



# **KERIO VALLEY DEVELOPMENT AUTHORITY**

**TENDER NO.: KVDA/T/013/2019-2020**

**PROPOSED CONSTRUCTION OF FENCE FOR WEIWEI  
INTEGRATED DEVELOPMENT PROJECT.**

**Receipt No.....**

**Tender Reg. No.....**

**CLOSING DATE: TUESDAY 18<sup>TH</sup> FEBRUARY 2020**

**CLOSING TIME: 10.00 AM**

## **Section A**

### **Form of Bid**

## Form of Bid

### KERIO VALLEY DEVELOPMENT AUTHORITY

#### Proposed Construction of perimeter Fence for Weiwei Sigor Integrated Development project

Contract No. \_\_\_\_\_

To:

**Kerio Valley Development Authority**  
KVDA Plaza, Oloo Street  
P.O. Box 2660-30100, Eldoret – Kenya  
Tel: +254 (053) 22063361-4  
Fax: +254(053) 2063365  
Email: [info@kvda.go.ke](mailto:info@kvda.go.ke)

**Gentlemen:**

1. In accordance with the requirements of the Bid Documents and Bill of Quantities and Addenda Nos. \_\_\_\_\_ for the execution of the above-named Works, we the undersigned, offer to construct and install such Works and remedy any defects therein in conformity with the requirements of the Bid Documents and Addenda for the sum of [*insert amounts in words*] Kenya

Shillings (KShs) \_\_\_\_\_

\_\_\_\_\_

[*Insert amounts in Figures*] \_\_\_\_\_ or such other sums as may be ascertained in accordance with the Contract Agreement.

2. We acknowledge that the Appendix to form of Bids forms part of the Bid.
3. We undertake, if our Bid is accepted, to commence and complete the Works as soon as is reasonably possible after the receipt of Engineers notice to commence, and to complete the whole of the Works comprised in the Contract within the time stated in the Appendix to Form of Bid.
4. We agree to abide by this Bid until the date 120 days after the date of Bid opening and it shall remain binding upon us and may be accepted at any time before that date.
5. We understand that the Client, upon determination of a responsive bid, will negotiate the bid price with the accepted bidder to within the limits of his budget allocation.
6. We agree that unless and until a formal Agreement is prepared, this Bid, together with your written acceptance thereof, shall constitute a binding Contract between us.

7. We understand that you are not bound to accept the lowest or any Bid you may receive.
8. On the basis of our previous experience we are fully experienced and competent in the type of work included in this tender and we have adequate financial resources to carry out the works described within the period for completion. We are in a position to fulfil the Contract for which we have tendered.

Name of Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Signature of Bidder: \_\_\_\_\_

Date: \_\_\_\_\_

Name of Witness to signature of Bidder: \_\_\_\_\_

Signature of Witness: \_\_\_\_\_

Address of Witness: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

## **Section B**

### **Appendix to Form of Bid**

## APPENDIX TO FORM OF BID

(This Appendix forms part of the Bid)

CONDITIONS OF CONTRACT	CLAUSE	VALUE
Definitions	1.1 (a), (i)	The Employer is:  <b>Kerio Valley Development Authority</b> KVDA Plaza, Oloo Street P.O. Box 2660-30100, Eldoret – Kenya Tel: +254 (053) 22063361-4 Fax: +254(053) 2063365 Email: <a href="mailto:info@kvda.go.ke">info@kvda.go.ke</a>
	1.1 (a), (iv)	The Engineers Representative-Engineer delegated for supervision works by the Employer
Site visit	C.1.6	14 <sup>th</sup> February 2020
Engineer's Authority to issue variations	2.1 (d)(ii)	Not exceeding 15% percent of Contract Sum
Language	5.1 (a)	The Language is English
Law	5.1 (b)	The law in force is that of Kenya
Bid security		No bid security is required. However, the bidder shall be required to fill in tender securing declaration form for AGPO
Amount of performance Bond	10.1	Section 142(3) of PPADA,2015 applies
Program to be submitted	14.1	Not later than seven (7) days after issuance of Order to Commence
Language ability of Contractor's representative	13.6	The Language shall be English
Period for commencement, from Engineer's order to commence	41.1	Fourteen (14) days
Time for completion	43.1	Six (6) Months
Amount of liquidated damages	47.1	0.5% of Contract Sum per day
Limit of liquidated damages	47.1	10% of Contract Sum
Defects liability period	49.1	Six (6) Months
Value of advance Payment	60.0	Nil-Section 146 of PPADA, 2015
Payment of Material on site	60.1	75% of Value
Minimum amount of interim certificates	60.2	10% of Contract Sum
Percentage of retention	60.5	10% of Payment Certificate
Appointer of arbitrator	67(3)	Chairman Institute of Arbitrators of Kenya

## **Section C**

### **Instructions to Bidders**

## Section C

### Instructions to Bidders

#### PART 1 - GENERAL

##### 1.0 C.1.1 Scope of bid

1. Kerio Valley Development Authority,(KVDA) funded by GoK, wishes to receive Bids for the Construction of perimeter fence at Sigor Weiwei Sigor integrated project in West Pokot County. The scope of the works is as follows:
  - Bush clearing for fence construction
  - Installation of steel angle iron poles
  - Installation of 14g triple twist netting, gates and accessories
  - Erecting of gabions
  - Any other works as specified in the Bill of quantities
2. The successful Bidder will be expected to complete the Works within the period stated in the Appendix to Form of Bid from the date of commencement.
3. Throughout these Bidding documents, the terms '*Employer's Representative*' and '*Engineer*' and the terms '*Bid*' and '*Tender*' and their derivatives (*Bidder/Tenderer, Bid/Tender, Bidding/Tendering, Tender/Bid Sum, and Bid/Tender Price etc.*) and the terms '*it*' and '*he*' and their derivatives (*its/his, itself/himself, etc.*) are synonymous, and day means calendar day. Singular also means plural.

##### 2.0 C.1.2 Eligible bidders

1. This invitation to Bid is open to all eligible bidders.
2. Bidders shall provide such evidence of their eligibility satisfactory to the Employer as requested in Section D and as the Employer shall reasonably request.
3. Government-owned enterprises may only participate if they are legally and financially autonomous and operate under commercial law.

##### 3.0 C.1.3 Qualification of the bidder

1. Bidders shall as part of their Bid:
  - a) Submit a written power of attorney authorizing the signatory of the bid to commit the bidder; and
  - b) Provide legal proof of registration as a business and valid Tax compliance certificate, and other compliance to the business requirement of the Government.
  - c) Provide proof of registration by the Ministry of Public Works as Civil Engineering Contractor.
2. As a minimum, Bidders shall provide the following information:
  - a) Evidence of access to lines of credit and availability of other financial resources
  - b) Financial predictions for the current year and financial for previous years as per schedule I, Section D, including the effect of known commitments



- c) Current work commitments
  - d) Current litigation information; and
  - e) Availability of critical equipment
- 3 Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements:
- a) the Bid shall include all the information as required in sections C.1.3.1 and C.1.3.2 above
  - b) the Bid, in case of a successful Bid, shall be signed so as to be legally binding on all partners;
  - c) one of the partners shall be nominated as being in charge, and submitting a power of attorney signed by legally authorized signatories of all partners shall evidence this authorization
  - d) the partners in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the Contract, including payment shall be done exclusively with the partner in charge;
  - e) all partners of the joint venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a statement to this effect shall be included in the authorization mentioned under c) above, as well as in the Bid and in the Agreement (in case of a successful Bid);and
  - f) a copy of the agreement entered into by the joint venture partners shall be submitted with the Bid
- 4 Bidders shall also submit proposals of work methods and schedules in sufficient detail to demonstrate the adequacy of the Bidder's proposals to meet the technical specifications and the completion time referred to in the Appendix to Form of Bid.

#### **4.0 C.1.4 One bid per bidder**

- 1 Each Bidder shall submit only one Bid by itself. A Bidder who submits or participates in more than one Bid will be disqualified.

#### **5.0 C.1.5 Cost of bidding**

- 1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

#### **6.0 C.1.6 Site visit**

- 1 The Bidder is advised to visit and examine the Site of the Works and its surroundings and obtain for himself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for construction of the Works. The cost of visiting the Site shall be borne by the Bidder.
- 2 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents, will release and indemnify the Employer and its personnel and agents from and against all liability in

respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

## PART 2 – BIDDING DOCUMENTS

### 7.0 C.2.1 Content of bidding documents

- 1 The Bidding documents are those stated below, and should be read in conjunction with any Addenda issued in accordance with the provisions of this section:
  - Invitation to Bid
  - Form of Bid
  - Appendix to form of Bid
  - Instructions to Bidders
  - Schedules of Supplementary Information
  - Form of Contract Agreement
  - Conditions of Contract
  - Technical Specifications
  - Bill of Quantities
  - Tender Drawings
- 2 The number of copies to be completed and returned with the Tender is specified in the invitation to Bid.

### 8.0 C.2.2 Clarification of bidding documents

- 1 A prospective Bidder requiring any clarification of the Bidding documents may notify the KVDA in writing or by cable (hereinafter, the term cable is deemed to include facsimile and e-mail) to the KVDA at the address indicated in the Appendix to Form of Bid, but not later than seven (7) days prior to the submission of Bids. The KVDA will respond to any request for clarification that he receives earlier than the time above prior to the deadline for submission of Bids. Copies of the KVDA response will be forwarded to all purchasers of the Bidding documents, including a description of the inquiry but without identifying its source.

### 9.0 C.2.3. Amendment of bidding documents

- 1 At any time prior to the deadline for submission of Bids, the Employer may, through the Engineer, amend the Bidding documents by issuing Addenda.
- 2 Any Addendum thus issued shall be part of the Bidding documents pursuant to Clause C.2.1, and shall be communicated in writing or by cable to all prospective bidders. Prospective Bidders shall promptly acknowledge receipt of each Addendum in writing or by cable to the KVDA.
- 3 To give prospective Bidders reasonable time in which to take an Addendum into account in preparing their Bids, the KVDA may extend as necessary the deadline for submission of Bids.

## PART 3 – PREPARATION OF BIDS

### **10.0 C.3.1 Language of bid**

- 1 The Bid, and all correspondence and documents related to the Bid exchanged by the Bidder and the KVDA shall be written in English, and shall be copied to the Employer.

### **11.0 C.3.2 Documents comprising the bid**

- 1 The Bid submitted by the Bidder shall comprise the following:
  - i) duly filled-in Form of Bid;
  - ii) priced Bills of Quantities;
  - iii) duly filled-in Schedules of Supplementary Information;
  - iv) any information or other materials required to be completed and submitted by Bidders in accordance with these Instructions to Bidders;
  - v) any other information that the Bidder wishes to submit to qualify its Bid.
- 2 The Bidder shall provide an outline program for the Works with his Bid sufficient to allow the KVDA to ascertain the Bidder's intentions and plans for delivering the completed Works within the time for completion stated in the Appendix to Form of Bid.

### **12.0 C.3.3 Bid prices**

- 1 The Contract shall be for the whole Works, as described in Sub-Clause C.1.1.1, based on the priced Bill of Quantities submitted by the Bidder
- 2 The Bidder is required to submit Tender prices to cover for the execution, completion and commissioning of the Works including making good defects in accordance with the Contract drawings.
- 3 The Bidder shall fill in prices for all items of the Works in the Bill of Quantities. Items against which no price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items in the Bill of Quantities.
- 4 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date of submission of Bids shall be included in the prices and the total Bid Price submitted by the Bidder. The Bid prices shall also include all associated costs to be borne by the Contractor including all overheads, profits and supervision costs.
- 6 The rates in Bills of Quantities shall be used for interim payments and, where appropriate, for the valuation of variations.

- 7 The rates and prices quoted by the Bidder shall not be subject to adjustment during the performance of the Contract on account of price fluctuations or fluctuations in the rate of exchange of the various currencies.

#### **13.0 C.3.4 Currencies of bid and payment**

- 1 The prices shall be entirely in Kenya Shillings (**KShs**) and all payments shall be made in the same currency.

#### **14.0 C.3.5 Bid validity**

- 1 Bids shall remain valid for a period indicated in the form of Bid after the date of Bid opening
- 2 In exceptional circumstances, prior to expiry of the original Bid validity period, the Employer may request that the Bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing or by cable. A Bidder agreeing to the request will not be required or permitted to modify its Bid.

#### **15.0 C.3.6 Pre-bid meeting**

- 1 The Bidder's designated representative is invited to attend a pre-Bid meeting, which will take place at the venue and time stipulated in the Letter of Invitation to Bid.
- 2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
- 3 The Bidder is requested, as far as possible, to submit any questions in writing or by cable, to reach the Engineer before the time of the meeting. It may not be practicable at the meeting, to answer questions received, but questions and responses will be transmitted subsequently.
- 4 Minutes of the meeting, including the text of the questions raised and the responses given, together with any responses prepared after the meeting, will be transmitted without delay to all purchasers of the Bidding documents.
- 5 The Engineer shall make any modification of the Bidding documents listed in Clause C.2.1, which may become necessary as a result of the pre-Bid meeting exclusively through the issue of an Addendum pursuant to Clause C.2.3 and not through the minutes of the pre-Bid meeting.

#### **16.0 C.3.7 Format and signing of the bid**

- 1 The Bidder shall prepare one original of the documents comprising the Bid as described in Clause C.3.2 of these Instructions to Bidders, bound with the section containing the Form of Bid and clearly marked "ORIGINAL." In addition, the Bidder shall submit copies of the Bid, in the number specified in the Bidding Data, and clearly marked as "COPIES." In the event of discrepancy between them, the original shall prevail.

The Bid document shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. The person or persons signing the Bid shall initialize all pages of the Bid where entries or amendments have been made. Each page of the Priced Bill of Quantities shall be initialed and the Summary page shall be completed and signed.

- 2 The Bid shall contain no alterations, omissions, or additions, unless such corrections are in accordance with instructions issued by the Engineer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

## PART 4 – SUBMISSION OF BIDS

### 17.0 C.4.1 Sealing and marking of bids

- 1 The Bidder shall seal the Bid Document in two inner envelopes and one outer envelope, duly marking the inner envelopes as “ORIGINAL” and “COPIES”. The envelope shall:
  - (a) Be addressed to the Engineer at the address provided in the Appendix to form of Bid; or any other address as may be directed in the Letter of Invitation to Tender.
  - (b) Bear the name and identification number of the Contract. In addition to the identification required in sub-Clause C.4.1.1 (a), the inner envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to Clause C.4.2.1, and for matching purposes under Clause C.4.3.
  - (c) Provide a warning not to open before the time and date for Bid opening, as specified in the Bidding Data.
- 2 If the outer envelope is not sealed and marked as above, the Engineer will assume no responsibility for the misplacement or premature opening of the Bid.

### 18.0 C.4.2 Deadline for submission of bids

- 1 The Bidders must submit the Bids to the Engineer at the address specified in the invitation to Bid, no later than **Tuesday 18<sup>th</sup> February 2020 at 10.00 A.M.**
- 2 The KVDA may, in exceptional circumstances and in consultation with the Employer, extend the deadline for submission of Bids by issuing an Addendum in accordance with Clause C.2.3, in which case all rights and obligations of the Employer and the Bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

### 19.0 C.4.3 Late bids

- 1 The KVDA shall return any Bid received after the stipulated deadline for submission of Bids prescribed in Clause C.4.2, unopened to the Bidder.

#### **20.0 C.4.4 Modification, substitution and withdrawal of bids**

- 1 The Bidder may modify, substitute, or withdraw its Bid after Bid submission, provided that written notice of the modification or withdrawal is received by the KVDA prior to the deadline for the submission of Bids.
- 2 The Bidder's modification, substitution, or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with the provisions of Clause C.4.1, with the envelope additionally marked "MODIFICATION" or "WITHDRAWAL", as appropriate.
- 3 Subject to clause C.5.3, no Bidder may modify its Bid after the deadline for the submissions of Bids.

### **PART 5 – BID OPENING AND EVALUATION**

#### **21.0 C.5.1 Bid opening**

- 1 The KVDA will open the Bids, including withdrawals and modifications made pursuant to Clause C.4.4, in the presence of the Bidders' designated representatives who choose to attend, at the time, date, and location stipulated in the Letter of Invitation to Bid. The Bidders' representatives who are present shall sign a register evidencing their attendance.
- 2 Envelopes marked "WITHDRAWAL" and "SUBSTITUTION" shall be opened first and the name of the Bidder shall be read out. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause C.4.4 shall not be opened.
- 3 The Bidders' names, the Bid Prices, including any deviation, any discounts, Bid modifications and withdrawals, and any such other details as the Engineer may consider appropriate, will be announced by the KVDA at the opening. Subsequently, all envelopes marked "MODIFICATION" shall be opened and the submissions therein read out in appropriate detail. No Bid shall be rejected at Bid opening except for late Bids pursuant to Clause C.4.3.
- 4 The Engineer shall prepare minutes of the Bid opening, including the information disclosed to those present.
- 5 Bids not opened and read out at Bid opening shall not be considered further for evaluation, irrespective of the circumstances.

#### **22.0 C.5.2 Process to be confidential**

- 1 Information relating to the examination, clarification, evaluation and comparison of Bids, and recommendations for the award of a Contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. The KVDA, in accordance with the provisions of this section, shall carry out the evaluation of the Bids. Any effort by a

Bidder to influence the Bid Evaluation process or award decisions will result in the rejection of the Bidder's Bid.

### **23.0 C.5.3 Clarification of bids**

- 1 To assist in the examination, evaluation, and comparison of Bids, the KVDA may, at its discretion, ask any Bidder for clarification of its Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable.

### **24.0 C.5.4 Examination of bids and determination of responsiveness**

- 1 Prior to the detailed evaluation of Bids, the KVDA will determine whether each Bid (a) has been properly signed; (b) is substantially responsive to the requirements of the Bidding documents; (c) is accompanied by the required securities; and (d) provides any clarification and/or substantiation that the KVDA may require to determine responsiveness pursuant to this Clause.
- 2 A substantially responsive Bid is one that conforms to all the terms, conditions, and specifications of the Bidding documents without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.
- 3 If a Bid is not substantially responsive, it may be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

### **25.0 C.5.5 Correction of errors**

- 1 The KVDA will check the Bids determined to be substantially responsive for any arithmetic errors. Errors will be corrected by the Engineer as follows:
  - i) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and
  - ii) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Engineer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.
  - iii) The amount stated in the Bid will be adjusted by the KVDA in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered binding upon the Bidder. If the Bidder does not accept the corrected amount of Bid, its Bid will be rejected.

### **26.0 C.5.6 Evaluation and comparison of bids**

- 1 The Engineer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause C.5.4.

- 2 In evaluating the Bids, the KVDA will determine for each Bid the Evaluated Bid Price by adjusting the Bid Price as follows:
  - (a) making any correction for errors pursuant to Clause C.5.5;
  - (b) excluding Provisional Sums and the provision, if any, for Contingencies in the Summary of the Schedules;
- 3 In order to assess the capability of the Bidder to carry out the Works in the Contract, account shall be given to the information submitted by the Bidder in the Schedules of Supplementary Information.
- 4 The Employer reserves the right to accept or reject any variation or deviation. Variations and deviations and other factors which are in excess of the requirements of the bidding documents or otherwise result in unsolicited benefits for the Employer will not be taken into account in Bid evaluation.

#### **27.0 C.5.7 Negotiations**

- 1 The Employer shall, if it is deemed necessary, enter into negotiations with the Bidder with the lowest Evaluated Bid Price or any other Bidder prior to Contract award. The negotiations shall not necessarily be limited to cost but may cover other issues such as scope, project schedules or project personnel and other resources.

### **PART 6 – AWARD OF CONTRACT**

#### **28.0 C.6.1 Award**

- 1 Subject to Clause C.6.2, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and who has offered the lowest Evaluated Bid Price pursuant to Clauses C.5.6 and, who shall be considered to be technically qualified to carry out the Works as explained in Clause C.5.6 above.

#### **29.0 C.6.2 Employer's right to accept any bid and to reject any or all bids**

- 1 The Employer reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids, at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

#### **30.0 C.6.3 Notification of award**

- 1 Prior to expiration of the period of Bid validity prescribed by the Employer, the Employer will notify the successful Bidder by cable confirmed by registered letter that its Bid has been accepted. This letter shall specify the sum, which the Employer will pay the Contractor in consideration of the execution and completion of the Works and the remedying of any defects therein by the Contractor.
- 2 The notification of award will constitute the formation of the Contract.



### **31.0 C.6.4 Signing of Agreement**

- 1 Employer will notify the successful Bidder that its Bid has been accepted. The successful Bidder shall then issue to the Employer a Letter of Acceptance of the offer. Once the Employer receives the Letter of Acceptance from the successful Bidder, he will send to the Bidder the Contract Agreement (in the form attached hereinafter) incorporating all agreements between the parties. Any agreements made following negotiations held subsequent to the Bid submissions (refer to Clause C.5.7), shall be incorporated in the Contract documents. The Engineer shall act on behalf of the Employer on all matters pertaining to this Contract as stipulated in the Conditions of Contract.
- 2 Within 1(One) week of receipt of the Agreement, the successful Bidder shall sign the Agreement and return it to the Employer.
- 3 The Employer will thereafter, promptly notify the other Bidders that their Bids have been unsuccessful.

### **C.6.5 Performance Security**

- 1 Within 14 days after receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in the amount and in the form (Bank Guarantee stipulated in the Contract Data, denominated in the type and proportions of currencies in accordance with the Conditions of Contract.
- 2 If the Performance Security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued either at the Bidder's option, by a bank located in the country of the Employer.
- 3 If the Performance Security is to be provided by the successful Bidder in the form of a Bond, it shall be issued by a surety which the Bidder has determined to be acceptable to the Employer.
- 4 Failure of the successful Bidder to comply with the requirements of Sub-Clause C.6.5.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security

## **Section D**

### **Schedules of Supplementary Information**

**SCHEDULE I**  
**QUALIFICATION INFORMATION**

- 1.1 Constitution or legal status of bidder: *[attach copy]* \_\_\_\_\_  
Place of registration: \_\_\_\_\_  
Principle place of business: \_\_\_\_\_
- 1.2 Ministry of Public Work Registration No and Class. : *[attach copy]* \_\_\_\_\_ *Renewal*  
date \_\_\_\_\_
- 1.3 Power of attorney of signatory of Bid: *[attach copy]*
- 1.4 Total annual volume of construction work performed in five years, in the local trading currency:  
*[insert]*
- 2018 \_\_\_\_\_
- 2017 \_\_\_\_\_
- 2016 \_\_\_\_\_
- 2014 \_\_\_\_\_
- 2013 \_\_\_\_\_
- 1.6 Details of work under way or committed, including expected completion date.

Project name and Location	Name of client and contact person	Type of work performed and year of completion	Value of contract

**SCHEDULE II**  
**MAJOR ITEMS OF CONSTRUCTION PLANT AND EQUIPMENT**

The Bidder hereby commits himself to produce Equipment in accordance with this Schedule as a minimum, but detailed departures therefrom are to be expected in line with actual conditions. This Schedule will be taken into account during the assessment of Bids.

Description Type, Model, Make	
No. of each	
Owned/ Leased/ Imported	
Capacity ton or m cu or other relevant units	
New or Used	
Year of Manufacture.	

The Tenderer shall enter in this schedule all major items of plant and equipment which he proposes to bring to site. Only reliable plant in good working order and suitable for the work required of it shall be shown on this Schedule.

### **SCHEDULE III**

#### **KEY PERSONNEL**

The Bidder shall list in this Schedule the key personnel (including first nominee and the second choice alternative) he will employ from his headquarters and from the Site offices to direct and execute the Contract, together with their qualifications, experience, positions held and nationalities, including supporting CV's for key staff.

The Bidder hereby commits himself to provide staff generally in accordance with this Schedule as a minimum, but detailed departures there from are to be expected in line with actual conditions. This Schedule will be taken into due account during the assessment of tenders.

<b>Designation</b>	<b>Name of:</b> <b>(i) Nominee</b> <b>(ii) Alternative</b>	<b>Summary of Qualification, Experience and Present Occupation</b>

**SCHEDULE IV**

**SUB-CONTRACTORS**

**NOMINATED BY THE CLIENT**

The Following Contractor has been nominated by the Client to carry out specialised installations. Notwithstanding such information the Bidder, if awarded the Contract, shall remain entirely and solely responsible for the satisfactory completion of the works performed by itself or the Sub-Contractors.

<b>Element of Work to be Sub-Contracted</b>	<b>Approximate Value (Kshs.)</b>	<b>Name and Address of Subcontractor</b>

**SCHEDULE V**

**SUB-CONTRACTORS**

**NOMINATED BY CONTRACTOR**

The Bidder shall enter in this Schedule a list of the sections and appropriate value of the work for which he proposes to use Sub-Contractors, together with the names and addresses of the proposed Sub-Contractors. The Bidder shall also enter a statement of similar works previously executed by the proposed Sub-Contractors, including description and location of work, year completed and name and address of the Employer. Notwithstanding such information the Bidder, if awarded the Contract, shall remain entirely and solely responsible for the satisfactory completion of the works performed by itself or the Sub-Contractors.

<b>Element of Work to be Sub-Contracted</b>	<b>Approximate Value</b>	<b>Name and Address of Sub-Contractor</b>	<b>Statement of Similar Works Previously Executed</b>

**A: ACCEPTANCE LETTER**

**Kerio Valley Development Authority**

KVDA Plaza, Oloo Street  
P.O. Box 2660-30100, Eldoret – Kenya  
Tel: +254 (053) 22063361-4  
Fax: +254(053) 2063365  
Email: [info@kvda.go.ke](mailto:info@kvda.go.ke)

We offer to execute the *[name and identification number of Contract]* in accordance with the Conditions of Contract accompanying this Bid for the Contract Price of *[amount in numbers], [amount in words] [name of currency]*.

The Contract shall be paid in Kenyan Shillings.

The advance payment required is: \_\_\_\_\_.

We accept the appointment of *[name proposed in Bidding Data]* as the Adjudicator.

*[or]*

We do not accept the appointment of *[name proposed in Bidding Data]* as the Adjudicator, and propose instead that *[name]* be appointed as Adjudicator, whose daily fees and biographical data are attached.

This Bid and your written acceptance of it shall constitute a binding Contract between us. We understand that you are not bound to accept the lowest or any Bid you receive.

We hereby confirm that this Bid complies with the Bid validity and Bid Security required by the bidding documents and specified in the Bidding Data.

Authorized Signature \_\_\_\_\_

Name and Title of Signatory \_\_\_\_\_

Name of Bidder \_\_\_\_\_

Address \_\_\_\_\_

**B: ARTICLES OF AGREEMENT**

**This Agreement** made this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_\_  
between \_\_\_\_\_

\_\_\_\_\_ of \_\_\_\_\_  
\_\_\_\_\_ (Hereinafter called “the Employer”) of the one part AND  
\_\_\_\_\_ of

(Hereinafter called “the Contractor”) of the other part.

**WHEREAS** the Employer is desirous that \_\_\_\_\_  
\_\_\_\_\_ (hereinafter  
called “the Works”) located at \_\_\_\_\_  
\_\_\_\_\_ be executed by the Contractor and has accepted a Tender by  
the Contractor for the execution and completion of such works and remedying of any defects herein,

**NOW IT IS HEREBY AGREED AS FOLLOWS:**

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contracts hereafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of the Agreement, Viz;
  - (a) The Letter of Acceptance;
  - (b) The said Tender;
  - (c) The Conditions of Contract (Parts I and II);
  - (d) The Specifications;
  - (e) The Drawings; and
  - (f) The Bill of Quantities;
3. In Considerations of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provision of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and Completion of the Works and remedying of defects therein, the Sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (KShs) \_\_\_\_\_,



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(hereinafter referred to as “the Contract Sum”), or such other sum as shall become payable hereunder at the times and in the manner prescribed by the Contract.

<sup>1</sup>**AS WITNESS** the hands of the said parties:

Signed by the said Employer: \_\_\_\_\_

In the presence of:

Name \_\_\_\_\_

Address \_\_\_\_\_

Signature \_\_\_\_\_

Signed by the said Contractor: \_\_\_\_\_

In the presence of:

Name \_\_\_\_\_

Address \_\_\_\_\_

Signature \_\_\_\_\_

---

<sup>1</sup> a) The Contract shall be under seal:

(i) When the Articles of Association of a Limited Company which is a party to the Contract so require.

(ii) When either party is a non-trading corporation such as a hospital or school board, or

b) If the Contract is to be executed under seal delete “As Witness the hands of” and insert “Signed and sealed by”.

**32.0 C: FORM OF A TENDER BOND**

**LETTER BY THE GUARANTOR TO THE CONTRACTING AGENCY**

**Kerio Valley Development Authority**  
KVDA Plaza, Oloo Street  
P.O. Box 2660-30100, Eldoret – Kenya  
Tel: +254 (053) 22063361-4  
Fax: +254(053) 2063365  
Email: [info@kvda.go.ke](mailto:info@kvda.go.ke)

We, the undersigned \_\_\_\_\_ (Guarantor), in order to enable \_\_\_\_\_ to Tender for the *Construction of perimeter fence Sigor Weiwei: TENDER NO:* \_\_\_\_\_ (project, object of contract), hereby irrevocably and independently guarantees to pay you an amount up to a total of \_\_\_\_\_ waiving all objections and defenses.

We shall effect payments under this guarantee on your first written demand, which must be accompanied by your confirmation that you have accepted the above-mentioned Tender and that the firm \_\_\_\_\_ is no longer prepared to abide by this Tender.

This guarantee shall expire no later than \_\_\_\_\_.

By this date we must have received any claims for payment by letter or encoded telecommunication. It is understood that you will return this guarantee to us on expiry or after payment of the total amount to be claimed hereunder.

This guarantee is governed by the laws of the Republic of Kenya.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Guarantor

**33.0 D: CERTIFICATE OF TENDERER'S SITE VISIT**

1. This is to certify that I \_\_\_\_\_  
(Name of Tenderer or his Representative) of the Firm of \_\_\_\_\_  
\_\_\_\_\_ (name of Firm Tendering) in the company of \_\_\_\_\_  
\_\_\_\_\_ (Project Engineer/KVDA Representative conducting the visit)  
visited the Site in connection with Tender for the

*Construction of perimeter fence Sigor Weiwei integrated development project: TENDER NO:*  
\_\_\_\_\_

2. Having previously studied the Tender Documents, I carefully examined the Site.
3. I have made myself familiar with the local conditions and access roads likely to influence the works and the cost thereof.
4. I further certify that I am satisfied with the description of the work and the explanations given by the said Representative and that I understand perfectly the work to be done as specified and implied in the execution of the Contract.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Name: \_\_\_\_\_

(Tenderer or his Representative)

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Name: \_\_\_\_\_

(Kerio Valley Development Authority)

**E: PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)**

To: \_\_\_\_\_ (Name of Employer) \_\_\_\_\_ (Date)  
\_\_\_\_\_  
\_\_\_\_\_ (Address of Employer)

Dear Sir,

**WHEREAS** \_\_\_\_\_ (hereinafter called “the Contractor”) has undertaken, in pursuance of Contract No. \_\_\_\_\_ dated \_\_\_\_\_ to execute \_\_\_\_\_ (hereinafter called “the Works”);

**AND WHEREAS** it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognised bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

**AND WHEREAS** we have agreed to give the Contractor such a Bank Guarantee:

**NOW THEREFORE** we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Kshs. \_\_\_\_\_ (*amount of Guarantee in figures*) Kenya Shillings \_\_\_\_\_ (*amount of Guarantee in words*), and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of Kenya Shillings \_\_\_\_\_ (*amount of Guarantee in words*) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change, addition or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this Guarantee, and we hereby waive notice of any change, addition, or modification.

This guarantee shall be valid until 28 days after the date of issue of the Certificate of Completion.

**SIGNATURE AND SEAL OF THE GUARANTOR** \_\_\_\_\_

Name of Bank \_\_\_\_\_

Address \_\_\_\_\_

Date \_\_\_\_\_

**34.0**

**35.0**

### 36.0 F: DECLARATION

We underscore the importance of a free, fair and competitive procurement process that precludes fraudulent use. In this respect we have neither offered nor granted, directly or indirectly, any inadmissible advantages to any public servants or other persons in connection with our Tender, nor will we offer or grant any such incentives or conditions in the present procurement process or, in the event that we are awarded the contract, in the subsequent execution of the contract.

We also underscore the importance of adhering to minimum social standards (“Core Labour Standards”) in the implementation of the project. We undertake to comply with the Core Labour Standards ratified by the Republic of Kenya.

We will inform our staff about their respective obligations and about their obligations to fulfill this declaration of understanding and to obey the laws of the Republic of Kenya.

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Place, Date	Tenderer
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#### THE CONDITIONS HEREIN BEFORE REFERRED TO

- |                                     |     |  |
|-------------------------------------|-----|--|
| <b>Definitions</b>                  | 1.1 | (i) The Employer is the party stipulated in the Appendix to form of Bid<br>(ii) The Engineer is the party stipulated in the Appendix to form of Bid, or any other person appointed by the Employer, and notified to the Contractor, to act in replacement of the Engineer.   |
| <b>Engineers duty and Authority</b> | 2.1 | The Engineer shall obtain the specific approval of the Employer before taking any of the following actions as specified in part 1:<br><br>(a) Consenting to subletting of any part of the works<br><br>(b) Certification of any additional cost determined under Clause 12;<br><br>(c) Determining an extension of time under clause 44;<br>(d) Issuing a variation under Clause 51, except;<br><br>(i) in an emergency situation as reasonably determined by the Engineer; or |

- (ii) if such variations would increase the Contract price by  
less than the amount stated in the Appendix to Bid; or

(e) Fixing rates or prices under clause under clause 52.

‘notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an Emergency occurs affecting the safety of life or the works or of the adjoining property, he may, without relieving the Contractor of any of his duties and responsibilities under the Contract, instruct the Contractor to execute all such works or to do all such things as my, in the opinion of the of the Engineer, be necessary to abet or reduce the risk. The Contractor shall forthwith comply, despite the absence of the approval of the Employer, with any such instruction of the Engineer. The Engineer shall determine the addition to the Contract Sum, in respect of such instruction, in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy of the Employer.

<b>Language and Law</b>	5.1	(a) The language is stipulated in the Appendix to Form of Bid  (b) The Law is the Law in the Country stipulated in the Appendix to Form of Bid.
<b>Priority Contract Documents</b>	5.2	(1) The Contract Agreement ( <b>Completed Form of Contract Agreement</b> ) (2) The Letter of Acceptance (3) The Bid and Appendix to form of Bid (4) The Conditions of Contract (5) The Technical Specifications (6) The Drawings (7) The priced Bill of Quantities; and (8) Other documents, as listed in the Appendix to Bid.
<b>Contractor’s Obligations</b>	8.1	The Contractor will execute and complete the works shown upon the drawings and set out on the accompanying bill of quantities to the reasonable satisfaction of the Employer’s Representative.  The Contract sum shall be deemed to have been calculated to include all duties and taxes on materials, labour and plant to be used in the works.
<b>Errors in Design</b>	8.5	“The Contractor shall promptly notify the Employer and the Engineer of any error, omission, fault and any other defects in the design of or specification for the works which are discovered when reviewing the Contract Documents or in the process of executing the Works.”
<b>Performance Security</b>	10.1	“The Contractor shall provide, at his own expense, Security for his proper performance of the Contract to the Employer within 14 days after the receipt of the Letter of Acceptance. The Performance Security

shall be an unconditional bank guarantee in the form provided in Section E of the Tender Documents. The amount of the bank guarantee shall be 10 (ten) percent of the Contract Sum. The Contractor shall notify the Engineer when providing the Performance Security to the Employer.

“Without limitation to the provisions of the preceding paragraph, whenever the Engineer determines an addition to the Contract Price as a result of a change in cost and/or legislation or as a result of a variation of the portion of the Contract Sum payable, the Contractor, at the Engineer’s written request, shall promptly increase the value of the Performance Security by an equal percentage. The Performance Security of a joint venture shall be in the name of the joint venture.”

**Validity of the Performance Security** 10.2 The Performance Security shall be valid until a date 28 days from the date of issue of the Taking-Over Certificate. The security shall be returned to the Contractor within 14 days of expiration.

Notwithstanding the above, the Performance Security shall not be released until such time as all claims filed against the Contractor resulting from the performance of the Contract, have been settled by the Contractor.

**Cost of performance security** 10.4 The cost of complying with the requirements of this Clause shall be borne by the Contractor

**Program works** 14.1 The Contractor shall submit to the Engineer not later than 7 days from the date of award of the Contract a general description of his proposed arrangements and methods for the execution of the Works. During the execution of the Works, the Contractor shall submit to the Engineer full and detailed particulars of any proposed amendments to the arrangements and methods submitted in accordance with the foregoing.

The various operations pertaining to the works shall be carried out in such a progressive sequence as will achieve a continuous and consecutive output of fully completed works within the time limits specified in the Contract.

**Revised Programme** 14.2 If at any time it should appear to the Engineer that the actual progress of Works does not conform to or could be foreseen to be delayed from the current Contractual Construction Programme to which consent has been given under Sub-clause 14.1, the Contractor shall submit, at the request of the Engineer or immediately after identification of such possibility, a revised programme showing the modifications to such programme to ensure recovery of lost time and completion of the Works within the stipulated Time of Completion.

**Contractor’s Superintendence** 15.1 The Contractor’s Superintendence shall not leave the site for a period of more than 24 hours without the Approval of the Engineer; such

approval shall not be unnecessarily withheld.

The Contractor's Representative shall be competent in speaking, reading and writing English.

**Safety, security and protection of the Environment** 19.1

Notwithstanding the Contractor's obligation under Sub-Clause-19.1 paragraph (a), (b) and (c) of the Conditions of Contract, the Contractor shall observe the following measures with a view to reducing or elimination of adverse environmental effects by the site works:

- (i) All quarries and borrow pits shall be suitably back filled and landscaped to their original state after extraction of construction material
- (ii) Soil erosion due to surface runoff or water from culverts or other drainage structures should be avoided by putting in place proper erosion control measures that shall include, but are not limited to grassing and planting of trees
- (iii) Spillage of oils, fuels and lubricants shall be avoided and if spilt, shall be collected and disposed off in such a way as not to adversely affect the environment.

**Damage to Persons and Property** 22.1

(a) Injury to Persons: The Contractor shall be liable for and shall indemnify the Employer against any liability, loss, claims or proceedings whatsoever whether arising in Common Law or under any Local Legislative Acts in respect of personal injuries to persons whether in his employment or not, arising out of or in the course of the execution of the Contract and against all costs and charges incurred in relation to the investigation or settling of such claims.

(b) Damage to Property: The Contractor shall be liable for and shall indemnify the Employer in respect of any liability, loss claim or proceedings and for any injury or damage whatsoever arising out of or in the course of the execution of the Contract Works to any property, real or personal, due to any negligence, or omission or default of himself, his agents or his servants or any Sub-Contractor or to any circumstances within his control.

(c) The Contractor shall secure the due performance of these indemnities by forthwith entering into proper and sufficient policies of insurance. The cost of insurance shall be borne by The Contractor. The insurance policy shall be drawn in the combined name of the Contractor and the Employer.

**Notices and Fees** 26.1

The Contractor shall comply with all rules, regulations and by-laws of any Local Authority, Water or Lighting Companies and shall conform to the provisions of any acts of Parliament of the Government of Kenya, relating to the works and he must give all notices required by the said Acts, rules, regulations and by-laws and pay all fees legally demandable.



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<b>Engagement of staff and Labour</b>	34.1	The Contractor, in engaging, labour for execution of works, shall give preference to the local community (From Kibera). The ratio of local labour to the total workforce shall not, at anytime, be less than 80% for unskilled labour, 60% for semi skilled labour and 20% for skilled labour.
<b>Rates of Wages and Conditions of Labour</b>	34.2	The Contractor shall pay rates of wages and observe hours and conditions of labour not less favourable than those established in Kenya. In the absence of any rates of wages or conditions of labour so established, the Contractor shall pay rates of wages and observe conditions of labour which are not less favourable than the general level of wages and conditions observed by other employers whose general circumstances in the trade or industry in which the Contractor is engaged are similar.
<b>Sanitation on Site</b>	34.6	<p>The Contractor shall provide and maintain adequate toilet facilities at convenient locations on the Site for use by his staff and labour in order to ensure a high standard of cleanliness and hygienic conditions on the Site.</p> <p>These facilities shall be cleaned and maintained daily to the satisfaction of the Engineer. The Contractor shall instruct his staff and labour to use only these facilities.</p> <p>Disposal of sewage shall be as approved by Government health authorities.</p>
<b>Epidemics</b>	34.7	In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or local medical or sanitary authorities, for dealing with and overcoming the same.
<b>Observance by Subcontractors</b>	34.13	The Contractor shall be responsible for the observance by his Subcontractors of the foregoing provisions of this Clause, which shall apply to all persons employed by his Subcontractors, for the purposes of or in connection with the Contract.
<b>Commencement of the Works</b>	41.1	The Contractor shall commence the Works on or about the date indicated in the Appendix to Form of Bid as the date on which possession of the site is given to the Contractor. For purposes of this Contract that date shall be taken to be the commencement date.
<b>Time for Completion</b>	43.1	The Contractor shall proceed with the Works, and complete the same within the time for completion stated in the Appendix and the Letter of Award, subject nevertheless to provisions for extension of time hereinafter contained.
<b>Extension of Time</b>	44.1	If in the opinion of the Employer's Representative the works have been delayed through any cause not under the control of the Contractor, the Employer's Representative shall make a fair and reasonable extension of time for completion of the works.

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- Report of Delays** 47.1 The Contractor shall promptly report in writing to the Engineer, the occurrence of any event or condition that might delay or prevent completion of the Works in accordance with the approved schedule and to indicate steps being taken to minimise the effects or meet the situation.
- Defects** 49.2 The Contractor shall make good at his own expense any defects, shrinkage, and other faults, which may appear within twelve (12) months from the completion of the works arising in the opinion of the Employer's Representative from poor quality of materials or bad workmanship.
- Variations** 51.1 **The Employer and Contractor agree that no variation required by the Employer's Representative shall vitiate the Contract but that all variations required or authorized by the Employer's Representative shall be measured and valued by the Employer's Representative in consultation with the Contractor. The amount to be allowed on either side in respect of the Variations so ascertained shall be added to or deducted from the Contract sum as the case may be. The Engineers Authority to make Variations to the Quantity of Works or components of works is up to the percentage as indicated in the Appendix to form Tender.**
- The term "variation" as used in these Conditions means the alteration or modification of the design, quality or quantity of the Works as shown upon the Contract Drawings and described by or referred to in the Bill of Quantities, and includes the addition, omission or substitution of any work, the alteration of the kind or standard of any of the materials or goods to be used in the Works and the removal from the site of any work materials or goods executed or brought thereon by the Contractor for the purposes of the Works other than work, materials or goods which are not in accordance with the Contract.**
- No change in the unit rates or prices quoted shall be considered for items included in the schedule of day works, schedule basic items of, or Provisional Sums and items, or for any item in the Bill of Quantities.
- Fluctuations** 52.3 Allowance is deemed to have been made in the Contract Rates for anticipated fluctuations of price of materials or labour or other elements required for the execution of the Works. The Contract Sum is deemed to have been calculated to include all basic prices of materials inclusive of all duties on materials, the rates of wages and other emoluments and expenses. However, compensation for fluctuation of prices shall be made in the event of changes in Government legislation leading to changes in taxes, levies and the like.
- Omissions of Quantities** 55.1 Items of Works described in the Bill of Quantities for which no rate or price has been entered in the Contract shall be considered as included in other rates and prices in the Contract and will not be paid for separately by the Employer.

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<b>Breakdown of lump sum items</b>	57.2	<p>The Contractor shall submit, within 14 days after the receipt of letter of Acceptance, a breakdown of each provisional sum item contained in the Bill of Quantities. The breakdown shall identify the the component unit of the work that makes up the provisional sum item and identify the quantities and rates of the sum price corresponding to each component of the work. The quantities and rates shall be such that the products when totalled shall equal the provisional sum price. This breakdown shall be used to for making progress payment and reporting progress.</p>
<b>Monthly Statement</b>	60.1	<p>The Contractor shall submit a Financial statement to the Engineer at the end of each month, in a tabulated form approved by the Engineer, showing the amounts to which the Contractor considers himself to be entitled. The statement shall include the following items, as applicable;</p> <ul style="list-style-type: none"><li>• The value of the Permanent Work executed up to the end of previous month</li><li>• Such an amount (not exceeding 75 percent of the value) as the Engineer may consider proper on account of materials for permanent work delivered by the Contractor to the site</li><li>• Such amount as the Engineer may consider fair and reasonable for any Temporary Works for which separate amounts are provided in the Bill of Quantities</li><li>• Any other sum to which the Contractor may be entitled under the Contract</li></ul> <p>If the Engineer disagrees with or cannot verify any part of the statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes and corrections in the statement as may be directed by the Engineer. In cases where there is difference in opinion as to the value of any item, the Engineer’s view shall prevail.</p>
<b>Monthly Payment</b>	60.2	<p>Upon written application by the Contractor, at intervals of twenty-eight (28) days the Employer’s Representative shall issue within a reasonable time a Interim Payment certificate stating the amount due to the Contractor from the Employer, and the Contractor shall, on presenting any such certificate to the Employer, be entitled to payment therefore within fourteen (14) days from presentation. Interim valuations shall be made whenever the Engineer considers necessary for the purpose of ascertaining the amount to be stated as due in an Interim Certificate.</p> <p>The Employer will pay to the Contractor the amounts certified less 10% retention. Upon practical completion of the works the Employer Shall pay the Contractor all the monies due less only 5% retention, which shall be retained as a retention fund and held until the Contractor has made good defects in accordance with Clause 10 herein or in any case no sooner than the Defects Liability Period</p>
<b>Payment of</b>	60.3	<p>Upon the issue of the Completion Certificate with respect to the whole</p>

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<b>retention money</b>		<p>of the Works, one half of the Retention Money, or upon the issue of a Taking-Over Certificate with respect to a Section or part of the Permanent Works only such proportion thereof as the Engineer determines having regard to the relative value of such Section or part of the Permanent Works, shall be certified by the Engineer for payment to the Contractor. The Contractor may substitute the remaining retention money with an on-demand bank guarantee in a form, and from a source, acceptable to the Employer.</p> <p>Upon the expiration of the Defects Liability Period for the Works, the other half of the Retention Money shall be certified by the Engineer for payment to the Contractor (or return of the remaining security, which replaced the Retention Money). Provided that, in the event of different Defects Liability Periods being applicable to different Sections or parts of the Permanent Works pursuant to Clause 48, the expression “expiration of the Defects Liability Period” shall, for the purposes of this sub-clause, be deemed to mean the expiration of the latest of such periods.</p> <p>Provided also that if at such time, there shall remain to be executed by the Contractor any work instructed, pursuant to Clauses 49 and 50, in respect of the Works, the Engineer shall be entitled to withhold certification until completion of such work of so much of the balance of the Retention Money as shall, in the opinion of the Engineer, represent the cost of the work remaining to be executed.</p>
<b>Correction of certificates</b>	of 60.4	<p>The Engineer may by any Interim payment certificate make any correction or modification in any previous certificate which has been issued by him, and shall have authority, if any work is not being carried out to his satisfaction, to omit or reduce the value of such works in any interim payment certificate.</p>
<b>Final Statement</b>	60.6	<p>Not later than 15 days after the issue of the Defects Liability, Contractor shall submit to the Engineer for consideration a draft final statement with supporting documents showing in detail, in the form approved by the Engineer;</p> <p>(a) The final value of all work done in accordance with the Contract;</p> <p>(b) Any further sums which the Contractor considers to be due to him.</p> <p>If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonable require and shall make such changes in the draft as may be required.</p>
<b>Final Certificate</b>	60.8	<p>Upon acceptance of the Final Statement, the Engineer shall prepare a Final Payment Certificate which shall be delivered to the Contractor's authorized agent or representative for his signature. The Final Payment Certificate shall state:</p> <p>(a) The final value of all work done in accordance with the Contract;</p> <p>(b) After giving credit to the Employer for all amounts</p>

previously paid by the Employer, the balance, if any, due from the Employer to the Contractor or the Contractor to the Employer.

**Termination of Contract by Either Party** 63.4 Either party may give a 14 days written notice to terminate the Contract to the other party if:

- (a) for whatever reason, it has become impossible for either party to performance its part of the Contract or;
- (b) the other party has breached the Contract in a manner that entitles the aggrieved party to treat the Contract as repudiated by the party in breach or;
- (c) there is war or hostile or kindred activities in the country that either (1) make it impossible for either party or both to perform Contractual obligations or (2) would subject either party to loss or expense or;
- (d) Work is suspended for a prolonged period (exceeding 6 months) for reasons beyond the control of either party.

At the expiry of the 28 days' notice, the execution of the Contract shall be terminated and either party shall be entitled to payment for services rendered or compensation for damages due to breach of Contract, provided the loss or expense can be attributed to the breach of Contract by the party in breach.

**Settlement of Disputes** 67.1 The Employer's Representative shall, in general, be responsible for administering and interpreting the Contract. In discharging that duty, the Employer's Representative shall be impartial, fair and reasonable.

If however, a dispute arises during or after the execution of the Works in connection with any opinion, instruction, determination, certificate or valuation of the Employer's Representative or any other matter in relation with the execution of the Works, the aggrieved party shall in the first place request the Employer's Representative to review the matter and make a decision.

If the Employer's Representative fails to review and make a decision or if either party is not satisfied with the decision of the Employer's Representative, the aggrieved party may seek the agreement of the other party to refer the matter in dispute to arbitration.

Consequently, the Employer and Contractor hereby agree that if any dispute or difference arises in connection to any matter concerning the Works in the manner explained above, then either party shall forthwith give to the other written notice of such dispute or difference and the same shall be referred to an Arbitrator appointed by the Chairman of the Chartered Institute of Arbitrators (Kenya Branch) whose award shall be final and binding on all parties concerned.

The conduct of the arbitration shall be ad hoc though the arbitrator may elect to apply rules of any arbitral institution. The place of the arbitration shall be in Nairobi, Kenya.

The parties shall however, continue to pursue an amicable solution and may by agreement between them, seek the opinion or assistance of a mediator or disputes review expert as they deem necessary.

If an amicable solution is reached after the appointment of the Arbitrator, then the Arbitrator shall record the agreement reached by the parties, without having to give his reasons for the agreement.

<b>Arbitration</b>	67.3	Any dispute in respect of which either the decision of the Engineer has not become final and binding or amicable solution is not achieved shall be finally settled by an arbitrator to be agreed upon between the parties or failing agreement to be nominated on the application of either party by the appointee designated in the form of Tender for the purpose and any such referee shall be deemed to be a submission to arbitration within the meaning of the Arbitration Laws of the Republic of Kenya.
<b>Taxes and Duties</b>	73.1	The Contractor shall pay any and all duties, taxes and levies as required by the laws and regulations of the Government of Kenya, or any other charges during the period of the Contract. The Contractor shall acquaint himself with the relevant laws and regulations in this matter and include costs in the rates and prices of various items in his Tender unless the exemption is defined clearly herein.

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## **1 GENERAL**

### **1.1 General introduction**

This contract is for the construction of the proposed perimeter fence in Sigor Weiwei Location of the works; The proposed project is situated in Sigor division, Sigor location of West Pokot County. The area is accessible from the Kitale – Lodwar road along Lomut Nakuru road. The technical specifications provided in this section are generic and is considered applicable where exclusions are not stated.

### **1.2 Extent of contract**

The works to be executed under this Contract comprise:  
The project will be designed to comprise of:-

- i. Bush clearing for fence construction
- ii. Installation of steel angle iron poles
- iii. Installation of 14g triple twist netting, gates and accessories
- iv. Any other works as specified in the Bill of quantities

#### **a. Provision of equipments, material and labour**

The contractor shall provide all equipments, transport consumable materials and labour necessary for the satisfactory completion of the works in compliance with the specifications herein. The Engineer reserves the right to inspect plant and materials prior to contractor selection, and may reject plant or material that in his/her opinion is substandard or inappropriate. The contractor shall provide full descriptions of all plants to be deployed for these works. The contractor shall also present method statements describing in detail the proposed approach to work.

The contractor shall provide summary detail of the experience of key personnel to be deployed for these works.

#### **b. Occupation of site**

The employer will provide land on which the works shall be constructed. The contractor shall be given possession of such parts of the site that he requires for activities related to construction works including storage of raw materials, equipments and setting up of camp during the period of contract provided his operation does not interfere with the daily activities of the local community.

The Contractor shall not enter upon or occupy with men, tools, equipment and materials any land other than the land or right of way provided by the employer

**c. Diligent performance**

The contractor shall at all times perform the Works diligently and in accordance with sound professional practice. He/she shall not proceed from one stage of works to another without the express permission of the Engineer.

Decisions regarding temporary halt, discontinuing of any element or part of any element of these works, or abandonment of these works, shall be discussed jointly between the contractor and the Engineer before any further actions are authorised by the Engineer. The Engineer's decision shall be final.

The Engineer will require a written submission justifying any steps taken by the Contractor taken without the Engineer's approval. An unsatisfactory explanation shall lead to non-payment for works undertaken without prior agreement, and may be included for consideration as liquidated Damages.

**d. Units of Measurement**

The Contract shall be conducted in the Systems International d'Units (SI) system of units in accordance with the provisions of ISO 31 and ISO 1000.

**e. British Standards BS**

"B.S." followed by the reference number and date of issue where appropriate, shall refer to the latest British standard for the quality and/or workmanship of the items described. Material required to conform to a particular B.S may be obtained from any country provided it complies with the minimum requirements of the relevant B.S.

**f. Drawings**

The project drawings shall comprise

- (a) The drawings listed in *Section I* of the tender documents
- (b) Such other drawings and/or sketches as are issued from time to time by the Engineer to deal with design modifications in response to on-site conditions.

**g. Record drawing**

As the work proceeds the Contractor shall mark up 'As Built' details on a set of prints of the contract Drawings modified to portray the works as actually constructed and issue to the Engineer's representatives for approval within 7 days of completion of the works covered by each drawing.

**h. Level datum**

It shall be the responsibility of the Contractor before commencing work to obtain from the Engineer in writing the values and locations of the benchmarks to be used in these works. All temporary benchmarks shall be referred thereto. The Contractor shall construct such temporary benchmarks as the Engineer may direct and shall agree the levels thereof with the Engineer. The establishment of such temporary benchmarks shall be deemed part of the Contractor's responsibility in setting out the works.

**i. Setting out**

The Contractor shall appoint and employ the necessary qualified and experienced staff to set out the works accurately.

The Contractor shall establish and locate all lines and levels and be responsible for the correct location of all works.

Where directed by the Engineer, the Contractor shall take such levels and dimensions as may be required for the purposes of measurement before disturbance of the ground. These shall be agreed between the Contractor and the Engineer in writing before any ground surface is disturbed or covered up. Any work commenced without taking the said levels and dimensions shall be measured on the Engineer's recording of their values before disturbance. The Engineer's decision on this matter shall be final.

**j. Construction and checking of work**

The Contractor shall be solely responsible for and shall provide all labour, tools, lifting tackle, and other equipment required for the construction and checking of the works.

No operative shall be allowed to execute any type of work which is normally carried out by a skilled tradesman, unless the operative is thoroughly experienced and proficient in the trade concerned. Supervisors and operatives may be required to demonstrate their proficiency or produce certificates of competence to the satisfaction of the Engineer.

As each part of the work is carried out, it shall be subject to the approval of the Engineer.

**k. Supervision and labour**

The Contractor will be required to maintain a competent supervising Foreman on Site throughout the construction period until completion of the works, and thereafter as may be required during the Defects Liability Period. The Engineer shall give prior approval to the appointment of this Foreman and shall have the authority to withdraw this approval at any time in accordance with the Conditions of Contract.

All staff and labour employed on the works shall be employed in accordance with the labour and employment laws and regulations of the Republic of Kenya.

**l. Priority to Local Labour**

The Contractor shall give priority to the local community when hiring unskilled and skilled labour. The recommended proportion of local labour to the total workforces will be as follows;

- a) Unskilled labour 70%
- b) Semi skilled labour 20%
- c) Skilled labour 10%

**m. Contractor's site offices, staff, workshops, storage and working areas, communication, etc**

The contractor shall be allowed use of the existing fenced site compound to establish the site office, workshops and for storage. Responsibility for the compounds security will however remain with the contractor until handover. The contractor shall advise the

Engineer at which of his offices any notices may be served in accordance with the conditions of contract.

**i. Language of correspondence and records**

All communication from contractor to the Engineer and the Engineer's Representative shall be in English language.

All site books, time sheets, records, notes drawings, documents, specifications etc. shall be in English language

**ii. Contractor's duty staff & offices**

At least one responsible representative of the contractor shall be immediately available at all times and he shall be on site during normal working hours.

To such representative shall be delegated full authority to confer with Engineer's Representatives or his deputy and to take all steps and to issue all those instructions which may be required in an emergency to ensure the safety of all personnel of the works and of all the Employer's and other property on the site and in the immediate vicinity thereof. The Engineer's Representative may from time to time at his discretion after taking into consideration all the prevailing conditions allow some relaxation of this clause but such relaxation shall be made only with his written permission and subject to any special conditions which he may then require.

The contractor shall maintain at the site, offices for the use of representative and to which written instructions by the Engineer's Representative can be delivered. Any instructions delivered to such offices shall be deemed to have been delivered to the contractor.

**iii. Engineers Office Accommodation, transport**

The contractor shall make available to the engineer a suitable office with a computer, printer, scanner and officer furniture. The office shall be of permanent construction (walling of bricks of fired blocks with appropriate finishes) and shall comprise of 3 No. rooms each with a minimum floor area of 30m<sup>2</sup>.

In addition the he shall arrange appropriate accommodation place for the engineer and provide a vehicle at site for the exclusive use of the engineer's office. The vehicle shall be a 4 wheel drive, engine capacity of at least 2400cc and a double cabin pickup. All the items outlined in this clause shall revert to the client after the lapse of the contract.

**iv. Demolition of contractor's temporary structures**

The Engineer may at any time before the end of the period of maintenance give the contractor notice in writing to demolish and remove those buildings and works which are no longer required, whereupon the title to such buildings and works and materials connected therewith shall revert to the contractor. After the demolition and removal of building and works as required by the Engineer, the contractor shall level, clear, restore and make good the sites and surrounding ground and fill in and compact all latrines, drains, pits and similar works leaving the satisfaction of the Engineer's Representative.

## **v. Public Relations**

The contractor shall designate within his site organization competent staff whose responsibility shall be to ensure good relations.

The location of all yards, stores, workshops, offices, etc. shall be agreed beforehand with the Engineer's Representatives and shall be such as to avoid obstruction and nuisance to public and/or the client.

The contractor shall provide and maintain at or near the site suitable and sufficient shelters, mess rooms, washrooms, latrines etc. as are necessary and customary, to the satisfaction of the Engineer and in accordance with the law and regulations of the relevant authorities.

## **n. Definition and use of the Site**

### **i. Definition of the Site**

The Site shall include all those areas of land which, being public or private:

- Are being provided by the Employer for the construction of the permanent works.
- Are being provided by the Employer for temporary works, including camps, offices and stores.
- Are acquired, leased, or operated by the Contractor as borrow pits or spoil tips for the permanent works, including all access roads.

### **ii. Use of the Site**

- Access to the Site is gained from public and private roads. The Contractor shall be responsible for maintaining all existing site roads affected by his work while he is on Site. He shall also be responsible for repairing and making good any damage to these roads. If the Contractor, his subcontractors or suppliers, causes the damage, then the repairs will be at his own cost.
- The Contractor shall be responsible for the construction, maintenance and repair of any temporary works access roads.
- The lands and other places outside the Site, which are the property of or under the control of the Employer, shall not be used except with the approval of the Engineer.
- The Contractor shall promptly remove any vehicle, wagon, barge or vessel or any other obstruction under his control that the Engineer may require to be moved for any purpose. The Contractor shall remove such obstruction promptly upon receiving such instruction and at his own cost, unless the Engineer shall decide otherwise.
- The Contractor shall maintain access for the inspection, operation and maintenance of any of the Employer's assets within the Site or elsewhere.
- The Contractor shall not use any portion of the Site for any purpose not connected with the works unless the written permission of the Engineer has been obtained.
- Except with the written permission of the Engineer, to be given when necessary for the execution of the works, the Contractor's employees will not be permitted to enter any of the Employer's buildings or lands or sites under the control of



other contractors or the Engineer. The Contractor shall warn his employees that any person found within such buildings or sites without authority is liable to be removed from the works in accordance with the Conditions of Contract

### **iii. Possession of the Site**

The Contractor shall restrict his activities to those areas of the Site adjacent to the works being executed and shall avoid any encroachment upon lands outside the areas for which possession has been given. Any trespass or damage or any claim arising from such encroachment shall be the Contractor's sole responsibility and he shall hold the Employer indemnified against all claims arising from such trespass or damage.

### **iv. Interference with existing works**

The Contractor shall not interfere in any way, with any existing works, be it the property of the Employer or of a third party, whether such works has been shown to the Contractor by the Engineer, except where such interference is specifically described as part of the works, either in the Contract or in instructions from the Engineer to take over such works.

#### **o. Materials for the works**

- All materials shall comply with the appropriate Standard Specifications unless otherwise required hereinafter.
- The Contractor, shall, before placing any order of materials, manufactured articles or machinery for incorporation in the works, submit for the approval of the Engineer the names of the suppliers from whom he proposes to obtain such materials, manufactured articles or machinery, together with a list of the same, giving the origin, quality, weight, strength, description and other relevant details. No materials, manufactured articles or machinery shall be ordered or obtained from any suppliers not approved in writing by the Engineer.
- All materials shall be delivered to the Site a sufficient period of time before they are required for use in the works, to enable the Engineer to take such samples as he may wish for testing and approval.
- Notwithstanding the fact that approval has been given to the source of supply, the Engineer may forbid the use of any materials if, upon delivery, they are found to be defective, or he considers them unsuitable for incorporation in the works. Such rejected materials shall be removed from the site forthwith.
- The Contractor may propose alternative materials of equivalent quality to those specified, and subject to the Engineer's approval, such materials may be used in the works.
- The Contractor shall have no claim against the Employer in respect of any financial loss which he may suffer as a result of the rejection of any such materials, and he shall also bear the cost of removing them from the Site.
- The Engineer shall have the right to inspect materials and plant for the permanent works during the course of manufacture. The Contractor shall arrange for the right of access to manufacturing premises for the Engineer and his staff during normal working hours. The Contractor shall give the Engineer sufficient notice to allow him to observe the testing of any materials for the works at the place of manufacture. The Engineer shall also be given the opportunity to inspect any material or plant in their completed state before packing for transport to the site.

- If requested by the Engineer, the Contractor shall provide the Engineer with copies of orders for the supply of goods or materials required for the works.

**i. Rejected materials and defective work**

Materials or work which, in the opinion of the Engineer, do not comply with the Specification, shall be classified as rejected materials or defective work, and shall be cut out and removed from the works and replaced as directed by the Engineer.

**ii. Alternatives**

The Contractor's main Bid shall comply fully with the Specification.

The Contractor is however at liberty to include alternative materials, items of Plant or methods of construction for which he claims advantages to those indicated in the Specification and Drawings, provided the modes of operation and methods of construction are fully described and are at least equal to those shown on the Drawings or Implied in the Specification.

The Contractor shall submit manufacturer's detailed descriptions of alternatives and he shall draw attention to any aspect of each component that does not fully comply with the requirements of this Specification. These detailed descriptions, including any departure from the requirements of the Specification may, after approval by the Engineer, be included among the Contract Documents and each item shall be in accordance with the description of it. Approval of a manufacturer's description shall not include approval of any departure from the requirements of the Specification unless the Engineer in writing specifically approves the departure.

Where materials, Plant or methods of construction differ from those specified, the Contractor shall submit with his Bid drawings showing any amendments of system design necessary to suit the alternative. The Engineer will either approve these drawings or issue others if he approves the components concerned.

The Engineer however, may not necessarily accept any alternative put forward.

**p. Existing works and services**

The Contractor shall acquaint himself with the positions of all existing works and services including water mains, sewers, stormwater drains, and cables for electricity and lighting poles before any excavations are commenced.

The Contractor will be held responsible for any damage, however caused, in the course of the execution of the works, to such existing works and services. Any damage caused shall be made good at the Contractor's expense.

Such existing works and services, where exposed by the execution of the works, shall be properly shored, hung-up and supported to the satisfaction of the Engineer and of the authority concerned. The Contractor shall exercise special care when refilling trenches or other excavations around such existing services. Stop cock boxes, water meters and the like shall not be covered up.

Poles supporting cables and the like adjacent to the works shall be kept securely in place until the works are completed and shall then be made as safe and permanent as before.

Notwithstanding the foregoing requirements and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer immediately any existing works have been exposed and shall comply with any requirements of the authority concerned. Only when and as directed by the Engineer shall the position of existing works or services be changed by the Contractor to meet the requirements of the proposed work.

The Contractor shall make adequate provision so that when carrying out his work, no interference, damage or pollution is caused to roads and footpaths, or to any mains, drains, sewers, and the like or other parts of the works.

The Contractor shall not store any plant or materials or spoil heaps over existing water mains, or in such positions that interference with access to the mains, control valves and the like is created. Approval by the Engineer to the means of protection employed shall not relieve the Contractor of any responsibility in respect of damage occasioned by his operations.

The laying of pipework, ducts, drains and the like shall be arranged so as to cause as little disruption, to traffic or public movement as possible with the smooth operation of existing works.

When breaking out and making good existing structures, the Contractor shall disturb the existing structures as little as possible. All structures shall be made good with materials similar to those used in the existing works, or such materials which are considered by the Engineer to be of similar appearance and suitable in all other respects.

#### **i. Overhead power lines**

Where work is being carried out in the vicinity of overhead power lines, the Contractor shall be responsible for ensuring that all persons working in such areas are aware of the safe working distances in the vicinity of high voltage overhead power lines especially when cranes or other large masses of steel are in the vicinity of the power lines.

The Contractor's attention is drawn to BS 162, which gives safe clearance for various voltages.

The Contractor shall take all necessary precautions to ensure the safety of his employees and all other persons where work is being carried out near overhead power lines.

#### **ii. Excavation across roads and tracks**

Before excavating across any public or private road or track, the Contractor shall give the Engineer seven days notice of his intention to excavate and shall include, in writing, the precautions he proposes to take for the continuance of passage and safety of traffic, and details of the warning signs and lights to be provided and operated. The excavation shall not commence until the written approval of the Engineer has been given.

### **iii. Liaison with police and other officials**

The Contractor shall keep in close contact with the police and other officials in the areas concerned regarding their requirements for the control of workmen, movement of traffic, or other matters and shall provide all assistance and facilities which may be required by such officials in the execution of their duties.

### **iv. Preservation of trees**

No tree shall be removed without prior written permission of the Engineer who will limit the removal of trees to the minimum necessary to accommodate the permanent works.

If trees are removed or damaged by the Contractor or his employees, without approval, then the Contractor shall replace such trees.

Replacement trees shall be not less than two years of age, obtained from a reputable nursery and of a species approved by the Engineer.

The Contractor shall plant, water and ensure that the replacement trees are properly established.

### **v. Protection from water**

The Contractor shall keep the whole of the works free from water and shall be deemed to have included for all pumping, shoring, temporary drains, sumps and other measures and provisions necessary for such purposes and for clearing away and making good to the satisfaction of the Engineer any damage caused thereby.

### **vi. Protection against fires**

The Contractor is advised that, at all times, it is necessary to guard against fires starting within the Site or in the environs thereof, particularly as the result of the works or from the actions of his employees. The Contractor shall have available, at all times, a trained fire-fighting team provided with adequate fire-fighting equipment and shall deal with all fires on the Site howsoever caused.

### **q. Watching, fencing and lighting**

The Contractor shall employ competent watchmen and guard the works both by day and by night.

Any excavations, material dumps, spoil dumps or other obstructions likely to cause injury to any person or thing shall be suitably fenced off and at night marked by red warning lights.

Fences shall consist of at least three 15 mm diameter hemp ropes or 4mm diameter wires, or more if required, stretched tightly between poles, and standards securely planted in solid ground, well clear of the excavation. The poles and standards shall not be more than 15 metres apart, and where circumstances require, they shall be placed closer. Ropes or wires shall be stretched tight approximately 0.4 m, 0.8 m and 1.2 m above the ground. The Engineer may accept banks of spoil instead of fencing, if of suitable height and form.

Fences and spoil banks shall be clearly marked at the ends, all corners, and along the length at intervals of not more than fifteen metres by means of white lime-washed boards, discs, stones or oil drums during the daytime and by red lamps burning at night. Markers shall be freshly lime-washed at regular intervals to ensure that they are white and clean.

If a road is closed, or partly closed to traffic, temporary traffic signs and barricades shall be erected by the Contractor to the satisfaction of the Engineer and the police, or other relevant authority, to give proper warning to traffic and the public. Lettering on road signs shall be black on a yellow background and shall incorporate reflective material. The signs shall be adequately illuminated at night.

**r. Water and power for use on the works**

The Contractor shall be solely responsible for the location, procurement and maintenance of a water supply adequate in quality and quantity to meet his obligations under the Contract.

The Contractor shall be solely responsible for the location and continuity of the supply of water for use on the works. Supplies may be derived from boreholes, rivers and streams, but shall in all cases be to the Engineer's approval. The abstraction of water from any sources shall not interfere with any permanent water supply. The Contractor shall be solely responsible for the transporting of water from its source to the point at which it is required for construction purposes, and in such quantities and quality as to enable the works to proceed without hindrance due to the shortage of adequate water supplies.

The Contractor shall take care to avoid unnecessary use of water and to prevent any water running to waste.

The Contractor shall make his own arrangements for power supplies and shall be solely responsible for the location, procurement and maintenance of a power supply, adequate to meet his obligations under the Contract.

**s. Telephone and communications**

The Contractor shall obtain suitable means of communications during the course of the Contract. The use of radio communications may be permitted but the Contractor shall be responsible for obtaining all the necessary permits and licences.

**t. Sanitation**

The Contractor shall provide adequate sanitation and refuse collection and disposal facilities complying with state laws and local by-laws for all houses offices workshops, and the like, erected on the site, all to the satisfaction of the Engineer.

The toilet facilities provided at the site by the Contractor shall be made available, free of charge, to the employees of the Contractor and any of his subcontractors.

The Contractor shall warn his employees and subcontractors that any employee found fouling the site shall be removed from the site immediately in accordance with the Conditions of Contract.

**u. First aid and medical services**

The Contractor shall provide and maintain all equipment necessary to render first aid in case of accidents, snakebites or other emergencies. This equipment shall be kept in readiness at the sites 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 at all such places with knowledge of simple first aid procedures and able to administer snakebite treatment.

**v. Health checks**

The Employer may arrange for the taking of swabs, urine and stool samples from all persons who will be working in and around the works, to ensure that all such persons are free from contagious diseases.

The Employer will pay all medical costs incurred in the taking and analyses of these samples. The Contractor shall make his employees available during normal working hours for undergoing the above mentioned health checks. Reasonable notice will be given.

The Contractor shall keep records in respect of all his employees, showing the dates on which health checks have been and will be carried out.

Every employee whom the Contractor intends to engage on the works shall, in addition to being available for the above tests, successfully undertake a test for typhoid and paratyphoid at an approved hospital or medical centre. The medical certificate for each employee shall be submitted to the Engineer before the employee shall be allowed on Site.

**w. Inspections by the Engineer during the Defects Liability Period**

The Engineer will give the Contractor due notice of his intention to carry out any inspection during the defects liability period. 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 shall take note of all matters and things to which the Engineer shall direct his attention.

**x. Health and safety**

**i. General**

The Contractor shall use his best endeavour to ensure, so far as is reasonably practicable and to the satisfaction of the Engineer, the health, safety and welfare at work of his employees, including those of his Subcontractors, and of all other persons on the Site. His responsibilities shall include:

- i. Provision and maintenance of safe and properly illuminated Contractor's Equipment;
- ii. Establishment of safe and well-illuminated systems of working;
- iii. Provision of protective clothing and equipment;

- iv. Establishment of first aid stations, staffed and equipped to provide information, instruction, training and supervision on all aspects of safety and health on site;
- v. Appointing as Safety Officer one of his senior staff who shall have specific knowledge of safety regulations and have had experience of safety precautions on similar works and who shall advise the Contractor on all aspects of safety and health on Site;  
Provision and maintenance of safe access to all work areas on the Site;
- vi. Provision of 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;
- vii. Measures to control flies, mosquitoes and pests in both working and recreational areas including chemical spraying, if necessary, in compliance with the rules and regulations of the Employer;
- viii. Reporting details of any accident to the Site Safety Officer as soon as possible after its occurrence;
- ix. Reasonable prevention of non-site personnel from entering the work areas.

### **ii. Safety equipment and training**

The Contractor shall provide:

- All necessary breathing apparatus, safety harnesses and any other equipment required to ensure safe working of all his personnel on Site;
- Test certificates for all safety equipment;
- Proof that all relevant personnel have received appropriate training.

### **iii. Health and safety plan**

The Contractor is required to produce a health and safety plan 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 he will employ to ensure compliance with his plan.

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

- Details of all potential risks and the proposals for dealing with such hazards;
- Controls to regulate risks that occur during all construction, testing and commissioning activities;
- Measures to avoid health risk in connection with the use, handling, storage and transportation of hazardous and harmful substances;
- Safety equipment and training proposals in respect of equipment referred to above.

### **y. Sign boards**

Before the erection of any signboards or posters by the Contractor, the Contractor shall obtain the approval of the Employer and the Engineer to the size, location and wording of such sign boards or posters.

### **z. Building regulations**

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

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**aa. Progress photographs**

Photographs showing the progress of the works shall be taken by a competent photographer every month from positions to be selected by the Engineer.

Special photographs showing particular features of the works or matters of interest concerning the works or their surroundings shall also be taken from time to time as and when required by the Engineer.

Photographs shall not be less than 120 mm x 90 mm and shall be inscribed with the date when taken and a brief description or title.

All negatives shall be numbered; retained on the site and on completion of the works the negatives shall become the property of the Employer.

An item is included in the Bill of Quantities for the cost of such photographs.

**bb. Contractor's tracked equipment**

The Contractor's tracked equipment may not be run on any public or private road without the written permission of the owner or authority concerned.

**cc. Site meetings**

The Contractor shall be obliged to attend all site meetings at the appointed time. Site meetings would be held on a monthly basis or at any other duration as may be communicated by the engineer.

**dd. Pollution**

During the execution of the works, the Contractor shall ensure that no pollution of existing watercourses is allowed to take place because of his activities. The Contractor shall take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the republic or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

**ee. Site clearance**

On completion of the works, the Contractor shall clear the site and remove all temporary buildings, equipment and debris. The Contractor shall level off and grade all areas used for haul roads and all building, store and workshop areas. The whole of the site shall be left in a clean and tidy condition.



**v. EXCAVATION AND FILLING**

**a. Site Clearance**

**i. Areas occupied by Permanent Works**

The Contractor shall clear all borrow areas and other areas where it is intended to use the material below for construction purposes by removing all trees, roots, stumps, topsoil, vegetable matter and other debris which is unsuitable for fill. The Contractor shall deal similarly with all areas under permanent and temporary embankments, in other foundation areas, under permanent roads where organic material is present, and where it is intended to place fill directly on the existing ground surface.

**ii. Areas Occupied by Temporary Works**

The bush clearing for the contractor's camps, offices, stores, working areas and for his access roads and his own borrow areas shall be at the Contractor's expense. Clearance for temporary works shall be kept to a minimum and be subject to the approval of the Engineer.

**iii. Structures**

Structures shall not be demolished unless specified or directed. Methods of demolition shall be approved.

**iv. Spoil Materials**

Material shall not be left lying around just outside the periphery of the area to be cleared, but shall be properly disposed of or removed completely to the approval of the Engineer.

The Contractor shall dispose of all trees, bushes and other vegetable matter by stockpiling in piles or windrows (longitudinal heaps) and burning. Secondary burning shall be carried out as necessary such that all material is reduced to a white ash. All burning shall be kept under full control. Unburnt tree trunks shall be either restock piled and included in further burning operations or cut up and removed from the area.

**v. Programming**

The programming of all clearing works shall be subject to the approval of the Engineer.

**b. General Excavation Clauses**

**i. Advance Notification of Proposed Methods**

The Contractor shall submit for the consent of the Engineer detailed proposals for methods, dewatering and safety arrangements in respect of each major or critical section of excavation, including drilling and blasting where appropriate. Except as may be otherwise agreed, the proposals shall be presented at least 1 week before the intended start date and the Engineer shall comment on the proposals within 4 days. Only after the receipt and revision of these proposals as may be requested, and with the written consent of the Engineer, shall the Contractor commence the excavation work to which the proposals refer.

The Engineer shall not unreasonably withhold consent and will request revisions of proposals only if he considers that an acceptable end result would otherwise be unlikely. The Contractor shall not subsequently vary the agreed procedure, except in detail, without having obtained the written consent of the Engineer to the change.

No consent as described above shall relieve the Contractor of his responsibility for carrying out his operations in a workmanlike manner and as safely as is reasonably possible to the lines and levels shown on the Drawings or as instructed by the Engineer.

## **ii. Dewatering of Excavations**

The Contractor shall maintain all excavations free from water, irrespective of its source, to the extent necessary for the execution of the Works or in the interests of safety, and to the satisfaction of the Engineer. He shall provide, install, operate and maintain all necessary appliances and Plant for this purpose.

The Contractor shall take all necessary precautions at points of discharge of water to avoid flooding or damage to the Works, adjoining works or property and to avoid pollution of watercourses.

The dewatering of excavations immediately prior to concreting shall not be commenced until at least one standby pump is on hand.

## **iii. Remedial Work**

Any damage resulting from the Contractor's operations during excavation, including damage to foundations and excavated surfaces shall be repaired at the expense of the Contractor and to the satisfaction of the Engineer.

## **iv. Safety of Excavations and Persons**

### **Safety of Excavations**

The Contractor shall take full responsibility for the stability and safety of all excavation works and methods of construction including temporary support of excavated surfaces, diversion of water, pumping etc. He shall assume full responsibility for the safety and prevention of injury to personnel and for damage. His safety provisions shall comply with relevant local regulations and the requirements of Section 1.8.

The Contractor shall provide and install handrails, toeboards and all necessary temporary supporting works such as timbering, shoring, anchorages and the like wherever such support is required. All support arrangements must be to the approval of the Engineer, who may order such support to be strengthened or altered if it is considered necessary in the interests of the work or to safeguard against accidents to workmen.

If the Contractor wishes to batter and/or cut back the face of an excavation in order to eliminate or reduce the quantity of timbering and shoring required, he shall obtain permission from the Engineer. Both the slope and the extent to which such battering is to be carried out must be agreed with the Engineer before excavation is commenced.

Timbering and shoring shall be so designed and constructed that, if necessary, it can be inserted as excavations proceed and safely withdrawn as backfilling is raised. Waling

and struts shall be suitably positioned to permit pipes and other materials to be installed in the excavations. No temporary supports shall remain in excavations after backfilling unless approved by the Engineer.

If slips of material occur in any part of the excavations during the execution of the Works or during the Defects Liability Period, the necessary remedial works shall be executed to the approval of the Engineer. Such remedial work shall be at the Contractor's expense in cases where the Engineer considers that the Contractor has not exercised reasonable preventive measures.

#### **v. Inspection and Surveys by the Engineer**

The Engineer shall have the right to gain access to any area of excavation giving adequate notice. The Contractor shall provide whatever assistance and incidental materials may be required. This work will be arranged so as not unduly to disrupt the Contractor's normal working arrangements and he shall allow for it in his programme.

#### **vi. Classification of Excavated Material**

##### **General**

Excavation shall be classified for payment purposes only as follows:

(a) Class 1:

All soil overburden, weathered and shattered rock, or cemented sand in river terrace areas and other material which can be removed by hand, by single shank ripping and bull-dozing with a track mounted tractor at least equivalent to a modern Caterpillar D6 in weight and horsepower of 165Hp or, in confined areas, by a mechanical excavator equivalent to a modern Caterpillar 446B of flywheel horsepower of 102Hp (or gross horsepower of 110Hp) fitted with an extreme service trenching bucket. When used for classifying materials the condition of the equipment should be as new

(b) Class 2:

Rock and artificial hard materials which cannot be removed effectively by the methods described in (a) above and which normally require recognised rock excavation methods such as drilling and blasting or use of hydraulic breakers.

In the event of a dispute as to the classification of a material, the decision of the Engineer shall be final.

The Engineer shall be empowered to require rock to be excavated without explosives and payment will be made accordingly.

#### **vii. Limits of Excavation**

##### **General**

The surfaces exposed by open cut excavation against which concrete is to be placed shall be excavated to the lines shown on Drawings or as required by the Engineer. No material shall remain within the outline of structural concrete. Elsewhere in open cut, the excavation shall be to the lines and levels shown on the Drawings or as required by the Engineer except that local points of undisturbed hard rock may be permitted to extend within the required lines of excavation where approved by the Engineer.

### **Revision of Limits**

During the progress of the work, the Engineer may find it necessary or desirable to revise the required lines and levels of any part of the excavations because of the conditions disclosed by the excavations or for any other reason. When the Contractor is advised of such revision before the excavation of such part has been commenced to the lines and levels shown on the Drawings, the revised excavation will be paid for at the billed rate for the main excavation. If, however, such revision requires additional excavation to be made after the excavation of such part has already been carried out to a point where the normal procedure for the main excavation cannot reasonably be used, the additional work shall be carried out as specified and will be paid for under the contractual provisions for variations. This will include removal of rock and filling of resultant voids which, in the opinion of the Engineer, could not reasonably have been anticipated and are beyond the control of the Contractor.

### **Excavation beyond Limits**

The Contractor shall not deliberately excavate beyond the lines and levels shown on the Drawings or designated by the Engineer (as above or otherwise) without prior written approval. Any deliberate excavation beyond the required lines and levels which is performed by the Contractor for any purpose (such as for working space) shall be at the expense of the Contractor. If such excavation should, in the opinion of the Engineer, require to be backfilled, such backfilling shall be done at the Contractor's expense to the satisfaction of the Engineer with concrete or material similar to the fill to be placed against the excavated surface. Beneath load bearing structures, foundations and other reinforced concrete work, the filling to any over excavation shall be of the same quality concrete as that required for the associated concrete structure unless the Engineer permits leaner concrete.

Where it is intended that concrete be cast against the side of excavated material the Contractor may alternatively propose to the Engineer to over excavate, back shutter and backfill, but the Engineer will be under no obligation to accept the proposal and, subject to the conditions listed in the notes on measurement, no extra payment will be made if the alternative proposal is accepted.

#### **viii. Sources of Fill Materials**

The Contractor shall obtain the necessary general fill materials for construction of the works from excavations required to be undertaken for the permanent works.

Other fill materials such as sand, graded aggregate and rockfill for use as fill materials shall be obtained by the Contractor from sources to be approved by the Engineer. The Contractor will be entirely responsible for ensuring that the materials supplied meet the requirements of the Specification including for any necessary crushing, blending or other preparation.

Acceptance by the Engineer of the source of any material will in no way be deemed to imply approval by the Engineer of the material to be supplied, nor shall approval of a potential borrow area be construed as constituting approval of all materials contained therein.

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## **ix. Use of Material from Excavations for the Works**

### **General**

Depending on its nature and quality, excavated material will either be:-

- Re-used as fill or backfill;
- taken to spoil.

The Contractor shall select materials as required and use his skills to avoid unnecessary waste of potentially usable materials.

### **Re - Used f Material**

Where the Contractor has been informed that the intention is that excavated material is to be re-used elsewhere in the Works, the Contractor shall ensure that his excavation techniques result in material suitable for the particular re-use requirement which is described.

In order to achieve particular materials the Contractor shall be prepared to sort materials into different stockpiles, which he must maintain in an uncontaminated condition. Any contaminated material shall be abandoned and replaced at the Contractor's expense. The contractor may be required to cart the excess contaminated material to spoil or dispose them in-situ as directed by the Engineer. No extra costs will be paid to the contractor for complying with such instructions. In executing the instructions issued by the Engineer, the contractor will be required to give effect to the environmental concerns specified in section 1.9 hereof.

In all such cases it will be to the Contractor's advantage to phase as far as possible the excavation work to suit the construction in which the excavated material is to be re-used, particularly as no additional payment for double handling of materials will be made.

## **x. Requirements Specific to Excavations for Particular Parts of the Works**

### **Trenches, Manholes and Confined Foundations**

Confined and narrow excavations, such as for trenches and manholes, shall be excavated with particular care and attention to adequacy of temporary strutting because trench collapses are one of the commonest causes of death and injury on construction sites. The dangers inherent in inadequate supervision of such work, particularly in water bearing ground or damp conditions, cannot be over-emphasised. Continuous dewatering may be necessary in water bearing ground.

Excavated material shall be cast or moved to a position sufficiently far away from the edge of the trench that instability of the trench wall (supported or otherwise) will not be called into question.

Excavated material which will clearly be unsuitable as backfill shall be removed to spoil as soon as possible after being excavated.

The widths of trenches for pipes shall be of the minimum required or as shown on the Drawings. Trenches shall not be so narrow that the pipe cannot be properly installed and

jointed. Neither shall they be of excessive width or with battered sides because this will increase the loading on an unprotected pipe. At pipe joint locations the trench shall be widened and deepened to leave the joints unsupported so that they can be properly made and inspected. In Class 2 material an extra 150 mm over the depth for Class 1 material shall be excavated and replaced by pipe bedding material.

Supports shall be left in permanently when so directed when they are removed, the removal shall be done progressively as backfilling proceeds and in stages so that no voids are left.

Excavations at or near the toes of cuttings or embankment slopes shall be carried out in such a manner that there is no excavation into the slopes. In such trenches the pipe run shall be completed and backfilled at the end of each day's work unless otherwise agreed with the Engineer.

### **Structures**

The Contractor shall excavate such that concrete and other structures may be formed to the lines and levels shown on the Drawings or as instructed by the Engineer. He shall increase the dimensions above the minima required in the interests of safety if so directed by the Engineer. In the course of the excavation work, the surrounding material shall be preserved in the soundest possible condition.

Excavation for foundations in Class 1 material shall be made to approximately 0.5 m above the levels shown on the Drawings. Final trimming shall be delayed until shortly before foundation preparation is due to commence.

During the course of blasting operations where, in the opinion of the Engineer, action is necessary to avoid damage to adjoining material or to adjacent structures, the Engineer may instruct the Contractor to reduce the explosive charges or to use other methods such as pre-splitting or cushion blasting or to cease using explosives altogether and to continue by other means such as use of hydraulic breakers or line drilling.

Excavated surfaces which will remain permanently exposed shall be finished off in a neat and workmanlike manner and graded to provide adequate drainage. Rocky material liable to become detached from such surfaces shall either be removed (and holes backfilled where practicable) or anchored.

Excavated surfaces on or against which concrete structures will be cast shall be trimmed so that there are no projections within the permissible limits and cleaned to remove loose, soft or foreign materials by hand, air and water jets or other effective means. Unless shown otherwise on the Drawings or directed by the Engineer, the Contractor shall cast all in situ concrete structures against the excavated side surface in Class 2 material. Thus, when excavating in Class 2 material, excavation lines shall be kept as close as possible to the actual structural requirements.

Where the Contractor over excavates sides of excavations by an additional width exceeding 500 mm, the Engineer shall be empowered to direct the Contractor to use formwork at his own expense to achieve the final surfaces of in situ concrete structures.

### **xi. Disposal of Excavated Material**

Material which has to be excavated in order to execute the Works, but is unsuitable for construction purposes or which is surplus to requirements as fill, shall be kept separate from other materials and not allowed to cause contamination of material required for use in the Works. Such unwanted material shall be disposed of by spreading the material in layers in designated spoil areas as directed by the Engineer. The material shall be compacted to the maximum practicable extent by routing the haulage traffic over the area. Permanent spoil areas visible after completion shall be shaped to follow existing contours such that the tips blend in with the local topography. Such disposal areas shall be kept neat and tidy. Surfaces shall be finished and graded to the extent necessary to provide surface drainage, and grassed to prevent future erosion of the materials.

### **xii. Dust and Noise Prevention**

The Contractor shall make masks and ear muffers available to those personnel engaged on operating inherently noisy equipment and other work entailing long-term exposure to dust and noise and the consequent danger of contracting ill effects there from.

The Engineer shall be empowered to ask for excessively noisy equipment to be removed and replaced.

### **xiii. Procedure on Completion of Excavation**

Upon substantial completion of excavation, the excavated surface shall be cleared of spoil sufficiently to allow inspection by the Engineer. Final clearing and surface preparation procedures shall not commence until the Engineer has approved the excavated level. Neither shall any excavated surface for the Permanent Works be covered until the Contractor has obtained the approval of the Engineer. The Contractor shall at his own expense uncover any excavation which has been covered without such approval.

Where the material replaced in an excavation is other than the material removed, supports shall be removed before or during filling and in such a way that the material from the walls of the excavation does not contaminate the replacement material.

Excavated surfaces which are to have fill material or concrete placed upon them shall be prepared as specified elsewhere.

### **xiv. Site Investigation**

Information regarding the geology of the soil in the region is not provided to the Contractor, the Contractor will be deemed to have made his own enquiries and investigation at the time of tender.

### **xv. Backfilling of Excavations**

#### **Scope**

These clauses cover the backfilling of excavations except for pipe trenches and the like, for which the requirements are given in the Pipe work Section.

### **Materials**

Fill material used for backfilling excavations shall be approved Class 1 material free from large clods, large rocks, rubbish and other undesirable constituents. Where free draining material is shown on the Drawings, all layers thereof shall be of consistent quality.

Backfill material shall normally be selected by the Contractor from excavated material at the Site which he has set aside for this purpose. When suitable backfill material cannot be obtained in this manner, it shall be obtained by the Contractor from another borrow source and brought to the Site. Both the source and the type of material to be used will be subject to approval by the Engineer.

### **Procedure**

Unless otherwise agreed, backfilling shall be carried out in layers not exceeding 150 mm after compaction. Each layer shall be watered to the approximate optimum moisture content and thoroughly compacted uniformly over the full area of each layer to the density of the surrounding ground. Unless otherwise instructed, vibrating plate or similar compaction equipment shall be used in confined areas. Where appropriate the final layer of backfill shall be neatly finished to accord with the surrounding ground levels and any settlement which occurs shall be made good by re-compacting and the addition of further compacted backfill.



## **vi. CONCRETE WORKS**

### **a. General**

#### **Code of practice**

All workmanship, materials, tests and performances in connection with the reinforced concrete work are to be in conformity with the latest edition of British Standard Code of Practice (C.P. 8110 for “Structural Use of Concrete”) where not inconsistent with these specifications.

### **b. Materials**

#### **i. Cement**

Cement, unless otherwise specified, shall be Portland cement approved by the Engineer and shall comply with the requirements of B.S. 12 with the exceptions that it may contain reactive volcanic ash (of not more than 10% of total weight) and the quantity of insoluble residue permitted in B.S. 12 may be exceeded. A manufacturer’s Certificate of Test in accordance with B.S. shall be supplied for each consignment delivered to site.

Should the Contractor require using cement of the rapid hardening variety, he shall obtain the approval of the Engineer and also obtain any instructions regarding the modifications to the preambles caused thereby. Any additional cost that may be caused by the use of the rapid hardening cement shall be at the Contractor’s expense.

Cement may be delivered to site either in bags or in bulk. If delivered in bags, each bag shall be properly sealed and marked with the manufacturer’s name and on the site is to be stored in a weather-proof shed of adequate dimensions with a raised floor. Each consignment shall be kept separate and marked so that it may be used in the sequence in which it was received. Any bag found to contain cement which has set or partly set shall be completely discarded and not used in the Works. Bags shall not be stored more than 1500 mm in height.

If delivered in bulk the cement shall be stored in a weather-proof silo either provided by the cement supplier or by the Contractor, but in either case the silo shall be to the approval of the Engineer.

#### **ii. Aggregates**

The aggregates shall conform to the requirements of B.S. 882 and the sources and all types of all aggregates are to be approved in all respects by the Engineer before work commences.

The grading of aggregates shall be one within the limits set out in B.S. 882 and as later specified and the grading, once approved, shall be adhered to throughout the Works and not varied without the approval of the Engineer. Fine aggregate shall be clean, coarse, siliceous sand of good, sharp, hard quality and shall be free from lumps of stone, earth, loam, dust, salt, organic matter and any other deleterious substances. It shall be graded within the limits set out in zone 1 or 2 of B.S. 882.

Coarse aggregate shall be good, hard, clean approved black trap or similar stone, free from dust, decomposed stone, clay, earthy matter, foreign substances or friable thin elongated or laminated pieces. It shall be graded within the limits of Table 1 of B.S. 882 for its respective nominal size.

If in the opinion of the Engineer the aggregate meets the above requirements, but is dirty or adulterated in any manner it shall be screened and/or washed with clean water if he so directs at the Contractor's expense.

Aggregates shall be delivered to the site in their prescribed sizes or grading and shall be stockpiled on paved areas or boarded platforms in separate units to avoid intermixing.

### **iii. Fine aggregate**

Fine aggregate shall be sand free from impurities and complying with British Standard No. 882. Grading zone 2 of Table 2.

### **iv. Coarse aggregate**

Coarse aggregate shall be hard crushed rock free from impurities and complying with British Standard No. 882 "graded aggregate" 20 mm to 5 mm nominal size as Table 1.

### **v. Water**

Water for concrete shall be free from impurities, complying with BS 3148

### **vi. Hardcore**

Hardcore for filling under floors shall be good, hard stone ballast or quarry waste, to the approval of the Engineer, broken to pass through not greater than a 150 mm ring or to be 75% of the finished thickness of the layers being compacted, whichever is the lesser. Hardcore shall be free from all weeds, roots, vegetable soil, clay, black cotton soil or other unstable materials.

It shall be graded with smaller stones and fine materials to give a dense compact mass after consolidation. Sufficient fine material shall be added to each layer to give gradation of material as necessary to obtain a solid compact mass after rolling. Hardcore filling is to be laid in layers each of a consolidated thickness not exceeding 250 mm. Each layer shall be compacted by at least 8 passes of a 10-tonne smooth-wheeled roller or a 2-tonne vibrating roller until all movement ceases. Sufficient water is to be added to obtain maximum compaction to the Engineer's approval. To each layer a 25 mm thick layer of sand complying with the specification of fine aggregate for concrete shall be spread over the surface and forced into the hardcore by the use of a vibrating roller weighing not less than 2 tonnes. This operation should be carried out when the materials are dry and repeated whilst the sand is well watered. Should all the sand be absorbed the Engineer may require a further layer to be applied and the process repeated.

The top surface of the hardcore shall be levelled or graded to fall as required, and shall then be blinded with a layer of similar material broken to 25 mm gauge and finished with a 10-tonne smooth-wheeled roller. The surface so obtained shall be to the Engineer's approval.

### **vii. Compacted hardcore**

The sub-grade shall be compacted by a smooth-wheeled roller of 8 to 10 tonnes weight or the vibrating roller of minimum 1300 Kg., or other approved plant. The number of coverage shall be at least 10 and there shall be a 50% overlap of successive coverage. If so instructed by the Engineer, water shall be added during compaction to obtain optimum water content. Filling shall be compacted as above but in maximum 200 mm deep layers.

### **viii. Sand**

The sand shall be as described for fine aggregate but that for plastering shall be light in colour and well graded to a suitable fineness in accordance with the nature of work in order to obtain the finish directed.

### **c. Finishes**

#### **i. General**

The Contractor will be required from an early stage in the contract to prepare samples, for the approval of the Engineer, of the various concrete finishes specified hereafter. Samples are to be prepared using the same materials and the same methods of construction, compaction, curing, etc. as the Contractor proposes to use for executing the full quantity of the work. A record of the mix, water content, method of compaction, any additives used, etc., is to be kept for each sample prepared. When the Engineer has approved a sample it will be kept on site in an approved location. The finishes in construction will be expected to be up to a standard equal to the approved sample. Consistency in cement colour, and the colour, grading and quality of aggregates must be maintained in all finished concrete work.

#### **ii. Mortars**

Cement mortar shall consist of one part of Portland cement to three parts sand by volume. The cement/lime mortar shall consist of one part of Portland cement, one part of lime and six parts of sand by volume.

The ingredients of mortar shall be measured in proper gauge boxes on a boarded platform, the ingredients being thoroughly mixed dry, and again whilst adding water. In the case of cement/lime mortar, sand and lime shall be mixed first and then the cement added.

All mortar is to be thoroughly mixed to a uniform consistency with only sufficient water to obtain a plastic condition suitable for troweling. No mortar that has commenced to set is to be used or re-mixed for use.

#### **iii. Tamped finish**

Areas so specified shall be finished at the time of casting with a tamped finish to the Engineer's approval produced by an edge board. Board marks are to be made to a true pattern and will generally be at right angles to the traffic flow. Haphazard or diagonal tamping will not be accepted.

#### **iv. Fair face**

Fair face surfaces shall be clean, smooth, even, true to form, line and level, and free from all board marks, joint marks, honeycombing, pitting, and other blemishes. Forms are to be provided with a smooth lining of plywood, steel, or other approved material which will achieve the required finish without any general rubbing down. Rubbing down will only be permitted to remove any projecting fins at corners or joints.

#### **v. Fine face**

Fine face surfaces shall be for Fair face above, but to a higher standard obtained from forms provided with an impervious sheet lining of metal or plastics faced plywood in large panels arranged in an approved pattern. Rubbing down shall only be permitted after an inspection by the Engineer. The finished surfaces shall be capable of receiving a painted finish.

#### **vi. Chisel-dressed finish**

Chisel-dressed finish is to be carried out on any grade of concrete but not until it is at least 30 days old. The surfaces are to be fully chisel-dressed to remove a maximum of 12 mm (average 9 mm) of the surface by shearing and exposing the aggregate without excessive cracking of the surrounding matrix. Arises of columns, beams, etc., are pre-formed fair face with timber fillets set in the formwork and care must be taken in working up to these to preserve a clean line.

For vertical surfaces of walls and columns particular care must be taken to remove all sharp projections. For beam soffits this requirement is not necessary. All surfaces requiring this treatment are to have margins chisel-dressed by hand for a minimum width of 75 mm commencing from the fillet edge. Thereafter, mechanical chisel-dressing may be used, but the Contractor must ensure that a uniform texture and even plane surface is achieved. The use of sharply pointed steel tools for both hand and mechanical chisel-dressing is essential. Upon completion the surfaces are to be thoroughly wire brushed and washed down.

#### **vii. Protection of finishes**

Wherever possible, in-situ exposed concrete finishes should be commenced at the highest level and worked progressively down the building. Precaution shall be taken to avoid staining or discoloration of previously finished concrete faces by leakage of grout from newly placed concrete. The Contractor shall, during all stages of construction, adequately protect all concrete finishes from Damage by leaking grout, knocking, paint stains, falling plaster, etc. In cases of balustrade walls to staircases and members where Damage is otherwise likely, concrete finishes shall be protected by cladding with timber, celotex, or other approved sheeting.

#### **d. Blinding**

All blinding concrete to be 1:3:6, or as otherwise instructed by the Engineer in writing.

#### **e. Formwork**

The method and system of formwork which the Contractor proposes to use shall be approved of by the Engineer before construction commences. Formwork shall be substantially and rigidly constructed of timber or steel or pre-cast concrete or other approved material.

All timber for formwork shall be good, sound, clean, sawn, well-seasoned timber, free from warps and loose knots and of scantings sufficiently strong for their purpose.

#### **f. Construction of formwork**

All formwork shall be of sufficient thickness and with joints close enough to prevent undue leakage of liquid from the concrete and fixed to proper alignment, level and plumb and supported on sufficiently strong bearers, shores, braces, plates e.t.c. properly held together by bolts or other fastenings to prevent displacement, vibration or movement by the weight of materials, men and plant on same and so wedged and clamped as to permit easing and removal of the formwork without jarring the concrete. Where formwork is supported on previously constructed portions of the reinforced concrete structural frame, the Contractor shall by consultation with the Engineer ensure that the supporting concrete is capable of carrying the load and/or sufficiently propped from lower floors or portions of the frame to permit the load to be temporarily carried during construction.

Soffits shall be erected with an upward camber of 5 mm for each 5 meters of horizontal span or as directed by the Engineer.

Great care shall be taken to make and maintain all joints in the formwork as tight as possible, to prevent the leakage of grout during vibration. All faulty joints shall be caulked to the Engineer's approval before concreting. The formwork shall be sufficiently rigid to ensure that no distortion or bulging occurs under the effects of vibration. If at any time the formwork is insufficiently rigid or in any way defective the Contractor shall strengthen or improve such formwork as the Engineer may direct.

The Contractor's attention is drawn to the various surface textures and applied finishes required and the faces of formwork next to the concrete must be of such material and construction and be sufficiently true to provide a concrete surface which will in each particular case permit the specified surface treatment or applied finish.

All surfaces which will be in contact with concrete shall be oiled or greased to prevent adhesion of mortar. Oil or grease shall be of a non-staining mineral type applied as a thin film before the reinforcement is placed. Surplus moisture shall be removed from the forms prior to placing of the concrete.

Temporary openings shall be provided at the base of columns, wall and beam forms and at any other points where necessary to facilitate cleaning and inspection immediately before the pouring of concrete. Before the concrete is placed the shuttering shall be trued-up and any water accumulated therein shall be removed. All sawdust, nails, chips and other debris shall be washed out or otherwise removed from within the formwork. The reinforcement shall then be inspected for accuracy of fixing. Immediately before placing the concrete the formwork shall be well wetted and inspection openings shall be closed. The erection, easing, striking and removing of all formwork must be done under the personal supervision of a competent foreman, and any Damage occurring through faulty formwork or its incorrect removal shall be made good by the Contractor at his own expense.

After removal of formwork, all projections, fins etc., on the concrete surface shall be chipped off, and made good to the requirements of the Engineer. Any voids or honeycombing shall be treated as described in "Faulty Concrete".

#### **i. Stripping formwork**

All formwork shall be removed without undue vibration or shock and without Damage to the concrete. No formwork shall be removed without the prior consent of the Engineer.

#### **g. Concrete mixes**

Concrete to be used shall be of the classes specified in "Ministry of Works standard Specification" Section 17.

Class	Nominal mix	Trial Strength in N/mm <sup>2</sup>		Where used in this Contract
		7 day	28 day	
15	1:3:6	13	19.5	Surround to pipes, blinding
25	1:2:4	25	32.5	General Concrete Works

#### **h. Concrete mixing and placing**

The concrete shall be mixed only in approved power-driven mixers of a type and capacity suitable for the work, and in any event not smaller than 0.04/0.28 m<sup>3</sup> capacity. The mixer shall be equipped with an accurate water measuring device. All materials shall be thoroughly mixed dry before water is added and the mixing of each batch shall continue for a period of

not less than two minutes after the water has been added and until there is a uniform distribution of the materials and the mass is uniform in colour.

The entire contents of the mixed drum shall be discharged before recharging. The volume of mixed material shall not exceed the rated capacity of the mixer. Whenever the mixer is started, 10% extra cement shall be added to the first batch and no extra payment will be made on this account.

As a check on concrete consistency slump tests may be carried out and shall be in accordance with B.S. 1881. The Contractor shall provide the necessary apparatus and carry out such tests as are required. The slump of the concrete made with the specified water content, using dry materials, shall be determined and the water to be added under wet conditions shall be so reduced as to give approximately the same slump.

The concrete shall be mixed as near to the place where it is required as is practicable, and only as much as is required for a specified section of the work shall be mixed at one time, such sections being commenced and finished in one operation without delay. All concrete must be efficiently handled and used in the Works within twenty (20) minutes of mixing. It shall be discarded from the mixer direct either into receptacles or barrows and shall be distributed by approved means which do not cause separation or otherwise impair the quality of the concrete. Approved mechanical means of handling will be encouraged, but the use of chutes for placing concrete is subject to prior approval of the Engineer.

Concrete shall be placed from a height not exceeding 1,500 mm directly into its permanent position and shall not be worked along the shutters to that position.

Concrete shall be placed continuously until completion of the part of the work between construction joints as specified hereinafter or of a part of the approved extent. At the completion of a specified or approved part a construction joint of the form and in the positions hereinafter specified shall be made. If stopping of concrete be unavoidable elsewhere, a construction joint shall be made where the work is stopped. A record of all such joints shall be made by the Contractor and a copy supplied to the Engineer.

Any accumulation of set concrete on the reinforcement shall be removed by wire brushing before further concrete is placed. The Contractor shall provide runways for concreting to the satisfaction of the Engineer. Under no circumstances will the runways be allowed to rest on the reinforcement. Care shall be taken that the concrete is not disturbed or subjected to vibrations and shocks during the setting period. Mixing machines, platforms and barrows shall be clean before commencing mixing and be cleaned on every cessation of work. Where concrete is laid on hardcore or other absorbent materials, the base shall be suitable and sufficiently wetted before the concrete is deposited.

#### **i. Works cube tests**

Work cubes are to be made at intervals as required by the Engineer in accordance with C.P. 114, and the Contractor shall provide a continuous record of the concrete work. The cubes shall be made in approved 150 mm moulds in strict accordance with the Code of Practice. Three cubes shall be made on each occasion. Each cube shall be marked with a distinguishing number (numbers) to run consecutively and the date, and a record shall be kept on site giving the following particulars:-

- a) Cube No.
- b) Date made
- c) Location in work

- d) 7-Day Test, Date, Strength
- e) 28-Day Test, Date, Strength

Cubes shall be forwarded, carriage paid, to an approved Testing Authority, in time to be tested two at 7 days and the remaining one at the discretion of the Engineer. No cube shall be dispatched within three days of casting. Copies of all Works Cube Tests shall be forwarded to the Engineer and one shall be retained on site. If the strengths required above are not attained and maintained during the carrying out of the contract, the Contractor will be required to increase the proportion of cement and/or substitute better aggregates so as to give concrete which does comply with the requirements of the contract. The Contractor may be required to remove and replace at his own cost any concrete which fails to attain the required strength as ascertained by Works Cube Tests.

#### **j. Compaction**

At all times during which the concrete is being placed, the Contractor shall provide adequate trained and experienced labour to ensure that the concrete is compacted in the forms to the satisfaction of the Engineer. Concrete shall not be placed at a rate greater than will permit satisfactory compaction or to a depth greater than 400 mm before it is compacted.

During and immediately after placing, the concrete shall be thoroughly compacted by means of continuous tamping, spading, slicing and vibration. Vibration is required for all concrete of classes 40, 35, 25, and 20. Care shall be taken to fill every part of the forms, to work the concrete under and around the reinforcement without displacing it to avoid disturbing recently placed concrete which has begun to set. Any water accumulating on the surface of newly placed concrete shall be removed and no further concrete shall be placed thereon until such water is removed.

Internal vibrators shall be of a frequency not less than 7000 cycles per minute and shall have a rotating eccentric weight of at least 0.05 Kg. with an eccentricity of not more than 12 mm. Such vibrators shall visibly affect the concrete within a radius of 250 mm from the vibrator. Internal vibrators shall not be inserted between layers of reinforcement less than one and one half times the diameter of the vibrators apart. Contact between the vibrators and reinforcement, and vibrators and formwork shall be avoided. Internal vibrators shall be inserted vertically into the concrete at not more than 500 mm centres and shall be moved constantly from place to place. No internal vibrator shall be permitted to remain in any one position for more than ten seconds and it shall be withdrawn very slowly from the concrete.

In consolidating each layer of concrete the vibrating head shall be allowed to penetrate and re-vibrate the concrete in the upper portion of the underlying layer. In the area where newly placed concrete in each layer joins previously placed concrete more than usual vibration shall be performed, the vibrator penetrating deeply at close intervals along these contacts. Layers of concrete shall not be placed until layers previously placed have been vibrated thoroughly as specified. Vibrators shall not be used to move concrete from place to place in the formwork.

At least one internal vibrator shall be of the high frequency, low amplitude type applied with the principal direction of vibration in the horizontal plane. They shall be attached directly to the forms at no more than 1200 mm centres. Vibrating elements shall be of the low frequency high amplitude type operating at a speed of not less than 3000 r.p.m.

#### **k. Curing and protection**

Care must be taken that no concrete is allowed to become prematurely dry and the fresh concrete must be carefully protected, within two hours of placing, from rain, sun and wind by means of Hessian sacking, polythene sheeting, or other approved means. This protective layer

and the concrete itself must be kept continuously wet for at least 7 days after the concrete has been placed. The contractor will be required to provide complete coverage of all fresh concrete for a period of 7 days. Hessian or polythene sheeting shall be in the maximum widths obtainable and shall be secured against wind. The Contractor will not be permitted to use old cement bags, Hessian or other materials in small pieces.

Concrete in foundations and other underground work shall be protected from admixture with falling earth during and after placing. Traffic or loading must not be allowed on the concrete until the concrete is sufficiently matured, and in no case shall traffic or loading be of such magnitude as to cause deflection or other movement in the formwork or Damage to the concrete members. Where directed by the Engineer props may be required to be left in position under slabs and other members for greater periods than those specified hereafter.

#### **l. Faulty concrete**

Any concrete which fails to comply with these specifications, or which shows signs of setting before it is placed shall be taken out and removed from site. Where concrete is found to be defective after it has set, the concrete shall be cut out and replaced in accordance with the Engineer's instructions. On no account shall any faulty, honeycombed, or otherwise defective concrete be repaired or patched until the Engineer has made an inspection and issued instructions for the repair. The whole cost whatsoever, which might be occasioned by the need to remove faulty concrete, shall be borne by the Contractor.

#### **m. Pre-cast units**

Pre-cast reinforced concrete slabs to be made to sizes as shown in the Drawings. Slabs shall be cast with Grade 25 concrete in approved formwork, suitably vibrated and cured for 28 days before use.



## **vii. REINFORCEMENT**

### **a. Material**

Reinforcement shall be as specified by the Engineer.

#### **i. Bending and placing reinforcement**

Reinforcement shall be cleaned before placing and secured with space blocks in the correct position. It shall be bound with suitable wire and have such cover as shown on the drawings.

#### **ii. Strength of reinforcement**

Characteristic strengths of reinforcement are as given in B.S. 4449, 4461, and 4483.

#### **iii. Rod reinforcement**

The steel reinforcement shall comply with the latest requirements of the following British Standards:-

Hot Rolled (High Tensile) bars for the Reinforcement of concrete to B.S. 4449 (metric units)

Cold worked (Mild Steel) steel for the reinforcement of concrete to B.S. 4461 (metric units)

The Contractor will be required to submit a test certificate of the rolling. Reinforcement shall be stored on racks above ground level. All reinforcement shall be free from loose mill scale or rust, grease, paint or other substances likely to reduce the bond between the steel and the concrete.

#### **iv. Fabric Reinforcement (BRC)**

The BRC should be electrically cross-welded steel wire mesh reinforcement to B.S. 4483:, or as directed by the Engineer, and of the size and weight specified in the Drawings.

The fabric shall be free from scale, dust, rust, grease or other substance likely to reduce the bond between the steel and the concrete and shall be laid with a minimum 300 mm laps and bound with No. 18 S.W.G. annealed iron wire.

### **b. Fixing reinforcement**

Reinforcement shall be accurately bent to the shapes and dimensions shown on the Drawings and in accordance with B.S. 4466. Reinforcement must be cut and bent cold and no welded joints will be permitted, unless so detailed. Reinforcement shall be accurately placed as shown on the Drawings, and before and during concreting, shall be secured against displacement by using No. 18 S.W.G. annealed binding wire or suitable clips at intersections, and shall be supported by concrete or metal supports, spacers or metal hangers to ensure the correct position. No concreting shall be commenced until the Engineer has inspected the reinforcement in position and until his approval has been obtained and Contractor has given two clear days' notice of intention to concrete.

The Contractor is responsible for maintaining the reinforcement in its correct position, according to the drawings, before and during concreting. During concreting, a competent steel fixer must be in attendance to adjust and correct the position of any reinforcement which may be displaced. The vibrators are not to come into contact with the reinforcement.

**c. Position and correctness of reinforcement**

Irrespective of whether any inspection and/or approval of the fixing of the reinforcement has been carried out above, it shall be the Contractor's sole responsibility to ensure that the reinforcement complies with the details on the Drawings and is fixed exactly in the positions shown therein and in the positions to give the prescribed cover. The Contractor will be held entirely responsible for any failure or defect in any portion of the reinforced concrete structure and including any consequent delay, claims, third party claims. etc. where it is shown that the reinforcement has been incorrectly positioned or is incorrect in size or quantity with respect to the detailed Drawings.

**d. Protecting reinforcement**

Where reinforcement projects from a concreted section of the structure and this reinforcement is expected to remain exposed for some time, it is to be coated with a cement grout to prevent rust staining on the finished concrete. This grout is to be brushed off the reinforcement prior to the continuation of concreting.

## **viii. PIPEWORK**

### **a. Unplasticised Polyvinyl Chloride (UPVC) Pipes and fittings**

U.P.V.C pipes and fittings shall comply with BS 3505 and KS-06-149.

U.P.V.C pipes of diameters less or equal to 50-mm diameter shall be jointed with solvent cement joints in accordance with the manufacturer's instructions. Pipes having diameter larger 50 mm shall be jointed using approved flexible mechanical joints.

All tees, reducers, sockets flange etc. of any diameter are to be jointed to pipes with solvent cement joints.

All jointing and lying of U.P.V.C pipes and fittings shall be carried out strictly in accordance with the manufacturer's instructions.

### **b. Polyethylene (PE) Pipes and fittings**

PE pipes and fittings shall comply with ISO4427-1996, DIN8074 – 1999 (German Standards) or any other acceptable international Standard.

Jointing of pipes and fittings shall be by Electro fusion and shall comply with BS ISO 8085:2001, Part 2 –socket fusion using heated tools and for the use with electro fusion fittings and Part 3 – Electro fusion fittings

All jointing and lying of PE pipes and fittings shall be carried out strictly in accordance with the manufacturer's instructions.

Pipe diameters 63mm and below shall be supplied and laid in roll of 100m whole diameter greater than 90mm shall be supplied in 6m standard lengths.

All pipes and fittings supplied shall be certified by the manufacturer to have been tested in accordance with the relevant Standard Specification.

### **c. Galvanised Pipes and Specials**

All piping shall conform to BS 1387 for Medium Piping. The pipes shall be screwed, socketted or flanged. Threaded joints shall conform to BS 21. Galvanised coatings shall be of the hot dipped type and conform to BS 729 Coating weight shall have be a minimum weight of 400 gms~m<sup>2</sup>.

All specials shall be of such dimensions as will mate with the piping supplied. Screw down stop valves shall conform to BS 1010, Barrel Nipples shall conform to BS 21 and all other specials shall conform to BS 1256.

All pipes and fittings supplied shall be certified by the manufacturer to have been tested in accordance with the relevant Standard Specification.

#### **d. Valves**

Gate valves shall comply with the requirements of BS 5163. The gate valves shall be suitable for use in pipelines and for the operating pressure equipment to a head of 100 meters of water.

The gate valves shall be flanged. The dimensions and drilling of flanges shall be in accordance with BS 4504. Flanges shall be machined flat. Flanges shall be PN16 complying with BS 4504

Valves shall be securely fixed with the spindle in vertical position, unless otherwise stated. They shall be checked for ease of operation and water tightness. Valve glands shall be repacked if necessary.

Unless otherwise stated, sluice valves should be able to withstand the working pressure of the class of pipe adjoining the valve.

#### **e. Pipes Specification**

Pipes shall be specified according to the nominal diameter and nominal operating Pressures at 20<sup>o</sup>c measured in bars. Specification for the various pipes shall be as follows;

- PVC pipes - Nominal External Diameter and Nominal Pressure Classes, Class B, C, D and E,
- GI/Steel Pipes – Nominal Internal Diameter and Nominal Pressure, PN10, PN15 and PN25
- PE pipes – Nominal External Diameter, Standard Dimension Ratio (SDR), Nominal Pressures, PN6, PN9, PN12 and PN15.

#### **f. Manufacturer's instructions**

The contractor shall be responsible for obtaining copies of any manufacturer's instructions for pipe laying and jointing and shall familiarize himself and his employees with these instructions. If the special/new techniques are specified, the contractor shall make it upon himself to properly train his/her staff on the new installation technique.

All necessary tools and equipment required for the laying, jointing and testing of pipes and joints shall be provided by the contractor at no extra costs.

#### **g. Trench Excavation**

Excavated material shall be placed tidily and compactly at the sides of the trench so as to occupy as little space as possible and to create as little nuisance as possible.

The bottom of the trench shall be absolutely smooth and completely free from stones and sharp objects so as to ensure that the pipes rest uniformly upon original ground throughout its length.

Backfilling with excavated material beneath the pipe at low spots will not be permitted. Excavation below the bottom of the trench at pipe joints must be kept to a minimum.

If the bottom of the trench materials that is unsuitable for pipe laying, the Engineer may instruct the contractor to excavate below formation level and backfill to formation with suitable approved material properly compacted.

No pipe laying is to take place until the bottom of the trench is carefully examined by the engineer's representative.

#### **h. Minimum trench depth**

The minimum depth for pipe trenches shall be that which ensure minimum cover of 1.2m to the crown of the pipe.

#### **i. Backfilling in pipe trenches**

Backfilling around the pipe and to a height of 300 mm above it is to be carried out by using material that is free from stones and carefully compacted in layers not exceeding 150 mm thick.

Backfill to trenches shall be properly compacted and subsequent subsidence shall be the contractor's responsibility and shall make it good at his own expense.

All topsoil shall be kept aside during excavation and be replaced after backfilling.

All surplus material from the excavations shall be disposed.

#### **j. Removal of timbering**

All timbering materials shall be removed from trenches before or during backfilling unless, in the opinion of the Engineer, its removal will cause any subsidence in which case he may instruct the contractor to backfill leaving the timbering in place.

#### **k. Reinstatement**

Immediately backfilling of trenches has been completed, temporary reinstatement of the ground surface shall take place.

When in the opinion of the Engineer's representative a suitable period has elapsed after the temporary reinstatement and expects no further settlement, he shall allow the contractor to carry out the permanent reinstatement. This shall in any way relieve the contractor of his responsibility for the reinstatement and, should any further unforeseen settlement take place, the contractor will be required to make good the reinstatement at his own expense.

Permanent reinstatement means the ground surface shall be restored to its original form and condition.

#### **l. Handling and storing pipes**

Particular care shall be taken during loading, unloading, handling and transportation to avoid distortion, flattening, denting, scoring or any Damage to external or internal coating, sheathing or lining of the pipes, fittings, etc.

Pipes shall be stacked clear of the ground on the timbers of adequate dimensions to prevent Damage to the pipes and successive tiers shall be separated by timber of similar dimensions. Wooden wedges shall be fixed to these timbers to prevent the wedges from rolling.

Fittings etc. shall be stacked clear of the ground on timbers not more than 1 tier high.

All valves rubber joint rings, gaskets, nuts, bolts, washers and similar fittings shall be stored in approved locked premises and shall not be distributed to the trench until immediately prior to fixing. All rubber joint rings and gaskets must be stored in a cool place.

All pipes and fitting should be stored under cover and protected from the weather to the satisfaction of the Engineer.

#### **m. Examination of pipes**

Before laying each pipe must carefully be examined for Damage. Any defects in the external coating or internal lining shall be made good. The pipes shall be carefully examined for cracks or chipped ends. Damaged ends shall be cut off beyond the damaged area and machined true.

All pipes shall be cleaned internally before laying.

#### **n. Laying of pipes**

All pipes shall be laid strictly to the lines, levels and gradients as shown on the drawings unless where otherwise directed by the Engineer.

Mains shall be boned to even gradients using site rails no dips or bumps permitted.

All pipes shall be solidly bedded on the trench bottom. Joint holes shall be as small as possible and filled in compactly before the refilling of the trench commences.

The contractor shall make full allowance for all cuttings and jointing of pipes.

#### **o. Surface water**

No surface water or other extraneous matter shall be allowed to enter the pipes during or after laying. Should this happen, the contractor shall arrange for the necessary cleaning of the pipe at his own expense.

#### **p. Painting of exposed pipes, valves, fittings and metalwork**

All pipes, valves, tubes, manhole covers and the like, that are left exposed to the air at river crossings, in manholes, chambers etc., except where galvanized, shall be thoroughly cleaned and painted with two coats of approved bituminous paint after erection.

#### **q. Testing of pipes**

All pipes and apparatus that are to contain water under pressure shall be tested to a maximum of 1.5 times the rated pressure of the lowest rated component. If the pipes are in

the trench they shall be backfilled for the two thirds of the distance between joints, leaving joints exposed. The fill shall be a minimum of 450mm deep.

Testing shall take place in the presence of the Engineer's representative as the work proceeds, test lengths being approved by the Engineer. The maximum length of the pipe laid without pressure testing must not exceed 1 km.

Pipes shall be securely anchored and pipe ends shall be closed by means of caps or blank flanges. Sluice valves shall not be used at the end of a test length.

The contractor shall give the Engineer's representative a minimum of 24 hours notice of his intention to carry out a test.

All water, materials and apparatus for carrying out the tests are to be provided by the contractor at no extra cost.

The procedure for testing is as follows.

- (a) The test length shall be filled with water and brought to the required test pressure by means of a pressure pump. When the required is obtained, indicated by an approved pressure gauge, the pump shall be disconnected, and the pressure of the water watched for a period of 60 minute, any drop in pressure being carefully monitored.
- (b) If there is a drop in pressure at the end of the 60 minutes period, the pump should be reconnected and the test pressure re-established. The pump should then be disconnected and the pressures lowered immediately by bleeding off the water from the mains through a tap into a container. The process shall be repeated until the pressure is steady after 60 minutes.
- (c) If the test fails, it is the contractor's responsibility to locate the leak and remedy it so that the pipeline passes the test.

#### **r. Sterilisation**

Treated water mains should be washed out and sterilised before being put into service. Sterilisation should consist of introducing water containing a quantity of chlorine such that there is a concentration of chlorine throughout the mains at not less than 30 parts per million. This solution is to remain in the pipeline for a period of 24 hours after which the main shall be thoroughly flushed out with water to be used for the supply.

The inside of water retaining structures shall, after being thoroughly cleaned, be filled to overflow level with water containing 20 parts per million of chlorine and left for at least 24 hours before flushing out.

After flushing, bacteriological samples of water shall be taken in accordance with the Engineers instructions. If any of the samples proves to be inferior to that of the supply water, the sterilisation and flushing shall be repeated.

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All costs of sterilisation shall be the contractor's responsibility. The cost of sampling and testing shall be the responsibility of the employer if successful but if not shall be borne by the contractor.

**s. Concrete surround for pipes**

Bed the draw off pipe and surround it with Class 15 concrete as specified. The sequence of work will involve:

- (a) Lay the Concrete bed
- (b) Lay, and joint the pipes on the Concrete bed.
- (c) After the pipes have been tested complete the Concrete surround.



**ix. MATERIALS**

**a. General**

The approval in writing or otherwise by the Engineer of any materials shall not in any way whatsoever relieve the Contractor from any liability or obligation under the Contract and no claim by the Contractor on account of the failure, insufficiency or unsuitability of any such materials will be entertained.

- a. All items shall be suitable for water works purposes and for use with cold water installation and operation being in a tropical climate.
- b. All items hereinafter specified shall be to such other Standard or Specification which in the opinion of the Engineer provides for a quality of material and workmanship not inferior to the Standard Reference Number (SRN) quoted. The Standard or Specification must be submitted to the Engineer for approval before commencement of work.
- c. All ferrous pipes and fittings shall be coated with a protective paint suitable for use in and transport through a tropical climate.
- d. The Contractor shall supply to the Employer a certificate stating that each item supplied has been subjected to the tests hereinafter laid down and conforms in all respects to the said Specification.
- e. The Contractor shall provide adequate protection to all piping, flanged items and valves so as to guard effectively against damage in transit and storage and ingress of foreign matter inside the valves.
- f. All pipework and fittings shall be subjected to a works hydrostatic test pressure which shall be not less than twice the maximum operating pressure.
- g. The Contractor should exercise diligence to provide the best material.
- h. Where applicable the manufacturer's Specification should accompany all offers. The name of the manufacturer must in every case be stated.
- i. Where necessary the Contractor shall provide rubber gaskets to comply with SRN 208 and all other bolts, nuts, washers, etc. to undertake jointing at fittings etc.
- j. Any articles required under this Contract which are found to be faulty due to a crack, flaw or any other reason or is not in accordance with the Specification stipulated will not be accepted nor will the Employer be liable for any charges in respect of such an article. Where any such rejected article can, in the opinion of the Engineer, be rendered usable, the Contractor may deal with it accordingly and include it in the Contract at a price to be mutually agreed. Straight pipes which have been cut will be accepted at the discretion of the Engineer, provided the length is not less than 4 metres or two thirds of the standard length whichever is the lesser and will be priced pro-rata.

- k. Wherever possible, samples of pipes and fittings shall be submitted for approval of the Engineer prior to the Contractor obtaining the total requirements.

**b. Galvanised pipes and specials**

All piping shall conform to SRN 823 and SRN 903 for “Medium” Piping. The pipes shall be screwed and socketed, coupled or flanged.

All specials shall be of such dimensions as will mate with the piping supplied. Screw down stop valves shall conform to SRN 826. Barrel nipples shall conform to SRN 823 and all other specials shall conform to SRN 824.

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

**c. Ductile iron and cast iron pipes and specials**

All cast iron piping and fittings shall conform to the requirements of SRN 200.

Ductile iron pipes and fittings shall comply with SRN 202. Where required the pipes shall be protected as specified by the manufacturer of the pipes and shall be used as recommended by the manufacturer of the pipe.

Where the requirements include for the supply of flexible couplings the Contractor shall submit for approval by the Engineer full details of the type of joint offered and a full description of the method of jointing prior to arranging for the delivery of goods on site.

All flexible couplings shall be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material.

The quality of metal used for the manufacture of the pipes shall be of good quality grey cast iron and subject to the various quality control tests as specified in the relevant Standards.

All piping and fittings shall be coated internally with cement mortar lining to SRN 211. Cement mortar lining shall not contain any constituents soluble in water nor any ingredient which could impart any taste or odour whatsoever to the water after sterilization and washing out of the mains. External protection to be as specified in SRN 258.

The flanges of straight pipes shall be at right angles to axis of the pipe and the faces of the flanges shall be parallel and machine finished.

The faces of the flanges of fittings shall be at right angles to the directional axis. The bolt holes shall be concentric with the bore and located symmetrically off the centre line.

In flanged pipework the holes in one flange shall be located in line with those in the other.

All flanges shall be drilled to SRN 207, unless otherwise detailed.

The weights of the pipe and fittings shall comply with the Specification in the relevant Standard.

#### **d. Asbestos cement pipes and specials**

All piping and bends shall be plain ended suitable for use with flexible couplings and shall comply with the requirements of SRN 401. Fittings shall be of asbestos cement or cast iron complying with requirements of SRN 201, or mild steel complying with SRN 210.

Where possible, fittings shall have plain ends of an external diameter equal to that of the asbestos cement pipes and shall be suitable for use with asbestos cement, cast iron or mild steel mechanical joints. Where compatible external diameters of fittings and pipes cannot be supplied, suitable stepped couplings of approved manufacturer shall be used.

Flexible couplings shall be supplied complete with bolts, nuts, washers and joint rings as may be required. All metal parts of the joints shall be adequately protected with rust-proof paint.

The couplings shall, if required by the Engineer, be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material.

The Contractor shall submit full details of the type of joint and a full description of the method of jointing.

The lengths of piping supplied shall be in accordance with SRN 401.

All pipes and bends supplied shall be certified by the manufacturer to have been tested in accordance with the relevant clauses of Standard Specification.

Unless specified, the pipes, joints and bends shall be coated internally with cement mortar lining complying with SRN 212. This lining should not impart any taste or odour to the water. External protection for pipes, joints and bends to be as specified in SRN 212.

Precautions shall be taken to avoid damage to the pipes and fittings during handling and storing and during laying, all to the satisfaction of the Engineer.

Where ferrules are tapped into the piping, saddles should be used, otherwise service connections can be incorporated by use of suitable long collar joints.

#### **e. Steel Pipes and Specials**

All piping shall be plain ended unless otherwise specified and suitable for use with flexible mechanical couplings. The grade of steel used shall comply with the requirements of SRN 213.

The pipes shall be welded or seamless and shall conform to SRN 210.

All the pipes shall be internally protected with cement mortar lining in accordance with SRN 212. External protection to be as specified in SRN 241.

All joints shall be of the flexible mechanical type and shall be supplied complete with all bolts, nuts, washers and joint rings as may be required. All metal parts of joints shall be adequately protected with rust-proof paint. The joints shall be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material.

All fittings and specials shall be of such dimensions as will mate up with the piping supplied.

Flanged adaptors shall be pieces suitable for connecting a flanged gate valve etc. to the type of piping supplied and shall be supplied complete with all bolts, nuts, washers and joint rings.

The spigot ends of all Tees shall be suitable for connection to the pipework supplied using the aforementioned flexible mechanical joints. Branches shall be flanged with flanges drilled to NP 16 or NP 25, as specified in the drawings in accordance with SRN 207, unless otherwise detailed.

All flanges on specials shall conform to NP 16 or NP 25, as specified in the drawings in accordance with SRN 207, unless otherwise detailed.

All flanged joints shall be protected from corrosion by wrapping with Denso paste and tape or some similar approved material.

#### **f. Unplasticised UPVC Pipes**

Unplasticised PVC piping shall be in accordance with SRN 300.

The maximum sustained working pressures to which the pipes and fittings will be subjected is based on water at a temperature of 20 degrees centigrade.

The Contractor shall submit full details of the pipes he intends to supply.

The pipes upto and including 40mm diameter can be of a solvent weld type. The pipe shall be supplied with interchangeable sockets preformed at the factory and of such internal diameter that it takes the plain end of the pipe with the same nominal diameter.

The joint shall sustain the end thrust to which the pipe shall be subjected. The Contractor shall supply sufficient quantity of the cleaner and adhesive which shall be required to make the joints with the pipes.

The pipes of 50mm diameter and over shall consist of a grooved socket at one end of the pipe. The socket shall be designed to give a clearance fit on the outside diameter of the parent pipe. The sealing medium which shall seat in the groove shall be a rubber ring.

If the formation of the socket and groove results in the thinning of the original wall thickness of the pipe, it shall be compensated for by shrinking on to the outside of the socket area a reinforcing sleeve of the same material as the pipe. The socket and groove shall incorporate no sharp angles where the stress points are created.

The joint shall take 10% deformation of the spigot at the point where it enters the socket without leakage from the pipe when subjected to the test pressure specified for the pipe. Thermal expansion of the pipe shall be accommodated in the joint. The joint shall be capable of linear deflection upto 3 degrees.

The sealing ring shall be of first grade natural rubber and the physical properties of the mix shall meet the requirements of SRN 222.

The Contractor shall supply sufficient quantity of any lubricant or other material which shall be needed to make the joint which shall be assembled by hand.

The Contractor shall submit full details of the type of joint offered and a full description of the method of jointing.

The fittings shall have the same type of joint as for the pipes to be used. The Contractor shall submit full details of the materials dimensions and test pressures of the fittings offered.

Precautions shall be taken to avoid damage to the pipes and fittings.

In handling and storing the pipes and fittings, every care shall be taken to avoid distortion, flattening, scoring or other damage. The pipes and fittings shall not be allowed to drop or strike objects. Pipe lifting and lowering shall be carried out by approved equipment only.

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

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

#### **g. G.R.P. Pipes and Specials**

Glass Reinforced Plasting piping shall be in accordance with SRN 317.

#### **h. Gate Valves**

Gate valves shall comply with the requirements of SRN 501.

The gate valves shall be suitable for use in pipelines and for the operating pressure to a head of 160 metres or 250 metres of water (NP 16) or NP 25.

The gate valves shall be double flanged. The dimensions and drilling of flanges shall be in accordance with SRN 207. Flanges shall be machined flat. Flanges shall be NP 16 / NP 25 complying with SRN 207.

Spindles of the gate valves shall be provided with cast iron caps conforming to the requirements as specified under “Valve Caps” in SRN 501 or handwheels if so specified.

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

The gate valves shall be subject to “Closed End Tests” in accordance with the procedure set out in SRN 501.

The gate valves shall be suitable for opening and closing against an unbalanced head by manual operation.

### **i. Fire Hydrants**

Fire hydrants shall be in accordance with SRN 509. They shall be for installation underground and shall be in accordance with SRN 509.

The spindle shall be provided with a cast iron cap conforming to dimensions under “Spindle Cap” in SRN 501.

The spindle of the fire hydrant shall be of the non-rising type and screwed so as to close the hydrant when rotated in a clockwise direction viewed from above. The direction of closing shall be clearly cast on the valve cap.

The flanged outlet of the outlet bend shall have a Bayonet Joint Outlet for a 63mm standpipe. The outlet of the hydrant shall be of the hooked type with hooks 112mm apart.

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

Both flanges shall be 63mm drilled to requirements of SRN 207.

The outlet bends shall be subject to a hydrostatic test in accordance with procedure set out in SRN 509 and shall be water-tight against a test pressure of 1.85 Pa. head of water.

### **j. Air Valves**

The Contractor shall provide air valves to suit the site on which the main is located and the maximum water pressure specified. The body and cover of air valves shall comply with SRN 906 and SRN 916.

The body, cover, splash cowl and joint support ring of the air valve shall be of mechanite cast iron with flanges drilled to SRN 207.

The internal screwed isolating valve shall have the valve and seating of gun metal, operating screws of bronze, nuts of gun metal, and glands and cap of mechanite.

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

The double orifice type of air valve shall comprise a small and large orifice unit with common connection to the main and screw down isolating valve to permit inspection of the valve. The spindle of the isolating valve shall be screwed so as to close the valve when rotated in a clockwise direction and be provided with a Spindle Cap to dimensions as specified in SRN 501.

Design of the air valves shall be such that the balls do not blow shut under any working or test conditions when large volumes of air are being released.

### **k. Water Meters**

All water meters upto 50mm size shall be of the rotary piston positive action type with all moving parts composed of non-corrosive material.

75mm diameter and over meters shall be of the inferential helix full flow type.

The body of the 12mm to 25mm size of meter shall be of brass, the larger sizes in cast iron. The external surface of the brass bodies shall be coated with baked enamel and the cast iron bodies shall be painted to suit.

The working chamber of the rotary type meter shall be made of bronze or similar non-corrosive material and the piston shall be in ebonite or similar material.

The working parts of the Helix type meter shall facilitate removal for repair or replacement without removing the meter body from the pipeline. The working parts shall be inter-changeable and the working chamber so designed as to be full of water under all conditions of flow.

The dial of the meter shall be of the direct reading type registered in cubic metres with suitable lid locking device.

The capacities of the piston type meter shall not be less than the following amounts per month:-

12mm meter	250 cubic metres
18mm meter	350 cubic metres
25mm meter	600 cubic metres
38mm meter	1100 cubic metres
50mm meter	1700 cubic metres

The Helix type meter shall be capable of continuous working with a head loss not exceeding 300mm at the following rates of flow:-

75mm meter	22.5 cu.m./hr
100mm meter	45 cu.m./hr
150mm meter	90 cu.m./hr

All meters shall be accurate to within  $\pm 2\%$  over the range of the meter upwards from the minimum flows given for each size:-

12mm	23 litres/hour
18mm	28 litres/hour
25mm	32 litres/hour
38mm	110 litres/hour
50mm	190 litres/hour
75mm	2.5 cu.m./hr
100mm	2.8 cu.m./hr
150mm	4.5 cu.m./hr

Meters above 150mm diameter should conform to manufacturer's specifications approved by the Engineer.

The 12mm and 18mm sizes shall be guaranteed to register commencing at 5 litres/hour.

The meters shall be tested to a head of not less than 16 bar or as specified.

### **l. Stop Valves**

All stop valves shall be in accordance with SRN 826. Samples of valves shall be submitted for test and approval to the Engineer.

### **m. Check Valves (Directional Valves)**

Check valves shall comply with the requirements of SRN 505 with cast iron body and cover, gun metal doors with bronze facing rings and flanged connections in accordance with SRN 207, NP 16.

### **n. Flanged Joints**

All flanges on fittings and pipework where flanged connections are required must comply with the requirements of SRN 207 and drilled to NP 16, unless otherwise specified.

Inspection gaskets for flanged joints shall be rubber reinforced with cotton, 3mm thick and shall be in accordance with SRN 208. Bolts, washers and nuts for flanged joints shall be of mild steel complying with SRN 914.

### **o. Flexible Joints**

All flexible couplings (Viking Johnson or other approved type) shall be supplied complete with rubber gaskets, bolts, nuts and washers. All couplings shall be coated with red oxide primer and bituminous composition suitable for use with potable water.

### **p. Paints**

All priming, undercoating and finishing paints shall be in accordance with SRN 877 or SRN 878 as appropriate.

### **q. Marker and Indicator Posts**

Marker posts shall be erected at changes in direction of water mains as directed by the Engineer. Indicator posts shall be erected at valves and other fittings as directed.

Marker and indicator posts shall be embedded in concrete as shown on drawings and shall be vibrated precast reinforced concrete as per dimensions shown on drawings. They should be painted in colours as indicated on the drawings.

### **r. Polyethylene (Palothene, Peh) Pipes**

Polyethylene High Density pipes shall comply with SRN 307 for testing, storage, handling, laying and backfilling. Contractor shall conform to requirement indicated for PVC pipes. Joints shall be required to sustain test pressures similar to which the pipe shall be subjected.

Contractor shall comply with all instructions issued by the manufacturers and shall submit full details of the type, class, dimensions and test pressures of the brass fittings to the Engineer for approval.



### s. Precast Concrete Units

Precast concrete covers to be precast units for use in the works, whether instructed under the Contract or proposed by the Contractor.

a) Formwork for Precast Units

Moulds shall be so constructed that they do not suffer distortion or dimensional changes during use and are tight against loss of cement grout or fines from the concrete.

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

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

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

b) Reinforcement for Precast Units

Reinforcement in precast units shall comply with the requirement of Clauses 736 and 419-420. When preformed and cages are used the cages shall be made up on jigs to ensure dimensional accuracy and shall be carefully supported within the mould in such a way that they cannot move when concrete is placed. Reinforcement complying with SRN 126 may be tack welded where bars cross to provide rigidity in the cage but reinforcement complying with SRN 127 shall not be welded.

Cover to main reinforcement shall be as shown on the drawings, or if not shown shall be not less than 25mm or the diameter of the bar, whichever is the greater. Cover on distribution steel shall not be less than 15mm or the diameter of the bar whichever is the greater.

Bars shall be spaced so that the minimum clear distance between them is the maximum nominal aggregate size plus five millimetres but in any case not less than the diameter of the bars.

Bars may be placed in pairs provided that there are no laps in the paired lengths.

c) Casting of Units

Concrete for precast units shall comply with Clauses 724 and 401-410 using the class of concrete specified on the drawings.

If lightweight aggregates are specified, they shall comply with SRN 147.

The area in which units are cast shall be adequately protected from the weather so that the process is not affected by rain, sun or drying winds.

d) Curing Precast Units

Requirements for curing shall be generally as set out in Clause 407.

The Contractor shall ensure that units do not suffer any loss of moisture or sudden changes of temperature for at least four days after casting. If a water spray is used for curing, the water shall be at a temperature within 5 degrees centigrade of the temperature of the unit being cured.

If Contractor proposes curing at elevated temperatures, the method shall be subject to the agreement of the Engineer and shall include means whereby units are heated and subsequently cooled evenly without sudden changes of temperature.

e) Dimensional Tolerances of Precast Units

Units shall be accurately formed to the dimensions shown on the drawings unless closer tolerances are called for by the Engineer.

f) Surface Finish of Precast Units

The formed faces of precast units shall be finished to Class F3 as set out in Clause 505(C) unless another class of finish is specified on the drawings.

Free faces shall be finished to Class UF2 unless another class of finish is specified on the drawings.

In cases where a special finish is required a trial panel shall be constructed by the Contractor which after approval by the Engineer shall be kept available for inspection at the place of casting and production units shall thereafter match the approved pattern.

Those parts of the unit which are to be joined to other units or to in-situ concrete shall be brushed with a stiff brush before the concrete has fully hardened. Alternatively, if the concrete has been allowed to harden, the surfaces shall be roughened by sand blasting or by the use of a needle gun.

g) Handling and Storage of Precast Units

Precast units shall be handled in a manner which will not cause damage of any kind and shall be stored on a hard impermeable base.

Prestressed units and large precast normally reinforced units shall be handled and stored so that no stresses shall be induced in excess of those which they will incur in their final positions in the Works unless they have been designed to resist such stresses.

Units shall be provided with adequate lifting holes or loops, placed in the locations shown on the drawings or agreed by the Engineer and they shall be lifted only by such holes or loops. Where it is not possible to provide holes or loops, suitable sling positions shall be indicated in paint on the units.

Units shall be marked indelibly with the reference number and date of casting and shall be stacked on suitable packers which will not damage the concrete or stain the surfaces. Not more than two packers shall be placed under each unit and these shall be located either at the positions of the permanent support points or in positions such that the induced stresses in the unit will be a minimum.

h) Testing Precast Units

Precast units shall be capable of safely sustaining the loads which they have been designed to carry. The Contractor shall subject units selected by the Engineer to load tests simulating the working conditions. Details of such tests shall be agreed between the Engineer and the Contractor.

In the case of units subject to bending loads the test piece shall be supported at full span and a loading equivalent to 1.25 times the sum of the live and dead loads which were assumed in the design shall be maintained for one hour without the appearance of any signs of distress. The recovery one hour after the removal of load shall be not less than 75 per cent of the full load deflection.

If the unit fails to meet the above requirements, further tests shall be carried out on two more units. If either of these fail the whole batch of units will be rejected.

If the Engineer so requires, a test to destruction shall also be carried out which on units subject to bending shall be as follows:-

The units shall be supported at full span and a load applied in increments instructed by the Engineer up to 95 per cent of the designed ultimate load. This load shall be held for 15 minutes without failure of the unit. The deflection at the end of this period shall be not more than 1/40th of the span. The load shall then be further increased until failure occurs.

If the unit fails to sustain the required load for the prescribed period or if the deflection exceeds the specified amount, the Engineer may order two further tests, and if either of these fail, the batch of units which they represent may be rejected.

**t. Submission of Samples**

As soon as possible after the contract has been awarded, the Contractor shall submit to the Engineer a list of the suppliers from whom he proposes to purchase the materials necessary for the execution of the Works. Each supplier must be willing to admit the Engineer or his representatives, to his premises during ordinary working hours for the purpose of obtaining samples of the materials in question. Alternatively, if desired by the Engineer, the Contractor shall deliver the samples of the materials to the Engineer's office without charge.

The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no source of supply shall be changed without the Engineer's prior approval once a supplier, source or material has been approved.

Samples of materials approved will be retained at the Engineer's office until the completion of the contract. Samples may be tested to destruction.

All materials delivered to site must be at least equal in all respects to approved samples, otherwise they shall be rejected. No special payment will be made for compliance with clauses specifying tests etc. to ensure quality control etc. unless specifically itemised in Bills of Quantities.

#### **u. Materials for Concrete**

##### a) General

The Contractor shall submit to the Engineer full details of all materials which he proposes to use for making concrete. No concrete shall be placed in the Works until the Engineer has approved the materials of which it is composed. Approved materials shall not thereafter be altered or substituted by other materials without the consent of the Engineer.

##### b) Cement

Cement shall comply with the following Kenya Standards:-

- SRN 103 for Ordinary Portland cement.
- SRN 103 for Rapid Hardening Portland cement plus all special conditions to its use stipulated by the manufacturer.
- SRN 104 for Sulphate Resisting or High Alumina cement.

Cement shall be free flowing and free of lumps. It shall be supplied in the manufacturer's sealed unbroken bags or in bulk. Bagged cement shall be transported in vehicles with effective means of ensuring that it is protected from the weather.

Bulk cement shall be transported in vehicles or in containers specially built and equipped for the purpose.

Cement in bags shall be stored in a suitable weatherproof structure of which the interior shall be dry and well ventilated at all times. The floor shall be raised above the surrounding ground level and shall be so constructed that no moisture rises through it.

Each delivery of cement in bags shall be stacked together in one place. The bags shall be closely stacked so as to reduce air circulation but shall not be stacked against an outside wall. If pallets are used, they shall be constructed so that bags are not damaged during handling and stacking. No stack of cement bags shall exceed 3 metres in height. Different types of cement in bags shall be clearly distinguished by visible markings and shall be stored in separate stacks.

Cement from broken bags shall not be used in the Works.

Cement in bags shall be used in the order in which it is delivered.

Bulk cement shall be stored in weatherproof silos which shall bear a clear indication of the type of cement contained in them. Different types of cement shall not be mixed in the same silo.

The Contractor shall provide sufficient storage capacity on site to ensure that his anticipated programme or work is not interrupted due to lack of cement.

Cement which has become hardened or lumpy or fails to comply with the Specification in any way shall be removed from the site.

All cement for any one structure shall be from the same source.

All cement used in the Works shall be tested by the manufacturer or the Contractor in a laboratory acceptable to the Engineer. The tests to be performed shall be those set out in SRN 103 and the Contractor shall supply two copies of each certificate to the Engineer.

Each set of tests carried out by the manufacturer or Contractor shall relate to not more than one day's output of each cement plant, and shall be made on samples taken from cement which is subsequently delivered to the site. Alternatively, subject to the agreement of the Engineer, the frequency of testing shall be one set of tests for every 200 tonnes of cement delivered to site from each cement plant.

Cement which is stored on site for longer than one month shall be re-tested in the laboratory of the Materials Branch of the Ministry of Roads, Public Works & Housing or at the Kenya Bureau of Standards or at any other approved laboratory at the rate of one set of tests as shown in SRN 103 for every 200 tonnes, and at monthly intervals thereafter.

Cement which does not comply with the Specification shall not be used in the Works and it shall be disposed off by the Contractor.

The Contractor shall keep full records of all data relevant to the manufacture, delivery, testing and use of all cement used in the Works and shall provide the Engineer with two copies thereof.

c) Fine Aggregate

Fine aggregate shall be clean, hard and durable and shall be natural sand, crushed gravel sand or crushed rock sand complying with SRN 108. All the material shall pass through a 5mm standard sieve and the grading shall be in accordance with Zones 1, 2 or 3 of SRN 109. In order to achieve an acceptable grading, it may be necessary to blend materials from more than one source. Fine aggregate for mortar only shall comply with SRN 135.

The fine aggregate shall not contain iron pyrites or iron oxides. It shall not contain mica, shale, coal or other laminar, soft or porous materials or organic matter unless the Contractor can show by comparative tests, on finished concrete as set out in SRN 117, that the presence of such materials does not adversely affect the properties of the concrete.

Other properties shall be as set out below:

Content passing a 75 micron standard sieve shall not exceed 3 per cent for natural or crushed gravel sand or 15 per cent for crushed rock sand.

Chlorides soluble in a 10 per cent solution by weight of nitric acid shall not exceed 0.05 per cent by weight expressed as chloride ion when tested as set out in SRN 107, subject also to the further restriction given in the note on total chloride content in sub-clause 724 (d).

Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as  $SO_3$ , when tested as set out in SRN 601, subject also to the further restriction given in the note on total sulphate content in sub-clause 724 (d).

Soundness: After five cycles of the test in AASHTO T104 or an approved equivalent, the aggregate shall not show a weight loss of more than 10 per cent.

Organic impurities:

If the test for presence of organic impurities in aggregates described below shows that more than a trace of organic impurities is present, the fine aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect the properties of the concrete.

Test for presence of organic impurities in aggregates:

This test is designed to indicate the presence of organic impurities in aggregates used for making concrete.

A 350 cc graduated bottle shall be filled to the 120 cc mark with a sample of the aggregate to be tested and a 3% solution of sodium hydroxide in water added until the volume of aggregate and liquid after shaking gives a total volume of 200 cc. The bottle shall be stopped, shaken thoroughly and allowed to stand for 24 hours. If, after 24 hours, the colour of the solution is not darker than a pale brown, the aggregate under test may be deemed satisfactory.

d) Coarse aggregate

Coarse aggregate shall be clean, hard and durable crushed rock, crushed gravel or natural gravel complying with the requirements of SRN 110. The material shall not contain any iron pyrites, iron oxides, flaky or laminated material, hollow shells, coal or other soft or porous material, or organic matter unless the Contractor can show by comparative tests on finished concrete as set out in SRN 117 that the presence of such materials does not adversely affect the properties of the concrete. The pieces shall be angular, rounded or irregular as defined in SRN 107.

Coarse aggregate shall be supplied in the nominal sizes called for in the Contract and shall be graded in accordance with SRN 111 for each nominal size.

Other properties shall be as set out below:-

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

The content of hollow and flat shells shall be such as will not adversely affect the concrete quality when tested as set out in SRN 117. The total content of aggregate shall not be more than the following:

- 40mm nominal size and above 2% of dry weight
- 20mm nominal size 5% of dry weight
- 10mm nominal size 15% of dry weight

Chlorides soluble in a 10 per cent solution by weight of nitric acid shall not exceed 0.03 per cent by weight, expressed as chloride ion when tested as set out in SRN 107 but subject also to the further restriction under the note on total chloride content hereunder. Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as SO<sub>3</sub> when tested as set out in SRN 601 subject also to the further restriction given in the note on total sulphate content hereunder.

Soundness: After 5 cycles of the test in AASHO T104, the aggregate shall not show a weight loss of more than 12 per cent.

When tested in accordance with test C289 of the American Society for Testing of Materials (ASTM), the aggregate shall be non-reactive.

Flakiness Index when tested in accordance with SRN 113 shall be as set out hereunder:

- For 40mm stone and above, not more than 40
- For 20mm stone and below, not more than 35

If the Flakiness Index of the coarse aggregate varies by more than five units from the average value of the aggregate used in the approved trial mix, then a new set of trial mixes shall be carried out if the workability of the mixes has been adversely affected by such variation.

Impact value: Not more than 45 per cent when tested in accordance with SRN 107.

Ten per cent fines value: Not less than 50kN when tested in accordance with SRN 107.

Shrinkage: When mixed with other ingredients in the approved proportions for concrete and tested as set out in SRN 117, the shrinkage factor shall not exceed 0.05 per cent.

Organic impurities: If the test for presence of organic impurities in aggregates shows that more than a trace of organic impurities is present, the aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect the properties of the concrete.

Water absorption: The aggregate shall not have a water absorption of more than 2.5 per cent when tested as set out in SRN 112.

Aggregate Crushing Value (ACV): Not more than 35 per cent.

Los Angeles Abrasion (LAA): Not more than 50 per cent.

NOTE: Total chloride and sulphate content:-

The total chloride content, expressed as chloride ion, arising from all ingredients in a mix including cement, water and admixtures shall not exceed the following limits, expressed as a percentage of the weight of cement in the mix:-

For prestressed concrete, steam cured concrete or concrete containing sulphate resisting or super sulphated cement: 0.05 per cent.

For any other reinforced concrete: 0.3 per cent in 95 per cent of all test results provided no result is more than 0.5 per cent.

The total sulphate content expressed as SO<sub>3</sub> of all the ingredients in a mix including cement, water and admixtures shall not exceed 0.4 per cent by weight of the aggregate or 4.0 per cent of the weight of cement in the mix, whichever is the lesser.

e) Testing Aggregates

i) Acceptance testing

The Contractor shall deliver to the Engineer samples containing not less than 50 kg of any aggregate which he proposes to use in the Works and shall supply such further samples as the Engineer may require. Each sample shall be clearly labelled to show its origin and shall be accompanied by all the information called for in SRN 107.

Tests to determine compliance of the aggregates with the requirements of sub-clause 724(c) and (d) shall be carried out by the Contractor in a laboratory acceptable to the Engineer. If the tested materials fail to comply with the Specification, further tests shall be made in the presence of the Contractor and the Engineer and acceptance of the material shall be based on such tests.

A material shall be accepted if not less than three consecutive sets of test results show compliance with the Specification.

ii) Compliance testing

The Contractor shall carry out routine testing of aggregates for compliance with the Specification during the period that concrete is being produced for the Works. The tests set out below shall be performed on aggregates from each separate source on the basis of one



set of tests for each day on which aggregates are delivered to site provided that no set of tests shall represent more than 250 tonnes of fine aggregate nor more than 500 tonnes of coarse aggregate, and provided also that the aggregates are of uniform quality. If the aggregate from any source is variable, the frequency of testing shall be increased as instructed by the Engineer.

- Grading SRN 107
- Silt and clay contents SRN 107
- Moisture content SRN 107
- Check on organic impurities

In addition to the above routine tests, the Contractor shall carry out the following tests at the frequencies stated:

Moisture content: As frequently as may be required in order to control the water content of the concrete as required by the Specification.

Chloride content: As frequently as may be required to ensure that the proportion of chlorides in the aggregates does not exceed the limit stated in the Specification.

The Contractor shall take account of the fact that when the chloride content is variable it may be necessary to test every load in order to prevent excessive amounts of chloride contaminating the concrete. For this purpose the Contractor shall use the rapid field test (the Quantab test). In the event of disagreement regarding the results of the field test, the chloride content of the aggregate shall be determined in the laboratory as described in SRN 107 (the Volhard test).

f) Delivery and storage of aggregates

Aggregates shall be delivered to site in clean and suitable vehicles. Different types or sizes of aggregate shall not be delivered in one vehicle.

Each type or size of aggregate shall be stored in a separate bin or compartment having a base such that contamination of the aggregate is prevented. Dividing walls between bins shall be substantial and continuous so that no mixing of types or sizes occurs.

The storage of aggregates shall be arranged so that as far as possible, rapid drying out in hot weather is prevented in order to avoid sudden fluctuations in water content. Storage of fine aggregates shall be arranged so that they can drain sufficiently before use in order to prevent fluctuations in water content of the concrete.

g) Water for concrete and mortar

Sea water or brackish water containing more than 1,000 ppm chloride ion or 2,000 ppm sulphate ion shall not be used for mixing or curing concrete.

Water shall be clean and free from harmful matter and shall comply with the requirements of SRN 114.

The Contractor shall carry out tests in accordance with SRN 114 to establish compliance with the Specification.

h) Admixtures

i) General

The use of the admixtures in concrete may be required under the Contract to promote special properties in the finished concrete or may be proposed by the Contractor to assist him to comply with the Specification.

In all cases the Contractor shall submit to the Engineer full details of the admixture he proposes to use and the manner in which he proposes to add it to the mix. The information provided shall include but not be limited to:-

- a) The typical dosage, the method of dosing and the detrimental effects of an excess or deficiency in the dosage.
- b) The chemical names of the main active ingredients in the admixture.
- c) Whether or not the admixture contains chlorides, and if so the chloride ion content expressed as a percentage by weight of admixture.
- d) Whether the admixture leads to the entrainment of air when used at the manufacturer's recommended dosage, and if so, the extent to which it does so.
- e) Details of previous uses of the admixture in Kenya.

The chloride ion content of any admixture shall not exceed 2 per cent by weight of the admixture nor 0.03 per cent by weight of the cement in the mix.

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

Calcium chloride or admixtures containing calcium chloride shall not be used in prestressed concrete.

ii) Workability agents

Workability agents shall comply with SRN 149 and shall not have any adverse effect on the properties of the concrete.

#### **v. Building Stone**

All building stone shall be capable of withstanding when wet a crushing stress of 1.4 kg./sq.mm. The source of stone shall be approved by the Engineer and stone supplied therefrom shall be free from Magadi, overburden, mudstone, cracks, sandholes, veins, laminations or other imperfections.

The stone shall be chisel dressed into true rectangular blocks, with each surface even and at right angles to all adjoining surfaces, to the size specified. For exposed stonework the maximum permissible variation of any of the specified dimensions shall be 6mm provided that cut stone, supplied as 'rock face' stone may be hammer dressed on one face only, or on one face and one end, if in other respects it conforms with this specification. Stones shorter than 375mm will not be accepted.

Unless the Engineer allows otherwise the Contractor shall at his own expense provide and dress four 100mm cubes of stone for testing.

The stone shall be sound when tested in accordance with SRN 870 except that:-

- i) The treatment shall be repeated for 10 cycles only; and
- ii) The second criterion of failure shall be amended to allow for a loss of weight of not more than 20% of its original weight.

#### **w. Stone Dust**

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

Passing 10mm sieve	100%
Passing No. 4 sieve	85% - 100%
Passing No. 100 sieve	5% - 25%

#### **x. Murram**

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, top soil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under SRN 601) and allowed to soak in water for four days, shall not be less than 30%. This C.B.R. is a guide to quality only and the compaction in the work will be judged by density.

#### **y. Water for Cement Treated Materials**

If water for the works is not available from the Employer's supply the Engineer's approval must be obtained regarding the source of supply and manner of its use. Water to be used with cement or lime shall be free from salt, oil, alkali, organic matter, and other deleterious substances. If the water is required to be tested, this shall be done in accordance with SRN 114: Tests for Water for Making Concrete, all to the cost of the Contractor.

**z. Cement Mortar**

Cement mortar shall consist of proportions by volume as specified of Portland Cement and natural sand or crushed natural stone or a combination of both as specified in SRN 135 and SRN 136 : Building Sands from Natural Sources. The constituent materials shall be accurately gauged and mixed in an approved manner.

Cement mortar shall be made in small quantities only as and when required, and any mortar which has begun to set or which has been mixed for a period of more than one hour shall be rejected.

**aa. Hydrated Lime**

Hydrated lime shall comply with SRN 801: Building Limes, and shall be of the semi-hydrated type.

**bb. Calcium Chloride**

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

**cc. Lime Mortar**

Lime mortar shall consist of proportions by volume as specified of hydrated lime and naturals and/or crushed natural stone or a combination of both as specified for cement mortar in Clause 729. The constituent materials shall be accurately gauged and mixed in an approved manner.

**dd. Cement-Lime Mortar**

Cement-lime mortar shall consist of Portland Cement, hydrated lime and natural sand or crushed natural stone or a combination of both, as specified for cement mortar in Clause 707. The constituent materials shall be accurately gauged and mixed by volume in an approved manner in the proportions specified.

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

**ee. Cement Grout**

Cement grout shall consist of Portland Cement and water mixed in the proportion of one part by volume of cement and one and a half parts by volume of water. The grout shall be used within one hour of mixing.

**ff. Cast Stone**

Cast stone shall be manufactured by an approved manufacturer to the shapes and dimensions shown on the drawings, and shall conform to the requirements of SRN 871 : Cast Stone. It shall have a dense and even surface of the texture and colour detailed on the drawings or required by the Engineer. Where indicated exposed faces of the stone shall be formed of a specially graded mix. Metal bond ties of approved manufacture shall be cast in with the stone as shown on the drawings. Samples of the completed stone shall be submitted for the Engineer's prior approval.

All stones shall be protected from damage during transport and erection by means of cement slurry coatings or by other approved methods.

### **gg. Reinforcement for Concrete**

Reinforcement which shall comply with the following Standards, covers plain and deformed bar reinforcement and steel fabric to be cast into concrete in any part of the Works but does not include prestressing tendons or any other embedded steel.

- SRN 126 for hot rolled plain bar and high yield deformed bar
- SRN 127 for cold worked steel bar
- SRN 128 for steel mesh fabric

All reinforcement shall be from an approved manufacturer and, if required by the Engineer, the Contractor shall submit a test certificate from the manufacturer.

All reinforcement for use in the Works shall be tested for compliance with the appropriate British Standard in a laboratory acceptable to the Engineer and two copies of each test certificate shall be supplied to the Engineer. The frequency of testing shall be as set out in the relevant Standard.

In addition to the testing requirements described above, the Contractor shall carry out additional tests as instructed by the Engineer.

Any reinforcement which does not comply with the Specification shall be removed from site.

All reinforcement shall be delivered to site either in straight lengths or cut and bent. No reinforcement shall be accepted in long lengths which have been transported bent over double.

Any reinforcement which is likely to remain in storage for a long period shall be protected from the weather so as to avoid corrosion and pitting. All reinforcement which has become corroded or pitted to an extent which, in the opinion of the Engineer, will affect its properties shall either be removed from site or may be tested for compliance with the appropriate Standard at the Contractor's expense.

### Dowel Bars

Dowel bars and tie bars shall consist of mild steel, or deformed bars of high yield steel all complying with SRN 126 and they shall be free from oil, paint other than bond-breaking compound, dirt, loose rust and scale.

Dowel bars and tie bars shall be of sizes as shown on the drawings and directed by the Engineer, and shall be straight, free from burred edges, or other irregularities and shall have their sliding ends sawn or, if approved, sheared.

Bond breaking compound for dowel bars shall consist of 66 per cent of 200 pen bitumen blended hot with 14 per cent light creosote oil and, when cold, brought to the consistency

of paint by the addition of 20 per cent solvent naphtha or other approved compound meeting the following requirements.

- i) It shall not retard or in any other way affect the setting of concrete.
- ii) The average bond stress on bars coated with the compound with half their length cast into concrete specimens and subject to pull out tests at 7 days shall not exceed 0.14 newtons per square millimetre and the total movement of the dowel bar relative to the concrete shall not be less than 0.25 millimetres at that stress. The concrete specimens shall be 150 millimetres by 150 millimetres in section and 0.45 metre long and made with the same mix proportions as used in the Works.

#### **hh. Structural Steel for Welded Work**

Structural steel for riveted and welded work shall comply with the requirements of SRN 125 : Structural Steel, SRN 126 : The Use of Structural Steel in Building and for Welded Work, SRN 125 : High Yield Stress and High Tensile Structural Steel, High Tensile (Fusion Welding Quality) Structural Steel for Bridges, etc. and General Building Construction.

#### **ii. Waterproof Underlay**

Waterproof underlay shall consist of either waterproof paper complying with SRN 856 : Waterproof Building Paper, containing approved fibrous reinforcement, or 500 gauge polythene sheeting as stated in the Bill of Quantities.

#### **jj. Preformed Joint Filler**

Preformed joint filler shall be of the thickness shown on the drawings or as stated in the Bill of Quantities.

The material comprising joint filler shall be as stated on the drawings or approved by the Engineer.

#### **kk. Joint Primer**

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

#### **ll. Joint Sealing Compound**

Poured joint sealing material shall consist of an approved rubber-bitumen compound, complying with the requirements of SRN 879, or a two component, cold applied compound complying with SRN 879 as stated in the Bill of Quantities. Test Certificates, prepared by an approved testing laboratory, shall be supplied by the Contractor to show that the material does in fact comply in respect of cone penetration, flow and bond with the under-mentioned requirements:

<u>Test Cone Penetration</u>	<u>Hot-poured Materials</u>	<u>Cold-poured Materials</u>
0.15 kg. for 5 secs. at 25° centigrade	Penetration not to exceed 9mm	Penetration to be not less than 5mm not

using standard grease cone

more than 27.5mm

Flow

On a plane inclined at 75° to the horizontal, 5 hours at 60° centigrade	Flow not to exceed 5mm	Flow not to exceed 20mm
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Bond

25mm wide joint extended 12mm at rate of 4mm per hour at 18° centigrade. No more than one specimen in three to develop a crack separation or other opening more than 4mm deep	Five cycles of extension and recompression	Three cycles of extension and recompression
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Approved hot-poured materials shall also comply with a requirement whereby when heated for a period of 6 hours at a temperature of 80 degrees centigrade above recommended pouring temperature or 30 degrees centigrade below the safe heating temperature whichever is the greater shall still comply with the flow requirements of this clause.

In addition to materials complying with SRN 879, the Engineer may approve the use of alternative materials provided that they meet the requirements of this clause relating to cold-poured joint sealing compounds.

**mm. Concrete Pipes and Specials**

Concrete pipes and specials shall comply with the requirements of SRN 840. They shall carry the relevant Standards Institution registration certification trade mark, or test certificates shall be furnished by the manufacturers.

**nn. Concrete Porous Pipes**

Concrete porous pipes shall comply with the requirements of SRN 410: Concrete Porous Pipes for Under-drainage.

**oo. Concrete Drain Invert Blocks**

Precast concrete invert blocks shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

**pp. Concrete Slabs for Open Drains**

Precast concrete slabs for lining open drains shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

**qq. Agricultural Tiles and Pipes**

Agricultural tiles and pipes shall be best well-burnt earthenware, true and circular in bore and with an external flat bottom and plain ends suitable for laying with open or butt joints.

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**rr. Manhole Covers and Frames**

Manhole covers and frames shall be basically in accordance with the requirements of SRN 846: Cast Manhole Covers, Road Gully Gratings and Frames for Drainage Purposes except that the manhole covers shall be constructed of mild steel, concrete filled, in accordance with the standard detail drawings.

Foul water sewer manholes shall have triangular Grade “A” heavy duty covers and frames. Circular manhole covers and frames shall be used on surface water sewer manholes.

**ss. Gully Gratings and Frames**

Gully gratings and frames shall be basically in accordance with the requirements of SRN 846, nominal size 500mm x 350mm except that the gully gratings shall be constructed of mild steel concrete filled in accordance with the standard detail drawings.

Where indicated as being kerb inlet type, the gullies shall conform to the shape and dimensions given on the detail drawings supplied, but in respect of materials and workmanship conform to SRN 846.

**tt. Precast Concrete Manholes and Inspection Chambers**

Precast concrete manholes and inspection chambers shall comply with the requirements of SRN 854: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies, and they shall carry the relevant Standard Institution registered certification trade mark, or test certificates shall be furnished by the manufacturer.

**uu. Precast Concrete Gullies**

Precast concrete gullies shall be unreinforced and shall comply with the requirements of SRN 854: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies.

**vv. Manhole Step Irons**

Step irons of general purpose type shall comply in all respects with SRN 845: Malleable Step Irons.

**ww. Timber**

Timber shall be sound, well seasoned and entirely free from worm, beetle, warps, shakes, splits, and all forms of rot and deadwood. Where required, all timber shall be treated with creosote, as specified in SRN 872: Coal Tar Creosote for the Preservation of Timber or an alternative approved timber preservative.

**xx. Water Bars**

Water bars shall be “Dumbell” type and be of natural or synthetic rubber or extruded PVC. They shall be flexible, tough, elastic and durable and of dimensions detailed. They should be unaffected on contact with dilute acids or alkalis. Joints and junctions shall, when possible, be prefabricated by the manufacturer, but if made at site the manufacturer’s instructions including recommended adhesives shall be followed and used. Samples shall be submitted for approval of the Engineer before use of any material.



**yy. Concrete Blocks**

Solid and hollow concrete blocks for walling shall comply with SRN 904 in every respect.

All solid and hollow concrete blocks used in the walling must be capable of withstanding a crushing pressure of not less than 0.35 kg per square millimetre after 28 days. The blocks shall be cast in Metric sizes.

**x. WORKMANSHIP**

**a. Handling of Pipes and Fittings**

The Contractor shall exercise care in the handling of all pipes, specials, valves etc., to prevent damage to the structure surfaces and to the ends of the pipes.

**b. Loading and Unloading**

Normally loading and unloading of small diameter pipes and fittings can be undertaken by hand; where mechanical means are used care should be exercised to ensure that the handling methods do not damage the pipes and fittings.

**c. Storage**

The Contractor shall comply with the manufacturer's specification regarding the storage of pipes, fittings and valves. Where storage dumps are to be provided along the route of the pipeline, these will be subject to the Engineer's approval. The cost of so providing shall be borne by the Contractor and deemed to be covered by his rates in the Bill of Quantities.

**d. Transport**

The Contractor shall provide such transport arrangements as will effectively cater for the lengths of pipes provided and the material of the piping. Adequate support shall be provided so as to ensure that the piping and fittings are not subject to excessive movement.

**e. Examination of Pipes and Fittings**

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

**f. Interference with Fences, Drains and Other Services**

The Contractor shall ensure the proper reinstatement of fences, drains, telephone lines, KP&L cables etc. where affected by his work. All services shall be adequately protected and propped to the satisfaction of the Engineer. The Contractor shall be liable for any damage caused to the services due to his failure to provide adequate protection.

**g. Method of Excavation**

The Contractor is deemed to have covered in his excavation rates all the work that is necessary in order to comply with the provisions of the Specifications in general and this Clause in particular.

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

- b) For the purpose of measurement, the width of trench shall be taken as the nominated width for the particular size of sewer, irrespective of the width of trench the Contractor may choose to excavate.

Nominated trench width for:

75mm main	0.5m
100mm main	0.6m
150mm main	0.6m
200mm main	0.6m
225mm main	0.6m
250mm main	0.6m
300mm main	0.7m
400mm main	0.8m
500mm main	0.9m
600mm main	1.0m
700mm main	1.1m
800mm main	1.2m

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

- c) Where the trench passes through grassland, arable land or gardens, whether enclosed or otherwise, the turf, if any, shall be carefully pared off and stacked, and the productive soil shall be carefully removed for a width of 600mm greater than the nominated trench width, or equal to the overall width of track of excavating machine, whichever is greater, and laid aside to be subsequently used in reinstating the surface of the ground after the trench has been refilled.
- d) The bottom of the trench shall be properly trimmed off, and all low places or irregularities shall be levelled up with fine material. Where rock or large stones are encountered, they shall be cut down to a depth of at least 100mm below the level at which the bottoms of the barrel of the pipes or flanges are to be laid, and covered to a like depth with fine material, so as to form a fine and even bed for the pipes. The bottom of trenches to accommodate uPVC piping shall be hardened by tamping in gravel or broken stone in all soft spots. The bedding shall consist of soil which can be properly compacted to provide support for the pipe and to comply with Clause 809 b).
- e) Joint holes shall be excavated to suit minimum dimensions as will allow the joints to be well and properly jointed.
- f) The pipe trench shall be kept clear of water at all times as per Clause 321 of this Specification.
- g) The Contractor shall, wherever necessary, by means of timbering or otherwise, support the sides of the trench so as to make them thoroughly secure, and afford adequate support to adjoining roads, land, buildings and property, during the whole time the trench remains open and shall remove such timbering when the trench has been backfilled. The cost of such timbering or other work shall be deemed to be included in the rates for excavation. In case the Contractor is instructed by the

Engineer to leave any portion of such timber in position after backfilling the trench, he will be paid for it accordingly.

- h) The clear width inside the timbering shall be at least 150mm in excess of the external diameter of the pipe being laid, in order to allow it to be freely lowered into position, in the trench without damage to the external protection.
- i) Should the excavation be taken out to a greater depth than is specified the bottom shall be made good to the correct level with Class 15/20 concrete or other material approved by the Engineer. No payment shall be made for any over excavation carried out by the Contractor nor for the cost of filling up to required levels.
- j) If a mechanical excavator is used by the Contractor, he shall indemnify the Employer against all claims for damage which in the opinion of the Engineer, may be caused by the use of this plant.
- k) The Contractor shall fix Sight Rails for use with boning rods at intervals of not more than 30 metres and temporary Bench Marks related to the Survey of Kenya Datum shall be provided at such intervals as directed by the Engineer.

#### **h. Main Laying**

- a) Mains shall be laid in straight lines and/or smooth curves as indicated on the drawings. The vertical profile of the pipe shall be to even gradients. Any pipes not so laid shall be removed if so directed by the Engineer, and re-laid in proper manner at the Contractor's expense.

In laying the pipes and specials care shall be taken not to damage the protective linings and the pipes shall be handled with tackle if so directed by the Engineer.

The pipes and specials shall be checked for flaws before they are lowered into the trench. After the pipes or specials have been checked they shall be cleaned and set to proper gradient and line so that there is a continuous rise from each washout to air valve.

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

- b) Large diameter curves to mains shall wherever possible be formed by allowing for deflection at flexible joints, not exceeding 3 degrees, or as specified by the manufacturers.
- c) In jointing of the pipes and specials the Contractor shall comply with the standards adopted for the various types of joints as specified.
- d) In laying pipes and specials with flanged joints, flanges shall be brought together and bolted with the faces absolutely parallel. A rubber jointing gasket ring 3mm thick shall be used in each flange joint and one washer with and not provided for each bolt.

The bolts shall be tightened up gradually and equally in the customary manner in order to distribute the stress evenly over the flange. If it is found necessary to deviate slightly from the normal run of the flanged piping, the deflection shall be obtained by means of a bevelled gun metal ring washer between the flanges.

- e) The Contractor shall fix the gate valves, air valves and washout pipes all in accordance with the drawings.
- f) The Contractor shall, subject to approval of the Engineer, cut pipes to such lengths as directed. Pipes should be cut off clean and square with the axis. Cuts should be made with an approved cutting device dependant on the type of pipe specified. Ends of pipes should be tapered by means approved by the Engineer if mechanical joints are to be used.
- g) Equipment for tapping off the mains under pressure may be employed in the making of service or branch connections. The Contractor is required to choose a suitable method for fixing of the ferrule to the type of pipe specified, to the Engineer's approval.

**i. Backfilling of Trench**

- a) When a section of the main has been jointed, the ends shall be temporarily closed with caps, plugs or flanges to prevent ingress of foreign matter into the pipe to the satisfaction of the Engineer. The trench shall be properly backfilled and rammed for its whole length so that the soil cover to the main shall not be less than 600mm except at joint holes which shall be kept clear of all backfilling, if necessary, by the use of timbering, so that each joint is left fully exposed for the Engineer's inspection. Special care shall be exercised when using surround to A.C. and uPVC pipes which shall be free from any stones and well compacted in layers to not less than 100mm above the crown of the pipe.
- b) The Contractor's attention is drawn to the special requirements for bedding and sidefill to uPVC pipes. Clay should not be used. Soils which are of a granular nature and provide adequate support after compaction shall be used. If unavailable from excavated material the Contractor should provide suitable material for which an item in the Bill has been included.

With flexible pipes it is important that the sidefill should be firmly compacted between the pipe and the soil sides of the trench. The bedding material shall be placed in 75mm layers up to the crown of the pipe with adequate compaction and then to a minimum height of 100mm or two thirds of the pipe diameter. The progress of filling and tamping should proceed equally on either side of the pipe so as to maintain an equal pressure on both sides.

- c) Where a main is laid across a road or is in such a position as to interfere seriously with the normal use of the road, the Contractor may, with the consent of the Engineer and at his own risk, fill such holes as may be necessary. Due consideration is to be given to compaction of section of the trench across the road to prevent undue settlement. In the event of damage at this section the Contractor is required to re-excavate and repair the pipeline all at his own expense.

### **j. Anchor Blocks and Supports**

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

### **k. Chambers and Surface Boxes**

Gate valves, air valves and fire hydrants etc. shall be provided with suitable chambers or surface boxes in accordance with detailed drawings. In roads and footpaths the boxes shall have metal covers laid flush with the surface. Indicator posts to suit shall also be provided.

### **l. Testing**

- a) The Contractor shall test as long a section of main as possible subject to the maximum length of open trench approved by the Engineer. The test shall be carried out within 12 working days of the completion of such section of the main.
- b) The pipeline shall be adequately anchored during the test at stop ends or valves to prevent movement under the test pressures.
- c) The test section shall be filled with water and great care should be taken to drive out all air through air valves, ferrules etc. The test pressure is to be at least 1.5 times the nominal working pressure for the class of pipe being tested and is to be applied for at least 2 hours.
- d) The leakage from the mains and connections from each section tested shall be according to SRN 316, i.e. not exceeding 0.02 litres per millimetre of nominal bore per kilometre of pipeline per 24 hour per bar of applied pressure head.

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

If the leakage is at a greater rate than that specified, the Contractor shall re-excavate the trench where necessary and shall re-make the joints and replace defective work until the leakage shall be reduced to the allowable amount.

- e) The Employer shall charge the Contractor the cost of any couplings required to join up tested lengths of main if, in the Engineer's opinion, greater lengths could reasonably have been tested or if failure under test, requires the pipe to be cut, or other methods of laying should have been adopted.

Water used in testing the main shall be supplied by the Contractor. The Contractor shall carry out all work which may be necessary for making

temporary connections to the existing mains to obtain water for testing at his own expense.

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

The Engineer shall be the sole judge of water tightness.

**m. Cleaning and Sterilising the Main**

- a) When a pipeline is complete and where applicable, has successfully passed the test, it shall be thoroughly washed out, using if possible, an open end. Thereafter it shall be sterilised by being filled with a suitable solution containing not less than 20 p.p.m. of free available chlorine or such other sterilising agent as the Engineer shall approve. After standing for 24 hours the main shall again be washed out and refilled with mains water prior to the taking of bacteriological samples. The Contractor shall provide all necessary stop-ends, fittings and chemicals for this work.
- b) Emptying and washing out of the pipes shall be done in such a manner as not to damage the trench or cause undue flooding of the vicinity, and the Contractor shall supply and use piping, specials and/or hose as may be necessary to facilitate the flow of water to the nearest drain or watercourse. Water used for washing out and sterilising may be supplied by the Employer when a suitable supply is available but all expenses should be payable by the Contractor.

Before any section of the main is put into use, a bacteriological sample or samples will be taken by the Engineer's Representative and only on receipt of a satisfactory certificate from a Medical Research Laboratory or similar organisation will the main or section of main be permitted to be put into supply and be considered as having been substantially completed.

Any expenditure involved in providing facilities or materials for the taking of samples shall be included in the Contractor's tendered rates and the Engineer will specify and shall be the sole judge as to the number of samples required and the points at which they are to be taken.

The cost of the bacteriological examination will be borne by the Employer but if the sample or samples are not satisfactory, the cost of any subsequent analysis will be borne by the Contractor.

**n. Clearance of Site**

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

**xi. TESTING OF MATERIALS AND WORKMANSHIP**

**a. Apparatus Required for Testing On Site**

Apparatus for testing shall be, if directed by the Engineer, made available on site of the works, for as long a period as required by the Engineer, and regarded as constructional plant. The Contractor to allow for this provision in his rates. The following may be required:-

- a) A set of sieves complying with British Standard 410 : Test Sieves, or the following nominal sizes:-
- b) Fine mesh wire cloth 200, 100, 72, 52, 36, 25, 18, 14, 10 and 7.
- c) Medium mesh wire cloth 3mm.
- d) Perforated plate 5mm, 6mm, 9mm, 12mm, 20mm, 38mm, 50mm, 65mm and 75mm.
- e) A suitable balance, a pycnometer and a stove or other approved apparatus for determining the moisture content of the aggregate. The methods of test shall be as described in Part Four of British Standard 812: Sampling and Testing of Mineral Aggregates, Sands and Fillers.
- f) A 200 ml. graduated cylinder in accordance with British Standard 604: Graduate Measuring Cylinders, for the use in the field settling test for clay and fine silt in aggregates.
- g) Two 0.34 kg graduated clear glass medicine bottles for use in the test of organic impurities in sand.
- h) Apparatus required for testing soils in accordance with British Standard 1377: Methods of Test for Soil Classification and Compaction, and British Standard 1924: Methods of Test for Stabilised Soils.
- i) Apparatus for testing concrete in accordance with British Standard 1881: Methods of Testing Concrete, Parts 1 to 7.
- j) A straight edge 3 metres long and measuring wedge or other approved apparatus for testing the accuracy of surfaces.
- k) Additional testing equipment as stated in the Bill of Quantities or as required by the Engineer.

**b. Load Testing Of Pipes**

The Engineer may instruct the Contractor to make a Loading Test (Three-Edge Bearing or Sand Bearing) on pipes to be used to construct the sewer. Payment for Load Tests will be entirely in accordance with the General Conditions of Contract.



## **Section H**

### **Preamble to Bills of Quantities**

## Section H –Bills of Quantities

### (A) PREAMBLE TO BILL OF QUANTITIES

#### 37.0 H.1 - GENERAL PRINCIPLES

H.1.1 This Preamble is deemed to form part of the Bill of Quantities.

H.1.2 The Bill of Quantities is to be read in conjunction with all the other documents comprising the Tender Documents at the tender stage and the Contract Documents after award of the Contract.

H.1.3 Appropriate provisions of this Preamble shall also apply to the measurement of completed work in conjunction with the relevant Notes on Measurement.

#### 38.0 H.2 - DEFINITIONS

H.2.1 The following words and expressions have the meanings hereby assigned to them unless specifically stated otherwise.

H.2.2 "Conditions of Contract" shall be as defined elsewhere in the Documents.

H.2.3 "Work" includes work to be carried out, goods, materials and services to be supplied, and the liabilities, obligations and risks to be undertaken by the Contractor under the Contract.

H.2.4 "Expressly required" means work which is shown on the Drawings, described in the Specification or ordered by the Engineer as a specific requirement pursuant to the Contract.

H.2.5 "Bill of Quantities" means the list of items giving brief identifying descriptions and estimated quantities of the work comprising the Contract and shall include this Preamble.

H.2.6 "Daywork" refers to the method of valuing work on the basis of time spent by the workmen, the materials used and the plant employed.

H.2.7 "Work Classification" means the alphabetical Work Classification set out herein.

H.2.8 "Original Surface" means the ground level before any work under the Contract has been carried out.

H.2.9 "Final Surface" means the surface indicated on the Drawings to which excavation is to be carried out.

H.2.10 "Commencing Surface" means:

In relation to a single item in the Bill of Quantities, the surface of the ground before any work covered by that item has been carried out;

- In relation to a group of items in the Bill of Quantities for work in different materials in an excavation or a bored, drilled or driven hole, the surface of the ground before any work covered by any item in that group has been carried out.

H.2.11 "Excavated Surface" means, the surface to which excavation included in the work covered by the relevant item is to be carried out.

- H.2.12 Expressions such as "depth 2-4 m" in bill items shall apply to operations within a range of depths which includes all depths exceeding 2 m but not exceeding 4 m. Thus the smaller dimension is excluded but the larger dimension is included.
- H.2.13 Where "(provisional)" appears after a work item description this means that a rate and amount are required for the quantity entered although the necessity for the work was uncertain at the time of preparing the document.
- H.2.14 "Supply" shall be deemed to include delivery to the Site and unloading to store unless expressly stated otherwise.

### **39.0 H.3 - WORK CLASSIFICATIONS AVAILABLE**

(Not Applicable)

### **40.0 H.4 - ARRANGEMENT OF THE BILL OF QUANTITIES**

#### **Principal Quantities**

- H.4.1 If any estimated total principal quantities of the Permanent Works are given in the Instructions to Tenderers or elsewhere in the Tender Documents, they are solely to assist Tenderers in making a rapid initial assessment of the general scale of the Contract but shall not have any contractual significance.

#### **Mode of Description**

- H.4.2 To avoid unnecessary length, item descriptions will generally identify the component of the Works and not the tasks to be carried out by the Contractor, e.g.  
An item will be described as "Mild steel bar reinforcement diameter 20 mm", rather than as "Supply, deliver, cut, bend and fix mild steel bar reinforcement to BS 4449 diameter 20 mm".
- H.4.3 Where the work identified by an item is specifically limited, the limitation will be stated in the item description, e.g.  
"Fix only handrailing supplied by others under item

#### **Day works: Labour and Materials**

- H.4.4 After each of the Provisional Sums for there will be an item where the tenderer may insert a percentage addition to be added to the basic expenditure under the relevant item. In the case of the Provisional Sum for Plant the tendered percentage shall be applied only when the Plant used on dayworks has to be specially hired by the Contractor.
- H.4.5 Any dayworks carried out by sub-contractors shall be paid as for dayworks by the Contractor except that dayworks carried out by Nominated Sub-Contractors may be subject to a separate schedule as directed by the Engineer when issuing instructions for placing a Nominated Sub-Contract.

#### **Headings and Sub-Headings**

- H.4.6 Each Part of the Bill of Quantities will be given a heading and groups of items within each part may be given sub-headings. Headings and sub-headings shall be read as part of the item descriptions to which they apply and will normally be repeated at the start of each new page which lists items to which they apply.

**Itemization and Description**

- H.4.7 Descriptions will identify the work covered by the respective items, but the nature and extent of the work is to be ascertained from the other Tender Documents, which shall be read in conjunction with the Preamble and Notes on Measurement.
- H.4.8 Full detail or description may be omitted from an item description provided that, if necessary to aid clarity, an equivalent reference to the Drawings or Specification is given in its place.
- H.4.9 Where a normal item description seems insufficient to identify clearly the particular work covered by the item, additional description will have been given to identify the work by reference to its location or other physical features shown on the Drawings or described in the Specification.

**Ranges of Dimensions**

- H.4.10 Where within one operation material has to be removed from an increasing depth as the operation proceeds and the words "in range" are included against dimensions in the item description, e.g. "in range 2-4 m", this means that there are separate items for measurement and payment of other ranges of depth during the course of that operation. For the above example, work at depths of 2 m or less, at 2- 4 m and at depths exceeding 4 m would be billed under separate items. If all the work had a final depth of 2-4 m there would be separate items for 2-4 m and for depths not exceeding 2 m. It is unlikely that this will be applied to items other than certain items in Classes B, C, E and F.

Where the words "in range" do not appear as described above, this means that the whole operation from zero depth to final depth will all be paid under one item at one rate per unit of work. If all the work had a final depth of 2-4 m, there would be only one item and the range stated in the description would refer to the final depth of the operation. Similar work elsewhere would be measured and paid under other items where the final depth either exceeds 4 m or does not exceed 2 m.

**Provisional Sums**

- H.4.11 A Provisional Sum for a general overall contingency allowance will, if required, be given in the Bill Summary as described later in this Section.
- H.4.12 Provisional Sums for particular items of work will be given in the general items of Class A within the relevant Part of the Bill of Quantities.
- H.4.13 The item descriptions against Provisional Sums for particular items of work will distinguish work where the use of a Nominated Sub-Contractor was envisaged at the time of preparing the Tender Documents.
- H.4.14 Whenever the Bill includes Provisional Sums for particular items of work for which it is stated that payment is envisaged by dayworks if such work is necessary, the Provisional Sum shall be deemed to include all the percentage additions for dayworks.

**Quantities**

- H.4.15 The quantities inserted in the Bill are, wherever possible, computed net from the Tender Drawings, unless otherwise required in the Notes on Measurement or elsewhere in the Documents. Quantities have been rounded up or down where appropriate.

The Tenderer must recognise that the billed quantities represent estimated quantities subject to variations on each item, and no claim shall be made for deficiency or over-run therein, actual or relative. Accordingly, while the Tenderer must complete his Tender using the

estimated quantities shown, he shall do so on the understanding that these estimated quantities are only intended to give general guidance to the Tenderer, and to enable tenders to be compared on a uniform basis.

### **Ground and Excavation Levels**

H.4.17 The following shall apply except where there is a specific reference to the contrary in the relevant Notes on Measurement:

- The Commencing Surface will be identified in the description of each item for work involving excavation, boring or driving when the Commencing Surface is not also the Original Surface.
- The Excavated Surface will be identified in the description of each item for work involving excavation when the Excavated Surface is not also the Final Surface.

### **Bill Summary**

H.4.18 Provision is made for the amounts inserted on each page to be totalled. Where appropriate the page totals within each Part of the Bill of Quantities are carried to a summary of each Part. The page or Part totals, as appropriate, are carried to the Bill Summary.

H.4.19 The total of the pages or Parts will comprise the Bill Total.

H.4.20 A Provisional Sum for a general contingency (the General Contingency Allowance) will, if required, be given in the Bill Summary following the Bill Total, usually computed as a percentage thereof.

H.4.21 The Tender Sum is the Bill Total plus the General Contingency Allowance, if any

## **41.0 H.5 - COMPLETION AND PRICING OF THE BILL OF QUANTITIES BY THE TENDERER**

### **Insertion of Rates and Prices**

H.5.1 Rates and prices shall be inserted in the Rate column of the Bill of Quantities, and elsewhere as instructed, in the currency and number of decimal places as directed in the Instructions to Tenderers.

H.5.2 In inserting tendered rates and prices in the Bill of Quantities, the Tenderer thereby offers to perform the relevant items of work at those rates and prices, and declares that every rate and price which he submits in his Tender:

- (a) Has been derived in a reasonable fashion;
- (b) Properly reflects the cost of doing the portion of the work to which that price or unit price pertains; and
- (c) Is inclusive of everything necessary to perform and complete in accordance with the Tender Documents that portion of the Work to which the price or unit price pertains including, without limiting generality, all supervision, labour, maintenance, equipment, supplies, materials, facilities, overhead, profit and contingent expenses of every kind except as otherwise specifically provided for in the Tender Documents.

H.5.3 Page or Part totals, as appropriate, shall be carried to the Bill Summary.

### **Relationship to Other Documents**

- H.5.4 Certain clauses in the Conditions of Contract or Specification may be mentioned in the item descriptions contained in the Bill of Quantities but where no clause is mentioned the Contractor shall not be relieved of any of his obligations under the Contract. In general, a specification reference will be the first clause principally relating to the item but not necessarily the only clause.
- H.5.5 The various prices and rates to be inserted in the Bill of Quantities are together to be the full inclusive value of the work described, including all costs and expenses which may be required in and for the construction of the work described, together with all risks, liabilities and obligations set forth or implied in the Tender Documents.
- H.5.6 General Directions and descriptions of work and materials given elsewhere are not necessarily repeated in the Bill of Quantities and reference is to be made to the Tender Drawings, Specification and other relevant documents for this information.
- H.5.7 Operations included in a billed rate are generally listed only where it is felt necessary to differentiate between the content of a number of items, each of which covers a different part of a whole process. The use of the word "including" may be taken to highlight a particular operation but shall not mean that no other operations need be included in the rate. It follows that no claim for additional payment will be considered if based merely on the proposition that not all necessary operations within any item are included in any description or discussion. Thus, all necessary operations listed in or implied by the Specification and Drawings including supply, handling and fixing will be deemed to be included in the rates irrespective of whether some, all or none are specifically mentioned in the Bill, except where the item description gives a limit, e.g. "Fix only handrailing supplied by others under Item . . . .".
- H.5.8 Rates shall include for testing where specified except where testing is billed separately.

### **Adjustment of Total**

- H.5.9 If provision is not made in the Bill Summary for the tenderer to adjust the Bill Total but the Tenderer nevertheless finds it essential to do so during the last phase of the tendering process and offers an Adjustment, this fact (but not the amount of the Adjustment) shall be noted on the Bill Summary page. The amount of the Adjustment shall be stated in a letter accompanying the Tender, shall be a lump sum, not a percentage, and will not be varied on account of cost escalation.
- H.5.10 Any additions or deductions in respect of an Adjustment Item shall be made by lump sum instalments on each interim certificate in the proportion that the total otherwise certifiable bears to the Bill Total in the Tender, and shall not exceed the amount of the Adjustment. If, however, by the date of issue of the Taking-Over Certificate for the whole of the Works any balance of the Adjustment is outstanding, the balance shall be added to or deducted from the retention monies then due to the Contractor.

### **Procedure during Assessment of Tenders**

- H.5.11 The tenderer shall not alter or otherwise qualify the printed text of the Bill of Quantities unless so instructed by a tender addendum etc. Any alterations or qualifications made without such authority will be ignored during evaluation and the text of the Bill as provided will be used.
- H.5.12 If there are any arithmetic discrepancies between a tendered rate and the corresponding amount in the Bill, the rate shall always be taken as correct during the assessment of tenders.

H.5.13 Items contained in the Bill of Quantities against which no rate or price is entered by the tenderer will be deemed to be covered by other prices or rates in the Bill.

**Re-measurement**

H.5.14 Because, as already stated, the quantities are estimated quantities derived from preliminary drawings and are not therefore to be taken as exact quantities to be executed by the Contractor in fulfilment of his obligations under the Contract, the value of the whole work executed to the satisfaction of the Engineer shall be ascertained by re-measurement and valuation.

No allowance in measurement for payment will be made for wastage of materials.

**Breakdown of Provisional Sums**

Subject to the provisions of clause 57.2 of the Conditions of Contract, the tenderer should take note that the successful tenderer will be required to provide detailed breakdowns for all provisional sum prices inserted by it against bill items including all such items.

## Section H –Bills of Quantities

### (B) BILL OF QUANTITIES

<b>BILL OF QUANTITIES FOR FENCING ; WEIWEI IRRIGATION PROJECT FARM 17km PERIMETER</b>					
ITEM NO.	DESCRIPTION	UNIT	QUANT .	RATE (KSh)	AMOU NT (KSh)
	<b>Bush clearing and Excavation works</b>				
1	Bush/debris/shallow earth and gully earth work clearing ,3m wide area to provide and open up the fencing line	m2	51,000		
2	Excavation of holes on normal soil for installation of MS poles (0.45m deepx0.25m dia. at 3m centres) and MS pole supports at 100m centers	m3	140		
	<b>Concrete works</b>				
4	Provide mass concrete class 20/20 (1 :2:4) for fixing of poles and pole supports	m3	140		
	<b>Steel works</b>				
6	Supply and install heavy duty 8.5 feet long 2"x2" x0.25" angle iron bar fabricated for holding stringers and barbed wire	no.	5685		
7	Supply and install 8.5 feet 2"x2"x0.25" angle iron pole supports on both sides of the pole at 100m centres.	no.	350		
8	Fabricate, erect and paint grilled steel gate at entry points as per design(5.5m wide x2.m high) Complete with 100mm dia GI pillars as directed, drawing attached	no.	5		
9	Supply install 7 feet high galvanized, 14 gauge tripple twist wire netting(heavy duty), 18m length per roll	rolls	946		
10	Supply and install heavy duty galvanized mild steel stringers,12.5gauge, 3mm thick at 900mm centers(50kg per roll)	Lm	51060		
11	Supply and install barbed wire , 16 Gauge ,500 m long two strands at 150mm centers on top of fence cross section(25kg per roll)	Lm	34040		
12	Suppy of binding wire for fastening	kg	2500		



13	Supply and install standard 2.2mm thick 2mx1mx1m gabions filled with hard core as directed ,volume of gabion for each gully( 2mx15mx2m) to allow installation of fence on gully crossings.	m3	420		
	<b>Grand Total</b>				
	<b>ADD 5% upcountry percentage (Eldoret to Weiwei)</b>				
	<b>Allow for 5% supervision fee</b>				
	<b>Allow for 5% contingencies</b>				
	<b>TOTAL</b>				

### Summary of Bills of Quantities

<b>Bill Number</b>	<b>Description</b>	<b>Number of Pages</b>
Bill NO. 1		
Bill No. 1:		
Bill No. 2:		
Bill No. 3:		

## **TENDER-SECURING DECLARATION**

[The Tenderer shall fill in this Form in accordance with the instructions indicated.] Date:  
[insert date ] Tender No.: [insert tender number]

To: [insert name of Procuring Entity]

We, the undersigned, declare that: We understand that, according to your conditions, tenders must be supported by a Tenders-Securing Declaration. We accept that we will automatically be suspended from being eligible for tendering in any contract with the Procuring Entity for the period of time as determined by the Authority if we are in breach of our obligation(s) under the tender conditions, because we: (a) have withdrawn our Tender during the period of Tender validity specified in the Form of Tender; or (b) does not accept the Procuring Entity's corrections of arithmetic errors in accordance with the Instructions to Tenderers; or (c) having been notified of the acceptance of our Tender by the Procuring Entity during the period of Tender 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 ITT.

We understand this Tender Securing Declaration shall expire if we are not the successful Tenderer, upon the earlier of (i) our receipt of your notification to us of the name of the successful Tenderer; or (ii) twenty eight (28) days after the expiration of our Tender validity period. Signed: [insert signature of person whose name and capacity are shown] Name: [insert complete name of person signing the Tender Securing Declaration] In the capacity of [insert legal capacity of person signing the Tender Securing Declaration] Duly authorized to sign the Tender for and on behalf of: [insert complete name of Tenderer]

Dated on \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ [insert date of signing]  
Corporate Seal (where appropriate) [Note: In case of a Joint Venture, the Tender Securing Declaration must be in the name of all partners to the Joint Venture that submits the tender.]

## Appendix

### Evaluation criteria

#### a) Mandatory Requirements

No	Requirement	Compliance
1.	Copy of Registration/incorporation certificate to show that the applicant is a registered <b>company</b> and legally authorized to do business in Kenya	Must meet
2.	Valid Tax compliance certificate	Must meet
3.	Valid Business Permit	Must meet
4.	Submission of a valid registration certificate issued by the National Construction Authority (NCA) for category <b>NCA 6</b> or superior for <b>Building works category</b> .	Must meet
5.	KRA PIN Certificate	Must meet
6.	Duly filled Self Declaration Form not to engage on Corruption /Fraudulent practices	Must meet
7.	Duly filled and signed Certificate of Site Visit/Pre-bid meeting	Must meet
8.	Duly filled form of tender	Must meet
9	Power of attorney of signatory of Bid	Must meet
10.	Current CR 12 from registrar of companies	Must meet
11.	All bids Submitted must be serialized /Paginated	Must meet
12	Tender securing declaration- AGPO	Must meet

**NOTE: Tenderers who will not meet ANY of the above mandatory requirements will not be evaluated further.**

i **Technical Evaluation. Technical requirements will be scored as indicated below: -**

TECHNICAL EVALUATION SCORE				
ITEM		DESCRIPTION		POINT SCORE SCALE
1		<b>EXPERIENCE</b>		<b>Max 40</b>
	a	General Experience in construction works Evidence of availability of critical equipment		0-5 0-5
	b	<p><b>Specific experience in related works</b> Company past similar works experience of building works in the last 3 years of not less than Kenya shillings Fifty million and above each. Provide proof of similar works in terms of copies of contracts agreements, LPO, completion certificates or Interim completion certificates of not less than 70% complete.</p> <ul style="list-style-type: none"> <li>• Three or more similar works – 30 Marks</li> <li>• Two similar works – 20 Marks</li> <li>• One similar work – 10 Marks</li> <li>• None – 0 Marks</li> </ul>		0-30
2		<b>KEY PERSONNEL</b>		<b>Max 30</b>
		<b>Project Manager (Max 10marks)</b>	Qualification	Post Graduate 5.0
				Degree 3.0
			Relevant Experience	5 years and above 5.0
				Below 5 years 3.0
		<b>Site Agent Engineer 5 marks</b>	Relevant Qualification	Degree 3.0
				Higher National Diploma 1.0
			Relevant Experience	5 years and above 2.0
				Below 5 years 1.0
		<b>Surveyor (Max 5marks)</b>	Qualification	Degree 3.0
				Diploma 2.0

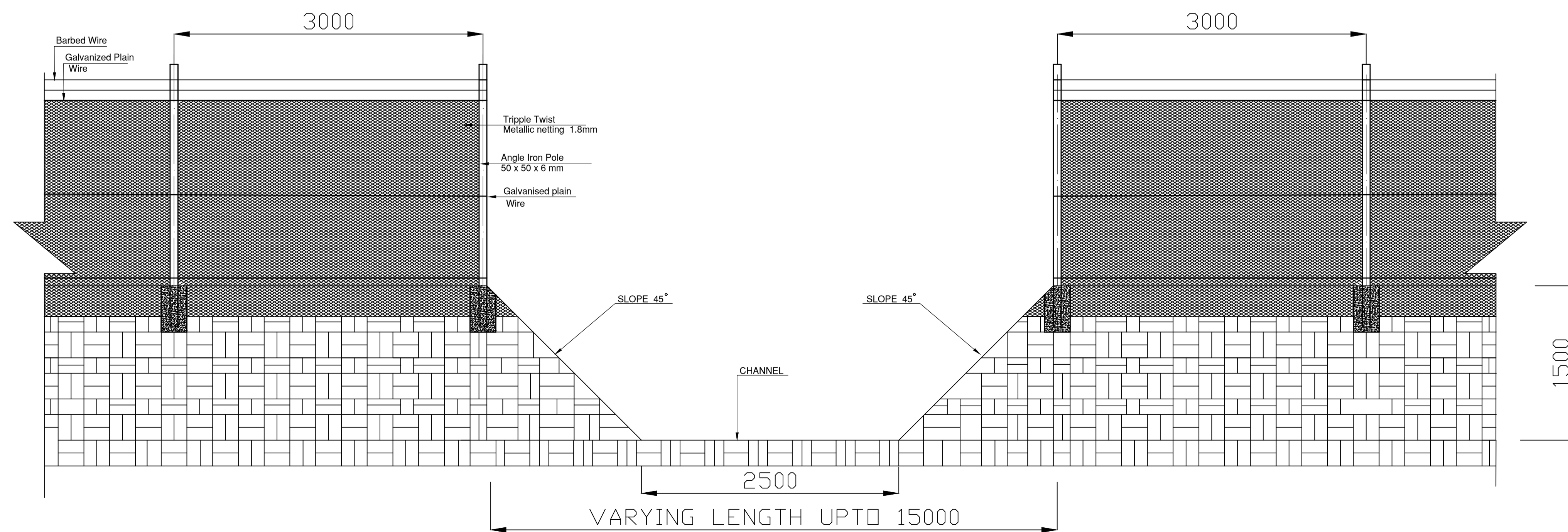
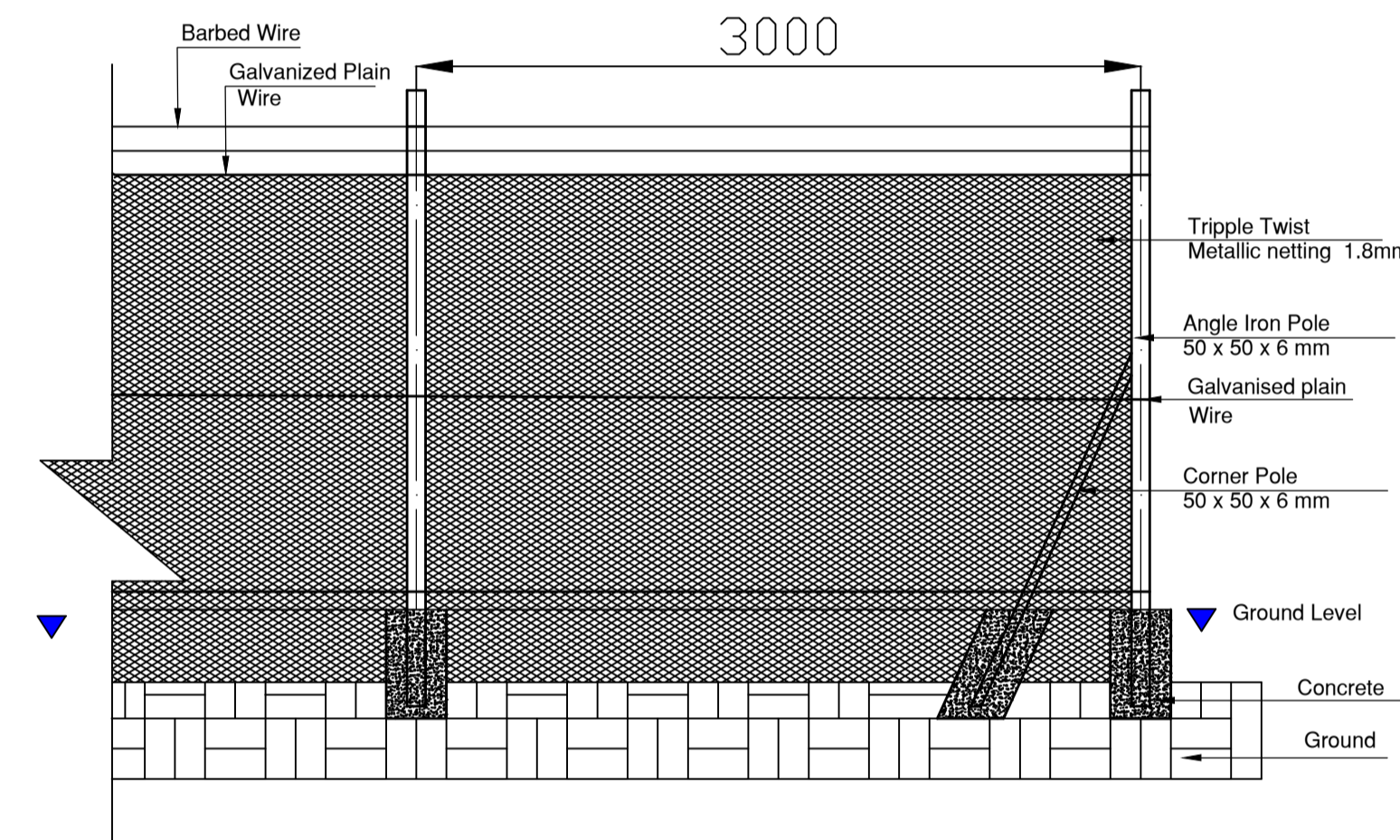
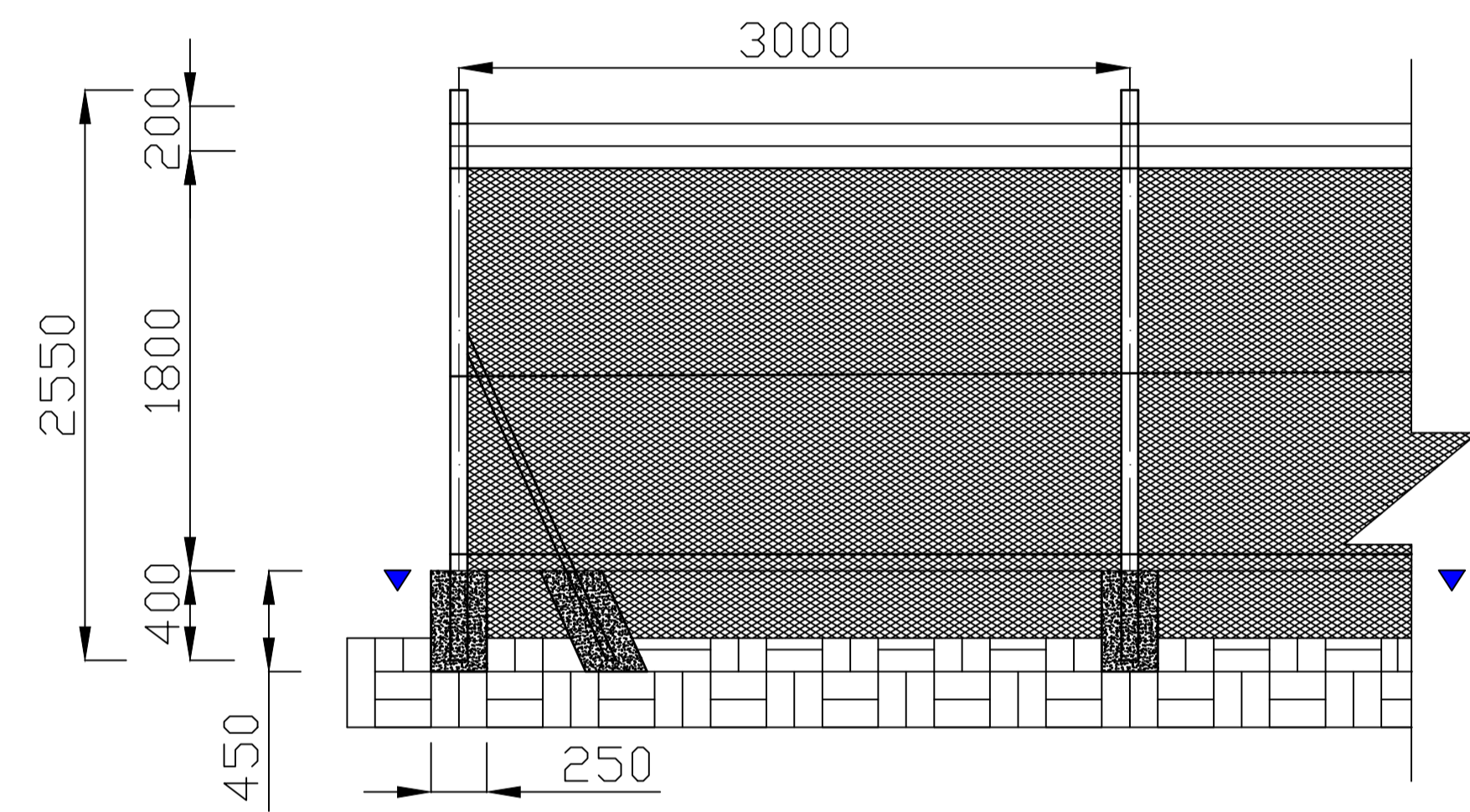
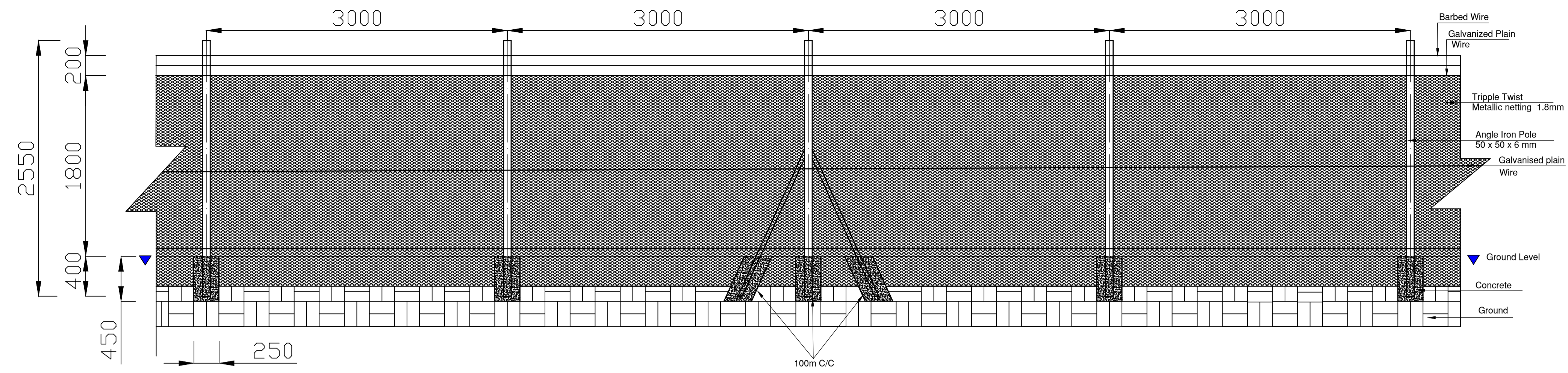
	<b>Site Foreman (Max 5marks)</b>	Relevant Experience	5 years and above	2.0
			Below 5 years	1.0
		Qualification	Degree	3.0
			Diploma	2.0
		Relevant Experience	5 years and above	2.0
	<b>Civil Engineering / Technician (Max 5.0marks)</b>	Experience	Below 5 years	1.0
		Qualification	Degree	3.0
			Diploma	2.0
		Relevant Experience	6-10 years and above	2.0
			3-5 years 1-2 years	1.0 0.5
3	Financial capacity  Provide audited accounts for past three years  Evidence of access to credit lines and availability of other financial resources		<b>Maximum</b>	<b>20</b>  5-15  1-5

<b>4.WORK METHODOLOGY</b>		<b>Max 10</b>
a)	Program of works	0- 4
b)	Detailed Methodology	0- 3
c)	Methodology on safety during the construction period	0-3
<b>TOTAL</b>		<b>MAX 100</b>
<b>Minimum Technical Score</b>		<b>70</b>



**NOTES**

1. The Contractor to confirm all dimensions on site before commencing the works.
3. Figured dimensions only to be taken and all dimensions are in millimetres unless stated otherwise.
4. Concrete to be class 25/20



**ISSUES**

DATE	TO	APPLICATION

**REVISIONS**

DATE	BY	DESCRIPTIONS

**REFERENCE DRAWINGS**

No.	DESCRIPTIONS

CLIENT: KERIO VALLEY DEVELOPMENT AUTHORITY      JOB No. SIWWIP-K03

PROJECT TITLE: SIGOR WEI-WEI INTEGRATED DEVELOPMENT PROJECT PHASE III

DRAWING TITLE: PROPOSED WHOLE IRRIGATION SCHEME'S FENCING CONSTRUCTION DETAILS.

DRG No.      FILE No.      SCALE: 1:20      FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING

APPROVED BY

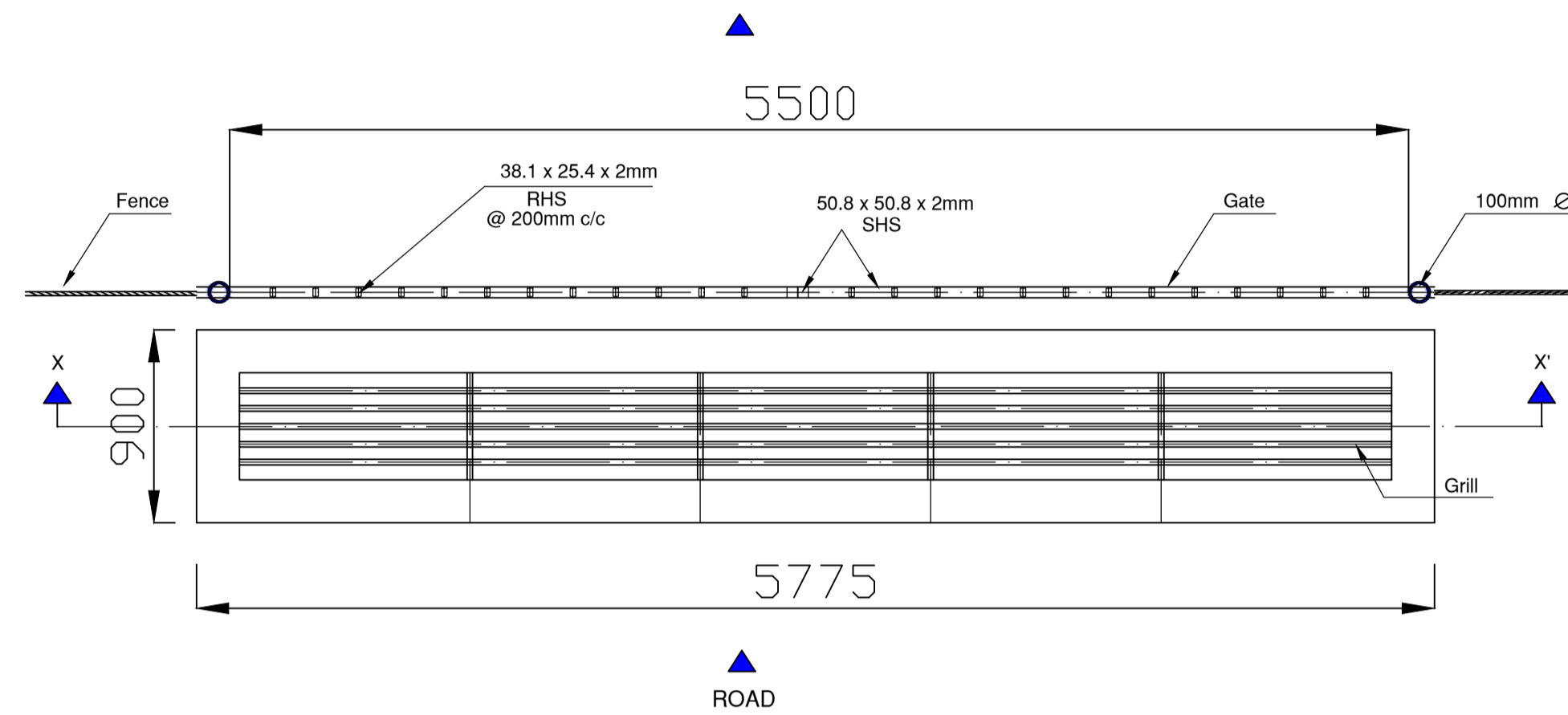
NAME	SIGNATURE	DATE
DESIGN/DRAWN: T.O.M		17/10/2019
CHECKED BY: ENG. KIPLAGAT		17/10/2019



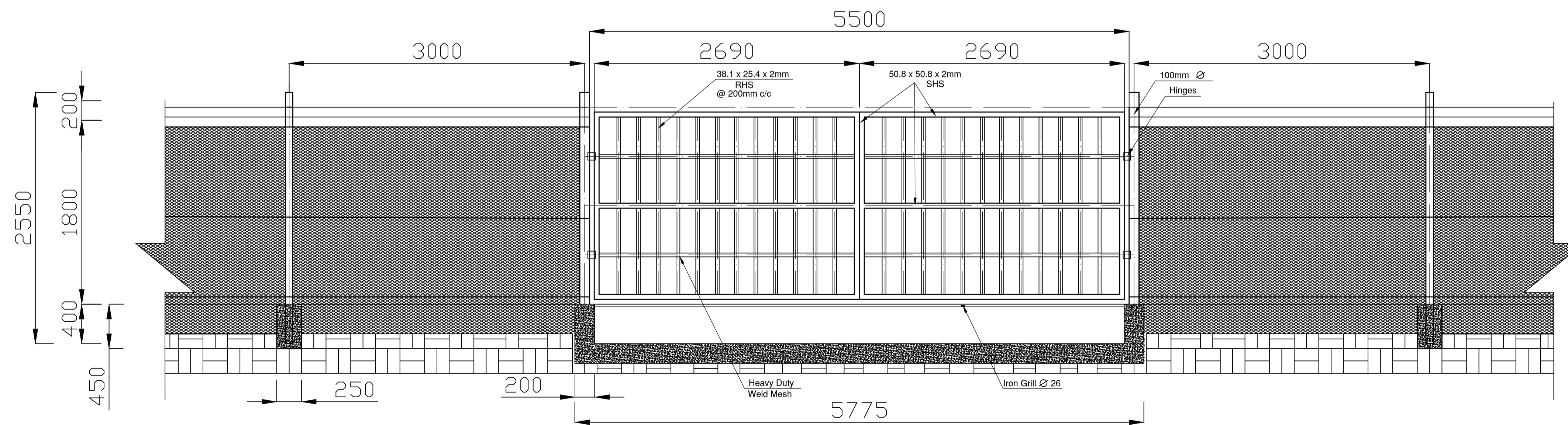
**NOTES**

1. The Contractor to confirm all dimensions on site before commencing the works.
3. Figured dimensions only to be taken and all dimensions are in millimetres unless stated otherwise.
4. Concrete to be class 25/20

**GATE PLAN**



**GATE SECTION X-X'**



**ISSUES**

DATE	TO	APPLICATION

**REVISIONS**

DATE	BY	DESCRIPTIONS

**REFERENCE DRAWINGS**

No.	DESCRIPTIONS

CLIENT	JOB No.
KERIO VALLEY DEVELOPMENT AUTHORITY	SIWWIP-K03

PROJECT TITLE  
**SIGOR WEI-WEI  
 INTEGRATED DEVELOPMENT PROJECT  
 PHASE III**

DRAWING TITLE  
**PROPOSED  
 WHOLE IRRIGATION SCHEME'S  
 FENCING  
 CONSTRUCTION DETAILS.**

DRG No.	
FILE No.	

SCALE	FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
1:20	

APPROVED BY

NAME	SIGNATURE	DATE
DESIGN/DRAWN	T.O.M	17/10/2019
CHECKED BY	ENG. KIPLAGAT	17/10/2019