES

Wherever it is necessary to undertake in-situ welding of steel fittings and flanges the workshall be undertaken under cover, temporary or otherwise. Outside of buildings, the cost ofproviding such cover shall be deemed included in the Contractors rates. Only suitably qualified welders shall be employed.

Welding procedures used shall comply with SSRN 670.

Prior to deployment of any welder he shall within the preceding 3 months have satisfactorily undergone an ‘approved testing’ in accordance with SSRN 671 and certification thereof shall be provided to the satisfaction of the Engineer. Each welder deployed shall at intervals of not more than 6 months undergo similar approved retesting

and only those who pass such retesting will be allowed to continue to undertake the in-situwelding works.

All testing and retesting will be deemed to be covered in the Contractors rates.

PIPE SUPPORTS

Pipe supports shall meet the requirements of SSRN 406.

SERVICE PIPE CONNECTIONS

All tapping shall be carried out using tapping saddle clamps (sleeves or collars type – surrounding the pipe). Self tapping directly on pipes shall not be permitted. Ferrules aloneshall not be permitted

The form of the customer connection tapping clamp shall be two equal halves held together by threaded ends, washers and bolts. The tapping clamp for flexible pipes shall be double band with a minimum thickness of 1.5 mm if made from stainless steel. The body part of the tapping clamp shall be of robust ductile iron or stainless steel with a fusion bonded epoxy coating of not less than 300microns dry firm thickness. The seal shall be of elastomer or nitrile rubber material and shall surround the pipe circumference completely and shall be suitable for use with potable water. The tapping clamp shall be supplied complete with removable and lockable ferrule (if indicated on drawing). They shall be of approved manufacture which shall not be unreasonably withheld.

The customer connection tapping clamp shall have following features:

They shall be impressed with the logo of the Employer.

All stainless steel parts shall conform to high corrosion protection grade (AISI 316L).

The rubber lining shall eliminate metal to metal contact or metal to plastic contactand insulate against galvanic corrosion between two different types of metals.

They should be able to fit range of pipe diameters and also be able to adapt topipe irregularities and ovality

Double band or wide bodies to allow large surface area contact with the pipe bodyfor supporting the pipe.

Any Tenderer who in his Tender offers service pipe connections that are not fully in compliance with these requirements will be required to confirm in writing that he will meetthe requirements of this clause in full without any price adjustment to his offer if his Tenderis to be considered for possible award.

HYDROSTATIC TESTING OF PIPELINES

After laying, new pipelines shall be tested under pressure and where in trench, such testsshall be made before it is completely back- filled. During the test, all joints shall be clear of earth, timber, etc. to allow visual inspection. Testing shall commence when not more than 20% of all pipework has been laid and at no time may there be more than that remaining untested.

Where old pipelines that are yet to be taken into service are involved they shall be similarly tested, except that the Engineer may specify at what stage testing is required.

The pipeline shall be tested in lengths between valve locations or in such shorter lengths as the Engineer may approve on the understanding that no extra cost will be incurred to the Employer but the maximum length of main to be tested, shall not normally exceed1 km.

The Contractor shall supply all necessary materials to carry out the test in accordance with the requirements including force pumps, water pressure gauges, including tools for the use of the Engineer, interconnecting pipework, feeding tank, blank flanges, temporary

stop-ends, struts and water for the test. The test section shall be capped or flanged off ateach end and all branches. Testing shall not take place against closed valves.

For a pipeline incorporating flexible joints, testing shall not commence until after all the permanent anchor blocks along the pipeline have been constructed and soil around them backfilled and compacted. Capped or flanged ends along the pipeline shall also be anchored adequately to withstand the force due to test pressure. The Contractor shall submit his proposals for temporary anchoring to the Engineer for approval.

After the main has been clear of debris, and all necessary stop- ends and gauges fitted tothe Engineer's approval, the Contractor shall fill up the pipe with water free from silt, and sand and grit and bring up the pressure steadily to the nominal pressure of the pipe or incorporated fittings, whichever is the lesser, (except for old pipelines where a lower valuemay be specified by the Engineer), and maintain it with a force pump for 24 hours.

The pressure shall then be increased steadily in increments of 1.0 kg/cm^2 with a pause ofone minute between each increment to the specified test pressure for the section. Unlessotherwise specifically mentioned, the applied test pressure shall be measured at the lowest point along the section being tested.

Where test pressure has not been specified, it shall be assumed to be 1.5 times the ratednominal pressure (PN or NP) of the pipe.

After a period of half an hour, the fall in test pressure shall be recorded and sufficient water again pumped into the line under test to bring the pressure back to the test pressure. The procedure shall be repeated every half-an-hour for a total period of 3 hours, or longer, if the Engineer so directs, and the amount of water pumped in recorded.

The rate of leakage shall be calculated from the amount of water pumped in during testingand if it is less than 1 litre of water per 10 mm diameter of pipe per km of length of pipeline, for each 24 hours and for every 30 m head, the pipeline will be considered to have passed the test.

Leaks exceeding permissible amounts shall be made good. And faulty pipes, fittings, andspecials, shall be replaced by the Contractor at his own expense and the section tested again before approval is given for backfilling. Payment for the section will not be certified,until the test has been passed and backfilling completed.

FLUSHING AND STERILISATION

This shall be done in accordance with the recommendations set out in SSRN 651.

All tested pipework shall be flushed and cleaned and all treated water pipework shall additionally be sterilised. The rates inserted are to be for the flushing and sterilising, andwhere appropriate for cleaning shall be inclusive for, sampling, testing and inclusive of thereports on the bacteriological quality of water.

HORIZONTAL DIRECTIONAL DRILLING (HDD) FOR ROAD AND RAIL CROSSINGS

The Contractor shall install pipes using horizontal directional drillings at the locations specified in the drawings and the bills of quantities. The locations are normally across heavily trafficked roads and railway crossings where bypass or diversions cannot be readily made. The Contractor shall be responsible for all the design, permit acquisition from the relevant authority responsible for roads or rail and for implementation and restoration. The following procedure shall be applicable for HDD:

Design Guidelines

Prior to submitting an application for a Right-of-Way Permit to the relevant authorityresponsible for roads or rail that will involve horizontal directional drilling (HDD), theContractor shall ensure that the following decision process and tasks are completedand approved by the Engineer:

Prepare or obtain scaled mapping for the planned installation

including all exiting surface facilities and improvements.

and including any indication of underground facilities or improvements.

Collect existing underground utility information

including the horizontal location of all known substructures (expected).

and including the depth of all known substructures (whenever possible).

Obtain Right-of-Way information from the relevant authority responsible forroads or rail.

Obtain general and/or specific geotechnical information as required or deemednecessary

including soil data for the project area.

and possibly including site-specific geotechnical sampling and analysisto confirm the soil data.

Prepare Design Drawings using the information noted above

including the location of all planned improvements,

including existing underground utility information, and

including right-of-way limits and property ownership information (asrequired).

In addition to the design requirements listed above, the Contractor shall takeinto consideration the following:

the minimum horizontal and vertical clearance requirements when determiningthe HDD alignment

including road setbacks and existing surface features,

and including exiting underground utilities and other underground faci-lities;

pipe sizes to be installed and their corresponding reamer diameter require-ments;

Pipe Diameter	Reamer Diameter
< 200mm	Diameter + 100 mm
200 – 600mm	Diameter + 150 mm
> 600mm	Diameter + 300 mm

the bore geometry for the given ground profile

including bore length(s) and depth requirements, and

including bending radii for the final product pipe (Typically 13m radius per 10mm pipe diameter, with 200m to 330 m radius minimums depend-ing on subsurface materials and equipment requirements);

drilling equipment requirements for the given geotechnical conditions, geo- metry and final product diameter

including thrust and pullback ratings

including mud motors vs jetting heads and

including wire line vs walkover tracking systems;

equipment and material handling requirements

including drilling fluid and drilling fluid containment

and including drill operation and final product staging.

material strengths, capacities, and coupling methods.

Right-of-Way Permit Application Requirements

The Contractor shall submit the following information with the application:

Provide proposed HDD Location Information

Pipe diameters, type, pressures etc.,

Locations, length and depths, covers, clearances.

Provide Design Drawings on scalable mapping and shall include:

the proposed alignment (dimensioned),

existing utility information (within 10m of the proposed crossing), and

the road right-of-way information

Provide specific installation requirements or typical installation parametersindicating the design bending radii and diameter(s).

Provide assumed subsurface geotechnical conditions based on localknowledge or based on specific site soil tests.

Provide a Traffic Control Plan

Provide a Storm Water Pollution Prevention Plan

Provide a Construction Schedule indicating the proposed start date(s), com-pletion date(s), and restoration schedule.

Construction Safety Guidelines

Prior to performing work involving HDD under a Right-of-Way Permit, the Contractorshall consider the following safety guidelines and shall obtain approval of theEngineer:

Perform all operations in compliance with safety guidelines and ensure that allpersonnel are properly trained and equipped to work in the public right-of-way;

Ensure that the approved traffic control plan (required with the permit appli-cation) is implemented and followed at all times;

Ensure that all storm water pollution prevention measures (required with thepermit application) are implemented and followed at all times;

Ensure all setbacks, offsets, and clearances are maintained;

Ensure that **the relevant authority responsible for roads or rail**or otherutility coordination requirements have been met;

Positively identify from records or by potholing all crossed utilities that areexpected to be

above and within 2 m of the proposed vertical alignment,

below and within 1 m of the proposed vertical alignment,

and additionally as requested by the relevant responsible authorities;

Positively identify from record or by potholing all parallel utilities at thebeginning and ending of all bores and

every 70 m if it is within 2 m of the proposed alignment,

every 15 m if it is within 1 m of the proposed alignment,

and additionally as requested by the Engineer.

The HDD Contractor shall have a planned response in the event of a utilitystrike including utility owner notification and

avoiding electrocution in the event of an electric strike,

avoiding combustion in the event of a gas line strike,

avoiding contamination in the case of a sewer strike.

Drilling Fluid Containment and Disposal Requirements

The HDD Contractor shall contain, handle, and dispose of drilling fluids in accordance with the following requirements:

The use and composition of all drilling fluid and fluid additives shall bedisclosed to the Engineer in advance.

Excess drilling fluid shall be confined in a containment pit at the entry and exitlocations until recycled or removed from the site.

Precautions shall be taken to ensure that drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and/or any other drainage system or body of water.

Unintended surfacing of drilling fluid shall be contained at the point of discharge and recycled or removed from the site.

Drilling fluids that are not recycled and reused shall be removed from the site and disposed at an approved disposal site.

Drilling fluids shall be completely removed from the construction site prior to back filling or restoring the site.

Collection, transportation, and disposal of drilling fluids shall be environmen- tally safe and comply with local ordinances and government regulations.

Construction Requirements

All construction work shall be performed in accordance to the following unless statedotherwise by **the relevant authority responsible for roads or rail**, and as outlinedbelow. For all work involving horizontal directional drilling under a Right-of-Way Permit, the Contractor shall perform the following:

Prior to Construction:

The HDD Contractor shall familiarize itself with the work area and the technicalrequirements of the plans;

The Contractor shall establish construction marking/staking, prior to cons- truction, to indicate

HDD entry and exit locations, and

proposed HDD alignment at 10m (max) intervals;

Provide the Engineer with a contact list of all crew foremen.During Construction:

The HDD Contractor shall calibrate its tracking and locating equipment at the beginning of each work day;

The HDD Contractor shall monitor and record the alignment and depth readings provided by the tracking system

every 10 m for normal conditions,

every 2 m where precise alignment control is necessary;

The HDD Contractor shall complete the HDD installation as designed and permitted both horizontally and vertically unless otherwise authorized by the Engineer;

The HDD Contractor shall attempt to maintain drilling fluid circulation through-out the HDD process;

during the initial pilot hole installation, and

during the reaming and back pull process(es)

The HDD Contractor shall not expand the bore hole by more than 150mm using only compaction reamer(s);

The HDD Contractor shall plan its reaming and back pulling operations carefully to insure that, once started, all reaming and back pulling operations can be completed without stopping and within the permitted work hours;

The HDD Contractor shall at all times and for the entire length of the HDD alignment be able to demonstrate

the horizontal and vertical position of the alignment,

the fluid volume used, return rates, and pressures;

The HDD Contractor shall inspect the work and surrounding area to insure thatno construction-related damage has occurred

including heaving or humping of paved surfaces, and

including drilling fluid fractures or releases.

At all times the Contractor shall provide access to the Engineer's representative for inspection of the HDD operations;

Following Construction:

The Contractor shall notify the Engineer as appropriate upon completion of the authorized work;

Prior to the start of backfilling excavations under paved surfaces, the Contractor shall notify the Engineer to schedule an inspection. Upon completion of all right- of-way restoration activities, the Contractor will schedule a closeout inspection;

The Contractor shall insure that all cleanup and restoration is in compliance withthe requirements for restoration, reinstatement and cleaning up;

The Contractor's 1 year maintenance period will not begin until any corrective actions required have been completed and inspected to the Engineer's satis- faction.

Storm Water Pollution Prevention

All construction activities shall be performed in accordance with the acceptable international standards and Best Management Practice, to ensure that storm water runoff is not contaminated by sediment caused by land disturbances associated withconstruction activities. The following seven main objectives shall be applied for all Storm Water Pollution Prevention planning:

ensure that sediment controls are in place prior to disturbance.

Maintain sediment controls throughout the construction and restoration processes.

Minimize the overall disturbance whenever possible.

Protect disturbed areas throughout the construction process.

Prevent storm water runoff from entering disturbed areas.

Never intentionally discharge construction contaminants directly into creeks,rivers, ditches, or storm systems.

Complete permanent restoration as soon as possible.

In addition to those overall goals stated previously, the contractor shall, at aminimum, implement the following specific Best Management Practices:

Provide temporary erosion protection whenever possible:

Mulch, seed, or gravel may be applied even if a disturbed area may and/or will be disturbed again or other permanent measures of stabili- zation are to follow;

Cover spoil piles with a tarp or contain with a sediment barrier.

Contain disturbed sediment on site:

Use sediment barriers such as silt fence, sand bags, straw bails, rock checks and/or sediment traps to contain sediment on the construction site;

Existing vegetation may be used as a sediment filter where minimal grades and sheet flow runoff will occur;

Ensure that all sediment barriers are installed and functioning properly.

Avoid causing flooding in roadways and adjacent right-of-way:

Do not block existing culverts and storm inlets except as a last resort;

Ensure that sediment is removed from sediment traps and filters after storm events.

Construction Records and As Built Plan Requirements

The HDD Contractor shall keep detailed and accurate records of all activities associated with the HDD process. Upon completion of HDD installations, the Contractor shall provide the Engineer with As Built plans and any supportingdocuments within 60 days of project completion. As Built plans are preferred in AutoCAD format but may be submitted in paper form. HDD construction records andAs Built plans shall include the following:

HDD tracking data and operator logs shall be maintained daily and shall be made available upon request from the **relevant authority responsible for roads or rail**. These field records and operator notes shall specify:

the type of tracking equipment used,

the length and depth of the HDD installation,

additional information that may include steering adjustments and other equipment performance parameters;

As Built plans shall be derived from the tracking data and operator logs. At a minimum, the drawings shall indicate:

horizontal and vertical HDD alignment,

existing utility horizontal locations and depths at all exposed locations,

existing utility horizontal locations where indicated with field locates.

TIE-IN WORKS BETWEEN EXISTING AND NEW PIPELINES

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 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 performdescribed 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.

Fittings

The Contractor shall take delivery of any fittings required at the Works not less than 96 hours before the commencement of the tie in operations. He shall provide all thenecessary guarding to ensure that such fittings do not get misplaced or stolen. TheContractor shall, check the suitability of such fittings including checking of alldimensions, 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 toEngineer 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 theEngineer who shall check the materials against the schedule as approved where hedeems 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.

Personnel

The Contractor shall ensure that at least one senior member of his field supervisorystaff who has proven experience of such operations and fluent in English and the language of his labourers is on site throughout the whole duration of the tie in operation.

The Contractor shall also ensure that all necessary skilled artisans for the operationof 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 approvalthe Engineer may require that operative is tested in the performance of his duties inthe operation of the plant for which he is in attendance. In particular this requirementshall 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 attendanceupon the site during the period of the tie in operation.

Pre Tie-in Works

The Contractor shall execute all works possible before the commencement of theoperations which shall include:-

Excavation and supports to the excavation.

Blinding with concrete the bottom of the excavation and (where instructed bythe Engineer) immediate working areas.

Provision of any required drains a sump of adequate size from which anyaccumulating water is to be pumped out.

Casting of the floor of any chamber which is to be constructed around such tie-in works.

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 commence-ment 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 thetie-in operations.

Plant

The Contractor shall prepare a schedule of the plant which he proposes to have onsite either to use, or on standby, or for emergency use and shall obtain the approvalof the Engineer not less than 48 hours before the commencement of the tie-in operations.

Such Plant shall include:

Excavation plant

Cutting equipment

Lifting equipment

Pumping equipment (unless a drain is provided)

Concrete Mixer

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 whoshall check the plant against the schedule as approved where he deems this necessary.

Actual Tie-in Works

The Contractor shall prepare a programme giving details of the proposed schedulingand 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 verballygive 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 duringthe night for purposes of minimising the effect of such tie-in on the respective consumers/authority, the Contractor shall make all required preparation for provisionof 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 andthe operating FIDIC Condition of Contract and shall obtain an endorsement if necessary to ensure that the insurances remain valid in the event that the Engineertakes 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.

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 tiein operation, and shall remove all temporary supports within a further 48 hours afterthe permanent support works have been approved by the Engineer. The temporarysupports 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 havecompleted 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, andshall 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 remainin force for a period extending for 28 days from the date of approval of thecompletion 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 issuea 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.

Form to be Used

A copy of the Form to be used for each tie-in work is given below.

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 Schedule of those		…… 48 hours
needed submissionapproval		……
Arrival on Site		…… 48 hours
Checked on Site by the Engineer		…… 24 hours
3) Works Programme of Execution		……
	submissionapproval	……
	submissionapproval	…… 72 hours
Schedule of plant	arrival on site	……
		…… 48 hours
Plant		…… 24 hours
checked on site by engineer ……		
Artisans	approved by	…… 24 hours
engineertesting 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 Re-commission 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

B) Where items are not given the Contractor shall ensure executionof that item so as not to cause any other item to be delayed.

PART V – VALVES, METERS, FITTINGS AND OTHER RELATED ITEMS

VALVES - GENERAL

Isolating Valves up to and including DN 300 shall be gate valves, and valves larger than DN 300 shall be butterfly valves, except where otherwise specified on drawings or in Billsof Quantities.

All valves shall bear an identification mark on the upper body that shall include:

the name of the manufacturer and/or his trade mark

the nominal diameter (DN)

the nominal pressure (PN)

The manufacturer's full technical leaflets shall be supplied to the Engineer in triplicate by the Contractor for approval prior to confirmation of any order for valves.

The valve body shall be cleaned and shot blasted to SSRN 937 before being internally and externally protected.

All isolating valves shall be protected by fusion bonded powder epoxy or equivalent, internally suitable for potable water and to a minimum thickness of 150 microns, or in aggressive soils of 300 microns thickness indicated as such on drawings and in the Bills of Quantities.

All valves shall be designed for a maximum permissible pressure of 16 bar except whereotherwise specified on drawings or in bills of quantities. All valves shall close when the stem rotation is in a clockwise direction unless otherwise specified.

GATE VALVES

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 SSRN 501. The epoxycoating shall be not less than 150 microns thickness. The gate shall be completely rubberencapsulated, the gate valve being of pocketless type with a straight through port. Gate valves shall be capable of sustaining a maximum permissible working pressure of 16 barexcept where otherwise indicated on drawings or in bills of quantities. Gate valves shall be provided with integral flanged ends unless otherwise indicated on drawings or in bills ofquantities.

Unless otherwise specified the face to face dimensions of gate valves with integral flangedends shall be in accordance with SSRN 518 basic series 14 (short) or basic series 15 (long) as indicated on the drawings or in the bills of quantities.

Where specified, valves for replacement washouts shall have valve bodies of epoxy coated ductile iron and the flanges shall be undrilled. Face to face dimensions for these valves shall be to EN 558 and EN 12627 basic series 14 (short).

Gate valves shall be of the non-rising stem type except where specifically indicated otherwise. The stem seal shall be of toroidal sealing rings (O-rings) with at least two suchseals. Seals shall be capable of being replaced with the valve under pressure and in thefully open position.

The gate shall be of ductile iron fully rubber encapsulated, the gate sealing in the body being ensured by compressing of the rubber.Wedge/gate guides of wear resistant plasticwith high gliding features shall be provided in the body, optimally placed to guarantee lowwear and tear of the gate and low closing torques.

The bonnet gasket shall be of elastomer (suitable for potable water). The bonnet studs or allen screws shall be corrosion-protected. In addition the studs/allen screws shall be placed in countersunk holes in the bonnet and completely sealed with wax or a suitable material, which can be removed by low-temperature melting in case they have to be disassembled.

The gate valves bodies shall be works cleaned and shot-blasted in accordance with SSRN 937 before being coated internally and externally. The body, the bonnet and the gate of the valve shall be made of ductile iron to SSRN 240, the gate being encapsulatedwith elastomer EPDM, nitrile or equivalent.

The operating stem shall be made of stainless steel at least equivalent to SSRN 936/A, except in areas of aggressive soils where this shall be to SSRN 936/B, indicated as such on drawings and in bills of quantities.

The stem nut shall normally be made of high tensile brass to SSRN 941, except in areas of aggressive soils where this shall be aluminium bronze to SSRN 942, indicated as such on drawings and in bills of quantities.

Furthermore and in aggressive soils indicated are such on drawings and in bills of quantities, outside bolts and nuts shall be made of stainless steel to SSRN 936/C or as detailed on drawings.

BUTTERFLY VALVES

Butterfly valves for manual operation shall comply with SSRN 506 and shall be double flanged, resilient and metal seated tight shut-off design and of the eccentric disc type supported from two shafts placed in self lubricating bearing bushes.

Butterfly valves shall be capable of sustaining a maximum permissible differential workingpressure of 16 bar except where otherwise indicated on drawings or in bills of quantities.

They shall operate with a clockwise closing direction. The valve disk shall rotate though an angle between 0 degrees and 90 degrees inclusive. The sealing ring shall be made ofEPDM rubber and shall be attached at the disk edge circumference by a retaining ring without adjustment to form a resilient and durable seal.

The valve disc seal shall be replaceable without dismantling the operating mechanism, disk or shafts, and without removing the valve from the pipeline.

The Butterfly valve shall be equipped with an inversible and proportional worm gear operator. This shall be either with or without an additional primary reduction gear placed within a waterproof housing dependant upon nominal valve diameter and maximum working conditions as stated in the bills of quantities.

The operating mechanism shall be permanently lubricated, not in contact with the water and tilted with an OPENED/CLOSED proportional position indicator in order to indicate the disk angular position. The mechanism shall be sized in order to minimise torque for easeof manual operation under maximum differential pressure and shall be with high-class enclosure IP67 to SSRN 038. Valve body, disk and disk retaining ring shall be in ductile "SG" iron casting to SSRN 240. Disk shafts shall be in stainless steel to SSRN 936/A.

The valve body shall be cleaned and shot blasted to SSRN 937 and internally and externally protected with paint suitable for potable water.

Each butterfly valve shall be works pressure tested in accordance with SSRN 517

body test at a minimum pressure of 1.5 times the maximum permissible pressure

seal test at a minimum pressure of 1.1. times the maximum permissible pressure.

HANDWHEELS AND VALVE CAPS AND VALVES

Handwheels are to be provided for all valves in chambers. They shall have cast into themthe words 'open' or 'closed', together with an arrow indicating the direction for such opening or closing.

Valves for tee-key operation shall be provided with valve caps conforming to the appropriate tender/contract drawing.

VALVE KEYS

These shall be of mild steel with ends to suit either valves to SSRN 501, valves to SSRN506 or valves to SSRN 511 fitted with valve caps, dimensioned to the appropriate Tender Drawing.

NON-RETURN VALVES

These shall have bodies made from bronze for DN not greater than 40 mm and they shallbe of the swing pattern and shall be rated for at least PN 10 or greater as specified. The ends shall be either screwed to SSRN 223 or flanged to SSRN 207, PN 10 or as the installation demands.

For DN greater than 40 mm they shall be of a profiled poppet type with non-slam characteristics (surge suppressing type) and be of approved manufacture. The proposed valve shall be of low pressure loss and maintenance free with PN 16 rating (unless otherwise specified) and shall achieve a movement from fully open to fully closed on pump stoppage in 0.1 to 0.3 seconds. The valve housing shall be of epoxy-coated cast iron and flanged with the closing system of stainless steel.

With his tender, a Tenderer shall have supplied full technical details of the valves he proposes to supply and install. If the Engineer deems the valve proposed to be appropriate he will accept the offer. If however the Engineer considers the offer to be inappropriate he will reject the offer from the Tenderer and instruct him instead as to the

acceptable manufacturer(s) of these items. Should a financial offer from a Tenderer in this regard be obviously under-priced then the cost of supplying an appropriate valve shallbe fully to the account of the Contractor.

AIR RELEASE AND VACUUM BREAK VALVES

Automatic air relief and vacuum break valves (air valves) shall be of the anti-shock anti-surge type (Ventomat RBX or approved equivalent) design.

Bids which apparently contain non-compliant offers will be required to confirm that theywill meet these specifications in their totality at the rates quoted in their offer.

Such valves shall 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 disentrained 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 rejoining of separated water columns.

The air release and vacuum break valve shall be of a compact single chamber design withsolid 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, ors/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 rejoining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior tovalve 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 largeorifice. Discharge of pressurised air shall be controlled by the seating and unseating of asmall 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 strengthcharacteristics, 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 anexplosive 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 aseparate isolating butterfly valve.

Unless otherwise specified all air valves shall be provided with an integral flanged inlet with studs appropriate to SSRN 207 NP 10 or as the installation demands and complyingwith the appropriate nominal pressure.

All air valves at new installations shall be fitted to an air accumulator tee with the branch of a diameter not less then 0,6 times the diameter of the main. Where necessary, a concentric taper either integral with or as a separate fitting shall be inserted between the branch and the isolating valve immediately beneath the air valve and an abrupt diameter change between branch and isolating valve shall be avoided.

SURFACE BOXES

These shall be of cast iron, (hinged and locked) and from an approved manufacturer to SSRN 513. They shall be sized to suit the purpose required and as otherwise shown on the relevant drawings.

The number of keys required (if any) is indicated in the Bills of Quantities.

VALVE CHAMBERS

New chambers shall be constructed in accordance with the drawings, and where indicatedshall incorporate thrust walls.

Rehabilitated chambers shall be constructed or rebuilt or repaired in accordance with theoriginal drawings or as directed by the Engineer's Representative using materials approved by the Engineer's Representative.

Notwithstanding the size and shape of the valve to be supplied the Contractor shall ensure that the minimum clearance as indicated on the drawings are provided within the

chamber and that where chambers have pre-cast roofs, the manhole cover provided shallbe of a size sufficient to allow for the removal and replacement of the valve without disassembly.

VALVES CHAMBER COVERS

Unless otherwise indicated in the Bills of Quantities, valve chamber covers shall be reinforced concrete with a weight of minimum 50 kg per piece and provided with embedded steel device for lifting at each end. They shall be supplied complete with liftingkeys. Except where a chamber is provided with pre-cast roof slabs to facilitate placing and removal of the valve or valves within the chamber, the clear opening in the chamber cover shall in all cases allow for this. It will be the Contractor's responsibility to ensure that the covers he provides are of an appropriate clear opening size.

RESERVOIR INLET VALVES

All reservoirinlet float operated valves shall be of one of the following types as specified:

Of the streamline type wherein operation is effected automatically by change of displacement of the float, the alternate actuating forces provided by weight and buoyancy being transmitted by lever mechanism to the valve element.

The float action shall operate the pilot valve housed within the plunger thereby ensuring sensitive response to the small mechanical forces applied. Closure shall be drop tight and the valves shall discharge vertically downwards.The valve shall actfrom fully open to fully closed with a change in reservoir water level of the order of magnitude indicated below.

Inlet Diameter (Nominal) (mm)	Reservoir Level Change (valve open to close) Approx. (mm)
80	130
150	230
200	260
250	320
300	380
400	850

Where controlled closing and opening of the float valve is required the valve will beprovided with a stilling basin to ensure gentle transition on valve closure so as to avoid sudden pressure rise in the incoming main as a result of closure.

Of a type that has been specifically designed to overcome problems of influence in operation by water surface turbulence and of the risk of causing surge pressures inthe upstream pipeline as a result of the closing mechanism deployed. They shouldfurther be simple to service without the need for special tools or lifting equipment.

In either case, the valves shall be of approved manufacture.

TWO-POINT TIME-MODULATED PRESSURE REDUCING VALVES

To facilitate pressure management, the tender may call forshall supply and installation oftwo-point time-modulated pressure reducing valves as indicated on the drawings and in the Bill of Quantities.

The time modulated Pressure Reducing Valves shall comprise a main valve and a pilot control system. The valve gate shall comprise a horizontally mounted resilient disc moving upward to open the valve and downward onto a seat so as to close the valve. It shall be held in place by a diaphragm assembly and spring, accessible from above via a removable cover. Opening, closing and throttling shall be achieved through the connection of upstream, cover chamber and downstream compartments of the valve through appropriate restrictions and throttling controls.

The throttling control shall be capable of being adjusted automatically from outside of the valve at a minimum of two outlet pressures through a time based modulator such that both the pre-set time of adjustment of outlet pressures and the outlet pressures themselves can be changed if circumstances require it. The time modulating device shall be an encapsulated, self contained, watertight device inclusive of a power pack. The power pack shall have a minimum guaranteed usable life of two years. Means of replacing battery pack, and adjusting time and pressures shall be straightforward.

If included, a Tenderer shall be specifically required with his tender to have supplied full technical details of the valves and PRV controllers he proposes to supply and install. If the Engineer deems the valves and controllers proposed to be appropriate he will accept the offer. If however the Engineer considers the offer to be inappropriate he will reject the offer from the Tenderer and instruct him instead as to the acceptable manufacturer(s) of these items. Should a financial offer from a Tenderer in this regard be obviously under- priced then the cost of supplying an appropriate valve and controller shall be fully to the account of the Contractor.

BULK METERS ELECTRO-MAGNETIC TYPE

General

Electromagnetic flow meters shall be of new technology microprocessor based electronic water flow meter and be capable of monitoring flow totals and flow rate in both forward and reverse flow direction. The flow meter shall have no moving parts to ensure that there is no damage from particulate matter, e.g. stones, weed, etc.

The meter shall be suitable for 85 to 265 Volt AC, 40 to 400 Hz supply without the need for link setting or voltage selection and shall be supplied with an uninterrupted power supply (UPS) inclusive of voltage protector. In addition, automatic battery backup must be included to ensure no loss of metering during AC power loss periods.

Alternatively, the meter shall be suitable for operation from two internal 3.6V lithium batteries which provide an operating life of three years. It shall be possible to change the batteries in the field.

Performance

The accuracy of + 0.25% for AC meters and + 0.5% for battery meters shall be achieved. The meters shall be suitable for a maximum working temperature to 70°C at pressure up to at least 16 bars.

Spare Parts

The manufacturer shall also supply a full and compete list of all parts of the meters offered duly named (In English) and numbered together with the prices for each separate part. The normal usage and cost of the spares will be considered when assessing the cost of each meter which will be a factor in the selection of the Tenderer.

BULK WATER (WOLTMAN) METER (HELICAL VANE TYPE)

Meter Characteristics

Bulk water meters for either major consumers or for monitoring district flow measurements shall comply with SSRN 510 and SSRN 520.

The meters shall be approved as Class B water meters for horizontal, vertical or inclined installation. The meter shall be of the Woltmann type with the axis of the turbine parallel to the flow direction. The mechanism shall be removable and shall be of an approved standard.

The bulk meters shall be supplied as follows:

Meter calibrated in cubic metres

Volt-free pulser for interface with datalogger

Suitable In-line strainer with Stainless Steel screen

Performance

The maximum flowrate (Qmax) is the highest flowrate at which the meter can function over limited periods without damage, and without exceeding the maximum permissible error (+/-2%) and the maximum permissible value for loss of pressure.

The nominal flowrate (Qn) is equal to about half the maximum flowrate, Qmax. It is expressed in cubic metres per hour and is issued to designate the meter.

At the nominal flowrate, Qn, the meter should be able to function in normal use, i.e. in continuous and intermittent operating conditions, without exceeding the maximum permissible error (+/-2%).

The minimum flowrate (Qmin) is the flowrate above which the meter must not exceed the maximum permissible error (+/-5%), and is fixed as a function of Qn.

The transitional flowrate (Qt) is the flowrate which divides the upper and lower regions of the flow range and the rate of the maximum permissible error is +/-2%.

The flowrate values shall (as a minimum) meet the following (for diameters up to and including DN 300 mm this shall be in both forward and reverse flow for network management):

The minimum and maximum flows must be stated by the Tenderers and supported by testcertificates from the National Standards Institute of the country of manufacture. Tenderers should state the equivalent International Standards Institute e.g. ISO, BS, DIN, AWWA. The class of meter must also be stated. The minimum flows to be registered for the following meter sizes are specified below but the Tenderers are to state the minimum flowfor other sizes:

Nominal Diameter mm	50	80	100	150	200	250	300
Maximum flowrate Qmax , m^3/h	30	80	120	300	500	800	1200
Nominal flowrate Qn, m^3/h	15	40	60	150	250	400	600
Minimum flowrate Qmin ,m^3/h	0.45	1.2	1.8	4.5	7.5	12	18
Transitional flowrate Qt , m^3/h	3	8	12	30	50	80	120
Head Loss at max. flowrate, bar	0.05	0.04	0.10	0.10	0.10	0.09	0.21

Sizes

The length of water meters should be standard and not exceed the following:

Nominal Diameter mm	50	80	100	150	200	250	300
Overall length, mm	300	350	350	300	350	450	500

Tightness, Pressure and Temperature Resistance

The water meter shall permanently sustain (without leakage, malfunctioning or permanent deformation) a working pressure of 16 bar and a maximum water temperature of 50 degree Celsius, unless otherwise specified in the BOQ.

Headloss

The head loss shall not exceed 0.2 bar at Qmax for all nominal diameters.

Materials

The water meter shall be made with materials appropriate to each specific use. The bodyshall be made of high quality cast iron with an internal and external epoxy powder coating.

Inner plastic parts shall be non-toxic and non-tainting.The

Counter

The transmission between the turbine and the totalizer shall be of the magnetic type properly shielded against any magnetic external influence. The helical vane shall revolvein direct proportion to the flow of the water.

Totalizer and transmission gears shall be hermetically capsuled in a brass box and a scratch resistant mineral glass sealed to IP 68. The dial and the cover shall rotate through360° without using of any tools and without breaking the meteorology seal.

The indicator shall, as minimum requirement, record the following values:

Size of Meter (ND)	Minimum Registration (m^3)	Maximum Registration Before Self Re-Set (m^3)
50 – 100mm	0.01	1,000,000
150 - 300mm	0.1	1,000,000,000

The meter shall be fitted with an uni-directional pulsar suitable to interface with dataloggerproducts (4-20mA). The pulsar shall be of the reed switch type and shall deliver different pulse values depending on their position in the totalizer. The following pulse values shallbe available:

Pulse Values	DN 50 to 100	DN 150 to 300
Reed pulse unit	1 m^3 and 10 litres	10 m^3 and 100 litres

Accuracy

Characteristic curves of accuracy with parallel tables up to the maximum operation capacity are to be provided by the Tenderer. These characteristic curves must besupported by test certificates from the National Standards Institute of the country of manufacture or an equivalent International Standard. The accuracy curves must be comparable with the standard and shall be equal to or better.

The maximum error permitted must be indicated. The maximum error at maximum and recommended continuous flow shall not be more than +2% and +5% at minimum flow.

Head Loss

Characteristic curves of heads plotted against the rate of flow up to the safe maximum operating capacity shall be provided by the Tenderer. The head losses must be plotted against the whole range of flows.

Flanges

All bulk meters shall be flanged. Flanges shall be drilled to NP 16 according to SSRN 207(unless otherwise indicated in the BOQ) and shall be supplied complete with flange gaskets, bolts, nuts and washers.

Weight

The weight of the meter should not exceed the following:

DN (mm)	50	80	100	150	200	250	300
Weight (kg)	13.5	18	24	45	55	90	110

Marking

On the body an arrow on both sides shall show the direction of flow. In addition, an individual serial number, the manufacturer's sign or name, initial inspection date toconform to the obligatory marking standard.

Strainer

The bulk meters shall be supplied with suitable in-line strainers. The strainers shall be able to withstand a working pressure of 16 bar and a temperature of 50 degree Celsius.

The sieve element shall be of stainless steel grade 316 with a hole size of 3 mm to prevent large particles from damaging the measuring mechanism. The sieve element shallbe removable without disturbing the flange joints.

Materials and Design

The materials uses in the construction shall be designed to withstand raw and treated water and normally operate for 5 years without normal need for maintenance or repair andthe maximum error shall not exceed the specified limits. The Tenderers shall specify the optimum pH and the aggressive water quality for which the meter has been designed. The tenderers are also required to give details of any water quality parameter that may adversely affect the normal operation of the meters to be supplied.

Meter Bodies

The meter shall have a durable outer case protecting the inside of the meter through which the vane operates. The casting shall not be repaired in any manner. The outer bodycasing shall be of the split case type with the upper part fitted to the lower part by means of the cap bolts and nuts. Alternatively for the smaller meters the outer casing may consistof two parts which are screwed together. The meter body casing must be made from materials with a life expectancy under normal use in excess of over 20 years.

On all the meter sizes, model and direction of flow shall appear in indelible marking cast inraised characters on the outer case of the meter. The letters of the water company followed by the serial number shall also appear in raised characters in an easily visible position on the outer case of the meter but not on the lid.

External Case Bolts

Where external case bolts screw cap blots, nut and bolts form part of the meter design these shall be arranged for easy removal after a long service. They shall be of the same composition as the meter casing as appropriate or of stainless steel.

Registers

Internal mechanisms of the register shall not be in fluid contact with the water being measured. Registers may be of the fully sealed pattern with the external parts running in amixture of glycerine and water of similar mixtures appropriate to the design of the counter.The viewing window shall be of a transparent material which will not shutter, discolour become opaque or distort in normal use. A lid shall over-lap the viewing window when in closed position. They should comply withthe local standard or equivalent or better international standards.

Intermediate Gears

Intermediate gear trains shall be made of materials which can be shown by the manufactures to have satisfactory characteristics and designed for performance expectancy of at least 5 years. Gear trains exposed to the water being measured shall beconstructed from materials designed to be lubricated by water.

Helical Vanes

These shall be made of vulcanised hard rubber or other materials having satisfactorily characteristics including sufficient rigidity and strength to operate at the rated capacity of

the meter. They should have sufficient dimensional stability to retain operating clearance at working temperature of up to 50° C. Designed life expectancy in excess of 5 years is expected of all moving parts of the working chambers.

Seal Wire Holes

Meter casing, register box screws inlet and outlet coupling nuts shall have holes drilled forseal wire. The meter shall be sealed at the factory before dispatch. The holes shall be 2.5mm in diameter.

Spare Parts

The manufacturer shall also supply a full and compete list of all parts of the meters offeredduly named (In English) and numbered together with the prices for each separate part. The normal usage and cost of the spares will be considered when assessing the cost of each meter which will be a factor in the selection of the Tenderer.

CONSUMER WATER METERS

General

Domestic water meters for house connection shall comply with SSRN 510 and SSRN 520.In addition, it shall comply with the EEC Council Directive No. 75/33/EECas well as with the norms and regulations that govern their manufacturing and final tests, whether the latter are specifically mentioned in this specifications or not.

The domestic water meters shall be approved Single Jet velocity type - Class C or volumetric type - Class C. The meter shall provide the specified flow accuracy when installed as detailed here below.

The domestic meters shall be supplied as a complete kit comprising the following items:

Meter, SingleJet water meters with extra dry dial and magnetic protection of up to2000 Gauss, calibrated in cubic metres

Volumetric type of meters shall be the semi positive rotary with grooved piston

The meters shall have no external calibration screw to prevent fraud

Meters are to be corrosion proof copper alloy or polymer plastic

The outer body casing shall be of the split case type. The outer casing may consistof two parts which are screwed together and a watertight seal between the two

Isolating/disconnection valve

Union sockets;

UV resistant plastic meter box complete with lid and with security master key

DN 15 BSP threaded inlet and outlet tail pieces complete with unions on each end,suitable for connection to galvanised iron pipe

Built-in strainer

Built-in non return valve to prevent meter reversal

The meter and the box shall be complete as a package for instant connection and use.The domestic meters shall have threaded connections.

Performance

The maximum flowrate (Qmax) is the highest flowrate at which the meter can function over limited periods without damage, and without exceeding the maximum permissible errors (+/-2%) and the maximum permissible value for loss of pressure (1 bar).

The nominal flowrate (Qn) is equal to half the maximum flowrate, Qmax. It is expressed incubic metres per hour and is issued to designate the meter.

At the nominal flowrate(Qn) the meter should be able to function in normal use, i.e. in continuous and intermittent operating conditions, without exceeding the maximum permissible errors (+/-2%).

The minimum flowrate (Qmin) is the flowrate above which the meter must not exceed the maximum permissible errors (+/-5%), and is fixed as a function of Qn.

The transitional flowrate (Qt) is the flowrate which divides the upper and lower regions of the flow range and the rate of the maximum permissible error is +/-2%.

The flowrate values shall (as a minimum) meet the following:

Nominal Diameter	mm	15	20	25	40
Nominal flowrate ..... Qn	m^3/h	1.5	2.5	3.5	10
Maximum flowrate..... Qmax	m^3/h	3	5	7	20
Minimum flowrate..... Qmin	l/h	15	25	35	100
Transitional flowrate. ..... Qt	l/h	22.5	37.5	52.5	150

Metrological Classes

The meters performance specification shall be to SSRN 510Class C or to equivalent internationally recognized Standard according to the value of Qmin and Qt as shown in the following table:

Class	Qn =Less than 15m^3/h	Qn=15 m^3/h or more
Class C Value of: Qmin Value of: Qt	0.01 Qn 0.015 Qn	0.006 Qn 0.015 Qn

The Supplier shall provide the reference metrological signature (error curve) for each typeof water meter.The metrological signature shall be established on a representativesampling of water meters. The water meters shall have the ability to be verified by any certified laboratory (in liquid flow metering) without requiring the purchase of special equipment or the undertaking of special works.For DN15 and DN 20, the Qstart shall be6 litres/hour or less to reduce unaccounted for water for consumers with storage tanks.Error curves of meters provided shall not vary more than ±2% when testing flows between Q2 and Q4 (or between Qt and Qmax) and shall not vary more than ±5% whentesting flows between Q1 and Q2 (or between Qmin and Qt).

The meters must be able to retain their accuracy when installed in either horizontal, vertical or inclined planes and maintain the accuracy for not less than 6 years.

Tenderer shall provide certificate of the metrological class of the meters offeredand an approval certificate indicating clearly that the meter is approved for both horizontal and vertical installations.

Sizes

For each meter size designated the corresponding fixed set of dimensions must correspond to SSRN 510 and no deviations from this shall be accepted. The lengths of water meters shall not exceed the following:

Nominal Diameter	mm	15	20	25	40
Length	mm	165	165	199	300

Tightness, Pressure and Temperature Resistance

The water meter shall permanently sustain (without leakage, malfunctioning or permanent deformation) a minimum working pressure of 10 bar (DN 15 mm) or 16 bar (DN 20 mm) and be suitable for water temperatures up to 50 degree Celsius.The meter should also beable to operate at minimum network pressure of 0.5 bars or less.

Headloss

Characteristic curves of head losses plotted against the rate of flow from the minimum flow rate shall be provided by the Tenderer. The meters shall show a loss of head not exceeding 1 Bar at Qmax and 0.25 bar at Qn in accordance with SSRN 510.

Materials

The materials used in the construction shall be designed to withstand raw and treated (potable) water and operate for at least 5 years without normal need for maintenance or repair and without the maximum error exceeding the specified limits.

Tenderer shall specify the optimum pH and the water quality for which the meters have been designed.

They must be constructed throughout of materials which are resistant to internal and external corrosion and if necessary be protected by some suitable surface treatment. All materials of the water meter which are in contact with the water flowing through the watermeter shall be food grade, non-toxic and non-taintingas attested by a reputable and certified international laboratory. Water temperature variations within the working range shall not adversely affect the materials used in the construction of the water meter.

The outer body casing shall be of the split case type. The outer casing may consist of twoparts which are screwed together and a watertight seal between the two. The meter bodycasing must be made from materials with a life expectancy under normal use in excess of20 years.

The water meter shall be made with materials appropriate to each specific use. The bodyof domestic meters (DN15 - DN25) shall be manufactured from copper alloy or polymer.For water meters designed for domestic use (DN15 – DN 20mm), single jet watermeters manufactured from a special thermoplastic material with highest technical characteristics will be given preference over any other material if all the technical requirements are met (pressure, metrology, life etc)

The measuring element shall be of high grade polymer to ensure minimum wear and a high degree of reliability.

Counter

The indicator shall provide for reliable and unambiguous direct reading of the volume ofwater measured in cubic metres or in cubic meters and litres.

The indications of volume shall be by any of the two types as follows:

Type 1 By a row of inline consecutive digits in one or more apertures (drum counters); or

Type 2 A combination of drum counters for whole units of cubic meters and pointers on circular scales for fractions of cubic meters.

Drum counters shall be black for indication of a cubic metre and its multiples shall be redfor indication of fractions of a cubic metre. Visible movements of the digits shall be upwards and the actual or apparent height of the digits on the drums shall be not less than5 mm. The advance of a digital unit shall be completed while the next lower valued digit iswithin the last tenth of its travel. The drums showing digits of lowest value shall move continuously in Type 1, and may move continuously in Type 2. Indicators with pointers (Type 2) shall rotate in a clockwise direction. The value of each division on the scales shall be expressed in multiples or sub-multiples of ten. Each scale shall be graduated in cubic meters or accompanied by a multiplying factor (x0.01 x0.1 x10 x100) according to

the value of the scale. The symbol m³ shall appear on the dial. The gear unit and the counter shall be combined and completely sealed.

The number drums shall be contained in a non-toxic fluid for lubrication and protection. The counter shall be placed in a window in the meter body and be placed so as to allow for ease of meter reading. Counter window shall be of minimum 7mm thicknessto preventhot wire needle tamper. Any fraud or fraud attempts be indicated and easily detected when reading the water meteThe Supplier shall provide in his technical brochures the tests carried out to prevent fraud or to detect it, particularly for the following types of fraud(if applicable): software frauds, magnetic, intrusion, electromagnetic, clamp-joint, hot needle.

There shall be no occurrence of condensation or deposit in the counter under the mineralglass lens. Black numbers on white shall denote cubic metres and white numbers on redshall denote litres. The counter shall reset to zero at a reading of not less than 10,000 m³.

The indicator shall, as minimum requirement, record the following values:

Size of Meter (DN)	Minimum Registration (m³)	Maximum Registration Before Self Re-Set (m³)
15mm	0.001	10,000
20mm to 40mm	0.001	100,000

Protection

A suitable in-built strainer (0.75 mm aperture and 2,844 mm² mesh area) shall protect themeasuring mechanism and an in-built non return valve shall prevent meter reversal.

Marking

Each water meter shall be marked on the casing with the following information:

Direction of flow of water on both sides of the meter

Maximum flow rate (3m³/hr)

Individual Serial number (engraved)

Individual Serial Number in bar code;

Manufacturer's name

Meter Class

Country of manufacture

Year of manufacture

Operator's name (max 10 letters)Sealing

Water meters shall be provided with a means of sealing so that after sealing, both before and after the water meter has been properly installed, there shall be no possibility of dismantling or altering the water meter or its adjustment device without visibly damaging the seal. The meters shall be sealed subsequent to manufacture and before delivery to the purchaser.

The preferred method of sealing is by a corrosive resistant wire inserted through 2.5 mm diameter holes in the halves of the body, and secured by a circular metal seal impressedby a device which provides a unique imprint on the seal.

Tenderer's shall provide details of the sealing wire type with proof of corrosive resistant and method proposed.

Meter Box

Domestic water meters (DN15 and DN 20) shall be preferably installable in a meter box complete with a stop valve (high quality plastic ball valve with chrome plated brass ball), external inlet and outlet BSPT male connections, lid with a special key and base. Joints toall fittings in the meter box are to be fusion welded to prevent leaks. The meter box shallbe made of a highly resistant composite material resistant to UV rays.

The meter box shall be of an appropriate size to accommodate the sizes of meters and the water meter assembly shall be suitably keyed to prevent it from rotating during installation. The meter box will have risers to allow installation at varying depths (existingservice connections) and a box bottom. The box must incorporate a lock mechanism, builtinto the lid.Locking mechanisms using screws shall not be accepted.

Packing and Transportation

Packing shall be made of strong wooden crates, and inside such crate, each meter shall be packed in its own carton box.The water meters' performance shall not be deteriorateddurin sea, air or land transportation. The threads and pipe extremities shall be protectedwith appropriate devices. All protections shall be easily removable before the water meters' installation. The water contained in the water meters shall not deteriorate the protection level offered by the conditioning, nor the internal elements of the watermeters.Upon delivery, the conditioning shall include on the sides a summary of the watermeters' model and diameter, as well as the serial numbers. The packaging sealing shall allow the detection of any previous opening attempt. Upon delivery, the wrapping shall show (prior to its opening) traces of shocks or dents that may have damaged the water meters.

Workmanship

The meters shall be guaranteed against defects in materials and workmanship for a minimum period of one year from date of delivery. Parts to replace those in which a defectmay develop within such period shall be supplied without charge, piece for piece, upon the return of such defective parts to the supplier thereof or upon proof of such defects.

Meters should be designed for easy disassembly and re-assembly without the use of special tools or equipment and should be easy to maintain and repair. Meters designed toresist vandalism will be preferred.

The Supplier shall prove the resistance of his water meters to disinfection agents, like forexample chlorine dioxide, within the limits of the thresholds set by regulations in relation topotable water.The Supplier shall submit in his technical proposal documented evidence ofthe resistance of his water meters to suspended particles, describing the devices used todiminish the risk of blockages.

Consumer Water Meter Repair Kits

The manufacturer shall also supply a full and complete list of all parts of the meters offered duly named (in English) and numbered together with the prices for each separatepart with his tender.

Quality management system

The Supplier's manufacturing sites shall be certified to SSRN 673. Any other certification,for example SSRN 675, shall be favourably taken into consideration.The Supplier shall highlight in his technical proposal the pre-established and current dispositions taken to manage the manufacturing process, particularly:

The list of controls and tests carried out during and at the end of the manufacturingprocess;

The external control by a certified body for aspects related to regulatory certifications and approvals;

The arrangements taken to measure the products' performances after their commercialization

The procedures used to manage client's claims and corrective/preventive actions taken

Training & manufacturing

The Supplier shall describe the training arrangements proposed for the Client. Details of such training, additional costs if any and training programme shall be provided in the proposal.

The Supplier shall communicate in advance all the information related to planned modifications on the purchased water meters (nature of the modification, tests carried out,results and starting date), to allow the Engineer to validate these modifications prior to delivery.

The Supplier shall allow the visit of auditors designated by the Client to his manufacturingsites. During these audits, calibration and sampling of water meters might be carried out for testing in laboratories certified by Engineer.

The Supplier shall describe in his technical proposal the means at his disposal for Customer Service. Addresses of Local Agents and details of after - sales - service shall begiven. Information on stocks of meters, meter spares, workshop facilities, meter testing facilities, etc., with the Local Agents shall be provided.

PREPAID CONSUMER WATER METER

General

This specification covers supply and installation of cold water consumer meters complete with equipment, materials, software, installations and training and other technical services for the implementation of prepaid water metering system for prepaid consumer meters and standpipes.

The Bidder shall demonstrate that the hardware/ software package that he is proposing meets the minimum functionality requirements laid out. To do this the Bidder shall includewith his bid:

Catalogues and specification sheets for all equipment proposed.

Details of software packages, their functionality and capabilities, sample inputs, outputs etc.

Details of currently operating systems based on the proposed equipment & software or its predecessors. These shall include details of the community types, housing types, customer numbers, pay point numbers method of commercial operation implementation problems encountered and solutions developed.

Metering

Except as otherwise modified or supplemented herein, SSRN 510 Class C for cold-watermeters or the latest revision thereof shall govern the materials, design, manufacture, andtesting of all meters furnished under this specifications.The metering unit shall comply in all aspects with Clause 565 of these specifications.

In addition the meter should have the following capabilities:

The meter should have a leak detection installation system
The meter should have provision for a pulse output with possibility to link to AMR system

Display

The unit shall have a simple LCD or similar display capable of informing the customer ofthe balance remaining and reporting fault codes.

Power Supply

The unit shall draw power from an internal battery power supply and shall not require anymains power feed. Battery life shall be guaranteed for at least 5 years under normal operating conditions.

Prepayment Component

The hardware and software part of the prepaid meter shall as a minimum comprise of;

Smart card for each prepaid water meter with a service life of at least 10 years

Credit dispensing unit (CDU) software + PC

System Master Station (SMS) +PC

Security spanner for yard meter

Credit dispensing unit (CDU) software

Printer POS TM-U210

The supplier will be required to offer the following services:

Meter Installation

Installation of master station

Provide training to client's Staff in the use of the metering system. The training shall be conducted immediately after delivery of the units. The supplier shall propose a training plan for approval by the Engineer.The bidder will include in his bid costs related to venue and transport.

Performance Warranties

The prepaid meters and associated equipment must come with a minimum of 1-year direct guarantee from the contractor/tenderer. All costs associated with offering such a guarantee are to be built in the rates for supply and installation of the equipment.

Tariff System

The proposed tariff system calls for a rate per m3 of water which shall take into account the applicable tariff bands. In addition there shall be different rates for different customersas per the Client's Tariff structure. For example:

The services billed for include water, sewerage, sanitation levy.

The system should be capable of tracking arrears for recovery on an agreedpercentage of the current consumption.

The meter rentals shall be included in the Tariff System.

The technology shall be able to add other charges as the Client may decide on, atvery short notice.

Billing and Management

The billing system to be implemented shall consist of a prepayment centre whereconsumers go to pay for their water and are issued with a token or card which can transferthe units purchased to the meter unit. The units uploaded shall be non-transferable from one meter unit to another.

The system shall utilise rechargeable tokens or cards which the metering units shall be capable of reading. Systems requiring scratch cards and any form of keyboard entry on the meter unit or vending unit shall not be accepted.

The tokens or cards to be used shall be capable of not only transferring units bought to the meter but also of reading consumption data from the meter for transfer back to the management software. The software should seamlessly integrate with the existing Client

billing system. The bidder may need to familiarize himself with existing billing system priorto tendering

Prepayment Centre

The Client shall make an office available for the installation of the equipment for the prepayment centre. The Supplier under this contract will be limited to:

Supply and installation of all management and billing software and all othersoftware required for the correct operation of the system on the PCs.

Supply and installation of the token or card reader/ writer hardware.

Supply of all other necessary equipment for the management of the system,including but not limited to:

Additional specialised tokens /cards for configuration, testing and tariff setting ofmeters and vending units.

The system must not be limited to billing the number of consumer indicated in theBidding Documents but must accommodate any expansion in the customer base.

Management Software Capability

The software to be provided with the system shall have the following capabilities:

Secure Management and reconciliation of payments and recharges

Upload of consumption data from tokens/cards brought for recharge

Receipt printing showing amount of recharge, deductions for debt collection etc.

Recovery for arrears on the account

Any other services as the customer would require, as specified from time to timeon the tariff sheet.

Configurable to local currency

Automatically synchronize arrears on the client computer, Server, and token orsmartcards

Keep a record of initial arrears and subsequent payment towards arrears

Handle variable tariff bands according to tariff category which should be alterableas and when necessity arises

Handle accumulated customer water consumptions weekly and monthly and therelated payments for the consumptions

Generate various reports (Financial and technical reports) that can be exported toexcel or PDF and flexibility to create additional reports when need arises

The system should have a customer complaint resolution module

Operate on both Windows XP Professional and Windows 7 Professional or higher

Determine battery status on customer meter and customer interface unit

The server side of the system should run on Microsoft SQL 2005 SP3 or higher asa database and should have report writer. The server side of the management system should be supported by Window Server 2003 and Windows Server 2008 orhigher operating system

Be able to categorise customers as either Domestic (Institutional, Government, Private) or Commercial (Institutional, Government, Private)

The system should be able categorise properties according to Town, Branch, Townships, Walk routes

Should be able to integrate with other computer applications running on SQL 2005or higher such as SAGE Accpac and other systems

The management system should be able to accommodate mobile payment systems/solutions

Client machines should be able to run without a stable dedicated connection to server for a predefined period and be able to re-establish connection and synchronise with the server

System should handle payments by cash, cheque or other means Token/Card

Reader and Control Unit

Meters shall be capable of reading tokens/cards issued for metered customers, transferring balance from the token/card to the meter and writing to the token/card the consumer's consumption pattern information for use in system management.

Meter units shall automatically disconnect supply when the balance is exhausted.The control unit shall handle all of the billing and tariff functionality laid out in this specification.

CATHODIC PROTECTION AND TEST STATIONS

General

Cathodic protection systems shall comply with SSRN 273 on cathodic protection for land applications. The cathodic protection system or works shall be guaranteed against faulty design, materials and workmanship. Normal wear and tear and malfunctioning due to major changes in the conditions under which such systems or works have to operate, other than weather and which could not have been reasonably foreseen at the time of installation, shall be excluded. The Contractor shall supply all labour, supervision, installedand consumable materials, services, equipment, tools, and each and every item ofexpense necessary for the design, procurement, installation, commissioning and testing ofcathodic protection systems for ferrous materials in contact with soil (buried piping).

Cathodic protection shall include, but not be limited to, the following tasks:

Obtain, generate and evaluate necessary information to confirm design, installation, testing, commissioning and documentation of the cathodic protection systems.
Provide detailed design for permanent cathodic protection and testing systems in compliance with this Specification and referenced standards and suitable for the pipeline works environmental conditions.
Supply and install permanent testing facilities to monitor the cathodic protection systems using proven technology that will be subject to approval by the Engineer.
Commission, test and adjust the newly installed temporary and permanent cathodic protection systems
Test for, locate and mitigate any shorts in the cathodic protection systems.
Test for, evaluate and mitigate possible interference caused by cathodic protectionsystem on communication and low energy control systems.
Test for, evaluate and mitigate stray currents generated by newly installedcathodic protection systems.
Provide documentation for system design and installation.

After installation, the insulating joints must be inspected to ensure their compliance with the specifications and drawings and to test their efficiency for satisfactory electrical insulation. The Engineer, the designer of the cathodic protection installation and the Contractor shall witness the inspection.

Soil Resistivity

The Contractor shall confirm the soil resistivity of the soils proposed for bedding and backfill and confirm the proposed cathodic protection system of the pipeline and

appurtenant fittings. This shall be submitted to the Engineer at least 24 working days before pipelaying commences.

On acceptance and approval by the Engineer the Contractor shall be responsible for installation of the systems and works required for the cathodic protection of the pipeline. Acceptance and/or approval of any report by the Engineer shall however not relieve the Contractor from his obligation to provide and install a protective system and works which shall effectively and sufficiently afford protection to the pipeline and fittings under current and reasonably foreseen conditions.

Stray Current Survey and Report

As soon as possible after pipelaying has commenced, keeping in mind the inherent danger of damage within a short time to unprotected pipelines exposed to stray currents, the Contractor shall carry out a stray current survey along the pipeline route.

A full report of such survey together with the Contractor's proposals for protection against stray currents shall be submitted to the Engineer. On acceptance and approval of the recommendations by the Engineer, the Contractor shall be responsible for installation of all systems and works which might be required for protection of the pipeline.

Workmanship

All materials and plant installed shall be the best of their respective kinds and spare parts, replacements and servicing facilities shall be readily available from local sources.

All bonding cables across flexible pipe joints shall be double insulated copper cables 2 x 16 mm^2 for pipe smaller than 700 mm nominal bore or 2 x 35 mm^2 for pipe greater than 700 mm nominal bore fixed by thermowelding only.

Bonding cables across flexible pipe joints shall be given sufficient slack to maintain flexibility at joints or fittings. Where joints are provided to provide routine access, provision shall be made that bonding cables can be removed and replaced without permanent damage to the cable or its electrical continuity.

Where joints are bonded across, the Contractor shall carry out tests to prove complete electrical continuity over the pipeline sections bonded.

All thermowelds and bare metal areas on bolts, nuts, lugs and cables shall be protected by means of a reinforced, hot applied bitumen layer of 5mm minimum thickness or other acceptable means compatible with the pipe coating.

Test points shall be brought up from the pipe to the ground surface by means ofpolyethylene or PVC double insulated 10 mm^2 cables. The cables to terminate in weatherand corrosion proof test boxes fixed to firmly concreted-in precast concrete posts. Whenever feasible these test post shall be concreted in hard up against air valvechambers or other suitable pipeline concrete structures. Test points shall be at locations as dictated by conditions prevailing at any particular pipeline route.

Anodes

High Potential magnesium anodes shall have the following chemical composition:

Al 0.02% maximum
Mn 0.80% to 1.5% maximum
FE 0.03% maximum
Ni 0.002% maximum
Cu 0.003% maximum
Zn 0.02% maximum
Other 0.001% maximum
Mg Remainder

Perforated galvanized steel core not to exceed 0.15 kg per metre of core. Permeable

cloth bag, containing the anode and backfill material is to consist of:

Ground Hydrated Gypsum 75%
Powdered Wyoming Bentonite 20%
Anhydrous Sodium Sulphate 5%
The grain size limits are:
100% passing the 850 x 10^{-6} m sieve size
50% or more retained by the 150 x 10^{-6} m sieve size

The mixture shall be firmly packaged around the anode by means of adequate vibration. Backfill material should be of sufficient quantity to cover all parts of the anode to a minimum thickness of 25 x 10^{-3} m. Anodes packaged in cloth bags shall be shipped in a plastic or heavy paper bag of sufficient thickness to permit normal handling without tearing. The shipping container shall be watertight plastic. The plastic shipping container is to be removed prior to installation. Anodes shall carry a label identifying the manufacturer, type of anode, metal and backfill composition, and the net weight of the anode.

Use at least one 7.7 kg magnesium anode at each end and one near the centre of the water main sections as specified by the Engineer. A minimum of 10 litre of water shall be poured on each anode to initiate the anode's operation.

CHAPTER 5

SEWERAGE, DRAINAGE AND ROAD PAVEMENT WORKS

TABLE OF CONTENTS

CLAUSE NO.	DESCRIPTION	PAGE NO.
DEFINITIONS		1
ORDER OF WORK		1
EXCAVATION		2
EXCAVATION OF TRENCHES		2
LAYING OF PIPES		2
JOINTING AND TESTING OF PIPELINES		2
PIPE BEDDING MATERIAL FOR FOUL AND SURFACE WATER DRAINS		4
BEDDING, LAYING AND SURROUNDING OF PIPES		4
CONCRETE BEDS, SURROUNDS AND HAUNCHES		5
SUBSOIL DRAINS		5
MANHOLES, CHAMBERS AND GULLIES		5
MANHOLE COVERS AND FRAMES		6
BLOCKWORK WALLS		7
STONE FOR RIP-RAP		7
IRON PIPES AND FITTINGS		7
CEMENT MORTAR		7
INFILTRATION TESTING OF SEWERS		7
MANHOLE WATER TIGHTNESS TESTS		8
OPEN CHANNELS		8
ACCESS ROADS		8
BLOCK PAVING -GENERAL		11
MATERIALS		11
SUB-BASE		11
ROAD BASE		11
LAYING COURSE		11
EDGE RESTRAINTS		12
IRONWORK		12
BOND 12		
ROAD BASE		12
TRIMMING		12
COMPACTION		13
JOINT FILLING		13
SEALER		13
EARLY TRAFFICKING		13
CONSTRUCTION IN INCLEMENT WEATHER		13
LAYING OF CONCRETE BLOCK PAVING		13
WATERPROOF UNDERLAY		14
PRECAST CONCRETE KERBS AND CHANNELS		14
BLOCK PAVING CHANNELS		14
KERB AND CHANNEL LAYING		14
TEMPORARY TRAFFIC SIGNS		15
PERMANENT WHITE ROAD MARKINGS.		15
SEWER REPLACEMENTS		15
MANHOLE AND CHAMBERS		15
MANHOLE COVER LIFTING AND REFITTING		15
RODDING, FLUSHING AND CLEANING OF SEWERS		15

SAFETY DURING SEWER CLEANSING 16
REHABILITATION OF EXISTING MANHOLE COVERS 16
CONNECTING SULLAGE TO SEWERS 16
MAINTENANCE OF FLOWS 16
GRANULAR BEDDING AND SURROUND TO GRAVITY PIPES 17
TESTING OF GRAVITY PIPELINES 18
WATER-TIGHTNESS AND CLEANLINESS GENERALLY 18
PIPES KEPT CLEAN 18
SLOPE PROTECTION SLABS IN PROPOSED SLUDGE DISPOSAL WASTE STABILISATION PONDS 19
FILLING OF POND EMBANKMENTS 19
COMPACTION OF FILL IN EMBANKMENTS AND POND BASES 19
SECURITY AND MANOEUVRABILITY AT THE POND SITE 19
EARTHWORK, PERMEABILITY TEST AND CLAY LINING FOR PONDS 19
DISPOSAL OF SURPLUS EXCAVATED MATERIAL 20
COMMISSIONING OF PONDS 20
WEEPHOLES 20
DEBRIS SCREENS 20

CHAPTER 7 – SEWERAGE, DRAINAGE AND ROAD PAVEMENT WORKS

701 DEFINITIONS

For the purposes of these Specifications, the following definitions shall apply:-

Sewerage Systems

Sewerage systems include the structures, devices, equipment and appurtenances intended for the collection, transportation and pumping of sewage and other liquid wastes,
e.g. gravity pipelines, manholes, pumping stations, rising mains, etc.

Culverts

A culvert is defined as any single structure composed of steel and/or concrete, the internalcross sectional area of which, measured in a place perpendicular to the culvert centreline,is less than 12 m^2. Multiple pipes or boxes whose total area exceeds 12 m^2, will be deemed as culverts providing the units of which they are composed do not exceed 12 m^2 cross-section area each. These definitions, though arbitrary, are aimed at providing a reasonable basis for the separation of different types of construction work, namely the installation of minor cross drainage and major pipe structures or bridges.

Surface Water Drainage Systems

Surface water drainage systems include structures, devices, equipment and appurtenan- ces intended for the collection, transportation and pumping of storm water, e.g. street gullies, street side drains, sandtraps, manholes, gravity pipelines, pumping stations, risingmains, open channels, etc.

Access Roads

These are roads within the boundaries of the Site and/or roads connecting the Site to thepublic highway system.

ORDER OF WORK

Culverts, Sewerage and Surface Water Drainage Systems in Embankments

The Contractor shall, wherever practicable, construct all culverts, pipelines or any struc- ture of the sewerage or surface water drainage systems, required under embankments orfill ahead of the earthworks.

The Engineer may, however, permit this work to be inserted after the construction of an embankment or fills subject to the following conditions:-

that this concession shall apply only to concrete pipes not surrounded by concrete and to corrugated metal pipes;

that the Contractor will be responsible for any damage or delays caused by the temporary omission of these works;

that the construction of these works shall follow immediately upon thesubstantial completion of the earthworks above it;

that the Contractor will be paid only for the volume of trench excavated, calculated from the height of trench excavated from commencing surface tothe final surface; any additional excavation and backfilling will be at the Contractor's expense;

that, should the Engineer consider the Contractor is causing delay to the work or inadequately compacting the trenches, this concession may be revoked and the Contractor required to construct all the work ahead of the embankments or fills and bear all additional expenses arising therefrom.

Drainage Work in Cuttings

Where drainage and culvert work is to be constructed under a road formation in cutting, it shall generally be excavated after the earthwork is completed. The Engineer may permit the culverts to be excavated before the earthwork is completed; but payment for the excavation of the trench will only be made upon the volume excavated below the final surface of the cutting.

EXCAVATION

Excavation and backfilling of trenches and the classification of excavated material shall be in accordance with the methods elsewhere described in these Specifications.

EXCAVATION OF TRENCHES

Trenches for pipes shall be to the lines and depth shown on the Drawings, or as directed by the Engineer, and of sufficient widths to give an equal clearance on both sides of the barrel of the pipe. The nominal and minimum trench width for different diameters shall be as shown in the following tables.

PVC PIPES

NOMINAL DIAMETER (mm)	100	160	200	250	315	400	500
WIDTH OF TRENCH (m)	0.6	0.6	0.80	0.85	0.90	1.00	1.10

CONCRETE PIPES

INTERNAL DIAMETER (mm)	100	150	225	300	375	450
WIDTH OF TRENCH (m)	0.85	0.90	1.00	1.05	1.10	1.20

D.I. PIPES: The width of trench shall be the nominal pipe diameter plus 600 mm.

Excavation for manholes, head walls or any drainage structures, shall be carried out to the levels and outlines of such structures shown on the Drawings or as directed by the Engineer, to give clearance to construct the works efficiently. Quantities will be measured net, excluding working space.

LAYING OF PIPES

The methods of laying, jointing, bedding, backfilling trenches and reinstatement shall be in accordance with that elsewhere described in these specifications.

Unless otherwise approved by the Engineer, pipes shall be laid in an upstream direction and the socket of the pipes shall face upstream and every pipe shall be concentric with the previous one.

JOINTING AND TESTING OF PIPELINES

General

No pipes shall be laid until the floor of the trench has been cleared of all stones and other debris to the approval of 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.

All concrete pipes shall be saturated with water, before jointing, and the inside of the joint flushed up with mortar, as specified. Surplus jointing material shall be removed and the pipes scraped and cleaned internally. Pipes shall be firmly bedded throughout their length to the required alignment and level so that they are concentric at each joint. All pipes

shall be suitably wedged, shored or otherwise restrained to prevent movement during testing and backfilling but such restraints shall not be left in place permanently unless so instructed or agreed by the Engineer

Unless otherwise agreed by the Engineer, a close fitting brush or swab shall be placed in pipelines having nominal diameters of 650 mm or less and shall be drawn forward progressively as pipelaying proceeds by means of a suitable rope which shall be threadedthrough each pipe as it is laid.

Pipelines having nominal diameters greater than 650 mm shall be kept clean by suitable means as pipelaying proceeds. No debris of any kind shall be allowed to remain in the pipeline. Where the pipeline has internal lining, persons entering shall wear rubber bootsand equipment trolleys shall have rubber tyred wheels.

Pipes and joints shall be kept free of dirt, mud and other deleterious matter at all times. If pipelaying is stopped at any time, a cap shall immediately be placed on the end of the lastpipe laid to exclude dirt.

Rigid Spigot and Socket Pipes

When laying rigidly jointed pipelines with pipes having integral sockets, before entering a pipe spigot into its socket, both spigot and socket shall be clean and free from mud, oil, grease or other deleterious matter.

The spigot shall be entered into the socket of the previously laid pipe until it bears on the back face of the socket and is centred in it. Tarred yarn shall then, in two turns, be firmly caulked into the back of the socket, using an approved caulking tool, to a depth between 10 and 20 mm. The joint shall be completed by pressing 1:2 cement mortar firmly into thejoint, finishing with a neat 45 ø fillet from the outside of the socket. The pipes shall not be pressure tested or disturbed in any way for at least 48 hours after jointing.

Pipes with Ogee or Butt Joints

The joint faces shall be thickly covered with 1:2 cement/sand mortar and the newly laid pipe shall be driven hard up to the previously laid pipes. Excess mortar squeezed out of the joint shall be removed from both the inside and outside of the joint.

The outside of the joint shall be pointed up with a band of 1:2 cement/sand mortar, 75 mmwide and 25 mm thick, all the way round the barrel and central over the joint.

All other Pipes

All other pipes shall be jointed as specified in Part 4 of these Specifications.

Testing of Pipelines and Manholes

Before testing commences the Contractor shall ensure that all anchor and thrust blocks are complete or that temporary supports have been installed. Thrust from temporary pipe ends or branch pipes shall be adequately strutted and the section under test closed off with stop ends, blank flanges or other closure fittings. All pipes shall be cleaned before testing by flushing or as agreed by the Engineer. All tests shall be carried out in the presence of the Engineer and for this purpose the Contractor shall give the Engineer 24 hours notice in writing of any tests which he intends to carry out.

A water test shall be applied, as specified in BS 8301, after laying and jointing the pipelineand before backfilling or placing the concrete surround or bedding concrete, to reveal cracked or porous pipes and faulty joints. Any visible leakage and excessive sweating, which causes a drop in test water level, will be rectified by the Contractor at his expense. Wherever possible, testing shall be carried out from manhole to manhole. Short branch drains, connected to a main sewer between manholes, shall be tested as one system. Long branches shall be tested separately.

The tests shall be carried out by inserting suitable strutted plugs in the lower end of the pipelines and in the connections, if necessary, and by filling the system with water. A period of one hour shall be allowed for absorption.

For small pipes, a knuckle bend may be temporarily jointed in at the top end and a sufficient length of vertical pipe jointed to it in order to provide the required test head. Alternatively, the required test head may be applied by means of a small bore pipe leadingfrom a suitable container and connected to a plug. Precautions shall be taken, by struttingor otherwise, to prevent any movement of the pipeline during the test.

A test pressure of 1.2 m. head of water above the soffit of the drain shall be applied at thehigher end but not more than 2.4 m. at the lower end. Steeply graded drains shall be tested in stages where the above maximum head would be exceeded if the whole sectionwere tested at once.

The loss of water over a period of 30 minutes, is to be measured by adding water from a measuring vessel at regular intervals of 10 minutes and noting the quantity required to maintain the original water level in the stand-pipe. The average quantity of water added shall not exceed 0.06 litre per hour per 100 linear metres per millimetre of nominal bore ofthe pipe for diameters up to 300mm. For larger diameter pipes, the average quantity of water to be added shall not exceed 0.12 l/hr/100 m/mm of normal bore.

On completion of the work, or at suitable intervals during construction, infiltration tests shall be carried out. The permissible amount of infiltration shall be 2 litres of water per minute per kilometre of pipeline of any diameter. All water for testing shall be provided at the Contractor's expense.

PIPE BEDDING MATERIAL FOR FOUL AND SURFACE WATER DRAINS

Unless otherwise approved, materials for pipe bedding or surround shall be a nominal single size granular material, natural crushed gravel or rock. The water soluble sulphate content shall not exceed 1.9 g of sulphate (expressed as SO3) per litre when tested in accordance with BS 1377 Part 3 and the material shall be graded within the following range:

TABLE 7.1: PIPE BEDDING MATERIAL (FOUL AND SURFACE WATER)

BS SIEVE SIZE	PERCENTAGE BY MASS PASSING
37.5 mm	100
20.0 mm	95 – 100
10.0 mm	0 -10

BEDDING, LAYING AND SURROUNDING OF PIPES

Immediately following the excavation of the trench the pipes shall be laid and jointed on the pipe bed. Pipes shall be laid so that each one is in contact with the bed throughout thelength of the barrel. The bed shall be cut away and removed at each socket or sleeve in the case of socketed or sleeved jointed pipes to give a clearance of at least 50 mm so thatthe socket or sleeve does not bear on the bed. Brick or other hard material shall not be used as temporary support.

Except where a concrete bed and surround is specified, pipe-bedding material shall be a granular material complying with relevant Clause

After jointing the pipes the bedding shall be brought up equally on both sides of the pipe tothe level of the centre of the pipeline. Only after inspection and testing, as required by theEngineer, shall the bedding material be brought to a level 150mm above the top of the pipe collars. The remainder of the trench shall then be backfilled with backfill material as specified in relevant Clause.

CONCRETE BEDS, SURROUNDS AND HAUNCHES

The floor of the trench shall be cleaned, trimmed and compacted before any concrete bedis laid. The concrete bed shall be thoroughly cleaned before any surround or haunch is laid. No concreting shall commence until the previous work has been approved by the Engineer.

All concrete for beds, surrounds and haunches shall be Class 15 concrete, formed to thedimensions shown on the Drawings or as directed by the Engineer.

Unless otherwise written in the Specifications or Bills of Quantities or, directed by the Engineer, a 0.15 m. thick concrete surround shall be provided to pipes in the following circumstances:-

Pipes up to and including 600 mm diameter with less than 0.60 m. cover or more than 6.00 m cover.

SUBSOIL DRAINS

A subsoil drain includes any type of drain designed to collect groundwater whether this isrising from below or percolating from the surface and may or may not include a pipe. It may also include impermeable membranes above or below the pipe or permeable filter membranes all as detailed on the drawings.

Trenches for subsoil drains shall not be less than 0.3 m wide or the outside diameter of the pipe plus 0.15 m whichever is the greater.

Perforated uPVC pipes shall be used for subsoil drains and shall be laid with no gaps between their ends.

The trench shall be filled with approved stone of size not less than 10 mm nor greater than40 mm and the grading of the stone between these limits shall be a reasonable curve andto the satisfaction of the Engineer.

MANHOLES, CHAMBERS AND GULLIES

Manholes, chambers and gullies shall be constructed from concrete Class C20/20 to dimensions and thicknesses as shown on the Drawings.

Unless otherwise agreed by the Engineer, Manholes shall be constructed after pipes havebeen laid, except that bases may be constructed earlier to avoid deterioration of the formation.

Manholes and chambers for foul water shall be constructed with sulphate-resisting cementand those for surface water drainage with Ordinary Portland cement.

Sulphate resisting cement is not required for entire manholes, except for the benching. sulphate resisting cement is required for the pipes and in chambers where sewage is allowed to fill into e.g. pumping stations and in the flushing tank. Wherever the Bills of Quantities contain indications for ordinary Portland cement those shall be expanded as toinclude also for cost of sulphate resisting cement.

The manhole foundation shall be cast from in-situ concrete Class 15. It will be thoroughlycleaned before pouring the benching concrete Class 15. The benching should risevertically from the top edge of the channel pipe to a height not less than that of the soffit ofthe outlet and be sloped upwards to meet the wall of the manhole. It should be floated to asmooth hard surface with a coat of 1:2 cement mortar, using sulphate-resisting cement forfoul water drainage, or floated to a smooth hard surface while it is green for surface waterdrainage. Where possible, main channel inverts shall be half round of vitrified clay, asbestos cement, precast concrete or, where the drain is of cast iron or steel, of the samematerial. Channel branch bends, up to 150 mm diameters, shall be of vitrified clay of half section, curved in the direction of flow, and set to deliver above the main channel invert. Channel branch bends over 150 mm diameter, curved in the direction of flow, may be clayware or formed in the concrete base, rendered and trowelled smooth as specified.

The connections with pipelines shall be watertight. Pipelines approaching manholes shall be surrounded with Grade 15 concrete, 150 mm thick and 600mm long.

Manhole covers, gully gratings and frames shall be fixed at the top of the manhole, or gully, and will be adjusted to the new road levels or to the levels as directed by the Engineer. They shall comply with B.S. No. 497, grade and shape being as shown on the Drawings. They shall be fixed in place using concrete Class 15. Where required, step irons shall comply with Part 6 of these Specifications. They shall have tails 80mm long built in at 300 mm vertical intervals and staggered 150 mm each side of a vertical centre line. The uppermost step iron shall be at least 600 mm from the top of the manhole/chamber cover and shall not be required when the depth from cover to benchingis 900 mm or less. When the depth from cover to top of benching exceeds 4.5 m, an approved ladder shall be used instead of step irons. Deep manholes shall be provided with ladders and rest chambers as shown on the Drawings.

Precast concrete manholes shall be constructed as shown on the Drawings using precastconcrete components set on bases cast from in-situ concrete. The lowest chamber element shall be bedded on and haunched with cement mortar, or approved bitumastic sealant, to the base. The precast concrete cover slab shall, similarly be bedded to the topmost element. The joints of intermediate precast concrete elements shall be liberally coated with approved bituminous material, of trowelling grade, prior to being fixed in position. Surplus bituminous material shall be neatly struck off.

The precast concrete elements shall be reinforced, as required, and provided with lifting holes which shall be cleaned and filled with cement mortar after placing the units. Step irons shall not be used for hoisting or lowering components.

Where the depth from ground level to the base of the precast elements exceeds 4.5 m, the precast units shall be encased in Grade 15 in-situ concrete, 150 mm thick, below thisdepth.

All manholes and chambers, upon completion, shall be filled and tested with water provided at the Contractor's expense. The loss of water shall not exceed 5 litres over a period of two hours.

Where manholes are constructed on drains of 600mm diameter and over, galvanised safety chains shall be placed across the mouth of the outlet and galvanised solid bar handrails, 25mm thick, shall be provided at the edges of all benchings and platforms.

Backfilling around completed Manholes shall be with suitable material deposited equally all round and compacted in layers not exceeding 300 mm.

MANHOLE COVERS AND FRAMES

Covers and frames shall be the type, size and weight shown on the drawings. They shall be fabricated from cast iron or steel frames of recessed type which shall be filled on site with concrete, to the levels indicated on the Drawings or as directed by the Engineer. Level differences shall be made up by not more than three courses of brickwork betweenthe frame and the roof of the manhole.

Generally, the strength standard shall be to Class A (BS 497) or Class D 400 (European standard EN124) and may only be varied to Class B (BS 497) or Class B 125 (EN 124) where shown on the drawings and only in areas where vehicular access is impossible. Such relaxation shall only be made on express instructions of the Engineer.

Care shall be taken to see that frames do not suffer any distortion and that the cover will seat without any rocking.

All manhole covers shall be lock able to their frames, having a special lock and key or spanner, made in such a way that only authorised persons can access the manhole.

Where manholes are situated in the roadway, their frames shall be carefully bedded and levelled such that when closed the cover lies flush with the roadway.

BLOCKWORK WALLS

Blockwork walls shall have the outside joints pointed flush and the inside joints shall beraked out as work proceeds to receive rendering.

Unless otherwise specified, blockwork wall thickness shall be as follows:-Walls up

to 3 metres below ground level	200 mm
Between - 3 and 6 metres below ground level	400 mm

Walls of more than 7 metres below ground level should be of precast elements to BS5911 or cast in situ of concrete of specified class.

Relieving arches of concrete shall be arranged in blockwork walls over large sized pipes.

Pipes passing walls shall generally be cast in or built in monolithically in one operation flush with the inside face of the wall.

Pipes for future connections shall also be placed as work proceeds and the external end sealed off with completely watertight temporary stoppers.

The pipes passing walls shall be as short as practicable and when jointed in and outgoingpipes no strain shall occur in rigid joints. The distance from the inside wall face to externaljoint may not exceed 600 mm for walls up to 400 mm thick.

Where boxing out for pipes passing walls has been allowed, jointing to outside pipelines shall be made before concreting into walls is finally carried out.

STONE FOR RIP-RAP

The stone used for rip-rap shall be obtained from approved quarries. It shall be free from impurities, overburden, mudstone, cracks, sandholes, veins, lamination or other imperfect-ions. The stone shall be left irregular, when stone pitching is done, for dissipating the water energy in open channels or water courses. It will be laid in mortar 1:2 or dry withoutmortar as shown on the Drawings.

IRON PIPES AND FITTINGS

Cast iron pipes and fittings shall be of the class and have joint ends as shown on the Drawings and mentioned in the Bills of Quantities and Specifications, and otherwise comply in all respects with B.S. No. 78, except that flanged pipes and flanged fittings shallcomply with B.S. No. 2035.

CEMENT MORTAR

Cement mortar for jointing pipes, masonry, slabs and plastering shall consist of cement and clean sharp fine sand all as specified and mixed in the required proportion by volume.

Mortar for use in connection with foul water shall be made with sulphate-resisting cementwhile that for use in connection with surface water drainage shall be made with Ordinary Portland cement. All mortar shall be conveyed fresh to the work as required for use. No mortar after setting shall be re-used or remixed for use.

INFILTRATION TESTING OF SEWERS

Sewers shall be tested for infiltration after backfilling. All inlets to the pipeline to be tested shall be effectively closed and the residual flow regarded as infiltration.

Limits of infiltration not to be exceeded are for sewers not exceeding 750 mm nominalinternal diameter.

$Q = 0.08 \times L \times D$

Where Q = Limit of infiltration in litres during 1 hour

L = Number of 100 metre lengths of tested sewerD = Nominal diameter

of sewer tested in mm.

MANHOLE WATER TIGHTNESS TESTS

Where so required, manholes shall be tested for water tightness by filling with water. The Engineer will then decide whether the tightness is acceptable or not.

OPEN CHANNELS

Open channels shall be constructed of precast components - invert block drains or half round concrete channel and side slabs - as specified and shown on the Drawings.

The precast components shall be manufactured of specified concrete class and according to applicable specifications in relevant clause. Cube test certificate shall be submitted to the Engineer if so required.

Excavation to receive precast components shall be true to line and gradient and allow for bedding material as specified on the Drawings. Earth sides shall be given a slope of 1:1 or as otherwise specified or directed by the Engineer. The formation of the excavation shall give a firm base for the channel components.

Where required, sight rails shall be used to bone in channel with traveller.

Invert blocks, channels and side slabs shall be neatly jointed in cement sand mortar 1:3. Ends to be jointed shall be thoroughly soaked with water before jointing. Jointing shall be carried out as the work proceeds, all joints being trowelled to a smooth finish. Joints shall be protected from sun, wind and rain by approved covering kept constantly damp for a period of at least 3 days after forming.

ACCESS ROADS

Preparation of the Formation

The formation of access roads shall be compacted as defined in these Specifications, the drawings and Bills of Quantities. The preparation of the formation shall only take place after all subgrade drainage, pipes, ducts and services, below the formation have been laid. No work above formation level shall take place until the formation has been approved by the Engineer.

Lateritic Material for Sub-Base

Material Requirements All Materials:

CBR at 95% MDD (Modified AASHTO)	Min. 30 and 4 days soak

Clayey and Silty Sands:

Passing 2 mm sieve (%)	Max. 95
Passing 0.075 mm sieve (%)	Min. 10 - Max. 30
Uniformity Coefficient	Min. 5
Plasticity Index	
In dry areas:	Min. 5 - Max. 20
In wet areas:	Min. 5 - Max. 12
Plasticity Modulus:	Max. 250

Construction Procedures

Minimum thickness of compacted layer: 100mm LAYING: by grader

COMPACTION:

Use of grid roller or equivalent may be required to break down coarse particles.

Minimum dry density: 95% MDD (Modified AASHTO)

Compaction moisture content: between 80 and 105% OMC (ModifiedAASHTO)
Maximum thickness compacted in one layer: 200mm

Lime Improved Material for Base

Material requirements Material before treatment
Silty sands and clayey sands:

Maximum size	1 - 10 mm
Passing 0.075 mm sieve	Max. 40%
Uniformity Coefficient	Min. 5
Plasticity Index:	Max. 25
Plasticity Modulus:	Max. 2,000
Organic matter	Max. 1%

Extra requirements for lime treatment: Passing 0.425 mm sieve
Min. 15%
Plasticity Index Min. 10
Lime

Hydrated calcium lime to B.S.890, Class BAmount usually

required: 4 - 6%

Treated Material

CBR of Lab. mix at 95% MDD (Modified AASHTO) and 7 days cure + 7 dayssoak: Min. 160

Plasticity Index: Max 15

Construction procedures

Minimum thickness of compacted layer: 125 mmLAYING: by grader

MIXING: in place (pulvimixer or travel plant)COMPACTION:

Minimum dry density: 95% MDD (Modified AASHTO)
Compaction moisture content: between OMC-2 and OMC (ModifiedAASHTO)

Maximum thickness compacted in one layer: 200mm

Time allowed to complete compaction and finishing: 2 hrs (cement), 12 hrs(lime)

PROTECTION AND CURING:

Time allowed to place protection: 4 hrs (cement), 24 hrs (lime)

No traffic permitted for first 7 days

Finishing

After compaction, the finished surface of the base shall be tested for smoothness to grade and cross-section profile. If tests on compaction and/orsmoothness fail, the Contractor has to make this good at his own expense.

Bituminous Surfacing - General

The grades and spraying temperatures for approved bitumens used for surfacingshall be:-

Prime coat :	Cutback M.C.30	- 20 to 60 C
Seal coats :	Straight run	- 120 to 150 C

- 80 - 100 penetration

Heaters used for bitumen shall conform to BS1676 and the heated bitumen shall be applied by self propelled pressure distributors with spray bars complying with BS1707 or BS3136. Where different grades of bitumen are used, heaters and distributors shall be thoroughly cleaned before the grade of bitumen is changed. Flushings from heaters and distributors shall be drained to disposal pits and not discharged into drains, ditches or watercourses. Any bitumen heated above the maximum specified temperate shall be removed from the Site and replaced at the Contractor's expense. Hand spraying shall onlybe used if approved by the Engineer.

Where spraying is commenced or stopped, metal sheets or building paper shall be spreadacross the width of area to be sprayed to produce a clean sharp edge to the area. The sheets shall be cleaned daily and the building paper destroyed after use. During spraying,all kerbs, headwalls and other road furniture shall be protected from bitumen splashing. Any such features accidentally marred shall be cleaned immediately.

Equipment to be provided by the Contractor shall also include approved self propelled mechanical chip spreaders, power brooms and self-propelled pneumatic-tyred rollers weighing not less than five tonnes.

During the course of the work only essential construction equipment shall be allowed intothe area and not allowed to stand on completed work. The road shall not be opened to general traffic until directed by the Engineer.

Bituminous Prime Coat

Immediately before applying the bituminous material, the surfaces to be treated shall haveall loose dirt and other objectionable material removed by power brooms. If so ordered bythe Engineer, a light application of water shall be made just before the bitumen is sprayed.

MC-30 grade cutback bitumen shall then be applied to the surface at the rate of 1.0 l/m2 or as otherwise directed by the Engineer.

Bituminous Surface Dressings

Binder for surface dressing shall only be applied upon completion of the priming as specified in paragraph (e) of this Clause and when any defects to the primed surfaces have been repaired. No binder shall be applied until the primed surfaces have been approved by the Engineer.

Aggregate shall be spread, by mechanical chip spreaders, immediately following the spraying of the binder and no work is to commence until sufficient supplies of aggregate are to hand. Manual spreading of aggregate shall only be permitted when approved by theEngineer. After applications of aggregate, the surface shall be lightly broomed to give a uniform coverage with no areas having an excess or deficiency of aggregate. Within twenty minutes of application and brooming of the aggregate, the surface shall be rolled with a self-propelled pneumatic-tyred roller, weighing not less than five tons, until a smooth, well compacted surface is obtained. Upon completion, all loose aggregates shallbe removed from the surface to disposal off the Site.

Bitumen binder shall be straight run 80/100 penetration grade bitumen and the first seal coat shall consist of bitumen sprayed at the rate of 1.2 l/m2 of surface area and 19mm aggregate spread at the rate of 70m2/m3 of aggregate. The second seal coat shall consist

of bitumen sprayed at the rate of 1.2 l/m2 of surface area and 12mm aggregate spread atthe rate of 100m2/m3 of aggregate.

The aggregate grading should be as follows:-

SIEVE (mm)								
	20	14	10	6.3	5	3	2	0.5
First seal	100	85-100	0-30	0-7	-	-	0-2	-
Second seal	-	100	85-100	0-30	0-10	-	0-2	-

and should have the following aggregate requirements:

LAA max. 35
ACV max. 26
SSS max. 12
FI max. 25

BLOCK PAVING -GENERAL

Block paving may be used for all roads, footways, cycleways, pedestrian areas, access lay-bys and adoptable parking areas. The design of pavements constructed with **block paving** shall in general conform to BS 7533. **Block paving** shall be laid only by an approved Contractor.

MATERIALS

Paving blocks shall comply with BS 6717 Part 1 and BS 6677 having a work size thickness of 65mm where used in non-vehicle trafficked areas and 80mm where used in carriageways, lay-bys and parking areas and having chamfered wearing surfaces. The tensile splitting strength of the blocks shall be 3.5 N/mm.

SUB-BASE

The sub-base material shall be Type 1 granular material. The finished surface level of thesub-base shall not deviate from the design levels by more than ±10mm. The finished surface shall be free of any soft patches and shall be close knit so that the laying course material cannot penetrate downwards. Where any soft patches are removed they shall bereplaced with Type 1 granular material. Under no circumstances may laying course material be used to replace soft patches or for levelling the surface of the sub-base.

ROAD BASE

Where the pavement construction is not completed before building construction commences a **road** base shall be laid consisting of either dense bitumen **road** base or cement bound base. The finished surface level of the **road** base shall not deviate from thedesign levels by more than ± 10mm. Prior to laying the laying course the road base shall be punctured on a 1m grid with holes of diameter < 50mm.

LAYING COURSE

The laying course sand shall be in accordance with Table D2 of BS 7533: Part 3: 1997 (Annex D). The sand shall be pre-compacted with a plate vibrator and then levelled by screeding. The surface level of the bedding/laying course shall be treated with anapproved active pre

and post emergence residual weed killer, at the rate of spread recommended by the manufacturer for total control. Special care must be taken near shrubs and trees, and arboricultural advice sought. The moisture content of the bedding sand needs to be a uniform 6-7%, it is therefore essential that the sand should be stored in an area which is well drained and that it be kept covered during periods of hot, dry weather or wet weather.

In some locations where a degree of rigidity is considered essential in the pavement surface, e.g. adjacent to drainage furniture, the incorporation of 5.6% by weight OPC maybe permitted.

Only sufficient material for one day's work shall be prepared and in any case such that theposition of this boundary shall not be more than one metre from the laying face at the endof the working period. Disturbance of the prepared laying course by pedestrian or wheeledtraffic prior to placing of the blocks shall be avoided.

The course shall have a minimum sand thickness of 30mm for a bound **road** base and 50mm for a type 1 **road** base. The screeding of sand is very important and a surcharge ofsand is required from the start.

EDGE RESTRAINTS

Edge restraint shall be provided at the perimeter of all paved areas and shall be adequateto support traffic loads and prevent the escape of laying course material from beneath thepaved surface. Edge restraints shall consist of pre-cast concrete kerbs and channels or approved made blocks. Where the **block** pavement abuts an existing structure, the Engineer's approval shall be obtained before laying commences so that any necessary strengthening or damp proofing precautions which the Engineer may require, can be carried out prior to laying the **block** pavement.

IRONWORK

Frames and covers for gullies and manholes in **block paving** areas shall be properly bedded on mortar before laying commences. Frames and covers for gullies and manholesin **block paving** areas shall comply with the requirements of relevant clause and shall bewithout flanges, and shall be set 5mm lower than the finished **block** level. There shall bea minimum of one course of stretcher bond adjacent to all ironwork with the aim to have flush. A 300mm to 500mm wide piece of a suitable filter geotextile shall be laid under thelaying sand and up the face of any ironwork or cover slab to prevent the migration of the laying sand.

BOND

The blocks shall be laid hand-tight working from an existing face or edge restraint and shall be laid to a herringbone pattern in carriageways. Stretcher bond shall only be used infootway and non-trafficked areas. **Block** shapes designed to assist with the formation of boundaries and with changes of direction may be incorporated as appropriate. Full blocksshall be laid first, closure units shall then be laid. Each area shall be completed as far as possible in full **block** units. Infilling to boundaries and obstructions shall proceed as the laying course proceeds and shall be completed before compaction commences. Alignment of the blocks shall be checked periodically and adjustments made where necessary to achieve straight joint lines.

ROAD BASE

In agreement with the Engineer the developers are permitted to omit laying the Blockworkuntil after building words are completed. In such cases the top 75mm of sub-base shall bereplaced with dense bitumen macadam binder course. Prior to laying of the blockwork thebase shall be cleaned, if the surface is in a poor condition the base course shall be removed and replaced with MOT Type 1 granular material to the correct level. If the DBMbinder course remains it shall be punctured.

TRIMMING

Block shall be trimmed to shape and size in order to form boundaries and to work around obstructions. Where trimming is required it shall be carried out using an approved **block** splitting device or a powered concrete saw. No part of a **block** of less than one half of a whole **block** in size shall be used. Where it is unavoidable to fit the blocks neatly up to anobstruction with the Engineer's approval an in-situ granolithic concrete fillet may be formed.

The granolithic concrete shall consist of one part OPC, one part of fine aggregate and 2 parts of 10mm granite chippings measured by volume. Wherever in-situ concrete is used,careful selection of fine aggregate and colour pigment is required to achieve a colour match with the blocks. Such fillets are only acceptable with a minimum 120mm width anddepth.

COMPACTION

The blockwork surface shall be compacted by a plate compactor to ensure the filling of thelower **block** to **block** joint by the laying course material and to produce an even surface finish. The plate compactor used shall have a plan area of not less than 0.25m² and shalltransmit an effective force of 75-100kN per square metre of plate area. The frequency of vibration shall be within the range 75-100Hz.

Compaction shall follow completion of laying as soon as possible after each day's work and shall be compacted to within one metre of the laying face. No other area shall be leftuncompacted at the completion of each day's work.

JOINT FILLING

After compaction of the blockwork surface jointing sand, free flowing silica sand complyingwith Table D3 of BS7533: Part 3: 1997 Annex D shall be brushed into the joints and usinga plate vibrator compacted to refusal. The finished level of the sand shall be 5mm below the top of the blocks. The sand shall contain no deleterious salts or other contaminants and shall not stain the surface of the blocks.

Joint filling and final compaction shall be completed as soon as practicable after laying and at the completion of each days work. No traffic shall be permitted on the **block** surface until final compaction has been satisfactorily completed.

Note: A neoprene coated sole plate may be required on special surfaces733

SEALER

Finally, an elastomeric prepolymer sealer shall be applied in accordance with the manufacturer's instructions to the surface of the small element **paving** immediately after the jointing sand has been brushed/vibrated in making sure it is evenly spread over the surface of the **paving** and allowing it to completely fill the joints before being absorbed into the jointing sand. Generally rate of spread varies between 2-3m²/litre. No sealant shallbe left to "pond" on the surface of the slabs. Approved sealants are Nufins Blockseal,
A.C.M. Paveseal or Resiblock Ltd's Resiblock Superior.

EARLY TRAFFICKING

Where during the period of early trafficking any movement of the surface course occurs the blocks shall be removed as directed by the Engineer and the cause established. Afterremedial work has been carried out to the Engineer's satisfaction, the disturbed area shallbe immediately re-laid and re-compacted in accordance with the requirements of the foregoing clauses.

CONSTRUCTION IN INCLEMENT WEATHER

No laying of concrete blocks or laying course shall take place on frozen material in the lower layer. No frozen material or material containing ice shall be used.

LAYING OF CONCRETE BLOCK PAVING

The acceptable tolerance for the laid surface of blocks shall be ±6mm with a maximum relative difference between adjacent blocks of 2mm. The acceptable tolerances forcapping layer, sub-base and base shall be as relevant Clause.

All block cutting shall be done using a purpose made block splitter or saw and the minimum size of laid block shall be 33% of a full block. The bond shall be broken as necessary to accommodate the minimum cut block size.

Full edge restraint must be provided prior to the laying of the blocks. The edge restraint should present a vertical face down t the level of the underside of the laying course.

Where block paving abuts a macadam surface an approved form of channel edge supportshall be provided set flush into the surface of the block paving. Where the block paving adjoins manhole frames, gully frames etc the blocks shall be neatly cut and may require tobe set in coloured cement mortar. The use of in-situ concrete infill is not acceptable.

On completion of paving the surface course should be fully compacted using a plate compactor to achieve the required compaction of the laying course. Joints between blocksshall be fully filled with dried free-flowing silica sand conforming to BS7533: 3. Joints should be refilled as necessary and the paving re-vibrated with two or more passes.

WATERPROOF UNDERLAY

Waterproof underlay shall be approved 125µm impermeable plastic sheeting. Over lapping of plastic sheeting shall be at a minimum of 300mm.

PRECAST CONCRETE KERBS AND CHANNELS

All kerbs and channels irrespective of type shall be laid, bedded and backed in accordance with relevant Clauses and be laid to a flowing alignment to the satisfaction ofthe Engineer.

Longitudinal falls less than 1 in 100 will not normally be acceptable. The Engineer should be consulted at an early stage in the design if the Contractor intends to use gradients lessthan 1 in 100.

Precast concrete kerbs shall be 125 mm x 255 mm half battered and shall comply with BS7263 Part 1, and shall be hydraulically pressed. Precast concrete radius kerbs shall beused on radii not exceeding 12.0 m.

Precast concrete dropped vehicular crossing kerbs shall be 125mm x 178mm and shall comply with BS 7263 Part 1 except dimensionally and shall be hydraulically pressed. Transition kerbs shall comply with the British Standard.

Precast concrete channels shall be 150 mm x 150 mm and shall be hydraulically pressed and manufactured in accordance with BS 7263 Part 1 except dimensionally. Precast concrete channels shall be used where the carriageway falls towards the kerb and may beused where the carriageway falls away from the kerb.

Precast concrete channels laid to a radius not exceeding 12m shall not exceed 450 mm long.

Precast units conforming to BS 5328 Part 1 should not be cut to a length of less than300 mm

BLOCK PAVING CHANNELS

Where approved by the Engineer, approved concrete paving blocks may be used as channels only where a block paving surface is being used. They shall be laid in stretcher bond on bedding sand as specified. The channel shall be laid to a level 5mm below the finished edge of carriageway level. Block channels will not be approved for longitudinal gradients less than 1 in 80.

KERB AND CHANNEL LAYING

Typical sections giving full details of the foundation and backing are shown in Standard Details.

Where units are to be set on a race of fresh concrete, a foundation of ST2 concrete should be deposited along the line of units, onto which the units are laid directly on fresh mixed concrete and set to line and level. The backing concrete should be laid monolithically with a race of fresh concrete, dowel bars should be fixed into the base andextended into the backing haunching.

Where units are to be bedded onto a concrete edge beam, the concrete foundation shall be formed on the compacted sub-base to a minimum thickness of 150mm and wide enough to accommodate the units and backing concrete. Soundly fixed formwork or shuttering shall be used and the Class ST2 concrete to BS 5328 shall be compacted to produce a dense foundation free from honeycombing. The minimum period between concreting and the removal of the formwork or shuttering shall be 24 hours.

Kerb and channel units on the concrete foundation shall be laid butt jointed on a maximum25 mm thick bed of semi-dry 3:1 cement mortar. Any surplus bedding material shall be thoroughly cleaned off and the foundation wetted if necessary prior to the placing of the backing concrete. The backing of ST2 concrete to BS 5328 shall be placed in a soundly fixed road form or shutter and thoroughly compacted to produce a concrete dense and free from honeycombing to the section as shown on Standard Details.

Kerb and channel units shall be laid true to line and level in a flowing alignment and shallnot be backed until they have been inspected and approved by the Engineer.

Channels shall be laid in a broken joint bond with the kerbs.

TEMPORARY TRAFFIC SIGNS

Any design required for temporary traffic signs shall be carried out by the Contractor and submitted to the Engineer for approval.

PERMANENT WHITE ROAD MARKINGS

White road marking shall be in accordance with the latest National Traffic SignsRegulations and General Directions.

The material type shall be thermoplastic material complying with BS 3262 Part 1 Class Aand BS EN 1436 and shall be either sprayed, extruded or screed applied.

All markings shall be reflectorised.

Road marking shall be laid in accordance with BS 3262 Part 3.

SEWER REPLACEMENTS

In order to carry out sewer replacement works, it will be necessary for the Contractor to make arrangements to deal with existing flows by over-pumping or other appropriate method approved by the Engineer. All arrangements for dealing with flows shall be approved by the Engineer prior to any diversion of flows. No flow shall be permitted to pass to any natural watercourse or surface water drainage system and the Contractor shall take steps to minimise smell and noise nuisance arising from any diversion works.

MANHOLE AND CHAMBERS

Manholes and chambers, including pumping stations, for sewage shall be constructed withsulphate-resisting cement. Sulphate-resisting cement is required for benching, bases andtop slabs and covers of manholes and chambers. Precast concrete rings (components) forprecast concrete manholes shall be cast with sulphate-resisting cement.

Whenever the Bill of Quantities mentions ordinary Portland cement, this shall be deemed to include also the cost of sulphate-resisting cement.

MANHOLE COVER LIFTING AND REFITTING

The Contractor shall be responsible for the lifting and refitting of all manhole covers and for provision of temporary protection in the event that a manhole cover and frame is damaged whilst being lifted or temporarily set aside during flushing, cleaning survey and repair operations.

RODDING, FLUSHING AND CLEANING OF SEWERS

The Contractor is to clean all accumulated silt and debris from the sewerage systems as directed by the Engineer. At the end of the operation every sewer length shall be free fromall deposits and shall be flowing freely.

The Contractor shall make arrangements satisfactory to the Engineer for dealing with all flows into the sewer length to be cleansed, and shall adequately ventilate the length to eliminate all toxic gases before commencing cleansing.

After cleansing the Contractor shall inspect each length for indications of structuraldamage and inform the Engineer accordingly.

The techniques to be adopted for sewer cleansing are specified as rodding but the Contractor is required to select the most appropriate technique for each situation.

In some cases the sewers are surcharged due to blockage or damage and the Contractorwill be required to eliminate this condition.

Where the Contractor wishes to employ jetting or flushing techniques he shall make all thenecessary arrangements for locating a source of water, which must be approved by the Engineer; and shall include in his rates for all associated costs and charges.

Solid matter dislodged from the sewers shall be collected and carted from site. It shall notbe pumped to waste with the sewage flow or flushing water.

The Contractor shall submit a method statement giving comprehensive details, including safety measures, of his proposals for sewer cleansing, flow control and the intended sequence of operations.

The Contractor shall keep accurate records of the progress of the sewer cleansing works,identifying the techniques adopted and the size of pipe work to which each technique hasbeen applied, and shall submit this information to the engineer.

The cost of providing all water for flushing shall be included in the Contractor's rates.

SAFETY DURING SEWER CLEANSING

Cleansing of the gravity main shall require the establishment of safe working procedures inorder to protect operatives and other staff from hazards which can occur in this type of work.

The main objectives are to establish a safe working environment whereby:-

Traffic is diverted around the operational areas;

Pedestrians are denied access to working areas;

A safe physical working environment is created for operatives;

A safe atmosphere is established and monitored in the gravity main;

An effective and adequate rescue equipment is immediately to hand;

An effective communication system is maintained with the operational headquarters.

REHABILITATION OF EXISTING MANHOLE COVERS

The existing manholes which are damaged shall be rehabilitated where directed by the Engineer. The Contractor shall remove the existing damaged chamber cover slabs and replace them with the appropriate type approved for the project. The Contractor shall exercise extreme caution not to cause further damage to the existing manholes to be reused. Where instructed, the Contractor shall replace the manhole covers with the approved type for the project.

CONNECTING SULLAGE TO SEWERS

In some cases, sullage i.e. wastewater from kitchens, bathrooms and laundry is not dis- charged to the sewers but to the open storm water drains. This sullage or ‘grey water’ shall be connected to sewers.

MAINTENANCE OF FLOWS

Where existing live sewers and laterals (house connections) are to be replaced or tempo-rarily cut the Contractor shall make arrangements for sewage flows to be maintained by

use of temporary by-pass pipes, over-pumping or other methods. The Contractor shall submit details of his proposed method to the Engineer for approval prior to commencing the relevant section of the Works.

In addition to sewage flows all other flows of water through existing pipes, ditches, drains, ducts, culverts and the like shall be maintained. In some locations these flows may be seasonal or tidal and the Contractor shall ensure that adequate diversions are maintainedin places where such variable flows are known to pass.

GRANULAR BEDDING AND SURROUND TO GRAVITY PIPES

All sewer or stormwater pipes laid in rock or on mass concrete infill and all PVC/HDPE pipes shall be laid on granular bedding or as otherwise detailed on the drawings.

Granular bedding material shall consist of non flaky broken stone or gravel, graded 20 mmto 5 mm size and shall have a Compaction Fraction not greater than 0.3 as ascertained bythe test method described at the end of this clause.

Sand bedding material shall consist of approved local sand which material shall have a Compaction Fraction ascertained by the test method described below of not greater than
0.3. The Contractor shall provide all necessary testing apparatus for the use of the Engineer on site. Frequency of tests shall be at the discretion of the Engineer.

Before placing pipe bedding material the trench bottom shall be prepared and all loose stones, lumps of clay, rock projections, boulders and other hard spots removed. The approved bedding material shall then be laid over the full width of the trench to such depththat after the pipes have been laid to line and level, the thickness of bed beneath the barrel of the pipes is not less than 200 mm or as otherwise stated in the Bill of Quantities or on the drawings. The bedding material shall be evenly spread and carefully compacted and where the bedding beneath the pipe exceeds 200 mm in thickness it shall be placed in two separate equal layers. Any clay, large stones and other unsuitable material falling onto or into the bed from the trench sides or from any other source shall be immediately removed.

Should hand ramming fail to produce even compaction the Engineer may require mechanical compaction to be used, and the Contractor shall not be entitled to claim any extra payment on such account.

Timbering or any other form of trench support should be withdrawn, whenever possible, asthe bedding material is placed so as to avoid disturbance of the bedding by later removal.

Pipes shall be laid and jointed as specified elsewhere. Any adjustments to line and level must be made by adding or removing bedding material under the body of the pipe and notby wedging and blocking. All hard objects or timber shall be removed before laying the pipes.

After the pipes have been laid correctly to line and level the bedding material shall be brought up to half diameter of the pipe and compacted as before and so as to prevent anyvoids under the pipe barrel and give uniform support all round. Care shall be taken not to disturb the pipeline from its approved position at this stage and as the subsequent backfilling of the trench proceeds as specified elsewhere.

For HDPE non-pressure pipe and where sand or granular surround is billed, the pipe shallthen be covered with bedding material compacted as before to a depth of 150 mm above the top of the pipe barrel, or as otherwise shown on the drawings.

Where ground water conditions are such that the bedding material would be likely to act asa carrier for ground water from higher to lower ground, the Engineer may instruct flow barriers of suitable selected soil to be inserted in lieu of bedding material. Such barriers tobe erected at reasonable intervals close to flexible joints in the pipe, without alteration of the rate for bedding etc.

TESTING OF GRAVITY PIPELINES

All new sewers and gravity pipelines shall be water tested, before the pipes are backfilled,for leakage out of the pipeline in the presence of the Engineer under a minimum head of
1.2 m above the pipe soffit or, if higher, the ground water level at the upstream end and amaximum head not exceeding 6.0 m at the lowest point of the pipeline under test. The water loss from within the pipeline shall not exceed 10 ml per cm of diameter per kilometreper hour.

After temporary reinstatement of the trench and before the final reinstatement all new sewers shall be tested in the presence of the Engineer for the infiltration of ground water into the pipeline. The water flow into the pipeline shall not exceed 10 ml per cm. of diameter per kilometre per hour.

In every case the water for testing the pipes shall be left in the pipes until they are coveredwith earth or other trench filling materials to a depth of at least 1.25 m or to ground level ifthis is less, over the top of the pipes and until permission is given by the Engineer for the water to be released. If after the Engineer has approved the sewer and has given permission for the trenches to be refilled the pipes become damaged and lose water fromany cause and/or admit subsoil water the Contractor shall have the pipes uncovered and the defect made good and the pipes retested as before to the satisfaction of the Engineerand all at the Contractor's expense.

The Engineer may, exceptionally, permit the use of air or smoke tests in which case air orsmoke shall be pumped into the test length until a pressure equivalent to 100 mm of wateris indicated on a 'U' tube gauge. The pressure shall not fall below 75 mm at the end of thefive minutes.

The Contractor shall provide all labour, water, plugs, caps, bends, pumps, gauges and other needful appliances for conducting the tests and no pipes or other work shall be covered up until they have been seen and passed by the Engineer as being absolutely watertight.

WATER-TIGHTNESS AND CLEANLINESS GENERALLY

The manholes, chambers, etc., shall be substantially watertight, with no identifiable flow ofwater penetrating the permanent Works, and shall be clean throughout and may be testedas requested by and in the presence of the Engineer. The Contractor shall provide all labour, water, drain-stoppers, bends, pumps, gauges and other needful appliances for conducting the tests and shall remedy any leaks or other defects.

The Contractor shall remedy any defective or leaky pipes, etc. and remove all dirt, silt or other obstructions from them or failing the Contractor doing this the Engineer may arrangeto do so and deduct the cost of the same from any monies due to the Contractor. Such action shall not relieve the Contractor from any damages for which he may be liable in theevent of the Works not being completed in the Contract time.

The Contractor shall include in his rates and prices for all water-tightness tests.

PIPES KEPT CLEAN

All pipes must be kept thoroughly clean and no water will be allowed to flow in laid pipes during the construction of the Works unless by special written permission of the Engineer.The Contractor shall make all necessary provision for the temporary conveyance by means of troughs or other approved methods of any drainage water during the execution of the Works and he shall be entirely responsible for the cleansing of any ditches, channels, drains, etc. into which he may discharge such water.

A wooden ball or similar approved 25 mm less in diameter than the diameter of the pipes under inspection shall be passed through each length of sewer when so ordered by the Engineer and any obstruction found shall be removed by the Contractor.

All pipelines shall be subjected to inspection for cleanliness before the issue of the certificate of Completion.

SLOPE PROTECTION SLABS IN PROPOSED SLUDGE DISPOSAL WASTE STABILI-SATION PONDS

The Contractor shall construct a concrete beam at the bottom of the proposed embank- ment slabs to hold them in position in all the ponds. The Contractor shall undertake all theworks related to the construction of the new reinforced concrete sedimentation and stabilisation ponds. The Contractor shall submit a method statement giving compre- hensive details of his proposal for implementation of the slope protection slabs, flow con- trol and the intended sequence of operations

FILLING OF POND EMBANKMENTS

Material for filling of embankments shall be placed and compacted in layers not exceeding150 mm compacted thickness to the profiles shown on the Drawings. The filling shall be built up and compacted thoroughly and evenly and shall be maintained at all times with a sufficient cross fall to enable surface water to drain freely from it. Surplus excavated material shall be used wherever possible subject to the approval of the Engineer.

Suitable imported natural material for filling shall consist of uniform readily compactible material free from roots, vegetable matter, building debris, clay lumps retained on a 75 mm sieve and stones larger than 25 mm.

Granular fill shall consist of material having the following characteristics: 100% by weight passing a 40mm sieve, not more than 12% by weight passing a 12 mm sieve and Compaction fraction not exceeding 0.2.

Filled surfaces of embankments which are to be the final surface shall be trimmed and regulated to form an even surface free from slurry, loose material or debris and compactedas specified.

Rock fill, if required, shall consist of rock, broken stone, concrete or other hard inert material of a suitable size.

COMPACTION OF FILL IN EMBANKMENTS AND POND BASES

Each layer of fill shall be thoroughly and evenly compacted by means of an approved vibratory roller to the satisfaction of the Engineer. The fill shall be compacted to an average of at least 95% of the maximum dry density.

Where water has to be added to achieve the optimum moisture content it shall be appliedin an even manner. The rate of application shall be such that no transverse or longitudinalflow occurs. The previously compacted surface shall be prevented from drying out by watering prior to placing of the next layer.

Where the finished levels of the pond bases or banks are below existing ground levels, thebase or banks shall be compacted to an average of at least 95% of the maximum dry density for a depth of 150 mm below the finished levels.

SECURITY AND MANOEUVRABILITY AT THE POND SITE

The Contractor shall ensure that the site of the works shall be adequately protected by temporary or permanent fencing and gates to inhibit the access of members of the Public,and also livestock and wildlife, from entering the site and being exposed to danger. The Contractor shall ensure that the secure site can accommodate sufficient operating space for heavy-duty sludge disposal trucks.

EARTHWORK, PERMEABILITY TEST AND CLAY LINING FOR PONDS

All fill shall be carried out in layers not exceeding 150mm and will be compacted to 95% maximum dry density (MDD) at optimum moisture content (OMC). All finished cut surfacesshall be scarified and compacted to 95% MDD at OMC.

Upon completion of the earthworks the Contractor, shall carry out, at his cost, permeabilitytests to identify ‘K” coefficient of permeability. Each test should cover an area notexceeding 200sqm of the pond bottom surface. Where ‘K’ is ≤ 10-6m/s, the Contractor shall scarify and compact the surface in this area. Permeability test will be repeated in thisarea.

Clay lining, shall consist of imported CL (clayey silt) classification and will be spread to a thickness of 100 mm and compacted to 98% MDD at OMC.

DISPOSAL OF SURPLUS EXCAVATED MATERIAL

All surplus excavated material shall be disposed off the site. The Contractor shall be deemed to have allowed for haulage in his tender rate. Overhaul shall not be carried out until approval has been given by the Engineer.

COMMISSIONING OF PONDS

The Contractor may not commission the ponds until such time when he notifies the Engineer of his intent to do so and receives written approval from the Engineer to proceed.

The Contractor shall ensure that all flow controls are correctly set before commencing commissioning.

The Contractor shall take appropriate care when filling the ponds, to prevent erosion of thepond base at the point of impact of the initial inlet flows upon the pond base and side slopes. The commissioning of the ponds will involve filling up all the ponds with liquid to aminimum depth of 1 m to avoid growth of any grass and to permit the gradual develop- ment of the algal and bacterial populations. The Contractor may propose certain herbi- cides to prevent such growth of grass between the period of completion of the works and commissioning of the ponds.

WEEPHOLES

Where shown on the Drawings or directed by the Engineer, the Contractor shall cast weepholes into concrete walls. The Contractor shall provide and place plastic pipes of thediameter shown on the Drawings to form weepholes which will be firmly held in position during the placing of the concrete. A 500 mm x 500 mm square of approved filter fabric shall be placed, central on the weephole between the concrete wall and backfill material.

DEBRIS SCREENS

Where shown on the Drawings, the Contractor shall fabricate and install debris screens across the full width of the drain channel cross-section. The screens shall be fabricated using galvanised mild steel complying with BS 729. They shall be mounted on R.C. supports and incorporate a safe access platform to facilitate manual clearing of debris as shown on the Drawings.

CHAPTER 6

STANDARD SPECIFICATION REFERENCE NUMBERS (SSRN)

INDEX

NUMBERS	SUBJECT	PAGE
001- 092	Electrical and Mechanical Standards	1 - 3
100- 156	Concrete	4 - 5
200- 285	Metallic Pipes	6 - 10
300- 323	Plastic Pipes	11 - 12
401- 422	Other Pipes	13 - 14
501- 524	Valves, Surface Boxes & Meters	15
600- 680	Engineering General	16 - 17
700-759	Drawings & Glossaries	18 - 19
801-879	Building Works	20 - 24
900-946	Metal Work	25 - 27

SECTION VII- BILLS OF QUANTITIES

Construction of Sewer laterals in NAMSIP areas Kiganjo - Phase II

GRAND SUMMARY

Bill	Description	Bill Amount (KES)
1	PRELIMINARY AND GENERAL WORKS	-
2	CONSTRUCTION OF SEWERS LATERALS	-
SUB TOTAL (inclusive of TAXES and DUTIES)		
	CONTINGENCIES 10 %	
BILL OF QUANTITIES TOTAL (inclusive of TAXES and DUTIES)		

	PRELIMINARY AND GENERAL WORKS				1
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QUANTITY**	**RATE KES**	**AMOUNT KES**
	All rates in these Bills of Quantities are to include all taxes and duties.				
1-A	**GENERAL ITEMS**				
1-A1	**CONTRACTUAL REQUIREMENTS**				
1-A11	Performance Security	Sum	1		
1-A121	Contractor's all risk insurance (CAR)	Sum	1		
1-A2	**SPECIFIED REQUIREMENTS**				
1-A24	**New equipment for Use by Engineers Staff**				
1-A249.2	Provide and maintain Contractor owned RTK survey equipment as specified in the specifications during contract period for exclusive use of the Engineer. Contractor retains ownership of equipment.	month	6		
1-A249.6	Contractor's overheads & profit for items A249.2	%	#VALUE!	#VALUE!	
1-A25	**Attendance upon Contract Administrators**				
1-1.A252	Chainmen Provide (1 No.)	month	6		
	By Third Party Inspection (man-made other than pipes)				
1-A264.2	Concrete crush test: 150 mm moulds cubes in sets of 3 samples	nr	1		
1-A264.3	Steel Reinforcement: tensile strength test	nr	1		
	By Third Party Inspection (pipes)				
1-A266.5	Concrete pipes	nr	1		
1-A266.6	HDPE Pipes & Fittings	nr	1		
	Testing of Works				
1-A277	Test Run of Works 2 weeks prior & 2 weeks after substantial completion	Sum	1		
	Signboards				
1-A279	Provide project signboard as detailed in the drawings	nr	1		
1-A28	**Temporary Works**				
1-A282	Traffic diversions	Sum	1		
1-A282	Traffic regulation (including signages,warning tapes and warning signs); establishment, operation and removal	Sum	1		
1-A287	Provide & maintain 10 m head 100 m3/hr sewer pump for diverting flow from existing trunk sewer line & overpumping to downstream manholes for the entire project duration. Include 100 m temporary diversion piping.	Sum	1		
	TOTAL CARRIED FORWARD TO BILL COLLECTION SHEET				

	PRELIMINARY AND GENERAL WORKS				1
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QUANTITY**	**RATE KES**	**AMOUNT KES**
1-A381	**METHOD RELATED CHARGES** The Contractor to allow a lump sum amount to cater for his method related costs including overheads & profits by considering the following site conditions: (i) The sewer lines will be laid in areas with numerous active Existing Services, both on the surface and buried; and along busy Streets/ Roads in Commercial and Residential areas. (ii) The works are to be carried out in congested Built-up areas with limited working space and limited access for Mechanical Equipment. The area is predominantly rocky. (iii) The sewerlines will be constructed mainly along road reserves. Execution of Works in such conditions are deemed to be included in the Contractor's Rates.	Sum	1		
1-A382	Contractor's Camp and Storage Yard: Allow for any costs, overheads and profit for establishment of the Contractor's Camp(s), Offices, Storage Yard and other facilities including mobilization, demobilization and removal on Completion. Include for all equipment, temporary measures, machines, tools, materials, facilities for workers, water and electricity supply etc. all as specified for execution of the Works, for the entire Contract Period	Sum	1		
1-A383	Setting Out of the Works: To be done in accordance with Specifications. The Work will entails establishment of Level Datum, setting out of the Works in accordance with Specifications, staking out of the construction wayleave along all Sewer Line routes, Topographical Survey, preparation of updated Layout Plans (with Contours at 1m interval), submission of plans & sewer profiles and Setting Out of proposed manholes and pipelines	m	1,150		
1-A384	Allow for any costs of implementing all Environment, Health (including Covid-19) and Safety Requirements as per prevailing Legislation	Sum	1		
1-A384	Provisional Sum of KES 300000 for any payments for services by roads authorities, County Government, NEMA etc and any other that have any statutory jurisdiction over the works. Rate to include sourcing road cutting permits and reinstatement to standard, permits to work on road verges and tree cutting permits as may be required.	Sum	1		
1-A385	Allow for desilting of the existing manholes in vicinity of the works and as instructed by the Engineer. Rate to include repair/replacement and realignment of the of damaged/collapsed sections of the manholes and disposal of the solid and liquid wastes to appropriate sites	nr	2		
1-A387	Provide "As Built drawings" in AutoCAD and 5nr A3 hard copies and Operation and maintenance manuals for all plant, and equipment installed or constructed and rehabilitated. Include general layouts, pipeline profiles, chamber plans, sections & reinforcemnt detailing	Sum	1		
	TOTAL CARRIED FORWARD TO BILL COLLECTION SHEET				

	PRELIMINARY AND GENERAL WORKS				1
ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE KES	AMOUNT KES
COLLECTION SHEET					
	PAGE NO.				
	1				
	2				
	TOTAL CARRIED TO SUMMARY SHEET				-

	CONSTRUCTION OF SEWERS LATERALS				2
ITEM No.	D E S C R I P T I O N	UNIT	QUANTITY	RATE	AMOUNT (KES)
	Rates to include all taxes and duties				
	CLASS A - GENERAL ITEMS				
	Testing of the Works				
3-A260.2	Carrying out test on sewer line				
	Include provision of all equipment and materials	m	1,150		
	CLASS B - SITE INVESTIGATION				
3-B111	1.5 m x 1.5 m Trial pits/holes				
	Depth n.e 4 m	nr	23		
	CLASS D - DEMOLITION AND SITE CLEARANCE				
	Pipeline and access track				
3-D100	Nom. Bore 200 mm socket & spigot joints	m	1,150		
	Dense bush and thicket, removal from site and disposedof	m^2			
3-D154	as directed		4,600		
	CLASS I: PIPEWORK-PIPES, SEWERS & FITTINGS - SUPPLY ONLY				
	225 mm HDPE Double-Wall Corrugated	m			
	socket endedsewer pipes SN 8 to specifications				
3-I1924.n	Nom. Bore 200 mm socket & spigot joints		1,150		
	CLASS J: PIPEWORK-PIPES, SEWERS & FITTINGS-INSTALL				
	Method of Measurement type A in metres				
	HDPE Pipes In trenches & piers, beddings & concrete haunches				
	The rates entered against the items in this section shall include for stripping top soil, laying aside and subsequently replacing over refilled trench, excavation in trench in all materials including rock, shoring, strutting, shuttering where necessary, refilling and compacting, spreading surplus soil evenly over and alongside pipe trench compacting, lay, jointing, bedding and haunching type "D" as per drawing THIWASCO/SD/7.0 sheets 1 & 2. for the entire length of pipeline to correct depths, line & level.				
	Installation of Supplied Pipe Nominal Bore: 200 mm				
3-J1933	In trenches, depth: 1.0 m - 1.5 m	m m	100		
3-J1934	In trenches, depth: 1.5 m - 2.0 m	mm	400		
3-J1935	In trenches, depth: 2.0 m - 3.0 m		600		
3-J1936	In trenches, depth: 3.0 m - 4.0 m		50		
	CLASS K: PIPEWORK - MANHOLES & SEWER WORK ANCILLARIES				
	Manholes & other chambers, in accordance with standard drawings				
	The rates entered are to include for: Excavating in all types of soils including rock, manhole base, manhole rings, shuttering where necessary, concrete slabs and covers, step irons or ladder, backfilling and compacting around manholes, and disposing of surplus material				
	Precast concrete sewer manholesPipe	nr nr			
	Nominal Bore: 200	nr nr			
3-K1577.4	Depth not exceeding 2.0 m	nr	2		
3-K1577.5	Depth 2.0 m - 3.0 m		10		
3-K1577.4	Depth 3.0 m - 4.0 m		2		
3-K1577.5	Depth 4.0 m - 5.0 m	nr nr	2		
3-K1577.6	Depth 5.0 m - 6.0 m	nr	2		
	Precast concrete sewer manholes with dropsDepth				
3-K1577.4a	not exceeding 2.0 m		1		
3-K1577.5a	Depth 2.0 m - 3.0 m		1		
3-K1577.4a	Depth 3.0 m - 4.0 m		1		
	PAGE TOTAL CARRIED FORWARD TO SECTION COLLECTION SHEET				

	CONSTRUCTION OF SEWERS LATERALS				2
ITEM No.	D E S C R I P T I O N	UNIT	QUANTITY	RATE	AMOUNT (KES)
	Crossings Sewer, ditch or drain crossing Allow for microtunneling of under drains. Rate to include for incorporation of any special materials required to cross the drain as per drawings				
3-K621	Pipe Nominal Bore: 200	nr	10		
	Reinstatement Breaking up and temporary reinstatement - unsurfaced road Allow for Crossing of roads. Rate to include for incorporation of any special materials required to cross the road as per drawings				
3-K721	Pipe Nominal Bore: 200	m	45		
	Breaking up and temporary reinstatement - surfaced road Allow for Crossing of roads. Rate to include for incorporation of any special materials required to cross the road as per drawings				
3-K731	Pipe Nominal Bore: 200	m	30		
	CLASS L: SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	Extras to Excavation and Backfilling Trenches (Note: Blasting not allowed for any rock excavation)				
	Other than in pipe trenches and as directed				
3-L171	Excavation of rock	m^3m	450		
	Beds: pipe beddings using imported granular materialPipe				
3-L337	Nominal Bore: 200	m	150		
	Haunches: using mass concrete				
3-L447	Concrete haunch type D to Pipe of Nominal Bore: 200	m	150		
	300 mm thick concrete surrounds				
3-L547	Pipe Nominal Bore: 200		150		
	Customer Connections	nr			
3-X9.1	Provide OD 160 HDPE pipes for connection of new & reconnection of existing THIWASCO customers. Rate to include all material required for Inspection Chamber.		250		
	PAGE TOTAL CARRIED FORWARD TO SECTION COLLECTION SHEET				

	CONSTRUCTION OF SEWERS LATERALS				2
ITEM No.	D E S C R I P T I O N	UNIT	QUANTITY	RATE	AMOUNT (KES)

COLLECTION SHEET

PAGE NO.

1

2

TOTAL CARRIED TO GRAND SUMMARY	-

PART III - CONDITIONS OF CONTRACT AND CONTRACT FORMS

SECTION VIII - GENERAL CONDITIONS OF CONTRACT

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

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

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

General Conditions of Contract

A. General

1. Definitions

1.1 Bold face type is used to identify defined terms.

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

b) **The Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.

c) **The Adjudicator** is the person appointed jointly by the Procuring Entity and the Contractor to resolve disputes in the first instance, as provided for in GCC 23.

d) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

e) **Compensation Events** are those defined in GCC Clause 42 hereunder.

f) **The Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC Sub-Clause 53.1.

g) **The Contract** is the Contract between the Procuring Entity and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC Sub-Clause 2.3 below.

h) **The Contractor** is the party whose Bid to carry out the Works has been accepted by the Procuring Entity.

i) **The Contractor's Bid** is the completed bidding document submitted by the Contractor to the Procuring Entity.

j) **The Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

k) **Days** are calendar days; months are calendar months.

l) **Day work**s are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

m) **A Defect** is any part of the Works not completed in accordance with the Contract.

n) **The Defects** Liability Certificate is the certificate issued by Project Manager upon correction of defects by the Contractor.

o) **The Defects Liability Period** is the period **named in the SCC** pursuant to Sub-Clause 34.1 and calculated from the Completion Date.

p) **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, include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

q) **The Procuring Entity** is the party who employs the Contractor to carry out the Works, **as specified in the SCC,** who is also the Procuring Entity.

r) **Equipmen**t is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

s) **"In writing" or "written"** means hand-written, type-written, printed or electronically made, and resulting in a permanent record;

t) The Initial Contract Price is the Contract Price listed in the Procuring Entity's Letter of Acceptance.

u) **The Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is **specified in the SCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

v) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

w) **Plant i**s any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

x) **The Project Manager** is the person **named in the SCC** (or any other competent person appointed by the Procuring Entity and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

y) **SCC** means Special Conditions of Contract.

z) **The Site** is the area of the works as **defined as such in the SCC**.

aa) **Site Investigation Reports** are those that were included in the bidding document and are factual and interpretative reports about the surface and subsurface conditions at the Site.

bb) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

cc) **The Start Date** is **given in the SCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

dd) **A Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

ee) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

ff) **A Variation** is an instruction given by the Project Manager which varies the Works.

gg) **The Works** are what the Contract requires the Contractor to construct, install, and turn over to the Procuring Entity, **as defined in the SCC**.

2. Interpretation

21 In interpreting these GCC, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

22 If sectional completion is specified in the SCC, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

23 The documents forming the Contract shall be interpreted in the following order of priority:

a) Agreement,
b) Letter of Acceptance,
c) Contractor's Bid,
d) Special Conditions of Contract,
e) General Conditions of Contract, including Appendices,
f) Specifications,
g) Drawings,
h) Bill of Quantities[6], and
i) any other document **listed in the SCC** as forming part of the Contract.

[6] *In lump sum contracts, delete "Bill of Quantities" and replace with "Activity Schedule."*

3. Language andLaw

3.1 The language of the Contract is English Language and the law governing the Contract are the Laws of Kenya.

3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Procuring Entity's Country when

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 from that country or any payments to any country, person, or entity in that country.

4. Project Manager's Decisions

4.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Procuring Entity and the Contractor in the role representing the Procuring Entity.

5. Delegation

5.1 Otherwise **specified in the SCC,** the Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may revoke any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

7. Subcontracting

7.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Procuring Entity in writing. Subcontracting shall not alter the Contractor's obligations.

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Procuring Entity between the dates given in the Schedule of Other Contractors, as **referred to in the SCC.** The Contractor shall also provide facilities and services for them as described in the Schedule. The Procuring Entity may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

9. Personnel andEquipment

9.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid, to carry out the Works or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

9.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

9.3 If the Procuring Entity, Project Manager or Contractor determines, that any employee of the Contractor be determined to have engaged in Fraud and Corruption during the execution of the Works, then that employee shall be removed in accordance with Clause 9.2 above.

10. Procuring Entity's and Contractor's Risks

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

11. Procuring Entity's Risks

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

a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to

i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or

ii) negligence, breach of statutory duty, or interference with any legal right by the Procuring Entity or by any person employed by or contracted to him except the Contractor.

b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Procuring Entity or in the Procuring Entity's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

11.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is a Procuring Entity's risk except loss or damage due to

aa) a Defect which existed on the Completion Date,

bb) an event occurring before the Completion Date, which was not itself a Procuring Entity's risk, or

cc) the activities of the Contractor on the Site after the Completion Date.

12. Contractor's Risks

12.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Procuring Entity's risks are Contractor's risks.

13. Insurance

13.1 The Contractor shall provide, in the joint names of the Procuring Entity and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles **stated in the SCC** for the following events which are due to the Contractor's risks:

a) loss of or damage to the Works, Plant, and Materials;

b) loss of or damage to Equipment;

c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

d) personal injury or death.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

13.3 If the Contractor does not provide any of the policies and certificates required, the Procuring Entity may effect the insurance which the Contractor should have provided and recover the premiums the Procuring Entity has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

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

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

14. Site Data

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

15. Contractor to Construct the Works

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

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

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

17. Approval by the Project Manager

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

17.2 The Contractor shall be responsible for design of Temporary Works.

17.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

17.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

17.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

18. Safety

18.1 The Contractor shall be responsible for the safety of all activities on the Site.

19. Discoveries

19.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Procuring Entity. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

20. Possession of the Site

20.1 The Procuring Entity shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date **stated in the SCC,** the Procuring Entity shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

21. Access to the Site

21.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

22. Instructions, Inspections and Audits

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

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

22.3 The Contractor shall permit and shall cause its subcontractors and sub-consultants to permit, the Procuring Entity and/or persons appointed by the Public Procurement Regulatory Authority 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 Public Procurement Regulatory Authority. The Contractor's and its Subcontractors' and sub-consultants' attention is drawn to Sub-Clause 25.1 (Fraud and Corruption) which provides, inter alia, that acts intended to materially impede the exercise of the Public Procurement Regulatory Authority's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Public Procurement Regulatory Authority's prevailing sanctions procedures).

23. Appointment of the Adjudicator

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

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

24. Settlement of Claims and Disputes

24.1 Contractor's Claims

24.1.1 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 Project Manager, 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.

24.1.2 If the Contractor fails to give notice of a claim within such period of 30 days, 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.

24.1.3 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.

24.1.4 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 Project Manager. Without admitting the Procuring Entity's liability, the Project Manager 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 Project Manager to inspect all these records, and shall (if instructed) submit copies to the Project Manager.

24.1.5 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 Project Manager, the Contractor shall send to the Project Manager 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 Project Manager 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 Project Manager.

24.1.6 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 Project Manager and approved by the Contractor, the Project Manager 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.

24.1.7 Within the above defined period of 42 days, the Project Manager shall proceed in accordance with Sub-Clause

24.1.8 [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.

24.1.9 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.

24.1.10 If the Project Manager does not respond within the timeframe defined in this Clause, either Party may consider that the claim is rejected by the Project Manager and any of the Parties may refer to Arbitration in accordance with Sub-Clause 24.4 [Arbitration].

24.1.11 The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a 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 this Sub-Clause 24.3.

242 Amicable Settlement

24.2.1 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 24.1 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.

243 Matters that may be referred to arbitration

24.3.1 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 Project Manager upon the said person ceasing to act.
b) Whether or not the issue of an instruction by the Project Manager 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 Contractor agree otherwise in writing.

244 Arbitration

24.4.1 Any claim or dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 24.3 shall be finally settled by arbitration.
24.4.2 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.
24.4.3 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.
24.4.4 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.
24.4.5 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.
24.4.6 The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Project Manager, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Project Manager from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.
24.4.7 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.
24.4.8 Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, and the Project Manager shall not be altered by reason of any arbitration being conducted during the progress of the Works.
24.4.9 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.

24.5 Arbitration with National Contractors

24.5.1 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

24.5.2 The institution written to first by the aggrieved party shall take precedence over all other institutions.

24.6 Alternative Arbitration Proceedings

24.6.1 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.

24.7 Failure to Comply with Arbitrator's Decision

24.7.1 The award of such Arbitrator shall be final and binding upon the parties.

24.7.2 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.

24.8 Contract operations to continue

24.8.1 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.

25. Fraud and Corruption

25.1 The Government requires compliance with the country's Anti-Corruption laws and its prevailing sanctions policies and procedures as set forth in the Constitution of Kenya and its Statutes.

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

B. Time Control

26. Program

26.1 Within the time stated in the SCC, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.

26.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

26.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the SCC. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the SCC from the next payment certificate and

continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.

26.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

27. Extension of the Intended Completion Date

27.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

27.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

28. Acceleration

28.1 When the Procuring Entity wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Procuring Entity accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Procuring Entity and the Contractor.

28.2 If the Contractor's priced proposals for an acceleration are accepted by the Procuring Entity, they are incorporated in the Contract Price and treated as a Variation.

29. Delays Ordered by the Project Manager

29.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

30. Management Meetings

30.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

30.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Procuring Entity. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

31. Early Warning

31.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

31.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

C. Quality Control

32. Identifying Defects

32.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

33. Tests

33.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

34. Correction of Defects

34.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the SCC. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

34.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

35. Uncorrected Defects

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

D. Cost Control

36. Contract Price[7]

36.1 The Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

37. Changes in the Contract Price[8]

37.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Procuring Entity.

37.2 If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

38. Variations

38.1 All Variations shall be included in updated Programs9 produced by the Contractor.

38.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

38.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

38.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

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[7] *In lump sum contracts, replace GCC Sub-Clauses 36.1 as follows:*

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

[8] *In lump sum contracts, replace entire GCC Clause 37 with new GCC Sub-Clause 37.1, as follows:*
The Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

[9] *In lump sum contracts, add "and Activity Schedules" after "Programs."* [10] *In lump sum contracts, delete this paragraph.*

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

38.6 If the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in Sub-Clause 39.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work

38.7 Value Engineering: The Contractor may prepare, at its own cost, a value engineering proposal at any time during the performance of the contract. The value engineering proposal shall, at a minimum, include the following;

a) the proposed change(s), and a description of the difference to the existing contract requirements;
b) a full cost/benefit analysis of the proposed change(s) including a description and estimate of costs (including life cycle costs) the Procuring Entity may incur in implementing the value engineering proposal; and
c) a description of any effect(s) of the change on performance/functionality.

38.8 The Procuring Entity may accept the value engineering proposal if the proposal demonstrates benefits that:

a) accelerate the contract completion period; or
b) reduce the Contract Price or the life cycle costs to the Procuring Entity; or
c) improve the quality, efficiency, safety or sustainability of the Facilities; or
d) yield any other benefits to the Procuring Entity, without compromising the functionality of the Works.

38.9 If the value engineering proposal is approved by the Procuring Entity and results in:

a) a reduction of the Contract Price; the amount to be paid to the Contractor shall be the **percentage specified in the SCC** of the reduction in the Contract Price; or
b) an increase in the Contract Price; but results in a reduction in life cycle costs due to any benefit described in (a) to (d) above, the amount to be paid to the Contractor shall be the full increase in the Contract Price.

39. Cash FlowForecasts

39.1 When the Program[11], is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

40. Payment Certificates

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

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

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

40.4 The value of work executed shall comprise the value of the quantities of work in the Bill of Quantities that have been completed12.

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

40.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

40.7 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*.

41. Payments

41.1 Payments shall be adjusted for deductions for advance payments and retention. The Procuring Entity shall pay the Contractor the amounts certified by the Project Manager within 30 days of the date of each certificate. If the Procuring Entity makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.

41.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

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

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

42. Compensation Events

42.1 The following shall be Compensation Events:

d) The Procuring Entity does not give access to a part of the Site by the Site Possession Date pursuant to GCC Sub-Clause 20.1.

e) The Procuring Entity modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

f) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

g) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

h) The Project Manager unreasonably does not approve a subcontract to be let.

i) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

j) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Procuring Entity, or additional work required for safety or other reasons.

k) Other contractors, public authorities, utilities, or the Procuring Entity does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

l) The advance payment is delayed.

m) The effects on the Contractor of any of the Procuring Entity's Risks.

n) The Project Manager unreasonably delays issuing a Certificate of Completion.

42.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

42.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

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[11] *In lump sum contracts, add "or Activity Schedule" after "Program."*

[12] *In lump sum contracts, replace this paragraph with the following: "The value of work executed shall comprise the value of completed activities in the Activity Schedule."*

42.4 The Contractor shall not be entitled to compensation to the extent that the Procuring Entity's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

43. Tax

43.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 30 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC Clause 44.

44. Currency y of Payment

44.1 All payments under the contract shall be made in Kenya Shillings

45. Price Adjustment

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

P = A + B Im/Io

where: P is the adjustment factor for the portion of the Contract Price payable.

A and B are coefficients[13] **specified in the SCC,** representing the non-adjustable and adjustable portions, respectively, of the Contract Price payable and Im is the index prevailing at the end of the month being invoiced and IOC is the index prevailing 30 days before Bid opening for inputs payable.

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

46. Retention

46.1 The Procuring Entity shall retain from each payment due to the Contractor the proportion stated in the **SCC** until Completion of the whole of the Works.

46.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 53.1, half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" Bank guarantee.

47. Liquidated Damages

47.1 The Contractor shall pay liquidated damages to the Procuring Entity at the rate per day stated in the **SCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the SCC. The Procuring Entity may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

47.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC Sub-Clause 41.1.

48. Bonus

48.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day **stated in the SCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

49. Advance Payment

49.1 The Procuring Entity shall make advance payment to the Contractor of the amounts stated in the **SCC** by the date stated in the **SCC**, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Procuring Entity in amounts and currencies equal to the advance payment. The Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.

49.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

49.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

50. Securities

50.1 The Performance Security shall be provided to the Procuring Entity no later than the date specified in the Letter of Acceptance and shall be issued in an amount **specified in the SCC,** by a bank or surety acceptable to the Procuring Entity, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 day from the date of issue of the Certificate of Completion in the case of a Bank Guarantee, and until one year from the date of issue of the Completion Certificate in the case of a Performance Bond.

51. Dayworks

51.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

51.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.

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

52. Cost of Repairs

52.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

53. Completion

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

54. Taking Over

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

55. Final Account

55.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

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[13] *The sum of the two coefficients A and B should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulae for all currencies, since coefficient A, for the non-adjustable portion of the payments, is a very approximate figure (usually 0.15) to take account of fixed cost elements or other non-adjustable components. The sum of the adjustments for each currency are added to the Contract Price.*

56. Operating and Maintenance Manuals

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

56.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the SCC pursuant to GCC Sub-Clause 56.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount **stated in the SCC** from payments due to the Contractor.

57. Termination

57.1 The Procuring Entity or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

57.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

a) the Contractor stops work for 30 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager;

b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 30 days;

c) the Procuring Entity or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

d) a payment certified by the Project Manager is not paid by the Procuring Entity to the Contractor within 84 days of the date of the Project Manager's certificate;

e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

f) the Contractor does not maintain a Security, which is required;

g) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as **defined in the SCC**; or

h) if the Contractor, in the judgment of the Procuring Entity has engaged in Fraud and Corruption, as defined in paragraph 2.2 a of the Appendix A to the GCC, in competing for or in executing the Contract, then the Procuring Entity may, after giving fourteen (14) days written notice to the Contractor, terminate the Contract and expel him from the Site.

57.3 Notwithstanding the above, the Procuring Entity may terminate the Contract for convenience.

57.4 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

57.5 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC Sub-Clause 56.2 above, the Project Manager shall decide whether the breach is fundamental or not.

58. Payment upon Termination

58.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as specified in the SCC. Additional Liquidated Damages shall not apply. If the total amount due to the Procuring Entity exceeds any payment due to the Contractor, the difference shall be a debt payable to the Procuring Entity.

58.2 If the Contract is terminated for the Procuring Entity's convenience or because of a fundamental breach of Contract by the Procuring Entity, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

59. Property

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

60. Release from Performance

60.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Procuring Entity or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment wasmade.

SECTION IX - SPECIAL CONDITIONS OF CONTRACT

Except where otherwise specified, all Special *Conditions of Contract should be filled in by the Procuring Entity prior to issuance of the bidding document. Schedules and reports to be provided by the Procuring Entity should be annexed.*

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	A. General
GCC 1.1 (q)	The Procuring Entity is: **Thika Water and Sewerage Company Ltd of P.O. Box 6103-01000, Thika**
GCC 1.1 (u)	The Intended Completion Date for the whole of the Works shall be: 6 months after contract signature
GCC 1.1 (x)	The Engineer is:
GCC 1.1 (z)	The Site is located at **Kiganjo area.**
GCC 1.1 (cc)	The Start Date shall be: 7 days after contract signature
GCC 1.1 (gg)	The Works consist of: **Construction of additional laterals in NAMSIP areas in Kiganjo-phase II**
GCC 2.2	Sectional Completions are: **Not Applicable**
GCC 5.1	The Engineer may delegate any of his duties and responsibilities.
GCC 8.1	Schedule of other contractors: **Not Appropriate**
GCC 9.1	**Key Personnel** GCC 9.1 is replaced with the following: 9.1 Key Personnel are the Contractor's personnel named in this GCC 9.1 of the Special Conditions of Contract. The Contractor shall employ the Key Personnel and use the equipment identified in its Bid, to carry out the Works or other personnel and equipment approved by the Engineer. The Engineer shall approve any proposed replacement of Key Personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid. [insert the name/s of each Key Personnel agreed by the Procuring Entity prior to Contract signature.]
GCC 13.1	The minimum insurance amounts and deductibles shall be:as indicated in the BOQs (a) for loss or damage to the Works, Plant and Materials: *[insert amounts]*. (b) For loss or damage to Equipment: *[insert amounts]*. (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract *[insert amounts]*. (d) for personal injury or death: (i) of the Contractor's employees: *[amount]*. (ii) of other people: *[amount]*.
GCC 14.1	Site Data are: *[list Site Data]*
GCC 20.1	The Site Possession Date(s) shall be: *[as shall be agreed by both parties]*
GCC 23.1 &	Appointing Authority for the Adjudicator: **NCIA**

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
GCC 23.2	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: **As it shall be agreed upon by both parties**
B. Time Control	
GCC 26.1	The Contractor shall submit for approval a Program for the Works within (14**)** days from the date of the Letter of Acceptance.
GCC 26.3	The period between Program updates is **(30)** days. The amount to be withheld for late submission of an updated Program is [*inset amount]*.
C. Quality Control	
GCC 34.1	The Defects Liability Period is: *[365]* days. *[The Defects Liability Period is usually limited to 12 months, but could be less in very simple cases]*
D. Cost Control	
GCC 38.9	If the value engineering proposal is approved by the Procuring Entity the amount to be paid to the Contractor shall be _10__% of the reduction in the Contract Price.
GCC 44.1	The currency of the Procuring Entity's Country is: **Kenya Shilings**
GCC 45.1	The Contract **is not** subject to price adjustment in accordance with GCC Clause 45, and the following information regarding coefficients **does not** apply. The coefficients for adjustment of prices are: (a) *[insert percentage]* percent nonadjustable element (coefficient A). (b) *[insert percentage]* percent adjustable element (coefficient B). (c) The Index I for shall be *[insert index]*.
GCC 46.1	The proportion of payments retained is: **5%**
GCC 47.1	The liquidated damages for the whole of the Works are **0.1%** per day. The maximum amount of liquidated damages for the whole of the Works is **10%** of the final Contract Price.
GCC 49.1	The Advance Payments shall be: **Not Applicable**
GCC 50.1	The Performance Security amount is *[insert amount]* (a) Performance Security – Bank Guarantee: in the amount(s) of **1%** percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount. (b) Performance Security – Performance Bond: in the amount(s) of **1%** percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount.
E. Finishing the Contract	
GCC 57.2 (g)	The maximum number of days is: **( )**
GCC 58.1	The percentage to apply to the value of the work not completed, representing the Procuring Entity's additional cost for completing the Works, is: **Not Applicable**

FORM No 1: 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 on the format below.

FORMAT

1. For the attention of Tenderer's Authorized Representative
   - *i)* Name: *[insert Authorized Representative's name]*
   - *ii)* Address: *[insert Authorized Representative's Address]*
   - *iii)* Telephone: *[insert Authorized Representative's telephone/fax numbers]*
   - *iv)* 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.]

2. Date of transmission: [*email*] on [*date*] (local time)

   This Notification is sent by (*Name and designation*) _____

3. Notification of Intention to Award

   - *i)* Procuring Entity: *[insert the name of the Procuring Entity]*
   - *ii)* Project: *[insert name of project]*
   - *iii)* Contract title: *[insert the name of the contract]*
   - *iv)* Country: *[insert country where ITT is issued]*
   - *v)* ITT No: *[insert ITT reference number from Procurement Plan]*

   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:

4. Request a debriefing in relation to the evaluation of your tender

   Submit a Procurement-related Complaint in relation to the decision to award the contract.

   a) The successful tenderer

      i) Name of successful Tender_____

      ii) Address of the successful Tender _____

      iii) Contract price of the successful Tender Kenya Shillings _____ (in words_____)

   b) Other Tenderers

   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. For Tenders not evaluated, give one main reason the Tender was unsuccessful.

SNo	Name of Tender	Tender Price as read out	Tender's evaluated price (Note a)	One Reason Why not Evaluated
1				
2				
3				
4				
5				

(Note a) State NE if not evaluated

5. How to request a debriefing

a) DEADLINE: The deadline to request a debriefing expires at midnight on [*insert date*] (*local time*).

b) 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 (5) Business Days of receipt of this Notification of Intention to Award.

c) Provide the contract name, reference number, name of the Tenderer, contact details; and address the request for debriefing as follows:

i) Attention: [*insert full name of person, if applicable*]

ii) Title/position: [*insert title/position*]

ii) Agency: [*insert name of Procuring Entity*]

iii) Email address: [*insert email address*]

d) If your request for a debriefing is received within the 3 Days deadline, we will provide the debriefing within five (3) 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 (3) 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.

e) 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.

f) 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) Days from the date of publication of the Contract Award Notice.

6. How to make a complaint

a) Period: Procurement-related Complaint challenging the decision to award shall be submitted by midnight, [*insert date*] (local time).

b) Provide the contract name, reference number, name of the Tenderer, contact details; and address the Procurement-related Complaint as follows:

i) Attention: [*insert full name of person, if applicable*]

ii) Title/position: [*insert title/position*]

iii) Agency: [*insert name of Procuring Entity*]

iv) Email address: [*insert email address*]

c) 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.

d) Further information: For more information refer to the Public Procurement and Disposals Act 2015 and its Regulations available from the Website info@ppra.go.ke or complaints@ppra.go.ke.

You should read these documents before preparing and submitting your complaint.

e) There are four essential requirements:

i) 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.

ii) The complaint can only challenge the decision to award the contract.

iii) You must submit the complaint within the period stated above.

iv) You must include, in your complaint, all of the information required to support your complaint.

7. Standstill Period

i) DEADLINE: The Standstill Period is due to end at midnight on [*insert date*] (local time).

ii) The Standstill Period lasts ten (14) Days after the date of transmission of this Notification of Intention to Award.

iii) The Standstill Period may be extended as stated in paragraph Section 5 (d) above.

If you have any questions regarding this Notification please do not hesitate to contact us. On behalf of the Procuring Entity:

Signature:_____ **Name:**_____

Title/position:_____ **Telephone:**___ **Email:** _____

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

[letterhead paper of the Procuring Entity] [date]

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

This is to notify you that your Tender dated *[date]* for execution of the *[name of the Contract and identification number, as given in the Contract Data]* 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 …… (*name of Procuring Entity)*.

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 VIII, Contract Forms, of the Tender Document.

Authorized Signature:.....

Name and Title of Signatory:.....

Name of Procuring Entity.....

Attachment: *Contract Agreement*.....

FORM NO 4: CONTRACT AGREEMENT

THIS AGREEMENT made the_____day of_____, 20____, between _____of _____ (hereinafter "the Procuring Entity"), of the one part, and_____of_____(hereinafter "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 Special Conditions of Contract
   e) the General Conditions of Contract;
   f) the Specifications
   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 and sealed by_____(for the Procuring Entity)

Signed and sealed by_____(for the Contractor).

FORM NO. 5 - PERFORMANCE SECURITY

[Option 1 - Unconditional Demand Bank Guarantee]

[Guarantor letterhead]

Beneficiary:_____*[insert name and Address of* Procuring Entity*]* **Date:**_____

_____*[Insert date of issue]*

Guarantor: [*Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that_____(hereinafter called "the Contractor") has entered into Contract No._____dated_____with (*name of Procuring Entity*)_____(the Procuring Entity as the Beneficiary), for the execution of _____(hereinafter called "the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

3. At the request of the Contractor, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of_____(*in words*),[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 the 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 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.*

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 letterhead]*

1. By this Bond_____as Principal (hereinafter called "the Contractor") and_____] as Surety (hereinafter called "the Surety"), are held and firmly bound unto_____] as Obligee (hereinafter called "the Procuring Entity") in the amount of_____for the payment of which sum well and truly to be made in the types and proportions of currencies in which the Contract Price is payable, the Contractor and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

2. WHEREAS the Contractor has entered into a written Agreement with the Procuring Entity dated the _____day of_____, 20 , for_____in accordance with the documents, plans, specifications, and amendments thereto, which to the extent herein provided for, are by reference made part hereof and are hereinafter 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 thereunder, 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 herein or the heirs, executors, administrators, successors, and assigns of the Procuring Entity.

6. In testimony whereof, the Contractor has hereunto 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 behalfof 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]

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_____(hereinafter called "the Contractor") has entered into Contract No._____*dated*_____with the Beneficiary, for the execution of _____ (hereinafter called "the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum _____(*in words*) is to be made against an advance payment 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_____(*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 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 Contractor 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 Contractor 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.

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[1]*The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency of the advance payment as specified*
in the Contract.
[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.*

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]* (hereinafter 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*]* (hereinafter called "the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, and payment of *[*insert the second half of the Retention Money] is to be made against a Retention Money guarantee.

3. At the request of the Contractor, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]*_____(*[insert amount in words*_____*])*[1] upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

4. A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the second half of the Retention Money as referred to above has been credited to the Contractor on its account number_____at_____*[insert name and address of Applicant's bank]*.

5. This guarantee shall expire no later than the …..... Day of ….....……, 2.....…[2], and any demand for payment under it must be received by us at the office indicated above on or before that date.

6. The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed *[six months] [one year]*, in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.

[Name of Authorized Official, signature(s) and seals/stamps]

Note: All italicized text (including 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 second half of the Retention Money.*
[2]*Insert a date that is twenty-eight days after the expiry of retention period after the actual completion date of the contract. The Procuring Entity should note that in the event of an extension of this date for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee.*

FORM NO. 9 BENEFICIAL OWNERSHIP DISCLOSURE FORM

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

INSTRUCTIONS TO TENDERERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful tenderer pursuant to Regulation 13 (2A) and 13 (6) of the Companies (Beneficial Ownership Information) Regulations, 2020. In case of joint venture, the tenderer must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Tenderer is any natural person who ultimately owns or controls the legal person (tenderer) or arrangements or a natural person on whose behalf a transaction is conducted, and includes those persons who exercise ultimate effective control over a legal person (Tenderer) or arrangement.

Tender Reference No.:_____[*insert identification no*]

Name of the Tender Title/Description:_____*[insert name of the assignment]* to:

_____*[insert complete name of Procuring Entity]*

In response to the requirement in your notification of award dated__*[insert date of notification of award]* to furnish additional information on beneficial ownership:_____*[select one option as applicable and delete the options that are not applicable]*

I) We here by provide the following beneficial ownership information.

Details of beneficial ownership

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
1.	Full Name		Directly-------- % of shares Indirectly-------- % of shares	Directly…… …….% of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No---- 2. Is this right held directly or indirectly?: Direct…… …	1. Exercises significant influence or control over the Company body of the Company (tenderer) Yes -----No---- 2. Is this influence or control exercised directly or indirectly? Direct……..
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality					
	Date of birth *[dd/mm/yyyy]*					
	Postal address					
	Residential address					

	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)**
	Telephone number				Indirect…… …...	Indirect……
	Email address					
	Occupation or profession					
2.	Full Name		Directly------ ----- % of shares Indirectly---- ------ % of shares	Directly…… …….% of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No---- 2. Is this right held directly or indirectly?: Direct…… … Indirect…… …...	1. Exercises significant influence or control over the Company body of the Company (tenderer**)** Yes -----No---- 2. Is this influence or control exercised directly or indirectly? Direct…….. Indirect……
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality(ies)					
	Date of birth *[dd/mm/yyyy]*					
	Postal address					
	Residential address					
	Telephone number					
	Email address					
	Occupation or profession					
3.						
e.t .c						

II) Am fully aware that beneficial ownership information above shall be reported to the Public Procurement Regulatory Authority together with other details in relation to contract awards and shall be maintained in the Government Portal, published and made publicly available pursuant to Regulation 13(5) of the Companies (Beneficial Ownership Information) Regulations, 2020.(Notwithstanding this paragraph Personally Identifiable Information in line with the Data Protection Act shall not be published or made public). *Note that Personally Identifiable Information (PII) is defined as any information that can be used to distinguish one person from another and can be used to deanonymize previously anonymous data. This information includes National identity card number or Passport number, Personal Identification Number, Date of birth, Residential address, email address and Telephone number.*

III) In determining who meets the threshold of who a beneficial owner is, the Tenderer must consider a natural person who in relation to the company:

(a) holds at least ten percent of the issued shares in the company either directly or indirectly;

(b) exercises at least ten percent of the voting rights in the company either directly or indirectly;

(c) holds a right, directly or indirectly, to appoint or remove a director of the company; or

(d) exercises significant influence or control, directly or indirectly, over the company.

IV) What is stated to herein above is true to the best of my knowledge, information and belief.

Name of the Tenderer: .....[insert complete name of the Tenderer]_____*

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

Designation of the person signing the Tender: ..... [insert complete title of the person signing the Tender]

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

Date this ..... [insert date of signing] day of..... [Insert month], [insert year]