REPUBLIC OF KENYA

GERMAN DEVELOPMENT BANK

KISUMU WATER AND SANITATION COMPANY LIMITED

KIWASCO HEADQUARTERS ALONG NYERERE ROAD, TOM MBOYA ESTATE
P.O BOX 3210 - 40100
KISUMU

TENDER NAME: PROPOSED CONSTRUCTION OF 500M^3 ELEVATED PRESSED STEEL TANK

TENDER NUMBER: KWSC/RBW/003/2025 - 2026

APRIL 2026

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1) NAME AND CONTACT ADDRESSES OF PROCURING ENTITY

Name	:	KISUMU WATER AND SANITATION COMPANY LIMITED
Address	:	P. O Box 3210 - 40100, Kisumu
Email address	:	info@kiwasco.co.ke

2) Invitation to Tender (ITT) No.: KWSC/RBW/003/2025-2026

3) Tender Name: PROPOSED CONSTRUCTION OF 500M^3 ELEVATED PRESSED STEEL TANK

INVITATION TO TENDER

PROCURING ENTITY: KISUMU WATER AND SANITATION COMPANY LIMITED

CONTRACT NAME AND DESCRIPTION: PROPOSED CONSTRUCTION OF 500M^3 ELEVATED PRESSED STEEL TANK

1. The Kisumu Water and Sanitation Company Limited - KIWASCO invites sealed tenders for the construction of water supply improvement works comprising Proposed Construction of 500m^3 Elevated Pressed Steel Tank at Watson Bank, Milimani Estate within Kisumu City. The construction works are expected to be completed within a period of 6 months and thereafter a Defect Notification Period of 3 months.

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

3. Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours i.e. from 8.00am to 5.00pm at the address given below.

4. A complete set of tender documents may be obtained electronically from KIWASCO Website www.kiwasco.co.ke or Public Procurement Information Portal's website https://tenders.go.ke. Tender documents obtained electronically will be free of charge.

5. Tender documents may be viewed and downloaded for free from the website www.kiwasco.co.ke or from the Public Procurement Information Portal's website https://tenders.go.ke. Tenderers who download the tender documents **must** forward their particulars immediately to e-mail procurement@kiwasco.co.ke, to facilitate any further clarification or addendum. ***Tenderers are urged to check our website from time to time for any clarifications or addendum.***

6. Tenders shall be quoted be in Kenya Shillings and shall include all taxes. Tenders shall remain valid for 90 days from the date of opening of tenders.

7. All Tenders must be accompanied by a tender Security of **Kshs. 280,000.00.**

8. The Tenderer shall chronologically serialize, sign and stamp all pages of the tender documents submitted.

9. Completed tenders must be delivered to the address below **on or before Wednesday, 22nd April 2026 at 11.00am.** Electronic tenders will not be permitted.

10. 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.

11. Late tenders will be rejected.

10. The addresses referred to above are:

A. Address for obtaining further information and for purchasing tender documents

Kisumu Water and Sanitation Company Limited
KIWASCO Headquarters, Tom Mboya Estate, Along Nyerere Road.
P.O Box 3210 – 40100
Kisumu
Officer to be contacted: Antony Ogwang
E-Mail: aogwang@kiwasco.co.ke
Tel: 0722 443769

B. Address for Submission of Tenders.

Kisumu Water and Sanitation Company Limited
KIWASCO Headquarters, Tom Mboya Estate, Along Nyerere Road
P.O Box 3210 – 40100
Kisumu
Attention Managing Director

C. Address for Opening of Tenders.

Kisumu Water and Sanitation Company Limited
KIWASCO Headquarters, Tom Mboya Estate, Along Nyerere Road
P.O Box 3210 – 40100
Kisumu

Authorized *official of KIWASCO issuing the invitation*

Name: Thomas Odongo

Designation: Managing Director

Date: *7th April 2026*

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 labour) 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.

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

7. 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. <u>Preparation of Tenders</u>

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:

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

b) 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. <u>Submission and Opening of Tenders</u>

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. <u>Award of Contract</u>

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 ***PROPOSED CONSTRUCTION OF 500M³ ELEVATED PRESSED STEEL TANK*** The reference number of the Contract is : **KWSC/RBW/003/2025-2026** The number and identification of lots (contracts) comprising this Tender are: **Lots are not Applicable in this Tender**
ITT 2.3	The Information made available on competing firms is as follows: **NONE**
ITT 2.4	The firms that provided consulting services for the contract being tendered for are: **Design Master Plan in Association with Gauff Consultants Africa**
ITT 3.1	Maximum number of members in the Joint Venture (JV) shall be: **JOINT VENTURES ARE NOT ALLOWED IN THIS TENDER.**
B. Contents of Tender Document	
8.1	(A) A mandatory pre-tender conference *shall* take place at the following date, time and place: **Date**: 13th April 2026 **Time**: 10.30am **Place:** KIWASCO Boardroom, KIWASCO Headquarters, Kisumu. (B) A pre-arranged mandatory pre-tender visit of the site of the works *shall* take place at the following date, time and place: **Date:** 13th April 2026 **Time:** 11.00am **Place:** Watson Bank, Milimani Estate within Kisumu City. All interested bidders are requested to assemble at KIWASCO head office then proceed to the site.
ITT 8.2	The Tenderer will submit any questions in writing, to reach the Procuring Entity not later than Wednesday, 15th April 2026 at 17.00hrs
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 www.kiwasco.co.ke

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
ITT 9.1	For Clarification of Tender purposes, for obtaining further information and for purchasing tender documents, the Procuring Entity's address is: **Kisumu Water and Sanitation Company Limited** **KIWASCO Headquarters, Along Nyerere Road, Tom Mboya Estate** **P.O Box 3210 – 40100** **Kisumu** **Officer to be contacted: Antony Ogwang** **E-Mail: aogwang@kiwasco.co.ke** **Tel: 0722 443769**
C. Preparation of Tenders	
ITP 13.1 (h)	The Tenderer shall submit the following additional documents in its Tender: i. Certificate of Incorporation/Registration ii. PIN/VAT certificate iii. Company's CR12 iv. Valid and Current Tax Compliance Certificate v. Valid and Current Business Permit vi. Valid and current NCA6 and above on Water Works and Valid and current NCA annual practicing certificate (Required before award and contract signing) vii. Valid and Current Certificate of Registration for Water Development Contractors Issued by the Ministry of Water, Sanitation and Irrigation viii. Form of Tender duly filled, signed and stamped ix. Confidential business questionnaire duly filled, signed and stamped x. Audited financial statements for the last 3 years xi. A line of credit of Kshs. 5 Million from your bankers issued within the last 3 months. xii. Bid Bond of Kshs. 280,000.00 from a recognized bank or insurance company in the format provided in the bid document xiii. Power of Attorney duly executed by an advocate of the high court of Kenya xiv. All pages of bid document chronologically serialized, signed

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	/initialled and stamped xv. Title deed or tenancy lease agreement as proof of existence of a functioning office xvi. Attendance of pre-tender conference and pre-tender site visit
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 Applicable**:
ITT 16.5	The prices quoted by the Tenderer shall be: ***fixed***
ITT 20.1	The Tender validity period shall be **91** days.
ITT 20.3 (a)	(a) The delayed to exceeding 42 number of days. (b) The Tender price shall be adjusted by the following percentages of the tender price: **Not Applicable**
ITT 21.1	*[If a Tender Security shall be required, a Tender-Securing Declaration shall not be required, and vice versa.]* A Tender Security ***shall be*** required. If a Tender Security shall be required, the amount and currency of the Tender Security shall be **KES 280,000.00** *(amount in Figures)* **KES Two Hundred and Eighty Thousand only** *(amount in Words)*
ITT 21.2 (d)	The other Tender Security shall be **from an Insurance Company**
ITT 21.5	On the Performance Security, other documents required shall be dully filled, signed and stamped Beneficial Ownership Disclosure Form
ITT 22.1	In addition to the original of the Tender, the number of copies is: ***1***
ITT 22.3	The written confirmation of authorization to sign on behalf of the Tenderer shall consist of: Power of Attorney duly signed by Directors of the Tenderer delegating *authority for the signatory to sign the Tender* and effected by a Notarised Lawyer or Commissioner of Oath

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
D. Submission and Opening of Tenders	
ITT 24.1	A) For Tender submission purposes only, the Procuring Entity's address is **Kisumu Water and Sanitation Company Limited** **KIWASCO Headquarters, Along Nyerere Road, Tom Mboya Estate** **P.O Box 3210 – 40100** **Kisumu** **Attention Managing Director** Date and time for submission of Tenders: **Wednesday, 22nd April 2026 at 11.00am.** Tenderers 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: **Kisumu Water and Sanitation Company Limited** **KIWASCO Headquarters, Tom Mboya Estate, Along Nyerere Road** **P.O Box 3210 – 40100** **Kisumu** **At KIWASCO Boardroom** State date and time of tender opening: Wednesday, the 22nd day of April 2026 at 11.05am.
ITT 27.1	If Tenderers are allowed to submit Tenders electronically, they shall follow the electronic tender submission procedures specified below: **Not Aplicable**
ITT 27.6	The number of representatives of the Procuring Entity to sign is 4 (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 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 35.2	The invitation to tender is extended to the following groups that qualify for Reservations: **Not applicable.** **This tender is open to all and therefore not subject to reservations.**

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
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: *15% 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	The parts of the Works for which the Procuring Entity permits Tenderers to propose Specialized Subcontractors are designated as follows: ***Not Applicable***
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 is The Institution of Engineers of Kenya- IEK. Top Plaza, Kindaruma Road, 1st Floor room 11 P.O. Box 41346 – 00100 Nairobi, Kenya TEL: (+254) 202729326, (+254)202716922 Email: iek@iekenya.org Website: https://iekenya.org/ at an hourly fee of Shs.1,000.00 per hour.
ITT 52.2	Other documents required are: Filled, signed and stamped Beneficial Ownership Disclosure Form
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: Mr. Thomas Odongo Title/position: Managing Director Procuring Entity: Kisumu Water and Sanitation Company Limited-KIWASCO Email address: md@kiwasco.co.ke In summary, a Procurement-related Complaint may challenge any of the following:

ITT Reference	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	(i) the terms of the Tender Documents; and (ii) the Procuring Entity's decision to award the contract.

SECTION III - EVALUATION AND QUALIFICATION CRITERIA

1. 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:

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

b) Value of single contract - Exchange rate prevailing on the date of the contract signature.

c) Exchange rates shall be taken from the publicly available source identified in the ITT 14.3. Any error in determining the exchange rates in the Tender may be corrected by the Procuring Entity.

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.

2. Preliminary examination for Determination of Responsiveness

The Procuring Entity will start by examining all tenders to ensure they meet in all respects the eligibility criteria and other requirements in the ITT, and that the tender is complete in all aspects in meeting the requirements of "Part 2 – Procuring Entity's Works Requirements", including checking for tenders with unacceptable errors, abnormally low tenders, abnormally high tenders and tenders that are front loaded. The Standard Tender Evaluation Report 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 Tenderer shall submit the following documents in its Tender

i. Certificate of Incorporation/Registration
ii. PIN/VAT certificate
iii. Company's CR12
iv. Valid and Current Tax Compliance Certificate
v. Valid and Current Business Permit
vi. Valid and current NCA6 and above on Water Works and Valid and current NCA annual practicing certificate (Required before award and contract signing)

vii. Valid and Current Certificate of Registration for Water Development Contractors Issued by the Ministry of Water, Sanitation and Irrigation
viii. Form of Tender duly filled, signed and stamped
ix. Confidential business questionnaire duly filled, signed and stamped
x. Audited financial statements for the last 3 years
xi. A line of credit of Kshs. 5 Million from your bankers issued within the last 3 months.
xii. Bid Bond of Kshs. 280,000.00 from a recognized bank or insurance company in the
format provided in the bid document
xiii. Power of Attorney duly executed by an advocate of the high court of Kenya
xiv. All pages of bid document chronologically serialized, signed and stamped/initialed
xv. Title deed or tenancy lease agreement as proof of existence of a functioning office
xvi. An e-mail indicating intention to participate in the tender for registration purposes
xvii Attendance of pre-tender conference and pre-tender site visit

N/B: Bidders who do not satisfy any of the above requirements shall be considered non-responsive and their tenders will not be evaluated any further.

3. Tender Evaluation (ITT 35) Price evaluation:

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

i) **Alternative Completion Times, i**f permitted under ITT 13.2, will be evaluated as follows: **Not Applicable**

ii) **Alternative Technical Solutions** for specified parts of the Works, if permitted under ITT 13.4, will be evaluated as follows: **Not Applicable**

iii) **Other Criteria; i**f permitted under ITT 35.2(d): **Not Applicable**

4. Multiple Contracts (Not applicable In this tender)

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

OPTION 1

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

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

OPTION 2

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

5. Alternative Tenders (ITT 13.1) (Not permitted in this tender)

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.

6. Margin of Preference is not applicable

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

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

b) 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.

i) The Tenderer shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow of Kenya Shillings Five Million (Kshs. 5M). (Provide proof from your bankers of either a line of credit issued in the last 3 months or bank statement showing a bank balance of the same amount)

ii) Minimum average annual construction turnover of Kenya Shillings 36 Million, equivalent calculated as total certified payments received for contracts in progress and/or completed within the last 3 years. This will be checked in the bidders' audited financial statements)

iii) At least 5 (Five) number of contract(s) of a similar nature executed within Kenya, or the East African Community or abroad, within the last 3 years, that have been satisfactorily and substantially completed as a prime contractor, or joint venture member or sub-contractor each of minimum value Kenya shillings 10 Million equivalent. (provide proof in terms of contracts signed and project completion certificates)

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

- Project Manager (Key partner/director). Degree in any relevant field and minimum 10 years of post-qualification experience and minimum 5 years' experience in similar assignments (water infrastructure works)

- ❖ Site Agent – Degree in Bsc, civil engineering or equivalent and minimum 6 years of post-qualification experience and minimum 4 years' experience in similar assignments (water infrastructure works)
- ❖ Water Works Foreman – Diploma in water engineering or equivalent and minimum 5 years of post-qualification experience and minimum 3 years' experience in similar assignments (water infrastructure works)
- ❖ Site Engineering Surveyor – Ordinary National Diploma in Engineering Survey or equivalent and minimum 5 years of post-qualification experience and minimum 3 years' experience in similar assignments (water infrastructure works)

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

1. HDPE Butt Fusion Welding Machine (1 No)
2. Concrete mixer – 0.3m3 (1 No.)
3. Survey Equipment – 1 no
4. Pipeline pressure testing equipment – 1 No
5. Excavator/Backhoe loader with rock breaker head attachment (bucket capacity at least 0.5m3) – 1 No
6. Light duty truck (pickup or equivalent) – 1 No
7. Air Compressor – 1no
8. 0.73m3 Concrete Dumper – 1No
9. 40mm Concrete Vibrator
10. Dewatering Pump – 50mm (Min) inlet – I No.

Bidders Must provide proof of ownership or if leased proof of lease agreement of the above equipment.

8. 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 3 years. The required information shall be furnished in the appropriate form.

9. 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.

10. Litigation History

There shall be no consistent history of court/arbitral award decisions against the Tenderer, in the last 3 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.

11. Methodology and work plan to carry out the various components for the works

Methodology
This should be summarized as follows:

- Project/site management
- Health and safety management
- Environmental management
- Quality management

Work plan
The bidder is expected to submit logical detailed work plan with a maximum period of performance specified in the bid document. Must be presented in weeks of 7 calendar days.

IN SUMMARY, THE FOLLOWING TABLE SHOWS THE CRITERIA THAT WILL BE USED TO EVALUATE TECHINCAL CAPABILITIES AS DETAILED ABOVE AND THE SCORES ASSIGNED TO EACH CRITERIA:

No	Criteria	Specifics	Marks Assigned
1	**Project Methodology and Work Plan**	Come up with a clear methodology addressing key areas as below: Project/ Site Management – **3 Marks or 0 Mark for none**	**10 Marks**
		Health and Safety Management – **2 Marks or 0 for none**	
		Environmental Management – **2 Marks or 0 for none**	
		Quality Management – **2 Marks or 0 for none**	
		Submitted a logical detailed workplan with maximum period of performance specified in the bid document – **1 Marks for work plan or 0 for none.**	
2	**Financial Capabilities**	Minimum annual construction turnover of **Kshs. 36 Million** checked in financial statements. Turnover of Kshs. 36 M and above – **7 Marks.** Otherwise prorate for less.	**10 Marks**
		Line of Credit of Kshs. 5 Million issued in the last 3 months. (attach line of credit) – **3 Marks for LOC or 0 for none**	
3	**Key Personnel for the Assignment**	Project Manager - (with CV, certificate and required years of experience)- **5 Marks for all or 0 for none**	**20 Marks**
		Site Agent - (with CV, certificate and required years of experience)- **5 Marks for all or 0**	
		Water Works Foreman (with CV, certificate and required years of experience)- **5 Marks for all or 0**	
		Site Engineering Surveyor (with CV, certificate and required years of experience)- **5 Marks for all or 0**	
		HDPE Butt Fusion Machine – 1 No. Provide proof of ownership or lease **– 2 Marks or 0 for none**	
		Concrete Mixer 0.3m³ – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		Survey Equipment – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for**	

4	**Required Equipment**	**none**	**20 Marks**
		Pipeline Pressure Testing Equipment – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		Excavator with backhoe loader with rock breaker head attachment – 0.5m³ bucket capacity – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		Light duty truck (pickup or equivalent) – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		Air Compressor – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		0.73m3 Concrete Damper – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		40mm Concrete Vibrator – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
		Dewatering Pump 50mm Min Inlet – 1 No. Provide proof of ownership or lease – **2 Marks or 0 for none**	
5	**Specific Construction and Management Experience**	Five (5) No. of contracts of similar nature executed within Kenya in the last 3 years of a minimum value of Kshs 10M that have been satisfactorily completed (attach evidence in the form of letters of award, signed contracts and/or completion certificates and IPC's. If project is on-going, commencement letter should be attached) – **6 Marks for each contract of 10M and above otherwise prorate for less.**	**30 Marks**
6	**History of Non-performing Contracts**	Demonstrate that non-performance of a contract did not occur because of default of the tenderer in the last 3 years (Appropriate form filled, signed and stamped) **2 Marks for information provided as above or 0 for none**	**2 Marks**
7	**Pending Litigation**	Tenderer shall provide information on pending litigations in the appropriate form (Appropriate form filled, signed and stamped) **1 Mark for information provided as**	**1 Mark**

		above or 0 for none.	
8	**Litigation History**	**Tenderer shall demonstrate that they have no consistent history of court/arbitral award decisions against the Tenderer, in the last 3 years.** (Appropriate form filled, signed and stamped) **1 Mark for information provided or 0 for none.**	**1 Mark**
9	**Other Forms Filled, Signed and Stamped**	Tenderers' qualification Form filled, signed and stamped – **1 Mark for compliance or 0 for none**	**6 Marks**
		Certificate of Independent Tender Determination Form filled, signed and stamped - **1 Mark for compliance or 0 for none**	
		Disclosure of Interest Form filled, signed and stamped - **1 Mark for compliance or 0 for none**	
		Self-Declaration Form SD1 filled, signed and stamped - **1 Mark for compliance or 0 for none**	
		Self-Declaration Form SD2 filled, signed and stamped - **1 Mark for compliance or 0 for none**	
		Declaration and Commitment to the Code of Ethics Form filled, signed and stamped. - **1 Mark for compliance or 0 for none**	
	TOTAL		**100**

NOTE: To qualify for financial evaluation, the bidder must score a minimum of 85 marks.

FINANCIAL EVALUATION

The bidder who shall be determined as the lowest evaluated bidder after meeting the minimum criteria in technical score shall be considered and recommended for award.

12. 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 2023	Form CON-2	
8	Suspension Based on Execution of Tender/Proposal Securing Declaration	Not under suspension based on-execution of a Tender/Proposal Securing Declaration pursuant to ITT 19.9	Form of Tender	

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)***
	by the Procuring Entity			
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 2023	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 5 Million equivalent for the subject contract(s) net of the Tenderer's other commitments. (ii) The Tenderers shall also demonstrate, to the satisfaction of the Procuring Entity, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future	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)***
		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 3 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 36 Million, equivalent calculated as total certified payments received for contracts in progress and/or completed within the last 3 years, divided by 3 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 3 years, starting 1st January 2023.	Form EXP – 4.1	
	Specific Construction & Contract Management Experience	A minimum number of 5 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 2023 and tender submission deadline i.e. 5 (number) contracts, each of minimum value	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)***
		Kenya shillings 10 Million or 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 be met by specialized subcontractors, if permitted in accordance with ITT 34.3]*		

SECTION IV – TENDERING FORMS

A. QUALIFICATION FORMS

1. 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	

2. 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*]

3. 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:

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

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

Signature: _____

Date: (day month year): _____

Countersignature of authorized representative of the Tenderer:

Signature: _____

Date: (day month year): _____

B. 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.

4.1 FORM ELI -1.1

Tenderer Information Form

Date: .....

ITT No. and title: .....

Tenderer's name
In case of Joint Venture (JV), name of each member:
Tenderer's actual or intended country of registration: *[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.

4.2 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.

4.3 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 non-performance: *[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]*

4.4 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)					
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 the last 3 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.

4.5 FORM FIN – 3.2:

Average Annual Construction Turnover

Tenderer's Name: .....

Date: .....

JV Member's Name.....

ITT No. and title: .....

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

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

4.6 FORM FIN – 3.3:

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction 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		

4.7 FORM FIN – 3.4:

Current Contract Commitments / Works in Progress

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

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

4.8 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: _____	

4.9 FORM EXP - 4.2(a)

Specific Construction and Contract Management Experience

Tenderer's Name: .....

Date: .....

JV Member's Name.....

ITT No. and title: .....

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

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	

4.10 FORM EXP - 4.2(b)

Construction Experience in Key Activities

Tenderer's Name: .....

Date: .....

JV Member's 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: _____

C. OTHER FORMS

5. FORM OF TENDER

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

INSTRUCTIONS TO TENDERERS

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

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

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

Date of this Tender submission: .....

[insert date (as day, month and year) of Tender submission]

Tender: Kisumu Water Supply Improvements Aid on Delivery- AoD Project

Tenderer Name : ..... and .....

Tender Identification Ref: .....

To: **Kisumu Water and Sanitation Company Ltd- KIWASCO**

Dear Sirs,

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

   Kenya Shillings *[amount in words]* _____

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

2. We undertake, if our tender is accepted, to commence the Works as soon as is reasonably possible after the receipt of the 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.

3. 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.

4. We, the undersigned, further declare that:

   i) *No reservations:* We have examined and have no reservations to the tender document, including Addenda issued in accordance with ITT 28;

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

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

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

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

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:

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

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

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

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

viii) 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*];

ix) *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;

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

xi) *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;

xii) *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.

xiii) *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*];

xiv) *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.")

xv) 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;

xvi) 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;

xvii) 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;

xviii) 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.

xix) We undertake to adhere by the Code of Ethics for Persons Participating in Public Procurement and Asset Disposal, copy available from

The Public Procurement and Asset Disposal Act, 2015 – Public Procurement Regulatory Authority (ppra.go.ke) during the procurement process and the execution of any resulting contract.

xx) 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.

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

a) Tenderer's Eligibility; Confidential Business Questionnaire – to establish we

are not in any conflict to interest.

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

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

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

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

Name of the Tenderer: *.....

Name of the person duly authorized to sign the Tender on behalf of the Tenderer: ** .....

.....

Title of the person signing the Tender: .....

Signature of the person named above: .....

Date signed .....

Date signed_..... day of.....

Notes

* *In the case of the Tender submitted by joint venture specify the name of the Joint Venture as Tenderer*

** *Person signing the Tender shall have the power of attorney given by the Tenderer to be attached with the Tender.*

a). TENDERER'S ELIGIBILITY- CONFIDENTIAL BUSINESS QUESTIONNAIRE

Instruction to Tenderer

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

i) Tenderer's details

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

General and Specific Details

ii) Sole Proprietor,

provide the following details.

Name in full_____Age_____

Nationality_____Country of Origin_____

Citizenship _____

iii) Partnership,

provide the following details.

	Names of Partners	Nationality	Citizenship	% Shares owned
1				
2				
3				

iv) Registered Company,

provide the following details.

i) Private or public Company_____

ii) State the nominal and issued capital of the Company_____

Nominal Kenya Shillings (Equivalent) .....

.....

Issued Kenya Shillings Equivalent).....

.....

iii) Give details of Directors as follows.

	Names of Director	Nationality	Citizenship	% Shares owned
1				
2				
3				

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

i) Are there any person/persons in .....

(Name of Procuring Entity) who has/have an interest or relationship in this firm? Yes/No……

If yes, provide details as follows.

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

ii) Conflict of interest disclosure

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

vi) 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 .....

..... and .....

(Signature) *(Date)*

b). CERTIFICATE OF INDEPENDENT TENDER DETERMINATION

I, the undersigned, in submitting the accompanying Letter of Tender to the:

Kisumu Water and Sanitation Company Ltd- KIWASCO

for:

Kisumu Water Supply Improvement Aid on Delivery- AoD Project

Tender Reference Nr: .....

in response to the request for tenders made by: .....

.....

[Name of Tenderer] do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of:

.....

[Name of Tenderer] that:

1. I have read and I understand the contents of this Certificate;
2. I understand that the Tender will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am the authorized representative of the Tenderer with authority to sign this Certificate, and to submit the Tender on behalf of the Tenderer;
4. For the purposes of this Certificate and the Tender, I understand that the word "competitor" shall include any individual or organization, other than the Tenderer, whether or not affiliated with the Tenderer, who:
   a) has been requested to submit a Tender in response to this request for tenders;
   b) could potentially submit a tender in response to this request for tenders, based on their qualifications, abilities or experience;
5. The Tenderer discloses that [check one of the following, as applicable:
   a) The Tenderer has arrived at the Tender independently from, and without consultation, communication, agreement or arrangement with, any competitor;
   b) the Tenderer has entered into consultations, communications, agreements or arrangements with one or more competitors regarding this request for tenders, and the Tenderer discloses, in the attached document(s), complete details thereof, including the names of the competitors and the nature of, and reasons for, such consultations, communications, agreements or arrangements;
6. In particular, without limiting the generality of paragraphs (5)(a) or (5)(b) above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
   a) prices;
   b) methods, factors or formulas used to calculate prices;
   c) the intention or decision to submit, or not to submit, a tender; or

d) the submission of a tender which does not meet the specifications of the request for Tenders; except as specifically disclosed pursuant to paragraph (5)(b) above;

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

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

Name.....

Title .....

Date .....

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

c). 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: -

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

   .....

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

   .....

   For: ***Kisumu Water Supply Improvement Aid on Delivery- AoD Project***

   For: ***Kisumu Water and Sanitation Company Ltd.***

   and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its Directors and subcontractors have not been debarred from participating in procurement proceeding under Part IV of the Act.
3. THAT what is deponed to herein above is true to the best of my knowledge, information and belief.

....

(Title) (Signature) (Date)

Bidder Official Stamp

FORM SD2

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

I, ...

of Post Office Box .....

being a resident of .....in the Republic of

..... do hereby make a statement as follows: -

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

.....

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

.....

For: ***Kisumu Water Supply Improvement Aid on Delivery- AoD Project***

For: ***Kisumu Water and Sanitation Company Ltd.***

and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its servants and/or agents /subcontractors will not engage in any corrupt or fraudulent practice and has not been requested to pay any inducement to any member of the Board, Management, Staff and/or employees and/or agents of

Kisumu Water and Sanitation Company Ltd. which is the procuring entity.

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

Kisumu Water and Sanitation Company Ltd. which is the procuring entity.

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

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

....

(Title) (Signature) (Date)

Bidder Official Stamp

DECLARATION AND COMMITMENT TO THE CODE OF ETHICS

I ..... 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: .....

6. APPENDIX 1- FRAUD AND CORRUPTION

(Appendix 1 shall not be modified)

1. 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.

2. 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 behaviour: -

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

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

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

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

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

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

5) An employee or agent of the procuring entity or a member of the Board or committee of the procuring entity who has a conflict of interest with respect to a procurement: -

   a) shall not take part in the procurement proceedings;

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

c) shall not be a subcontractor for the bidder to whom was awarded contract, or a member of the group of bidders to whom the contract was awarded, but the subcontractor appointed shall meet all the requirements of this Act.

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

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

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

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

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

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

iii) "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;

iv) "obstructive practice" is:

- deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede investigation by Public Procurement Regulatory Authority (PPRA) or any other appropriate authority appointed by Government of Kenya into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
- acts intended to materially impede the exercise of the PPRA's or the appointed authority's inspection and audit rights provided for under paragraph 2.3 e. below.

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

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

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

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

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

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

---

[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.*

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

Beneficiary: .....

Request for Tenders No: .....

Date: .....

TENDER GUARANTEE No.: .....

Guarantor: .....

1. We have been informed that

   .....

   (herein after called "the Applicant")

   has submitted or will submit to the Beneficiary its Tender ***(herein after called" the Tender")*** for the execution of

   Kisumu Water Supply Improvements Aid on Delivery- AoD Project

   under Request for Tenders No. ..... ***("the ITT").***

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

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

   KES .....

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

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

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

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

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

.....

[signature(s)]

FORMAT OF TENDER SECURITY [Option 2–Insurance Guarantee]

TENDER GUARANTEE No.: __

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

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

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

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

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

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

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

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

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

_____ _____

[Date] *[Signature of the Guarantor]*

_____ _____

[Witness] *[Seal]*

6.

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

8. TENDER-SECURING DECLARATION FORM

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

Date: .....

(as day, month and year) of Tender Submission]

Tender Reference No: .....

To: .....

[insert complete name of Purchaser]

I/ We, the undersigned, declare that:

1. I/ We understand that, according to your conditions, bids must be supported by a Tender-Securing Declaration.
2. I/ We accept that I/we will automatically be suspended from being eligible for tendering in any contract with the Purchaser for the period of time of [insert number of months or years] starting on [insert date], if we are in breach of our obligation(s) under the bid conditions, because we – (a) have withdrawn our tender during the period of tender validity specified by us in the Tendering Data Sheet; or (b) having been notified of the acceptance of our Bid by the Purchaser during the period of bid validity, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the instructions to tenders.
3. I/ We understand that this Tender Securing Declaration shall expire if we are not the successful Tenderer(s), upon the earlier of:
   a) our receipt of a copy of your notification of the name of the successful Tenderer; or
   b) thirty days after the expiration of our Tender.
4. I/ We understand that if I am/we are/in a Joint Venture, the Tender Securing Declaration must be in the name of the Joint Venture that submits the bid, and the Joint Venture has not been legally constituted at the time of bidding, the Tender Securing Declaration shall be in the names of all future partners as named in the letter of intent.

Signed:.....

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

Name: .....

Duly authorized to sign the bid for and on behalf of:

.....

[Insert complete name of Tenderer]

Date: .....

[Insert date of signing] Seal or stamp

PART 3

CONDITIONS OF CONTRACT AND CONTRACT FORMS

PART 3 - CONDITIONS OF CONTRACT AND CONTRACT FORMS

SECTION VIII - GENERAL CONDITIONS OF CONTRACT

These General Conditions of Contract (GCC), read in conjunction with the 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.

A. General

1. Definitions

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

3.1 In interpreting these GCC, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

3.2 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).

3.3 The documents forming the Contract shall be interpreted in the following order of priority:

a) Agreement,

b) Letter of Acceptance,

c) Contractor's Bid,

d) 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.

3. Language and Law

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

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

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

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

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

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 and Equipment

11.1 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.

11.2 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.

11.3 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

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.

[6] *In lump sum contracts, delete "Bill of Quantities" and replace with "Activity Schedule."*

11. Procuring Entity's Risks

11.4 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.

11.5 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) 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

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

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

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

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

The Contractor shall be responsible for the safety of all activities on the Site.

19. Discoveries

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

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

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.

24.2 Amicable Settlement

Where a notice of a claim has been given, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a notice of a claim in accordance with Sub-Clause 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.

24.3 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.

24.4 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

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. <u>Time Control</u>

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

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

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

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]

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 Price8

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 Flow Forecasts

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.

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

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

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 **Io** 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

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

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.

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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."*

52. Cost of Repairs

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

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

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

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.

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.

[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.*

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

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

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 was made.

SECTION IX - SPECIAL CONDITIONS OF CONTRACT

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: **Kisumu Water and Sanitation Company Limited** **P.O Box 3210 – 40100** **Kisumu** **Authorized Representative: Thomas Odongo, Managing Director**
GCC 1.1 (u)	The Intended Completion Date for the whole of the Works shall be 31st December 2026
GCC 1.1 (x)	The Project Manager is **Eng. Moses Jura** **Chief Engineer, Technical Services** **P.O Box 3210- 40100** **Kisumu**
GCC 1.1 (z)	The Site is located at Watson Bank in Milimani Estate within Kisumu City and is defined in the drawings attached
GCC 1.1 (cc)	The Start Date shall be 1st June 2026
GCC 1.1 (gg)	The Works consist of Construction of proposed elevated pressed steel tank of 500m^3 in target area of Watson Bank in Milimani Estate within Kisumu County.
GCC 2.2	Sectional Completions are: Not applicable in this tender
GCC 5.1	The Project manager may delegate any of his duties and responsibilities.
GCC 8.1	Schedule of other contractors: None
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 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. [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: (a) for loss or damage to the Works, Plant and Materials: Kshs. 100,000.00 (b) For loss or damage to Equipment: Kshs. 200,000.00 (c) for loss or damage to property (except the Works, Plant, Materials, and

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	Equipment) in connection with Contract: Kshs. 100,000.00 (d) for personal injury or death: (i) of the Contractor's employees: Kshs. 200,000.00 (ii) of other people: Kshs. 100,000.00
GCC 14.1	Site Data are: Site safety features and protocols
GCC 20.1	The Site Possession Date(s) shall be: 1st June 2026 (or ealier) at Watson Bank at Milimani Estate within Kisumu City
GCC 23.1 &	Appointing Authority for the Adjudicator: Managing Director, KIWASCO
GCC 23.2	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: *[insert hourly fees and reimbursable expenses]*. TBD
	B. Time Control
GCC 26.1	The Contractor shall submit for approval a Program for the Works within 7 days days from the date of the Letter of Acceptance.
GCC 26.3	The period between Program updates is 14 days. The amount to be withheld for late submission of an updated Program is Kshs. 100,000.00
	C. Quality Control
GCC 34.1	The Defects Liability Period is: 180 days.
	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 Shillings.
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. *[Price adjustment is mandatory for contracts which provide for time of completion exceeding 18 months]* The coefficients for adjustment of prices are: (a) *[insert percentage]* percent nonadjustable element (coefficient A). (ib) *[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: 10%
GCC 47.1	The liquidated damages for the whole of the Works are 0.05% per day. The maximum amount of liquidated damages for the whole of the Works is 1% of the final Contract Price.
GCC 48.1	The Bonus for the whole of the Works is : Not applicable
GCC 49.1	The Advance Payments shall be: 15% of the contract amount and shall be paid to the Contractor no later than 21 days after receipt of request for advance payment and upon submission of Advance Payment Guarantee of the same amount from a

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	reputable bank.
GCC 50.1	The Performance Security amount is 10% of the contract amount (a) Performance Security – Bank Guarantee: in the amount(s) of 10 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 10 percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount.
	E. Finishing the Contract
GCC 56.1	The date by which operating and maintenance manuals are required is 30 days after project handover The date by which "as built" drawings are required is 30 days after project handover
GCC 56.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 58.1 is 2% of the retainer
GCC 57.2 (g)	The maximum number of days is: 90 days
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 5%.

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SECTION X - Contract Forms

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]

Contract 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 .....

(herein after "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 ..... , 20 .....[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)

.....

[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. 7 - ADVANCE PAYMENT SECURITY

[Demand Bank Guarantee]

[Guarantor letterhead]

Beneficiary: .....

[insert name and Address of Procuring Entity*]*

Date: .....*[Insert date of issue]*

ADVANCE PAYMENTGUARANTEE 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 figures)

   ..... (*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 .....,20.....,[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)

.....

[Seals/stamps].

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

[1]*The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency 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 PAYMENTGUARANTEE No.: .....

[Insert guarantee reference number]

Guarantor: .....

[Insert name and address of place of issue, unless indicated in the letterhead]

1. We have beeninformed that (JV name where applicable)

   .....

   (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, 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

   ..... (in figures)

   ..... (*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 ..... , 20.....[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)

.....

[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.: .....

Name of the Tender Title/Description: .....

[insert name of the assignment]

to:

.....

[insert complete name of Procuring Entity]

In response to the requirement in your notification of award dated

.....

[insert date of notification of award]

to furnish additional information on beneficial ownership:*[select one option as applicable and delete the options that are not applicable]*

I) We here by provide the following beneficial ownership information.

Details of beneficial ownership

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
1.	Full Name		Directly----------% of shares Indirectly---------- % of shares	Directly……% of voting rights Indirectly----------% of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No----- 2. Is this right held directly or indirectly?: Direct…… Indirect……..	1. Exercises significant influence or control over the Company body of the Company (tenderer**)** Yes -----No---- 2. Is this influence or control exercised directly or indirectly? Direct……. Indirect……
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality					
	Date of birth *[dd/mm/yyyy]*					
	Postal address					
	Residential address					
	Telephone number					
	Email address					
	Occupation or profession					

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
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					

	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)
3.						
etc						

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 ..... day of..... [Insert month, year]

Bidder Official Stamp

PART 2 - PROCUREMENT ENTITY'S REQUIREMENTS

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GENERAL DESCRIPTION OF THE PROJECT AREA

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CHAPTER 2 – EARTHWORKS

CHAPTER 3 - CONCRETE, REINFORCEMENT & SHUTTERING

CHAPTER 4 - BUILDINGS AND APPURTENANCES

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SECTION VII - BILLS OF QUANTITIES

A PREAMBLE AND NOTES TO BILLS OF QUANTITIES

B BILLS OF QUANTITIES

1 PART 2

2 PROCUREMENT ENTITY'S REQUIREMENTS

3 : SPECIFICATIONS

4 PART 2 - PROCUREMENT ENTITY'S REQUIREMENTS

5 SECTION VI - SPECIFICATIONS

6 GENERAL DESCRIPTION OF THE PROJECT AREA

55. Background and Context

Water Sector Trust Fund received funding from the Government of Kenya and the Government of Germany (via KfW) to finance the implementation of improvement projects through its Aid on Delivery (AoD) Programme. The financial incentives (subsidies) provided under AoD project are to support eligible Water Services Providers (WSPs) to expand, extend, rehabilitate, or modernise urban water supply, sewerage and sanitation services, and customer services. KIWASCO presented their project proposal, which was duly evaluated, and accepted for consideration under the WSTF Phase IV Programme.

56. Project Objectives and Scope

Project Objectives

The specific objectives of the KIWASCO project are;

1. To increase network coverage by approx. 15km including appurtenances (including air valves, washout, section control valves and chambers) in Nyamasaria target supply areas.
2. To increase storage by constructing a 500m^3 steel tank in Watson's Tank site.
3. To increase access of water through provision of 750 Nr (740 Nr individual households and 10 Nr communal water kiosks) metered water connections.
4. To increase water sales through the 750 water connections.
5. To install 9 Nr bulk meters to improve monitoring of NRW and zonal consumption for checking the billing amounts.
6. To increase reliability and availability of water by provision of 24-hour water service to the target supply area.
7. To provide potable water through supply of treated water to the target supply area.

Scope of Works

The proposed KIWASCO AoD project involves the following project area.

- Nyamasaria Distribution Network

The proposed measures as contained the project brief include;

- Distribution pipelines totalling14.63 Km with pipe sizes ranging from 50mm to 200mm
- Increased water supply to the under-served areas for last mile connectivity.
- 750 new connections.
- Installation of 9 bulk meters

The summary pipeline lengths are illustrated in the following Table.

This proposed project area is located specifically in Nyamasaria area of Kisumu. Nyamasaria stretches across four sub-locations of Kisumu East sub-county in Kisumu County. The four sub-locations are Nyalenda 'A', Kasule, Buoye and Nyalunya sub-locations.

The growing middle class and urbanization trends in this area have increased the demand for housing and modern amenities, leading to rapid expansion in real estate development especially in Nyamasaria area. This expansion places additional pressure on the existing water supply and sanitation infrastructure, necessitating the need for KIWASCO's interventions hence this proposed project.

The figure below shows the proposed project area.

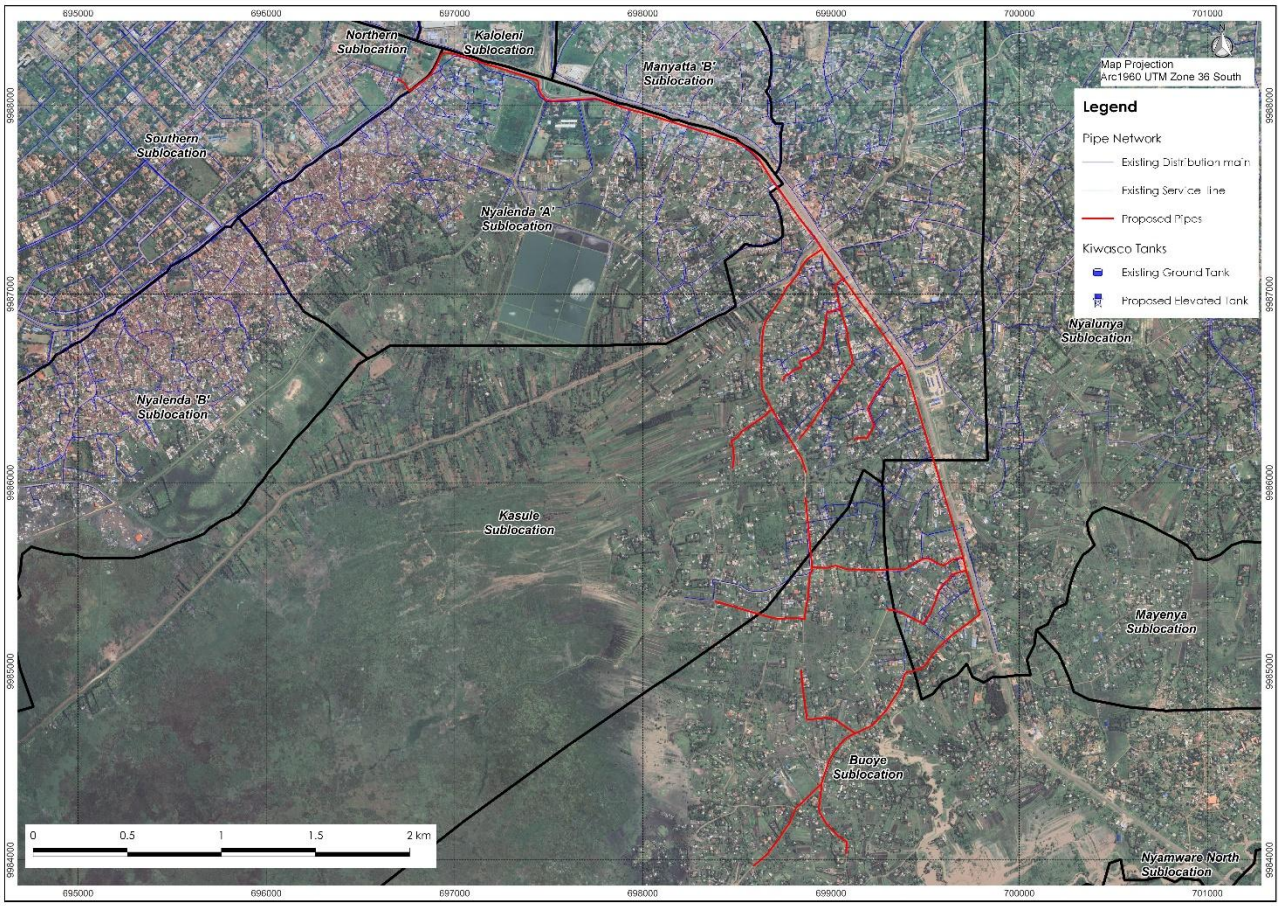

Figure 1: Proposed Project Area

CHAPTER 1

GENERAL

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CHAPTER 1 - GENERAL

101 DRAWINGS

The Drawings for this Contract are listed in Volume X of the Contract Document. The Book of Drawings itself forms Volume X of the Contract Documents. Where the Contractor is required to 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 to provide one draughtsman (proficient in the use of AutoCAD) on a continuous basis throughout the contract period to update the electronic copy drawings, under the direction of the Engineer's Representative.

102 BENCH MARKS

Benchmarks and points or origin for survey will be indicated on request 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 for protecting and preserving the same shall from that time onwards rest with the Contractor and the Contractor shall at the Contractor's own expense re-locate and replace any such TBM that shall for any reason be displaced or removed from its original location.

103 SURVEY BEACONS

During the progress of the Works, the Contractor shall not remove, damage, alter or destroy in any way whatsoever, any plot or survey beacons. He shall notify the Engineer of the need to interfere with any beacon. The Engineer shall 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.

104 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 marked on 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 to do so from the Engineer or Engineer's Representative. Large scale Drawings shall be taken in preference to Drawings of a smaller scale.

105 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 same heads of items of work as are used in the Programme.

The Programme shall include as a minimum the following activities:

(a) Confirmation of Quantities and Placing of Orders

(b) Erection of materials storage facilities

(c) Local procurement of major materials

(d) Offshore procurement of major materials
Manufacture/Preparation for shipping
Shipping
Clearing at Port, transport to site and offloading to appropriate storage facilities.

(a) Mobilisation to commence Works on Site

(b) Sequence of work

(c) Major elements of work on Site, in sufficient itemisation to allow for continuous monitoring of progress of Works

(d) Tests on Completion

(e) The Contractor will be required to submit and maintain with monthly updates, a procurement schedule for all materials. This should be submitted at the same time the monthly schedule update is submitted.

The Contractor shall construct the works as summarised in the Invitation to Tender and as detailed 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 the existing supply will only commence once the final extent is agreed between the Engineer and 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.

106 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 inspections as they deem necessary at all times during the currency of the Contract.

107 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 their staff and payment of the same shall be made through the appropriate items in the Bills of Quantities.

The Contractor shall not employ "forced or compulsory labour" in any form. "Forced or compulsory labour" consists of all work or service, not performed voluntarily, that is extracted from an individual under threat of force or penalty.

108 FACILITIES FOR THE ENGINEER'S REPRESENTATIVE TO TAKE SAMPLES

The Contractor shall provide all facilities and equipment for the Engineer's Representative to 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 be allowed.

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

109 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 the Site 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 working hours and shall have, when open, at least one person presents whom the Contractor has authorised to receive correspondence or written messages on the Contractor's behalf.

110 WORKING HOURS

The working hours for this Contract shall be defined as 7.00 to 17.00 on weekdays and 8.00 to 12.00 on Saturdays. Sundays as well as National Public Holidays shall be set aside for rest, except under special circumstances. If the Contractor wishes to execute permanent works outside these hours, he shall obtain written permission from the 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 the Contractor's own cost.

The Contractor shall not be reimbursed any of these costs.

111 ACCOMMODATION FOR EMPLOYEES

The Contractor shall provide and maintain sufficient suitable adequately ventilated and weather-proof shelters and mess rooms for the Contractor's 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.

At the time of Bidding, bidders will clearly indicate the type, nature and building materials that will be used in providing such accommodation. Bidders will also confirm that such structures will be demolished and suitably disposed of and the area returned to its pre-use condition to the satisfaction of the Engineer's Representative,

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 and in accordance with the Contractor's approved Health and Safety Programme.

112 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 and in accordance with the Contractor's approved Health and Safety Programme. The Conditions of Contract will be rigidly enforced in any case where these instructions are disobeyed.

113 SUPPLY OF ELECTRICITY

The Contractor shall supply, pay 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 all necessary arrangements for the provision of electricity to be provided at the Contractor's own cost for use in the execution of the Works, both Temporary and Permanent, for the work of any Sub-Contractors..

114 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 and in accordance with the Contractor's approved Health and Safety Programme.

Save as is otherwise provided for in the Contract, the Contractor shall arrange for all water required for the execution of the Works to be provided at the Contractor's own cost 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.

115 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 staff.

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

116 FIRST AID OUTFITS

During the progress of the Works the Contractor shall at each place of work provide an adequate First Aid Outfit that 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 the Contractor's own cost. The provision of these kits shall be considered part of the Contractor's obligations in setting up the Contractor's 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 live and work. The Contractor shall ensure that there are persons available to all such places with knowledge of simple first aid procedures.

117 ACCESS ROADS

Having regard to the Conditions of Contract, the Contractor shall at the Contractor's 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 the relevant 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 and shall 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 the Contractor's rates.

118 TRAFFIC CONTROL PLAN

The Contractor shall be responsible for all traffic control measures necessary for execution of the works.

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 of any works across or alongside public roads the Contractor shall obtain the approval of the Engineer's Representative of his plans for flagging and traffic control.

Traffic Control Plan

No later than thirty (30) days from the receipt of the Notice to Proceed, the Contractor shall submit for the Engineer's prior approval, a Traffic Control Plan to explain the means and method to be taken for proper and adequate control of traffic during the course of the Works. This Plan shall include, but not necessarily be limited to:

- Traffic control equipment the Contractor proposes to use for the Works;
- Traffic control signage including location and sign descriptions;
- Traffic control means during no working periods;
- Methods of public access around the site that will be maintained and ensuring public and residents safety, especially women and children;
- Safety of construction workers; and
- Traffic control means and devices for night and off-hour periods.
- Dealing with people with special needs such as children, the elderly, those that are disabled, expectant mothers, those accompanying small children; and
- Priority or difficult areas such as schools, hospitals, clinics, and those with dense populations.

General Traffic Management Requirements

The following conditions shall apply in regard to traffic management:

(a) The Contractor shall keep open to traffic, existing roads during the performance of the Works, provided that when approved by the Engineer the Contractor may bypass traffic over a detour. At all times, the Contractor shall keep roads and footpaths affected by the Contractor's operations free from material spillage.

(b) The Contractor shall keep the length of the construction areas in such condition that traffic will be accommodated safely. Traffic control devices and services shall be provided and maintained both inside and outside the Project limits as needed to facilitate traffic guidance should this be necessary.

(c) Prior to the start of construction operations, the Contractor shall erect such signs, barricades and traffic control devices as may be required by the plans, Specifications or as directed by the Engineer.

(d) Any devices provided under this Clause that are lost, stolen, destroyed or deemed unacceptable – while their use is required on the Project – shall be replaced by the Contractor without compensation.

(e) Night-time operations shall be illuminated by a lighting system approved by the Engineer. The lighting system shall be positioned and operated to preclude glare.

(f) The Contractor shall take necessary care at all times during the execution of the works to ensure the existing convenience and safety of residents along and adjacent to the road, and any public highway or facility that may be affected by the Works.

(g) The Contractor should thoroughly acquaint himself with existing traffic conditions and understand the importance of maintaining traffic safety and the avoidance of excessive traffic delay. The Contractor shall cooperate with the pertinent agencies regarding traffic control and all details will be subject to the Engineer's prior approval.

(h) The Contractor's requirements shall include, but not necessarily be limited to, provisions of traffic control devices and services for the control and protection of traffic through areas of construction.

(i) The Contractor's Health and Safety Manager shall work closely with the person assigned with the responsibility for Social and Gender issues (see clause 159) to identify social and gender related concerns in relation to Traffic Management, and to mitigate against any negative impacts of these to the full satisfaction of the Engineer's Representative.

(j) Any failure of the Contractor to meet these requirements will entitle the Engineer to carry out such works as he deems to be necessary and to charge the Contractor with the full cost thereof plus ten percent of such cost, which sum will be deducted from any money due or which may become due to the Contractor under the Contract.

Traffic Control

The Contractor shall ensure that all works are adequately sign posted. The Contractor shall provide details in writing to the Engineer for approval at least seven (7) days in advance of the works. On receipt of the Engineer's approval, advance warning signs (reflectorized, coning and bunding, stop and give way signs), other appropriate signing and lighting shall be provided and maintained by the Contractor in accordance with the Contractor's proposals and the effectiveness of this signing and lighting shall be constantly monitored by the Contractor.

All full, partial and temporary road closures shall be manned by the Contractor, day and night. All operatives shall be trained and fully briefed by the Contractor on their responsibilities. These shall include achieving minimum disruption to traffic consistent with the safety of pedestrians, construction operatives and supervisory staff and vehicular traffic.

The Contractor's Health and Safety Manager will communicate with local communities with regards to the temporary closures to minimise disruptions and to communicate any safety requirements that need to be followed during this time, using both printed and verbal means of communication.

Where required and as appropriate, the traffic controllers or flagmen shall be provided with communication equipment.

Traffic Signs and Safety

The Contractor shall carefully plan all traffic control management and liaise with all concerned parties to advertise and seek agreement on the most universally acceptable traffic management practices. Diversions shall be advertised in advance and fully signed and lighted when implemented. Safety of all parties using and working on the road shall be paramount. The Contractor will be required to provide and maintain effective protective fences, bunding, etc. below slope works and to define the edges of steep excavations or existing down slopes and provide signing and lighting as necessary.

Traffic Control Signs, Delineator and Warning Lights

Item	Specification
1.General	The Contractor shall provide one-way traffic control for the 200 m or less long construction section through the project. In these areas, the Contractor shall provide for one-way traffic control beginning and ending 50 metres from the work area. Signs, delineators, warning lights and flagmen shall be posted and maintained as described in Items 2, 3, and 4.
2. Signs	1.2- and 1.3-meters square plywood painted reflective white with 12 centimetres reflective red letters shall be installed at 50 metres intervals commencing 150 metres from the worksite. The signs shall be 1.2 metres high and placed on the edge of pavement facing the traffic flow. Sign wording shall be SLOW-LANE OR ROAD CLOSED AHEAD; CAUTION: ROAD CONSTRUCTION AHEAD; REDUCE SPEED, CONSTRUCTION PROGRESS; STOP, OBEY FLAGMEN; REDUCE SPEED, ON LANE AHEAD.
3.Delineators	Reflective red or orange plastic or rubber cones 45 centimetres high shall be placed at 30 metres interval along the traffic side of the restricted area.
4. Warning Lights	Amber flashing lights with a 15 centimetres diameter lens head shall be provided at all sign locations. The intensity of the lights shall be at least 4 candle powers and have a flash rate between 50-75 flashes directing traffic movements.

All barricades fences and such other aids that maybe required shall be reflectorised and shall conform to the local regulations and shall be illuminated at night by lantern.

Contractor's Liabilities and Responsibilities

The Contractor shall be fully liable for traffic control and safety. Approval by the Engineer of the Contractor's traffic control and signing proposals shall in no way be construed as relieving the Contractor of any of the Contractor's obligations or

liabilities. If, in the opinion of the Engineer, the Contractor does not fulfil the contractually required duties and responsibilities, the Engineer will be forced to carry out such works as he deems to be necessary and to charge the Contractor with the full cost thereof plus ten percent of such cost, which sum will be deducted from any money due or which may become due to the Contractor under the Contract.

Payment for the cost of the following items will be included in the relevant item in the Bill of Quantities or, if not shown separately, deemed to be included in the bill items provided.

Description	Quantity	Unit
Labor		
Traffic Personnel	Contract period	month
Materials (Quantities shown below shall be supplied for the entire contract duration)		
Warning Signs	30	each
Guide Signs	30	each
Traffic Cone	150	pcs
G.I. Barricade and Warning Signs	150	m
Traffic Flags	15	pcs
Reflectorized Vests	36	pcs

119 ADDITIONAL LAND

The Contractor shall select and arrange at the Contractor's own expense for any temporary occupation of land outside the Site that 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.

120 TEMPORARY WORKS

The Contractor shall provide, maintain and remove on completion of the Works all temporary Works including roadways, sleeper tracks and staging, etc. over roads, footpaths, streams or unstable ground and he shall make them safe and suitable in every respect to carry all Plant required for the Work or for providing access or for any other purpose. Such temporary works shall be constructed to the satisfaction of the Engineer, but the Contractor shall nevertheless be responsible for any damage done to or caused by such temporary road works

Details of temporary Works shall be submitted in advance to the Engineer for his approval, which when approved, shall not relieve the Contractor of complete responsibility for their safety and satisfactory operation.

Before constructing temporary works, the Contractor shall, at no cost to the Employer, make all necessary arrangements, including payment (if required) to the public authorities or landowners concerned for the use of the land and shall obtain the prior approval of the Engineer. Such approval will be dependent on the Engineer being satisfied with the Contractor's proposals for items such as signing, lighting together with the proposed maintenance arrangements. Such approval will

not, however, relieve the Contractor of his responsibilities under the Contract. Upon completion of the works, the Contractor shall clean up and restore the land to the satisfaction of the Engineer. Land which the Contractor acquires for temporary works, and which is not otherwise compensated by the RAP, shall be compensated by the Contractor to the owner in compliance with the RAP policies and rules, or better.

121 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 of the Site, or elsewhere. In the event the Contractor encounters conditions under which he considers such interference necessary, he shall forthwith notify the Engineer's Representative 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.

122 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 be responsible 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 with the lawful orders of the relevant authorities and the Contractor shall allow for the same within his rates.

123 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.

124 SUBMISSION OF SAMPLES

Before the supply of any materials or articles that he intends to incorporate into the Permanent Works, the Contractor shall submit to the Engineer's Representative for his approval a sample of each respective material or article, and such samples shall be delivered to and kept at the Engineers Office for reference. Should the samples be considered by the Engineer's Representative to be unsuitable for the purpose intended, or not to comply with the Specification or the nominated Standard Specification the Contractor shall submit samples of the materials or articles from a different source for approval. All the respective kinds of materials and articles used

in and upon the Works, shall be at least equal in quality to the approved samples. Each and every sample shall be a fair average of the bulk material or of the article it represents. The Engineer's Representative may decide the method by which each sample to be taken from the bulk shall be obtained and the number of such samples. The Contractor shall allow for complying with the provisions of this Clause within his rates.

125 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 the Contractor shall not be entitled to any time credit for delay occasioned by the Contractor's neglect to order sufficiently well in advance or to payment of any costs he may incur as the result thereof.

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

126 TESTING OF MATERIALS AND MANUFACTURED ARTICLES BEFORE USE

Any or all of the materials and manufactured articles supplied by the Contractor for use on any of the Works 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 Engineer who 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 ordered by the Engineer to be carried out by an independent person at a place other than the Site or place of manufacture or fabrication shall be borne by the 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.

127 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 be used upon the Works but shall be branded if, in the opinion of the Engineer this is necessary, and shall forthwith be removed from the Site of the Works, all at the Contractor's expense and in each case as the Engineer shall direct.

128 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.

129 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, and with the requirements of the ESMP, with regard to the execution of construction work and shall follow all instructions issued by the competent Authorities and the Engineer.

The Contractor shall at his discretion base his Price 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 be complied with as a minimum. Where no local Standard Specification exists, then the relevant standard specification issued by the International Standard Organisation (ISO), if any, shall be complied with as a minimum. 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 the 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.

130 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.

131 OFFICE ACCOMMODATION ON SITE FOR ENGINEER'S REPRESENTATIVE

Not applicable.

132 HOUSING FOR RESIDENT ENGINEER

Not applicable.

133 INSURANCE OF RESIDENT ENGINEER'S OFFICE, FURNITURE AND EQUIPMENT

Not applicable.

134 TRANSPORTATION FOR THE RESIDENT ENGINEER AND HIS STAFF

Not applicable.

135 SURVEY INSTRUMENTS AND EQUIPMENT

If so instructed, the Contractor shall provide for the exclusive use of the Engineer and his staff 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.

136 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 Satellite Tracking 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 Windows interface 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.

137 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 is to be handed over to the Employer in a neat and clean condition to the satisfaction of the Engineer. Compliance with this Clause shall be a prerequisite condition for the issue of a Taking-Over Certificate.

138 NON-EXPLOSIVE ROCK REMOVAL FOR EXCAVATION WORKS

Blasting and use of explosive materials is forbidden for all excavation for the Work including rock removal. The Contractor may only use a non-explosive method for which nevertheless the prior approval of the Engineer shall be obtained. The Contractor shall employ personnel licensed to handle such non-explosive materials and equipment. He shall take all practical precautions for the protection of person's properties and the Works.

Great care shall be taken to see than any surrounding rock is not shattered, particularly in the bottoms of trenches and foundations. All loose and shaken pieces of rock shall be removed.

139 SIGN BOARDS

The Contractor shall provide, sign-write, erect and maintain until the expiry of the Defects Notification Period signboards of sound steel construction and hollow section steel uprights to the dimensions, sign-written and painted in durable colours, as directed by the Engineer. 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 be imbedded in Class 20 concrete of sufficient volume to give the whole assembly adequate stability.

140 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 all arrangements for the acquisition of the land required for provision of the Contractor's 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 time that 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 this confirmation, he shall be liable in whole or in part at the sole discretion of the Engineer, for all additional costs and/or legal charges that might arise therefrom.

141 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 relatively large distance that high voltage can "short" to earth when cranes or other large masses of steel are in the vicinity of the power line. The Contractor's attention is drawn to SSRN 027 which gives safe clearance to the various voltages.

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

In all cases where such existing works are exposed, they shall be properly shored or hung up. Special care must be exercised in re-filling to consolidate the ground under any main cables, 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 is completed, 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 works that are exposed.

The Contractor shall be responsible for arranging for the moving of services, subject to the agreement 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. Where the Contractor encounters conditions where the alteration 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.

The Contractor shall carry out detailed investigations sufficiently in advance of the Works to enable identification of the locations of the existing power supply system that will require relocation in order to undertake the Works without undue delay. The Contractor will provide accurate records of such locations to the Engineer prior to commencement of the Works in any affected section of the road.

The Contractor shall cooperate fully with the public utility companies in the removal and relocation of any services or facilities so as to safeguard and minimize disruption to the services. In the event of a utility service being interrupted as a result of damage caused by the Contractor, the Contractor shall promptly notify the authority and shall be responsible for the cost of any repairs that are required to restore the services.

All work related to the relocation of the existing electrical distribution system requires specialization that may only be undertaken by the responsible Utility Company (ESCOM) or a Subcontractor accredited by ESCOM. The Contractor shall enter into a separate Agreement with ESCOM who shall undertake all relocation works that include but not necessarily limited to:

(a) Supply and installation of new steel poles, pole line hardware and cables, including transformers;

(b) Relocation of existing steel and concrete poles, pole line hardware including all miscellaneous work items to complete;

(c) Replacement of wooden poles with steel poles and relocation of existing pole line hardware including all miscellaneous items to complete;

(d) Relocation of existing concrete poles, cables as well as removal and disposal of existing concrete/steel pipe for telephone distribution system.

If in case the work is done by an accredited Subcontractor, the Contractor shall enter into a separate contract agreement with the accredited Subcontractor for the works listed above. The Contractor shall also enter into a separate Memorandum of Agreement with ESCOM with regards monitoring and acceptance of the works done by the accredited Subcontractor.

The Provisional Sum for these works is included as a fixed amount and the Bidders are not entitled to modify the figure.

The amount to be paid for the relocation works shall be determined by the Engineer after a review and evaluation of the proposed costs and scope of works submitted in BOQ format by ESCOM or submitted by the accredited Subcontractor, as the case maybe, through the Contractor. After a determination of the amount to be paid and scope of works for relocation works, the Engineer shall endorse the same to the Employer for approval. The approved amount and scope of works shall be incorporated in the contract agreement between the Contractor and ESCOM or between the Contractor and the accredited Subcontractor. The approved amount should be within the Provisional Sum allocated for these works. Any additional costs exceeding this amount will be covered under the contingencies sum.

Any relocation works that need to be done by the Contractor (e.g. water/sewer lines) and which are not found in the BOQs can be carried out under the Dayworks items.

142 RELOCATION OF BILLBOARDS

Any billboards that are likely to be affected by the construction works shall be relocated by the owners at their own cost. The Contractor is obliged to identify and inform the owners of the intention to execute construction works in areas where the billboards might be affected and shall allow the owners sufficient time to relocate their properties. The Contractor is not entitled to damage or relocate any billboard without the consensus and written approval of the owner. Payments for relocation works done by the Contractor on behalf of the owner shall be borne by the owner.

143 CLOSURE OF ROADS

Where a road used by the Contractor for delivery of any material to be used in the Works is 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.

144 LIAISON WITH GOVERNMENT AND POLICE OFFICIALS

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

145 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 and of the water or electricity undertaker within whose area and jurisdiction the Works are to be executed.

146 BUILDING REGULATIONS

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

147 PHOTOGRAPHS AND VIDEO TAPE RECORD

Prior to executing any part of the Permanent Works, the Contractor shall make a video tape record of the existing conditions along the route of the works. This shall be in sufficient detail to enable the extent of the Works executed by the Contractor to be compared with the situation existing shortly prior to this work.

Where such photographs or video records are likely to include individuals, the consent of such individuals being included in the picture shall always be sought in advance. Where children are likely to be included in the picture, then the permission from a parent or guardian shall be obtained.

During the execution of the Works and on not less than a monthly basis, the Contractor shall take photographs sufficient in number to illustrate the work being executed as well as of any unforeseen obstructions or anomalies that he wishes to draw to the attention of the Engineer.

Pre and Post Construction Photographic Survey

The primary purpose of the surveys shall be to provide a baseline of photographic and video information against which any claims for damage or dislocation by people living along the pipeline routes can be assessed. However the record shall also serve a secondary purpose as a record of the construction works and general impacts. Special attention shall be paid to the pipeline routes.

Prior to commencing work on any pipeline the contractor shall arrange for a photographic of the route to be made. The record shall be made and stored in such a way that it is possible to later relocate any position on any pipeline within the photographic record. For this purpose the camera used shall be capable of geotagging photographs with the positional information with a typical horizontal

error of +-6m. Photographs shall be taken with a camera with resolution not lower than 5Mega Pixel.

The record shall be made in the direction of flow of the pipe. Photographs shall be taken looking along the alignment of the pipe with at least one photograph recorded every 5m along the route in built up areas and every 20m in open country or farmland. In addition close up photographs may be taken of other features of interest along the pipeline route such as buildings close to the pipeline or features obscured in the other photographs.

On completion of any pipeline the survey shall be repeated with new photographs taken looking along the alignment of the pipe with at least one photograph recorded every 5m along the route in built up areas and every 20m in open country or farmland.

The method of data capture, storage and dissemination shall be devised by the Contractor and shall be proposed to the Engineer within 4 weeks of the start of the contract. The Engineer shall comment and agree on a final method to be used and this method shall then be implemented by the Contractor.

148 OPERATION AND MAINTENANCE MANUAL

The Engineer will compile changes, alterations and additions to existing operation and maintenance manuals for use by the Employer's staff. To this end, the Contractor is required to provide in triplicate and in English details of all the different manufactured new Plant, 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 Specifications.

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

149 TRAINING FOR THE EMPLOYER'S PERSONNEL

The Contractor shall 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 foreman to work alongside the Contractors staff in the fields of pipeline repair and the installation of valves, 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 a programme previously submitted to and approved by the Engineer.

Training will be conducted by the contractor to its employees and subcontractor staffs on the importance and use of PPE on construction sites.

150 MISCELLANEOUS ACCOUNTS

The Contractor may be instructed by the Engineer to purchase and supply to the Engineer, or pay on the Engineer's behalf for miscellaneous items including but not limited to stores, equipment, computer wares and training, hotel accommodation, services and the like. The Contractor 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.

151 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:

a) Plaques affixed to Plant; or
b) 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.

152 ACCESS TO EXISTING FACILITIES

Where necessary for the execution of the Works, the Contractor and the Contractor's 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:

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

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

(iii) Organised gangs of technicians, artisans, workmen and labour, who shall enter the premises, work therein and leave as a group or groups, each group being under the supervision of a previously nominated person; and

(iv) Crews operating Contractor's Equipment who shall remain with their piece of equipment whilst upon such premises.

Unless otherwise specified, any authorities provided for access to such premises shall be deemed 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 extensions thereto as shall not require specific approval as specified above) at least seven days before work commences on such premises, and provide in the Contractor's application:

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

(ii) The normal working hours that shall be in effect;

(iii) The names of the supervisory staff who shall be responsible for and who shall enter and leave with the working gangs;

(iv) The areas in which work shall be carried out; and

(v) 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.

153 REMOVAL OF GOODS FROM EMPLOYER'S PREMISES

The Employer's staff at any of the Employer's premises shall be entitled to demand and to be 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 the Contractor's employees to determine that the description of such goods is true and accurate including the inspection of vehicles and the opening up of any containers, parcels or wrappings.

154 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 of Equipment and levels of staff and labour that 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 arise that 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 the Engineer's approval the Contractor's plan for works associated with the Disruption and details of the dates and times intended for such Disruption. The Engineer shall within 7 days of such submissions:

(i) 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;

(ii) 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

(iii) 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 in accordance with the Engineer's requirements. Notification of such withholding of approval such 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 two days before the commencement of the Disruption in three national newspapers, at a minimum of quarter page size, and on radio, TV and in community meetings.

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

155 COPIES OF STANDARDS

Within 60 days of the acceptance of the Tender, the Contractor shall provide to the Engineer copies in English, of all National and International Standards that 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.

156 SITE HEALTH AND SAFETY

The Contractor shall observe and cause the Contractor's employees to observe health and safety standards commensurate with the nature of the Works and in accordance to the IFC health and safety guidelines as well as the health and safety regulations of the country. To this end the Contractor shall appoint as Safety Officer one of the Contractor's senior staff who shall have specific knowledge of safety regulations and have had experience of safety precautions, and occupational health on similar works and who shall advise the Contractor on all aspects of safety and health on site.

The Contractor shall provide the Contractor's employees with:

(i) overalls, boots or shoes with reinforced toe caps.

(ii) reflective vests (at minimum).

(iii) hard hats suitable for a construction site.

(iv) other protective equipment such as gloves, earmuffs, goggles, fowl weather protective clothing, etc. as are necessary for particular work.

(v) 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. They must be gender separated. (latrines minimum of 20 m from inhabited structures and water supply for hand washing close by.

(vi) reporting details of any accident to the Engineer and competent authorities as soon as possible after its occurrence.

(vii) effective measures to prevent of non-site personnel from entering the work areas.

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

The Contractor is required to produce a Health and Safety Management Plan (HSMP) covering the hazards that may apply during the Contract, the rules and standards to be used in assessing risk and in undertaking work and the methods that will be employed to ensure compliance with this plan.

Health and Safety Management Plan

The Contractor shall submit a detailed, site-specific HSMP based on all relevant health and safety provisions found in the [Technical Specifications] and [Schedules] and applicable Laws to the Engineer within 28 days after receiving the notice under Sub-Clause 8.1 [Commencement of Work]. The HSMP must be approved by the Engineer prior to commencement of the execution of the Works.

Unless the Engineer, within 21 days after receiving the Health and Safety Management Plan, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the Health and Safety Management Plan.

The Contractor shall also implement the health and safety requirements of the approved HSMP and comply with instructions issued as a result of periodic inspections to be undertaken as part of the supervisory role required of the Engineer.

If, at any time, the Engineer gives notice to the Contractor that all or any portion of the HSMP fails (to the extent stated) to comply with the Contract, the Contractor shall submit a revised HSMP to the Engineer.

The Contractor shall notify the Engineer and the Employer within 24 hours or as soon as reasonably possible after the occurrence of any accident which has resulted in damage or loss of property, disability or loss of human life, or which has or which could reasonably be foreseen to have a material impact on the environment and shall submit to the Engineer, and the Employer no later than 7 days after the occurrence of such an event, a summary report thereof. The HSMP shall include details of the following:

(i) Details of all potential risks and the proposals for dealing with such hazards;

(ii) Controls to regulate risks that occur during all construction, testing and commissioning activities;

(iii) Measures to avoid health risk in connection with the use, handling, storage and transportation of hazardous and harmful substances;

(iv) Safety equipment and training proposals in respect of equipment referred to above;

(v) How the Contractor intends to ensure the health and safety of members of the public in the vicinity of the areas of work, including those with special needs.

The Health and Safety Plan shall include:

Management Acknowledgements

a. Certification and Commitment

The HSMP submitted by the Contractor shall provide a signed statement from the Contractor's managing directors attesting to a commitment that all environmental and social protection, safety and industrial health aspects of the Contract shall be given the highest priority in the discharge of contractual obligations and certifying a commitment to the provisions specified by the HSMP as approved by the Engineer.

b. Statutory Understanding and Compliance

The HSMP shall provide a statement attesting the firm's understanding of, and means of ensuring due compliance with, the statutory regulations relating to construction work in Malawi, specifically in regard to compliance with:

All safety and industrial health legislation including, without limitation, the Rules and Regulations of Malawi and the authorities having jurisdiction;

All health and safety requirements as stipulated;

All current environmental laws and regulations - be they international, national or local – related but not necessarily limited to:

- Noise;
- Air pollution and odour;
- Water contamination;
- Solid waste disposal;
- Hazard waste disposal
- Liquid waste disposal;
- Sanitary conditions (water supply, sewerage, etc.);
- Use of explosives; and
- Protection of public traffic.
- Gender mainstreaming, HIV/AIDS, TIP policies and regulations

The Contractor shall restore areas citing temporary plants and other areas of construction to their original condition on completion of Project Works. This shall include the clean-up of spillage and debris before leaving any temporary construction site.

c. Availability of Documents

The HSMP shall state where copies of relevant regulations and documents will be available on the construction site and verify that all regulations and documents have been or will be available and displayed or kept.

d. Management of Sub-Contractors

The Plan shall provide a commitment that the Contractor for the work shall:

Provide sub-contractors with copies of the HSMP and the decision letter (plus annexed conditions) and incorporate provisions of the HSMP and the decision letter (plus annexed conditions) into all sub-contract documentation to ensure the compliance with the Plan at all tiers of the sub-contracting.

Require all sub-contractors to appoint a health and safety representative who shall be available on the Site throughout the operational period of the respective subcontract; and

Ensure, as far as is practically possible, that employees of sub-contractors of all tiers are conversant with appropriate parts of the HSMP, ECC, SGIP, conditions stipulated in the permits issued by environmental authority, and all the statutory regulations.

Organization and Staffing:

a. Organization Chart

The HSMP shall include an organization chart identifying (by job title and by the name of the individual) the personnel to be engaged solely for environmental protection and safety. The chart and the supporting text shall identify the designated Environmental/Health and Safety Manager and identify other participants and their Areas of responsibility.

b. Identification of Responsibilities

The Plan shall provide a description of the responsibilities of the Environmental, Health and Safety staff appearing on the Organization Chart.

c. Nomination of proposed Health and Safety Manager

The Plan shall indicate the name of the proposed personnel.

d. Certification related to the Health and Safety Manager

The Plan shall certify that:

Such managers will be appointed and assigned duties throughout the period of the Contract entirely connected with the environmental, social and gender, and safety activities on the Site.

The proposed managers shall be suitably qualified and experienced to supervise and monitor compliance with the HSMP and will, in particular but without limitation, carry out auditing of the operation of the HSMP to be submitted, from time to time, to the Engineer for the Engineer's consent.

e. Linkages with Others

The HSMP shall clearly indicate the links between the HSMP and the Social and Gender Integration Plan (SGIP), and between the Staff involved in both Health and Safety and Social and Gender Integration and how these will be co-ordinated between the Contractor and the Engineer in terms of their implementation and reporting

Communications and Reporting:

a. Communications & Routine Reporting Procedures

The HSMP shall explain the proposed interaction and communication procedures between construction personnel and environmental protection, safety and traffic control staff, including:

- Communication facilities; and
- Routine reporting systems

b. Health and Safety Reports

The following health and safety related reports shall be submitted:

- Weekly Health and Safety Reports. Documented health and safety audits shall be undertaken on a weekly basis. This should include full results of health and safety results as received.
- Incorporation of Summaries in the Project Monthly Report. Summaries of the Weekly health and Safety Reports will be included in the Project's Monthly Progress Report.
- To be included in the Monthly Report shall be a section detailing as to how the Contractor is monitoring all health and safety risks and issues and as appropriate, this shall include copies of all the necessary supporting documents, minutes of meetings, memos etc.

c. Notification of Accidents

The Plan shall verify that provisions have been made to ensure that:

The Engineer will be notified immediately of any accidents that occur whether on-site or off-site in which the Contractor, the Contractor's personnel or construction plant, or those of any sub-contractors are directly or indirectly involved and which result in any injuries to any persons.

Such initial notification may be verbal and shall be within 24 hours of the accident followed by a written comprehensive report within 7 days of the accident, the latter including the consequences of the accident and the measures being adopted to minimise of exclude the risk of any repetition.

d. Communications with Sub-Contractors

The Plan shall specify:

The means by which health and safety and traffic control and industrial health matters and requirements will be communicated to sub-contractors at all levels and their due compliance with the HSMP and all relevant statutory regulations is ensured. Sub-contractors shall be supplied with copies of the HSMP. Additional activities may include attendance at training programs, circulation of newsletters and other means as specified by the HSMP.

The method by which the procedures and practices proposed by sub-contractors will be reviewed for compliance with the HSMP and statutory regulations. This could include, for example, the inclusion of environmental and safety criteria as a part of daily and/or weekly Site inspections.

Environmental control provisions:

The required project specific HSMP shall consider amongst others, the following Environmental Provisions:

1. Environmental Protection during Construction

- The Engineer shall have the power to disallow the method of construction and/or the use of any borrow/stockpiles/spoil disposal areas if, in the Engineer's opinion, the stability and safety of the Works or any adjacent features is endangered, or if there is undue interference with the natural or artificial drainage, or if the method or use off the area will promote undue erosion or other undue environmental damage, as identified by the ESMP.
- Borrow areas and quarries shall be sited, worked, and restored. Spoil shall be disposed of at approved disposal sites prepared, filled, and restored.
- Following excavation, the Contractor shall take all steps necessary to complete drainage and slope protection works in advance of each rainy season. Drainage will be maintained around each construction work site during construction works and made good following works completion the specific area. Erosion or instability or sediment deposition arising from operation not in accordance with the Specification shall be made good immediately by the Contractor at the Contractor's expense.
- Notwithstanding approval of the intended method of working, the Contractor shall at all times be responsible for constructing the earthworks in accordance with the Specifications and Drawings.
- The project area can experience heavy rainfall. It will be deemed that the Contractors is familiar with these conditions and has formulated his Works Programme considering possible loss of time due to these causes, and it shall be the obligation of the Contractor to revise the Works Programme and enhance construction efforts as necessary to ensure timely completion of the work schedule for each working season.
- In undertaking the Works, the Contractor shall be aware that the Engineer may prohibit or restrict the Contractor's activities in other ecologically, socially, culturally or historically sensitive areas, which become known during the course of the project. The location of any such areas shall be notified to the Contractor by the Engineer at the earliest opportunity.
- Re-vegetation of Disturbed Ground
- The contractor shall cut and re-vegetate as per the ESMP and Engineer's instructions.
- Where directed by the Engineer, the Contractor shall establish vegetation on fill slopes, cut slopes, worked out borrow pits, and other areas, which may include roadway shoulders and verges, spoil disposal areas, stockpile areas, quarries, access tracks, plant sites, camp, land slide scars, gullies and stream and river banks. Prior to placing topsoil and/or establishing vegetation on embankments, all fill

material not compacted to the required standards shall be removed from the side slopes.

- The Contractor shall be responsible for supplying sufficient planting material to carry out all re-vegetation work, and shall establish and operate plant nurseries as necessary. The Contractor shall make all arrangements for procuring cutting, slips and seed for growing. Re-vegetation materials should use endemic species or plant material that is approved by the national environmental authority for re-vegetation.

2. Prevention of Air and Water Pollution

- The Contractor shall ensure that the Contractor's activities do not result in any contamination of air, land or water by polluting substances. The Contractor shall implement physical and operational measures such as earth bunds of adequate capacity around fuel, oil and solvent storage tanks and stores, oil and greases traps in drainage systems from workshops, vehicle and plant washing facilities and service and fuelling areas and kitchens, the establishment of sanitary solid and liquid waste disposal systems, the maintenance in effective condition of these measures, the establishment of emergency response procedures for pollution, events, and dust suppressions, all in accordance with normal good practice and to the satisfaction of the Engineer.
- To facilitate this in relation to the atmosphere, the PMC will avail baseline ambient air quality threshold values to the Works Contractors as a benchmark.
- Should any pollution arise from the Contractor's activities including the improper deposition of sediment the Contractor shall clean up the affected area immediately at the Contractor's own cost and to the satisfaction of the Engineer, and shall pay full compensation to any affected parties.

3. Relationships with Local Communities and Authorities

- At all times, the Contractor will respect the social and cultural practices of the local communities affected by the construction activities and in particular respect the accepted norms related to relationships between men, women, children, the elderly, those disabled or in any way vulnerable. The Contractor will facilitate this by identifying the representative or representatives of each local community prior to commencing any work within the area of that community and will accept representation from such persons whenever such is made during normal working hours.
- In siting and operating plant and facilities and in executing the Works, the Contractor shall, at all times, and to the extent possible, minimize the impact of these activities on existing communities. Where communities are likely to be affected by major activities such as the establishment of a camp or quarry or extensive road closure or bypassing, the Contractor shall liaise closely with the concerned communities and their representatives and, if so directed, shall attend

additional meetings arranged by the Engineer or Employer to resolve issues and claims and minimize impacts on local communities, including any that relate to social and gender protection.

- Any problems arising from the Contractors operations and which cannot be resolved by the Contractor shall be referred to the Employer through the Engineer. The Contractor shall be responsible for any compensation due to reinstatements necessary with respect to any damage caused by the Contractor to areas outside the Site and no separate payment will be made in this regard.
- Any concerns raised by the local community representatives in regards to the Contractor's relationships with local communities as well as those in relation to local authorities will, if significant be immediately drawn to the attention of the Engineers Representative or if otherwise, shall be dealt with in the relevant Monthly Report. To be included, will be a clear indication as to the measure or measures adopted or being undertaken or proposed to handle and mitigate against any negative implications of the matters raised.

4. Privately or Community-Owned Services and Structures

- The Contractor shall take all necessary precautions to ensure that no public or private services, utilities or similar facilities are damaged or interrupted by the Works. These precautions shall include but not be limited to liaison with public and private service providers, local government units, and private owners; a condition survey of all affected services; provision of a satisfactory alternative service while the Works are carried out; and reinstatement of a satisfactory permanent facility after completion of the Works in each area.
- No service or utilities shall be disturbed or cut before arrangements have been made for a satisfactory alternative service, or the Contractor has obtained agreement in writing from the service provider or owner to a temporary cessation of service.
- Not less than 14 days before commencing site clearance on any particular area in accordance with the agreed Programme of Work, the Contractor shall supply to the Engineer for the Engineer's prior approval, a copy of the Contractor's condition survey of all utilities and services to be affected, copies of any agreements with service providers and owners, the Contractor's plans for providing temporary service, and the Contractor's plans for reinstating permanent service following construction of the Works.
- Provision of temporary and permanent services shall be to at least the pre-existing level of service and to the satisfaction of the Engineer.

5. Water Supply for Construction

- The Contractor shall make the necessary arrangements, at the Contractors own expense, for water supply for construction and other purposes. Only clean water, free from deleterious materials and appropriate quality for its intended use, shall be used. In providing

water, the Contractor shall ensure that the rights of and supply to existing users are not affected either in quality or timing.

- In the event of a dispute over the effect of the Contractor's arrangement on the water supply of others, the Engineer shall be informed immediately and shall instruct the Contractor as to appropriate remedial actions to be undertaken at the Contractor's expense.

6. Spoil and Spoil Disposal

- All suitable excavated materials shall be used insofar as it practicable in constructing the Works. Surplus and unsuitable material whether from site clearance, excavations, failed cut or fill slopes, landslides, or maintenance operations, shall be known as spoil.
- All spoil shall be deposited at spoil disposal sites approved in advance by the Engineer.
- The Engineer's approval of any spoil disposal site shall not in any way relieve the Contractor of responsibility, inter alia, for land acquisition, provision of temporary access, works preparatory to spoiling, management of the spoiling operation, and making good after completion of spoiling.
- Unless exempted by the Engineer, in all locations where deposited spoil material exceeds 250 mm average depth, the surface will be re-vegetated. The Engineer may direct that additional vegetation and stabilization measures be applied to any such slopes.
- Spoil disposal sites will fall into three categories:
  i) Borrow pits and quarries, whether pre-existing or opened up specifically for the works contract; other sites where spoil disposal will not result in a potential safety hazard, instability, erosion, or water management problems.
  ii) Preference shall be given to the backfilling of borrow pits and quarries as an aid to site reinstatement and to a larger number of smaller sites.
  iii) Spoil sites should be located away from wetland areas, tributaries, and rivers where at all possible. If riverside sites are required, the Contractor shall be required to receive permission from the Engineer for approval and must employ best practices in consultation with the Contractor's Environmental and Social Manager. Riverside sites shall be located only on major rivers with a high natural bed load but not their tributaries. Riverside sites should be chosen such that land take is minimized and the presence of spoil in the river channel will not harmfully deflect the flow under flood conditions. Local communities must have given their informed consent before any riverside site shall be permitted. Riverside sites will not be permitted in areas of cultivated land if alternative sites are available in the vicinity, or in riverine woodland.

- No spoil disposal sites shall be located:
  i) on slopes of more than 25 degrees
  ii) where geological structures are unfavourable to stability (e.g. in fault or sheer zones or where structural planes are dipping out of the slope)
  iii) on slopes that are being undercut by stream erosion.
  iv) on spurs above converging stream channels.
  v) on talus slopes or in any situation where they might be expected to load a slope along a failure plane.
  vi) in any watercourse or drainage line whether permanent or seasonal.
  vii) on areas identified within the ESMP to be protected areas or special status habitat.
- Disposal sites should also avoid woodland, cultivated land, active slope failure areas, and gullies. Areas of groundwater discharge, sources of drinking or irrigation water, areas where failure of the spoil tip would endanger or harm the Works or buildings or cultivated land, and areas where permanent stabilization of the filled disposal area would be difficult.
- The Engineer may restrict, prohibit, or otherwise modify the Contractor's spoil disposal proposals if, in the Engineer's opinion, they are likely to cause unacceptable environmental damage.
- Except at riverside sites, the Contractor shall prepare each approved disposal site to receive spoil by:
  i) marking the boundaries of the site with white paint so that the perimeter is clearly visible;
  ii) erecting a sign at the entrance to the site with the words "Road Project Tipping Area"
- Re-vegetation works shall not be measured and paid for separately and shall be deemed to be included in the unit prices of the other items of work.
- Payment for the Cost of Environmental Protection during construction and any associated construction measures shall not be paid separately, and should be considered as subsidiary to the other pay items in the contract.
- Payment for the cost of the following items will be included under the item for Environmental and Social Safeguards, included in the Bill of Quantities to be paid on a monthly basis:

Breakdown for Item: Health and Safety Safeguards

Description	Quantity	Unit
Labour		
Health and Safety Officer/Manager	24	mo.
Health and Safety Aide	24	mo.
Utility	24	mo.
Materials		
Consumables for:		
Reporting and Monitoring	24	mo.
Routine Periodic Monitoring	24	mo.

157 COUNTERPART CONTRIBUTIONS

The Employer may provide certain counterpart contributions to the Works but, where the contributions would affect the progress of the Works, shall 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.

158 LOCAL TECHNICAL AGENCY

The Manufacturer of any Pumps and Motors and of any Electrical Switchgear supplied under this contract will be expected to have, or shall prior to award undertake to appoint a local (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 be expected 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.

159 ENVIRONMENTAL AND SOCIAL MONITORING AND PROTECTION

The following Environmental Protection and Social Safeguard Clauses are to be read in conjunction with the remainder of the Contract Documents.

The Contractor shall be required to follow the IFC Performance Standards on Environmental and Social Sustainability, January 2012 and the national guidelines and laws.

The Contractor shall take all necessary measures and precautions to ensure that the execution of the Works and all associated operations are carried out in conformity with statutory and regulatory environmental and social requirements of the Government of Malawi. The Contractor shall be required to develop a Contractor's Environmental and Social Management Plan (CESMP) that follows the framework ESMP shown below, using generic ESMPs in ESIAs as also reflected in Section XI of this bidding document, and shall comply with the Contract Specifications, of which these Environmental and Social Safeguard provisions are a part.

Environmental and Social Impact Assessments (ESIAs) have been prepared for the works to be carried out consistent with IFC Environmental Guidelines, IFC Gender Policy and Government of Malawi and national environmental authority requirements. The Contractor will be required to develop their CESMP to comply with site-specific requirements and other measures identified in these assessments.

The CESMP shall also include the requirements and conditions stipulated in the permits issued by the national environmental authority, including the Environmental Compliance Certificate (ECC).

A Social and Gender Integration Plan (SGIP) has been prepared. The SGIP addresses issues related to social roles, responsibilities, and behaviours assigned to men and women in society, issues related to Trafficking in Persons (TIP), issues related to any components designed to address gender inequalities that limit women's and men's as well as vulnerable groups' opportunities to participate in or benefit from the Compact.

In the event of serious or repeated violations of the stipulated conditions in the ECC, CESMP and the Contract Specifications, the Employer reserves the right to withhold payments and/or stop construction

Contractors Environmental and Social Management Plan (CESMP)

The Contractor shall submit a detailed, site-specific Contractor's Environmental & Social Management Plan (or "CESMP) in respect of safety, security, and protection of the environment based on all relevant provisions found in the [Technical Specifications] and [Schedules] and applicable Laws to the Engineer within 28 days after receiving the notice under Sub-Clause 8.1 [Commencement of Work]. The CESMP must be approved by the Engineer prior to commencement of the execution of the Works.

Unless the Engineer, within 21 days after receiving the CESMP, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the CESMP.

If, at any time, the Engineer gives notice to the Contractor that all or any portion of the CESMP fails (to the extent stated) to comply with the Contract, the Contractor shall submit a revised CESMP to the Engineer.

The Contractor shall request written confirmation from the Engineer that actions requiring completion by the approved Resettlement Action Plan ("RAP") have been completed before the commencement of the execution of the Works or each Section (as the case may be). The Contractor shall also immediately notify the Engineer of any land acquisition or resettlement needs resulting from the design or Works that have not been addressed by the RAP. No work shall commence in any such newly identified area without the approval of the Engineer.

The Contractor shall implement environmental and social requirements of the approved CESMP and instructions issued as a result of periodic inspections to be undertaken as part of the supervisory role required of the Engineer, to ensure compliance with the requirements of the CESMP.

The Contractor shall be responsible for ensuring that all Subcontractor's and Contractor's Personnel understand and operate in accordance with the principles and requirements of the environmental, social, health and safety impacts provisions of this Sub-Clause and that similar standards apply to the Subcontractor's environmental, social, health and safety impacts management systems and environmental and social impacts performance.

The Contractor shall ensure the adequate disposal of construction and excavation wastes in accordance with the Environmental Guidelines and applicable Laws. This includes identifying the presence of hazardous materials and developing plans, approved by the Engineer, for proper handling and disposal of such materials.

The Contractor shall restore the Site to original conditions or to a state as set out in the Specifications after the completion of the Works.

The CESMP shall be organized in four sections as follows:

Management Acknowledgements

1. Certification and Commitment

   The ESMP submitted by the Contractor shall provide a signed statement from the Contractor's managing directors attesting to a commitment that all environmental and social protection, safety and industrial health aspects of the Contract shall be given the highest priority in the discharge of contractual obligations and certifying a commitment to the provisions specified by the CESMP as approved by the Engineer.

2. Statutory Understanding and Compliance

   The CESMP shall provide a statement attesting the firm's understanding of, and means of ensuring due compliance with, the statutory regulations relating to construction work in Malawi, specifically in regard to compliance with:

   All safety and industrial health legislation including, without limitation, the Rules and Regulations of Malawi and the authorities having jurisdiction;

   All social and gender integration requirements as stipulated;

   All current environmental laws and regulations - be they international, national or local – related but not necessarily limited to:

   - Noise;
   - Air pollution and odour;
   - Water contamination;
   - Solid waste disposal;
   - Hazard waste disposal
   - Liquid waste disposal;
   - Sanitary conditions (water supply, sewerage, etc.);
   - Use of explosives; and
   - Protection of public traffic.

- Gender mainstreaming, HIV/AIDS, TIP policies and regulations

The Contractor shall restore areas citing temporary plants and other areas of construction to their original condition on completion of Project Works. This shall include the clean-up of spillage and debris before leaving any temporary construction site.

3. Availability of Documents

The CESMP shall state where copies of relevant regulations and documents will be available on the construction site and verify that all regulations and documents have been or will be available and displayed or kept.

4. Management of Sub-Contractors

The Plan shall provide a commitment that the Contractor for the work shall:

Provide sub-contractors with copies of the CESMP and the decision letter (plus annexed conditions) and incorporate provisions of the CESMP and the decision letter (plus annexed conditions) into all sub-contract documentation to ensure the compliance with the Plan at all tiers of the sub-contracting.

Require all sub-contractors to appoint a health and safety representative who shall be available on the Site throughout the operational period of the respective subcontract; and

Ensure, as far as is practically possible, that employees of sub-contractors of all tiers are conversant with appropriate parts of the ESMP, ECC, SGIP, conditions stipulated in the permits issued by the national environmental authority, and all statutory regulations.

Organization and Staffing

1. Organization Chart

The CESMP shall include an organization chart identifying (by job title and by the name of the individual) the personnel to be engaged solely for environmental protection and safety. The chart and the supporting text shall identify the designated Environmental/Health and Safety Manager and identify other participants and their Areas of responsibility.

2. Identification of Responsibilities

The Plan shall provide a description of the responsibilities of the Environmental, Health and Safety staff appearing on the Organization Chart.

3. Nomination of proposed Environmental and Social Manager

The Plan shall indicate the name of the proposed personnel.

4. Certification related to the Environmental and Social Manager

The Plan shall certify that:

Such managers will be appointed and assigned duties throughout the period of the Contract entirely connected with the environmental, social and gender, and safety activities on the Site.

The proposed managers shall be suitably qualified and experienced to supervise and monitor compliance with the CESMP and will, in particular but without limitation, carry out auditing of the operation of the CESMP to be submitted, from time to time, to the Engineer for the Engineer's consent.

5. Linkages with Others

   The CESMP shall clearly indicate the links between the ESMP and the Social and Gender Integration Plan (SGIP), and between the Staff involved in both Health and Safety and Social and Gender Integration and how these will be co-ordinated between the Contractor and the Engineer in terms of their implementation and reporting.

These managers shall not be removed from the Site without the express, prior written permission of the Engineer. Within fourteen (14) days of any such removal or notice of intent of removal, replacement staff shall be nominated for the Engineers approval.

These managers shall be provided with supporting staff in accordance with the staffing levels set out in the Plan.

These managers and supporting staff will:

- Ensure that ESMP, SGIP, conditions stipulated in the permits issued by the national environmental authority and all statutory regulations are fully complied with during construction and at all times during the period of the contract.
- Be empowered to instruct all employees of the Contractor or Sub-contractors at any level to cease operations and take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the CESMP or the statutory regulations, shall maintain a daily Site Diary in order to comprehensively record all relevant matters concerning Site environmental and social management and safety, inspections and audits, related incidents. The Site Diary shall be available at all times for inspection by the Engineer.

Contact Information

Contact information for the Environmental and Social Manager and staff shall be provided in the Plan.

Communications and Reporting

1. Communications & Routine Reporting Procedures

   The CESMP shall explain the proposed interaction and communication procedures between construction personnel and environmental protection, safety and traffic control staff, including:

   - Communication facilities; and
   - Routine reporting systems

2. Environmental and Social Monitoring Reports

   The following environmental, social, and gender related reports shall be submitted:

- Weekly Environmental Social and Gender Reports. Documented environmental, social, and gender audits shall be undertaken on a weekly basis. This should include full results of Environmental monitoring testing and full social and gender results as received.
- Incorporation of Summaries in the Project Monthly Report. Summaries of the Weekly Environmental and Social and Gender Reports will be included in the Project's Monthly Progress Report.
- To be included in the Monthly Report shall be a section detailing as to how the Contractor is monitoring all social and gender related risks and issues and as appropriate, this shall include copies of all the necessary supporting documents, minutes of meetings, memos etc.

3. Notification of Accidents

The Plan shall verify that provisions have been made to ensure that:

The Engineer will be notified immediately of any accidents that occur whether on-site or off-site in which the Contractor, the Contractor's personnel or construction plant, or those of any sub-contractors are directly or indirectly involved and which result in any injuries to any persons.

Such initial notification may be verbal and shall be within 24 hours of the accident followed by a written comprehensive report within 7 days of the accident, the latter including the consequences of the accident and the measures being adopted to minimise of exclude the risk of any repetition.

4. Communications with Sub-Contractors

The Plan shall specify:

The means by which environmental management, social and gender, matters and requirements will be communicated to sub-contractors at all levels and their due compliance with the CESMP and all relevant statutory regulations is ensured. Sub-contractors shall be supplied with copies of the CESMP. Additional activities may include attendance at training programs, circulation of newsletters and other means as specified by the CESMP.

The method by which the procedures and practices proposed by sub-contractors will be reviewed for compliance with the CESMP and statutory regulations. This could include, for example, the inclusion of environmental and safety criteria as a part of daily and/or weekly Site inspections.

Environmental Control Provisions

Incorporating the provisions of the ESIA report - the required project specific CESMP shall consider amongst others, the following Environmental Provisions:

1. Environmental Protection during Construction

- The Engineer shall have the power to disallow the method of construction and/or the use of any borrow/stockpiles/spoil disposal areas if, in the Engineer's opinion, the stability and safety of the Works or any adjacent features is endangered, or if there is undue interference with the natural or artificial drainage, or if the method or use off the area will promote undue erosion or other undue environmental damage, as identified by the ESMP.

- Borrow areas and quarries shall be sited, worked, and restored. Spoil shall be disposed of at approved disposal sites prepared, filled, and restored.
- Following excavation, the Contractor shall take all steps necessary to complete drainage and slope protection works in advance of each rainy season. Drainage will be maintained around each construction work site during construction works and made good following works completion the specific area. Erosion or instability or sediment deposition arising from operation not in accordance with the Specification shall be made good immediately by the Contractor at the Contractor's expense.
- Notwithstanding approval of the intended method of working, the Contractor shall at all times be responsible for constructing the earthworks in accordance with the Specifications and Drawings.
- The project area can experience heavy rainfall. It will be deemed that the Contractors is familiar with these conditions and has formulated his Works Programme considering possible loss of time due to these causes, and it shall be the obligation of the Contractor to revise the Works Programme and enhance construction efforts as necessary to ensure timely completion of the work schedule for each working season.
- In undertaking the Works, the Contractor shall be aware that the Engineer may prohibit or restrict the Contractor's activities in other ecologically, socially, culturally or historically sensitive areas, which become known during the course of the project. The location of any such areas shall be notified to the Contractor by the Engineer at the earliest opportunity.

2. Re-vegetation of Disturbed Ground

- The contractor shall cut and re-vegetate as per the ESMP and Engineer's instructions.
- Where directed by the Engineer, the Contractor shall establish vegetation on fill slopes, cut slopes, worked out borrow pits, and other areas, which may include roadway shoulders and verges, spoil disposal areas, stockpile areas, quarries, access tracks, plant sites, camp, land slide scars, gullies and stream and river banks. Prior to placing topsoil and/or establishing vegetation on embankments, all fill material not compacted to the required standards shall be removed from the side slopes.
- The Contractor shall be responsible for supplying sufficient planting material to carry out all re-vegetation work, and shall establish and operate plant nurseries as necessary. The Contractor shall make all arrangements for procuring cutting, slips and seed for growing. Re-vegetation materials should use endemic species or plant material that is approved by the national environmental authority for re-vegetation.

3. Prevention of Air and Water Pollution

- The Contractor shall ensure that the Contractor's activities do not result in any contamination of air, land or water by polluting substances. The Contractor shall implement physical and operational measures such as earth bunds of adequate capacity around fuel, oil and solvent storage tanks and stores, oil and greases traps in drainage systems from workshops, vehicle and plant washing facilities and service and fuelling areas and kitchens, the establishment of sanitary solid and liquid waste

disposal systems, the maintenance in effective condition of these measures, the establishment of emergency response procedures for pollution, events, and dust suppressions, all in accordance with normal good practice and to the satisfaction of the Engineer.

- To facilitate this in relation to the atmosphere, the PMC will avail baseline ambient air quality threshold values to the Works Contractors as a benchmark.
- Should any pollution arise from the Contractor's activities including the improper deposition of sediment the Contractor shall clean up the affected area immediately at the Contractor's own cost and to the satisfaction of the Engineer, and shall pay full compensation to any affected parties.

4. Relationships with Local Communities and Authorities

- At all times, the Contractor will respect the social and cultural practices of the local communities affected by the construction activities and in particular respect the accepted norms related to relationships between men, women, children, the elderly, those disabled or in any way vulnerable. The Contractor will facilitate this by identifying the representative or representatives of each local community prior to commencing any work within the area of that community and will accept representation from such persons whenever such is made during normal working hours.
- In siting and operating plant and facilities and in executing the Works, the Contractor shall, at all times, and to the extent possible, minimize the impact of these activities on existing communities. Where communities are likely to be affected by major activities such as the establishment of a camp or quarry or extensive road closure or bypassing, the Contractor shall liaise closely with the concerned communities and their representatives and, if so directed, shall attend additional meetings arranged by the Engineer or Employer to resolve issues and claims and minimize impacts on local communities, including any that relate to social and gender protection.
- Any problems arising from the Contractors operations and which cannot be resolved by the Contractor shall be referred to the Employer through the Engineer. The Contractor shall be responsible for any compensation due to reinstatements necessary with respect to any damage caused by the Contractor to areas outside the Site and no separate payment will be made in this regard.
- Any concerns raised by the local community representatives in regards to the Contractor's relationships with local communities as well as those in relation to local authorities will, if significant be immediately drawn to the attention of the Engineers Representative or if otherwise, shall be dealt with in the relevant Monthly Report. To be included, will be a clear indication as to the measure or measures adopted or being undertaken or proposed to handle and mitigate against any negative implications of the matters raised.

5. Privately or Community-Owned Services and Structures

- The Contractor shall take all necessary precautions to ensure that no public or private services, utilities or similar facilities are damaged or interrupted by the Works. These precautions shall include but not be limited to liaison with public and private service providers, local government units, and private owners; a condition survey of all affected services; provision of a satisfactory alternative service while the Works are carried out; and reinstatement of a satisfactory permanent facility after completion of the Works in each area.
- No service or utilities shall be disturbed or cut before arrangements have been made for a satisfactory alternative service, or the Contractor has obtained agreement in writing from the service provider or owner to a temporary cessation of service.
- Not less than 14 days before commencing site clearance on any particular area in accordance with the agreed Programme of Work, the Contractor shall supply to the Engineer for the Engineer's prior approval, a copy of the Contractor's condition survey of all utilities and services to be affected, copies of any agreements with service providers and owners, the Contractor's plans for providing temporary service, and the Contractor's plans for reinstating permanent service following construction of the Works.
- Provision of temporary and permanent services shall be to at least the pre-existing level of service and to the satisfaction of the Engineer.

6. Water Supply for Construction

- The Contractor shall make the necessary arrangements, at the Contractors own expense, for water supply for construction and other purposes. Only clean water, free from deleterious materials and appropriate quality for its intended use, shall be used. In providing water, the Contractor shall ensure that the rights of and supply to existing users are not affected either in quality or timing.
- In the event of a dispute over the effect of the Contractor's arrangement on the water supply of others, the Engineer shall be informed immediately and shall instruct the Contractor as to appropriate remedial actions to be undertaken at the Contractor's expense.

7. Spoil and Spoil Disposal

- All suitable excavated materials shall be used insofar as it practicable in constructing the Works. Surplus and unsuitable material whether from site clearance, excavations, failed cut or fill slopes, landslides, or maintenance operations, shall be known as spoil.
- All spoil shall be deposited at spoil disposal sites approved in advance by the Engineer.
- The Engineer's approval of any spoil disposal site shall not in any way relieve the Contractor of responsibility, inter alia, for land acquisition, provision of temporary access, works preparatory to spoiling, management of the spoiling operation, and making good after completion of spoiling.

- Unless exempted by the Engineer, in all locations where deposited spoil material exceeds 250 mm average depth, the surface will be re-vegetated. The Engineer may direct that additional vegetation and stabilization measures be applied to any such slopes.
- Spoil disposal sites will fall into three categories:
    i) Borrow pits and quarries, whether pre-existing or opened up specifically for the works contract; other sites where spoil disposal will not result in a potential safety hazard, instability, erosion, or water management problems.
    ii) Preference shall be given to the backfilling of borrow pits and quarries as an aid to site reinstatement and to a larger number of smaller sites.
    iii) Spoil sites should be located away from wetland areas, tributaries, and rivers where at all possible. If riverside sites are required, the Contractor shall be required to receive permission from the Engineer for approval and must employ best practices in consultation with the Contractor's Environmental and Social Manager. Riverside sites shall be located only on major rivers with a high natural bed load but not their tributaries. Riverside sites should be chosen such that land take is minimized and the presence of spoil in the river channel will not harmfully deflect the flow under flood conditions. Local communities must have given their informed consent before any riverside site shall be permitted. Riverside sites will not be permitted in areas of cultivated land if alternative sites are available in the vicinity, or in riverine woodland.
- No spoil disposal sites shall be located:
    i) on slopes of more than 25 degrees
    ii) where geological structures are unfavourable to stability (e.g. in fault or sheer zones or where structural planes are dipping out of the slope)
    iii) on slopes that are being undercut by stream erosion.
    iv) on spurs above converging stream channels.
    v) on talus slopes or in any situation where they might be expected to load a slope along a failure plane.
    vi) in any watercourse or drainage line whether permanent or seasonal.
    vii) on areas identified within the ESMP to be protected areas or special status habitat.
- Disposal sites should also avoid woodland, cultivated land, active slope failure areas, and gullies. Areas of groundwater discharge, sources of drinking or irrigation water, areas where failure of the spoil tip would endanger or harm the Works or buildings or cultivated land, and areas where permanent stabilization of the filled disposal area would be difficult.

- The Engineer may restrict, prohibit, or otherwise modify the Contractor's spoil disposal proposals if, in the Engineer's opinion, they are likely to cause unacceptable environmental damage.
- Except at riverside sites, the Contractor shall prepare each approved disposal site to receive spoil by:
    i) marking the boundaries of the site with white paint so that the perimeter is clearly visible;
    ii) erecting a sign at the entrance to the site with the words "Road Project Tipping Area"
- Re-vegetation works shall not be measured and paid for separately and shall be deemed to be included in the unit prices of the other items of work.
- Payment for the Cost of Environmental Protection during construction and any associated construction measures shall not be paid separately, and should be considered as subsidiary to the other pay items in the contract.
- Payment for the cost of the following items will be included under the item for Environmental and Social Safeguards, included in the Bill of Quantities to be paid on a monthly basis, or if not indicated separately, deemed to be included in the other BOQ items.

Breakdown for Item: Environmental and Social Safeguards

Description	Quantity	Unit
Labour		
Environmental and Social Officer/Manager	Contract period	mo.
Environmental and Social Aide	Contract period	mo.
Utility	Contract period	mo.
Materials		
Consumables for:		
Reporting and Monitoring	Contract period	mo.
Routine Periodic Monitoring	Contract period	mo.

Compliance with the Requirements of the National Environmental Authority

The Contractor shall execute the Works in accordance with the requirements of the ESMP, SGIP, conditions stipulated in the permits issued by the national environmental authority and the following technical and operational guidelines:

1. Waste Management, Health and Safety
   - The relevant national and local authority's approved disposal methods for wastes shall be used.
   - Waste dumping sites shall not be located in wildlife areas, wetlands, woodlands, settled areas, cultural heritage and scenic sites
   - Waste in abandoned mobile camps shall be disposed to local authority licenced waste sites.
   - Training in the proper operation and maintenance of the extended and rehabilitated network facilities shall be an integral part of the programme
2. 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 not be permitted
   - No construction water containing spills or site effluents especially cement and oil shall be allowed to flow into natural water draining courses, or into drains that discharge to such watercourses
   - Wash water from washing out equipment shall not be discharged into watercourses 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 prevent erosion
3. Site Installation
   (a) Location
      - Work camp sites shall not be located adjacent to any surface water sources
      - The location of work camp sites shall be done with permission from the local 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

   (b) Drainage
      - Work camp sites shall have perimeter drains. The perimeter drains shall be excavated outside the site fence
      - All drainage channels inside the site shall discharge the effluent via oil interceptors
      - All buildings shall be surrounded by spoon drains
      - All sheds shall have spoon drains

   (c) Buildings
      - Buildings erected by the Contractor (which are to remain) shall be architecturally designed and constructed in a manner that will facilitate conversion to social service facilities such as schools, clinics, etc. at the end of the Works.

- All Buildings in work and camp sites shall be approved by the local authority Directorate of Planning.
- All sheds shall have concrete floors

(d) Labour Camp Facilities

- Labour camps shall have approved rubbish bays
- Labour camps shall have toilet facilities approved by local authority Directorate of Public Health
- Labour camps shall have one toilet for every 10-15 persons of each gender
- Pit Latrines shall be located no less than 250m in clay soils and 500m in loam soils and no less than 1000m in sandy soils from any wetland or water source.

(e) Community Education

- The Contractor shall collaborate with local authority for awareness education on STDs and HIV/AIDS to local communities where there is a likelihood of any social interaction between project workers and local communities is envisaged (see separate clause 159).
- The Contractor shall provide appropriate comprehensive targeted and accessible information about the Contractor's activities to local communities and in particular as to how they might impact on Health and Safety.
- The Contractor shall conduct an HIV-AIDS awareness program in the project areas as required by the approved CESMP and/or HSMP via an approved service provider, and shall undertake such other measures as are specified in the Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

4. Petroleum Products Handling

(a) Transportation

- Fuels shall be delivered to the sites by petroleum tankers certified by the national Bureau of Standards and the national Weights and Measures Agency for petroleum-based flammable liquids specification, as well as transportation of petroleum products operational requirements for tank vehicles.
- All petroleum tankers shall observe the regulations for transportation of petroleum products and the Traffic Act

(b) 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

(c) Dispensing and disposal

- Petroleum kerb sites shall be located on concrete platforms and surrounded by spoon drains
- Approved dispensing equipment shall be used for dispensing petroleum products

- 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

5. Material Mobilisation

(a) Haulage

- Haulage trucks carrying 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 aggregate shall not exceed haulage truck sides
- Vehicles transporting easily wind-blown materials such as sand, lime and soil shall be covered with a tarpaulin.
- Materials such as sand and soil shall be lightly wetted before loading, particularly in windy conditions.
- Washing of tires and lower body of vehicles when moving out from the construction site, regular sweeping of sealed roads which must be kept free of mud from vehicle tyres and spilt materials.

(b) Storage

- Sites used for stockpile must be to the approval of the Engineer and be selected to avoid nuisance or hazard to the community, water sources, wetlands, cultural or heritage sites.
- Stock piles of materials exceeding 10 tonnes and which are potentially polluting/ contaminating shall stand for no longer than 30 days
- Spraying of bare areas of ground with water while taking appropriate actions to negate sheet or rill erosion or sediment transportation into drains
- Stockpiles shall not be located on or near cultural heritage sites.
- Stock piles shall have perimeter drains and buffer vegetation
- In areas where strong winds are likely to blow away dust and debris, barriers shall be provided
- Storing cement and other such fine-grained materials delivered in bulk in closed silos fitted with a high-level alarm indicator; weigh hoppers shall be vented to a suitable filter.

(c) 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

6. Plant/Equipment Operations

(a) Noise Control

- IFC Performance Standards for noise are to apply, namely:
  Residential, institutional, educational areas:55 dBA day time; 45 dBA night time. Industrial, commercial areas: 70 dBA day time; 70 dBA night time

- Stationery Plant (generator) shall be noise masked
- No plant and equipment shall operate without exhaust silencers
- Plant and equipment speeds shall be limited to 60 km per hour

(b) Emission Control

- Plant and equipment exhaust pipes shall be fitted with catalytic converters
- Plant and equipment shall meet the emission standards sated in the ESMP

(c) Safety Control

- Carrying of abnormal loads of plant and equipment shall be done when there is less traffic on the roads
- All abnormal load carrying regulations shall be observed (Road Traffic Act)

7. 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

8. Borrow Pits (where applicable)

- The Contractor shall be responsible for all arrangements for the supply of any necessary aggregates including compensation for landowners and others, the acquisition of the environmental and any other necessary permits from the competent authorities, access, and site clearance and restoration, subject to the provisions of these Specifications and the Conditions of Contract.
- Borrow pits shall not be located near wetlands.
- Contractors shall obtain all required licenses from the relevant authorities to operate borrow pits
- The location of borrow pits shall be subject to approval by relevant national and local authority departments and local communities in the areas in which they are located
- The clearing of trees and other desirable vegetation shall be discouraged.
- Temporary ditches and/or settling basins shall be dug to collect runoff water and to prevent erosion and contamination of surface water.
- The undesirable ponding of water shall be prevented through temporary drains discharging to natural drainage channels.
- The site shall to be restored after construction activities have ceased. The site shall be left in a stable condition, without steep slopes. Stripped material shall be spread to stable contours in order to promote percolation and there shall be a regeneration programme with endemic species of natural vegetation and natural drainage.
- In making arrangements for winning and working construction materials the Contractor shall bear in mind the contractual duties and responsibilities towards the public and the environment as stipulated in the Conditions of Contract. The Contractor is reminded in particular when planning for moving large quantities of material on any particular route, to work safely and not to cause or exacerbate nuisance or

health problems, not to damage or interfere with public or private property or resources, to remedy or compensate for any damage or accidents caused by these activities, to leave excavated sites and related facilities in a condition fit for productive use and otherwise acceptable to the landowner and the Engineer, and to ensure that sub-contractors are under obligations identical to those of the Contractor.

- At least 14 days before commencing opening up any approved borrow pit or quarry, the Contractor shall submit to the Engineer the intended method of working and restoration. This shall include, but not necessarily limited to:
    i) the location, design and method of construction of any access track;
    ii) the volume and nature of materials to be removed;
    iii) the sequence and method of excavation of materials;
    iv) measures for controlling runoff and sediment from the site during operation;
    v) proposals for site restoration including approximate finished levels, drainage, erosion and sediment control, slope stabilization and re-vegetation, including restoration of the access track where so directed by the Engineer.
- No borrow pit or quarry operation shall be permitted until the method of working proposed by the Contractor for that particular pit or quarry has been approved by the Engineer in writing.
- The Contractor shall supply the Engineer with a copy of the relevant quarrying permits and the agreement with any landowner when so directed. Notwithstanding permission from others, such borrow pits and quarries may be prohibited or restricted in dimensions and depth by the Engineer where:
    i) they might affect the stability or safety of the Works or adjacent property or land;
    ii) they might interfere with natural or artificial drainage;
    iii) they may be environmentally unsuitable; and
    iv) where adequate health and safety procedures are not in place.
- Where the Contractor obtains the construction materials from borrow pits and quarries operated by others, the Engineer reserves the right to disallow such materials where the borrow pits or quarries in question are unlicensed or fall under the previous paragraph, points (i), (ii) or (iii) above.
- The Contractor should note that all borrow pits, quarries, and associated access tracks and stockpile areas shall be restored and re-vegetated, unless otherwise directed by the Engineer.
- The Engineer may direct that materials be selected in borrow pits that may include double handling, stockpiling and excavation in particular areas of a borrow pit.

- The Contractor shall construct all accesses, clear and remove all vegetation, boulders and unsuitable or oversize materials and dispose of it in an approved manner. The Contractor shall provide adequate supervision in every borrow pit and quarry to ensure that suitable materials are not contaminated with unsuitable material
- The Engineer may permit or direct that worked-out borrow pits or quarries be used as spoil disposal sites.
- The Contractor shall pay particular attention to the establishment of stable side slopes in excavations and a stable permanent drainage system. Where, for any reason, a working face is to be left exposed, the edge shall be permanently fenced, as instructed by the Engineer and the cost covered by the contractor.
- The Employer reserves the right to inspect the site of any borrow facilities or quarries established or used by the Contractor in connection with the Works and to undertake any corrective measures necessary to reinstate the site, and to recover the cost from money due or to become due to the Contractor.

9. Energy Acquisition
    - The Contractor shall not use, or permit to be used, wood as fuel for the execution of any part of the Works and to the extent practicable shall ensure that fuels other than wood are used for cooking, space and water heating in all camps and living accommodations. Any wood so used must be harvested legally, and the Contractor shall provide the Engineer with copies of the relevant permits if required.
10. Excess Materials
    - Excess materials, aggregate, concrete blocks, etc. shall be removed from the work sites no longer than 2 weeks after completion of works at that site.
11. Drainage Systems
    - Drainage systems shall not discharge into settled and cultivated areas
    - Drainage systems shall not discharge onto gazetted cultural heritage sites
12. De-vegetated Areas
    - All de-vegetated areas shall be replanted by the Contractor at the end of the works
    - There shall be no vegetation clearing near surface water sources, catchment areas, wildlife habitats, cultural heritage and scenic sites. All relevant legislation to this effect shall be observed
    - Unless otherwise provided in the Specifications, the Contractor shall ensure that no trees or shrubs or waterside vegetation are felled or harmed except for those required to be cleared for execution of the Works. The Contractor shall protect trees and vegetation from damage to the satisfaction of the Engineer. The Contractor shall be responsible for obtaining any necessary felling permits and for ensuring the disposal of felled trees in accordance with prevailing regulations. Endangered species shall be identified, and the Contractor will follow any special provisions in the ESMP regarding the potential removal of endangered species. No trees shall be removed without the prior approval of the

Engineer and any competent authorities. Should the Contractor become aware during the period of the Contract that any tree or trees designated for clearance have cultural or religious significance he shall immediately inform the Engineer and await the Engineer's instruction before proceeding with clearance.

- In the event that trees or other vegetation not designated for clearance are damaged or destroyed, they shall be repaired or replaced to the satisfaction of the Engineer.

13. 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 unless required as water reservoirs for wildlife
    - Restoration of borrow pits in settled areas shall be done only after consultations with local communities
    - Borrow pits left as community water reservoirs shall be drainable
    - Excavated and graded areas in cultural heritage and scenic sites shall be restored at the end of the works.

14. 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 requirements of the national environmental laws.

15. Fire Prevention
    - In addition to the provision of adequate fire-fighting equipment at the Contractor's base camp and other facilities to the satisfaction of the Engineer, the Contractor shall take all precautions necessary to ensure that no vegetation is affected by fires arising from the execution of the Works. These precautions shall include the prevention of fires for any purposes in the vicinity of the Works except where expressly permitted by the Engineer.
    - Should a fire occur in the natural vegetation or plantations adjacent to the Works, the Contractor shall immediately suppress it. In the event of any other fire emergency in the vicinity of the Works, the Contractor shall render all possible assistance to the civil authorities.
    - Areas of woodland, scrub or plantation damages by fire considered by the Engineer to have been initiated by the Contractor's staff shall be replanted and otherwise restored to the satisfaction of the Engineer at the Contractor's expense.

15. Environmental Protection during Construction
    - In undertaking the Works, the Contractor shall be aware that the Engineer may prohibit or restrict the Contractor's activities in other ecologically, culturally or historically sensitive areas, which become known to him during the course of the project. The location of any

such areas shall be notified to the Contractor by the Engineer at the earliest opportunity.

16. Relationships with Local Communities and Authorities

- In siting and operating the plant and facilities and in executing the Works, the Contractor shall, at all times, and to the extent possible, minimize the impact of such activities on existing communities. Where communities are likely to be affected by major activities such as excavation works or the establishment of a camp or quarry or extensive road closure or bypassing, the Contractor shall liaise closely with the concerned communities and their representatives and, if so directed, shall attend additional meetings arranged by the Engineer or Employer to resolve issues and claims and minimize impacts on local communities.
- Any problems arising from the Contractor's operations and which cannot be resolved by the Contractor shall be referred to the Employer through the Engineer. The Contractor shall be responsible for any compensation due to reinstatements necessary with respect to any damage caused by the Contractor to areas outside the Site and no separate payment will be made in this regard.

7 Social and Gender Integration

The CESMP shall address all issues identified in the SGIP, ESMP and ESIA. Specifically, the CESMP shall state clearly and unambiguously how the Contractor and the sub-contractor's employees will be educated in respect of the Trafficking in Persons (TIP) policy as laid out in the Project's SGIP, ESMP and ESIA as well as how the prevention of sexual harassment will be ensured and sufficient oversight at the workplace and in work camps will be provided.

The Certification of Commitment shall explicitly commit the Contractor and sub-contractor and employees to acknowledge understanding of, and compliance with the SGIP, and the Gender Integration Policy and Guidelines. A copy of the project SGIP shall be made available for inspection by all their sub-contractors and employees during all normal hours of work.

The Contractor's Social and Gender Manager or support staff shall include individual(s) with expertise in Social and Gender Assessment (SGA) issues, whether these be within its own organisation or in relationship to local communities, and local authorities, as well as in dealing with privately owned or community owned services. The staff member(s) will also be expected to work within the requirements of the ESMP, and to support HIV/AIDS related activities.

In so far as the contractual and employment obligations, terms of employment, and construction activities are of relevance to the requirements of the SGIP, the Contractor will be required to adhere strictly to the SGIP, ESMP and ESIA.

In particular this will include but not be limited to:

- undertaking that under no circumstances shall the Contractor or any sub-contractor employ child labour or engage in forced labour;
- providing training, and outreach related to the implementation of a zero tolerance policy in regards to the TIP both directly and with any immigration official. To assist in this the contractor shall be required to

develop in the CESMP, a TIP risk management plan to mitigate against such with routine and regular monitoring and reporting to the Engineer of any TIP related issues;

- undertaking special training efforts to improve the recruitment of females in those aspects of construction, given the nature of the tasks involved to a minimum workforce comprising of at least 30% women;
- ensuring that there is equal pay for equal work; and
- developing and implementing a policy that prohibits sexual harassment and anti-discrimination, including an incident referral and reporting plan.
- SGA Specialist will advise on appropriate Community engagement activities approaches of the contractor and targeting community members - be conducted as required by ESMP and contract works to cover all community members, with a focus to include women, youth and men.
- Manage, monitor and report social and gender risks and impacts during implementation of the project according to international standards.

160 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 shall undertake such other measures to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals in dealing with any positive results of such diagnoses. This shall be done in such a way that makes clear that this intervention is meant to protect both communities and employees.

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)—or Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular;
- where a local community believes in abstinence before marriage, all site staff and labour will be warned of the consequences of attempting to engage in sexual liaisons with members of that community;
- make available male or female condoms for all Site staff and labour as appropriate, provided that if a particular local community has reservations as to this practice this shall be drawn to the attention of the individual concerned and such items provided with caution; and
- in order to protect both employees and local communities provide for STI and HIV/AIDS screening, diagnosis, counselling and referral to a

dedicated national STI and HIV/AIDS program, (unless otherwise agreed) of all Site staff and labour.

- while Voluntary Counselling And Testing will be encouraged, if treatment is required, workers will be referred to relevant health facilities to seek treatment as this will not be catered for under the Contract.

The Contractor shall include in the program to be submitted for the execution of the Works under Sub-Clause 8.3 of the Conditions of Contract an alleviation programme for site staff and labour and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. In this respect, the CESMP shall clearly indicate the Contractor's policy on the housing of both staff employees and their families. 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 each component, the programme shall detail the resources to be provided or utilized and any related sub-contracting proposed. The programme shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this programme shall not exceed the Provisional Sum dedicated for this purpose.

CHAPTER 2

EARTHWORKS

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CHAPTER 2 - EARTHWORKS

201 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 centre line 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 300 mm layers.

202 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.

203 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.

204 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 the underlying sub-soil.

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

205 SOILING OF SIDE SLOPES AND VERGES

Soiling and compacting of side slopes to cuttings and embankments shall be carried out to an even surface with a thickness within the range of 100 mm – 200 mm, or in the case of verges as stated in the Bill of Quantities with surface soil as previously stockpiled or from an approved source.

206 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 the use of compressed air drilling for its removal or cannot be extracted by ripping with a tractor 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 that they 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 material by 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 or rooting.

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 the expense 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 extend up to 150 mm 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:-

(i) Material from swamps or marshes, silt, perishable material, slurry or mud, or

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

Suitable material shall comprise all that are acceptable in accordance with the requirements of 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 classified as 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 "fine grained 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 Crushing Strength	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		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	Particle shape: 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: Rough, Smooth, Polished	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		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)	- CLAY SILT	under 35%
					Examples of composite types	
				High plasticity (Fat clay)	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.	
					Firm, brown, thinly laminated SILT and CLAY	
	PEATS	Varies	Predominantly plant remains usually dark brown or black in colour, often with distinctive smell; low bulk density.		Plastic, brown, amorphous PEAT	

207 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 to permit the excavation, concreting, etc. being carried out satisfactorily. Water shall be removed by pumping and all temporary expedients required for dealing with water shall be the Contractor's liability. The Contractor shall be responsible for the stability of all excavations 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 relevant authorities.

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.

208 MECHANICAL EXCAVATION

(i) 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.

(ii) 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.

209 BLASTING

Blasting and use of explosive materials will only be allowed for quarrying activities. Blasting and use of explosive materials is forbidden for all excavation Works including rock removal as stipulated under Chapter I: General – Section 138: NON EXPLOSIVE ROCK REMOVAL FOR EXCAVATION WORKS. All clauses covered under this section will only apply to blasting methods used for quarrying activities.

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. The Contractor 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 such Laws.

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 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 the blasting and in the event of such regulation or prohibition the Contractor shall have no claim against the Employer.

The Contractor's Personnel in charge of blasting operations shall have valid licences for all types 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.

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

Notwithstanding any of the above, the Contractor shall cease blasting and continue to quarry 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.

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 the transportation, storage, handling, loading, and detonation of explosives
- 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
    - Local notification
    - Inspections after each blast
    - Disposal of waste blasting material

210 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, a volume corresponding to that which the excavated material occupied, shall, unless otherwise directed by the Engineer, be provided by the Contractor from his own 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 on Site. 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 300 mm 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 300 mm, 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.

211 EXCAVATION FOR PIPE LAYING

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

(ii) 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 300 mm 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 for fire hydrants, valve chambers or any other water works structure 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.

(iii) If in the opinion of the Engineer due to 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.

(iv) 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 shall be of as small a size as possible throughout their entire length. The trench shall be dug to within 150 mm 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 25 mm deep shall be cut across the trench at the required positions to enable the easy removal of pipe slings.

(v) If instructed to do so by the Engineer, the pipe trench shall be excavated to a depth of 100 mm 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.

(vi) 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 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 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.

(vii) 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.

(viii) 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.

(ix) 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 may 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.

(x) 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 depth of 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.

(xi) 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 or room for timbering or sheeting required, dealing with water, maintenance of the trench, and all labour, tools, materials, plants, supervision, overheads and profit.

(xii) The provisions of above Clause shall apply to the rates of excavation in "rock" and in addition the Contractor shall also allow in his rates for backfilling the invert with Class 15 concrete or other materials as directed by the Engineer and removing to a spoil dump all "rock" excavated.

212 EXCAVATION FOR FOUNDATIONS

(i) 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.

(ii) 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 the concrete or other work is placed.

(iii) If in the opinion of the Engineer due to the fault of the Contractor the ground becomes weathered 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.

(iv) The Contractor shall draw the attention of the Engineer to any patches of soft ground in 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.

213 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.

214 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.

215 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 250 mm loose depth unless as a result of compaction trials the Engineer approves spreading to a greater depth up to a maximum of 350 mm 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 450 mm 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 m^3 to 0.3 m^3 in size may be incorporated more than 600 mm 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 600 mm 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 (600 mm) 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 150 mm 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 150 mm 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.

216 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.

217 COMPACTION OF EARTHWORKS

All filling material used in earthworks shall be compacted to specification by Plant approved by 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 to the types of Plant, the number of passes and the loose depth of layer. The Contractor shall carry 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 be allowed 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 content of 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 only when 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 pits when measured on samples obtained from at least 300 mm above the level of the water table as 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 the Engineer orders the moisture content to be lowered or raised, such Work shall be treated as included in the rates. All adjustments of moisture content shall be carried out in such a way that the specified moisture content remains uniform throughout compaction.

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 embankments, 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:

(a) For the topmost 150 mm below formation level a maximum density of 100 per cent.

(b) For the remainder below formation a density of at least 95 as mentioned in the Bills of 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.

218 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.

219 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.

220 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 250 mm 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.

221 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 shall be kept dry, and all bailing and pumping, timbering, shoring and supporting of sides that may be required, and any refilling, ramming and disposal of surplus

materials necessary in carrying out the excavations for foundation pits and trenches shall be included in the prices for excavation.

222 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.

223 FOUNDATION PITS AND TRENCHES OF GREATER WIDTH AND DEPTH THAN NECESSARY

The Contractor shall not be entitled to payment in respect of excavation to any greater extent, whether horizontally or vertically, than is necessary to receive any structure for which the excavation is intended, except where a separate item is provided for additional excavation for Working Space, timbering or other temporary work. Excavation to a greater depth or width than 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.

224 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.

225 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 throughout and 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.

226 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.

227 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 in all respects to the instructions of the Engineer. They shall be properly graded and drained and finished with neatly trimmed slopes.

228 ROAD APPROACHES AND ACCESS ROADS

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

229 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 of the 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 trenches where 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 shall control 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 replaced and well rammed down by hand for a depth of not less than 600 mm to give sufficient cover to the 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. The backfill soil shall be free from clay lumps, boulders and rock

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 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.

Trenches shall be backfilled as soon as possible after pipe laying and at no time shall backfilling lag more than 50 m behind the last pipe laid. Excavation, bedding, pipe laying and backfilling is to be completed within 2 days, but temporary access needs to be provided within 1 day.

The Contractor may use his discretion as whether to backfill around joints before the pipeline is hydrostatically tested. Should the Contractor elect to leave joint holes open until after the hydrostatic test, he shall provide at his 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 at night with red warning lights.

The contractor is responsible to provide suitable borrow material for backfilling when rock excavation causes a shortage of suitable back fill material.

230 MAKING GOOD SUBSIDENCES AFTER REFILLING

All refilling whether over foundations or in pipe trenches shall be thoroughly compacted by ramming 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 topsoil has been replaced, the topsoil shall first be removed before any hollows are made up before being re-laid.

231 REINSTATEMENT OF SURFACES

(i) 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 restored by him in the first instance and permanently reinstated in the second instance when the ground has consolidated fully. Separate payment for reinstatement shall be made only for surfaced roads (e.g. tarmac, concrete, paving bricks or similar material), 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.

(ii) The Contractor shall be responsible for the temporary reinstatement and permanent reinstatement 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 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.

(iii) 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 shall be 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 surface fit for traffic, suitable material being added to all placed which have sunk or become rough.

(iv) 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.

(v) In verges and other grass 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 the grass fails to grow or is destroyed.

(vi) 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 trench shall be flush with the surrounding ground.

(vii) 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 necessary may be undertaken by the Engineer and/or the responsible Authority and the cost thereof shall be borne by the Contractor.

(viii) If at any time any trench becomes dangerous, the Engineer 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 the Contractor's expense.

(ix) 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 to the satisfaction of the responsible Authority.

232 FORMING BANKS AND FILLED AREAS

(i) 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 Engineer.

(ii) Before any filling is started, the ground on which embankments are to be sited, shall be stripped of all grass and topsoil and all roots, vegetable matters and other unsuitable substances removed.

(iii) 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 make them good to the satisfaction of the Engineer.

(iv) The filling shall be placed in layers not more than 150 mm thick, each layer being thoroughly compacted to the satisfaction of the Engineer.

233 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 onto the 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 embankments in 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 water tables, 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.

234 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 shall be included in the rates inserted in the Bills of Quantities.

235 REFILLING OF FOUNDATION PITS AND TRENCHES AND REMOVAL OF EXCAVATION 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 250 mm 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.

236 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 maintained within the range of amplitude and frequency recommended by the manufacturers of the Plant for the material to be compacted. The frequency shall be recorded by a tachometer indicating speed of rotation of any shaft producing vibration.

237 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 the Works. The Sites for these shall be approved by the Engineer.

238 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 objectionable materials.

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 shall be 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.

239 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 be thoroughly broken by approved means.

240 MEASUREMENT OF TOPSOILING AND GRASSING

Measurement for top-soiling and grassing shall be made according to the amount of square metres of top-soiled areas measured in place to the lines and grades on the Drawings or as established 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 seeds or sprigs.

241 FORMATION OF FOOTPATHS

The ground under footpaths shall be trimmed to formation level and 50 mm thick precast concrete paving slabs shall be bedded on 50 mm thick layer of fine sand unless the Engineer directs otherwise.

242 HARDCORE

Hardcore, shall be sound hard stone, rock or broken concrete not less than 100 mm in size unless otherwise directed. Sufficient but not excessive blinding material of smaller sizes may be permitted at the discretion of the Engineer.

243 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 50 mm mesh-sieve and retained on a 25 mm mesh-sieve and it shall be free from earth clay vegetation or other organic matter and shall contain no rubbish.

244 GEOTEXTILE

Geotextile shall be placed where indicated on the drawings or as instructed by the Engineer in order to prevent sand from migrating outside their confined area, whilst allowing water to drain. 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 resistance in 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 in accordance with the manufacturer's guidelines and the contractor's proposal in this regard shall be submitted for the Engineer's approval before installation commences.

245 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 transverse bar.

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 aqueous solutions 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 accordance with the values used in the design. This factor shall be based on full-scale tests carried out in 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 for the Engineer's approval before installation commences.

246 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 a load 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.

247 BAG WORK

Bag work protective construction shall be carried out in accordance with the drawings or as otherwise directed by the Engineer. The foundation shall be prepared to the satisfaction of the 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 of ISO 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

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CHAPTER 3 - CONCRETE, REINFORCEMENT & SHUTTERING

301 General

(i) The standard of materials and of workmanship shall be not inferior to the recommendations of the current:-

(a) A code of Practice dealing with the Structural Use of Reinforced Concrete in Buildings, 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

(b) 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 recommendations of the above and of this Specification, the requirements of this Specification shall prevail.

(ii) 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.

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

(iv) Names of manufacturers and test certificates, shall be supplied as soon as possible to the Engineer.

(v) 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 to herein in accordance with the General Conditions of Contract; the prices shall include also for transport of samples of cement, sand, concrete, aggregates, and similar materials to an approved materials testing 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.

(vi) Frequency of tests and number of samples required will be governed by the results of previous tests, the quality of the materials revealed during the tests and the uniformity of 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 cubes to be made and tested to determine the cause.

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

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

302 Steel Reinforcement

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

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

303 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.

304 Cement

(i) 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.

(ii) 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.

(iii) 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.

(iv) 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.

(v) 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.

(vi) 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 150 mm in depth below it. The cost of all work specified in this Clause shall be borne by the Contractor.

(vii) 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.

(viii) 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.

(ix) 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 be carried out before the cement is required for use.

(x) 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 of cement in which there are hardened lumps or cakes of cement, shall be rejected.

(xi) 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 the instructions 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.

305 Sand

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

306 Coarse and Fine Aggregates

(i) 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.

(ii) All aggregates for graded concrete, except granolithic and fine concrete, shall comply with 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, in volumes 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. Otherwise the 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 remain reasonably consistent, and shall, if necessary, stockpile and include different grading to 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 contaminate the stockpiles. When, in the opinion of the Engineer such contamination has taken 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 improve the consistency of the mix.

(iii) 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).

(iv) 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.

(v) 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.

(vi) 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.

307 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

SIEVE SIZES	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

308 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.

309 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/mm²	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 cement ratio 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.

310 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 with ordinary Portland Cement or sulphate-resisting cement.

TABLE 3.3: CRUSHING STRENGTHS

CLASS MIX	NOMINAL	MINIMUM CRUSHING STRENGTH ON 150 mm WORKS CUBES				MIX AVERAGE MINIMUM TRIAL 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 casting 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 are due 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 water proposed to be used on the works and at least two additional cubes shall be made for each 25 cubic metre of concrete mixed or when otherwise required by the Engineer. Should the crushing 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.

311 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).

312 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 be added 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 Standard Deviation 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.

313 Trial Mixes

314 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, the amount 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 concrete must not exceed 25 mm and for reinforced concrete work 50 mm.

The compaction factor of vibrated concrete shall not exceed 0.91.

315 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.

316 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 of aggregates 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 freshly mixed 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.

317 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.

318 Hand Mixing

If hand-mixing is permitted, the quantity of cement to be used shall be increased by 10 per cent. Hand-mixing shall be carried out on an approved water-tight platform, the aggregate and cement being turned over three times in a dry state and thoroughly mixed by means of shovels. 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.

319 Ready Mixed Concrete

Approval has to be obtained from the Engineer if the Contractor intends to use ready-mixed concrete, 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:

(i) 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).

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

(iii) 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 in a 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 concrete shall be such as will facilitate placing with the minimum of re-handling and without damage to the structure or the concrete.

320 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 proposes to 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 the concrete 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 maximum time allowed. Concrete remaining unplaced at the end of this period shall not be placed in the 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 cement and 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 at the 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 operation and 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.

321 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 used for 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 and care 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 approved vibrators 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 any finished face or within 450 mm of any other displacer. On completion of any lift displacers shall 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, no concreting 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 less than 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 be used but for thickness in excess of 150 mm an immersion or plate-type of vibrator shall be used 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 not exceeding 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.

322 Hot Weather Concreting

(a) 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.

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

(ii) Coarse aggregate shall be cooled by constant watering where possible.

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

(iv) Rapid hardening cement shall not be used.

(v) 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.

(b) 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.

(c) 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.

(d) 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.

(e) 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.

323 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.

324 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 of seven days after placing. The formwork shall also be kept damp and if struck earlier than 7 days, 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 be kept 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:

(a) 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.

(b) Except in the case of surfaces to which concrete has subsequently to be bonded, the concrete 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.

325 Loading

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

326 Placing of Concrete in Foundations

Before placing concrete in foundations, the bottom shall be thoroughly rammed and cleaned 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.

327 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 position by 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.

328 Joints

(a) 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 with regard 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 the satisfactory compaction of the concrete. Unless otherwise indicated on the Drawings or otherwise permitted by the Engineer for the construction of circular tanks, concreting shall be carried out continuously for the full circumference without vertical joints. Where permission is thus granted, the Engineer may order at no extra cost the inclusion of an approved water bar.

Horizontal Construction Joints in walls shall be formed to present a clean straight line to 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 concrete surfaces shall be left straight, free from all irregularities of level and clean of all loose aggregate. 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 the application 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 or chiselling, 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, and thoroughly wetted. In the case of horizontal joints, the face shall be rendered with 10 mm 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 and thoroughly 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 be entirely 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 an open 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 on the 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 by the Contractor in his general concrete rate.

(b) Rubber Bitumen Joint Sealer

Joint sealers shall:

(i) Retain elasticity at low temperatures;
(ii) Maintain the ability to form a watertight seal;
(iii) Not bleed or flow at sun temperatures;
(iv) 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 Construction of 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 circumstances shall 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 laying of bituminastic material, including priming, must be carried out exactly to the makers specifications. The practice of flooding the joint with primer is forbidden. Great care must 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 to the specified temperature in a purpose made heating unit and the temperature rigidly controlled with the aid of a suitable thermometer.

The practice of heating by use of a petrol drum over a wood-fire shall be avoided.

329 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 amount of 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 be worked to the tolerance indicated in SSRN 129 except for binders and links which shall be bent to a tolerance of 1.5 mm. Bars in which any errors in bending are beyond the limits of the 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 tags or 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, may be 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 junction of 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 the greater.

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 as directed 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.

330 Forms and Formwork for Concrete: Definitions

"Forms, formwork or shuttering" shall include all temporary moulds for forming the concrete to 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 may be required to produce a special concrete finish.

"Wrot" or "Wrought" formwork or shuttering shall mean formwork where the internal timber face in contact with the concrete is planed smooth, and the Contractor is to take particular care 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".

331 Forms and Formwork for Concrete: Construction

All forms shall be constructed so as to facilitate the accurate placing and proper compaction 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 so constructed 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 the concrete, 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 any adjusting 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.

332 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.

333 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.

334 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. The area of the key or keys so formed shall be at least 30% the area of the member. The block shall 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.

335 Special Methods of Working

Should working. the Contractor propose to use special methods of working not included in these Specifications, such as pumping concrete or using vacuum moulds, he shall obtain the Engineer's approval before commencing work, and comply with any subsequent specification made by the Engineer for this special method of

336 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 of working, 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.

337 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 necessary supports and stagings, bolts, nuts, straps, clamps, wedges and other fittings, also all cutting 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, cutting 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 in the 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 for where 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, if required 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 be set 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.

338 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	21 days, plus 1 day per 0.6 m in excess of 6 m with maximum of 28 days.

339 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.

340 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.

341 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:-

(a) the concrete does not conform to the Specifications; or
(b) deleterious materials or materials are likely to produce harmful effects have been included in the concrete; or
(c) the honeycombed or damaged surfaces are too extensive; or
(d) the finished concrete sizes are not in accordance with the Drawings within permissible tolerances; or
(e) the setting-out is incorrect; or
(f) the steel cover has not been maintained; or
(g) the protection, including curing of the concrete during the Construction was inadequate, resulting in damage; or
(h) the work of making or other remedial measures the Engineer may indicate are not carried out to his satisfaction; or
(i) undue deformation of or damage to the works has taken place due to inadequate shuttering, or to premature traffic and loading; or
(j) any combination of the above points has taken place resulting in unsatisfactory work.

342 Construction Joints

The details of the Construction Joints and their positions shall be submitted by the Contractor for approval together with the order of concreting.

Joints shall be made at right angles to the member. Stop end shutters shall be removed as soon 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 jetting or 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.

343 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 be taken 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 the Bills of Quantities.

344 Faulty Work

The Contractor shall on being requested in writing by the Engineer, remove and reconstruct any 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.

345 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, finishing, 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.

346 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.

347 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.

348 Concrete Work - Tolerances

(a) 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.

(b) 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 constructional, wind or other loads likely to be imparted to it, without producing deformation 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.

349 Water Bars

Waterbars shall be of PVC and of approved manufacture and securely fixed in place before concreting 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.

350 Admixtures to Mortar or Concrete

The use of any admixtures to mortar or concrete shall be subject to the written approval of the Engineer.

351 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 with such 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 with the cost of preparing all test records and supplying copies to the Engineer.

352 Testing of Concrete During Production

(a) 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 slump for 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.

(b) Slump Test

Slump tests shall be performed in accordance with SSRN 116, during the progress of the work to ensure consistency of the concrete and carried out at such frequency and on such concrete as the Engineer shall direct.

The Contractor shall keep a record of slump tests showing:-

(i) Date and time of test;
(ii) Class of concrete and position of batch in the Works;
(iii) Amount of slump;
(iv) 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.

(c) Method of Making Test Cubes

Test cubes shall be made by or under the supervision of the Engineer or his Representative 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 the Contractor 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 be acceptable 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 made 6 No. test cubes from 2 No. separate samples. Three test cubes from each sample to be 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:

(i) No more than one individual result in the same test shall fall below the specified works Cube Strength.
(ii) No individual result to fall below 0.9 x the specified works Cube Strength.
(iii) No test result (average of three cubes in one sample) to fall below the specified works 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.

(d) 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.

353 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 that quality.

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 (6 cubes to be tested at 7 days and 6 cubes at 28 days) until he is satisfied

that the materials and the method of mixing used are such as to produce a concrete which complies with the requirements 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.

354 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:-

(a) Failure of "Site Cubes" to attain the specified minimum strength requirements.

(b) Premature removal of shuttering

(c) Overloading of structure during construction

(d) 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 test shall be made at the Contractor's own cost.

If the loading test be ordered to be made for reason (d) the Contractor shall be reimbursed for 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 work concerned 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 out cylindrical 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.

355 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 Specifications referred to herein.

356 Testing Equipment

The Contractor shall provide the following equipment for carrying out control tests on the Site:-

(a) Straight edges (3.00 metres and 1.25 metres long) for testing the accuracy of the finished concrete.

(b) A glass graduated cylinder for use in the silt test for organic impurities in the sand.

(c) Slump test apparatus

(d) A sufficient number of 152.4 mm steel cube moulds with base plates and tamping rods to SSRN 117.

357 Repair of Concrete Structures

(a) 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 be subject 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 appearance of a smooth surface.

For surfaces in contact with potable water, the chemicals shall have been certified as suitable for use in potable water retaining structures by competent and internationally recognised authorities. Products acceptable include waterproofing chemicals consisting 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.

(b) 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 be filled 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 spalled concrete 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.

(c) 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).

(d) 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 rigid high strength material.

(e) 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.

(f) 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.

(g) 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 match existing or adjacent surfaces.

(h) 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 sealed with an approved bitumastic sealant (e.g. Igas Black) in accordance with the manufacturer's instructions.

(i) 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.

(j) 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 boxes shall be installed around them to prevent further wearing off of the concrete as directed by the Engineer.

(k) 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 made to a sufficient consistency to allow pressing into the cavities with a steel trowel.

(l) 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.

(m) 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.

(n) 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.

(o) 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.

358 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:

1. Col. A is the maximum allowable value of any sudden change of level in the surface.
2. Col. B is the maximum allowable value of any gradual irregularity of the surface, as indicated by the gap between the surface and a three metre long straight edge or correctly shaped template placed on the surface.
3. Col. C is the maximum allowable value of the difference in level or position between a three metre long straight edge or correctly shaped template placed on the surface and the specified level or position of that surface.

Where dimensional tolerances are given on the drawings or in this Special Specification they shall take precedence over those given in Table 3.5.

CHAPTER 4

BUILDINGS AND ASSOCIATED WORKS

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CHAPTER 4 - BUILDINGS AND APPURTENANCES

4001 GENERAL

(a) Throughout the Drawings, Standard Specification and their Special Specification, all references to Standard Specifications shall be deemed to be to the latest Edition of the Standard to which the Clause refers at the time of Tendering.

No allowance shall be made for the Contractor's lack of knowledge in this particular respect.

(b) This Special Specification is to be read in conjunction with other parts covering the Works.

(c) Details on Drawings and in the Bills of Quantities and instructions given on site by the Engineer will take precedence over the Specifications given herein.

4002 EXCAVATION AND EARTHWORKS

(a) The Contractor is advised to visit the Site and ascertain the nature of the soil to be excavated, as no claim will be allowed on account of the soil being of a different nature from that for which he allowed in his Tender.

(b) All grass, vegetable matter, etc. must be removed or burned on Site at the commencement of the Contract over the area of the buildings plus an area (3.0 m) distance all round or as directed by the Engineer. The line of all paths, roads, etc. shall also be cleared in the same manner. On no account will earth containing vegetable matter be used for backfilling.

(c) The foundation trenches for all walls, etc. shall be excavated to the width and diameter shown on the Drawings and to the depths below existing ground level as directed by the Engineer in order to obtain satisfactory foundations or sanitary conditions.

If, however, the Contractor excavates to any widths, diameter or depths greater than those shown on the Drawings or as instructed by the Engineer, he shall at his own expense fill in such depth, diameter or width with concrete (1:3:6) to the satisfaction of the Engineer.

All excavations are to be measured net as before digging. The Contractor shall be deemed to have allowed in his prices in the Schedule of Rates, for increase in the bulk after digging.

(d) Where buildings are to be erected upon a sloping ground, the ground shall be excavated to a minimum of 250 mm below finished floor level on the topmost sides of the slope for a horizontal distance of 3.0 m from the external wall of the building or buildings and the ground left sloping slightly away from the building. All banks formed by this excavation shall be cut to slope at an angle of 45 degrees or to the angle of natural repose of the excavated material and a natural earth drain formed to carry off surplus water around the foot of the slope so formed.

On the lower sides of the slope the ground shall be made up where necessary to form a similar slight slope 3.0 m wide from the external walls.

In all cases the finished floor level shall be at a minimum height of 250 mm above ground level unless otherwise specified or indicated on the Drawings.

4003 PRECAST CONCRETE

The mixes for Precast Concrete units shall be as follows: -

Lintels	1:2:4 (19 mm nominal aggregate)
Units less than 40 mm thick	1:2:2 (6.4 mm nominal aggregate)
All other units	1:2:4 (12.5 mm nominal aggregate)

The concrete shall be cast in suitable moulds true to shape and size, thoroughly tamped into the moulds (and round / twisted reinforcement where applicable) and shall be vibrated where specified herein. Moulds shall not be removed until 7 days after pouring and shall be protected by covering them with wet hemp sacks or other suitable material kept wet throughout that time. The cast work shall be seasoned for a further 7 days under cover and a further 7 days in the open before fixing. Unless otherwise described, faces are to be left rough for sawn moulds.

Where precast concrete is described as "finished fine" the moulds are to be made of metal or are to have linings which will produce a smooth dense fine face to the finished concrete free from all shutter marks, protuberances and pittances, so as to make them suitable to receive a direct painted finish.

Unless otherwise described prices of all precast concrete shall include for all moulds, finishing fine where so described, including rubbing down if required, hoisting and fixing, at the required levels, bedding and jointing in cement and sand (1:5) mortar and pointing beds and joints in exposed faces flush in cement; also for casting or cutting to the exact lengths required and any waste resulting from much cutting. The sizes of weathered or moulded items stated are extreme sizes.

4004 CONCRETE APRON

Concrete aprons where directed, shall comprise a 50 mm thick concrete (1:3:6), 1.0 metre wide round the perimeter of the building, laid on a 100 mm bed of hard-core.

4005 VENTILATORS

Unless otherwise stated, precast concrete ventilators shall be 300 mm or 225mm wide x 40 mm thick and of approved pattern. The ventilators shall be fixed double, one fixed flush with outer face of wall complete with approved copper mosquito gauze cut to size and fixed by tucking over top and bottom edges of ventilator before building in, the other ventilator shall be fixed flush with inner face of wall and rendered around sides, using cement and sand (1:4) top and bottom of ventilator opening.

4006 ENTRANCE STEPS

Entrance steps as required to suit ground and floor levels shall be formed in concrete (1:3:6), with suitable underneath foundations as directed by the Engineer. Treads shall be not less than 300 mm wide and risers not more than 175 mm high. All exposed surfaces shall be finished in cement and sand (1:4) trowelled smooth with a wood float 18 mm thick on treads and 12 mm thick on risers or finished with Carborundum dust.

4007 CONCRETE SHELVES

All suspended precast or in situ concrete shelves, pot slabs, etc, shall be reinforced with weld mesh to SSRN 128 as directed by the Engineer and/or shown on the Drawings and in the Bills of Quantities.

4008 PAVING

Precast concrete paving slabs shall conform to relevant BS Standards where required, these shall be size 609.6 mm x 609.6 mm x 50.8 mm thick of vibrated 1:2:4 concrete finished on top with a wood float, clean cut edges and free from all cracks, chips or broken corners. The slabs shall be laid on a 75 mm consolidated bed of sand or stone dust, in cement mortar 1:4. The jointing mortar shall be worked well down into the joints, the pointing to the key-drawn and all excess mortar cleaned off.

4009 ATTENDANCE UPON SUB-CONTRACTORS

Particular care shall be exercised by the Contractor to ensure that all pipes, ducts, drains, conduits, junction boxes, anti-static installation, etc. are laid before the concrete for the floor and roof slabs is poured. The Contractor will he held responsible for the cost of any additional cutting, etc. and making good which becomes necessary through his failure to make proper arrangements for all Sub-Contractors work to be undertaken in close co-operation with his own, or under his strict attendance.

4010 WALLING

All block walls throughout the work shall be carried up evenly with no part allowed to be carried up more than 1.0 m higher at one time than any other part, and in such cases, the jointing shall be made in long steps so as to prevent cracks arising, and all walls shall be levelled round at each stage. All faces of walls to be plastered shall have all projections dressed off and joints raked out as key for plaster.

The blocks shall be bedded and jointed in cement mortar 1:5 with beds and joints not more than 20 mm or less than 12 mm thick, all flushed up and grouted solid as the work proceeds. All walling shall be properly protected as the mortar is setting.

Ends of lintels, sills, joints, roof trusses etc., are to be pinned up to the underside of concrete beams and slabs with cement mortar.

Timber frames are to be built in with holdfasts and bedded solid and pointed both sides in cement mortar. Lugs of window, door and louver frames are to be built in or cut and pinned to blockwork. Frames are to be bedded solid in mortar and pointed in approved mastic applied externally.

4011 SILLS

Sills to windows shall comply with SSRN 801. They shall measure 105 mm deep, showing 70 mm at the front edge, by 175 mm wide and be of appropriate length as indicated on the Drawings. All sills shall be cast with a recessed throating under the front edge and shall bear 150 mm on supports.

4012 LINTELS

Lintels to windows, louver and door openings where these are separate from the reinforced concrete ring beam shall be of precast concrete complying in all respects with SSRN 861. They shall bear 300 mm on supports and shall be cast with a recessed throating under the front edge. Design calculations for lintels shall be submitted to the Engineer for approval before casting is commenced.

4013 SAND

All sand for making mortar shall be cleaned well, graded siliceous sand of good, sharp, hard quality equal to samples which shall be deposited with the Engineer for prior approval before use for the Works.

The sand shall be free from lumps of stone, earth, loam, dust, salt, organic matter and any other deleterious substance, and shall be sieved through a fine sieve and washed as necessary or when directed by the Engineer.

4014 LIME

Lime for mortar shall be non-hydraulic or semi-hydraulic quicklime or hydrated lime in accordance with SSRN 801.

Quick lime shall be run to putty in a pit dug on the Site or in an approved container immediately after delivery to Site. The water to be first run into the pit or container and the lime shall be added until it is completely submerged and stirred until all lumps are disintegrated. The resulting milk-lime shall then be run through a 3 mm square-mesh sieve and run into a pit or other container and kept clean and moist for not less than 4 weeks before use.

Hydrated lime shall be added to water in a clean receptacle thoroughly mixed to the consistency of thick cream. The lime shall then be allowed to stand and kept clean and moist for not less than 16 hours before use.

4015 CEMENT MORTAR

Cement mortar shall be to ratio 1:5. This will be achieved by addition of 50.0 kg of Portland Cement to 0.15 m^3 of sand. The mortar shall be measured in specially prepared gauge boxes and thoroughly mixed in an approved mechanical mixer or mixed dry on clean and approved mixing platforms, with water added afterwards until all parts are completely incorporated and brought to a proper consistency. The use of re-tempering of wholly or partially set mortar will not be allowed.

4016 GAUGED CEMENT LIME MORTAR

Gauged cement lime mortar shall be composed of 40.0 kg cement to 0.085 m^3 of lime to 0.34 m^3 of sand measured in specially prepared gauge boxes and thoroughly mixed dry on clean and approved mixing platforms, with water added afterwards until all parts are completely incorporated and brought to a proper consistency. No partially or wholly set mortar will be allowed to be used or re-mixed.

4017 GAUGED LIME MORTAR

Gauged lime mortar shall be composed of 2 parts by volume of lime putty to 9 parts by volume of sand measured in specially prepared gauge boxes and mixed dry on clean and approved mixing platforms with water added afterwards until all parts are completely incorporated and brought to a proper consistency.

The mortar shall be mixed 7 to 10 days before it is required for use and shall be stacked in a neat heap well smoothed off covered with wet sacks and allowed to mature.

Immediately before use 1 part by volume of Portland Cement, shall be added to 9 parts by volume of lime mortar, the whole being re-mixed with the addition of extra water until all parts are completely incorporated and brought to a proper consistency.

The gauged mortar must be used within 45 minutes of being mixed and the use of re-tempering of wholly or partially set mortar will not be allowed.

4018 PROTECTION

All walling shall be properly protected while mortar is setting, as the Engineer shall direct.

4019 SETTING OUT RODS

The Contractor shall provide setting out rods and set out all Works on same courses, openings, heights, etc and shall build the walls, piers, etc. to widths, depths and heights indicated on the Drawings. Setting out rods shall be gauged to allow an average height of 225 mm for each course.

4020 BONDING

The blocks or stone for general walling shall be bedded and jointed as described. Stones or blocks shall be properly bonded together and, in such manner, that no vertical joint in any one course shall be within 125 mm approximately of a similar joint in the courses immediately above or below. All walling of 300 mm thickness or less shall be built in single thickness of blocks or stone.

Walling exceeding 300 mm in thickness shall be built in two thicknesses of blocks or stone with through blocks or stone not more than 1.0 m (approximately) apart in each course or as directed by the Engineer.

Alternate courses of walling at all angles and inter-sections shall be carried through the full thickness of the adjoining wall.

All walling shall be built entirely solid in blocks, without voids.

All perpends, reveals and angles of the walling shall be built strictly true and square.

Stone blocks shall be wetted before being laid and the walling shall be kept wet while the mortar is setting and the top of the walling where left off shall be well wetted before recommencing building as the Engineer shall direct.

All walling shall be flushed up and grounded solid as the work proceeds.

4021 PARGING AND CORING OF FLUES

All flues shall be parged and cored in lime and sand mortar (1:4).

4022 DAMP PROOF COURSE

The bituminous felt sheeting for damp proof courses shall be three-ply approved membrane in accordance with SSRN 803 weighing not less than 3.175 kg per 8361 sq.m. The sheeting is to be lapped 152.4 mm at running joints and the full width of walls and angles. It shall protrude beyond the outer face of the wall for a minimum of 25 mm, the last 10 mm of which shall be turned down at an approved profile to form an anti-ant lip, and laid on a cement screed trowelled smooth. At all angles, intersections etc., the sheeting must be lapped not less than 75 mm. The net area covered is measured and the Contractor shall allow in his prices for all cutting and waste and extra material in laps at joints, angles, etc.

4023 REINFORCED WALLING

Walls of less than 225 mm thickness shall be reinforced with one row of 20 gauge hoop iron built into every third course, well lapped at junctions and joints and carried at least 115.0 mm into abutting walls at intersections.

4024 FIXING OF TIMBER DOOR FRAMES

All door frames are to be bedded, and pointed in mortar (as described for walling)

All frames shall be securely fixed to reveals by means of 22.5 mm mild steel cramps 300 mm long, bent and screwed to backs of frames and with flanged and built 225 mm into joints of walling, three cramps to each side frame of each door. Where the door is provided with fanlights, etc. four cramps are to be used to each side frame.

4025 HOLES FOR TIMBERS IN WALLING

Holes for timber-built into or passing through a wall, shall be square out to suit the timber size and angle and lined with 3 ply roofing felt cut flush to finished wall surfaces.

4026 CONCRETE BLOCKS

Concrete blocks shall be solid, hard, true to size and shape with sharp arises in accordance with SSRN 804 and approved by the Engineer.

They shall be obtained from an approved manufacturer or manufactured on Site in an approved block-making machine. The mix used shall be not less than (1:9) by volume and the maximum size of aggregate shall not exceed 12 mm.

All solid and hollow concrete blocks used in the walling must be capable of withstanding a crushing pressure of not less than 0.280 kg/mm2 after 28 days.

The blocks on removal from the machine shall be carefully deposited on edge on racks under sheds erected by the Contractor and left for 3 days during which period they shall be kept constantly wet after which they shall be placed on edge in the open on racks and protected by sacking or other approved covering and kept wet for a further 5 days. Thereafter, the blocks shall be left in the same position without wetting for a further 20 days.

No blocks will be allowed to be used in the work until they are 28 days old and until samples have been taken and approved by the Engineer.

They shall be laid dry except for the top surface which shall be wetted immediately before mortar is spread on. After laying, no further water shall be applied.

4027 INTERNAL FACINGS

Except where plaster finish is required internally, the internal faces of walls shall be finished fair with beds and joints neatly flush pointed as the work proceeds.

4028 WALLS LEFT FOR PLASTER

All walls to be plastered shall have the joints raked out 12 mm deep as key for plaster.

4029 JOINTS

The concrete blocks shall be bedded and jointed in gauged lime mortar as described with beds and joints not more than 12 mm or less than 6 mm thick, all flushed up and grouted solid as the work proceeds, or pointed as required.

4030 STONE WALLING

The stone for wall shall be sound and hard throughout, free from all defects, and shall be obtained from a quarry approved by the Engineer. It shall be chisel dressed into true rectangular blocks, with each surface even and at right- angles to all adjoining surfaces.

4031 STONE SIZES

Stone blocks for general walling shall nominally be 225mm high and 100 mm, 150 mm, 225mm or 300 mm thick as required for the works, the maximum permissible variation of any of the foregoing dimensions being 2.0 mm.

4032 JOINTS

The stone blocks shall be bedded and jointed in cement mortar as described with beds and joints not more than 12 mm or less than 6 mm thick, all flushed up and grouted solid as the work proceeds, or pointed as required.

4033 FIBRE CEMENT ROOF SHEETING

Fibre Cement roof sheeting and accessories shall be of approved manufacture in general accordance with SSRN 807, except that asbestos fibre shall not be used. The type of sheeting shall be as shown in the Drawings and of an approved colour and shall be laid and fixed strictly in accordance with the manufacturer's printed instructions. The fibre type shall be approved by the Engineer prior to the supply of such fibre cement roof sheeting.

4034 LAPS

Sheeting shall be laid with end laps of 150 mm and side laps of one corrugation of the side away from the prevailing wind.

4035 FIXING TO PURLINS

The sheets shall be fixed to timber purlins with 8 mm Galvanized gimlet pointed screws 115 mm long and to steel angle purlins with 8 mm diameter Galvanized hook bolts and nuts 50 mm longer in the shank than the depth of the steel purlin to which they are fixed and all screw and bolt fixings shall have "selawasher" plastic washers or other equal and approved.

4036 HOLES

Holes shall be drilled through the ridges of corrugations not in the hollows.

4037 INTERSECTIONS

Where four sheets meet, two sheets shall be cut and measured for the full length of the end lap and the full width of the side lap at the appropriate corners to ensure three thicknesses of sheeting at this point.

4038 RIDGES

Ridges and other accessories shall be supplied as shown in the Drawings and shall be fixed to timber and steel purlins as above described.

4039 FIXING BOLTS

All fixing bolts and screws shall comply with SSRN 808.

4040 QUALITY TIMBER

Softwood shall generally be Podocarpus or Cedar complying with BS 1186: Part 1 or other equal approved timber.

All softwood for carpentry shall be treated by the "Celcure" process or other equal approved process carried out by an approved firm. Joints in timber for carpentry shall only be in the positions shown on the Drawings or approved by the Engineer.

Softwood for joinery shall be kiln dried to moisture content between 10% and 12%. Hardwoods may, if approved by the Engineer, be used for joinery in place of softwoods but any additional costs arising shall be borne by the Contractor.

The qualities of timber are stated hereunder:

All timber described as "sawn podo" shall be Grade II (Select Grade) sawn podocarpus.

All timber described as "wrot podo" shall be Grade I (Prime Grade) wrot podocarpus.

All timber described as "wrot cedar" shall be first (Prime Grade) wrot cedar.

All Musharagi, Mvuli, Mahogany and any other hardwood shall be selected quality kiln seasoned or air dried and when delivered to Site, shall have a moisture content of not more than 14% of its dry weight.

All timber for permanent work in the building shall before use, be approved by the Engineer for quality in accordance with the foregoing Specification for its respective grade.

4041 CARPENTRY

All carpentry work shall be left with sawn surface except where particularly specified to be wrot. Scantlings and boarding shall be accurately sawn and shall be accurately set out and in strict accordance with the Drawings and shall be framed together and securely fixed in the best possible manner with properly made joints. Provide all beads, nails, screws, etc. as necessary and as directed and approved.

4042 NAILS AND SCREWS

Nails for joinery are to be oval lost head nails.

Screws are to be countersunk wood screws. Steel screws shall be used only in concealed positions, or where the work is to be painted. Steel screws in contact with aluminium shall be dipped in zinc chromate solution before fixing. Ironmongery is to be fixed with chromium plated brass screws.

4043 TOLERANCE OF SCANTLINGS

Variations from specified dimensions of scantlings shall not exceed the tolerance stated in the Grading Rules. Boards 25.4 mm thicker or less shall hold up to the specified sizes. All timber shall be as long as possible and practicable to eliminate joints.

4044 TREATMENT OF TIMBER

All structural timber used in the works shall be treated with an approved preservative. Such timbers shall be impregnated under pressure before fixing with Tanalith, Celcure or other approved medium, toxic to termites, cryptotermes and other timber pests. All cut ends of timber so impregnated are to be treated with two coats of "B" crystals or other approved method.

4045 SIZES AND THICKNESSES

Sizes and thicknesses of wrot carpentry and joinery are nominal that is to say 3 mm reduction off specified sizes will be allowed for each wrot face, except where described as finished sizes in which case no reduction from the stated thickness or size will be permitted.

4046 FASCIA AND BARGE BOARDS

Fascia and barge boards shall be in wrot cedar or as specified and to detailed Drawing.

4047 GANG BOARDING

Gang boarding 25.4 mm thick, butt jointed and securely nailed to ceiling joints shall be provided to form access floor 457 mm wide between ceiling opening and water storage cisterns unless otherwise specified.

4048 WALLPLATES

The wall plates shall be bedded on walls in cement mortar and secured with 12 mm diameter bolts 304.8 mm long at 914.4 mm centres built 228.6 mm deep into walling. Plates to be in long lengths, halved and spiked at joints and angles.

4049 JOINTS WITH SPLIT RING CONNECTORS

Where timbers of trussed rafters are connected at joints with split ring connectors, they shall be grooved as required to take split ring connectors and bored for and bolted together with 12 mm diameter mild steel bolts all in accordance with structural engineer's drawings.

4050 VALLEY RAFTERS

Valley rafters shall be fixed double and bolted or spiked together as directed or shown on Drawings.

4051 ENDS OF TIMBERS

Ends of timbers such as purlins, etc. required to be built into or through inner and outer walls shall have 12 mm air space between same and walling.

4052 JOINERY

All joinery shall be executed with workmanship of the best quality and in strict accordance with the detailed Drawings. All mouldings shall be accurately run and all work planned, sandpapered and finished to the approval of the Engineer. All finishes shall be slightly rounded. All framed work shall be cut out, properly tenoned, shouldered, etc. and framed together as soon after commencement of the works as is practicable but should not be wedged up until required for fixing in positioning. Any portions that warp, get in winding, develop shakes or other defects shall be replaced with new ones. Whenever required for fixing in position, the framing shall be glued together with best quality glue and properly wedged or pinned, etc. as described.

All timber is to be sound, straight, of matured growth, square edge and free from whitewood, shakes, large loose or dead knots, cracks, wavey edges or other defects and blemishes except to the extent to which the Engineer considers that the timber is not rendered unsuitable for its intended use.

Oval or round brads or nails shall be used for fixing all face work and in each case, all heads shall be properly punched in and puttied.

The quality of all workmanship shall conform to SSRN 816.

4053 PLUGS

All fixing for joinery, etc. shall be approved and plugging fixed into holes of a recommended size. The holes shall be drilled with special masonry drills and not cut with a cold chisel and hammer. Under no circumstances shall wooden plugs be permitted. The expression "plugged" shall be taken to mean fixed with and including plugs as last described to stone or concrete.

4054 PROTECTION

Any fixed joinery which in the opinion of the Engineer is liable to become bruised or damaged in any way, shall be properly cased and protected by the Contractor until the completion of the works.

4055 SETTING OUT

All joinery work shall be accurately set out on boards to full size for information and guidance of artisans before commencing the respective works with all joints, ironwork and other connections therewith fully delineated. All setting out details shall be submitted to the Engineer and approved before such respective works are commenced. All joinery work shall be wrot unless otherwise described.

4056 INSULATION BOARD

Insulation Board shall be 12.5 mm thick, of an approved type of fibreboard in accordance with SSRN 809. Insulation board ceilings shall be fixed to a symmetrical pattern in each room.

4057 SOFT BOARD

This board is similar to insulation board but having high moisture absorbing properties.

4058 BLOCK BOARD

Block board shall be of approved local or imported manufacture, to SSRN 810 and shall be made up of softwood or hardwood faced as hereinafter specified. A sample of the proposed blockboard shall be deposited with the Engineer for approval and which when so approved, shall form the standard for the works.

4059 PLYWOOD

Plywood shall be approved local or imported manufacture, in accordance with SSRN 811 and of approved first or second grade softwood faced, unless otherwise described. "Exterior Quality" plywood shall be exterior moisture resistant type.

4060 HARDBOARD

Hardboard shall be suitable for painting and in accordance with SSRN 809 and shall be used, prepared and fixed strictly in accordance with the manufacturer's printed instructions.

4061 CHIPBOARD

Chipboard shall be approved imported or local softwood faced in accordance with SSRN 813 and shall be used and fixed strictly in accordance with the manufacturer's printed instructions.

4062 PLASTIC SHEETS

Laminated plastic sheeting shall be of a type approved by the Engineer, in accordance with SSRN 814 and of the type and grade specified. The sheeting shall be prepared, fixed and used strictly in accordance with the manufacturer's printed instructions.

4063 WOOD WOOL SLABS

Wood wool slabs shall be of approved Normal Quality to SSRN 815. The slabs shall be and fixed in accordance with the manufacturer's printed instructions.

4064 DEFECTS

Should any of the Carpentry or Joinery shrink, warp, wind or develop any other defects within six months after the completion of the works or within the maintenance period, the same shall be removed and new fixed in its place together with all other work which may be affected thereby all at the Contractor's cost and expense.

4065 CEILING JOINTS

Where ceilings are shown on the Drawings, ceiling joints shall be fixed at 600 mm centres and round walls and the underside shall be perfectly level.

4066 BRANDERING

The brandering shall be 50 x 50 mm fixed to and level with the underside of ceiling joints, at 600 mm centres maximum in both directions. The Contractor shall include for cutting and fitting at trusses.

4067 PRIMING

Where intended to be in contact with stone, concrete blocks, concrete, cement or plaster, the backs and other surfaces of all door, window or other frames and linings, posts, architraves, skirting, fillets and fascias and cornices, etc. shall be treated with one coat of aluminium priming paint applied before fixing.

4068 CEILINGS

Where shown on the Drawings, ceilings to all rooms shall be formed of approved insulation board not less than 12.5 mm thick.

Ceilings shall be fixed to brandering in symmetrical pattern with edges chamfered to form 'V' joints, all to the approval of the Engineer.

4069 FLUSH DOORS

The materials used in the Construction of all flush doors shall be in accordance with SSRN 817 (a) Part 2A. Flush doors shall be obtained from an approved manufacturer.

The size of members and method of Construction shall be to the approval of the Engineer.

Flush doors shall be 45 mm (finished) thick to the sizes specified on the Drawings. Internal doors shall be faced both sides with 4 mm plywood and lipped on all edges with 10 mm (minimum) hardwood. External doors shall be faced both sides with 4 mm exterior quality plywood assembled with a waterproof adhesive to SSRN 818. They shall be lipped on all edges with 10 mm (minimum) hardwood. All doors shall have suitable blocking pieces to take door furniture.

4070 FRAMED, LEDGED AND BRACED DOORS

Framed, ledged and braced doors shall be 50 mm (Nominal) thick 838.2 x 1032 mm overall or to sizes specified on the Drawings and shall consist of 101.6 x 50.8 mm stiles and top rail, 228.6 x 25.4 mm lock and bottom rails and 101.6 x 25.4 mm diagonal braces filled in with 25.4 mm tongued, grooved and "V" jointed both sides boarding in matched widths and shall include chamfer on edge of stiles and adjacent boarding to form "V" joint.

4071 LEDGED AND BRACED DOORS

Ledged and braced doors shall be 50 mm (Nominal) thick (838.2 x 1032 mm overall) or to sizes stated on the Drawings and shall consist of 101.6 x 25.4 mm top rail and diagonal braces.

228.6 x 25.4 mm lock and bottom rails and covered on one face with 25.4 mm thick tongued grooved and "V" jointed both sides boarding in matched widths.

4072 WARDROBE DOORS

Wardrobe doors shall be 25.4 mm thick flush doors constructed of approved blockboard and hardwood lipped on all edges.

4073 DOOR FRAMES

Door frames shall be cedar 101.6 x 76.2 mm rebated and moulded frames. Door frames shall be secured to the concrete stone or brickwork with hold fasts built into the stone or brickwork and grouted into the concrete, all in accordance with first class practice.

4074 WARDROBE DOOR FRAMES

Wardrobe door frames shall be cedar 76.2 x 50.8 mm rebated frames.

4075 CUPBOARD DOOR FRAMES

Cupboard door frames shall be cedar 50.8 x 38.1 mm rebated frames.

4076 DOOR FURNITURE

Doors shall be provided complete with all hinges, locks, keys, knobs, handles, bolts, floor stops, etc., and all necessary screws, bolts or other fixings including mortices in concrete for bolt sockets, sinking for boxes etc. Ironmongery and locks shall be to the approval of the Engineer.

4077 ARCHITRAVES

The finishings to door frames to all doors shall consist of 76.2 x 19 mm wrought cedar splayed architraves plugged to walling and measured at all angles. Where the door frame is set against the face of the wall or where there is insufficient room for

architrave, the finishing shall consist of 19 mm wrought cedar quadrant moulding planted on the frame.

4078 WOODEN SHELVES

Slatted shelving shall consist of 50.8 x 25.4 mm wrought podo slats 19 mm apart screwed to bearers.

All board shelving exceeding 225 mm wide shall be cross- tongued.

Blockboard shelving shall be 25.4 mm thick with hardboard or softwood veneer as stated or shown on Drawings and with 12.7 x 25.4 mm softwood or hardwood edge strip on all edges. The shelving shall be screwed to bearers.

4079 TRAP DOORS

Where shown or directed in fibreboard ceilings trim ceiling joints and brandering shall be used to form access door in ceiling. Where directed the trap door overall size shall be 1000 x 850 mm. At hanging side of opening 75.0 x 50.0 mm splayed frame shall be provided 75.0 x 50.0 mm stop on top of trimmer planted. The door shall be formed with 50.0 x 25.0 mm frame covered with fibreboard to match ceilings, to hang on a pair of approved strong 96.2 mm steel butts and finish around opening with 38.1 x 25.4 mm rebated fillet which shall be screwed to trimmers to form stop.

4080 BAT PROOFING

The underside of projecting eaves to buildings with ceilings shall be bat proofed by means of 50.0 x 25.4 mm wrought podo framing filled in with stout Galvanized coffee tray-mesh. The framing shall be nailed on one edge to ends of rafters to butt up against fascia board and on other edge 50.0 x 25.4 mm sawn podo bearers plugged to wall.

4081 IRONMONGERY - QUALITY

All ironmongery shall be of the description and manufacture described and shall be fitted and fixed in an approved manner. All locks shall be provided with two keys and shall have a sufficient number of differs to ensure that no two external locks of the same contract may be opened with the same key. The Contractor shall include for all cutting, sinking, boring, mortising and fitting and for supplying all necessary and suitable matching screws. The Contractor shall also include for removing door furniture etc. during painting operations and afterwards re-fixing and for labelling all keys with door references and handing to the Engineer on completion.

Master keys shall be provided and properly labelled where directed.

Face plates with all locks shall match the door furniture.

All finishes shall be in satin chrome or silver anodised aluminium unless otherwise stated.

4082 IRONMONGERY - MOVEABLE PARTS

All locks, springs and other items of ironmongery with moveable parts shall be properly tested, cleaned and adjusted where necessary to ensure proper working order by the time of completion of the works and shall be left in perfect working order by the Contractor.

4083 IRONMONGERY - SAMPLES

Samples of all ironmongery specified shall be submitted to the Engineer for approval, and the approved samples shall thereafter be regarded as the standard for the work. Ironmongery which in the opinion of the Engineer does not conform to this standard shall be removed from the Site.

Alternatively, ironmongery of an equal standard will be acceptable providing samples are submitted and approved by the Engineer before orders for such ironmongery are placed.

4084 W.C. FITTINGS AT OFFICES

The following shall be provided and fixed with matching screws in the positions shown:

i) One chromium plated toilet roll holder of approved pattern screwed to door or plugged to wall.

ii) One C.P. hat and coat hook plugged to wall.

iii) One C.P. towel rail 600 mm long with brackets plugged to wall.

4085 DOOR STOPS

40.0 mm diameter rubber door stops shall be provided to all doors and securely plugged and screwed to floors with screws 40.0 mm long.

4086 STRUCTURAL STEEL AND METALWORK

Mild steel shall be sound, of approved manufacture and shall comply with the requirements of SSRN 819 and full threads to all screw work. Welds shall be neatly executed, filed smooth and left clean.

Prices for all mild steel shall include for removing all rust and scale and applying one coat of red oxide or other approved priming paint to all surfaces before fixing.

Cast Iron shall be best quality cast clean and sharp and free from all cracks, vents, holes and other defects.

4087 SPLIT RING CONNECTORS

Split ring timber connectors shall be of approved manufacture, in accordance with SSRN 820, or may be manufactured locally from Galvanized mild steel water tubing, to the approval of the Engineer.

4088 METAL WINDOWS

These shall be as shown on the Drawings.

4089 PLASTERWORK AND OTHER FLOOR, WALL AND CEILING FINISHINGS

The cement and sand pavings and finishings shall include for finishing of the surface to a perfectly smooth and hard standard with a steel trowel to deal level or true falls if so described. This shall apply for all temporary rules, formwork to stop pavings at openings or edges as required, for preparing concrete beds to receive paving by thoroughly brushing clean the surface with a steel wire-brush, and well wetting and painting the same with cement and sand (1:1) grout immediately before paving is laid, for any additional thickness of paving beyond the thickness specified

required due to irregularities in the concrete bed to receive such paving, and for keeping paving damp for at least 7 days after laying.

4090 PAVING GENERALLY

All pavings shall be laid with joints set out in accordance with a detailed pattern approved by the Engineer.

4091 PROTECTION OF FLOOR FINISHES

The Contractor shall protect the floor finish with heavy quality building paper or sheeting or sawdust to the satisfaction of the Engineer as each area is completed.

4092 PLASTERING

All surfaces to be plastered or rendered shall be brushed clean and be well wetted before the plaster is applied. All plaster and rendering shall be kept continuously damp for seven days after application.

All concrete surfaces which are to be plastered are to be hacked or otherwise suitably roughened to provide a key. All surfaces to receive plaster are to have the suction correctly adjusted by the application of clean water.

All arises shall be finished true and slightly rounded except where otherwise stated, and shall be run at the same time as the adjoining plaster. No partially or wholly set plaster or rendering will be allowed to be used or re-mixed.

4093 SAMPLES OF PLASTERWORK

The Contractor shall prepare samples of the plastering and rendering as directed until the quality, texture and finish required is obtained and approved by the Engineer after which all plastering executed in the work shall conform to the respective approved samples.

4094 DEFECTS IN PLASTERWORK

The Contractor shall cut and make good all cracks, blisters and other defects and leave the whole of the work perfect on completion. When making good defects the plaster or rendering shall be cut to a rectangular shape with edges undercut to form dovetailed key, all finished flush with face of surrounding plaster or rendering. 'Gypsum' or other equal and approved plaster shall be used when carrying out defective work.

4095 GAUGED (CEMENT LIME) PLASTER INTERNALLY

Gauged plaster internally shall consist of a first (or rendering) coat composed of one part cement, two parts lime and nine parts sand and a finishing coat composed of one part cement, three parts lime and six parts sand. The first or rendering coat shall be laid to a uniform surface, finished with a wood float, well cured and allowed to dry out for at least 7 days before applying the finishing coat. The second or finishing coat shall be thoroughly worked and finished hard and smooth with a steel trowel.

Great care shall be taken in applying the finishing coat to obtain uniformity of the surface, smoothness and hardness. The total finished thickness of plaster shall not be less than 12 mm.

4096 CEMENT PLASTER-INTERNALLY

Unless otherwise indicated internally applied cement plaster shall be composed of one part cement to five parts sand applied in two coats. The first coat shall be well scratched to form key and allowed to dry out at least 24 hours before applying the second coat. The second coat shall be finished with a steel trowel.

4097 CEMENT RENDER-EXTERNALLY

Unless otherwise indicated, this shall be as described for internal plaster but the second coat shall be finished hard and smooth with a wood float and the total finished thickness of render shall not be less than 12 mm thick.

4098 PLASTER OVER WALLPLATES

Where the wall plaster is carried over wallplates, a strip of expanded metal shall be spiked to the wallplate to form a key.

4099 PLASTER AROUND INSTALLATIONS

Make good plaster around Plumber's water, soil and waste pipes and around Electrician's conduit fittings and switches.

4100 DUBBING OUT, ETC.

The Contractor shall include in his Tender for dubbing out as necessary in cement and sand (1:7) hacking concrete to form key and for all internal angles, arises, other labours and for making good up to windows or door frames.

4101 GLAZING

All glass shall be of approved manufacture in accordance with SSRN 822 free from flaws, bubbles, specks and other imperfections cut to size to fit the opening for which it is required with not more than 1.6 mm play all round.

The glass for glazing generally shall be clear sheet and flat drawn sheet and shall be Ordinary Quality (O.Q) sheet glass of the required thickness to suit the size of sheet and position.

4.8 mm semi-obscured glass shall be fitted to windows of lavatories, bathrooms and W.C.'s.

4102 PUTTY

The putty for glazing shall be tropical putty of approved manufacture suitable for glazing to metal or wood frames as hereinafter specified.

All putty shall be delivered on Site in the original manufacturer's sealed cans or drums and used direct therefrom with the addition only of pure linseed oil if necessary. No mineral or other oils may be used.

The rebates of all windows shall be painted one undercoat before puttying. Before glazing the rebates of all windows shall be adequately back puttied.

The putty shall within 14 days dry and harden without wrinkling of the surface or caking and shall adhere satisfactorily to the surface of the glass and the frame.

4103 GLAZING WORKMANSHIP

All glazing to wood frames shall be springed while that to metal frames shall be fixed with clips. All glass shall be properly back-putted, and the front putty finished neatly and cleanly in line with back putty.

Glass to the glazed doors shall be fixed with glazing beads, secured with brass cups and screws and bedded in approved proprietary strip cut to fit the exact line of the beads.

The inside and outside of glass shall be cleaned to remove all paint and putty marks. Any broken scratched or cracked panes shall be replaced so as to leave all glazing sound and perfect at completion.

4104 PAINTING AND DECORATING TO BUILDINGS AND NON-METALLIC STRUCTURES

The Contractor may arrange for the painting work to be executed complete by an approved Sub-Contractor and he shall state the name of the Sub-Contractor he proposes to employ on the Form provided and included in this Tender Document in the list of approved Sub-Contractors. The Contractor shall not employ any other Sub- Contractor without the express permission of the Engineer in writing.

Before commencing the painting work, the Contractor shall submit to the Engineer for approval, a list of all the brands of paints and finishings including the necessary primers and undercoats to be used and immediately upon being approved orders shall be placed and total requirements obtained for the works.

Once approved, no other brand of material shall be used without the express permission of the Engineer in writing.

4105 MIXING OF PAINTS

All materials shall be delivered on Site intact in the original containers and shall be mixed and applied strictly in accordance with the manufacturer's printed instructions. No addition will be allowed to be made locally without the express permission of the Engineer.

4106 COLOURS OF PAINTS

The priming, undercoats and finishing coats shall each be of different tints, the printing and undercoats shall be the correct brands and tints to suit the respective finishing coats, in accordance with the manufacturer's instructions. All finishing coats shall be of the colours and types specified by the Engineer.

4107 PREPARATION PRIOR TO PAINTING

The Contractor shall include for the preparation of surfaces, rubbing-down between each coat, stopping, knotting and all other work in connection as previously described and as necessary to obtain a first class finish.

Plaster finished with a steel trowel and fair face concrete surfaces shall be well rubbed-down, filled and made good as necessary and thoroughly cleaned down immediately before decoration is applied.

Plaster finished with a wood float or other rough textured surfaces of a similar nature shall be made good as necessary and thoroughly brushed clean immediately before decoration is applied.

Cast-in-situ concrete with a rough textured surface shall be made good as necessary and thoroughly wire-brushed clean immediately before decoration is applied.

Insulation board or similar surfaces shall be filled and made good as necessary and lightly brushed-down to remove all dirt, dust and loose particles.

4108 PRIMING PAINT

All exposed cast iron or asbestos cement soil, waste and vent pipes shall be primed with two coats approved aluminium metal primer before further treatment.

Woodwork to be painted shall be well rubbed down and primed with aluminium wood primer well-brushed into the wood. All knots shall be covered with good shellac knotting before priming and all defects be filled with hard stopping after priming.

Plywood shall be filled over the entire surface, with an approved brush filler.

Woodwork to receive finishes other than paint shall have all stains removed, be well rubbed-down and have all defects levelled up with hard stopping or a colour to match the adjoining surfaces.

4109 METHOD OF PAINT APPLICATION

After each coat the work shall be allowed to dry and shall then be well rubbed-down with fine glass paper on blocks or other means as required for the particular work before the next coat is applied. The paintwork shall be finished smooth and free from brush marks.

4110 IRONMONGERY AND OTHER PROTECTION DURING PAINTING

All door furniture and other ironmongery shall during painting operations be removed and afterwards refixed as herein before described in the Ironmongery Preamble.

All metallic window and door frames shall be protected by drafting tape or other approved means before adjacent or adjoining surfaces are primed and painted.

4111 DISTEMPER

Distemper shall be oil-bonded or casein bonded washable distemper.

Distemper shall be thinned only with petrifying liquid made by the manufacturer of the approved distemper to be used, and in accordance with their printed instructions.

4112 EXTERNAL PAINTING WORK

All materials for external use shall be of exterior quality recommended by their manufacturers for external use.

4113 LIMEWASH

Limewash shall consist of slaked lime and coarse salt mixed in the following manner. To 25.0 kg of slaked lime add water into which has been dissolved (1 kg approximately) of coarse salt. Add clean water until the required consistency is obtained.

4114 COVERING UP DURING PAINTING

The floors, etc shall be swept cleaned and covered up with dust sheets when executing all printing and decorating work.

Paint splashes, spots and stains, shall be removed from floors, woodwork, etc. Any damaged surfaces shall be touched up and the whole of the work left clean and perfect upon completion.

4115 PAINTWORK TREATMENT FOR BUILDINGS

1.	Fibreboard ceiling	Three coats distemper
2.	Plastered Walls	Three coats plastic emulsion internally and two coats exterior water paint externally
3.	Metal Work	Prime and paint one undercoat and two finishing coats gloss-paint. Only approved systems to be used.
4.	Copper, Galvanized and coated Metal	Treat with approved calcium plumbate solution, prime paint two undercoats and one coat gloss-paint.
5.	Galvanized corrugated	Apply two coats of approved roof - Iron Roofing paint.
6.	Woodwork	Knot, prime, stop and paint one undercoat and two finishing coats gloss-paint. Only approved systems to be used.

4116 PLUMBING

Pipes and tubes shall be cut by hacksaw or other method which does not reduce the diameter of the pipe or form a bead or feather which might restrict the flow of water.

Bends shall be formed on an approved machine and in no case to an internal radius of less than eight times the outside diameter of the pipe.

Elbows may only be used on pipes of 12 mm and 19 mm diameters and not on hot water systems of any description.

All tubing exposed on faces of walls shall be fixed at least 25.4 mm clear of adjacent surfaces with approved holder bolts built into walls not more than 1.288 metres apart. Polythene tubing must be supported throughout the entire length in horizontal positions as directed.

Pipes fixed in roof spaces or to joinery shall be fixed with approved clips screwed to timber members, not more than 1.30 metres apart. Easy bends in the line of piping shall be made with an approved bending machine, no firebrands will be permitted. Where elbows are allowed, they will be of round pattern.

4117 PIPE MATERIAL FOR PLUMBING

All Galvanized mild steel tubing shall be of MEDIUM thickness in accordance with SSRN 823.

Fittings for the same shall be Galvanized malleable iron in accordance with SSRN 824. Joints are to be screwed and socketted and put together in approved jointing compound. Long screws and any other untapered threads shall have yarn as well as jointing compound incorporated in the joints.

Polythene tubing for cold water services shall be normal or heavy gauge as required or specified in accordance with SSRN 825. Joints and fittings shall be in accordance with the manufacturer's printed instructions.

All brass work and fittings shall be in accordance with SSRN 826 for draw-off taps and stop-valves and SSRN 827 for ball- valves (and plastic-floats in accordance with SSRN 828), and shall be high or low pressure as directed by the Engineer.

The soil, waste and vent pipes and their fittings shall be coated MEDIUM grade cast iron spigot and socket pipes. Pipes, fittings and accessories shall be in accordance with SSRN 843.

4118 PLUMBING WORKMANSHIP

Where directed, pipes shall be fixed in chases in walling and secured with approved holder bolts built into wall, not more than 1.30 metres apart.

All surface fixings, unless otherwise specified herein shall be carried out with "Philplug" or "Rawlplugs". The fixing holes shall be drilled with special masonry drills and not cut with a chisel. Under no circumstances will wooden plugs be permitted.

Lavatory basin brackets shall be fixed to solid walls with 6 mm diameter bolts 100 mm long with head nut and washer.

The tubing for the hot and cold water services, waste and overflow pipes, etc. is hereinafter described as Galvanized mild steel tubing.

4119 STOP COCK PIT

The stop-valve pit shall be constructed to size 250 x 250 x 600 mm deep internally and shall consist of 100 mm stone sides, 75.0 mm concrete base size 600 x 600 x 50 mm thick precast concrete cover slab of size 450 x 450 mm reinforced with 75 mm mesh, No. 10 gauge "Weldmesh" or other equal and approved fabric reinforcement and two 10 mm diameter mild steel rod lifting handles cast in the cover slab. Allowance shall be made for holes through the sides for pipes.

4120 CONNECTION OF PLUMBING PIPES AND TANKS

Each connection of tubing to cold water storage tank shall be made by drilling a hole on tank side and using a long screw, union and two backnuts all well screwed-up in red lead. Joints of tubing to flanged and bossed connections of hot water cylinders or boilers shall be made with a boiler screw, union and backnut screwed-up in red lead.

Connections to sanitary fittings shall be made with good flexible metal tubing with the required length. Copper to iron couplings shall be provided at each end, together with red lead joints to union of fitting and tubing.

4121 SANITARY FITTINGS

Where indicated on the Drawings or in the particular Specification, the supply, assembling and fixing of Sanitary fittings in the positions shown on the drawings shall allow for the provision of jointing material, mortises, plugs, screws, etc.

Sanitary fittings shall be manufactured by a manufacturer approved by the Engineer.

(a) <u>Pedestal Type W.C. Suite (Low Level)</u>

Pedestal type W.C. suite shall comprise white glazed vitreous china pan to SSRN 833, hinged black plastic seat to SSRN 834, complete with rubber buffers white glazed vitreous china 14.0 litres cistern with valveless siphon for normal flushing supported on pair of white porcelain enamelled brackets, 40.0 mm diameter white porcelain enamelled iron flush pipe with "Adaptors" or other equal rubber cone joint to pan and C.P. union connection to cistern.

(b) Pedestal Type W.C. Suite (High Level)

This shall be as (a) above but with 'P' trap, white glazed vitreous china pan and approved 9.0 litres plastic or other type cistern and all necessary fittings as directed by the Engineer.

(c) W.C. Suites

The pedestal type pan will be fitted above the floor level in ALL cases.

W.C. pans will NOT be placed in sinking below floor level unless specifically directed in writing by the Engineer.

(d) Lavatory Basins

The lavatory basin shall be glazed vitreous china lavatory type to SSRN 835 with combined waste and overflow complete with one 12.7 mm C.P. pillar valve to SSRN 832 fixed in tap hole provided, with fibre washer, C.P. waste, rubber plug and C.P. chain and stay, supported on a pair of porcelain enamelled towel rail brackets.

(e) Stainless Steel Sinks

Stainless steel sink shall be to SSRN 836 complete with draining board, work slab and back ledge overall size as in the Bills of Quantities with combined waste and overflow, complete with 19 mm diameter C.P. pillar valve to SSRN 832 marked "cold", fixed in tap hole and provided with fibre washer, rubber plug and C.P. chain stay, fixed on angle iron brackets.

4122 WASTE FITTINGS

All waste fittings shall be provided with brass 'S' or 'P' traps to SSRN 837 with 40.0 mm (minimum) seals. They shall be properly connected to tails of waste fittings with screwed red lead joints, and be complete with cleaning eyes. Traps to sinks shall be unpolished while those to lavatory basins shall have a chromium-plated finish.

4123 BRACKETS AND SUPPORTS FOR SANITARY FITTINGS

Brackets and supports for lavatory basins and sinks shall be to SSRN 838.

4124 WASTE PIPES

The sink shall be provided with a 40.0 mm diameter waste pipe the lavatory basin shall be provided with 30.0 mm diameter waste pipe. Waste pipe shall be run to falls through external walls to discharge over trapped gullies and shall be finished with splay cut-ends.

4125 OVERFLOW TO W.C. CISTERNS

The internal overflow arrangement shall be achieved by the siphon flushing mechanism, where a lever is included internally to regulate overflow. The cistern shall be 6/7/9 litres complete with a ball valve, siphon and 355 x 230 mm flush pipe.

4126 SOIL AND VENTILATING PIPES

Where shown on the Site Plan, the head of each main drain shall be provided with a 110 mm diameter PVC ventilating pipe as described with open-end finishing at least 450 mm above the level of the eaves, and not less than 3.0 metres from any permanent opening into the building, terminated with approved quality Galvanized wire-balloon grating. Where the ventilating pipe passes through the roof, a 24 gauge Galvanized sheet metal flashing of approved size to suit roof shall be provided and dressed tightly against pipe and over and under roof finish and sealed to Engineer's approval.

4127 TESTING OF PLUMBING WORK

On completion, the whole of the plumbing work shall be tested to the satisfaction of the Engineer and in accordance with his instructions. Any materials or workmanship not to his satisfaction shall be replaced or re-executed at the Contractor's own expense.

4128 PVC DRAIN PIPES

PVC drain pipes and fittings shall be spigot and socket pipes of approved manufacture in accordance with SSRN 309.

4129 CONCRETE DRAIN PIPES

Concrete drain pipes shall be spigot and socket pipes of approved manufacture in accordance with SSRN 840 and shall be totally immersed in water for at least 3 hours immediately preceding laying.

4130 JOINTING FOR PVC AND CONCRETE DRAIN PIPES

The joints for PVC and concrete drain pipes shall be made by first inserting three turns of cement slurried yarn, caulked well home to the end of the socket so that the consolidated width of the yarn does not exceed one quarter of the depth of the socket. The yarn shall be best quality white-spun long staple yarn, soaked in water for 24- hours before use and inserted in the joint while still wet.

The remaining portions of the socket shall be filled solidly and homogeneously with cement mortar (1:2) and finished with a neat cement fillet on the outside at an angle of 30 degrees. Immediately after jointing a tight fitting wad or scraper shall be drawn several times through the bore of the pipe to ensure that it is left clean and free from obstruction. The joints shall be protected from injury until they have set hard.

4131 PITCH FIBRE DRAIN PIPES

Pitch fibre pipes, coupling and fittings shall be of approved manufacture in accordance with SSRN 841 for pitch impregnated fibre drain and sewage pipes. The laying, cutting and jointing of pitch fibre pipes and the jointing to pipes of other materials shall be carried out strictly in accordance with the manufacturer's printed instructions.

4132 CAST IRON DRAIN PIPES

The cast iron drain pipes shall be coated spigot and socket pipes of approved manufacture in accordance with SSRN 842. All joints shall be made with P.C. 3 or other similar and approved jointing compound in accordance with SSRN 843.

4133 CAST IRON FITTINGS

The cast iron fittings shall comply in all respects with SSRN 829 and those of spigot and socket type for drains with SSRN 844 and will be used as drain connector to first manhole.

4134 CONCRETE BEDS FOR DRAIN PIPES

All drain pipes shall be laid on a concrete bed, or blinding as directed by the Engineer.

Beds shall first be laid to correct falls and levels with recesses formed in same for the pipe sockets so that the whole of the soffit of the pipe barrel bears evenly on the bed. When the concrete has set a thin layer of mortar (1:5) shall be spread on the bed to receive the pipe barrel, sufficient to ensure that a surplus is squeezed out when the pipe is laid, and finally adjusted to level. After jointing, the recesses around sockets shall be filled with concrete of the same mix as the bed and the haunching or surrounding completed.

Where pipes are laid under driveways and parking areas, the pipes shall be bedded and surrounded with beds if the cover on the pipe is less than 1.0 m deep.

4135 LAYING OF DRAIN PIPES

Drain pipes shall be laid in straight lines to even gradients and to the required depths commencing at the lowest end.

Before each pipe is laid, it shall be examined to ensure that the bore is clean, all foreign material removed and any cracked or damaged pipes shall be rejected.

4136 TESTING OF DRAINS AND MANHOLES

Each length of drain and manhole shall be tested as described hereinafter and approved by the Engineer before any backfilling of the trench takes place.

Testing shall not be carried out until after at least 24 hours following completion of jointing.

The test shall be as follows:-

i) The lower end of the pipe and all junctions shall be securely stoppered and the whole length under test filled with water.

ii) When full, a further stopper shall be inserted at the top leaving a pipe attached to the drain plug. This pipe shall be bent through 90 degrees and shall terminate in a header tank 250 mm square. The vertical distance between the centre-line of the drain plug and the top of the header tank, shall be not less than 900 mm.

iii) Water shall then be poured into the header tank which shall be kept full for a minimum period of 3 hours to allow absorption to take place. At the expiration of this period the header tank shall be topped-up and the testing of the drain commenced. If, after a further period of 30 minutes the water level in the header tank has not fallen by more than 12 mm, the test shall be considered satisfactory.

iv) In the event of a pipe failing to withstand the test, the point of failure shall be completely surrounded, at the Contractor's expense, with concrete (1:3:6-19 mm maximum aggregate) to achieve a minimum cover of 150 mm in all directions. The length affected shall then be re-tested.

v) Immediately a length of drain has been approved, the trench shall be backfilled to a depth of at least 300 mm above the top of the pipes.

4137 GULLIES

These shall be approved 100 mm salt glazed stoneware or cast iron trapped Gullies with 150 x 150 mm cast iron gratings to receive the wastes from waste fittings. The Gullies shall be bedded on and surrounded with concrete (1:3:6) of 100 mm minimum thickness, carried up to form 750 x 750 mm curb with all exposed surface finished in cement and sand (1:2) trowelled hard and smooth and all angles rounded. The cement joint to drain pipe and run drains to adjacent manhole shall be appropriately made good.

4138 ELECTRICAL INSTALLATION

All work in connection with the electrical installations shall be carried out by an approved Sub-Contractor under supervision of a qualified, competent and experienced supervisor. The finished work shall be to the satisfaction of the Engineer and in accordance with requirements of the local electricity supply company.

4139 GALVANIZED SHEET IRON

Galvanized sheet iron shall be at least Gauge 28 of approved manufacture, free from all defects and shall hold up to the gauge as specified.

Sheets shall be fixed with one and a half corrugated side laps and minimum 225 mm end laps secured to purlins by galvanised iron bolts and iron and lead washers spaced not more than 300 mm apart horizontally on each purlin.

Ridges, hips and valleys shall be at least 28 gauge galvanised sheet, minimum 450 mm girth with roll tops and fixed with galvanised iron screws and iron and lead washers spaced not more than 300 mm apart, lapped 150 mm at junction of lengths and with edges close dressed into corrugations of sheeting.

Valleys are to be inverted, lapped 150 mm at ends of lengths close welded and securely fixed under edges of roof sheeting.Flashings, gutters etc. shall be lapped 75 mm minimum at joints and shall be rivetted and soldered at joints where required.

Where applied to walls the side overlaps shall be seam bolted at 300 mm centres maximum with 6 mm diameter seam bolts 19 mm long each with diamond shaped bitumen washer, Galvanized steel washer and Galvanized steel nut.

4140 POLISHED TERRAZZO

Polished terrazzo shall be laid by an approved Sub-Contractor and shall consist of a screed or backing coat and a finishing coat of "Snowcrete" and marble chippings (1:2) mixed with "Cemantone No. 1" colouring compound in accordance with the manufacturer's instructions in the proportions of 10 lbs. compound to 100 lbs. cement. Overall thicknesses are to be as specified.

The finishing coat shall be a minimum of 12 mm thick for pavings trowelled to a smooth and even finish and well rubbed and polished with carborundum.

4141 TILES

Glazed and eggshell ceramic wall tiles shall comply with SSRN 879 and shall be of the colours described. Samples of tiles shall be submitted to the Engineer's Representative for approval.

Adhesive for fixing wall tiles shall be approved adhesive.

Tiles shall be wiped clean and fixed dry with the approved adhesive all in accordance with manufacturer's recommendations with straight joints 1.6mm wide, pointed in white cement.

Ceramic floor tiles shall be fully vitrified clay tiles complying with SSRN 879 and having a water absorption not exceeding 0.3%.

For laying of floor tiles the surface of the compacted bedding shall be spread with a 3mm thick cement and sand (1:1) slurry. Floor tiles shall be wiped clean and laid dry, in a square pattern with 3mm wide joints and tapped into the grout. Pointing shall be in an approved proprietary tile grout, tinted to match floor tiles.

CHAPTER 5

PIPEWORK

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CHAPTER 5 – PIPEWORK

PART I – ALL PIPES, VALVES & FITTINGS DURING DESIGN, MANUFACTURE, WORKS TESTING AND SUPPLY

501 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 an effort to ensure 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 working life shall be 40 years and pipe manufacturers shall provide a written guarantee to this effect which shall nevertheless be conditional upon the installation requirements 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 lasting coating 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 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 translation are acceptable. For these Standard Specification Reference Numbers, (SSRN), please refer to chapter 11. Whilst every effort has been made to quote the

latest available version of 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 editions current 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.

502 GENERAL

In general the recommendations contained in SSRN 679 with regards to pipe design), and SSRN 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 be made to SSRN 202 for ductile iron pipes; SSRN 24 and SSRN 201 for steel pipes; SSRN 300, SSRN 305 and SSRN 306, for PVCu; 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 times latest editions and updated standards and procedures for design and installation shall be used and adopted. This will ensure that the employer benefits from superior materials with enhanced useful life. In the same context the Contractor may provide, with the approval of the 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 shall be 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 Project Manager when they occur. Such incidences shall be remedied by using a higher class of 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 and installation

	SSRN 267 – Ductile Iron
	SSRN 653 (d) - Glass reinforced and thermosetting plastics
	SSRN 270 – Pipelines subsea – design, construction and installation
	653 (f) – Design and Construction of Steel Pipeline Inland
Steel pipes & fittings	Pipes SSRN 210
	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 otherwise indicated or specifically authorised following a design certified by 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. Injection moulded 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 providing these are not formed by bending straight pipe below the minimum radius specified.

These and other specific standard specifications are listed in Chapter 11 – 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 the two 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 the opinion 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 / S2 S3 / S4 S3 / S4 S3 / S4	With Project Engineer's approval or direction S2 S3 S4 S3
Minimum Surround Compaction	% MPD	90	MPD
Operating Temperature Secondary and Tertiary Primary Transmission	°C °C °C		 27 29 29
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.

Criteria	Units	Value	Specific Design Necessary
Partial Vacuum in Pipes Secondary & Tertiary Primary Distribution Transmission Mains		T No Yes Yes	
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	 No Yes Yes

Specific design (supported by properly documented calculations) and Project Manager'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 DN 110 may be affected if the native soil modulus is less than the MPa value indicated above and the Project Manager may require the pipe grade to be increased. Trench widths for pipes greater than DN 300 may be varied with the approval of the Project Manager to suit actual site conditions and approved working methods provided that the Contractor has proven that the minimum compaction specified is being continually bettered..

For ferrous pipes of diameter less than DN 80 mm and 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 will be allowed.

503 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 with the provisions of these Specification and the indicated National or International Standards, and that they shall conform to the required standards for all raw materials, processes, quality control, manufacturing, and for fully manufactured products including 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 a manufacturer 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 of this 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.

504 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 or his 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

desires respecting 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 each manufacturer's yard by a total of three representatives of the Employer and the Engineer during the manufacturing and pre-shipment stages.

505 THIRD PARTY INSPECTION DURING MANUFACTURE OF FIRMS WITH OR WITHOUT 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.

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).

506 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 Authority customs authorities for pre- or post- shipment inspection of imports into Local Authority. The costs for such inspection shall also be fully borne by the Contractor.

507 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 workmanship for 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 for the 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 workmanship.

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 – THERMOPLASTIC PIPES DURING MANUFACTURE, SUPPLY, INSTALLATION, COMMISSIONING & TESTING

523 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 tests in accordance with SSRN 305, and SSRN 301 (c) 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 the relevant 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, at all times, latest and updated standards and procedures for design and installation shall be used 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 do not affect costs or programme and that they can demonstrate the superiority of the materials through tests and guarantee certifications.

All PVC joints shall be of the spigot and integral socket type whilst solvent weld joints or joints with adhesives are not permitted. Fittings for use with PVC pipes shall be either of steel 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 solely hydraulic pressure classes. In all cases minimum cover shall be 900 mm and the bedding shall be restricted to S1, save that S2 bedding may be used with the approval of the Project Manager, but only if he is fully satisfied with the Contractors initial performance in regards to excavation, embedment, compaction and backfilling.

The maximum allowable deflection after laying of thermoplastic pipes shall be 2%. 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, soil conditions, trench width, depth, appropriate traffic loads and impact fatigue.

Minimum pressure ratings and cover for PVCu pipes shall be as follows:

<table>
<tr><th>Nom. DN (mm)</th><th>Minimum Pressure Rating (bars)</th><th>Minimum Cover (m)</th><th>Pipe Bedding</th></tr>
<tr><td>≤ 125</td><td>10</td><td>0.9</td><td rowspan="4">S1, (or 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</td><td colspan="2" rowspan="2">To suit specific design calculations, agreed design criteria, using EN 1295:1998, 1:B.1.12 design code of practice, and with the approval of the Engineer</td></tr>
<tr><td>Transmission Mains and off-takes</td></tr>
<tr><td>All pumping mains</td><td colspan="2">Not Permitted</td><td></td></tr>
</table>

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 301 and SSRN 305.

a. 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)

b. 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 to appropriate standards. 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 25 MPa.

c. 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 date received, and batch or lot numbers.

During production, records shall be kept for mixing ratios of all the components used in 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 work shift. The Contractor 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.

d. 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 the K value is in accordance with the relevant standards.

e. 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 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.

f. Inspection of pipes and pipe fittings

The inspection will consists of visual examining the external surfaces of the pipe that must 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 the 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.

g. Testing of Pipes and Fittings

For each lot, the pipes and fittings shall be tested at the factory before shipment in accordance to the 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 whole Lot will be rejected if the quantity of non-compliant pipes exceed the acceptable level.

h. 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

i. Release from manufacturers works

No PVCu pipes and fittings shall be released from the manufacturer's works until all tests results on the particular Blend and Lot it belongs are in conformance with requirements. No pipe shall also be delivered before a full lapse of 6 weeks from its production to allow for positive results of accelerated resistance hydrostatic test pressure testing.

j. Determination of pipe and socket wall thickness

All pipes shall be manufactured in accordance to SSRN 300 and SSRN 301 and the pressure rating design 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 thickness 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

k. Pipe Lengths

Pipes shall be in effective lengths (i.e. overall length minus the depth of engagement in the socket) of not exceeding 6.0 m length.

l. Pressure Classification

All PVCu Pipes supplied shall be classified by their PN operating pressure rating and their SDR ratio as required under this contract.

m. Protection of Fittings used with PVCu Pipes

All types of fittings shall be protected in conformance to their respective required standards.

(i) Protection of extruded PVCu fittings - Protection shall be in conformance to ISO 2035, 2034-5 and 2048 and their other respective standards.

(ii) Protection of Steel Fittings: - Steel fittings shall be coated and lined with fusion bonded 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.

(iii) Protection of DI fittings: - DI fittings shall be coated and lined with fusion bonded epoxy to a thickness as for the steel fittings above and shall similarly be shrink wrapped in 0.2 mm polythene packing for transport.

n. Packing for Shipment – PVCu 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, 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 stacking and 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 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

o. <u>In-country Storage, Handling and Transportation of PVCu Pipes</u>

(i) Storage Areas

The Contractor shall provide storage for PVCu pipes in a manner and in facilities approved by the Engineer's Representative. For pipes of local manufacture, this may include a temporary fenced-off area at the manufacturers premises, provided a Contractor in his Tender has so indicated his intention in this and the area to be fenced off is shown to be sufficient for the purpose.

(ii) 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 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. 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 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 heights allowable:

Pipe Outside Diameter 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 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 250^{o}C at all times, whilst the requirements of SSRN 302 shall be met with regards to storage, handling and transport.

(iii) Vehicle used to transport PVCu pipes shall have flat beds free from projections. Pipes shall be uniformly supported along their entire length and shall not overhang 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 stacked on vehicles in alternate layers so that the socket carries no load. Thicker wall pipes shall always be loaded before thin wall pipes.

(iv) 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 containers is not permitted, unless all pipes are first removed and then stored in accordance with e(ii) above.

(v) 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 the loading and offloading and pipes shall be neither thrown down nor dropped or rolled.

p. 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 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.

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 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, nor shall pipes be rolled or dragged along the ground.

524 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 to SSRN 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 may provide 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. Not less than Third Generation polyethylene known as PE 100 shall be used for the manufacture of the pipes. Second Generation polyethylene (PE 80) shall not be offered. The polyethylene shall be stabilised against the effects of ultraviolet radiation by the addition of carbon 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, and the pressure ratings shall not be lower than PN 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. DN (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="5">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</td><td colspan="2" rowspan="3">To suit specific design calculations, agreed design criteria, using EN 1295:1998, 1:B.1.12 design code of practice, and with the approval of the Engineer</td></tr>
<tr><td>Transmission Mains And off-takes</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 to 100 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 be supplied in lengths not exceeding 12 m. Installation – including fusion jointing work on HDPE pipelines – must be directed and supervised by suitably qualified and experienced persons and the Contractor shall have demonstrated his ability to provide this in his Tender, if necessary from his intended manufacturer.

a) 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 fittings shall 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.

b) 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 fittings connected by flange assemblies shall be used. Jointing with adhesives, cement glue or 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 fittings must 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 the fitting to the adjoining pipe or pipeline component as applicable. No heating element may be exposed and all coils are to be fully imbedded into the body of the fitting for protection 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 manual setting 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 recognition of 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 an easily removable centre stop not requiring tools for removal.

All internal or externally threaded transition adaptors in the nominal sizes up to and including DN 63 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 the modular principle, not being supplied moulded into an electrofusion fitting socket.

c) Product training and Technical Information

The manufacturer or the material supplier shall provide a specialised theoretical and active 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.

d) 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 523 (a) to (o) where appropriate and in conformance to their respective standards if not covered in this section.

e) In-country Storage, Handling and Transportation of HDPE Pipes

(i) Before transporting HDPE pressure pipes, the loading surface of the vehicle must be cleaned and free from projecting nails, screws or other sharp objects. The bottom layer of all pipes must as far as possible be in contact with the loading surface throughout their entire length and not project beyond it. The pipes must be secured from slipping and shall not be pulled over sharp edges when loading and offloading. Pipes shall not be dragged along the ground.

(ii) Pipes, fittings and coils of HDPE pipes shall be stored in such a way that they are completely protected from direct sunlight. When covered they must be well ventilated to avoid accumulation of heat and resultant deformation. Transparent coverings shall not be used. The storage location shall be flat and shall, for pipes, support the pipes throughout their length. Stones and sharp objects shall not be present. Pipes shall not be stacked to a height exceeding 1 m. The pipes must be secured at the sides to prevent them from rolling. Contact with harmful materials shall be avoided. As far as possible, coils shall be stored in a horizontal position. The area shall be free of stones and sharp objects. If stored upright they must be secured to avoid tilting.

(iii) 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 shall be used. A turnstile can be used with the coil laid in a horizontal position on it or with the coil mounted vertically on a slow moving lorry. The pipe shall never be removed from a coil in a spiral manner as this may cause kinking. Should kinking nevertheless occur the Contractor shall cut the pipe on either side of the kink, prepare the ends, and then use an approved joint after laying. All costs of dealing with kinking shall be to the Contractors expense. A minimum bending radii of 35 x the diameter shall be observed.

f) 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, 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 coils 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 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.

525 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 diameter underground glass reinforced plastic piping, joints, fittings and specials as specified in the engineering 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 Pressure Pipe 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 of Soils.
- ASTM D2290 Standard Test Method for Apparent Tensile Strength of Ring or Tubular Plastics and Reinforced Plastics by Split Disk Method.
- ASTM D2412 Standard Test Method for External Loading Properties of Plastic Pipe by Parallel- Plate Loading.
- ASTM D2487 Standard Test Method for Classification of Soils for Engineering Purposes.
- ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means 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-Reinforced Thermosetting Resin) Sewer and Industrial Pressure Pipe
- ASTM D5365 Long- Term Ring Bending Strain of Fibre Glass (Glass-Fibre Reinforced Thermosetting Resin) Pipe.

Product Standards

- ASTM D3754 Standard Specification for "Fibreglass" (Glass Fibre-Reinforced Thermosetting Resin) Sewer and Industrial Pressure Pipe
- ASTM D4161 Standard Specification for "Fibreglass" (Glass-Fibre Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals.

Product Description

Materials:

- Only approved polyester resin systems for which documented performance is available 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 in no way be detrimental to the performance of the product nor shall they impair visual inspection of the finished product.
- Elastomeric sealing rings must be supplied by recognised, acceptable, quality manufacturers. The elastomeric compound used must be approved for use in potable water systems.

Manufacture and Construction

- The pipes shall be supplied in accordance with the diameters and tolerances specified in "Dimensions". They shall be manufactured by a controlled, reproduction process using the materials described in the PGRP 3.1 to result in corrosion resistant, 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 and spigot 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 shall be Grade B mild steel. Couplings shall be GRP collars or VI couplings or a

combination 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 the longitudinal 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 minimum single point thickness shall not be less than 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 a wye or tee shall be 2 degrees. The tolerance on the laying length of a fitting shall be 50 mm.

Product

Pipes shall be supplied to the minimum initial specific stiffness of SN 5000. Pressure class shall be PN 25.

Qualification Testing

The physical properties and characteristics of the pipes shall be determined by prototype testing 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 may be 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 relative pipe 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. The actual 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 dimensions given 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 this specification. 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 in effect 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, the pipes 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 A WW A C950. The pressure class of pipes will be that specified. Any pipes failing to 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 A WW A C950 and ASTM D3517 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 following pipes. If they both pass and the average of all three sets also passes, then the entire lot is considered acceptable.

Barcol hardness tests will be conducted in accordance with ASTM D2583. Pipes failing to reach 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 in accordance 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, in addition 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 Class and Stiffness Class.
- Details of joints.
- Hydrostatic testing plan.
- Exceptions
- Details for nesting and packaging of pipe together with methods for de-nesting and unpacking of pipes
- Instruction for the storage and handling of pipes and couplings
- Installation Instructions including inter-alia bedding requirements, backfilling procedures and proposals for measuring initial diametrical deflections.

526 TRENCH EXCAVATION AND EARTHWORKS FOR THERMOPLASTIC PIPES

This clause for excavation shall apply except for thrust boring as specified in Clause 528 below.

(i) All trench excavation will as a minimum precaution be taped off to alert members of the public to its existence.

(ii) 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.

(iii) 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 sufficient width to give an equal clearance on both sides of the barrel of the pipe or pipes such that 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 the outside diameter or the pipe plus 30 cm whichever is greater. For pipes bedded in concrete sections, the breadth of concrete bedding for the pipes will be 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.

(iv) 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.

(v) 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 for 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 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 of the excavation. Grooves about 5 cm deep shall be cut across the trench in the lower bedding at the required positions to enable the easy removal of pipe slings.

(vi) 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 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.

(vii) 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.

(viii) 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 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 expects to request such inspections.

(ix) 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 be made upon the volume excavated below the road formation.

(x) 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 of excavation will be per number or per cubic metre of excavated material calculated to the exact outer dimensions and depths of the Permanent Works. In neither case will allowance will be made for bulking.

(xi) 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 or room for timbering or sheeting required, dealing with water, maintenance of the trench, and all labour, tools, materials, plants, supervision, overheads and profit.

(xii) 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 invert with Class 15 concrete or other materials as directed by the Engineer's Representative and removing to a spoil dump all "rock" excavated.

(xiii) 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 of rock 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.

527 PIPE LAYING FOR THERMOPLASTIC PIPES

Individual Pipes not supplied in Coils

(a) Pipes shall only be laid in the presence of the Engineer's representative unless written authority from the Engineer has been granted.

(b) 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.

(c) 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 in the 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 being separately boned between sight rails. The pipes shall be thoroughly brushed inside insofar 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 diameter and not merely covered in polythene sheet tied around the end.

(d) Trenches shall be bottomed up only immediately in advance of pipe laying, although at 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.

(e) 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 10 cm and then re-compacted to at least 90% MPD and then the surface loosened on the day of and prior to laying

(f) 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 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's Representative's approval.

(g) 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 any of 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 is dissatisfied with the degree of care being taken, the Contractor shall provide and use torque-wrenches for this purpose at no extra cost.

(h) Mechanical joints shall be made in accordance with the manufacture's instructions. After successful testing of pipelines, the joints will receive external protection as specified or to the Engineer's Representative's approval.

(i) The threads of any screw connections shall be coated with red lead before the joint is made.

(j) 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.

(k) 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 by the 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 be extended under the areas concerned and Tenderers shall have been deemed to have made allowance in their rates for compliance with this requirement.

(l) 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.

(m) 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.

(n) 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 not be allowed except with the special consent of the Engineer's Representative).

(o) 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 the bottom row shall be staked to prevent any rolling. The whole arrangement shall be subject to the approval of the Engineer's Representative.

(p) Care should be taken to minimise the risk of bush fires damaging any pipes laid out along the line of the mains.

(q) Refilling of pipe trenches shall conform to the specifications provided in Clause 528.

(r) The requirements for making good subsidence after refilling are provided for in Clause 529.

(s) Reinstatement of surfaces shall conform to the specifications provided for in Clause 530

(t) For Thermoplastic Pipes Laid in Trenches:

(i) 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 528 Tenderers shall allow for the price of such trenching and importation of necessary backfill material and compaction as part of the pipe installation price.

(ii) For all bedding classes, compaction shall be 90% MPD minimum.

(iii) 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

a. 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.

b. 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 straight and 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.

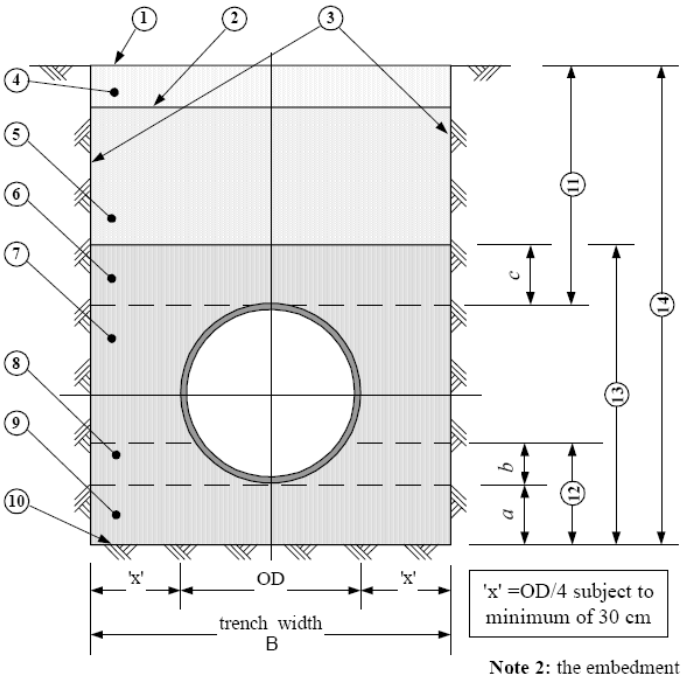
c. Electrofusion Control Units for HDPE Pipes

The Contractor shall provide electrofusion control units as recommended by the HDPE pipe manufacturer and confirming to EN 60335, EN 5008, EN 55014 and EN 61000. The workmanship shall be in accordance to the manufacturer's recommended procedure and quality.

528 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 rule trench width shall be not less than 1 ½ times the OD of the pipe but subject to the following figure and tables.

Typical Trench for Thermoplastic 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 (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

Lesser trench widths may only be authorised if the Contractor can prove to the satisfaction of 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.

Minimum Trench Width

Pipe Size DN	Trench Width
General	OD + minimum 600 mm
≤ 125 mm	D + 450
150 – 300	D + 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 a particular area is higher than anticipated at the time of design, cover shall be increased to a 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 depth range 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 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

(i) The placing and compaction of pipe embedment shall only be undertaken in the presence of the Engineer's representative unless written authority from the Engineer has been granted.

(ii) 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 to proceed with the Work obtained.

(iii) 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 embedment drawing 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 Representative before excavation commences. Any delays as a result of not seeking this approval in good time shall be entirely to the Contractor's account.

(iv) Where the 'as-dug' trench material contains material which meets the bedding class requirements as specified and providing that this is carefully screened to the sizes indicated above, and segregated from material that does not, the Contractor may, at his discretion, use it as such or incorporate such material into the imported embedment material being used.

(v) 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.

(vi) The upper bedding shall be introduced as carefully and thoroughly as practicable to the underside or haunch of the pipe such that no large spaces remain before it is compacted.

(vii) 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 to the approval of the Engineer's Representative and soil shall be replaced and well rammed down by hand for a depth of not less than 60 cm to give sufficient cover to the 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 be free from clay lumps, boulders and rock fragments greater than 50 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's Representative.

(viii) 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 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 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.

(ix) Before commencing the placing of embedment in the trenches, the Contractor shall obtain approval from the Engineer's Representative as to the methods he proposes to use and he shall demonstrate by means of tests that the specified compaction can be achieved (according to BS 1377 and ISO 22476 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.

(x) 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 leaking joints 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.

(xi) 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 the slab must extend at least 150 mm out beyond either side of the trench.

529 MAKING GOOD SUBSIDENCE AFTER REFILLING

Should any but very localised subsidence occur of the pipe trench after refilling and before the 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.

530 REINSTATEMENT OF SURFACES

(i) 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 restored by him in the first instance and permanently reinstated in the second instance when the ground has consolidated fully. Separate payment for reinstatement shall be made only for surfaced roads (e.g. tarmac, concrete, paving bricks or similar material), 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.

(ii) The Contractor shall be responsible for the temporary reinstatement and permanent reinstatement 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 to ensure 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.

(iii) 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 shall be 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 sunk or become rough.

(iv) 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 used in the original Work to the entire satisfaction of the Engineer's Representative and/or responsible Authority.

(v) 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 the grass fails to grow or is destroyed.

(vi) 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 trench shall be flush with the surrounding ground.

(vii) 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/or the responsible Authority and the cost thereof shall be borne by the Contractor.

(viii) 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 the Contractor's expense.

PART III - ALL PIPELINES DURING DELIVERY, INSTALLATION, TESTING AND COMMISSIONING

531 ON-SITE INSPECTION

All pipes, valves and fittings shall be inspected upon arrival at the pipe storage areas for damage 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.

532 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.

533 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 the pipe network, and branches, unless otherwise indicated in the Bills of Quantities

534 WORKING WIDTH

Where pipelines are within 20 metres of a motorable track, or through light bush or thicket a 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 upon this width except that the Engineer reserves the right to restrict this width due to the presence of obstructions, roads, houses and the like. Payments will then be according to the actual area cleared. No claims for additional space nor for inconvenience and the like caused by obstructions, will be allowed.

535 LOCATION OF UNDERGROUND SERVICES ETC.

It shall be the Contractors obligation when trenching, to locate and avoid the damaging of any existing services, be they water, drainage, sewage, electricity or telephone. Notwithstanding this obligation and should damage occur, it will be the Contractor's further obligation 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 satisfaction of the utility concerned.

536 CONCRETE PROTECTION

Unless otherwise provided in the Special Specification or Bills of Quantities or directed by the Engineer, a concrete surround of not less than 0.15 m shall be provided to water mains in the following circumstances:-

(a) Water mains with less than 0.6 m or more than 6.0 m of soil cover over the pipes.

(b) Water mains under carriageways if depth of soil cover is less than 1.30 m

(c) 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 granular material 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.

537 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 from Class 20 concrete to the dimensions indicated on Drawings unless otherwise directed by the Engineer. Support blocks shall be constructed from Class 15 concrete and allowed to cure for 7 days. Soil around anchor blocks shall then be compacted thoroughly before the hydraulic 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 other operations 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 be cast 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 curved to the outside diameter of the fitting and fitted with a protective rubber insert. Immediately after re-commissioning, the space between the thrust wall and the propped fitting shall be filled with class 20 concrete, thereby permanently encapsulating the steel joist. The proposed tie-in works

described in Clause 548 will therefore be preceded by the required anchor/thrust block casting.

538 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 and washouts, 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 spacing along the pipelines installed in open country or as directed by the Engineer. Marker posts shall be painted with at least two coats of all weather plastic emulsion paint of approved colour.

539 ADDITIONAL PROTECTION TO FLEXIBLE COUPLINGS AND FLANGE ADAPTORS IN 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 then shall 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..

540 PROTECTION TO FLEXIBLE COUPLINGS AND FLANGED ADAPTORS FITTED TO EPOXY COATED PIPE SPIGOTS.

Where factory coated flexible couplings have been used on pipes whose exposed surfaces beyond other protection materials have been factory protected using epoxy, then such 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 least 50 cm. This outer wrap shall be double strapped using a non-metallic strap to each pipe end beyond and not to the epoxy coating.

541 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.

542 IN-SITU WELDING OF STEEL FITTINGS AND FLANGES

Wherever it is necessary to undertake in-situ welding of steel fittings and flanges the work shall be undertaken under cover, temporary or otherwise. Outside of buildings, the cost of providing 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-situ welding works.

All testing and retesting will be deemed to be covered in the Contractors rates.

543 PIPE SUPPORTS

Pipe supports shall meet the requirements of SSRN 406.

544 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 alone shall 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 300 microns 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. 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 316 L).
- The rubber lining shall eliminate metal to metal contact or metal to plastic contact and 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 to pipe irregularities and ovality.
- Double band or wide bodies to allow large surface area contact with the pipe body for 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 meet the requirements of this clause in full without any price adjustment to his offer if his Tender is to be considered for possible award.

545 HYDROSTATIC TESTING OF PIPELINES

After laying, new pipelines shall be tested under pressure and where in trench, such tests shall 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 exceed 1 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 at each 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 to the 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 value may 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/cm2 with a pause of one minute between each increment to the specified test pressure for the section. Unless otherwise 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 rated nominal pressure (PN) 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 testing and 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, and specials, 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.

546 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, and where appropriate for cleaning shall be inclusive for, sampling, testing and inclusive of the reports on the bacteriological quality of water.

547 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. Where HDD is not feasible (due to the presence of rock or boulders) the Contractor may be permitted to open cut and employ approved traffic diversion at the discretion of the relevant road or railroad authority. 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:

A. <u>Design Guidelines</u>

Prior to submitting an application for a Right-of-Way Permit to the relevant authority responsible for roads or rail that will involve horizontal directional drilling (HDD), the Contractor shall ensure that the following decision process and tasks are completed and approved by the Engineer:

(i) 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.

(ii) Collect existing underground utility information
- including the horizontal location of all known substructures (expected).
- and including the depth of all known substructures (whenever possible).

(iii) Obtain Right-of-Way information from the relevant authority responsible for roads or rail.

(iv) Obtain general and/or specific geotechnical information as required or deemed necessary
- including soil data for the project area.
- and possibly including site-specific geotechnical sampling and analysis to confirm the soil data.

(v) 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 (as required).

In addition to the design requirements listed above, the Contractor shall take into consideration the following:

(vi) the minimum horizontal and vertical clearance requirements when determining the HDD alignment
- including road setbacks and existing surface features,
- and including exiting underground utilities and other underground facilities;

(vii) pipe sizes to be installed and their corresponding reamer diameter requirements;

Pipe Diameter	Reamer Diameter
< 200mm	Diameter + 100
200 – 600mm	Diameter + 150
> 600mm	Diameter + 300

(viii) 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 1 cm pipe diameter, with 200m to 330 m radius minimums depending on subsurface materials and equipment requirements);

(ix) drilling equipment requirements for the given geotechnical conditions, geometry and final product diameter
- including thrust and pullback ratings
- including mud motors vs jetting heads and
- including wire line vs walkover tracking systems;

(x) equipment and material handling requirements
- including drilling fluid and drilling fluid containment
- and including drill operation and final product staging.

(xi) material strengths, capacities, and coupling methods.

B. Right-of-Way Permit Application Requirements

The Contractor shall submit the following information with the application:

(i) Provide proposed HDD Location Information
- Pipe diameters, type, pressures etc.,
- Locations, length and depths, covers, clearances.

(ii) 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

(iii) Provide specific installation requirements or typical installation parameters indicating the design bending radii and diameter(s).

(iv) Provide assumed subsurface geotechnical conditions based on local knowledge or based on specific site soil tests.

(v) Provide a Traffic Control Plan

(vi) Provide a Storm Water Pollution Prevention Plan

(vii) Provide a Construction Schedule indicating the proposed start date(s), completion date(s), and restoration schedule.

C. Construction Safety Guidelines

Prior to performing work involving HDD under a Right-of-Way Permit, the Contractor shall consider the following safety guidelines and shall obtain approval of the Engineer:

a) Perform all operations in compliance with safety guidelines and ensure that all personnel are properly trained and equipped to work in the public right-of-way;

b) Ensure that the approved traffic control plan (required with the permit application) is implemented and followed at all times;

c) Ensure that all storm water pollution prevention measures (required with the permit application) are implemented and followed at all times;

d) Ensure all setbacks, offsets, and clearances are maintained;

e) Ensure that **the relevant authority responsible for roads or rail** or other utility coordination requirements have been met;

f) Positively identify from records or by potholing all crossed utilities that are expected 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;

g) Positively identify from record or by potholing all parallel utilities at the beginning 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.

h) The HDD Contractor shall have a planned response in the event of a utility strike 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.

D. Drilling Fluid Containment and Disposal Requirements

The HDD Contractor shall contain, handle, and dispose of drilling fluids in accordance with the following requirements:

a) All drilling fluid and fluid additives shall be disclosed to the Engineer.

b) Excess drilling fluid shall be confined in a containment pit at the entry and exit locations until recycled or removed from the site.

c) 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.

d) Unintended surfacing of drilling fluid shall be contained at the point of discharge and recycled or removed from the site.

e) Drilling fluids that are not recycled and reused shall be removed from the site and disposed at an approved disposal site.

f) Drilling fluids shall be completely removed from the construction site prior to back filling or restoring the site.

g) Collection, transportation, and disposal of drilling fluids shall be environmentally safe and comply with local ordinances and government regulations.

E. Construction Requirements

All construction work shall be performed in accordance to the following unless stated otherwise by **the relevant authority responsible for roads or rail**, and as outlined below. For all work involving horizontal directional drilling under a Right-of-Way Permit, the Contractor shall perform the following:

Prior to Construction:

a) The HDD Contractor shall familiarize itself with the work area and the technical requirements of the plans;

b) The Contractor shall establish construction marking/staking, prior to construction, to indicate

- HDD entry and exit locations, and
- proposed HDD alignment at 10m (max) intervals;

c) Provide the Engineer with a contact list of all crew foremen.

During Construction:

a) The HDD Contractor shall calibrate its tracking and locating equipment at the beginning of each work day;

b) 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;

c) The HDD Contractor shall complete the HDD installation as designed and permitted both horizontally and vertically unless otherwise authorized by the Engineer;

d) The HDD Contractor shall attempt to maintain drilling fluid circulation throughout the HDD process;

- during the initial pilot hole installation, and
- during the reaming and back pull process(es)

e) The HDD Contractor shall not expand the bore hole by more than 150mm using only compaction reamer(s);

f) 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;

g) 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;

h) The HDD Contractor shall inspect the work and surrounding area to insure that no construction-related damage has occurred
   - including heaving or humping of paved surfaces, and
   - including drilling fluid fractures or releases.

i) At all times the Contractor shall provide access to the Engineer's representative for inspection of the HDD operations;

Following Construction:

a) The Contractor shall notify the Engineer as appropriate upon completion of the authorized work;

b) 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;

c) The Contractor shall insure that all cleanup and restoration is in compliance with the requirements for restoration, reinstatement and cleaning up;

d) The Contractor's 1 year maintenance period will not begin until any corrective actions required have been completed and inspected to the Engineer's satisfaction.

F. 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 with construction activities. The following seven main objectives shall be applied for all Storm Water Pollution Prevention planning:

a) ensure that sediment controls are in place prior to disturbance.

b) Maintain sediment controls throughout the construction and restoration processes.

c) Minimize the overall disturbance whenever possible.

d) Protect disturbed areas throughout the construction process.

e) Prevent storm water runoff from entering disturbed areas.

f) Never intentionally discharge construction contaminants directly into creeks, rivers, ditches, or storm systems.

g) Complete permanent restoration as soon as possible.

In addition to those overall goals stated previously, the contractor shall, at a minimum, implement the following specific Best Management Practices:

h) 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 stabilization are to follow;

- Cover spoil piles with a tarp or contain with a sediment barrier.

i) 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.

j) 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.

G. 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 supporting documents within 60 days of project completion. As Built plans are preferred in AutoCAD format but may be submitted in paper form. HDD construction records and As Built plans shall include the following:

a) 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;

b) 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.

548 TIE-IN WORKS BETWEEN EXISTING AND NEW PIPELINES

a) 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 perform described under (g) below. The Engineer's instruction to perform the tie in will be given at least 14 days before the date on which the tie in is to be executed.

b) 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 the necessary guarding to ensure that such fittings do not get misplaced or stolen. The Contractor shall, check the suitability of such fittings including checking of all dimensions, particularly the external diameter of the pipe into which the connection is being made and the internal diameter(s) of couplings which are to be used for such connection. This shall be done by measuring diameter at 4 positions to a tolerance of 0.25 mm. The Contractor shall certify the suitability of such materials to Engineer not less than 48 hours before the commencement of tie-in operations.

The Contractor shall prepare a schedule of fittings including those on existing pipes that are to be used for such tie-in or redeployed elsewhere as instructed on the drawings and shall obtain approval of the Engineer not less than 48 hours before the commencement of tie in operations of such schedule.

The Contractor shall ensure that all materials are at the site of the works not less than 24 hours before the commencement of the tie-in operation and shall inform the Engineer who shall check the materials against the schedule as approved where he deems this necessary

Any non standard fittings which are required for the execution of the tie-in works shall be fabricated under the Engineer's supervision and shall be hydro statically tested to at least one and a half times the maximum working pressure.

c) Personnel

The Contractor shall ensure that at least one senior member of his field supervisory staff who has proven experience of such operations and fluent in English 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 operation of all his plant are on site for the whole duration of the tie-in operation.

The Contractor shall furnish the Engineer's Representative a list of the key personnel to be involved in the tie in exercise at least 48 hours before the commencement of the exercise and shall get the Engineer's approval at least 24 hours before the commencement in respect of such personnel. To gain this approval the Engineer may require that operative is tested in the performance of his duties in the operation of the plant for which he is in attendance.

In particular this requirement shall apply to all welders, pipe cutters using either mechanical or flame cutting equipment and lifting plant operators.

The Contractor shall ensure that an adequate number of labourers are in attendance upon the site during the period of the tie in operation.

d) Pre Tie-in Works

The Contractor shall execute all works possible before the commencement of the operations which shall include:-

- Excavation and supports to the excavation.
- Blinding with concrete the bottom of the excavation and (where instructed by the Engineer) immediate working areas.
- Provision of any required drains a sump of adequate size from which any accumulating 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 commencement of the tie-in operation or within a period that may be otherwise set by the Engineer upon issue of the Engineer's instruction to perform the tie-in works, and obtain the Engineer's approval not less than 24 hours before commencement of the tie-in operations.

e) Plant

The Contractor shall prepare a schedule of the plant which he proposes to have on site either to use, or on standby, or for emergency use and shall obtain the approval of the Engineer not less than 48 hours before the commencement of the tie-in operations.

Such Plant shall include:

- 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 who shall check the plant against the schedule as approved where he deems this necessary.

f) Actual Tie-in Works

The Contractor shall prepare a programme giving details of the proposed scheduling and sequencing of tie-in works necessary for minimising the interruption to the existing water supply. Approval of such programme by the Engineer shall be obtained not less than 72 hours before commencement of the tie-in operation.

The Contractor, unless relieved of the responsibility by the Client or the Engineer, shall first empty the section of the main on which the tie-in is to be

made and shall ensure that the nearest air valves and washouts immediately upstream and downstream are all open and the washout dry.

Where the Contractor is relieved of this operation, which shall be notified to him by the Engineer not less than 96 hours before the tie-in operation is due to commence, he shall check that air-valves and washouts mentioned above are in the state described.

When the Engineer is also satisfied that the main is empty of water he shall verbally give the order to commence the works from which time the Contractor shall be solely responsible for the execution and completion of the tie-in works unless relieved of such responsibility by the Engineer.

In event that the Engineer directs that the required tie-in works be carried out during the night for purposes of minimising the effect of such tie-in on the respective consumers/authority, the Contractor shall make all required preparation for provision of lighting (including standby and emergency) and any other measures as the Engineer may direct.

The Contractor shall provide all the insurance normally required by the Engineer and the operating F.I.D.I.C. Condition of Contract and shall obtain an endorsement if necessary to ensure that the insurances remain valid in the event that the Engineer takes over the direction of the works.

When the Engineer is satisfied that the tie-in works are completed he shall give notice for the main to be re- commissioned, when this has been satisfactorily accomplished the Contractor shall re-deploy his staff on the Engineer's verbal instructions of completion of the tie-in.

g) Post tie-in Works

Within 48 hours of the completion of the tie-in works the Contractor shall have completed all permanent works required to support the plant installed during the tie in operation, and shall remove all temporary supports within a further 48 hours after the permanent support works have been approved by the Engineer. The temporary supports shall not be removed before such approval has been given.

Within 14 days from the date of the completion of the tie-in the Contractor shall have completed all the other permanent works required to allow operation of the plant installed during the tie-in operation, or other plant for which the tie- in executed, and shall obtain the approval of the Engineer on the completion of such works.

The Engineer shall issue the Contractor with a notice stating the operations for which the plant installed during the tie-in operation may be used, which shall remain in force for a period extending for 28 days from the date of approval of the completion of the Post tie-in works as described above.

Before the expiry of the 28 day period described above the Contractor shall obtain the approval of the Engineer for the completed works when the Engineer shall issue a notice allowing full operation of the plant on the expiry of the above mentioned period upon which the Contractors responsibility for the works, unless requested otherwise shall cease.

h) 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	..... 48 hours
Schedule of those needed submission	.....
approval	..... 48 hours
Arrival on Site	..... 24 hours
Checked on Site by the Engineer	.....
3) Works Programme of Execution submission	.....
approval	..... 72 hours
Schedule of plant submission	.....
approval	..... 48 hours
Plant arrival on site	..... 24 hours
checked on site by engineer	.....
Artisans approved by engineer	..... 24 hours
testing of by engineer	.....
4) Notice of Responsibility for Drawing Mains	..... 96 hours
5) Pre-tie in Works completion of	..... 96 hours
inspection by engineer	..... 24 hours
6) Engineer's Verbal Instruction to Commence when Main is Dry	
7) Engineer's Verbal Instruction to 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 execution of that item so as not to cause any other item to be delayed.

PART IV – VALVES, METERS, FITTINGS AND OTHER RELATED ITEMS

549 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 bills of 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 bounded 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 where otherwise specified on drawings or in bills of quantities. All valves shall close when the stem rotation is in a clockwise direction unless otherwise specified.

550 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 epoxy coating shall be not less than 150 microns thickness. The gate shall be completely rubber encapsulated, the gate valve being of pocketless type with a straight through port. Gate valves shall be capable of sustaining a maximum permissible working pressure of 16 bar except 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 of quantities.

Unless otherwise specified the face to face dimensions of gate valves with integral flanged ends 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 such seals. Seals shall be capable of being replaced with the valve under pressure and in the fully 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 plastic with high gliding features shall be provided in the body, optimally placed to guarantee low wear 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 encapsulated with 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.

551 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 working pressure 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 of EPDM 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 ease of 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.

Butterfly valves with a by-pass pipe and a gate valve shall have a flow-optimised, double-eccentric disc. The proof sealing shall be easily adjustable and changed. The shaft bearings shall run in maintenance-free bush bearings. The shaft shall be sealed through O-rings inside and outside. The butterfly valves shall be enamelled inside for permanent protection against corrosion. The bearing sleeves shall be made of bronze while the driving shaft shall be made of stainless steel. The butterfly valve shall be hand-operated a with a ball knob and hand-wheel, unless an actuator is specified. Unless otherwise indicated, these special butterfly valves shall comply to all the relevant standards as indicated in the preceding paragraphs

552 HANDWHEELS AND VALVE CAPS AND VALVES

Where handwheels are specified, they shall have cast into them the 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.

553 VALVE KEYS

These shall be of mild steel with ends to suit either valves to SSRN 501, valves to SSRN 506 or valves to SSRN 511 fitted with valve caps, dimensioned to the appropriate Tender Drawing.

554 NON-RETURN VALVES

These shall have bodies made from bronze for DN not greater than 40 mm and they shall be 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 shall be fully to the account of the Contractor.

555 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) designed to meet the following requirements.

Bids which apparently contain non-compliant offers will be required to confirm that they will meet these specifications in their totality at the rates quoted in their offer.

The required valves shall provide all of the functions described below.

i. *Pipeline filling*

   Uninterrupted high volume air discharge through the large orifice.

ii. *Pipeline draining or Column Separation*

   Uninterrupted high volume air intake through the large orifice.

iii. *Pipeline full and operating*

   Discharge of disentrained pressurised air through the small orifice.

iv. *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 with solid cylindrical High Density Polyethylene control floats. These shall be housed in a tubular stainless steel or corrosion protected body with epoxy powder coated cast iron, or s/steel ends secured by means of stainless steel tie rods.

The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent rejoining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable.

Large orifice sealing shall be effect by the flat face of the control float seating against a nitrile rubber 'Ó' Ring housed in a dovetail groove circumferentially surrounding the large orifice. Discharge of pressurised air shall be controlled by the seating and unseating of a small orifice on a natural rubber seal affixed to the control float.

The intake/discharge area shall be equal to the nominal size of the valve i.e. a 150 mm valve shall have a 150 mm intake/discharge orifice.

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. This feature shall consist of easily replaceable components such as gaskets, seals or the like.

The air valve shall be provided with a separate isolating gate valve or if so specified with a separate isolating butterfly valve.

Unless otherwise specified all air valves shall be provided with an integral flanged inlet with studs appropriate to SSRN 207 NP 10 or as the installation demands and complying with 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 than 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.

556 SURFACE BOXES

These shall be made of HDPE from an approved manufacturer with the dimensions and cover weight according to DIN 4056. They shall be lightweight, easy to handle and maintenance-free. It shall be resistant against high impact forces at low temperatures and offer sufficient heat resistance for safe installation in hot rolled tarmac.

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.

557 VALVE CHAMBERS

New chambers shall be constructed in accordance with the drawings, and where indicated shall incorporate thrust walls.

Rehabilitated chambers shall be constructed or rebuilt or repaired in accordance with the original 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 shall be of a size sufficient to allow for the removal and replacement of the valve without disassembly.

558 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 lifting keys. 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.

Where indicated, valve chamber manhole covers shall be made of heavy duty fibreglass reinforced compound material which is non-corrosive and has no scrap value. The cover shall conform to load capacity as per BS EN-124 (Group 4 – Class D400). These shall either be round or square manhole covers as indicated in the drawings. Covers must be lockable and a single worker shall be able to comfortably open and close the cover without any risk of injury.

It will be the Contractor's responsibility to ensure that all the covers he provides are of an appropriate clear opening size.

559 RESERVOIR INLET VALVES

All reservoir inlet float operated valves shall be of one of the following types as specified:

(a) 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 act from 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 be provided 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.

(b) 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 in the upstream pipeline as a result of the closing mechanism deployed. They should further be simple to service without the need for special tools or lifting equipment.

In either case, the valves shall be of approved manufacture.

560 TWO-POINT TIME-MODULATED PRESSURE REDUCING VALVES

To facilitate pressure management, the tender may call for shall supply and installation of two-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.

561 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 complete 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.

562 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 data logger
- 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 test certificates 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 flow for other sizes:

Nominal Diameter mm	**50**	**80**	**100**	**150**	**200**	**250**	**300**
Maximum flowrate Qmax , m³/h	30	80	120	300	500	800	1200
Nominal flowrate Qn, m³/h	15	40	60	150	250	400	600
Minimum flowrate Qmin ,m³/h	0.45	1.2	1.8	4.5	7.5	12	18
Transitional flowrate Qt , m³/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 body shall 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 revolve in 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 through 360° 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)
100mm150 - 300mm	0.010.1	1,000,0001,000,000,000

The meter shall be fitted with an uni-directional pulsar suitable to interface with data logger products (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 shall be 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 be supported 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 PN 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 to conform 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 shall be 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 and the 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 body casing 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 consist of 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 in raised 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 a mixture 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 with the 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 be constructed 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 for seal 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 complete 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.

563 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/EEC.

The domestic water meters shall be approved rotary piston 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, Semi-positive rotary (grooved) piston volumetric type, calibrated in cubic metres;
- 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 consist of 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 suitable 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 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 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	l/h	22.5	37.5	52.5	150

flowrate.....Qt					

Meteorological Classes

The meters performance specification shall be to ISO 4064/1 or BS 5728/1 Part 1, Class 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 15m³/h	Qn=15 m³/h or more
Class C Value of: Qmin Value of: Qt	 0.01 Qn 0.015 Qn	 0.006 Qn 0.015 Qn

The meters must be able to retain their accuracy when installed in either horizontal, vertical or inclined planes.

Tenderer shall provide certificate of the meteorological class of the meters offered.

Sizes

For each meter size designated the corresponding fixed set of dimensions must correspond to SSRN 510 (BS 5728/1, ISO 4064/1) 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.

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 (BS 5728/1, ISO 4064/1).

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 water meter shall be food grade, non-toxic and non-tainting as 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 two parts which are screwed together and a watertight seal between the two. The meter body casing must be made from materials with a life expectancy under normal use in excess of 20 years.

The water meter shall be made with materials appropriate to each specific use. The body of domestic meters (DN15 - DN25) shall be manufactured from copper alloy or polymer. For water meters designed for domestic use (DN15 – DN 20mm), single jet water meters 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 of water 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 red for 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 than 5 mm. The advance of a digital unit shall be completed while the next lower valued digit is within 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 m^3 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 thickness to prevent hot wire needle tamper. Any fraud or fraud attempts be indicated and easily detected when reading the water mete The

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 mineral glass lens. Black numbers on white shall denote cubic metres and white numbers on red shall 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 (m^3)	Maximum Registration Before Self Re-Set (m^3)
hm20mm to 40mm	0.0010.001	10,000100,000

Protection

A suitable in-built strainer (0.75 mm aperture and 2,844 mm^2 mesh area) shall protect the measuring 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
- 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 impressed by 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

Each meter shall be fitted in a plastic 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 to all fittings in the

meter box are to be fusion welded to prevent leaks. The plastic shall be modified polypropylene 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 box must incorporate a lock mechanism, built into the lid.

Packing

Packing shall be made of strong wooden crates, and inside such crate, each meter shall be packed in its own carton box.

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 defect may 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 to resist vandalism will be preferred.

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 separate part with his tender.

CHAPTER 6

MISCELLANEOUS ITEMS

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CHAPTER 6 - MISCELLANEOUS ITEMS

601 TESTING OF WATER-RETAINING STRUCTURES

Water retaining structures shall be tested for the water tightness at appropriate stages or on completion. They shall be filled with water in stages and held at each water level for such lengths of time as required by the Engineer. Should leakage occur at any stage, the water shall be drawn off and the defects remedied. The procedure shall be continued and finally the structure shall be allowed to remain full for 7 days. At the expiration of this period, the level of the surface of the water shall be recorded and further measurements made at intervals of 24-hours for 7 days. The structure shall be deemed to be watertight if the total drop in surface level does not exceed 10 mm in 7 days. For open structures, additional allowance shall be made for evaporation. If the structure does not satisfy the condition of the test and the daily drop in water level is decreasing, the period of test may be extended for a further 7 days, and if the specified limit is then reached, the structure may be considered as satisfactory.

The Contractor shall provide a hook gauge to measure variations in water level during the tests.

The testing shall be carried out before the excavations are backfilled and embankments placed.

The Contractor shall be solely responsible for the water tightness of the structure and any remedial measures necessary.

602 CLEANING AND STERILIZING OF WATER-RETAINING STRUCTURES

The inside of all water-retaining structures and all interior pipework and fittings, shall be thoroughly cleaned and washed to remove all contamination and the water from these operations removed by squeezing and drained away.

The inside of water-retaining structures shall be filled to overflow level with water containing 50 parts per million of chlorine and left for at least 24-hours. They shall then be drained and refilled with clean water from which samples and analyses shall be taken as instructed by the Engineer. If the results of the analyses are unsatisfactory, the sterilizing process and refilling and sampling shall be repeated until the results of the test are satisfactory.

The provision of all necessary water, labour and materials for carrying out the foregoing operations, shall be included in the Contractor's rates and prices. The cost of sampling, testing and the reports on the bacteriological quality of the water will be borne by the Employer, provided the results of the tests are satisfactory, otherwise the cost of such sampling, testing and reporting shall be borne by the Contractor.

603 STRUCTURAL STEEL

All structural steel work shall be of mild steel confirming to SSRN 905. All sections shall be at least equivalent to those shown in SSRN 913.

Ends of beams and joints, etc. shall be cut to exact lengths true and square and shall be cleaned of burrs or rough edges. Drilled or punched holes shall not be greater than 1.5875 mm more than the bolt diameter and they shall be cleaned of burrs and rough edges. Punching of holes shall be allowed for plates thinner than 8 mm.

Prices for all mild steel shall include for removing all rust and mild scale and applying one coat of red lead or other approved priming paint to all surfaces before vising. Following erection, all structural steel not galvanised shall receive three coats of lead-free paint and be finished in an approved colour.

604 BOLTS, NUTS AND WASHERS

Bolts, nuts and washers shall conform to SSRN 914 threaded to SSRN 923. Washers shall be to SSRN 925 except that the outside diameter shall be at least 2.5 x the bolt diameter. Tapered washers shall be supplied where required.

Where specifically called for, nuts, bolts and washers shall be electroplated. For below ground environments including chambers, the electroplating shall be to SSRN 922. Elsewhere it shall be to SSRN 921.

605 HOT DIP GALVANIZING

All hot dip galvanizing shall conform to SSRN 903.

606 HANDRAIL

Handrailing shall be designed and manufactured in accordance with SSRN 848. It shall consist of 38 mm diameter galvanised steel sections of tubing to SSRN 203, screwed at each end. The sections shall be joined by 38 mm diameter galvanised steel equal crosses, equal tees or short radius 900 bends where appropriate, such that the top rail shall be 1 metre and the lower rail 0.5 metre above the concrete slab, and the spacing between standards shall be 2 metres maximum. A 38 mm diameter galvanised steel flange shall be screwed to the base of each standard and drilled for four 20 mm diameter, 100 mm long mild steel rag bolts which shall be cast into the R.C. slab.

All handrailing components shall be galvanised after cutting, screwing and drilling and shall be supplied complete with all bolts, nuts, washers and other fixings necessary to complete the installation

607 STEP IRONS

All step irons shall conform to SSRN 845 - General Purpose Pattern. The weight of each step iron shall be at least 2.15 kg.

608 CHEQUERED PLATE FLOORING

Chequered plate flooring shall be of mild steel and manufactured with diamond chequering or other non-slip pattern. The plates shall be of sufficient thickness not to bend or spring in ordinary usage and shall be fitted evenly and truly into steel angle frames or curbing with suitable attachments for building into concrete flooring.

609 FENCING

The fencing shall be as detailed on the Drawings, and in general shall follow the recommendations set out in SSRN 849, unless otherwise indicated.

Straining posts shall be 100 mm x 100 mm x 3 m long of reinforced concrete, and struts shall be 100 mm x 100 mm x 2.6 m long of reinforced concrete.

Straining posts to be provided at all ends, corners and changes of direction or acute changes of level and at intervals not exceeding 60 m in straight lengths, each shall be strutted in each line of fence.

Holes for straining posts shall be 450 mm square in plan and for struts 500 mm x 300 mm. All straining posts shall be set in foundation concrete for the full size of hole in plan and half the depth of the hole.

610 GATES

The gates shall be as detailed on the Drawings. They shall be complete with a sliding padbolt locking device and gate stops.

The gates shall be primed with calcium plumbate and painted with three coats of approved oil paint.

611 CHEMICAL WATERPROOFING OF CONCRETE

Should it become necessary or if indicated in the Bills of Quantities or directed by the Engineer, the Contractor shall apply a concrete waterproofing chemical to concrete surfaces. For surfaces in contact with potable water, such a chemical shall have been certified as suitable for use in potable water retaining structures by competent and internationally recognised authorities.

Products acceptable include waterproofing chemicals consisting 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.

612 REFURBISHED AND NEW PRESSED STEEL RESERVOIRS

Construction and Fittings

Pressed steel reservoirs shall be constructed (or reconstructed with panels of similar dimensions to existing panels) of pressed galvanised mild steel panels and in accordance with SSRN 909. They shall be externally flanged. The tanks shall be complete with all necessary stays, cleats, bolts, nuts, washers and jointing compound. Pipework and pipe connections shall be provided as shown on the Drawings.

Tanks that have a Central Division wall shall have this of similar construction to the external walls of the tanks and shall effectively divide the tank into two separate reservoirs which can be used independently.

For roof covers, weatherproof covers shall be provided. These shall be complete with all stiffeners, and supports, with pressed steel gable fillers where necessary, and with all necessary stays, cleats, bolts, nuts, washers and jointing compound. The connection between roof and walls shall be weatherproof.

Each tank, (or compartment in the case of tanks with Central Division walls) shall be equipped with an access manhole, 2 fresh air ventilators, internal and external access ladders, peripheral platform, a float indicator, a valve box with access manhole, and a float valve.

Galvanizing

For new panels galvanising shall be carried out at the manufacturers works and shall be in general conformity with SSRN 903. Re-usable existing panels shall be re-galvanised at an approved nominated subcontractor's works. Periodical inspection by the Engineer will be undertaken to confirm that the procedure followed for re-

galvanising and the final quality of re-galvanised panels is satisfactory. Where painting is required, refer to Clause 625.

Fittings

a) Access Manholes

Each tank or compartment shall have one access manhole to permit inspection of the tank internally. In addition, one manhole may be located on top of the valve box in order to permit inspection of the ball valve without entering the reservoir. Manholes shall be of appropriate size and/or the same size as existing ones (for refurbished tanks) and shall be equipped with a hinged lid, which shall be provided with a means of locking into position (with a padlock) on a thick gasket of felt or bitumen.

b) Access Ladders

External access ladders shall be mild steel galvanised and shall be provided adjacent to access manholes. External ladders shall be fitted with a safety cage and intermediate landing platform. Submerged steel & stairs within water-holding structures shall be stainless steel of grade 316L.

Ladders shall be designed and manufactured in accordance with SSRN 847. External ladders shall be of mild steel with 25 mm solid rungs at 250 mm centres. The stringers shall be 65 mm x 20 mm, 400 mm apart, turned over at top and bottom and drilled for 12 mm dia rag bolts. Stays shall be 75 mm x 10 mm, length to suit, bent to shape and drilled for 12 mm dia rag bolts, and shall be of such length that will give a minimum clearance of 200 mm behind the rungs. Finish to external ladders and stays shall be galvanised to SSRN 903 unless otherwise directed by the Engineer or shown on the Drawings. Internal ladders shall be of stainless steel grade 316L with 65mm x 10mm stainless steel flat bar rails which shall be spaced at 400mm. The wall mounted standoffs shall be 65mm x 10 mm flat bars welded to the rails at a maximum of 1500mm on centre. The standoffs shall be a minimum of 175mm and manufactured to flush fit with the wall. Rails shall be secured to the walls at standoff locations with grade 316 stainless steel 16mm anchor bolts. Slip resistant 35mm diameter ribbed rungs shall be spaced at 300mm on centres and welded to the outside of each rail.

c) Fresh Air Ventilators

Two fresh air ventilators shall be fixed to the roof of each compartment. They shall be cowled to prevent rain from entering and fully mosquito-proofed with fine meshed gauze all fixed to the satisfaction of the Engineer.

d) Float Level Indicator

Float level indicators shall be attached to the side of each compartment with vitreous enamelled scales graduated at intervals of 0.5 metres and clearly marked in indelible paint. Pointer and float shall be connected by a steel cable. Guides for the cable shall be provided to prevent snagging or fouling of cable travel.

e) Valve box

Valve boxes shall be provided to maximise the capacity of the reservoirs where float valves are to be fitted.

Testing, Sterilising and Flushing

a) Testing

After refurbishment and/or erection and before testing the Contractor shall ensure that the tank is cleaned internally and ensure that no foreign matter is present. Where applicable each compartment shall be tested by being filled with clean cold water and left for twenty four hours. Throughout the test period there shall be no visible leakage and no measurable drop in water level in the compartment. In the case of reservoirs with central division walls each compartment shall be tested separately and not concurrently.

b) Sterilising

Tanks shall be sterilised by filling them with potable water containing 50 mg/l of chlorine and permitting them to stand 4 hours when full. Thereafter the residual chlorine shall be measured. If no residual is found the process must be repeated. Chlorine shall be added to the test water in a manner approved by the Engineer.

c) Flushing

None of the water used for testing or sterilizing shall be released for consumption but all shall be discarded via the scour to drain. Tanks and pipes shall be thoroughly flushed with potable water after sterilization.

Supporting Steel Structures

Elevated reservoirs shall be supported on structural steel towers of height as indicated on the relevant drawing or in the Bills of Quantities. These towers shall be designed by the Nominated Sub-contractor and approved by the Engineer prior to fabrication. They shall be designed in accordance with SSRN 863. The design shall cater for all vertical and horizontal loads including those imposed by wind forces and seismic disturbances.

The towers shall be provided with all necessary beams, adequate cross bracing, bolts, cleats, base plates and holding down bolts. The tower shall be provided with an adequate valve operating platform one metre wide. These platforms shall be of open steel flooring with 20 mm diameter tubular handrails and angle iron handrail stands, and shall be provided with toe-boards.

The Nominated Sub-contractor shall provide two sets of properly dimensioned working drawings showing sizes of all principle tower members and maximum and minimum stanchion loads together with two sets of supporting detailed calculations for approval by the Engineer before fabrication. All damage to paintwork during the course of erection shall be repaired. The final painting of the tower etc. shall comprise two coats of suitable primer and two coats of a thixotropic, aluminium pigmented, bitumen based barrier coating paint.

Foundations

Concrete pad foundations for the towers shall be designed by the Nominated Sub-contractor and approved by the Engineer prior to erection. The nominated Sub-contractor shall provide, for approval, two sets of properly detailed calculations supporting the designs. These drawings shall also show details and position of holding down bolts.

Lightning Protection

Where present lightning protection is found inadequate or obsolete, the water tower structures are to be re-earthed so that the maximum resistance to earth is 10 ohms. At a position at the base of the tower a test clamp shall be fitted and from this test clamp a copper strip 25 mm x 3.2 mm shall be installed to the earth rod. The earth rod shall consist of a 12 mm dia. hard drawn copper rod approx. 2.5 metres long. The head of the earth rod shall be located in a concrete inspection pit, complete with cover.

Pipes and Pipework Fittings

Where required by the Engineer or shown on Drawings each tank or each compartment shall be fitted with inlet, outlet, overflow and scour pipework.

All overflow pipes shall be mosquito proofed with fine meshed gauge fitted covering the pipe opening inside the reservoir, fixed with galvanised wire tightly bound or otherwise to the satisfaction of the Engineer.

All pipes and fittings shall be flanged ductile iron or steel and shall comply with the specification for pipes and fittings contained elsewhere in this specification. Suitably designed pipework supports shall be provided in order to minimise pipeline stresses. After erection all pipework shall be painted externally with two coats of a suitable primer and two coats of a thixotropic aluminium based barrier coating paint.

615 PAINTING OF METALWORK

All work shall be carried out in accordance with SSRN 900, 908 and 917, as appropriate.

All paints shall be obtained from an approved manufacturer, and applied strictly in accordance with the manufacturer's instructions. The source of supply shall not be altered without the Engineer's approval. The colour of the paints used shall be to the Engineer's approval and where possible alternate coats shall be of different shades.

Where blast cleaning is specified prior to painting, the cleaned surfaces shall conform to First Quality finish to SSRN 933.

All preparation and painting shall be carried out under dry conditions and on completely clean and dry surfaces.

All preparation and painting at manufacturer's works shall be carried out under cover at a controlled ambient temperature in the range 15 to 21 degrees C. Site painting shall not proceed when the ambient temperature falls below 10 degrees C.

Where surfaces are joined during fabrication, they shall be brought together while the final protective coat is still wet.

After welding and fabrication, all weld areas shall be thoroughly cleaned and touched up as specified with the appropriate priming system.

Coatings and paints used for all structures, including tanks, pipes, valves, flow meters, fittings etc., which are in contact with potable water shall be non-toxic, and shall not foster microbiological growth or give rise to taste, odour, turbidity or discoloration of the water with which they are, or could be in contact.

The Engineer reserves the right to inspect all work prior to painting, and reasonable access shall be given for such inspection at any stage of the work.

616 SITE PAINTING

Equipment or plant that has to be refurbished on site shall be manually cleaned to the in compliance with SSRN 900, 908 and/or 917 as appropriate.

The protective system shall then, where possible conform to the requirements of Section 2.3 hereof. Any deviation shall be indicated in the appropriate schedule of Part 4.

617 TYPES OF PAINT PROTECTION

TYPE A (Hot Dip Galvanized)

(a) Blast clean to first quality finish to SSRN 933.

(b) Hot-dip galvanized to give a minimum coating weight of 610 g/m¨ in accordance with SSRN 903.

Finish dry film thickness shall both be less than 85 microns for metals in interiors of buildings and normally dry condition, and 140 microns for other conditions.

NOTE:

All fastenings including bolts, for use with materials having a Type A finish shall be sterilized in accordance with SSRN 934.

TYPE B (Zinc Rich 2-Pack Epoxy Primer And Heavy Duty Epoxy Coal Tar)

(a) Blast clean to First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning apply by airless spray one coat of 2-pack zinc rich epoxy primer, to a finished dry film thickness of not less than 50 microns.

(c) Apply by airless spray one coat of 2-pack zinc epoxy primer as in (b) above to a finished thickness of not less than 100 microns.

(d) Apply by airless spray two coats of high build epoxy coal tar, to a final finished dry film thickness of not less than 350 microns.

TYPE C

As type B above but with sufficient number of coats in (d) to give a final finished dry film thickness of not less than 450 microns.

TYPE D (2-Pack Zinc Rich Epoxy Paint)

(a) Blast clean to First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning apply by airless spray one coat of 2-pack zinc rich epoxy primer all as in Type B part (b) above.

(c) Apply two coats of 2-pack zinc rich epoxy high build matt finish dry film thickness of not less than 300 microns.

(d) Apply final coat of 2-pack epoxy gloss finish of approved shade to produce a total finished minimum dry film thickness of 350 microns.

Application shall be by airless spray and a minimum of 16 hours shall be allowed between coats.

TYPE E (Epoxy Paint)

(a) Blast clean to First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning, apply by airless spray one coat of high build 2-pack cold cure epoxy resin primer to give a finished dry film thickness of 125 microns.

(c) After a period of not less than 8 hours from the first coat ('b' above), a finish coat of high build pure epoxy shall be applied by airless spray to give a total dry film thickness of not less than 350 microns.

TYPE F (Epoxy Primer And Chlorinated Rubber Paint)

(a) Blast clean to First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning, apply by airless spray one coat of 2-pack zinc rich epoxy primer to give a finished dry film thickness of 50 microns.

(c) Apply 2 coats of 2-pack zinc epoxy high build to a matt finished dry film thickness of 300 microns.

(d) Apply one coat of chlorinated rubber paint of approved shade to a gloss finished dry film total thickness of not less than 350 microns.

TYPE G (Chlorinated Rubber Paint) - Brush Application

(a) Blast clean to First Quality finish to SSRN 933.

(b) Apply 2 coats of chlorinated rubber paint primer to give a finished dry film thickness of 100 microns.

(c) Apply 2 coats of chlorinated rubber based high build undercoat to give a finished dry film thickness of 220 microns.

(d) Apply 2 coats of chlorinated rubber base gloss finish of approved shade to give a total dry film thickness of 280 microns.

TYPE H (Chlorinated Rubber Paint) - Airless Spray Application

(a) Blast clean to First Quality finish to SSRN 933.

(b) Apply 2 coats of chlorinated rubber based high build primer to give a finished film thickness of 150 microns.

(c) Apply 2 coats of chlorinated rubber based high build semi-gloss finish of approved shade to give a total dry film thickness of 300 microns.

TYPE J (Lead Primer And Epoxy Paint)

(a) Blast clean First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning apply one coat of 2-pack epoxy metallic lead primer to give a finished dry film thickness of 50 microns.

(c) Apply 2 coats of 2-pack epoxy micaceous iron oxide undercoat to give a total dry film thickness of 150 microns.

(d) Apply one coat of 2-pack epoxy gloss finish of approved shade to give a total dry film thickness of not less than 180 microns.

TYPE K (Lead Primer And Epoxy Paint For Galvanized Metal)

(a) Thoroughly clean and degrease.

(b) Apply one coat of 2-pack epoxy metallic lead primer to give a finished dry film thickness of 50 microns.

(c) Apply one coat of 2-pack epoxy micaceous iron ore undercoat to give a finished dry film thickness of 120 microns.

(d) Apply one coat of 2-pack epoxy gloss finish of approved shade to give a total dry film thickness of not less than 155 microns.

TYPE L (Bitumen Coating)

(a) Blast clean to First Quality finish to SSRN 933 or pickle in hot dilute sulphuric acid.

(b) After thorough washing, phosphate coating by immersion in a bath of hot dilute phosphoric acid.

(c) Application of one coat of primer to SSRN 908.

(d) Hot dip bitumen/bitumen coating applied to give a smooth lining having a minimum dry film thickness of not less than 300 microns.

TYPE M (Electro-zinc Plated And Stove Enamelled)

(a) Blast clean to First Quality finish to SSRN 933 or pickling in hot dilute sulphuric acid.

(b) After thorough washing, phosphate coating by immersion in a bath of hot dilute phosphoric acid.

(c) Electro zinc plated.

(d) Apply stoved zinc based epoxy primer (incorporating suitable pigments to act as acid scavengers and counteract the formation of adhesion destroying compounds).

(e) Finishing coat(s) of stoved alkyd enamel to give a high standard of gloss finish of approved shade, and of not less than 150 microns dry film thickness.

TYPE N (Clean And Degrease)

Thoroughly clean using hand, and/or power tools where available, to remove all mill scale, rust and grease.

TYPE P (Lead Primer)

(a) Blast clean to First Quality finish to SSRN 933.

(b) Within 2 hours of blast cleaning apply by brush two coats of metallic lead primer to a finished thickness of not less than 100 microns.

TYPE Q (Bitumen Enamel Or Coal Tar Enamel Wrappings)

Apply bitumen enamel wrapping or coal tar enamel wrapping in accordance with SSRN 214.

TYPE R (Sealed Sprayed Aluminium Coating)

(a) Blast clean to First Quality finish to SSRN 933.

Surface preparation shall be in accordance with to SSRN 900.

(b) Apply suitable primer.

(c) Apply sprayed - aluminium coating to give a finished dry film thickness of not less than 150 microns.

(d) Apply suitable pre-treatment primer (e.g. Two-pack polyvinyl butyral or Two-pack polyvinyl butyral/phenolic, containing not less than 85% by weight of zinc tetroxychromate pigment).

(e) Apply suitable sealer e.g. (Blend of vinyl chloride/acetate copolymers, or Two-pack phenolic binder or Two-pack epoxy or Two-pack polyurethane).

TYPE S (Sealed Sprayed Zinc Coating)

(a) As in (a) type R.

(b) As in (b) type R.

(c) As in (c) type R but using sprayed zinc coating to give a finished dry film thickness of not less than 175 microns.

(d) As in (d) type R.

(e) Apply suitable sealer e.g. silicone resin containing not less than 95% by weight of aluminium pigment.

TYPE T (Decorative Painting)

Decorative paint (when specified) shall be compatible with the final finish paint or coating.

The final shade shall be as recommended by the Engineer.

The film thickness of decorative paint shall not be included in the total dry film thickness specified.

618 PAINTING SYSTEMS FOR METALWORK

The applications shall be to the approval of the Engineer but generally in accordance with the schedule below.

Item	*Application*	Type
1.	All steel ladders, staircases, guardrails, guardrail stands, safety cages, open steel flooring, small bore pipework and steel conduit. All small metalwork such as pipe supports, steel flooring supports and safety chains.	A
2.	All steelwork, castings and other metal surfaces which are immersed in water (non-potable water), sewage, and other effluents, or in contact with liquid or subject to splashing, or buried in the ground.	C
3.	All steel, ductile and cast iron pipes, valves, flow meters and fittings 75 mm diameter and larger, used for the conveyance of sewage and other effluents as in 2 above.	B
4.	All steelwork, castings, pipes, valves flow meters and other surfaces which are exposed (exterior) and frequently damp	B

Item	*Application*	Type
	or wet.	
5.	As 4 above but in interior of building and normally dry.	D or F
6.	All steel pipes laid underground.	Q
7.	All valves, penstocks, flow meters, tanks and fittings which are in contact with potable water.	E, F or H
8.	Potable water pumping plant installed inside pumping station-normally dry condition.	
	(a) <u>Suction and delivery pipes</u>	
	Internal protection	L
	External protection	E,F or H
	(b) <u>Valves</u>	
	Internal protection	E or L
	External protection	E, F or H
	(c) <u>Pumping Casing</u>	
	Internal protection	E or L
	External protection	E,F or H
	(d) <u>Flow meter (body)</u>	
	Internal protection	E,F or L
	External protection	E,F or H
	(e) <u>Extension shaft and couplings</u>	E,F or H
	(f) <u>Pump motor casing and support steelwork</u>	E, F or H
9.	Screw pumps (screws and shafts) used for potable water.	E or H
10.	Filter internals (potable water)	A
11.	Over painting of galvanized items (not in contact with potable water)	J
12.	Switchboard, multi-motor control panels and other similar enclosures.	M
13.	Metal cable trays, conduits and fixings	A
14.	Section of pipe to be built into concrete.	N
15.	All steelwork and castings in contact with potable water	A, D, E, F or H

619 REPAIR OF DAMAGED PAINTWORK COATINGS

Any damage to the protective coating shall be made good as soon as possible, and shall not be left until the time of gental finish painting. Damaged areas shall be cleaned down to bright metal by power wire brushing or sanding and feathered off to the surrounding area. A new protective system approved by the Engineer shall then be applied generally following the requirements of the system originally applied, modified if necessary to comply with the recommendations of the manufacturer of the protective materials used.

620 METALWORK SURFACE PREPARATION PRIOR TO PAINTING

Surface preparation shall conform generally to SSRN 900, 903 or 917 as appropriate, together with any additional preparation recommended by the paint manufacturer, and/or approved by the Engineer.

Prior to painting, protective coatings shall be thoroughly cleaned, degreased, and washed with clean water.

Where steelwork has been delivered with zinc rich epoxy primer and has been allowed to weather, the primed surface shall be washed with clean water to remove zinc salts and allowed to dry.

621 SITE PAINTING DURING ERECTION OF METALWORK

Site connections shall be given a second coat and be brought together wet. Where the finishing paint has been subject to damage during transit or erection, the areas affected shall be cleaned, repaired, and re-painted generally following the requirements of the system originally applied.

622 PAINTING OF STEEL TANKS AND TOWER SUPPORTS

(a) General

This clause shall be read in conjunction with the following sub-clauses described above, Cl. 613 "Painting of Metalwork", Cl. 617 "Repair of damaged paintwork coatings", Cl. 618 "Metalwork surface preparation prior to painting", Cl. 619 "Site painting during erection of metalwork"

(b) Painting internal tank surfaces with bitumen based paints

Internal surfaces of panel tanks shall be prepared by power brushing to remove all rust, scales and loose paint to the approval of the Engineer. Sand blasting shall not be allowed for tank panel unless if directed otherwise by the Engineer. On the prepared surface 2 coats of a bitumen based paint such as a single component, liquid coating, based on a blend of bitumen and solvents e.g. "Igol A" or a thixotropic high build fast drying bituminous coating e.g. "Intex No. 1", shall be applied in strict accordance with the manufacturer's specifications.

(c) Painting surfaces with epoxy paints

The surfaces shall be prepared as indicated in the Bill of Quantities. For steel hand rails, walkways, stairs and steel sections, this shall involve mechanical brushing. Sand blasting shall not be allowed for tank panels unless if directed otherwise by the Engineer. On the prepared surface 2 coats of an epoxy paint (a 2-component, solvent-free coating material based on epoxy resins) e.g "Sikaguard 63", shall be applied according to the manufacturer's instructions.

(d) Painting of steel tower frames with aluminium paint

Removal of soil deposits at the base of tower shall be done prior to cleaning entire surfaces including corners and edges, ladder, platforms etc. by wire brushing mechanically to the satisfaction of the Engineer. Alternatively surfaces may be prepared by blast cleaning to remove all rust and loose paint. Cleaned surfaces shall be painted with 2 coats of a suitable primer such as red oxide primer followed by 2 coats of an approved bituminous aluminium paint according to the manufacturer's instructions.

(e) Painting surfaces with oil-based gloss paint

Surfaces shall be cleaned by mechanical wire-brushing. Where surfaces are buried the material should be excavated and the surface cleaned using water and brush and after the surface is dry it shall be cleaned of all rust and loose paint by power-brushing. Cleaned surfaces shall then be painted with 2 coats of a suitable primer such as red oxide followed by 2 coats of an approved oil based gloss paint. The final shade shall be as recommended by the Engineer.

623 INSULATION OF DISSIMILAR METALS

Where dissimilar metals are likely to be in contact with each other a suitable insulating barrier shall be incorporated to prevent galvanic action occurring. This shall be to the approval of the Engineer.

624 EXPANDING RAWL BOLTS

These Bolts shall be expanding type and be made of stainless steel. Drilled or punched holes shall not be greater than 1.5 mm more than the bolt diameter and the depth shall be sized to suit the length of the bolt. The holes shall be cleaned of any loose material and rough edges before the bolts are fitted. Washers shall be at least 2.5 x the bolt diameter. Washers should be fitted under each bolt head.

CHAPTER 7

STANDARD SPECIFICATION REFERENCE NUMBERS (SSRN)

Chapter 7 - STANDARD SPECIFICATION REFERENCE NUMBERS (SSRN)

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CONCRETE

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
100 (a)	CONCRETE-GUIDE TO SPECIFYING	[5328]			1	1997	1045		91.100.30	
100 (b)	CONCRETE - SPECIFICATION, PRODUCTION, CONFORMITY		206		1	2000				
100 (c)	CONCRETE - CONSTITUENT MATERIALS SPECIFICATION		8500			2006				
100 (d)	CONCRETE - SPECIFICATION, PRODUCTION, CONFORMITY		206		1	2000				= AS 3600
101	STRUCTURAL USE OF CONCRETE	[8110]	1992		1	2004	See VOB		91.080.40	BS 8110 remains current
102	CONCRETE-WATER RETAINING STRUCTURES	(8007)	1992		3	2006			91.080.40	BS 8007 remains current
103 (a)	ORDINARY PORTLAND CEMENT		197		1	2000	1164	1, 2, 8	91.100.10	
103 (b)	ORDINARY PORTLAND CEMENT		197		1	2000	1164	1, 2, 8	91.100.10	
104	SULPHATE RESISTING PORTLAND CEMENT						1164	1;CL.4	91.100.10	
105	MORTAR, SCREEDS & PLASTERS-TESTING						1164	1;CL.4-4	91.100.10	
106 (a)	CEMENT - TEST FOR SETTING TIME & SOUNDNESS		196		3	2005	1164	EN 196	91.100.10	
106 (b)	CEMENT - TEST FOR FINENESS		196		6	2010	1164	EN 196	91.100.10	
107 (a)	TESTING AGGREGATES-SAMPLING AND TESTING								91.100.20	
107 (b)	TESTING AGGREGATES-METHODS OF SAMPLING								91.100.20	
107 (c)	TESTING OF AGGREGATES (CONT)						4226	1-4	91.100.30	
108 (a)	FINE AGGREGATES FOR CONCRETE - GENERAL		12620			2002			91.100.20	
108 (b)	FINE AGG. FOR CONCRETE - GENERAL (CONT)						4226	1-4	91.100.30	
109 (a)	FINE AGGREGATES FOR CONCRETE - GRADING		12620			2002			91.100.20	
109 (b)	FINE AGGREGATES FOR CONCRETE-GRADING (CONT)						4226	1-4	91.100.30	
110 (a)	COARSE AGGREGATES FOR CONCRETE - GENERAL		12620			2002			91.100.20	
110 (b)	COARSE AGG. FOR CONCRETE - GENERAL (CONT)						4226	1-4	91.100.30	
111 (a)	COARSE AGGREGATES FOR CONCRETE-GRADING		12620			2002			91.100.20	
111 (b)	COARSE AGG. FOR CONCRETE GRADING (CONT)						4226	1-4	91.100.30	
112 (a)	AGGREGATES-CON. SHRINKING & ABSORPTION	812			2, 120	1995			91.100.20	
112 (b)	COARSE AGG.-CON SHRINKING & ABSORPTION (CONT)						4226	1-4	91.100.30	
113 (a)	COARSE AGGREGATE FOR CONCRETE-FLAKINESS	812				1989			91.100.20	
113 (b)	COARSE AGGREGATE FOR CON.-FLAKINESS (CONT)						4226	1-4	91.100.30	
114	CONCRETE-WATER FOR MAKING		1008			2002			13.060.25; 91.100.30	
115 (a)	CONCRETE - SPECIFYING MIXES	5328			1	2000			91.100.30	
115 (b)	CONCRETE - CHOOSING MIXES & CONSTITUENTS	5328			1	2000	1084	1	91.100.30	
115 (c)	CONCRETE - SAMPLING, TESTING & ASSESSING	5328			1	2000			91.100.30	
115 (d)	CONCRETE - LAB. TESTING OF FRESH CONCRETE		12350		2	2000			91.100.30	
116	CONCRETE TESTING-SLUMP TEST	1881			125	1986			91.100.30	
117 (a)	CONCRETE TESTING-TEST CUBES		12390		2	2000	1048	5	91.100.30	
117 (b)	CONCRETE TESTING-TENSILE/COMPR. STRENGTH		12390		6	2000			91.100.30	
117 (c)	CONCRETE TESTING - FLEXURAL STRENGTH		12390		5	2000			91.100.30	
117 (d)	CONCRETE TESTING - WORKABILITY		12390		5	2000			91.100.30	
117 (e)	CONCRETE TESTING - COMPRESSION TEST MACHINE		12390		4	2000			91.100.30	
117 (f)	CONCRETE TESTING - AFTER HARDENING		12390		7	2000	1048	2	91.100.30	
117 (g)	CONCRETE TESTING - AFTER HARDENING (CONT)	1881			207, 208,2	various			91.100.30	
117 (h)	CONCRETE TESTING - LAB. MIXING & SAMPLING	1881			125	1986			91.100.30	
117 (j)	CONCRETE TESTING - FRESH, SEMI-DRY DENSITY	1881	12350		6	2000	1048	1	91.100.30	
118	CONCRETE MIXERS-BATCH TYPE	1305				1974			91.22	
119	CONCRETE MIXERS-PERFORMANCE	3963				1974			91.22	
120	STRUCTURAL USE OF CONCRETE	8110	1992-1		1	2004			91.080.40	
121	CONCRETE - READY MIXED	8500			1,2	2002			91.100.30	
122	BITUMEN RUBBER JOINT SEALING COMPOUND	2499			1, type A1	1993			93.080.20	

CONCRETE

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
123 (a)	JOINT SEALING-POLYSULPHIDE COMPOUND			11600		2003			91.100.50	
123 (b)	JOINT SEALING-THERMOPLASTIC SEALING STRIPS						18541	1, 2	91.100.50	
123 (c)	POLYSULPHIDE JOINT SEALING COMP. (CONT)								91.100.50	
124	WATERPROOF BUILDING PAPERS		1521		(Class A)	1997			91.100.99	
125	IMPACT TESTING OF MILD STEEL						50115		77.040.10	
126 (a)	STEEL R/F-HOT ROLLED STEEL BARS	4449				2005			77.140.60	
126 (b)	STEEL R/F-HOT ROLLED STEEL BARS (CONT)						488	1-3	77.140.15	
126 (c)	STEEL R/F-HOT ROLLED STEEL BARS (HIGH TENSILE STEEL)	4449				2005				= AS/NZS 4671 Grade 400 (500 Mpa)
127 (a)	STEEL R/F-COLD TWISTED	4449				2005			77.140.60	
127 (b)	STEEL R/F-COLD TWISTED (CONT)						488	1-3	77.140.15	
128 (a)	STEEL R/F STEEL FABRIC	4482				2005			77.140.65	
128 (b)	STEEL R/F STEEL FABRIC (CONT)	4483				2005			77.140.99	
128 (c)	STEEL R/F STEEL FABRIC (CONT)						488	4-5	77.140.15	
128 (d)	STEEL R/F STEEL FABRIC (HIGH TENSILE STEEL)	4483				2005				= AS/NZS 4671 Grade 450 (500 MPa)
129	BAR REINFORCEMENT & BENDING			4066		2000			77.140.60	
130 (a)	SAND FOR INTERNAL PLASTERING		13139			2002			91.100.20	
130 (b)	SAND FOR INTERNAL PLASTERING (CONT)		1200			2005			91.100.20	
131	PLYWOOD SHUTTERING					1995			79.060.10	
132 (a)	CONCRETE COMPACTION-GUIDE TO	8500			1,2	2002			91.100.30	
132 (b)	CONCRETE COMPACTION-VIBRATION EQUIPMENT						4235	1,2	91.22	
133	CONCRETE - SITE QUALITY CONTROL	8500			3	2002			91.100.30	
134	DESIGN OF CONCRETE MIXES-METHODOLOGY	8500			2	2002			91.100.30	
135	SAND FOR MORTAR	1200				1998			91.100.20	
136	SAND FOR RENDERING	1199				2005			91.100.20	
137	HOT APPLIED JOINT SEALER	2499			2	1992			93.080.20	
138 (b)	WATER STOPS AND WATER BARS (CONT)						7865	12	83.140.10; 91.100.50	
139	CONCRETE TESTING - COMP. MODULUS OF ELAST'TY	1881			121	1983			91.100.30	
140	CONCRETE TESTING - WATER ABSORPTION	1881			122	2011			91.100.30	
141	CONCRETE TESTING - FRESH CONCRETE CYLINDERS	1881	12390		1,2	2000			91.100.30	
142	PRECAST CONCRETE COMPONENTS - COPINGS	5642			2	1983			91.060.10	
143	STRUCT. USE OF CONC. - DESIGN & CONSTRUCTION	(8110)			1	1997			91.080.40	
144	STRUCT. USE OF CONC. - SPECIAL CIRCUMSTANCES		1992		1	2004			91.080.40	
145	IN-SITU-CONCRETE DIAPHRAGM WALLS						4126		93.02	
146	TEST SIEVES FOR THE AGGREGATES	410			2	2000			19.12	≠ ISO 565; ISO 2194; ISO 3310/1; ISO 3310-2:1990; ISO 3310-3:1990
147 (a)	LIGHTWEIGHT AGGREGATES FOR CONCRETE		13055		1	2002			91.100.20	
147 (b)	LIGHTWEIGHT AGGREGATES FOR CONCRETE (CONT)						4226	2	91.100.30	
148	SUPERSULPHATED CEMENT	4550				1978			91.100.10	
149	BLAST FURNACE SLAG AGGREGATE	1047	12620			2002			91.100.20	
150	LIGHTWEIGHT AGGREGATES	3797	13055		1	2002			91.100.20	
151	NON METALLIC PRODUCTS & POTABLE WATER	6920			1	2000			13.060.20	
152	CONCRETE. COMPLIANCE CRITERIA		206		1	2000			91.100.30	
153	EPOXY COATED REINFORCING STEEL	7295		14654	1, 2	1999			77.140.60	
154	FORMWORK-DESIGN, ERECTION, USE	5975				2008			91.22	
155	WATER AGGRESSIVENESS TO CONCRETE						4030	1, 2	91.100.30	
156 (a)	STEEL, CONC. & COMPOSITE BRIDGES - DESIGN	5400			1	1988	1072		93.04	≠ ISO 2394

CONCRETE

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
156 (b)	STEEL, CONC. & COMPOSITE BRIDGES - MAT. & WORK'P	5400			6	1999			93.04	≠ ISO 2394
156 (c)	STEEL, CONC. & COMPOSITE BRIDGES - BEARINGS	5400	1337		2,3,5,7,8	various			93.04	≠ ISO 2394
156 (d)	STEEL, CONC. & COMPOSITE BRIDGES - FATIGUE	5400			10	1999			93.04	≠ ISO 2394
157 (a)	PRE-CAST REINFORCED CONCRETE CULVERTS									SABS 986:2006 ed. 3.01, AS 1597 Part 2 for culverts from 1,500 mm to 4,200 mm span
157 (b)	PRE-CAST REINFORCED CONCRETE CULVERTS	(8110)	1992-1		1	2004				Box Culvert Assoc. UK, Standard Spec 1991
158 (a)	PORTLAND CEMENT EXTENDERS - GROUND GRANULATED BLAST-FURNACE SLAG									1491-1:2005 ED. 2
158 (b)	PORTLAND CEMENT EXTENDERS - FLY ASH									1491-2:2005 ed. 2
158 (c)	PORTLAND CEMENT EXTENDERS - SILICA FUME									1491-3:2006 ed. 2.01
159	CONCRETE ADMIXTURES - COMMON REQUIREMENTS		934		1	2008				= AS 1478

≠: related but not equivalent to BS =: technically equivalent to BS ≡: identical to BS
( ) superceded & replaced as show n [ ] obsolecent or replaced as show n but remains current

PLASTIC PIPES

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
300 (a)	uPVC PIPES FOR COLD WATER - GENERAL	[3505]	1452		1	2010			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-1:2009; ISO 4422-1:1996
300 (b)	uPVC PIPES FOR COLD WATER - PIPES		1452		2	2010			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-2:2009; ISO 1452-2:2009
300 (c)	uPVC PIPES FOR COLD WATER - FITTINGS		1452		3	2012			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-3:2010; ISO 1452-3:2009
300 (d)	uPVC PIPES FOR COLD WATER - VALVES		1452		4	2010			23.040.20; 23.040.45; 91.140.60;93.025	≠ EN ISO 1452-4:2009; ISO 1452-4:2009
300 (e)	uPVC PIPES FOR COLD WATER - FITNESS FOR PURPOSE OF THE SYSTEM		1452		5	2010			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-5:2009; ISO 1452-5:2009
301 (a)	uPVC PIPES-JOINTS & FITTINGS-INJECTION MOULDEDFITTINGS - PRESSURE	(4346-1)	1452		1	2010			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-1:2009; ISO 1452-1:2009, ISO 2035:1974,ISO 2048:1990
301 (b)	uPVC PIPES-JOINTS & FITTINGS - MECHANICAL JOINTS - PRESSURE	(4346-2)	1452		3	2012			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-3:2010; ISO 1452-3:2009
301 (c)	uPVC PIPES-JOINTS & FITTINGS-QUALITY & TESTING						8063	5:1999	23.040.45	
301 (d)	uPVC PIPES-JOINTS & FITTINGS-NOMEN. & SYMBOLS						16450	:1994	23.040.45	
302 (a)	uPVC PIPELINES - LAYING AND JOINTING	[CP 312]			2	1973			83.140.30; 91.140.60	≠ ISO/TR 4191
302 (b)	uPVC PIPELINES - LAYING AND JOINTING (CONT)						16928	:1979	23.040.20	
303 (a)	uPVC PIPELINES - PRESSURE TESTING	[CP 312[			2	1973			83.140.30; 91.140.60	≠ ISO/TR 4191
303 (b)	uPVC PIPELINES - PRESSURE TESTING (CONT)						4279	1,9,10	23.040.01	
304 (a)	uPVC PIPELINES - ADHESIVES FOR JOINTING	[4346]	14814			2007			83.18	EN 14814:2007
304 (b)	uPVC PIPELINES - ADHESIVES FOR JOINTING (CONT)						16970		83.180	
305 (a)	uPVC PIPES - GENERAL	[3505]	1452		1	2010			23.040.20; 23.040.45; 91.140.60; 93.025	≠ EN ISO 1452-1:2009; ISO 4422-1:1996
305 (b)	uPVC PIPES - GENERAL - INDUSTRIALIZED USES	3506				1969			83.140.30; 91.140.60	
305 (c)	uPVC PIPES - QUALITY & TESTING						8061	:1994	23.040.20	
305 (d)	uPVC PIPES - DIMENSIONS						8062		23.040.20	
306 (a)	uPVC PIPES-PRESSURE TESTS TO DESTRUCTION	[4728]	921			1995			23.040.20	≠ EN 921:1994, ISO 1167:1973
306 (b)	uPVC PIPES-PRESSURE TESTS TO DESTRUCTION (CONT)		1167		3	2007			23.040.20; 23.040.45	≠ EN ISO 1167-3:200; ISO 1167-3:2007
306 (c)	uPVC PIPES-PRESSURE TESTS TO DESTRUCTION (CONT)		1167		4	2007				≠ EN ISO 1167-4:2007; ISO 1167-4:2007
306 (d)	uPVC PIPES-PRESSURE TESTS TO DESTRUCTION (CONT)		1167		2	2006			23.040.20; 23.040.45	EN ISO 1167-2:2006; ISO 1167-2:2006
306 (e)	uPVC PIPES-PRESSURE TESTS TO DESTRUCTION (CONT)		1167		1	2006			23.040.20; 23.040.45	EN ISO 1167-1:2006; ISO 1167-1:2006
306 (f)	uPVC PIPES-PRESSURE TESTS	2782	1053		11	1996			23.040.21	
307 (a)	HDPE PIPES (GENERAL)	[3284]	12201		1	2011			23.040.01; 91.140.60; 93.030	≠ EN 12201-1:2011
307 (b)	HDPE PIPES (PIPES)	(6572)	12201		2	2011			13.060.20; 91.140.60	EN 12201-2:2011
307 (c)	HDPE PIPES (FITNESS FOR PURPOSE OF THE SYSTEM)	(6730)	12201		5	2011			23.040.01; 91.140.60; 93.030	≠ EN 12201-5:2011
307 (d)	HDPE PIPES (CONT)						16963	5:1999	23.040.20	
307 (e)	HDPE PIPES-DIMENSIONS						8074	:1999	23.040.20	
307 (f)	HDPE PIPES-QUALITY & TESTING						8075	:1999	23.040.20	
307 (g)	HDPE PIPES-JOINTS & FITTINGS -PERFORMANCE REQUIREMENTS	[5114]				1975			23.040.60 83.140.30	≠ ISO 3458; ISO 3459; ISO 3501; ISO 3503; ≠ KS 06-470, ISO 7/1
307 (h)	HDPE PIPES - COPPER AND COPPER ALLOY - COMPRESSION FITTINGS	864			3	1975			23.040.40	ISO 14236:2000
307 (i)	HDPE PIPES-JOINTS & FITTINGS		12201		3	2011	16963 parts as	1-4, 7-11, 13-15	23.040.45	EN 12201-3:2011
307 (j)	HDPE PIPES - CODE OF PRACTICE	[CP 312]			3	1973				
308 (a)	RUBBER RINGS FOR MECHANICAL JOINTS		681		1	1996			83.140.50	
308 (b)	RUBBER RINGS FOR MECHANICAL JOINTS		681		1	1996				
309	uPVC UNDERGROUND DRAIN PIPES & FITTINGS	[4660:00]	13598		1	2010			93.03	≠ EN 13598-1:2010
310	uPVC P. IMPACT TEST 20 DEGREE CENTIGRADE	[3505]	1452		1 to 5	2000			83.140.30; 91.140.80	≠ ISO 3127
311	uPVC PIPES SHORT TERM HYDROSTATIC TEST	[3505]	1452		1 to 5	2000			83.140.30; 91.140.80	≠ ISO 3127
312	uPVC PIPES LONG TERM HYDROSTATIC TEST	[3505]	1452		1 to 5	2000			83.140.30; 91.140.80	

PLASTIC PIPES

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
313 (a)	THERMOPLASTIC PIPES - INTERNAL PRESSURE ENDURANCE TEST (GENERAL METHOD)	2782	1167		1	2006			23.040.20; 23.040.45	≠ EN ISO 1167-1:2006, ISO 1167-1:2006
313 (b)	THERMOPLASTIC PIPES - INTERNAL PRESSURE ENDURANCE TEST (PREPARATION OF PIPE TEST PIECES)	2782	1167		2	2006	8061	:1994	23.040.20; 23.040.45	EN ISO 1167-2:2006; ISO 1167-2:2006 ≠ EN 921:1994
314 (a)	THERMOPLASTIC PIPES - WATER ABSORPTION TEST	2782	62			2008			83.080.01	EN ISO 62:2008; ISO 62:2008 ≠
314 (b)	THERMOPLASTIC PIPES - ABSORPTION TEST (CONT)						8061	:1994	23.040.20	
315 (a)	THERMOPLASTIC PIPES - VARIOUS OTHER TESTS	2782			11-1101A, 1103V, 1105D, 1107A, 1108A/B/C,	various			23.040.20; 23.040.45	≠ Method 1101A: ISO 3126 ≠ Method 1108A: ISO 3127:1980
315 (b)	THERMOPLASTIC PIPES - VARIOUS OTHER TESTS^(CONT)	2782			1110, 1110B, 1114A/B/C, 1127A,	various			23.040.20; 23.040.45	
315 (c)	THERMOPLASTIC PIPES - VARIOUS OTHER TESTS (CONT)		743	2505		2005			23.040.20	EN ISO 2505:2005, ISO 2505:2005 ≠
315 (d)	THERMOPLASTIC PIPES - VARIOUS OTHER TESTS (CONT)		578	7686		2005			23.040.20; 23.040.45	EN ISO 7686:2005, ISO 7686:2005 ≠
315 (e)	THERMOPLASTIC PIPES - VARIOUS OTHER TESTS (CONT)	Various ENs								ISO 2505-1,-1:1994, 3114:1997, 3472:1975, 3473:1977, 3474:1976
316 (a)	THERMOPLASTIC PIPES-DIMENSIONS & PRESSURES	5556				1978			23.040.20	≠ ISO 161/1; ISO 4065
316 (b)	THERMOP. PIPES-DIMENSIONS & PRESSURES (CONT)	2782			11-1121B	1997			23.040.20	≡ ISO 161-1:1996
316 (c)	THERMOP. PIPES-DIMENSIONS & PRESSURES (CONT)			11922	1	1997			23.040.20	
317	HDPE - COMPRESSION FITTING - NUTS									ASTM D 2565:99
318	HDPE PIPES, ELECTROFUSION CONTROL UNITS									EN 60335-1; EN 60335-2-45; EN 50081-1; EN 50082-1; EN 55014; EN 61000-3-3
319	DETERMINATION OF TESTING FREQUENCY ETC									SABS 966-1:06 Table B.1
320	DETERMINING DIMENSIONS OF THERMOPLASTIC PIPE AND FITTINGS									ASTM D 2122:04
321	IDENTIFICATION CARDS		7810			1996				≡ ISO 7810
322	IDENTIFICATION CARDS - RECORDING TECHNIQUE		7811		all					≡ ISO 7811
323	PVC PIPES - EXTRACTABILITY OF LEAD AND TIN - TEST METHOD									ISO 3114:1997

≠: related but not equivalent to BS =: technically equivalent to BS ≡: identical to BS

VALVES, SURFACE BOXES, & METERS

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
501 (a)	C.I. GATE VALVES (WATER)	5163			1,2	2004			23.060.30	≠ ISO 7259, type A
502 (a)	C.I. GATE VALVES (GENERAL)		1171			2002	3352	5	23.060.30	≠ ISO 5996
502 (b)	C.I. GATE VALVES (GENERAL) (CONT)						3202	4	23.060.01	
502 (c)	C.I. GATE VALVES (GENERAL) (CONT)								23.060.01	
503	C.I. (PARALLEL SLIDE) GATE VALVES (GENERAL)		1171			2002			23.060.30	
504	C.I. GLOBE VALVES (GENERAL)		13789			2010	3356		23.060.10; 23.060.50	
505 (a)	C.I. CHECK VALVES (GENERAL)		12334			2001			23.060.50	
505 (b)	C.I. CHECK (BACKFLOW) VALVES (GENERAL)		13959			2004	See DVGW		91.140.60	
506 (a)	C.I. & STEEL BUTTERFLY VALVES (GENERAL)	5155	593			2004			23.060.99	
506 (b)	C.I. & STEEL BUTTERFLY VALVES (GENERAL)								23.060.30	
507	BOURDON TYPE PRESSURE GAUGES		837		1	1998		1	17.1	
508	FLOAT OPERATED VALVES N.E. 50 MM	1212			1,2	1990			91.140.60	
509	FIRE HYDRANTS-BELOW GROUND	750				2012			13.220.10	
510 (a)	WATER METERS - SINGLE		14154		3	2011			17.120.10	
510 (a)	WATER METERS - GENERAL	(5728)	14154		1	2011				ISO 4064/1
510 (b)	WATER METERS - COMBINATION		14154		1	2011			17.120.10	
511 (a)	COPPER ALLOY GLOBE, STOP, GATE VALVES								23.060.30	
511 (b)	COPPER ALLOY GLOBE, STOP, CHECK VALVES		12288		3	2010			23.060.10; 23.060.50	
512	FIRE HOSE COUPLINGS & EQUIPMENT	336				2010			13.220.10	
513 (a)	SURFACE BOXES - UND'GR'ND STOPVALVES	5834			1	2009			91.140.40; 91.140.60	
513 (b)	SURFACE BOXES - SMALL	5834			2	2011			91.140.40; 91.140.60	
513 (c)	SURFACE BOXES - LARGE			5834	3	2005			91.140.40; 91.140.60	
513 (d)	SURFACE BOXES - PREFORMED CHAMBERS			5834	4	2005			91.140.40; 91.140.60	
513 (e)	SURFACE BOXES - PLASTIC						4055/6/7			
514	METALLIC BALL VALVES - GENERAL PURPOSE			7121		2006			23.060.20	≠ ISO 7121
515 (a)	uPVC VALVES									
515 (b)	uPVC VALVES - TESTS	2782	various		11-1131/34	various			23.060.01; 23.060.20; 83.140.30	
516	FIRE HYDRANT SYSTEMS FOR BUILDINGS	5041			1-5	various			13.220.10	
517	VALVES - PRESSURE TESTING FOR	6755	12266		1,2	2012			23.060.01	≠ ISO 5208:1993
518 (a)	BUTT-WELD & FLANGED VALVES - DIMENSIONS		12627	2080		various			23.060.01	= ISO 5752:1982
518 (b)	FLANGED VALVES - DIMENSIONS		558			2011			23.060.01	
519	STEEL GATE (PARALLEL SLIDE) VALVES		1984			2010			23.060.30	
520 (a)	WATER METERS - SINGLE - INSTALLATION		14154		1	2011			17.120.10	≡ ISO 4064/2 & 2/Add. 1
520 (b)	WATER METERS-COMBINAT'N - INSTALLATION		14154		1	2011			17.120.10	
521	STEEL GLOBE & CHECK VALVES		13709			2010			23.060.50	
522 (a)	VALVES - CORROSION PROTECTION - EPOXY						3476		91.140.60	
522 (b)	VALVES-CORROSION PROTECTION						30677	1, 2	23.040.99	
523	CAST IRON PLUG VALVES	5158				1989			23.060.20	
524	INDUSTRIAL-PROCESS CONTROL VALVES		60534		various	various			23.060.0125.040.40	

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( ) superceded & replaced as shown [ ] obsolecent or replaced as shown but remains current

ENGINEERING GENERAL

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
600 (a)	NON-DESTRUC. TESTING OF WELDS (TUBES)			10893	1	2011			23.040.10	
600 (b)	NON-DESTRUC. TESTING OF WELDS (TUBES)			10893	1	2011			23.040.10; 77.140.75	
600 (c)	NON-DESTRUC. TESTING OF WELDS (TUBES)								25.160.40	
600 (c)	NON-DESTRUC. T. OF WELDS (TUBES) (CONT)			6072		2011				
601 (a)	SOILS FOR C. ENG.- TEST METH.-AFTER SAMPLING	1377			1 to 8	1990			93.02	
601 (b)	SOILS FOR C. ENG .- TEST METHOD - IN SITU	[1377-9]		22476	2,3:2005	2011			93.02	
601 (c)	SOILS FOR C. ENG.- CLASSIFICATION						18196		93.02	
602	TESTING OF WATER PIPELINES - INTERNAL PRESSURE						4279	1-6,9,10	23.040.01	
603 (a)	TESTING OF CEMENT - CHEMICAL ANALYSIS		196		2	2005			91.100.10	
603 (b)	TESTING OF CEMENT- POZZALINIC CEMENT		196		5	2011			91.100.10	
603 (c)	TESTING OF CEMENT - CHLORIDE, CO_2, ALKALI CONTENT		196		2	2005			91.100.10	
604	MATERIAL TESTING - DOCUMENTATION						50049			ISO 404:1992, EN 21
605 (a)	MEASUREMENT OF WATER FLOW - SINGLE METERS		14154		2	2005			17.120.10	
605 (b)	MEASUREMENT OF PIPE WATER FLOW - MULTIPLE METERS		14154		1	1988			17.120.10	
605 (c)	MEASUREMENT OF PIPE WATER FLOW - COMBIN'T'N METERS		14154		2	1988			17.120.10	
605 (d)	MEASUREMENT OF PIPE WATER FLOW - COMBIN'T'N METERS		14154		3	1988			17.120.10	
606	DRINKING WATER QUALITY - TESTING			10304	1	2009			13.060.01	
607	MEASUREMENT OF WATER FLOW - VOLUMETRIC		8316	8316		1997			17.120.10	
650 (a)	SITE INVESTIGATIONS	5930				1999			91.2	
651 (a)	WATER SUPPLY - DOMESTIC - WITHIN BUILDINGS								91.140.60	
651 (b)	WATER SUPPLY-PRINCIPLES & REQUIREMENTS	6700				2006	2000		13.060.20	
651 (c)	WATER SUPPLY-TECHNICAL DRAWINGS						2425	3-6	01.100.99	
652 (a)	BUILDING DRAINAGE		752			2008	1986	1, 2, 4	91.140.80	
652 (b)	BUILDING DRAINAGE								13.060.30; 91.140.80	
653 (a)	WATER PIPELINE CONSTRUCTION - DUCTILE IRON		1610			1998			23.040.10	
653 (b)	WATER PIPELINE CONSTRUCTION - ASBESTOS CEMENT								23.040.50	
653 (c)	WATER PIPELINE CONSTRUCTION - PRESTRESSED CONC.								23.040.50	
653 (d)	WATER PIPELINE CONSTRUCTION - GRP	8010			2.5	1989			23.040.20	
653 (e)	WATER PIPELINE CONSTRUCTION - PRECAST CONCRETE								23.040.50	
653 (f)	WATER PIPELINE CONSTRUCTION - STEEL	CP 2010			2	1970			23.040.01	
653 (g)	WATER PIPELINE CONSTRUCTION - GENERAL	8010			1	2004			13.060.01	
654	TRENCHING FOR PIPELINES						4124		93.02	
655	SEWAGE PIPELINE CONSTRUCTION		752			2008			13.060.30	
656 (a)	WALLING - BRICK & BLOCK MASONRY	6697				2010			91.080.30	
656 (b)	WALLING - BRICK & BLOCK MASONRY	6697				2010			91.080.30	
656 (c)	WALLING (BRICK & BLOCK MASONRY) (CONT)						18330	Part C	91.010.20	
657	USE OF STRUCTURAL STEEL IN BUILDING								91.080.10	
658 (a)	SEWERAGE - GENERALITIES & DEFINITIONS								13.060.30	
658 (b)	SEWERAGE - PERFORMANCE REQUIREMENTS								91.140.80	
658 (c)	SEWERAGE - GUIDE TO NEW CONSTRUCTION		752			2008			13.060.30	
658 (d)	SEWERAGE - PUMPING & PUMPING STATIONS		752			2008			13.060.30	
658 (e)	SEWERAGE - SEWERS IN TUNNELS		752			2008			13.060.30	
658 (f)	SEWERAGE - OUTFALLS		752			2008			13.060.30	
659	SMALL SEWERAGE WORKS & CESSPOOLS								13.060.30; 91.140.80	
660	TEST PUMPING OF WATER WELLS			14686		2003			13.060.10	
661 (a)	MEASURING LIQUID FLOW IN CHANNELS - BY DILUTION	3680			2A	1995			17.120.20	≡ ISO 9555-1:1994
661 (b)	MEASURING LIQUID FLOW IN CHANNELS - ULTRASONIC		6416			2005			17.120.20	
661 (c)	MEASUR'G LIQ'D FLOW IN CHANNELS - ELECTROMAGNETIC			9213		2004			17.120.20	≡ ISO 9213:2004
661 (d)	MEASURING LIQUID FLOW IN CHANNELS - SAFE PRACTICES								17.120.20	

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661 (e)	MEASURING LIQUID FLOW IN CHANNELS - TIDAL AREAS			2425		2010			17.120.20	
661 (f)	MEASURING LIQUID FLOW IN CHANNELS - HYDRO. EQUIP'T.	3680			8H	1996			17.120.20	≡ ISO 11655:1995
661 (g)	MEASURING LIQUID FLOW IN CHANNELS - BED SAMPLING	3680			10C	1996			17.120.20	≠ ISO 4364:1977
662	MEASUREMENT OF FLOW IN CLOSED CONDUITS - BY PITOT STATIC TUBES OR CURRENT METERS	1042			2:Sec 2.1 2:Sec 2.4	1983 1989			17.120.20	≡ ISO 3966:2008 ≡ ISO 3354:2008
663	CONSTRUCTION & DEMOLITION OF CONCR. & MASONRY								91.2	
664	DRAINAGE OF ROOFS AND PAVED AREAS		12056		3	2000			91.060.20; 91.140.80	
665	FOUNDATIONS		6100			2007			93.02	
666	STRUCTURAL USE OF TIMBER - DESIGN, MATERIALS & WORMANSHIP								91.080.20	
667	EARTH RETAINING STRUCTURES						4126		93.02	
668	WATERPROOFING OF BUILDINGS & STRUCTURES						18195	1-10	91.120.30	CP 102, BS 8215
669	WATER QUALITY - SAMPLING		6068	5667	3	2003			13.060.01	ISO 5667-3:2003
670 (a)	WELDING PROCEDURES - APPROVAL TESTING			15614	8	2002			25.160.01	
670 (b)	WELDING PROCEDURES - APPROVAL OF PROCEDURES		288-9	15607		2003			25.160.01	
670 (c)	WELDING PROCEDURES - PIPELINES - BUTT WELDING		4515						25.160.01	
671	WELDERS - APPROVAL TESTING		287		1	2011			25.160.01	
672	LOGGING OF ROCK CORES									
673	QUALITY SYSTEMS - DESIGN/ DEVELOPMENT,								03.120.10	ISO 9004-2009
	PRODUCTION, INSTALLLATION & SERVICING									KS 10-1131-ISO 9001
674	QUALITY SYSTEMS: PRODUCTION AND								03.120.10	
	INSTALLATION									
675 (a)	QUALITY SYSTEMS: FINAL INSPECTION AND								03.120.10	ISO 17025:2005
	TESTING									
675 (b)	ENVIRONMENTAL MANAGEMENT SYSTEMS									ISO 14001
675 (c)	QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS		9001	9001		2008				≡ ISO 9001
676	REINFORCED SOILS		14475, 14490, 8006-2, 8006-1			various			93.02	
677	GEOTECHNICAL INVESTIGATIONS FOR C. ENG. PURPOSES						4020		93.020	
678	GROUND ANCHORAGES	8081				1989	4125		93.020	
679	PIPE MATERIAL SELECTION AND DESIGN		1295		1:B.1.12	1997			23.040.01	
680	CODE OF PRACTICE FOR SAFE USE OF EXPLOSIVES	5607				1998				

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681 (a)	METHODS OF TEST FOR SOILS FOR CIVIL ENG. CHEMICAL & ELECTRO-MECHANICAL	1377			3					
681 (b)	METHODS OF TEST FOR SOILS FOR CIVIL ENG.- GENERAL	1377			1	1990				
682 (c)	METHODS OF TEST FOR SOILS FOR CIVIL ENG.- OTHER	1377			2, 4-9	1990				
682	GULLEY TOPS & MANHOLE TOPS FOR VEHICULAR & PEDESTRIAN AREAS		124			1994				
683	PRECAST CONCRETE PRODUCTS- RETAINING WALL ELEMENTS		15258			2008				
684	CONCRETE BLOCK PAVING - CODE OF PRACTICE FOR LAYING	7533			3	2009				
685	CONCRETE PAVING BLOCKS -REQUIREMENTS & TEST METHODS		1338			2003				
686 (a)	ROAD MARKING MATERIALS - PHYSICAL PROPERTIES		1871			2000				
686 (b)	ROAD MARKING MATERIALS - PERFORMANCE FOR ROAD USERS		1436			2007				
686 (c)	ROAD MARKING MATERIALS - SPECIFIACTION FOR APPLICATION	3262			3	1989				
687	HEATERS FOR TAR AND BITUMEN - SPECIFICATION	1676				1970				
688	HOT BINDER DISTRIBUTORS FOR ROAD SURFACE DRESSING	1707				1989				
689	COLD EMULSION SPRAYING MACHINE FOR ROADS - SPECIFICATIO	3136			2	1972				
690	TREATMENT OF WATER - SILICA SAND AND GRAVEL		12904			2005				AWWA B100

≠: related but not equivalent to BS =: technically equivalent to BS ≡: identical to BS

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801	LIME FOR MORTAR		459		1	2001	EN ISO 81060	1	91.100.10	= EN 459-1:2001
802	SILLS - PC CONCRETE, STONE, CLAYWARE, SLATE	5642			1	1978			91.060.50	
803 (a)	DAMP PROOF COURSES-BRICKS & SLATES	6398, 6515, 8215				Various			91.100.01; 91.120.30	
803 (b)	DAMP PROOF COURSES-BITUMEN	6398				1983			91.120.30	
803 (c)	DAMP PROOF COURSES-POLYETHYLENE	6515				1984			91.120.30	
803 (d)	DAMP PROOF COURSES-DESIGN-INSTALLATION	8215				1991			91.120.30	
804 (a)	CONCRETE BLOCKS		772		2	1998			91.100.30	
804 (a)	CONCRETE BLOCKS (CONT)		771		3	2003			91.100.30	
804 (b)	CONCRETE BLOCKS (CONT)	6073			2	2008			91.100.30	
805	HOLLOW CLAY PARTITION BLOCKS		772		3,7	1998			91.100.20	
805	HOLLOW CLAY PARTITION BLOCKS (CONT)		771		1	2003			91.100.20	
806 (a)	MASONRY - UNREINFORCED - BRICK WALLING		1052		1	1999			91.080.30	
806 (a)	MASONRY - UNREINFORCED - BRICK WALLING (CONT)		5628		1	2005			91.080.31	
806 (b)	MASONRY - REINFORCED & PRESTRESSED	5628			2	2000			91.080.30	
806 (c)	MASONRY - MATERIALS & WORKMANSHIP	5628			3	2001			91.080.30	
807 (a)	FIBRE-CEMENT ROOF SLATES & FITTINGS		492			2004			91.100.20; 91.100.40	
807 (a)	FIBRE-CEMENT ROOF SHEETING & FITTINGS		494			2004			91.060.20; 91.100.40	
808	FIXINGS FOR ROOF & WALL COVERINGS	1494			1	1964			21.060.01; 91.060.10; 91.060.20	
809 (a)	FIBRE BUILDING BOARDS-HARDBOARD, MEDIUMBOARD, MEDIUM DENSITY FIBREBOARD & SOFTBOARD-GENERAL		120, 310, 316, 317, 318, 319, 320, 321, 322, 323, 325,			Various	68755		79.060.20	
809 (a)	FIBRE BUILDING BOARDS-HARDBOARD, MEDIUMBOARD, MEDIUM DENSITY FIBREBOARD & SOFTBOARD-GENERAL		324		1 & 2	1993	68755		79.060.20	
809 (a)	FIBRE BUILDING BOARDS-HARDBOARD, MEDIUMBOARD, MEDIUM DENSITY FIBREBOARD & SOFTBOARD-GENERAL		382		1	1993	68755		79.060.20	
809 (a)	FIBRE BUILDING BOARDS-HARDBOARD, MEDIUMBOARD, MEDIUM DENSITY FIBREBOARD & SOFTBOARD-GENERAL		622		1,2,3,4,5	1997	68755		79.060.20	
809 (b)	FIBRE BUILDING BOARDS-SPECIFICATIONS FOR		622		1-5	2003 to 2006			79.060.20	
809 (c)	FIBRE BUILDING BOARDS-FORMALDEHYDE CONTENT		120			1992			79.040	
809 (d)	FIBRE BUILDING BOARDS-BENDING STRENGTH		310			1993			79.040	
809 (e)	FIBRE BUILDING BOARDS-OF WOOD-GENERAL		316			1999			79.040	
809 (f)	FIBRE BUILDING BOARDS-SWELLING FROM WATER		317			1993			79.060.20	
809 (g)	FIBRE BUILDING BOARDS-HUMIDITY EFFECTS		318			2002			79.040	
809 (h)	FIBRE BUILDING BOARDS-PERP. TENSILE STRENGTH		319			1993			79.040	
809 (i)	FIBRE BUILDING BOARDS-SCREW WITHDRAWAL RES.		320			2011			79.040	
809 (j)	FIBRE BUILDING BOARDS-CYCLIC HUMID TESTS		321			2002			79.040	
809 (k)	FIBRE BUILDING BOARDS-MOISTURE CONTENT		322			1993			79.060.01	
809 (l)	FIBRE BUILDING BOARDS-DENSITY DETERMINATION		323			1993			79.060.01	
809 (m)	FIBRE BUILDING BOARDS-DIMENSION DETERMINAT'N		324		1, 2	1993			79.060.01	
809 (n)	FIBRE BUILDING BOARDS-TEST PIECE DIMENSIONS		325			2012			79.060.01	
809 (o)	FIBRE BUILDING BOARDS-SURFACE ABSORPTION		382		1, 2	1993/94			79.060.20	

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810	BLOCKBOARD AND LAMINBOARD			12466	2	2007			79.060.10; 79.060.20	
811 (a)	PLYWOOD - DIMENSIONS & GENERAL		315			2000	4078		All pts: 79.060.10; Pt 2, also: 01.040.79	
811 (b)	PLYWOOD - DRY, HUMID, & EXTERIOR CONDITIONS		636			2003			79.060.10	
811 (c)	PLYWOOD - CLASSIFICATION & TERMINOLOGY		313		1, 2	1996/2000			01.040.79; 79.060.10	
811 (d)	PLYWOOD - BONDING QUALITY		314		1, 2	2004			79.060.10	
811 (e)	PLYWOOD - DIMENSIONAL TOLERANCES		315			2000			79.060.10	
811 (e)	PLYWOOD - SURFACE APPEARANCE CLASSIFICATION		635		1-3	1995			79.060.10	
812	SEALING OF EXTERNAL WALL JOINTS	No British Standard					18540		91.100.50	
813 (a)	PARTICLEBOARD - SAMPLING, CONDITIONING & TEST METHODS		120, 309, 310, 311, 317, 323, 325			Various			79.060.20	
813 (a)	PARTICLEBOARD - SAMPLING, CONDITIONING & TEST METHODS (CONT)		324		2	1993			79.060.20	
813 (a)	PARTICLEBOARD - SAMPLING, CONDITIONING & TEST METHODS (CONT)		312		1,2,3,4,5, 6	Various			79.060.20	
813 (b)	PARTICLEBOARD - WOOD CHIPBOARD - GENERAL		312		5,7	1997			79.060.20	
813 (d)	PARTICLEBOARD-CHIPBOARD-SPECIAL PURPOSES						6872		79.060.20	
813 (e)	PARTICLEBOARD-ORIENTED STRAND BOARD		300			2006			01.040.79; 79.060.20	
813 (f)	PARTICLEBOARD-CEMENT BONDED		634		2	1997			79.060.20	
813 (f)	PARTICLEBOARD-CEMENT BONDED (CONT)		1328			1997			79.060.20	
813 (g)	PARTICLEBOARD-REQUIREMENTS & SPECIFICATIONS		312			2003			79.060.20	
813 (h)	PARTICLEBOARD-SPECIFIC PURPOSE SELECTION	7916				1998			79.060.20	
814 (a)	LAMINATED PLASTIC SHEETING		438		1, 2	2005			83.140.20	
814 (b)	LAMINATED PLASTIC SHEETING-TEST METHODS		438		1,2,3,4,5, 6,7	2005	EN 438		83.140.20	
814 (b)	LAMINATED PLASTIC SHEETING-TEST METHODS (CONT)		14323			2004	EN 14323		83.140.20	
815 (a)	WOOD WOOL CEMENT SLABS UP TO 125 mm THICK		13168			2001			91.100.40	
815 (b)	WOOD WOOL SLABS-REQUIREMENTS & TESTING						1101		79.060.99	
815 (b)	WOOD WOOL SLABS-INSTALLATION						1102		79.060.99	
816 (a)	QUALITY OF TIMBER JOINERY - WORKMANSHIP	1186			2	1988			79.02	
816 (b)	QUALITY OF TIMBER JOINERY - SPECIFICATION FOR TIMBER	1186			1	1991				
817 (a)	WOODEN DOORS - GENERAL	4787			1	1980			91.060.50	
817 (b)	WOODEN DOORS - EXTERNAL	459				1988			91.060.50	
817 (c)	WOODEN DOORS - INTERNAL						68706	1	91.060.50	
818	WATERPROOF ADHESIVE - FOR PLYWOOD	1203				2001			83.180	
819 (a)	STRUCTURAL STEELS - WEATHER RESISTANT	7668				2004			77.140.70	
819 (b)	STRUCTURAL STEELS - REQUIREMENTS		10210		1	2006			77.140.75	
819 (c)	STRUCTURAL STEELS - STEEL PLATES ABOVE 3 mm		10029			2010			77.140.50	
819 (d)	STRUCTURAL STEELS - WELDABLE		10025		1,3,4	2004			77.140.10	
819 (e)	STRUCTURAL STEELS - HIGH YIELD PLATES & FLATS		10025		1, 6+A1	2004			77.140.50	
819 (f)	STRUCTURAL STEELS - IMP. CORROSION RESISTANCE		10025		1,5	2004			77.140.10	
820	CONNECTORS FOR TIMBER		912			2000			21.060.01	
821	STEEL WINDOWS	6510				2005			91.060.50	
822 (a)	GLASS FOR GLAZING - CLASSIFICATION	952			1	1995			81.040.20	
822 (b)	GLASS FOR GLAZING - TERMINOLOGY FOR WORK ON	952			2	1980			01.040.81; 81.040.20	
822 (c)	GLASS FOR GLAZING - TOUGHENED (INC. TESTING)	3193				2008			81.040.30	
822 (d)	GLASS FOR GLAZING-TOUGHENED						1249	12	81.040.20	
823 (a)	STEEL TUBES FOR SCREWING OR WELDING - ALL		10255			2004			77.140.75	

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823 (b)	STEEL TUBES-THREADS FOR PRESSURE TIGHT JOINTS	21				1985			77.140.75	= ISO 7-1:1994 ≠ ISO 7-2:1982
823 (c)	STEEL TUBES FOR SCREWING OR WELDING-MEDIUM						2440		23.040.10	
823 (d)	STEEL TUBES FOR SCREWING OR WELDING-HEAVY						2441		23.040.10	
823 (e)	STEEL TUBES FOR SCREWING-SPECIFIED QUALITY						2442		23.040.10	
824 (a)	FITTINGS TO TUBING - MALLEABLE CAST IRON		10242			1995			23.040.40	
824 (b)	FITTINGS TO TUBING - MALLEABLE CAST IRON	1256				2000			23.040.40	
824 (c)	FITTINGS TO TUBING - MALLEABLE CAST IRON		10242			1995			23.040.40	
824 (d)	FITTINGS TO TUBING - STEEL		10241			2000	2980		23.040.40	
825 (a)	POLYTHENE TUBING-COLD WATER SERVICES		12201		1,2,5	2003			13.060.20; 91.140.60	
825 (b)	POLYTHENE TUBING-COLD W.S. (CONT)		12201		1,2,5	2003			13.060.20; 91.140.60	
825 (c)	POLYTHENE TUBING-HOT & COLD W.S.	7291			1, 3	2001			83.140.30; 91.140.60	
825 (c)	POLYTHENE PIPES-LOW DENSITY-DIMENSIONS						8072		23.040.20	
825 (d)	POLYTHENE PIPES-LOW DENS.-QUALITY & TESTING						8073		23.040.20	
825 (e)	POLYTHENE PIPES-HIGH DENSITY-DIMENSIONS						8074		23.040.20	
825 (e)	POLYTHENE PIPES-HIGH DENS.-QUALITY & TESTING						8075		23.040.20	
826	BRASSWORK & FITT. FOR TAPS & STOPVALVES	1010			2	1973			91.140.60	
827	BALL VALVES FOR CISTERNS (EXC. FLOATS)	1212			3	1990			91.140.60	
828	PLASTIC FLOATS FOR BALL VALVES	2456				1990			91.140.60	
829 (a)	CAST IRON SOIL, WASTE & VENT PIPES PART 1: S & S; PART 2: SOCKETLESS SYSTEMS	416	877+A1		1	1990 1999			23.12; 91.140.30; 91.140.80	
829 (b)	C. IRON SOIL, WASTE & VENT PIPES (CONT)						19522	1, 2	23.040.10	
830	GALVANIZED STEEL HOT & COLD WATER TANKS	417			2 cl A	1987			91.140.60	
831	ENAMELLED CAST IRON BATH	1189				1986			91.140.70	
832	PILLAR TAPS (SPRAY TAPS)	5388				1976			91.140.60	
833 (a)	GLAZED VITREOUS CHINA W.C. PAN		37, 33, 997			1999			91.140.70	
833 (b)	GLAZED VITREOUS CHINA W.C. PAN (CONT)						1381		91.140.70	
834	HINGED PLASTIC SEAT TO W.C. PAN	1254				1981			91.140.70	
835 (a)	GLAZED VITREOUS CHINA LAVATORY BASIN	1188				1974			91.140.70	
835 (b)	GLAZED VITREOUS CHINA LAVATORY BASIN (CONT)		32			1999			91.140.70	
836	METAL SINKS - CAST IRON, PRESSED & STAINLESS STEEL	1244			1	1956			91.140.70	
837 (a)	WASTES - PLASTICS 'S' AND 'P' TRAPS		274		1,2,3	2002			91.140.70	
837 (b)	WASTES - MATERIALS & DIMENSIONS		274		1,2,3	2002			91.140.70	
839 (a)	FIBRE/CEMENT DRAIN PIPES & FITTINGS		588		1	1997			91.140.80	
839 (b)	FIBRE/CEMENT DRAIN PIPES & FITTINGS-DIMENSIONS						19850	1	23.040.50	
840 (a)	CONC. DRAIN PIPES - NON PRESSURE-PRESTRESSED	5911+A1			5	2004			23.040.50	
840 (b)	CONC. DRAIN PIPES - MANHOLES & SOKAWAYS	5911	1917:2002		3	2002			91.140.80	
840 (c)	CONCRETE DRAIN PIPES - ROAD GULLEYS	5911+A1			6	2004			93.080.30	
840 (d)	CONCRETE DRAIN PIPES - OGEE	5911			110	1992			23.040.50	
841	PITCH FIBRE DRAIN PIPES	2760				1973			23.040.50	
842 (a)	CAST IRON DRAIN PIPES	437				2008			91.140.80	
843	JOINTING COMPOUND FOR C.I. DRAIN PIPES	6956			5	1992			91.140.10; 91.140.40; 91.140.60	
844	C.I. S. & S. DRAIN PIPES & FITTINGS	437				2008			91.140.80	
845 (a)	STEP-IRONS TO MANHOLES & SEPTIC TANKS		13101			2002			13.060.30; 93.010	
845 (b)	STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT)						1211	1, 2	97.145	
845 (c)	STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT)						1212	1, 2	97.145	
845 (d)	STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT)						1264	2	97.145	

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846 (a)	C.I. MANHOLE COVERS & FRAMES		124			1994			93.080.30	
846 (b)	C.I. MANHOLE COVERS & FRAMES (CONT)						4271	1, 2, 3	93.080.30	
846 (c)	C.I. MANHOLE COVERS & FRAMES (CONT)						19596		93.080.30	
847 (a)	LADDERS-STEEL- FOR PERMANENT ACCESS	4211				1994			65.040.20; 97.145	
847 (b)	LADDERS-STEEL- FOR PERMANENT ACCESS (CONT)	5395			3	1985			91.060.30	
847 (c)	LADDERS- FOR PERMANENT ACCESS (CONT)						18799	1, 2	97.145	
848	HANDRAILING IN & ABOUT BUILDINGS	6180				1999			91.060.99	
849 (a)	FENCING - METAL	1722			1, 2, 3, 8, 9, 10, 12, 14, 16	various			91.090	
849 (b)	FENCING - WOOD	1722			4, 5, 6, 7, 11	1986			91.090	
850 (a)	FLOORING, WALKWAYS; TREADS - STEEL (EXP. METAL)	4592			0, 2	2006			91.060.30	
850 (a)	FLOORING, WALKWAYS; TREADS - STEEL (EXP. METAL) - CONT		14122+A1		1,2,3,4	2010			91.060.30	
850 (b)	FLOORING, WALKWAYS; TREADS - SOLID PLATE	4592			0,5	2006			91.060.30	
850 (b)	FLOORING, WALKWAYS; TREADS - SOLID PLATE (CONT)	14122			1,2,3,4	2010			91.060.30	
851	MASTIC ASPHALT FOR ROOFING	6925				1988			75.140	
852	ALUMINIUM FOR LOUVRE WINDOWS	1161				1977			77.150.10	
853 (a)	FIXING ACCESSORIES FOR BUILDING PURPOSES	1494			1	1964			21.060.01; 91.060.10; 91.060.20	
853 (b)	FIXING ACCESSORIES FOR BUILDING PURPOSES	1494			2	1967			21.060.01	
854 (a)	PRECAST CONCRETE INSPECTION CHAMBERS	5911+A2	1917		4	2002			91.140.80	
854 (b)	PRECAST CONCRETE MANHOLES-COMPONENTS FOR						4034	1, 10	93.030	
855 (a)	PRECAST CONCRETE KERBS, CHANNELS & FLAGS - SPEC:		1339			2003			91.100.30	
855 (b)	PRECAST CONCRETE KERBS & CHANNELS - LAYING	7533			4	2006	483		93.080.20	
856 (a)	WATERPROOF BUILDING PAPERS-WALLS & ROOFS	1521			class A	1972			91.100.99	
856 (b)	WATER PROOF BUILDING PAPERS-BITUMEN-TESTING						52123		91.100.50	
856 (c)	WATER PROOF BUILDING PAPERS-PLASTIC ROOFING						16726		91.100.50	
856 (d)	WATER PROOF BUILDING PAPERS-BITUMIN. ROOFING						52128		91.100.50	
856 (e)	WATER PROOF BUILDING PAPERS-PVC-FIBRE R/F						16734		91.100.50	
857	METAL TIES FOR CAVITY WALL		845+A1		1	2003			91.060.10; 91.080.30	
858	A/C BUILDING PRODUCTS-TESTS	WITHDRAWN								
859	PRECAST CONCRETE FLAGSTONES	7263			1,3	2001			91.100.30	
860 (a)	ASBESTOS CEM. RAIN WATER GOODS	WITHDRAWN								
860 (b)	ASBESTOS CEM. RAIN WATER GOODS (CONT)	WITHDRAWN								
861	LINTELS - PREFABRICATED	1239	845		2	2003			91.060.10; 91.080.01	
862	uPVC SOIL AND VENT PIPES FITTINGS ETC.		1329		1	2000			83.140.30; 91.140.80	
862	uPVC SOIL AND VENT PIPES FITTINGS ETC.	4514				2001			65.060.35	
863	STRUCTURAL STEEL IN BUILDINGS		1993		1-1,1-5, 1-10, 5, 6, 1-8	1969			91.080.10	
864	PROTECTIVE BARRIERS IN & ABOUT BUILDINGS	6180				1999			91.060.99	
865	BUILDINGS-SURFACE REPAIR OF CONCRETE	8221			1,2	2000			91.040.01	
866 (a)	BITUMEN FOR BUILDINGS & CIVIL ENG .- ROADS		12591			2009			75.140	
866 (a)	BITUMEN FOR BUILDINGS & CIVIL ENG .- ROADS (CONT)		13924			2006			75.140	
866 (b)	BITUMEN FOR BUILDINGS & CIVIL ENG. - INDUSTRIAL USE	3690			2	1989			75.140	
866 (c)	BITUMEN FOR BUILDINGS & CIVIL ENG. - MIXTURES	WITHDRAWN								
867 (a)	SOLAR WATER HEATERS-DOMESTIC	5918				1989			27.160	AS 2813-85
867 (b)	SOLAR WATER HEATERS - ELASTOMERIC MATERIALS	7431				1991			27.160; 83.060	= ISO 9808:1990
868	FLOORING INITIAL TREATMENT/MAINTENANCE	6263			2	1991			91.060.30	

BUILDING WORKS

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
869	RIGID FLAT SHEET BUILDING MATERIALS									ISO 2777: 1974
870 (a)	DRAINS & SEWERS - HDPE PIPES - HEAT RESISTANT	No British Standard					19535	1, 2	23.040.20	
870 (b)	DRAINS & SEWERS-HDPE PIPES-DIMENSIONS						19537		23.040.20	
871 (a)	CONCRETE STRUCTURES - REPAIR OF - DEFINITIONS		1504		1, 2, 3	98/04/05			91.080.40	
871 (a)	CONCRETE STRUCTURES-REPAIR OF-TESTS-POLYMERS		1543			1998			91.080.40	
871 (a)	CONCRETE STRUCTURES-REPAIR OF-TESTS-EXPANSION		1770			1998			91.080.40	
872	NAILS - STEEL	1202			1	2002			21.060.50	
873	PIPE WRENCHES	3594			1, 2	1963/65				
874 (a)	GEOTEXTILE-QUALITY, TENSILE STRENGTH, ELONGATION								59.080.70	ISO 10319:2008
874 (b)	GEOTEXTILE-PUNCTURE RESISTANCE		12236			2006			59.080.70	≡ ISO 12236;2006
875 (a)	GEOGRID-QUALITY, TENSILE STRENGTH		10319			2008			59.080.70	≡ ISO 10319:2008
876 (b)	GEOGRID-CREEP LIMITED TENSILE STRENGTH		13431			1999			59.080.70	≡ ISO 13431:1999
877 (c)	GEOGRID-JOINT STRENGTH		10321			2008			59.080.70	≡ ISO 10321:2008
878 (d)	GEOGRID-SITE PARTIAL FACTORS (CODE OF PRACTICE)	8006			1,2	2010/11			93.02	
879	CERAMIC TILES		14411			2012			91.100.23	
880	CONCRETE KERB UNITS - REQUIREMENTS		1340			2003				
881	CODE OF BASIC DATA FOR DESIGN OF BUILDINGS									(CP 3)

≠: related but not equivalent to BS =: technically equivalent to BS ≡: identical to BS

METALWORK

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
900	ZINC SPRAY PROTECTION		2063	2063		2005			25.220.20	
900	ZINC SPRAY PROTECTION (CONT)					2010	55634		91.080.10; 77.060	
901	METALLIC ZINC RICH PRIMER	4652				1995			87.040	
902	COLOUR OF FINISH (BUILDING MATERIALS)	4800				2011			87.040	
903 (a)	HOT DIP GALVANIZING ON IRON & STEEL	729	1461	1461		1999			25.220.40	
903 (b)	HOT DIP GALV. ON IRON & STEEL (CONT)		12944 & 14713		1, 2, 3, 4, 5, 6, 7, 8	Various	50978		25.220.01; 91.080.10	
904 (a)	BLACK BITUMEN COAT. (COLD APP) - WATER TANKS	3416				1991			25.220.60	
904 (b)	BLACK BITUMEN SOL. (COLD APP)-M. TANKS						See DVGW			DVGW-GWS
905 (a)	STRUCTURAL STEELS - WEATHER RESISTANT	7668				2004			77.140.70	
905 (b)	STRUCTURAL STEELS - REQUIREMENTS		10210		1, 2	2006			77.140.75; 77.140.70	
905 (c)	STRUCTURAL STEELS - STEEL PLATES ABOVE 3 mm		10029 & 10286			2010			77.140.50	
905 (d)	STRUCTURAL STEELS - WELDABLE		10025		1, 3, 4	2004			77.140.10	≠ Pt 1:ISO 4950-1:1995;
905 (e)	STRUCTURAL STEELS - HIGH YIELD PLATES & FLATS		10025		1, 6	2004			77.140.50	
905 (f)	STRUCTURAL STEELS - IMP. CORROSION RESISTANCE		10155		1, 5	2004			77.140.10	≠ ISO 4952:2006
906	CLASSIFICATION OF GREY CAST IRON		1561			2011			77.140.80	
907	BEARING DESIGN LIFE	No British Standard								AGMA ST 510
908 (a)	BITUMEN HOT APPLIED - COATS TO IRON & STEEL		10300			2005			25.220.60	
908 (b)	BITUMEN HOT APP. - COATS TO IRON & STEEL (CONT)		12944 & 14713		1, 2, 3, 4, 5, 6, 7, 8	Various	50978		25.220.01; 91.080.10	
909	PRESSED STEEL RECTANGULAR TANKS	1564 & AMD 4150				1975			23.020.10	
910	FOUNDING. GREY IRON CASTINGS		1561		grade 10	2011	1686	1	77.140.80	
911 (a)	FOUNDING. MALLEABLE CAST IRON		1562			2012	1684	1	77.140.80	
911 (b)	MALLEABLE CAST IRON (CONT)									ASTM A 47-77
912	STEEL PLATES-HOT ROLLED-3mm & ABOVE		10029 & 18286			2010			77.140.50	
913 (a)	STRUCTURAL STEEL - HOT ROLLED SECTIONS	4			1	2005	1025	1, 5	77.140.70	
913 (b)	STRUCTURAL STEEL - HOT ROLLED SECTIONS (CONT'D)		10025		2	2005			77.140.70	= AS/NZS 3679.1 Grade 250
914	ISO METRIC BLACK HEX. BOLTS, SCREWS, NUTS	4190				2001			21.060.10; 21.060.20	= ISO 272; ISO 885; ISO 888; ISO 4759/1
915	SIZES FOR FERROUS & NON FERROUS BARS	6722				1986			77.140.01; 77.150.01	
916	FOUNDING. MEEHANITE IRON, GRADE E		1561		grade 14	2011			77.140.80	ASTM A 48, No.308
917 (a)	CORROSION PROTECTION - STEEL STRUCT.-CP		12944 & 14713		1, 2, 3, 4, 5, 6, 7, 8	Various			25.220.01; 91.080.10	
917 (b)	CORROSION PROTECTION-S. STRUCT.-PAINT		12944		1, 2, 3, 4, 5, 6, 7, 9	Various	EN ISO 12944:1-8		91.080.10	
918 (a)	PRIMARY ZINC		1179			2003			77.120.60	
918 (b)	FOUNDING. ZINC & ZINC ALLOYS		1774			1998			77.120.60; 77.150.60	
919 (a)	WELDING OF STEELS - ARC		1011		2	2001			25.160.10	
919 (a)	WELDING OF STEELS - ARC (CONT)		1011		1	1998			25.160.10	
919 (b)	WELDING OF STEELS-WELDABILITY-FUSION						8528	1, 2	25.160.10	
919 (c)	WELDING OF STEELS-JOINING OF PLATE						8553		25.160.10	
919 (d)	WELDING OF STEELS-WELDING OF VESSELS						8562		25.160.10	
919 (e)	WELDING OF STEELS-STRUCTURES-SUITABILITY FOR						18800	7	25.160.10	
920 (a)	STEEL PLATE, SHEET & STRIP - GENERAL	1449			1-1.1	1991			77.140.50	
920 (b)	STEEL PLATE, SHEET & STRIP - COLD ROLLED		10268			1999			77.140.50	≠ EN 149

METALWORK

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
920 (c)	STEEL PLATE, SHEET & STRIP - HOT ROLLED	1449			1-1.14	1991	1614	1	77.140.50	
920 (d)	STEEL PLATE, SHEET & STRIP - COLD ROLLED		10132		1,2,3	2000			77.140.50	
920 (e)	STEEL PLATE, SHEET & STRIP - COLD ROLLED		10268			1999			77.140.50	≠ EN 149
920 (f)	STEEL PLATE, SHEET & STRIP - HOT ROLLED	1449			1-1.8	1991			77.140.50	≠ EN 46
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10029			1991			77.140.50	
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10259			1997			77.140.50	
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10258			1997			77.140.50	
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10048			1997			77.140.50	
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10095			1999			77.140.50	
920 (g)	STEEL PLATE, SHEET & STRIP - STAINLESS		10051+A 1			1992/19 97			77.140.50	
920 (h)	STEEL PLATE, SHEET & STRIP - CONT. HOT ROLLED		10051+ A1			1992/19 97			77.140.50	
920 (i)	STEEL FLAT - HIGH YIELD - COLD ROLLED		10131			2006			77.140.50	
920 (j)	STEEL FLAT-COLD ROLLED FOR VITREOUS ENAMELLING		10209			1996			77.140.50	
920 (k)	STEEL FLAT - HOT ROLLED OF HIGH YIELD		10149		1, 2, 3	1996			77.140.50	
921 (a)	ELECTROP. COATINGS - THREADS - CADMIUM/ZINC ON STEEL	7371			12	2008			21.060.01; 25.220.40	
921 (b)	ELECTROP. COATINGS - THREADS - NICKEL ON STEEL OR COPPER	7371			12	2008			21.060.01; 25.220.40	
921 (c)	ELECTROP. COATINGS - THREADS - TIN ON COPPER	7371			12	2008			21.060.01; 25.220.40	
922	ELECTROP. COATINGS - THREADS - THICKER PLATINGS	7371			12	2008			21.060.01; 25.220.40	
923	ISO METRIC SCREW THREADS	3643			1, 2	2007			21.040.10	
924	ISO M. PRECISION HEX. BOLTS, SCREWS, NUTS	3692				2001			21.060.10; 21.060.20	
925	METAL WASHERS FOR GENERAL ENGINEERING	4320				1968			21.060.30	= ISO 887:1983
926	PAINTS FOR STEEL STRUCT. - POLYURETHANE	No British Standard								AAS 2602:83 2603:83
927	SHEAR TEST FOR METALS	No British Standard					50141		77.040.10	
928	WELDED STEEL TANKS FOR OIL STORAGE	799			5	2010			23.020.10	APS 650
929 (a)	LIFTING APPLIANCES- O'HEAD TRAVEL'G CRANES	466				1984			53.020.20	= ISO 4301/1 EQV; ≠ ISO 8306 NEQ
929 (b)	LIFTING APPLIANCES- O'HEAD TRAVEL'G CRANES									ISO 7752-5:1985
930	HIGH STRENGTH FRICTION GRIP (HSFG) BOLTS - PART 1: GENERAL GRADE PART 2: HIGHER GRADE	4395			1, 2	1969			21.060.01	= ISO 225; ISO 272; ISO 885; = ISO 888; ≠ ISO 887; ASTM A 325
931	ELECTRODES FOR MANUAL ARC - WELDING		2560	2560		2005			25.160.20	
932	PHOSPHATE TREAT. OF STEELWORK		12476			2000			25.220.20	
933 (a)	BLAST CLEANING PRIOR TO PAINTING	7079	12944		4	Various	EN ISO 12944	4	25.220.10; 87.020	
933 (b)	BLAST CLEANING PRIOR TO PAINTING		8501	8501	1	2001			17.040.20; 25.220.10; 87.020	
933 (c)	BLAST CLEANING PRIOR TO PAINTING	7079			A1 Supl. 1	1996			17.040.20; 25.220.10; 87.020	≡ ISO 8501-1:1988: Info Supp. of 1994
934	SHERARDIZED COATINGS	4921				1988			25.220.40	
935 (a)	GALVANISED STEEL ROOFING SHEETS	3083				1988			77.140.50	KS 06-02 Part II
935 (b)	GALVANISED STEEL ROOFING SHEETS						59231		77.140.70	
935 (c)	GALVANISED COATINGS ON IRON AND STEEL ARTICLES		1461	1461		1999				
936	WROUGHT AND STAINLESS STEEL- INSPECTION & TESTING		10250		1	2000	17440	:1.4021	77.140.20	
936 (a)	BRIGHT STEEL PRODUCTS		10277		1 to 5	2008			77.140.60	
936 (b)	STAINLESS STEEL						17440	:1.4404	77.140.20	
936 (c)	STAINLESS STEEL						17440	:1.4301	77.140.20	

METALWORK

SSRN	SUBJECT	BS	BS EN	BS ISO	PART	YEAR	DIN	PART	ICS No	OTHER
936 (d)	BRIGHT STEEL PRODUCTS - DIMENSIONS AND TOLERANCES		10278			1999				
937	PREPARATION OF STEEL - BLAST CLEANING		8503	8503	C-C1 to C4	2012			25.220.10	
938	HEXAGON HEADED BOLTS- GRADES A & B			4014		2001			21.060.10	
939	HEXAGON NUTS- GRADES A & B			4032		2001			21.060.20	
940	DUCTILE IRON CASTINGS		1564			2011			77.140.80	
941 (a)	BRASS FOR NUTS	1981				1991			21.060.10; 21.060.20	
941 (b)	BRASS FOR NUTS (CONT)						17660	:2.0380	77.150.30	
942	ALUMINIUM BRONZE FOR GENERAL PURPOSES - NUTS		12167			2011			77.150.30	
943	USE OF HSFG BOLTS IN STRUCTURAL STEELWORK		1993		1 - 8	2005			21.060.10; 91.080.10	
944	STRUCTURAL USE OF STEELWORK IN BUILDINGS - MATERIALS, FABRICATION & ERECTION	(5950)	1994-1		2 1	2001 2004			13.220.50; 91.080.10	
945	TESTING OF ZINC COATING ON STEEL WIRE		10244		2	2001			25.220.40	
946	EXTERNAL CORROSION OF BURIED METALLIC PIPELINES AND STRUCTURAL COMPONENTS					1985	50929	3	77.06	
947	HOT DIP GALVANIZING									ASTM B852 - 12, AS 4680

≠: related but not equivalent to BS =: technically equivalent to BS ≡: identical to BS
( ) superceded & replaced as show n [ ] obsolecent or replaced as show n but remains current

4142 PART 2

4143 PROCUREMENT ENTITY'S REQUIREMENTS

4144 : BILLS OF QUANTITIES

4145 PART 2 - PROCUREMENT ENTITY'S REQUIREMENTS

4146 SECTION VI – BILLS OF QUANTITIES

4147 A PREAMBLE AND NOTES TO BILLS OF QUANTITIES

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

interim payments shall be subject to the retention stipulated in the Contract Documents.

10. During construction the unit rate established for an item in one Bill of Quantities may be used as a basis for establishing a unit rate for similar work in another Bill of Quantities which contains no such item. No additional cost will be considered for such an eventuality.

11. The Contractor will be provided by the Employer with all that land occupied by the Permanent Works including the specified working width for pipe laying and other permanent construction works. The costs of compensation and entry upon land (if any) for the specified working width will be paid by the Employer. All other costs for temporary access to the works or additional working space shall be paid by the Contractor.

12. It shall be the responsibility of the Contractor to arrange for the removal of, or alteration to existing services where necessitated by the Works. Costs incurred will be paid under relevant items in the Bills of Quantities.

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

14. The rates for excavation items shall be deemed to include inter alia for setting aside spoil for reuse in the Works or disposing to approved tips identified by the Contractor in liaison with the Local Authority, except where otherwise provided for in the Bills of Quantities.

15. Generally, excavation items are based on volumes for structures and on linear measurements for certain pipelines. The work may be covered by one or more items. The rates shall include as appropriate for:-

    a) Breaking through surfaces, handling different classes of material separately; excavation beyond the net plan area of the foundations, for working space and for battering or timbering etc.

    b) Timbering

    c) Dealing with water from any source whatsoever

    d) Backfilling as specified

    e) Disposal of surplus spoil

    Measurement of volume of excavation for structures shall be net calculated from the plan dimensions of the structure.

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

    Items are included for "Extra Over for Rock" on a volume basis. The rates shall include for breaking out and for any other additional costs and the items shall apply to work encountered within measured excavation. Different classifications have been billed separately. Rock shall be measured as a volume calculated from the thickness encountered within the plan area of a mass excavation, within the plan dimensions of a structure, or within the nominal width of a trench. The decision of the Engineer's

Representative on the classification of rock encountered in excavation shall be final and binding. Note: Any excavation of murram in whatever form will be taken as common excavation.

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

16. When the site of any particular item of the Works has been sufficiently cleared of trees, undergrowth etc. and before any excavation or filling has been carried out, the Contractor shall carry out a survey under the supervision of the Engineer's Representative to take, record and agree upon an adequate number of original ground levels. The data so obtained shall be used as a basis for the computation of excavation and filling. If for whatever reason the Contractor commences excavation without taking levels, the Engineer's Representative's decision on the original ground levels to be used for computation will be final.
17. The volume of fill will be measured net to the finished levels as shown on the drawings or as amended by the Engineer.
18. The rates for concrete shall include for provision and mixing of all components- cement, sand, aggregate and water as specified, placing the concrete at the required locations, making and testing concrete cubes and slump tests and forwarding the results to the Engineer's Representative. Testing to be carried out by a Test Laboratory approved by the Engineer.
19. The rates for precast concrete paving shall include for all cutting, bedding, jointing and laying to falls.
20. The rates for precast concrete edging and kerbs shall include for formwork, concrete bed and backing, all cutting, jointing and laying.
21. All formwork must be cleaned and oiled prior to use. All exposed concrete edges shall have a 20mm chamfer unless otherwise directed. The formwork rates shall also be inclusive of all necessary box outs and cut outs for individual holes up to 1 square metre.

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

    Deductions from formwork quantities will be made for openings more than 1 square metre in area.
22. Formwork for upper surfaces inclined at 30 degrees or less to the horizontal is not measured and the cost of any such formwork used will be deemed to be included in the relevant concrete item rate.
23. Wrought formwork where specified will be measured to 150mm below final ground levels.
24. Items required for Structural Joints and Construction Joints shown on drawings shall be paid for as per the rates in the Bills of Quantities; the rate for providing and fixing PVC water bar is deemed to be inclusive of all joints, overlaps, junctions, welding, etc. formwork not shown on drawings shall be deemed to be included in the unit rates for concrete work.
25. All rates and sums in the Bills of Quantities shall be in the stated currencies.
26. If possible a construction wayleave of up to 10m for the Transmission Mains and

construction wayleave of up to 3m for Distribution Mains will generally be allowed. In the event the above mentioned wayleave widths are not available due to obstructions or restricted access, the Contractor will execute the works using suitable approved alternative methods. The costs for alternative methods are deemed to be covered by tender rates. No additional costs will be allowed.

Payment for site clearance will be based upon this width except that the Engineer's Representative reserves the right to restrict this width due to the presence of obstructions, roads, houses, footpaths, boundary walls, fences, trees and the like. Payment shall then be according to the actual area cleared. In case additional space is required this may be made available by the Contractor at his own cost.

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

27. All pipe diameters indicated in the Bills of Quantities and on Drawings are nominal. Fittings dimensions to suit size/type of pipes supplied by the Bidder and Bidder's rates are deemed to allow for this. No additional cost adjustment will be allowed.

    Nominal bore, also referred to as nominal diameter, and refers to the (nominal) inside diameter of pipes in mm independent of the pipe material. In case of uPVC or HDPE pipes and fittings, the diameter can also be given with O.D. (=outside diameter) which is bigger than the related nominal diameter.

28. All quantities have been measured in Metric Units.

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

L.S.	-	Lump Sum
P.S.	-	Provisional Sum
P.C.	-	Prime Cost
E.O.	-	Extra Over
Avg.	-	Average
Max.	-	Maximum
Min.	-	Minimum
n.e.	-	Not Exceeding
nr	-	Number
mm	-	Millimetre
m	-	Linear Metre
m^2	-	Square Metre
m^3	-	Cubic Metre
Ha.	-	Hectare
Drg.	-	Drawing
Kg.	-	Kilogramme
H.T.	-	High Tensile
M.S.	-	Mild Steel
B.L.	-	Bitumen Lined
Dia.	-	Diameter

E.C.	-	Epoxy Coated
E.L.	-	Epoxy Lined
S & S	-	Socket & Spigot
C.L.	-	Cement-mortar Lined
C.I.	-	Cast Iron
D.I.	-	Ductile Iron
uPVC	-	Unplasticised Polyvinyl Chloride
G.I.	-	Galvanized Iron
G.M.S.	-	Galvanized Mild Steel
PE	-	Polyethylene
HDPE		High Density Polyethylene
h	-	Hour
FE/Fe	-	Ferrous
wk.	-	week
mth	-	month
h.	-	Hour

30. The rates for metalwork shall include for bolts, nuts, washers and rag-bolts, fixing as specified or in accordance with the manufacturer's instructions and rectifying as specified any parts of the painted, coated or galvanized surface that may be damaged either before or after erection.

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

Shop Drawings

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

Prime Cost Items

33. Attendance on nominated Sub-Contractors shall include for all or any of the following as appropriate - labour, materials and plant required for taking delivery, carting, storing, hoisting and builder's work entailed in fixing, erecting and installing as specified or in accordance with the manufacturer's instructions and all overheads and profits.

34. When, in the opinion of the Engineer, it is reasonable to expect the Contractor to price the attendance item it will be so included in the Bills of Quantities. In all other cases it will form the subject of a Provisional Sum to be expended on a Day-works basis.

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

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

37. Definitions of Terms used in Bill of Quantities

a) **'Provide'** - shall mean all costs to cover purchase of materials in good condition, services for transaction with the supplier, supervision, transport to site of works all charges for rental, consumptions, overheads and profits throughout the Contract. It shall also include for all maintenance, insurance and handling and storage whenever applicable.

b) **'Excavate for'** - shall mean handling of any material from its incumbent position intended for specified work shown in the drawings or directed by the Project Manager and backfilling and compacting part of material after laying of pipes or erection of structures, and cart away remaining to tips to be provided by the Contractor. The cost for this work shall include all survey, supervision, labour, tools, machinery, protection of work, pumping, insurances and overheads and profits.

c) **'Laying'** - shall cover all work necessary for placing an object or material to true line and level specified in a drawing or as directed by the Engineer.

d) **'Jointing'** - shall mean process of fixing specified material, pipes, fittings and specials together using appropriate tools, material, labour and machinery. It should cover for all work necessary to provide matching of opposite parts in size, shape and position indicated and clamps, seatings and holders to hold firmly.

e) **'Testing'** - shall mean provision of all materials, apparatus, labour, machinery, charges for the media or chemical to be used and their transport, repair of object to be tested if required, re-testing, excavation of any part for visual inspection, erection of any type all until the object has been certified as having passed the required test satisfactorily.

f) **'Install'** - shall include for all work requirements stipulated for "laying" and "jointing". It will cover all expenses for the provision of labour, materials, removal from stores, complete erection, installation, supervision, site testing and commissioning as per the Specifications.

38. The unit rates for the various items listed in the BOQ shall include, except insofar as it is otherwise provided under the Contract, all labour, construction equipment, materials, erection, maintenance, supervision, insurances etc. set forth or implied in the Contract. These are all deemed to include all allowances for waste or surplus of any kind, which are not subject to measurement.

4148 B **BILLS OF QUANTITIES**

PROPOSED CONSTRUCTION OF 500M^3 ELEVATED PRESSED STEEL TANK

KISUMU AOD PROJECT

AID ON DELIVERY PROJECT		
PROPOSED CONSTRUCTION OF 500M3 ELEVATED PRESSED STEEL TANK		
1	CLASS X: OTHERS	
	Sub-total 1	
	Add 2% of the Sub total-1 BoQ for project Administration (Accompanying measures)	
	Add 5% Contingency	
	Subtotal 2	
	Add 16% VAT	
	GRAND TOTAL BOQ	

AID ON DELIVERY PROJECT

PROPOSED CONSTRUCTION OF 500M3 ELEVATED PRESSED STEEL TANK

Item No	Item Description	Unit	Quantity	Rate (Kshs)	Amount (Kshs)
	CLASS X: OTHERS				
	STEEL TANK				
X1	Excavation in all materials for tower foundations, including removal of surplus excavated material, levelling and preparation of ground to receive the 15 m high steel tower bases.	m3	180		
X2	Supply, fabrication, delivery, surface preparation, painting, and erection on the prepared 15 m high steel tower of one (1 No.) 496.5 m^3 pressed sectional steel water tank, dimensions 12.21 m × 12.21 m × 3.33 m high, with 5 mm thick bottom panels and 4 mm thick upper panels, including internal bracing, roof cover, manhole with bolted cover, water level indicator, inlet, outlet, overflow and drain nozzles with flanges, all necessary fittings, gaskets, high tensile bolts, nuts, washers and seals, joint sealing and hydrostatic testing.	sum			
X3	Supply, fabrication, delivery, surface preparation, painting, and erection of one (1 No.) 15 m high painted steel tower suitable to support the 496.5 m^3 water tank when full, including main columns, beams, horizontal and diagonal bracings, base plates, 610 mm wide walkway with 900 mm high hand-railing, and access ladder with safety hoops.	sum			
	TOTAL CARRIED TO SUMMARY				

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

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ACRONYMS AND ABBREVIATIONS

AC	Asbestos Cement
AIC	Africa Inland
Church AoD	Aid on
Delivery	
BoQ	Bill of Quantities
CBD	Central Business District
CCCR	County Council Community Residence
CGK	County Government of Kisumu
CIDP	County Integrated Development Plan
DMA	District Metered Areas
DN	Nominal Diameter
DOSH	Directorate of Occupational Safety and Health
DTI	Dairy Training Institute
EHS	Environmental Health and Safety
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management Coordination Act
ESMP	Environmental and Social Management Plan
ERP	Enterprise Resource Planning
ESIA	Environmental and Social Impact Assessment
GDC	Geothermal Development Corporation
GI	Galvanized Iron
GPS	Geographical Positioning System
HDPE	High Density Polyvinyl Chloride
KENHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KII	Key Informant Interviews
KCC	Kenya Cooperative Creameries
KM	Kilometer

KPLC	Kenya Power and Lightening Company
KWS	Kenya Wildlife Services
KURA	Kenya Urban Roads Authority
LR	Land Reference
Lcd	Litres per capita per day
MWS&I	Ministry of Water, Sanitation and Irrigation
NCA	National Construction Authority
KIWASCO	Kisumu Water and Sanitation Company
NAREDA	Natural Resources Management and Development Agency
NEAPC	National Environment Action Plan Committee
NEC	National Environment Council
NEMA	National Environmental Management Authority
NRW	Non-Revenue Water
OHS	Occupational Health and Safety
PHC	Population and Housing Census
PPE	Personal Protective Equipment
PPG	Personal Protective Gear
PPR	Polypropylene Random Polymer
RAP	Resettlement Action Plan
RC	Reinforced Concrete
SERC	Standards and Enforcement Review Committee
SES	Stakeholder Engagements
SESS	Supervision Environmental and Social Specialist
SPA	Service Provision Agreement
WASH	Water Sanitation & Hygiene
UPVC	Unplasticized Polyvinyl Chloride
WSP	Water Services Provider
WASREB	Water Services Regulatory Board
WRA	Water Resources Authority

WRUA	Water Resource Users Association
WSTF	Water Sector Trust Fund
WIBA	Worker Injury Benefits Act
WSPs	Workplace Safety & Prevention Services
WWS	Water Works Station

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The Environmental Management Plan (EMP) has been developed to assist in providing necessary mitigation actions and allocating responsibilities and the estimated cost of implementation. Environmental monitoring provides feedback about the actual environmental impacts of a project.

From EMP, a schedule for the project implementation could also be drawn that takes into consideration all issues that could develop into serious risks to environment, health and safety during construction and operational phases.

Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards.

The key aspects of the environmental management plan are based on the following:

- Environmental policy
- Nature and scale of operations,
- Pollution prevention strategies,
- Legal compliance,
- Employees' involvement

10.1 Objectives of the ESMP

- Encourage good management practices through planning and commitment to environmental issues concerning any project
- To provide rational and practical environmental guidelines that will assist in minimizing the potential environmental impact of activities;
- Comply and adhere to all applicable laws, regulations, standards and guidelines for the protection of the environment
- Train and bring awareness to employees and contractors with regard to environmental obligations and compliance.
- Increase efficiency through minimum consumption and conservation of energy deplete-able resources
- The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactorily prevented or mitigated, corrective action will have to be taken.

- Reduce environmental risk and provide better Health, Safety and Environment (HS&E)

10.2 Resources, roles, responsibilities and authority

10.2.1 KIWASCO

The KIWASCO will be the Project Proponent and together with the Consultant will have the following roles

a. Overall supervision of the project

b. Approve the Environmental and Social Management Plans

c. Ensure the works are conducted according to the Board's sustainability principles

d. Conduct periodic inspections or audits of the project to ensure compliance to Kenyan laws and regulations and the KFW/World Bank policies are upheld

10.2.2 Supervision Environmental Representative

The Supervision Environmental Representative (SER) will be part of the Resident Engineer's (RE) staff. The SER will be suitably qualified and experienced and independent of the client and the contractor.

The responsibilities of the Environmental Representative (SER) include:

a. Be the principal point of advice in relation to the environmental performance of the project

b. Be consulted in responding to the community concerning the environmental performance of the project where the resolution of points of conflict between the project and the community is required

c. Monitor the implementation of environmental management plans and monitoring programs required under the project approval

d. Monitor the outcome of environmental management plans

e. Have responsibility for considering and advising the client on matters specified in the conditions of NEMA approval, and other licenses and approvals related to the environmental performance and impacts of the project

f. Ensure that environmental auditing is undertaken in accordance with the requirements of NEMA and the project's environmental management system

g. Be given the authority to approve / reject minor amendments to the contractor's Construction Environmental Management Plan (CEMP), and

h. Having the authority and independence to require reasonable steps be taken to avoid or minimize unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.

i. Review and approve environmental management plans and related documents prepared for the Project

j. Review minor Project refinements that are consistent with the Project environmental assessment and approval documentation and recommend they be approved by the Client

k. Monitor the environmental performance of the Project in relation to NEMA license conditions and the ESIA recommendations

l. Evaluate and advise on compliance with RMS environmental requirements

10.2.3 The Project Manager

The environmental responsibilities of the Project Manager include:

a. Ensure all works comply with relevant regulatory and Project requirements

b. Ensure the requirements of this ESMP are fully implemented, and in particular, that environmental requirements are not secondary to other construction requirements

c. Endorse and support the Project environmental policy

d. Liaise with other government authorities as required

e. Participate and provide guidance in the regular review of this ESMP and supporting documentation

f. Provide adequate resources (personnel, financial and technological) to ensure effective development, implementation and maintenance of the ESMP

g. Ensure that all personnel receive appropriate induction training, including details of the environmental and community requirements

h. Ensure that complaints are investigated and issues raised resolved in accordance with Complaints and Enquiries Procedure

i. Stop work immediately where there is an actual or potential risk of harm to the environment

10.2.4 Construction Site Manager

The environmental responsibilities of the Construction Manager include:

a. Plan construction works in a manner that avoids or minimizes impact to environment

b. Ensure the requirements of this ESMP are fully implemented

c. Ensure construction personnel manage construction works in accordance with statutory and approval requirements

d. Ensure environmental management procedures and protection measures are implemented

e. Ensure all project personnel attend an induction prior to commencing works

f. Liaise with SER as required, and

g. Stop work immediately where there is an actual or potential risk of harm to the environment

10.2.5 Construction Superintendent

The environmental responsibilities of the superintendent include:

a. Communicate with all personnel and sub-contractors regarding compliance with the ESMP and site-specific environmental issues

b. Ensure all site workers attend an environmental induction prior to the commencement of works

c. Co-ordinate the implementation of the ESMP

d. Co-ordinate the implementation and maintenance of pollution control measures

e. Identify resources required for implementation of the ESMP

f. Report any activity that has resulted, or has the potential to result, in an environmental incident immediately to the Environmental Manager / Environmental Officers

g. Co-ordinate action in emergency situations and allocate required resources, and

h. Stop activities where there is an actual or potential risk of harm to the environment and advise the Construction Manager and Environmental Manager

10.2.6 Contractor Environment Manager

The environmental responsibilities of the Environmental Manager include:

a. Overall responsibility for the management of environmental aspects of the Project

b. Development, implementation, monitoring and updating of the ESMP and sub plans

c. Report to Project Manager on the performance and implementation of the ESMP

d. Ensure management reviews of the ESMP are undertaken annually, documented and actions implemented

e. Ensure environmental risks of the Project are identified and appropriate mitigation measures implemented

f. Identify where environmental measures are not meeting the set targets and where improvement can be achieved

g. Ensure environmental protocols are in place and managed

h. Ensure environmental compliance

i. Obtain and update all environmental licenses, approvals and permits as required;

j. Manage environmental document control, reporting, inductions and training

k. Manage environmental reporting within the Project team and regulatory authorities

l. Prepare reports on a monthly basis outlining the Project Works undertaken, achievements and areas where improvements were made

m. Oversee site environmental monitoring, inspections and internal audits

n. Manage all subcontractors and consultants with regards to environmental matters, including assessing their environmental capabilities and environmental documents

o. Prepare and/or distribute environment awareness notes

p. Develop and facilitate induction, toolbox talks and other training programs regarding environmental requirements for all site personnel

q. Notify relevant authorities in the event of an environmental incident and manage close-out of these

r. Stop activities where there is actual or potential risk of harm to the environment or to prevent an environmental non-conformance and advise the Project Manager, Construction Manager and Superintendent, and

s. Resolve environment-related complaints

10.2.7 Contractor sociologist

The responsibilities of the sociologist will include:

a. Managing stakeholder engagements throughout the construction period
b. Managing labor relations and compliance with labour laws
c. To play a central role in grievance redress process
d. Acting as a link with the communities
e. The focal point of complaints or comments relating to project activities

10.3 Competence, Training and Awareness

To ensure that the information highlighted under ESMP section is effectively implemented, each level of management is responsible for ensuring that all personnel reporting to them are aware of the requirements of this ESMP. The Environmental Manager will coordinate environmental training in conjunction with other training and development activities.

10.3.1 Environmental induction

All personnel, including sub-contractors, are required to attend a compulsory site induction that includes an environmental component prior to commencement on-site. The Environmental Manager (or delegate) will conduct the environmental component of the site induction. The environmental component will include an overview of:

a. Relevant details of the ESMP including purpose and objectives
b. Key environmental issues, i.e. Protection of the sensitive areas, dust and noise management
c. Conditions of environmental licenses, permits and approvals
d. Specific environmental management requirements and responsibilities
e. Mitigation measures for the control of environmental issues
f. Incident response and reporting requirements,
g. Information relating to the location of environmental constraints.
h. A record of all environment inductions will be maintained and kept on-site

The Environmental Manager may authorize amendments to the induction where required to address Project modifications, legislative changes or amendments to this ESMP or related documentation.

The Supervision Environmental Representative will review and endorse the induction program and monitor its implementation.

10.3.2 Toolbox talks, training and awareness

Toolbox talks will be used to raise awareness and educate personnel on construction related environmental issues. The toolbox talks will be used to ensure environmental awareness continues during construction.

Toolbox talks will be tailored to specific environmental issues including:

a. Hours of work
b. Emergency response
c. Noise
d. Project and clearing limits
e. Dust control

Toolbox attendance is mandatory and attendees of toolbox talks are required to sign an attendance form and the records maintained.

Targeted environmental awareness training will be provided to individuals or groups of workers with a specific authority or responsibility for environmental management or those undertaking an activity with a high risk of environmental impact such as across critical institutions.

Awareness notes, in the form of posters, booklets or similar may be developed and distributed to engineers, leading hands, foreman and others with a responsibility for managing specific work locations or activities. Awareness notes may also be distributed to the broader workforce at daily pre-start meetings.

The Supervision Environmental Representative will review and endorse the training program and monitor its implementation.

10.4 Communication

10.4.1 Internal communication

Clear lines of communication throughout all levels and functions (e.g. management, staff and sub-contracted service providers), is key to minimizing environmental impacts and achieving continual improvements in environmental performance.

The environmental team will meet regularly to discuss on-site environmental management, amendments to plans, changes to construction activities etc.

Regular meetings may also be scheduled with the Supervision Environmental Representative to communicate ongoing environmental performance and to discuss issues to be addressed.

The environment team members will participate regularly in toolbox talks to communicate to the wider project personnel on environmental performance, to advice on sensitive environmental matters for future work areas and to receive feedback from on-site personnel.

10.4.2 External and government authority consultation

The Environmental Manager will be the main point of contact regarding specific environmental issues. The Environmental Manager has the responsibility to report on the ongoing environmental performance to the Supervision Environmental Representative.

Each relevant authority will be notified immediately via the appropriate telephone number should a pollution incident occur that causes or threatens material harm to the environment.

The relevant authorities to be notified are:

a. NEMA

b. The ministry of health via the local public health unit

c. County environment secretary

10.5 Stakeholder and community communication

10.5.1 Community Engagement Strategy

A Community Engagement Strategy will need to be prepared by the contractor that describes the processes to follow for all community and stakeholder consultation in relation to the works

The purpose of the SES is to ensure that a consistent, comprehensive, co-ordinated and culturally appropriate approach to engagement is undertaken to avoid or mitigate potential social and environmental impacts. The approach should fulfil all relevant legal and regulatory requirements and should align to internationally recognized good practice. To this end the SES:

a. Outlines the approach and activities to be adopted and implemented for engagement, presenting how the engagement process will be integrated in the construction process;

b. Identifies potential stakeholders and mechanisms through which they will be included in the engagement process; and

c. Serves as a record of the engagement process followed for all phases of the project

The overall objectives of the stakeholder engagement process are threefold:

a. To inform stakeholders of the project;
b. To obtain stakeholder views and opinions on how best to execute the project; and
c. To formulate actions necessary to avoid or lessen any impacts the project could have on the communities within the project area.

The SES should focus on consultation, disclosure and engagement activities to be undertaken during construction. As a "live" document, the SES and the ensuing plan will be updated throughout the construction process when and where necessary. In any case stakeholder engagement will need to be undertaken for the lifecycle of the Project throughout the planning, construction, operation and decommissioning phases.

SES Aims to ensure that affected communities are appropriately engaged on issues that could potentially affect them; to build and maintain a constructive relationship with communities; and to establish a grievance mechanism.

10.6 The Suggested Strategy

Who to Consult:

a. Directly and indirectly affected communities
b. Positively and negatively affected communities/individuals
c. Those with influence due to local knowledge or political influence
d. Elected representatives, (MCAs)
e. Non-elected community officials and leaders (Chiefs, Ward representatives)
f. Informal/traditional community institutions and/or elders (local business associations)

When to Consult:

As early as possible or at the latest consultation should begin prior to construction. Consultation should be an on-going process throughout the life of the Project, i.e. iterative. Consultation should also allow for a feedback mechanism where affected people are able to present their concerns and grievances for consideration and redress.

What to Consult on:

a. Disclosure of Project information (purpose, nature, scale)
b. Disclosure on the Action Plan as a result of consultation, with periodic reports to Demonstrate implementation;

c. Risks and impacts of the Project

d. Updates actions and proposed mitigation measures to address negative impacts and Areas of concern for affected communities.

How to Consult:

a. Be inclusive

b. Allow for free, prior and informed participation of affected communities

c. Be in the language preferred by the affected communities

d. Consider the needs of disadvantaged and vulnerable groups

e. Be fed into the proposed mitigation measures

f. Be iterative

g. Be documented;

h. Be responsive to community concerns and grievances

i. Be easily understood and transparent;

j. Allow for differentiated means of engagement particularly for disadvantaged or vulnerable groups.

10.7 Grievance Redress Mechanism

There is potential for conflicts between the project and the communities during implementation. Such conflicts will principally be fourfold namely, labour, business disruptions, safety and relocation. The contractor should engage the community in developing a grievance redress mechanism that will be acceptable to both the contractor and the affected persons. As a start the contractor will be expected to form local inclusive committees, preferably in each intervention area of Nyalenda, Nyamasaria Odesa area and Orongo

10.8 Complaints and enquires protocol

A suggestion box, a phone number and email address shall be provided for receipt of complaints and enquiries. The suggestion box should be located outside the main offices and accessible to the public while telephone number and email addresses shall be posted at all work sites.

Information on all complaints received, including the means by which they were addressed and whether resolution was reached and whether mediation was required or used will be included in a complaints register. The information contained within the register will be made available to KIWASCO on request.

The Environmental Manager will apply an adaptive approach to ensure that corrective actions are applied in consultation with the appropriate construction staff

to ensure modifications and improvements in the management of any environmental issues which have resulted in community complaints.

10.9 Incidents and emergencies

All incidents and emergencies resulting from the Trenching Works will be managed in accordance with the Emergency Preparedness and Response Plan that the contractor must prepare as part of the preliminaries. Typically, the EPRP should provide the following:

a. Types of incidents

b. Criteria for classification of environmental incidents

c. Processes for systematically responding to and managing emergency situations, and

d. Processes and legal requirements (e.g. OSHA, NEMA Regulations) for the reporting and notification of an environmental incident

Environmental emergency requires various authorities to address the prevention of, preparedness for, response to and recovery from environmental emergencies caused by uncontrolled, unplanned or accidental releases and to reduce any foreseeable likelihood of releases of toxic or other hazardous substances into the environment.

In the event of environmental emergency or environmental incident occurring, NEMA requires that the person reporting the incident must (i) give accurate reporting of exact occurrence of incident(s), (ii) provide necessary details to assist in locating and addressing the incident and finally (iii) provide feedback on the effectiveness of incidence response.

When providing these details, NEMA requires that *High-Risk Incidents* to be addressed within 24 hours, *Medium Risk Incidents* within 48 hours, and *Low Risk Incidents* addressed with 14 days. Acknowledged and forwarded to relevant lead agency and finally, regular feedback to customers.

Although NEMA has not publicly provided guidelines on how to handle environmental emergency issues, the guidelines exist in other countries. For example, the Canadian government on their article **"Implementation Guidelines for the Environmental Emergency Regulations"** has provided the following actions to be taken in case of environmental emergency:

a. Quick activation of the emergency plan

b. Adequate resource mobilization

c. Rapid assessment of the probable path and impacts of the emergency

d. Proper notification of the emergency to first responders and affected parties, including alerting and warning the public

e. Maintenance of communication systems between stakeholders

f. Evacuating, confining and accounting for personnel and members of the public present at a facility's site, if needed

g. Adequate reporting

10.10 Recovery

"Recovery" refers to the restoration of any part of the environment damaged by or during the emergency. Recovery affects both the operating entity itself and the surrounding community. The issue of recovery is best managed through discussions among all involved parties to Implementation Guidelines for the Environmental Emergency Regulations, assess the damage and agree on a restoration plan.

Four suggested steps to assessing damage in a recovery situation are as follows:

a. Determine the extent of the damage and provide appropriate communication to all relevant parties, including the public.

b. Develop a system to bring in the proper resources, including people, at the right time.

c. Work with outside resources to support recovery.

d. Organize the community resources necessary for people recovering from an emergency situation.

10.11 Reporting

The Client shall generally be notified verbally immediately and in writing within 1 hour of the occurrence of an environmental incident. Incident reports will be provided to the Client within 24 hours of the incident occurring, including lessons learnt from each environmental incident and proposed measures to prevent the occurrence of a similar incident. All efforts should be undertaken immediately to avoid and reduce impacts of incidents and suitable controls put in place. Incidents should be closed out as quickly as possible, taking all required action to resolve each environmental incident.

In accordance with the law the contractor should also notify NEMA and other relevant central and county government agencies of any incident with actual or potential significant off -site environmental impacts on people or the bio-physical environment as soon as practicable and within 24 hours after the occurrence of the incident. The NEMA will be notified of any environmental incidents or pollution incidents on or around the site via the NEMA Emergency hotline (020 6006041 / 020 8077233).

10.12 Oversighting

10.12.1 Environmental inspections

a. Inspections Schedule

The Environmental Representative and KIWASCO staff will undertake regular inspections of work sites during construction. Inspections by the Environmental Representative in the company of the contractor staff would typically occur on a weekly or fortnightly basis depending on the complexity of the work and anticipated environmental risks associated with the stage of construction. Inspections by the ER accompanied by KIWASCO and contractor should occur monthly.

Deficiencies and required actions will be analyzed and prioritized at the completion of the inspection and timeframes for implementation of corrective actions agreed.

If any maintenance and/or deficiencies in environmental controls or in the standard of environmental performance are observed, they will be recorded. Records will also include details of any maintenance required, the nature of the deficiency, any actions required and an implementation priority. The completion of the actions will be monitored to ensure they are implemented within the agreed timeframes.

In addition, quarterly environmental audit of works by the supervision consultant is proposed to ascertain environmental performance and compliance with EIA license conditions among others

b. Documentation

The Environmental Manager is responsible for maintaining all environmental management documents as current at the point of use. Types of records include:

a. Monitoring, inspection and compliance reports/records
b. Correspondence with public authorities
c. Induction and training records
d. Reports on environmental incidents, other environmental non-conformances, complaints and follow-up action
e. Community engagement information, and
f. Minutes of Construction Environmental and Social Management Plans (CESMP) and construction environmental management system review meetings and evidence of any action taken

All environmental management documents are subject to review and continual improvement. This includes times of change to scheduled activities or to legislative or licensing requirements.

c. Recommended Routine Construction Practices to Avoid or Minimize Impacts

In this section construction practices and methodology aimed at reducing environmental and social impacts are presented. Typically, these are Best Engineering Practices that the contractor should routinely follow.

10.12.2 Sanitation

a. Adequate chemical latrines or on-site toilet facilities with appropriate waste management system shall be provided for all staff. They shall be emptied / serviced on a regular basis to prevent overflowing.

b. All sanitation facilities provided by the Contractor shall be efficient, sanitary and non-offensive.

c. Mobile toilets shall be provided to working crews.

d. A minimum of one toilet shall be provided per 20 persons at each working area such as the construction camp

10.12.3 Construction Waste

a. Temporary storage of construction waste will be limited to within the site, and within areas designated by the RE.

b. The Contractor will be responsible to remove and transport all waste material off site to a registered Waste Disposal Site.

10.12.4 Personnel

a. Working hours should ideally occur only between 07:00 and 18:00 during week days. Should the Contractor wish to work outside of these timeframes, negotiations must be conducted with the RE, the client and Site Manager in consultation with the local community.

b. Warning signs must be placed on and around the site as per the occupational health and safety requirements

c. The Contractor shall refrain from harming or clearing trees, timber and shrubs to any extent other than that necessary for the execution of the contract.

d. The Contractor shall ensure that as far as practical, suitable arrangements are made on the site for the maintenance of health,

e. The Contractor shall be responsible for his own security arrangements and shall comply with any security instructions which the client may issue from time to time.

f. The Contractor shall ensure that suitable safety regulations and precautions are established and brought to the attention of the personnel. Approved safety helmets and other protective clothing shall be worn where deemed necessary by the Supervisor. Such protective equipment shall be provided by the Contractor to the employees.

g. The Contractor shall, at his own cost provide for a constant supply of potable water for human consumption to the Construction Camp and other domestic use on site. The Contractor shall allow for chemical testing of water samples on a monthly basis, or more frequently if pollution is suspected by the RE.

h. The Contractor is responsible for the behavior and discipline of all personnel while they are present on the site and shall exercise strict supervision over them at all times.

10.12.5 Personnel Education

a. The Contractor shall ensure that his personnel are inducted on the requirements of the ESMP. This will be in the form of presentations and demonstrations to be conducted by the contractor's representative on Environmental Health and Safety (EHS) issues.

b. The Contractor shall ensure that his personnel have a clear understanding of the Health and Occupational Safety aspects of the contract works.

c. The Contractor shall ensure that his staff complies with the ESMP requirements for best practice as described by this document.

10.12.6 Site Clean Up and Rehabilitation

a. The Contractor must ensure that all structures, equipment, materials and facilities used or created on site for or during construction activities are removed once the project has been completed.

b. The construction site shall be cleared, cleaned and rehabilitated to the satisfaction of the ER, prior to revegetation.

10.13 ESMP Cost estimates

For successful implementation of the ESMP, the responsible parties must provide for financial facilitation. The cost of implementing this ESMP shall therefore be worked out and presented as a proposal and the budget must be developed by the various responsible parties. This shall then form part of the project bills of quantity

Table 10 -1: Environmental and Social Management Plan

Environmental and Social issues	Anticipated Impacts	Managements Actions	Responsibility	Monitoring timeframe	Budget estimate (Kshs)
Watson Bank Elevated Steel Water Tank					
Excessive Noise and Vibration	Potential Noise and vibration nuisance to the residential units, Nightingale Medical Centre and Commercial bank.	▪ Issue early warning notices of impending heavy steel works ▪ Continuous workers training and sensitization of ESH ▪ Regular maintenance of construction equipment. ▪ Provision of appropriate PPEs to workers. ▪ Hoarding of active construction site	Contractor	Construction period	Best engineering practices
Workers safety and health	Main health and safety risks: • Accidental falls from heights during steel water tank installation • Risk of cuts from the sharp objects • Risk of electric shocks, • Risk of accidental pricks from metals • Elevated noise levels	▪ Prepare a Work Place Safety Plan and enforce health and safety measures such as use of appropriate PPEs ▪ Constitute a Work Safety Committee with assigned responsibilities ▪ Regular toolbox talks ▪ Site health and safety audits	Contractor	Construction	
Vegetation Clearance	Cutting of mature trees to pave way for the steel water tank installation.	▪ Confine vegetation clearance within the project footprint ▪ Permits from KFS for cutting down of trees. ▪ Compensatory tree planting for any trees cut.	Contractor	Project construction period.	

Soil Contamination	Spillage of hydrocarbons into soil thus affecting soil micro and macro nutrients.	▪ Regular Servicing of machines and equipment at designated area ▪ Prompt remedial action in cases of oil spillages	Contractor	Construction	Best Engineering practices
Solid waste management	Loss of aesthetics and potential of disease outbreak.	▪ Contractor should prepare a waste management plan ▪ Contracting of a licensed waste collector ▪ Availing and marking of waste receptor bins Pre	Contractor	Construction	
Pipe laying works					
Water supply disruptions	Disruption of water supply	▪ Schedule works to start from the underserved areas ▪ Issue water service disruption notices to consumers	Contractor, KIWASCO	Construction	Best Engineering practices
Dust pollution	Potential of increased respiratory infections and allergic reaction amongst affected people	▪ Application of relevant dust suppression methods ▪ Provision of adequate and relevant PPEs to workers.	Contractor	Construction	Best Engineering practices
Worker safety	Accidental falls in trenches leading to injuries thus loss of working hours, compensation claims and sudden deaths	▪ Prepare a Work Place Safety Plan and enforce health and safety measures such as use of appropriate PPEs ▪ Constitute a Safety Committee with assigned responsibilities ▪ Regular toolbox talks ▪ Site health and safety audits ▪ Safety tapes at all trenching sites	Contractor	Construction	

Spread of HIV/AIDS	Increased number of new infection and increased disease burden in the community	▪ Engage a health facility to provide HIV testing and awareness creation ▪ All workers to sign a code of conduct prohibiting reckless sexual behavior	Contractor	Construction	
Utility Disruption	Disruption occasioned by utility interruptions or accidental breakages leading increased project cost	▪ For deliberate interruptions, issue notices of impending service disruptions to users ▪ Joint planning with utility companies to avoid/minimize service downtime	Contractor, KIWASCO	Construction	Best engineering practices
Temporary road side Traders	Interference of temporary businesses within the road reserve.	▪ Allow the small-scale road side traders to shift but remain within some locality to allow works. ▪ Early warning notices to the temporary road side traders of the intended works	Contractor, KIWASCO	Construction	No cost
Sanitation	Hygiene at work sites mainly along the pipe line	Provision of adequate sanitary facilities to workers.	Contractor	Construction	
TOTAL ESMP AMOUNT					

PART 2

DRAWINGS

ATTACHED SEPARATELY