

THE KILIMANJARO AGRICULTURAL  
DEVELOPMENT CENTER PROJECT  
IN  
THE UNITED REPUBLIC OF TANZANIA

禁止出賃


農業開発課

CONTRACT  
FOR  
CONSTRUCTION WORKS  
FOR  
TRIAL FARM

- 
- INSTRUCTIONS TO TENDERERS
  - FORM OF TENDER
  - FORM OF AGREEMENT
  - FORM OF PERFORMANCE BOND
  - CONDITIONS OF CONTRACT
  - GENERAL SPECIFICATIONS
  - TECHNICAL SPECIFICATIONS
  - BILL OF QUANTITIES
  - DRAWINGS
- 

JUNE 1980

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JAPAN INTERNATIONAL COOPERATION AGENCY

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FORM OF TENDER  
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## INSTRUCTIONS TO TENDERERS

### 1 - TENDERS

Tenders shall be submitted on the attached Form of Tender, and shall be accompanied by a complete set of Contract documents and priced Bill of Quantities, and with all information which the Specification requires to be submitted with Tenders.

Tenders shall be enclosed in sealed covers marked "TENDER FOR CONSTRUCTION WORKS FOR TRIAL FARM OF KADC PROJECT" and addressed to;-

Japan International Cooperation Agency  
Dar Es Salaam Office  
c/o Embassy of Japan  
P.O. Box 2577  
Dar Es Salaam, Tanzania

and delivered there before 10:00 a.m. (Dar Es Salaam local time on, ....., 198\_. Tenders received after this time will be returned unopened.

Tenders shall be signed in the handwriting of the Tenderers. In the case of a Corporation, Tenders shall be signed in the handwriting of the proper officers with the Corporation seal affixed. In the case of a Consortium, Tenders shall be signed by the proper officers of each corporate member of the Consortium and Tenders shall be affixed with the Corporation seals of each member of the Consortium.

### 2 - OPENING OF TENDERS

Tenders will be opened publicly at the office of the Japan International Cooperation Agency Dar Es Salaam Office on ....., 198\_ at 15:00 hours (Dar Es Salaam local time).

### 3 - COMPLETENESS OF TENDER

The Tenderer is required to complete:

- (a) The Form of Tender.
- (b) The Bill of Quantities, with every item legibly priced in ink and with the columns added up to the exact total amount of the Tender.

Any Tender which is incomplete or does not include the whole of the Works or does not comply with the Specification and the General Conditions will not be considered.

#### 4 - INTERPRETATION OF CONTRACT DOCUMENTS

If the Tenderers have any doubt as to the meaning of any portion of the Contract documents, they shall apply in writing to the Engineer for information and explanation before submitting their Tenders.

#### 5 - VALIDITY OF TENDERS

Tenders must be made valid for a period of ninety (90) days from the date specified above for delivery of Tenders.

#### 6 - ACCEPTANCE AND REJECTION OF TENDERS

The Employer does not bind himself to accept the lowest or any Tender, nor need to assign any reason for the rejection of any Tender.

#### 7 - CORRESPONDENCE

All correspondence in connection with the Tender and Contract and all matters accompanying the Tender which are relevant to its examination are to be in the English language and expressed in units of the metric system. Gregorian Calendar shall be used for the purposes of this Contract.

#### 8 - EXPENSES IN PREPARATION OF TENDER

The Employer will neither be responsible for, nor pay for, any expenses or losses which may be incurred by any Tenderer in the preparation of his Tender.

#### 9 - INFORMATION TO BE SENT WITH TENDERS

The followings shall be prepared by the Tenderers and shall be incorporated in the Tenders:

- (a) A preliminary construction programme, showing sequence of construction operations in which the Tenderers propose to construct the various parts of the Work which may differ from that in the Drawings.
- (b) A list of the Construction plants proposed to be used for the performance of the Contract, if any. The list shall enumerate the number, type and capacity of all major items of the Construction Plant. The list shall also show whether those items of the Construction Plant are owned by the Tenderer or are intended to be newly purchased. In the latter case, the source of origin thereof shall be stated.
- (c) A schedule of procurement of the Construction materials filled in by the Tenderer, which is attached to the Contract documents following the Bill of Quantities. The schedule shall show the sources of origin of the materials, the manner of procurement and whether to be procured by the Tenderer himself or through suppliers. The time schedule of procurement of the materials from the start to the completion of the Works shall be attached to the Schedule.
- (d) A list of parts of the Works the Tenderer proposes to sublet together with names of intended sub-contractors.
- (e) Cost analysis of the unit prices for such major items following the Bill of Quantities. It shall be noted that this cost analysis of the unit price is only for tender evaluation purposes and will not become part of the Contract.
- (f) Any alternative period for commencement of the Work after receipt of the Engineer's order to commence.
- (g) Business and technical organization.
- (h) Financial resources.
- (i) Experience in performing work of this nature and magnitude.

(j) Any other schedules filled in by the Tenderer, which are attached to the Contract document following the Bill of Quantities.

#### 10 - ALTERATIONS IN TENDERS

No alteration is to be made in the Form of Tender or the Bill of Quantities thereto except in filling in the blanks as directed. If any such alterations are made or if these Instructions to Tenderers are not fully complied with, the Tenders may be rejected.

#### 11 - ADDITION TO TENDERS

Tenderers, however, are at liberty to add further details that they may desire, and in the event of their so doing, shall print or type such details and annex the said details to their Tenders. Such additional details shall not be binding on the Employer, unless they are subsequently incorporated in the Contract.

#### 12 - SITE CONDITIONS

Tenderers shall have personal knowledge of the location of the proposed work and access thereto, and shall acquaint themselves with the actual conditions and requirements thereof, and shall not claim at any time after the submission of the Tenders or the subsequent execution of the Contract that there was any misunderstanding with regard to the conditions imposed by the Contract or prevailing at the site.

#### 13 - FURTHER INFORMATION

Any further information may be obtained on application in writing to the Engineer. Information if given verbally by the Engineer or by the staff of the Engineer or of the Employer will not be binding on either the Employer or the Engineer.

CONSTRUCTION WORKS  
FOR  
TRIAL FARM OF KADC PROJECT

FORM OF TENDER

(Notes: - The Appendix forms part of the Tender  
Tenderers are required to fill up all the blank spaces in  
this Tender Form and Appendix.)

To: Japan International Cooperation Agency  
Dar Es Salaam Office  
c/o Embassy of Japan  
P.O. Box 2577  
Dar Es Salaam, Tanzania

Gentlemen,

Having examined the Drawings, Conditions of Contract, Specification and Bill of Quantities for the execution of the above-named Works, we, the undersigned, offer to execute complete and maintain the whole of the said Works in conformity with the said Drawings, Conditions of Contract, Specifications and Bill of Quantities for the sum of \_\_\_\_\_  
\_\_\_\_\_ Tanzania Shillings.

2. We undertake, if our Tender is accepted, to commence the Works within thirty (30) days of receipt of the Engineer's order to commence, and to complete and deliver the whole of the Works in the Contract within one hundred and eighty (180) days calculated from the last day of the aforesaid period in which the Works are to be commenced.

3. If our tender is accepted, we will, if required, obtain the guarantee of an Insurance Company or Bank or other sureties (to be approved by you) to be jointly and severally bound with us in a sum not exceeding ten (10) per cent of the above-named sum for the due performance of the Contract under the term of a Bond to be approved by you.

4. We agree to abide by this Tender for the period of ninety (90) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

5. Unless and until a formal Agreement is prepared and executed, this Tender, together with your written acceptance thereof, shall constitute a binding Contract between us.

6. We understand that you are not bound to accept the lowest or any tender you may receive.

Date this \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_,  
Signature \_\_\_\_\_ in the capacity of \_\_\_\_\_  
duly authorised to sign tenders for and on behalf of \_\_\_\_\_

(IN BLOCK CAPITALS)

Witness \_\_\_\_\_ Address \_\_\_\_\_  
Address \_\_\_\_\_  
Occupation \_\_\_\_\_



APPENDIX TO TENDER

	CLAUSE	
Amount of Bond or Guarantee (if any) .....	10	Ten (10) per cent of the Contract Price
Minimum Amount of Third Party Insurance ...	23 (2)	One (1) per cent of the Contract Price
Period for commencement, from Engineer's order to commence .....	41	Thirty (30) calendar days
Time for completion .....	43	One hundred and eighty (180) calendar days
Amount of Liquidated Damages .....	47	Nil per day
Limit of Liquidated Damages .....	47	Nil
Amount of Bonus (if any) .....	47	Nil
Period of Maintenance .....	49	One hundred and eighty (180) calendar days
Provisional Sum .....	59 (4)	_____ per cent of Contract Price
Percentage of Retention .....	60 (2)	Ten (10) percent of the Contract Price
Limit of Retention Money .....	60 (3)	Five (5) per cent of the Contract Price
Time within which payment to be made after Certificate .....	60 (2)	Thirty (30) calendar days

FORM OF AGREEMENT

THIS AGREEMENT is made the \_\_\_\_\_ day of \_\_\_\_\_, 198\_\_  
BETWEEN Japan international Cooperation Agency Dar Es Salaam Office  
(hereinafter called "the Employer") of the one part  
AND \_\_\_\_\_  
of \_\_\_\_\_  
\_\_\_\_\_ (hereinafter called "the Contractor") of the other part

WHEREAS the Employer is desirous that certain Works should be executed,  
viz Construction Works for Trial Farm of KADC Project and has accepted  
a Tender by the Contractor for the execution completion and maintenance  
of such Works NOW THIS AGREEMENT WITNESSETH as follows:-

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

2. The following documents shall be deemed to form and be read and  
construed as part of this Agreement, viz.:-

- (a) The said Tender
- (b) The Drawings
- (c) The Conditions of Contract (Parts I and II)
- (d) The Specifications
- (e) The Bill of Quantities
- (f) The Schedule of Rates and Prices (if any)
- (g) The Letter of Acceptance

3. In consideration of the payments to be made by the Employer to  
the Contractor as hereinafter mentioned the Contractor hereby covenants  
with the Employer to execute complete and maintain the Works in conformity  
in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consider-  
ation of the execution completion and maintenance of the Works the Con-  
tract Price at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused their respective Common Seals to be hereunto affixed (or have hereunto set their respective hands and seals) the day and year first above written

The Common Seal of \_\_\_\_\_

\_\_\_\_\_ Limited

was hereunto affixed in the presence of:-

or

SIGNED SEALED AND DELIVERED by the

said \_\_\_\_\_

\_\_\_\_\_ in the presence of:-

FORM OF PERFORMANCE BOND

BY THIS BOND We, \_\_\_\_\_ Limited whose registered office is at \_\_\_\_\_ (hereinafter called "the Contractor") and \_\_\_\_\_ Limited whose registered office is at \_\_\_\_\_ (hereinafter called "the Sureties") are held and firmly bound unto Japan International Cooperation Agency, Dar Es Salaam Office (hereinafter called "the Employer") in the sum of \_\_\_\_\_ Tanzania Shillings for the payment of which sum the Contractor and the Sureties bind themselves and their assigns jointly and severally by these presents.

Sealed with our respective seals and dated this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_.

WHEREAS the Contractor by an Agreement made between the Employer of the one part and the Contractor of the other part has entered into a Contract (hereinafter called "the said Contract") to build or construct, erect, deliver and maintain certain Works as therein mentioned in conformity with the provisions of the said Contract.

NOW THE CONDITION of the above-written Bond is such that if the Contractor shall duly perform and observe all the terms provisions conditions and stipulations of the said Contract on the Contractor's part to be performed and observed according to the true purport intent and meaning thereof or if on default by the Contractor the Sureties shall satisfy and discharge the damages sustained by the Employer thereby up to the amount of the above-written Bond then this obligation shall be null and void but otherwise shall be and remain in full force and effect but no alteration in terms of the said Contract or in the extent or nature of the Works to be built or constructed, erected, delivered and maintained thereunder and no allowance of time by the Employer or the Engineer under the said Contract nor any forbearance or forgiveness in or in respect of any matter or thing concerning the said Contract on the part of the Employer or the said Engineer shall in any way release the Sureties from any liability under the above-written Bond. Provided Always that the above obligation of the Sureties to satisfy and discharge the damages sustained by the Employer shall arise only:

- (a) on written notice from both the Employer and the Contractor, and that the Employer and the Contractor have mutually agreed that the amount of damages concerned is payable to the Employer or
- (b) on receipt by the Sureties of a legally certified copy of an award issued in arbitration proceeding carried out in conformity with the terms of the said Contract that the amount of the damages is payable to the Employer.

The Common Seal of \_\_\_\_\_  
\_\_\_\_\_ Limited  
was hereunto affixed in the presence  
of:

The Common Seal of \_\_\_\_\_  
\_\_\_\_\_ Limited  
was hereunto affixed in the presence  
of:



## 1. CONDITIONS OF CONTRACT

### 1.1 PART I - GENERAL CONDITIONS

Conditions of Contract (International) for Works of Civil Engineering Construction (Third Edition) prepared by the Fédération Internationale des Ingénieurs - Conseils (FIDIC), on March 1977, shall be applied to the civil works construction of this project as the General Conditions of the Contract.

## 1.2 PART II - CONDITIONS OF PARTICULAR APPLICATION

The conditions contained in this Part may supplement the conditions in Part I by FIDIC and may contain conditions of the particular applications not contained in Part I.

In case of any inconsistency between the conditions contained in Part I and II, the conditions contained in Part II shall prevail.

### Clause 1 - Definitions

Employer: "The Employer" is Japan International Cooperation Agency (JICA).

Engineer: "The Engineer" is an expert to be dispatched to the Kilimanjaro Agricultural Development Center by the Government of Japan.

### Clause 2 - Powers and Duties of Engineer

The Engineer shall, without written approval of the Employer, have no authority to relieve the Contractor of any of his duties or obligations under the Contract nor, except as expressly provided hereunder or elsewhere in the Contract, to order any work involving delay or any extra payment by the Employer, nor to make any variation of or in the Works.

### Clause 5 - Languages and Law

The language is English. The Law to which the Contract is to be subject is the Laws in force in the United Republic of Tanzania.

### Clause 10 - Performance Bond

Within fifteen (15) days after receipt of Letter of Acceptance, the Successful Tenderer shall furnish a Performance Bond or Form of Surety in an amount in Tanzania Shillings equal to ten (10) percent of the total Contract Price.



Clause 14 - Programme

Within thirty (30) days after the Engineer's order to commence, the Contractor shall submit the programme to the Engineer.

Clause 21 - Insurance of Works

No particular application is provided in this Clause.

Clause 34 - Labour

No particular application is provided in this Clause.

Clause 47 - Bonus and Liquidated Damages

No particular application is provided in this Clause.

Clause 53 - Plant

No particular application is provided in this Clause.

Clause 60 - Certificate and Payment

The unit prices and lump sum prices in the Bill of Quantities of the Contract shall form the basis for the payments which will be made as follows:

- (1) Advance Payment will be made to the Contractor, upon presentation of a receipt by the Contractor, to the extent of ten (10) per cent of the Contract Price. The recovery of the temporary advances will be made from the amount due to the Contractor under the certificates duly approved by the Engineer pursuant to Sub-clause (2) of this Clause in a manner of percentage determined by the Engineer and, should the said amount be insufficient to satisfy the repayment of the advance, deductions will be made on the following certificates (interim or final) by the Engineer until the full payment thereof be made.

(2) Monthly Payment

The Contractor shall submit to the Employer as soon as possible after the end of each month a statement in a form approved by the Engineer showing the details of the following:

- (a) the quantity of work executed up to the end of the previous month, which has been measured in accordance with Clause 57,
- (b) the price of quantity of work executed in accordance with the respective rates from the Bill of Quantities together with any claims for adjustment of such rates.

On receipt and examination of the said statement, the Engineer shall approve as he deems fit and if necessary amend it and then approve as amended such statement, and forward it to the Employer for payment. At the same time the Engineer shall forward to the Employer a certificate (hereinafter referred to as an "Interim Certificate") certifying the amount due to the Contractor.

The Contractor will be paid monthly within thirty (30) days after the certificate has been delivered to the Employer ninety (90) percent of the amount due to him so certified for the works executed up to the end of the previous month together with ninety (90) percent of such amount (if any) as the Engineer may consider fair and reasonable on account of equipment and materials for works delivered by the Contractor at the site, in addition, ninety (90) percent of such amount as the Engineer may consider fair and reasonable for temporary works included in the Bill of Quantities. The remaining ten (10) percent shall be subject to a retention (referred to as the "Retention Money").

(3) Payment of Retention Money

One half of the Retention Money five (5) percent of the Contract Price of the work shall become due and shall be paid to the Contractor within the thirty (30) days after the issue of the Completion Certificate in accordance with Clause 48 hereof.

Subject to the production by the Contractor of a statutory declaration or a certificate from the relevant Ministerial Department of the United Republic of Tanzania stating that all wages due on the Contract have been paid, and a certificate from the Taxation Department that payment of all other contributions, charges and taxes required under the laws, ordinances, regulations, etc., in the said Republic have been made in full, the other half of retention money, for which Maintenance Certificate has been issued by the Engineer, shall become due and payable to the Contractor and the Performance Bond (specified in Clause 10) returned to the Contractor, within thirty (30) days after the date on which the said certificate has been presented to the Employer, notwithstanding that, at such time, there may be outstanding claims by the Contractor against the Employer. Provided always that the Performance Bond shall not be returned until the Contractor has submitted full details of any claims he wished to make and has certified that these claims are final and complete in all respects.

Provided further that if, at such time, there shall remain to be executed by the Contractor any works ordered during such period pursuant to Clause 49 "Period of Maintenance" hereof, the Employer shall be entitled to withhold payment or return, until completion of such work, a part of whole of the retention money.

Clause 68 - Notices

Employer's address is:

Japan International Cooperation Agency  
Dar Es Salaam Office  
c/o Embassy of Japan  
P.O. Box 2577,  
Dar Es Salaam, Tanzania

Engineer's address is:

Clause 70 - Changes in Costs and Legislation

No adjustment of the Contract Price will be made in respect of price or fall in the costs of labour and/or materials or any other matters affecting the cost of the execution of the Works.

The following Clauses shall be added:

Clause 73 - Taxation

- (1) The Employer will neither be responsible for nor pay except as otherwise provided in the Contract any tax leviable on the Contract or on his employees (whether under the designation income tax or otherwise). The Contractor shall at his own expense carry out such duties as may be imposed upon him by Law in respect of any such tax.
- (2) The Contractor's employee shall be liable to pay Tanzania Income Tax in respect of their salaries and other emoluments as are chargeable therewith under the Law for the time being in force and the Contractor shall perform such duties in regard to the deduction thereof as may be lawfully imposed on him by the Government of Tanzania.
- (3) The Tender is to be based on rates of taxes and duties current at the date of Tender.

The rate and prices stated in the Bill of Quantities shall be deemed to cover all such taxes.

## 2. GENERAL SPECIFICATIONS

### 2.1 GENERAL DESCRIPTION OF THE PROJECT

#### (1) Purpose

The Trial Farm with a net irrigation area of 9.6 ha is a farm infrastructure of the Kilimanjaro Agricultural Development Center (KADC) to carry out agricultural experiments, trial farming, and training for improved cultivation techniques and agricultural machinery operation, and for extension services. The construction works of the Trial Farm include: i) irrigation and drainage facilities, ii) farm roads facilities and iii) electric facilities required for the above operations.

#### (2) Location and Topography

The Trial Farm is located about 13 km southeast of Moshi town, behind the KADC building. The area is generally flat with a gentle slope averaging 1 to 250. The altitude of the area is about 725 m above M.S.L.

#### (3) Climate

The climate in the area is characterized by three distinct seasons: the rainy season from March to May, the dry season from June to October and a short-rain season from November to February. The annual rainfall is about 500 mm, of which about 60% falls in the rainy season. Mean temperature varies from 21<sup>o</sup>C in July to 26<sup>o</sup>C in March.

### 2.2 SCOPE OF CONTRACT

#### (1) Works to be carried out under the Contract

The Contractor shall, except as otherwise provided for in the Contract, furnish all labor, materials (except materials to be supplied by the Employer), construction equipment, temporary works and others necessary for the construction of the Works. The Contractor shall execute, complete and maintain the Works in strict accordance with the Specifications and Drawings or as directed by the Engineer.

The Works to be carried out under the Contract will include:

- (a) dismantling of an existing pump and its accessories of a main pump house.
- (b) installation of a submersible pump, its accessories and a discharge pipe of a main pump house.
- (c) installation of a pump, its accessories, suction and discharge pipes, and erection of a warehouse to be used as a booster pump house.
- (d) construction of a farm pond including inlet and outlet pits.

Effective storage volume            600 m<sup>3</sup>

- (e) installation of irrigation pipelines:

Main pipeline	590 m
No.1 pipeline	270 m
No.2 pipeline	680 m
No.3 pipeline	370 m

- (f) construction of drainage canals:

No.1 drain	312 m
No.2 drain	440 m
No.3 drain	228 m
No.4 drain	208 m
No.5 drain	218 m

- (g) construction of farm roads

No.1 farm road	868 m
No.2 farm road	253 m

- (h) installation of related structures for irrigation pipelines

Air valve box	3 units
Sluice valve box	2 "
Discharge meter box	3 "
Hydrant box	31 "
Blow off box	2 "

- (i) construction of related structures for drainage canals:

Culvert	5 units
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(j) installation of electric distribution line including distribution panels, grounding system and a water level sensor.

(2) Works to be carried out under the Employer

The Contractor shall arrange the works necessary for the completion of the Project but not covered by this Specification. The Employer will execute the works as follows:

- Supply equipment and materials in accordance with Clause 2.3 hereof.
- Land levelling for an area of 2.4 ha including construction of farm border.
- Earthfill for depression of dry field.

2.3 EQUIPMENT AND MATERIALS TO BE SUPPLIED BY THE EMPLOYER

The Employer will supply the Contractor the below listed equipment and materials and the Contractor shall use the said equipment and materials only for the execution of the Contract.

The Contractor shall thoroughly check and examine the list of equipment and materials hereof and the Drawings and shall satisfy himself as to the quantities of the equipment and materials to be supplied under this Clause. If there is any incompleteness in the quantities, the Contractor shall so notify the Employer in writing at the time of submission of the Tender. Failure to do so shall in no way relieve the Contractor from his obligation to complete the Works.

These equipment and materials will be handed over to the Contractor at the Site within 30 days from the Engineer's order to commence.

(1) Pumping Equipment

(a) Main pump house

- Submersible motor pump: $\phi$ 100, 7.5 kW	1 set
- Standard accessories	1 set
- Riser pipe, 2.75 m	8 units
- Submersible cable, 2 mm <sup>2</sup>	30 m
- Gas pipe, $\phi$ 150, 5.5 m	3 units
- Reducer, 150 x 100	2 "
- Elbow, 150 x 90°	4 "
- Short flange, 150	2 "

(b) Booster pump house

- Volute motor pump, $\phi$ 80 7.5 kW	1 set
- Standard accessories	1 set
- Gas pipe, $\phi$ 100, 5.5 m	3 units
- Elbow, 100 x 90°	6 "
- Short flange, 100	5 "

(2) Irrigation Pipeline

P.V.C pipe

VP 150	155 units
" 100	73 "
" 75	1 "
" 50	5 "
VU 250	145 "
" 150	43 "
" 125	90 "
" 100	2 "
" 75	18 "

P.V.C pipe fitting

TS joint Socket, 250	160 units
" , 150	220 "
" , 125	100 "
" , 100	80 "
" , 75	16 "
Reducer, 150 x 100	14 units
" , 125 x 100	4 "
" , 100 x 75	21 "
" , 75 x 50	3 "
T-pipe, 125 x 125	2 units
" , 125 x 100	4 "
" , 100 x 100	2 "
" , 100 x 50	15 "
Elbow, 75	16 units
" , 50	3 "
Valve socket, 50	20 units



	Bend, 150 x 90 <sup>0</sup>	3 units
	, 125 x 90 <sup>0</sup>	2 "
	, 100 x 90 <sup>0</sup>	2 "
	, 150 x 11.25 <sup>0</sup>	3 "
	, 100 x 45 <sup>0</sup>	3 "
DV joint	Elbow, 150	2 units
RR joint	Socket, 250	22 units
	" , 150	30 "
	" , 125	3 "
	" , 100	12 "
	" , 75	3 "
	RF, 150	9 units
	" , 100	10 "
	" , 75	3 "
BT joint	Bend, 250 x 90 <sup>0</sup>	2 units
	Reducer, 250 x 150	4 "
	T-pipe, 250 x 100	2 "
	Cross, 250 x 150	7 "
Adhesive		30 kg
Lubricant		6 kg
Hydrant	50	17 units
"	75	16 "
Air valve	20	3 "
Discharge meter,	150	2 "
"	100	2 "
Rubber plate,	2 m/m	2 m <sup>2</sup>

(3) Electric Distribution Line

Unplasticized Polyvinyl Chloride Pipe (UPVC),	ϕ54	290 units
"	, ϕ28	6 "
Rigid steel conduit,	ϕ54	3 "
Coupling for UPVC Conduit,	ϕ54	290 "
"	, ϕ28	6 "

Coupling for Rigid Steel Conduit, $\phi 54$	2 units
Normal Bends for UPVC Conduit, $\phi 54$	10 "
" , $\phi 28$	2 "
Bushing for UPVC Conduit, $\phi 54$	55 "
" , $\phi 28$	3 "
Bushing for Rigid Steel Conduit, $\phi 54$	2 "
Saddle for UPVC Conduit, $\phi 54$	22 "
" , $\phi 28$	11 "
600 V Cross-linked Polyethylene Insulated PVC Sheathed CV Cable, 4p 38 mm <sup>2</sup>	1,160 m
Polyvinyl Chloride Insulated and Sheathed Control Cable, 3p 3.5 mm <sup>2</sup>	660 m
Distribution Panel for Main Pump House	1 set
Distribution Panel for Booster Pump House	1 set
Electrode Type Water Level Sensor, 3p	1 set
Pull Box, 300 x 300 x 300	1 unit
Polyvinyl Chloride Insulated Wire for Grounding, 14 mm <sup>2</sup>	30 m
Grounding Rod, $\phi 25$ 1.5 m x 2	2 sets
Non-insulated Crimp-style Connecting Sleeve 14 mm <sup>2</sup> - 14 mm <sup>2</sup>	10 units
(4) Other Materials	
Corrugated Steel Pipe, $\phi 500$	20 m
" , $\phi 300$	35 m
Pre-fabricated Warehouse	1 set

#### 2.4 ACCESS TO SITE

The Site of the works is located at about 13 kilometers directly southeast of Moshi town. There are three access roads to the site from Moshi town: i.e., i) by way of the Moshi-Himo Highway, ii) along the railroad, and iii) by way of the Tanganyika Planting Company road. The locations of these roads are shown on the Drawings.

The Contractor shall be required to repair at his own expense any damage he may cause to the present road surfaces, road crossovers, open culverts and drains, water mains, telephone and electricity installations at the access to the Site during the period of the works.

## 2.5 SETTING OUT

The Contractor shall be entirely responsible for the accurate setting out of the works from the information supplied on the Drawings and the instructions given by the Engineer.

The levels shown on the Drawings are related to the Bench Marks No. 00 EL. 725.443 and No. 100 EL. 726.000.

## 2.6 DRAWINGS

The following drawings accompany and form a part of this Specifications. During the progress of the Works, additional drawings will be issued by the Engineer as necessity arises to supplement, supersede or further set forth details shown on the drawings hereto attached and such additional drawings shall thereupon become part of the Specifications.

<u>DWG. NO.</u>	<u>TITLE</u>
TF - 01	LOCATION MAP
" - 02	GENERAL LAYOUT
" - 03	SECTIONS OF FARM
" - 04	PROFILE OF MAIN & No.1 PIPE LINES
" - 05	" OF No.2 & No.3 PIPE LINES
" - 06	" OF No., No.2 & No.3 DRAINS
" - 07	" OF No.4 & No.5 DRAINS
" - 08	" OF No.1 & No.2 FARM ROADS
" - 09	MAIN PUMP HOUSE
" - 10	BOOSTER PUMP HOUSE
" - 11	FARM POND
" - 12	INLET & OUTLET PITS
" - 13	SLUICE VALVE BOX & DISCHARGE METER BOX
" - 14	HYDRANT BOX
" - 15	BLOW OFF & AIR VALVE BOX
" - 16	CULVERT
" - 17	PLAN OF ELECTRIC DISTRIBUTION LINE

## 2.7 CONSTRUCTION PROGRAMME

Within 30 days after the award of the Contract, the Contractor shall submit to the Engineer for his approval, a construction programme in bar chart form or otherwise, as may be required by the Engineer, showing in detail his proposed schedule of operation and providing for the orderly completion of the Work by the dates specified in the Contract. The Engineer's estimate of the construction time schedule shown on the Drawings is to be used only for consideration by the Contractor and does not relieve the Contractor from preparing and submitting his own time bar construction schedule.

The submission to and approval by the Engineer of such programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

## 2.8 PROGRESS REPORT AND PHOTOGRAPHS

### (1) Progress Report

The Contractor shall, before the tenth (10) day of each month or at any time designated by the Engineer, submit five (5) copies of a monthly progress report in a form acceptable to the Engineer on the progress of the work during the preceeding month. The report shall show but not be limited to:

- (a) the total percentage of progress as of the end of the report period and the percentage of each type of work progress for each structure during the preceeding month.
- (b) list of activities scheduled to be in progress or actually in progress during the report period with the Contractor's actual forecast start and/or completion date for each activity.
- (c) lists of works done, and labors and equipment used during the report period.
- (d) list of the equipment and materials supplied by the Employer and used during the report period.
- (e) list of activities scheduled to be started within 1 month with forecast starting dates.
- (f) Photographs set out in Clause 2.8 (2) hereof.

From time to time during the execution of the Contract, the Engineer is empowered to call meetings, either in his head office or at the Contractor's offices or on site, as he deems necessary for the purpose of control of the Contract. As required by the Employer or the Engineer, responsible representatives of the Contractor shall attend such meetings.

(2) Photographs

The Contractor shall, if so required, furnish to the Engineer photographs (black and white) of the work in progress at the locations directed by the Engineer throughout the Contract period. The photographs to be furnished to the Engineer shall be attached with monthly progress report specified in Clause 2.8 (1) and shall be in five (5) copies and suitably inscribed. The negatives of the photographs shall be the property of the Employer and no prints from these negatives may be supplied to any person or persons without the approval of the Engineer. The cost of such photographs shall not be paid separately and shall be deemed to be included in the rates for the various items in the Bill of Quantities.

2.9 WORKS TO BE KEPT CLEAR OF WATER

The Contractor shall keep the works well drained until the issue of the Maintenance Certificate, as specified in the General Conditions, and shall ensure that so far as is practicable in the opinion of the Engineer all works are carried out in the dry.

The Contractor shall construct and maintain all temporary works and other works, and shall carry out all pumping that may be necessary to exclude water from the works when the construction is in progress. All such temporary works shall be removed at a time as may be directed by the Engineer, when the works are completed.

All cost incurred by the Contractor in complying with the requirement of this Clause shall be deemed to be included in the Contract Rate for excavation except where a separate item for the temporary draining work at a particular site appears in the Bill of Quantities.

## 2.10 PRECAUTIONS FOR SAFETY

### (1) General

The Contractor shall take all necessary precautions against risks of loss of life or of injury to any person employed on the Works or to employees of the Employer and the Engineer or of others or to visitors or to persons having good and sufficient reasons to be about the Works and to this end shall properly safeguard the Works to the satisfaction of the Engineer.

The Contractor shall furthermore take all necessary precautions against damage to the property of the Employer or of others located at or adjacent to the Site.

The Contractor shall report promptly to the Engineer all accidents involving the death of or serious injury to any person, on the Site or resulting from the Contractor's operations.

No separate payment will be made for complying with the provisions of this Clause and all costs shall be deemed to be included in the rates for the various items in the Bill of Quantities.

### (2) Temporary Fencing

If required, the Contractor shall erect and maintain at his own expense suitable and approved temporary fencing to enclose such areas of the Works to be carried out and all area of land occupied by the contractor within the Site as may be necessary to implement his obligations as specified in the Conditions of Contract to the satisfaction of the Engineer.

Where any temporary fence has to be erected alongside a public road, footpath, railway, etc., it shall be of the type required by and shall be to the satisfaction of the Authority concerned.

## 2.11 CONTRACTOR'S OFFICES, STORES AND WORKSHOPS

The Contractor shall provide, maintain and remove when directed, such temporary buildings as Contractor's offices, workshops and adequately fenced store compounds as are necessary for the execution of the Works.

Not less than 30 days before constructing such buildings, the Contractor shall submit site plans and general particulars to the Engineer for his approval.

#### 2.12 ASSISTANCE TO ENGINEER'S STAFF

The Contractor shall render all necessary assistance to the Engineer and shall provide as required pegs, poles, straight edges, stagings, moulds, templates, profiles and all other requisites to be used for checking and measuring the Works.

#### 2.13 WATER AND POWER SUPPLY

The Contractor shall provide, operate, maintain and remove when directed upon completion of the Works, an adequate supply of water and electricity to his office, workshops and places of work on the Site.

#### 2.14 MATERIALS AND STANDARDS

The Contractor shall inform the Engineer of the names of the persons or firms from whom he desires to obtain any materials, ironwork, pipes, manufactured articles or other things which are to be supplied by him for use in the works and, except as regards trifling and unimportant matters, no order shall be placed except with the sanction of the Engineer. The Contractor shall keep the Engineer fully advised of the orders and delivery dates of materials. Delivery shall be made sufficiently in advance to enable to further samples to be taken and tested, if required.

All materials and equipment to be furnished under the Contract shall be new and shall conform to the authorized standard for materials and tests in Japan, United Kingdom or United States of America. Other national or international standards may be accepted provided the requirements therein are, in the opinion of the Engineer, equivalent to the current issue of the said standards.

If the Contract Documents conflict in any way with any or all of the above standards or codes, the Contract Documents shall have precedence and shall govern.

## 2.15 SPECIFICATIONS, DRAWINGS AND DATA TO BE SUPPLIED BY THE CONTRACTOR

The Contractor shall submit to the Engineer for approval ten (10) sets of complete specifications, drawings and data for materials and equipment to be supplied under the Contract within 30 days from the Engineer's order to commence.

However, it is to be understood that approval of the specifications, drawings and data will not exonerate the Contractor from any responsibility as stipulated elsewhere in the Contract.

## 2.16 MEASUREMENT AND PAYMENT

### (1) Temporary Works

Payment for Temporary Works specified in Clause 2.11 and 2.13 will be made under Item A of the Bill of Quantities in such manner that fifty (50) percent of the lump sum price in the Bill of Quantities is paid when the Engineer certifies that the Contractor has provided his offices, stores and workshops and construction utilities, and become operational. The remaining fifty (50) percent shall be paid upon completion of the whole Works and upon their removal, where directed, from the Site.

### (2) Land Clearing

Payment for land clearing and removal of trees specified in Clause A.01 in the Technical Specifications will be made at the Lump Sum in the Bill of Quantities. No payment will be made until the completion of the work under this item.

### (3) Excavation

Measurement for excavation will be made for the volume in cubic meters of earth excavated from the natural ground surface to the lines and grade shown on the Drawings or as directed by the Engineer. Payment for excavation measured as above shall be at the Rate entered in the Bill of Quantities, which shall include the cost of excavation, trimming of side slopes, draining, earth slip or slide prevention; laying out, constructing and maintaining catchwater drains in good order during the works; hauling and disposal of the excavated material; backfilling for structures, except if it is already covered under other



items in the Bill of quantities; removal of materials in earth slips or slides, including the costs of all materials, labor, depreciation of equipment, and all else necessary therefor and incidental thereto.

(4) Earthfill

Measurement of earthfill will be made for the volume of filled materials measured in cubic meters after compacting and trimming of the slopes as shown on the Drawings or as directed by the Engineer. Payment for earthfill in any embankments measured as above will be made at the Rate in the Bill of Quantities for:

- (a) Earthfill with excavated materials.
- (b) Earthfill with borrowed materials.

The Rate of any earthfill for embankment shall include the cost of stripping (except farm roads), foundation preparation, placing the fill material, sorting, strewing, harrowing, trimming, watering, compacting in accordance with specifications for respective embankment, and finishing-up of side slopes, extra filling and all else necessary therefor and incidental thereto.

In addition, the Rate of "Earthfill with excavated materials" shall be deemed to include the cost of handling and hauling of the material excavated which will not be covered in the Rate for excavation. The Rate of "Earthfill with borrowed material" shall include the cost of all works involved in opening borrow pits, such as clearing, stripping, drainage, slope protection, etc., finishing of side slopes of borrow pits; and all costs for excavation in borrow pits, handling and hauling fill materials to the fill site from the borrow pit.

(5) Concrete

Measurement of concrete for payment will be made only to the neat lines of the structures as shown on the Drawings or as established by the Engineer. In measuring concrete for payment, the volume of all cavities, depressions and openings will be deducted.

Payment for concrete in any concrete measured as above will be made at the Rates in the Bill of Quantities for:

- (a) Concrete 1 : 2 : 4
- (b) Concrete 1 : 3 : 6
- (c) Concrete 1 : 4 : 8

Payment of concrete in the various parts of the work will be made at the Rates per cubic meter in the Bill of Quantities. The Rate shall include the cost for excavation, concrete of all labor and materials, depreciation of equipment required in the construction, furnishing and handling of cement, and the cost for concrete form of furnishing all labor, equipment and materials, erecting and removing the formes, depreciation of the formes, scaffoldings, backfilling and also the cost of all other necessary works connected therewith.

(6) Reinforcing Bar

Measurement for payment for furnishing and placing reinforcing bars will be made only of the weight of the bars placed actually in the concrete in accordance with the Drawings or as directed by the Engineer. Payment for furnishing and placing of reinforcing bars will be made at the Rate per unit weight in the Bill of Quantities, which shall include the cost of furnishing reinforcing bars, furnishing and attaching wire ties and metal supports, if used, and of delivering, unloading, hauling, storing, sorting, cutting, bending, cleaning, placing, and securing and maintaining in position all reinforcing bars, as shown on the Drawings or as directed by the Engineer.

(7) Gravel Pavement

Measurement for payment of gravel pavement shall be made for volume in cubic meter of levelled material in place as shown on the Drawings or as directed by the Engineer.

Payment of gravel pavement measured as above will be made at the Rate in the Bill of Quantities, which shall cover the cost of supplying, loading, hauling, spreading the material on the road, levelling, compacting, and all else necessary and incidental thereto.

(8) Gravel

Measurement for payment of gravel will be made for volume in cubic meters of the material in place as shown on the Drawings or as directed by the Engineer.

Payment of gravel will be made at the Rate of the Bill of Quantities, which shall include all costs of furnishing, placing and compacting the material, and all else necessary therefor.

(9) Screens and Steel Covers

Measurement for payment of screens and steel covers shall be made for the number installed in accordance with the Specifications, Drawings and as directed by the Engineer.

Payment of screens and steel covers will be made at the Rate of the Bill of Quantities, which shall include all cost of materials, fabricating, furnishing and placing, and all else necessary therefor.

(10) Installation of Irrigation Pipelines

Measurement for payment of installation of the pipelines shall be made for the length in meter of pipelines as shown on the Drawings or as directed by the Engineer.

Payment for installation of the pipelines will be made at the Rate per meter in the Bill of Quantities, which shall include the cost of excavation, backfill and draining of trenches, bedding, jointing, field testing of pipes backfilling and all else necessary incidental thereto.

(11) Installation for Appurtenance of Irrigation Pipelines

Measurement for payment of such appurtenance as air valve, sluice valve, discharge meter and hydrant of irrigation pipelines will be made for the number installed in accordance with the Drawings and as directed by the Engineer.

Payment for installation of any appurtenance will be made at the Rates per number of the Bill of Quantities, which include the cost of installing, jointing with the pipe line, adjusting and all else necessary therefor.

(12) Installation of Corrugated Steel Pipe

Measurement for payment of corrugated steel pipes will be made from end-to-end of the pipes in place, and no allowance will be made for lap at joints or of connecting pipes to structures.

Payment for installation of corrugated steel pipes will be made at the Rate per linear meter in the Bill of Quantities, which shall include the cost of placing, jointing and all else necessary works, as shown on the Drawings or as directed by the Engineer.

(13) Installation of Electric Distribution Line

Measurement for payment of the electric distribution line shall be made for the length in meters of the lines in place as shown on the Drawings or as directed by the Engineer.

Payment for installation of the electric distribution line measured as above will be made at the Rates of the Bill of Quantities for:

- (a) Installation of the distribution line from the sub-station to the main pump house.
- (b) Installation of the distribution line from the main pump house to the booster pump house and to the water level sensor.

Payment for installation of the distribution line will be made at the Rate per meter in the Bill of Quantities. The Rate for installation of distribution line from the sub-station to the main pump house shall include the cost of excavation, backfill and draining of trench, bedding, jointing of the conduit pipes and installation of the power cable and all else necessary incidental thereto.

The Rate for installation of the distribution line from the main pump house to the booster pump house and to the water level sensor shall include the cost of bedding, jointing of the conduit pipes,

the installation of power cable and control cable and all else necessary therefor and incidental thereto.

(14) Erection of Distribution Panel Water Level Sensor and Grounding System

Payment for erection of above equipments will be made at the lump sum price in the Bill of Quantities, which include the cost of installation, connecting with the equipment and all else necessary therefor.

(15) Installation of Pumping Equipment

Payment for installation of pumping equipment will be made at the lump sum price in the Bill of Quantities, which include the cost of installation of the pumping equipment, its accessories, the suction and discharge pipes and erection of the pre-fabricated waterhouse, and all else necessary therefor and incidental thereto.



### 3. TECHNICAL SPECIFICATIONS

#### SECTION A EARTH WORKS

##### A.01 Land Clearing

The Contractor is to clear the parts of the Site, subsequently to be occupied by the Works, in a manner approved by the Engineer. He is to remove all vegetation, all bushes and all trees including all roots, and dispose of them either by burning or at approved locations.

The Contractor shall not clear the Site of or damage any living tree without the written permission of the Engineer. Each tree which the Contractor is permitted to cut down is to be trimmed and the trunks neatly stacked as directed by the Engineer. No timber shall be removed from the Site without the Engineer's authority.

##### A.02 Stripping of Farm Pond and Borrow Area

After site clearing, surface soil shall be stripped over the whole area between the outer toes of the farm pond earthfill and the land where fill materials are to be borrowed and disposed as directed by the Engineer. The minimum depth of stripping shall be 5 centimeters, unless otherwise directed.

The Engineer may direct deeper stripping to remove soil exposed by the initial stripping, which is in his opinion, unsuitable as a foundation for the earthfill or as fill material.

##### A.03 Excavation-General

All excavation shall be carried out to the lines and levels shown on the Drawings or to such lines and levels as the Engineer may direct. The Contractor shall trim all permanent excavations to the levels and dimensions shown on the Drawings.

Before commencing excavation, the Contractor shall survey and take levels over the entire area in which excavation is to be carried out. The surface levels so determined shall be subject to the Engineer's approval, and measurement of excavation shall be based upon the approved surface levels.

When any excavation has been taken out and trimmed, the Engineer shall be informed accordingly so that he may inspect the completed excavation, and no excavation shall be filled in or covered with concrete until it has been inspected and the Contractor has been authorized to proceed with the works.

If from any cause whatsoever excavations other than for concrete work are carried out beyond their true line and level other than at the direction of the Engineer, the Contractor shall at his own cost make good to the required line and level with approved material and in such a manner as the Engineer may direct.

If from any cause whatsoever excavations for concrete works are carried out beyond their true line and level other than at the direction of the Engineer, the Contractor shall at his own cost fill in to the required line and level with concrete similar in grade to that intended to be used in the true excavation unless otherwise directed.

#### A.04 Excavation for Structures

Excavation for foundation work shall be carried out in a safe manner and to the lines and levels shown on the Drawings or to such lines and levels as may be approved by the Engineer. Firm foundations are to be achieved by moistening and tamping if necessary.

#### A.05 Excavation for Trenches of Irrigation Pipelines

Excavation for trenches of irrigation pipelines shall be made in accordance with Clause A.03 hereof, and excavation is to be executed in such a manner as shown on the Drawings or directed by the Engineer.

#### A.06 Excavation for Farm Pond and Drainage Canals

Excavation for farm pond and drainage canals shall generally be carried out in accordance with Clause A.03 hereof, and excavation is to be executed in such a manner as to ensure that the side slopes, as shown on the Drawings, are not in any way endangered by undercutting. The Contractor may propose slight modifications to the side slopes for farm



pond and drainage canals shown on the Drawings provided that the sectional area of the canal is maintained and the proposed slope is stable.

#### A.07 Disposal of Materials

Except as otherwise specified, all suitable materials excavated in the construction of farm pond and drainage canals or structures shall be used in the construction of adjacent embankments. If there is an excess of materials in the excavation, it shall be used to strengthen the embankments in a manner approved by the Engineer.

Materials removed in excavation and not suitable for embankment construction and any suitable material not required for embankments or for embankment enlargement may be disposed at approved locations. The Contractor shall trim and regulate the spoil tips to profiles and to levels as directed by the Engineer.

#### A.08 Backfilling - General

No excavations for foundation work shall be backfilled before they have been inspected by the Engineer. Backfilling shall, unless otherwise specified, be carried out with approved materials and shall be well compacted in 15-centimeter layers compacted thickness to the satisfaction of the Engineer. Topsoil, vegetation or other organic material shall be excluded from backfilling material.

#### A.09 Backfilling for Trenches of Irrigation Pipelines

Trenches of irrigation pipelines shall be backfilled after completion of the field test as directed by the Engineer. Backfilling shall be carried out in accordance with Clause A.08 hereof. Backfill is to be executed such a manner as to deposit material without any damage to the pipe and to fill completely all spaces surrounding the pipe. The material shall be compacted in 7.5-centimeter layers compacted thickness below the crown of the pipe and in 15-centimeter above the crown of the pipe, to the satisfaction of the Engineer.

#### A.10 Fill adjacent to Structures

Fill materials adjacent to structures shall be placed in such a manner as will ensure that they can be satisfactorily compacted without damage to the structures. Compaction adjacent to all structures shall be carried out by hand or by a suitable hand operated plant.

Unless otherwise specified, no fill material shall be placed and no compaction shall be permitted adjacent to concrete for fourteen (14) days after the placing of the concrete.

Compaction of backfilling material placed above buried concrete, however mature, shall not be permitted to be carried out with vibrating rollers within 0.5 meter vertically of the surface of the concrete, except with the prior approval of the Engineer.

#### A.11 Foundation Preparation for Earthfill of Farm Pond

Foundation where earthfill for farm pond is to be built shall be stripped in accordance with Clause A.02 hereof, and suitably prepared for placing fill. Test pits, trenches and cavities made for the removal of unsound foundation materials or for the inspection of subsurface foundations shall be filled with selected material and properly compacted as directed by the Engineer.

Foundation material which, in the opinion of the Engineer, has insufficient density in its undisturbed condition shall be moistened and compacted by means of compaction equipment or shall be removed and refilled as directed.

The foundation surface under earthfill shall be scored with a plow or ripper making open furrows not less than 20 centimeters deep below natural ground surface at intervals of not more than one meter. This scarified foundation surface upon which compacted fill will be placed shall be moisture conditioned immediately prior to placing of fill.

No material shall be placed on any portion of earthfill foundations until such foundations have been approved by the Engineer for placing fill.

#### A.12 Foundation Preparation for Earthfill of Farm Road

No special treatment will be required for the foundation where earthfill for farm road is to be build unless otherwise directed by the Engineer. No filling shall be made until such foundation has been inspected and approved by the Engineer for placing fill.

#### A.13 Fill for Farm Pond

Earthfill for farm pond are to be formed of fine material, no particles of which are greater than 5 centimeters in size. The material shall be free from clay lumps, organic or perishable matter and is to be obtained from the adjacent borrow area or as otherwise directed by the Engineer.

Placing of material shall be in layers not exceeding 15 to 20 centimeters compacted thickness as directed by the Engineer. Compaction shall be carried out at a moisture content directed by and to the satisfaction of the Engineer.

#### A.14 Fill for Farm Road

Unless otherwise specified, material for farm road shall be free from clay lumps, vegetable matter and perishable material. Lumps of earthy material shall be broken down to such a size that they will not interfere with the compaction of the material. The material shall be obtained from the adjacent excavation, borrow area or as otherwise directed by the Engineer.

Compaction shall be carried out by means of compaction equipment approved by the Engineer. All compaction equipment must operate over the whole area to ensure uniform compaction. All filling shall be compacted in layers of not greater than 20 centimeters compacted thickness, or such other thickness as may be approved by the Engineer. Longitudinal and transverse joints in any two successive layers shall be staggered by a minimum distance of 3.0 meters.

#### A.15 Finish of Earthfill

The side slopes of all earthfill are to be in accordance with those shown on the Drawings or such other slopes as may be approved or ordered by the Engineer.

The finished surfaces of the top and sides of the earthfill shall present an even and neat appearance. The alignment, bank heights and regularity of surface shall be to the satisfaction of the Engineer and shall be trimmed as necessary.

#### A.16 Borrow Area

The Contractor shall make arrangements for obtaining fill materials from the borrow area. The borrow area may be the land adjacent to the place of the earthfill, but no excavation shall be made within 2 meters from the toe of the earthfill. Before excavation of any borrow pit the Contractor shall submit to the Engineer details of his proposed lengths, widths and locations of borrow area, and shall not proceed the works until the Engineer's approval thereto is obtained or until such modification has been made as the Engineer may order. The borrow area shall not be excavated more than 25 centimeters from the original ground surface.

The Contractor shall leave all borrow areas in a tidy and natural state, and he shall ensure that they are self-draining at all times and do not constitute a danger to health.

#### A.17 Gravel Pavement for Farm Road

Materials for road pavement shall be graded gravel consisting of a natural mixture of hard, durable particles of coarse aggregate, sand and silt. The materials shall be relatively free from soft particles and excess clay, and shall be uniformly graded so that it can be compacted into a hard, dense mass. Unless otherwise approved by the Engineer, no particles of greater than 25 millimeters in size shall be included in the materials, and fine materials passing 0.074 millimeters sieve shall not exceed 15% of the material in weight.

The materials shall be spread longitudinally and compacted separately in uniform layers to produce the correct finished thickness. Care shall be taken to ensure that no segregation occurs. Compaction of the materials shall be made at the moisture content approved by and to the satisfaction of the Engineer. The surface of the metalling shall be formed so that the finished surface is true to the line and the level without appreciable irregularity.

## SECTION B CONCRETE WORKS

### B.01 Cement

The Cement to be used throughout the Works shall be ordinary Portland cement and be obtained from manufacturers approved in writing by the Engineer. The portland cement shall comply with the requirements of B.S.12 "Ordinary Portland Cement" or its equivalent.

Each consignment of cement delivered to the site shall, as far as practicable, be accompanied by a certificate showing the place of manufacture and the result of standard tests carried out on the bulk supply from which the cement was extracted.

The cement shall be packed in paper bags sufficiently strong to withstand rough handling and each bag shall contain net 50 kilogrammes cement.

### B.02 Storage of Cement on the Works

Immediately upon receipt at site of work, the cement shall be stored in a dry, weathertight, properly ventilated structure, to adequately prevent absorption of moisture. The Contractor's method of handling and storing cement shall be subject to the approval of the Engineer.

### B.03 Concrete Aggregates

All concrete aggregates are to be obtained from sources approved by the Engineer. They shall be free from earth, clay, chalk, lime, loam, soft clayey shaley or decomposed stone, vegetable and organic matter and other impurities. The stone shall be hard and dense.

### B.04 Coarse Aggregates

The nominal sizes of the coarse aggregate in structural concrete shall be 38 millimeters to 5 millimeters, except where otherwise specified. The coarse aggregate, as far as practicable, shall conform to the following grading requirements:

Percentage by weight passing B.S. sieves	
B.S. 410 test sieve	Nominal size of graded aggregate 38 mm to 5 mm
76.20 mm	100
63.50	-
38.10	95 - 100
19.05	30 - 70
12.70	-
9.52	10 - 35
4.76	0 - 5

#### B.05 Fine Aggregate

Grading of the fine aggregate as delivered to the mixer, as far as practicable, shall conform to the following requirements.

Percentage by weight passing B.S. sieves	
B.S. 410 test sieve	Grading Zone 2
9.52 mm	100
4.76	90 - 100
2.40	75 - 100
1.20	55 - 90
0.60	35 - 59
0.30	8 - 30
0.15	0 - 10

#### B.06 Storage of Aggregates

Provision shall be made on the site for the separate storage of fine and coarse aggregates, as well as of each size of coarse aggregate, in such a manner as to avoid the contamination of the concrete by foreign material and to prevent segregation and excessive breakage; stockpiles shall be provided with suitable drainage facilities to ensure, as far as practicable, that the aggregates delivered to the batching equipment shall have the uniform and stable moisture content directed by the Engineer. Aggregates shall, during hot weather, be covered to protect them from the direct rays of the sun.

#### B.07 Mixing Water

Water for mixing concrete, mortar, and rendering shall be subject to the approval of the Engineer. It shall be clean, fresh and free from oil, acid, alkali, sugar and vegetable substances, and it shall, be free of organic or inorganic matter in solution or suspension in such amount that it may impair their strength, appearance or durability.

#### B.08 Concrete Mixes

Concrete shall consist of cement, graded aggregates and water thoroughly mixed and compacted to provide strengths as detailed below.

Type of Concrete Mix	Maximum Size of Aggregate	Specified compressive strength at 28 days
1 : 2 : 4	38 mm	180 kg/cm <sup>2</sup>
1 : 3 : 6	38	120
1 : 4 : 8	38	-

Type of concrete mix is indicated by the volumetric proportions of cement, fine aggregate and coarse aggregate. The mix proportions shown in the table above are given as a guide to the mixes ordinarily needed to achieve the specified strengths and shall not relieve the Contractor of the responsibility to obtain the specified strengths.

#### B.09 Batching

The aggregates and cement may be proportioned by volume in accurately calibrated gage boxes unless otherwise directed by the Engineer.

#### B.10 Mixing Concrete by Machine

The materials for concrete shall be mixed in an approved mechanical mixer. The mixing time for each batch shall not be less than the minimum mixing time, shall not exceed three (3) times the minimum time, and shall be constant for a series of batches of concrete for a particular structure.

The mixers shall not be loaded beyond their rated capacity, nor shall they be operated at a speed in excess of that recommended by the manufacturer. They shall produce a concrete of uniform consistency and appearance, at a continuous rate approved by the Engineer.



All mixing equipment shall be clean before commencing mixing, and shall be kept free from set concrete.

#### B.11 Mixing Concrete by Hand

Where it is not possible to employ machine mixing and approval has been obtained from the Engineer, concrete shall be mixed by hand, as near as practicable to the site where it is to be deposited. Clean mixing bankers or platforms of sufficient areas for the proper execution of the work shall be provided. These platforms if constructed of timber shall consist of planks closely jointed so as to avoid the loss of any grout or liquid from the wet concrete. The whole of the aggregate and cement shall be turned over on the banker in a dry state at least twice. The water shall then be added gradually through a rose head, after which the materials shall again be entirely turned over in a wet state at least three times before leaving the banker.

#### B.12 Protected Concreting in Unfavorable Weather

No concreting will be allowed in the open during storms or heavy rains. All concreting materials and plant are to be adequately protected against the effects of heavy storms and strong winds.

#### B.13 No Partially Set Material to be Used

All concrete and mortar must be placed and compacted within 30 minutes of its being mixed; no partially set material shall be used in the work.

#### B.14 Depositing Concrete

The arrangements for placing concrete are to be such that in all cases the material may be conveniently handled and placed in the required position as directed by the Engineer without re-handling or segregation. Wherever possible the concrete is to be deposited from bottom opening skips and in all cases shall be deposited in layers of such depth that each layer can be easily incorporated with the layer below with the use of internal vibrators or by spading, slicing, and ramming. Concrete shall not be delivered by chute or dropped from barrows or otherwise handled through a height greater than 1.5 meters except with the approval of the Engineer who may order the concrete to be dropped on to a banker to be turned over by hand before being placed.

The area on which any concrete is to be deposited must be made and maintained free from standing water during concreting operations unless otherwise approved. Running water crossing or entering such areas must be brought under control before concreting proceeds.

Concrete in reinforced concrete work shall be deposited in small quantities in a plastic state with a water cement ratio to give the specified strength. The depositing of concrete in individual members shall be continued without stoppage up to an approved pre-arranged construction joint or until the member is completed and shall be finished off in such manner that the junction of members shall be monolithic unless otherwise specified.

#### B.15 Compaction of Concrete

Concrete shall, during placing, be compacted by vibrators or any other compaction tool of approved type. Compaction shall continue until the concrete being placed shall be judged to be compacted by the appearance of a blistering and even surface except for slight irregularities where the coarse aggregate breaks through. All air shall be this time have been expelled.

#### B.16 Curing and Protection

The Contractor shall take adequate measures to ensure that the concrete is cured. These shall include covering the concrete with burlap matting or other effective means which shall be kept damp continuously for a minimum period of three days after casting or for such other time as the Engineer may direct. After removal of this covering, the concrete shall then be sprayed with water for a minimum period of a further seven days. Other methods of preventing the water of hydration in the concrete from evaporating may be used with the approval of the Engineer.

All concrete liable to be affected by running water or wave action shall be adequately protected from damage during the setting period and all temporary protective works shall be erected to the satisfaction of the Engineer.

#### B.17 Embedded Items

Before placing concrete, care shall be taken to determine that all embedded items are securely fastened in place as shown on the Drawings or as otherwise directed. All embedded items shall be thoroughly clean and free from oil and other foreign matter, such as loose coatings of rust, paint, scale, mortar, etc. The embedding of wood in concrete shall be prohibited unless specifically authorized.

Any pipelines or other materials embedded in structures under the Contract, as construction expedients, shall conform to the above requirements and upon completion of their use, shall be backfilled with concrete at no extra cost to the Employer.

#### B.18 Formwork

Forms shall be used, wherever necessary, to confine the concrete and shape it to the required lines. All exposed concrete surface having slopes steeper than 1:1 shall be formed, unless otherwise directed or approved by the Engineer.

Forms shall be simple; they shall be rigidly constructed of approved materials and shall be braced and strutted to withstand the pressure resulting from placing and vibrating the concrete, constructional loads, wind and other forces without appreciable deformation.

Surfaces of the forms to be in contact with concrete shall be free from adhering foreign matter, projecting nails and the like, grooves, splits or other defects. Shuttering boards shall be carefully jointed and so arranged as to be able to swell under the influence of humidity of the concrete, without causing any deformation to the forms. Interstices shall be properly filled with glazier's putty and the waterproofing of the forms shall be sufficient to prevent escape of cement resulting from excess of water in the concrete. However, paper tampint shall not be used unless otherwise approved by the Engineer.

A non-staining commercial mineral oil or other approved material shall be applied to the faces of the forms before concreting to prevent adherence to the concrete. Care must be exercised to prevent the

material applied to the faces of the forms from coming in contact with the reinforcement, but if this should inadvertently occur, the reinforcement must be cleaned.

When forms have been built and have been prepared ready for concreting, they will be inspected by the Engineer and no concrete shall be placed until the forms have been approved by him. In order to avoid delays in obtaining approval, the Contractor shall inform the Engineer, at least 24 hours in advance, of his intention to have the forms ready for inspection.

The Contractor shall take full responsibility that the proper time has elapsed for the concrete to attain sufficient strength before forms are removed. Nevertheless, the forms shall not be struck without the prior approval of the Engineer, and in any case at least three (3) days shall elapse before forms are struck.

Connections shall be so formed as to permit the easy removal of the forms without hammering, etc., and without the necessity of levering against the surface of the concrete.

#### B.19 Reinforcing Bar

Reinforcing bar for concrete shall be plain round hot-rolled milled steel bars complying with B.S. 4449 Part 1., or its equivalent.

When required by the Engineer, the Contractor shall submit three copies of mill sheets of steel bars issued by the iron and steel works for the approval of the Engineer before each shipment, and inspection at site will be made by the Engineer in accordance with the Specification and the above mill sheets.

#### B.20 Placing of Reinforcing Bar

The number, size, form and position of all reinforcing steel bars, fabric, ties, links, stirrups and other parts of the reinforcement are to be placed in exact accordance with the Drawings and kept in the correct position in the forms without displacement during the process of vibrating, tamping and ramming the concrete in place. The Contractor

shall provide all necessary distance pieces and space bars at his own cost to maintain the reinforcement in the correct position. Any ties, links or stirrups connecting the bars shall be taunt so that the bars are properly braced, the inside of their curved parts shall be in actual contact with the bars around which they are intended to fit. Bars shall be bound together with the best black annealed mild steel wire which is subject to the Engineer's approval, and the binding shall be twisted tight with proper pliers. The free ends of the binding wire shall be bent inwards.

The Contractor shall provide, at his own cost and to the approval of the Engineer, working drawings of all reinforcement accompanied by bending schedules and copies of the orders placed for bars.

Before any steel reinforcement is embedded in the concrete any scale, loose rust, oil, grease or other deleterious matter shall be removed. Partially set concrete which may be adhering to the exposed bars during concreting operations shall likewise be removed.

When reinforcement has been placed and is ready for concreting, it will be inspected by the Engineer and no concrete shall be placed until the reinforcement has been approved by him. The Contractor shall inform the Engineer at least 24 hours in advance of his intention to have the reinforcement ready for inspection.

The minimum concrete cover of reinforcement bar measured from the outside of the bar shall be 3 centimeters.

## SECTION C MISCELLANEOUS WORKS

### C.01 Screen and Steel Covers

The Contractor shall prepare dimensioned drawings showing details of a screen, steel covers and materials to be used for such purposes in accordance with the Drawings and the instructions given by the Engineer. Such dimensioned drawings shall be submitted to the Engineer for his approval prior to the commencement of material works.

### C.02 Gravel

The materials used for the gravel riprap and the foundation of structures shall be clean, durable stones and gravel graded from 100 millimeters to 20 millimeters. It shall be placed on the bed of the farm pond and under the concrete structures shown on the Drawings. The materials shall be compacted to the satisfaction of the Engineer.

### C.03 Installation of Corrugated Steel Pipes

The trench for laying corrugated steel pipes shall be carefully excavated to the required lines and levels shown on the Drawings or to such other lines and levels as the Engineer may direct.

The thickness and shape of foundation shall be as indicated on the Drawings or by the Engineer, according to soil conditions. If soft material is encountered, such material shall be excavated and removed, or if the trench bottom is unstable, the bottom of the trench shall be excavated below the levels specified and brought up to the required level with suitable fill material thoroughly consolidated to at least the same degree of compaction as the undisturbed material, as directed by the Engineer. In all cases, the trench bottom shall be carefully formed and graded to ensure that the pipes are in their correct position and are uniformly supported for their full length.

Each pipe, exclusive of fitting, shall be placed accurately to the previously specified lines and levels, and where necessary, shall be temporarily secured by struts and timber wedges. Any earth, cement or other extraneous materials shall be cleaned out of the pipe by drawing a closely fitting wad through it as work proceeds. A properly fitting plug

or cap shall be secured to the end of the last pipe laid and shall only be removed when pipe laying is resumed. The order of laying pipes shall be subject to the approval of the Engineer.

Corrugated steel pipes of the sizes and dimensions specified shall be placed in the trench with separate sections firmly jointed together, and with the outlaps of circumferential joints pointing upstream, or to the upper end of grade, and with longitudinal laps on both sides (never top or bottom). Pipe sections shall be corrected to the required shape before installation, and joints shall be carefully constructed to secure a firm fitting condition. When pipe coating is damaged in construction, the damaged coating shall be repaired at the Contractor's expense as indicated by the Engineer. Tightening of bolts for assembling the pipes shall be carefully done as directed by the Engineer.

Unless specified otherwise, backfilling shall be carried out with excavated material. The initial backfilling around pipes shall be to a height of 30 centimeters above the crown of the pipes, shall be rammed by hand and shall contain no rock or other hard material likely to damage the pipes or joints; subsequent backfilling shall be mechanically or hand rammed up to the original ground surface.

## SECTION D PIPE WORKS FOR IRRIGATION PIPELINE

### D.01 General

Rigid polyvinyl chloride (P.V.C.) pipes as well as necessary equipment and fittings to be installed for irrigation pipelines such as Main Pipeline, No.1 to No.3 Pipelines shall be supplied to the Contractor by the Employer free of charge. These equipment and materials are listed in the General Specifications.

P.V.C. pipe will comply with VP ( $10 \text{ kg/cm}^2$ ) of JIS K 6742 (Rigid Polyvinyl Chloride Pipe) for Main and No.1 Pipelines and with VU ( $5 \text{ kg/cm}^2$ ) of JIS K 6742 for No.2 and No.3 Pipelines as shown on the Drawings. The fitting of pipe will comply with JIS K 6743 (Rigid Polyvinyl Chloride Pipe Fitting for Water Works) as solvent welding socket (TS joint) and rubber ring joint (RR joint).

The installation of irrigation pipelines shall be carried out in accordance with the details shown on the Drawings and the instruction manual given by the Engineer.

### D.02 Pipe Bedding

The Contractor shall lay pipes not less than 60 cm below the ground surface as shown on the Drawings or as directed by the Engineer. The bedding material below the pipes shall be more than 15 centimeters deep and shall be well compacted to the satisfaction of the Engineer.

### D.03 Pipe Jointing

The pipes shall be generally fitted by the TS joint, but RR joints shall be used for jointing every 7 or 8 pieces of pipe which total about 30 meters of pipeline to keep the flexibility of pipeline. Before the pipes are jointed together, the Contractor shall inspect for any damage to the pipes and clean the inside and outside parts of the pipe ends and the joints as directed by the Engineer. If a TS joint is used, adhesive shall be applied to the pipe to be carefully inserted into the TS joint and held for 30 to 50 seconds.



D.04 Excavation and Backfilling for Trenches

Excavation and backfill of trenches shall be carried out in accordance with Clauses A.05 and A.09.

D.05 Installation of Appurtenance

The Contractor shall install appurtenance such as air valves, sluice valves, discharge meters and hydrants under the instruction of the Engineer.

D.06 Field Testing

Before backfilling trenches, all pipelines and their appurtenance shall be tested at the Site to ensure proper water tightness. Field tests shall be performed by the Contractor under the direction of the Engineer. The Contractor shall prepare all necessary instruments required by the Engineer for the proper testing of pipelines.

The Maximum allowable quantity of leakage per 1 centimeter of diameter and 1 kilometer of length shall be 100 liter/day in the pipelines.

Defects found from the abovementioned tests shall be investigated and shall be repaired immediately at the expense of the Contractor.

After the water conduction tests, the pipelines shall be drained completely and carefully to a safe place such as drainage canal by the Contractor with the approval of the Engineer.

## SECTION E ELECTRIC AND PUMPING EQUIPMENT WORKS

### E.01 Electric Work - General

The electrical works shall include the installation of a distribution line, distribution panels and water level sensor. Necessary equipment and materials which are listed in the General Specifications shall be supplied to the Contractor by the Employer free of charge.

The works shall be carried out as specified herein, as shown on the Drawings and as directed by the Engineer.

The electric source will be supplied from the sub-station of the KADC Building.

### E.02 Electric Distribution Line

All cables shall be in conduit pipes. Outdoor conduit pipes shall be laid not less than 60 centimeters below the ground surface. Conduit shall be located so as to minimize the possibility of damage by traffic. Where conduit must be installed under the roadways, it shall be suitably protected against damage by heavy traffic.

Conduit which runs parallel with or crosses over another subsurface structures, such as the water pipeline, shall have a sufficient clearance to prevent damage to either structure.

Conduit installed through a building wall shall have internal and external seals intended to prevent the entrance of rain into the building.

The cable shall be continuous between the conduit outlets. The cable shall be drawn through the conduits after they have been cleaned. Oil or grease shall not be used as a lubricant for the cable pulling operation; however, an approved compound may be used for this purpose.

Suitable cable route markers shall be provided at short runs and at 20 meters spacing for long runs.

Conduit which has been crushed or deformed shall not be used in the works.

The conduit shall be installed in such a manner as to ensure that it's inside remains in a dry conditions. The conduit shall be securely fastened to all hand holes and pull boxes with bushing.

#### E.03 Distribution Panels

The distribution panels shall be mounted on the wall, so that the height from the floor to the top of panels will not exceed 180 centimeters, as shown on the Drawings.

#### E.04 Grounding

All electrical equipment shall be substantially grounded. Adequate size of annealed copper conductor based on the maximum fault grounding current in the circuit shall be used.

#### E.05 Water Level Sensor

The water level sensor shall be installed as shown on the Drawings and directed by the Engineer.

#### E.06 Pumping Equipment Work - General

The water will be supplied from an existing borehole. The water will be lifted up by a submersible pump to be installed at the main pump house and will be stored in the farm pond. From the pond, the water will be conveyed to the fields through the pipelines. The booster pump will be provided in the pipeline for sprinklers. Necessary pumping equipment and materials which are listed in the General Specifications shall be supplied to the Contractor by the Employer free of charge.

#### E.07 Installation of Pumping Equipment

The installation of pumping equipment will be carried out in accordance with the details shown on the Drawings and instructions given by the Engineer.

The works of the main pump house shall include the installation of pumping equipment, its accessories and a discharge pipe. The works of the booster pump house shall include the installation of pumping equipment, its accessories, suction and discharge pipes, and erection of prefabricated warehouse.

After the installation of the pumping equipment as above, the Contractor shall operate and check for proper operation in the presence and to the satisfaction of the Engineer.





# BILL OF QUANTITIES

## Summary

Item No.	Description	Total (Shs <sup>*</sup> )
A	Temporary Works	
B	Pump House	
C	Farm Pond with Inlet and Outlet Pits	
D	Irrigation Facilities	
E	Drainage Facilities	
F	Farm Road	
G	Land Preparation	
H	Electric Facilities	
Grand Total		

\*Shs: Tanzania Shillings

Item No.	Description	Unit	Q'ty	Rate (Shs.)	Amount (Shs.)
<u>Temporary Works</u>					
A-1	Maintenance of access road during the period of the Works	L.S.			
A-2	Construction, maintenance and subsequent removal of Contractor's staff quarters, office, stores, workshops and temporary fencing	L.S.			
A-3	Installation, operation, maintenance and subsequent removal of water and power supply systems for Contractor's staff quarters, office, workshops and work site	L.S.			
A-4	Assistance to Engineer's staff	P.S.			
<u>Pump House</u>					
<u>Main Pump House</u>					
B-1	Installation of pump and accessories	L.S.			
B-2	Dismantling of existing pump	L.S.			
B-3	Concrete 1 : 2 : 4	cu.m	0.50		
B-4	Concrete 1 : 4 : 8	cu.m	0.04		
<u>Booster Pump House</u>					
B-5	Installation of pump, accessories and erection of pump house	L.S.			
B-6	Concrete 1 : 3 : 6	cu.m	0.50		
B-7	Concrete 1 : 4 : 8	cu.m	0.05		



Item No.	Description	Unit	Q'ty	Rate (Shs.)	Amount (Shs.)
<u>Farm Pond with Inlet and Outlet Pits</u>					
C-1	Excavation	cu.m	180		
C-2	Earthfill w/excavated material	cu.m	150		
C-3	Earthfill w/borrowed material	cu.m	1,850		
C-4	Concrete 1 : 2 : 4	cu.m	2.7		
C-5	Reinforcing bar	kg	270		
C-6	Gravel	cu.m	2.9		
C-7	Screen	nos.	1		
<u>Irrigation Facilities</u>					
<u>Main Pipeline</u>					
D-1	Installation of pipeline	lin.m	590		
D-2	Concrete 1 : 2 : 4	cu.m	0.16		
D-3	Concrete 1 : 4 : 8	cu.m	0.04		
D-4	Reinforcing bar	kg	20		
D-5	Gravel	cu.m	0.1		
D-6	Installation of air valve	nos.	3		
<u>No.1 Pipeline</u>					
D-7	Installation of pipeline	lin.m	270		
D-8	Concrete 1 : 2 : 4	cu.m	2.0		
D-9	Concrete 1 : 4 : 8	cu.m	0.16		
D-10	Reinforcing bar	kg	180		
D-11	Gravel	cu.m	1.3		
D-12	Steel cover	nos.	1		

Item No.	Description	Unit	Q'ty	Rate (Shs.)	Amount (Shs.)
D-13	Installation of discharge meter	nos.	1		
D-14	Installation of hydrant	nos.	15		
<u>No.2 Pipeline</u>					
D-15	Installation of pipeline	lin.m	680		
D-16	Concrete 1 : 2 : 4	cu.m	3.1		
D-17	Concrete 1 : 4 : 8	cu.m	0.4		
D-18	Reinforcing bar	kg	290		
D-19	Gravel	cu.m	0.2		
D-20	Steel cover	nos.	2		
D-21	Installation of sluice valve	nos.	2		
D-22	Installation of discharge meter	nos.	1		
D-23	Installation of hydrant	nos.	12		
<u>No.3 Pipeline</u>					
D-24	Installation of pipeline	lin.m	370		
D-25	Concrete 1 : 2 : 4	cu.m	1.8		
D-26	Concrete 1 : 4 : 8	cu.m	0.2		
D-27	Reinforcing bar	kg	180		
D-28	Gravel	cu.m	0.3		
D-29	Steel cover	nos.	2		
D-30	Installation of sluice valve	nos.	2		
D-31	Installation of discharge meter	nos.	1		
D-32	Installation of hydrant	nos.	4		

Item No.	Description	Unit	Q'ty	Rate (Shs.)	Amount (Shs.)
<u>Drainage Facilities</u>					
E-1	Excavation	cu.m	2,000		
E-2	Concrete 1 : 2 : 4	cu.m	2.5		
E-3	Concrete 1 : 3 : 6	cu.m	7.2		
E-4	Reinforcing bar	kg	250		
E-5	Installation of corrugated steel pipe	m	45		
<u>Farm Road</u>					
F-1	Earthfill w/borrowed material	cu.m	2,500		
F-2	Earthfill w/excavated material	cu.m	500		
F-3	Gravel pavement	cu.m	570		
<u>Land Preparation</u>					
G-1	Land clearing and removal of tree	L.S.			
<u>Electric Facilities</u>					
H-1	Installation of distribution line from sub-station to main pump house	m	420		
H-2	Installation of distribution line from main pump house to booster pump house and to water level sensor	m	660		
H-3	Erection of distribution panel and water level sensor	L.S.			
H-4	Erection of grounding system	L.S.			

Item No.	Description	Unit	Q'ty	Rate (Shs.)	Amount (Shs.)
H-5	Concrete 1 : 2 : 4	cu.m	18		
H-6	Concrete 1 : 3 : 6	cu.m	0.5		
H-7	Reinforcing bar	kg	1,800		
H-8	Gravel	cu.m	2.7		
H-9	Installation of corrugated steel pipe	lin.m	5		







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