

9. Specification for Trial Construction
of
Water Supply System

AGREEMENT

OF

MODEL WATER SUPPLY SYSTEM CONSTRUCTION

IN HORO BIRNI, YABO

FOR

THE STUDY FOR GROUNDWATER DEVELOPMENT

SOKOTO STATE, NIGERIA

JULY, 1989

BETWEEN

JICA STUDY TEAM

AND

CONDITIONS OF ENGAGEMENT

1. GENERAL PROVISIONS

1.1 Terms of Reference

The Works to be performed by the Contractor under this Agreement are described in the Technical Specification set forth in Appendix "A".

1.2 Payment and Cost

Payment conditions and model water supply system construction cost are described in Appendix "B" and "C" respectively.

1.3 Type of Contract

The work shall be performed on the Construction

Cost basis:

There shall be no rise and fall variations allowed for escalation, inflation or any other reason.

2. COMMENCEMENT, COMPLETION AND ALTERNATION OF THE AGREEMENT

2.1 Agreement in Force

The Agreement is considered to have come into force immediately upon the signing of the agreement.

2.2 Commence Date

The Contractor shall commence the works (as described in Appendix "A") within 2 weeks after the Agreement has come into force.

2.3 Completion date

The works shall be completed by the 30th of November, 1989.

2.4 Alternations

Should circumstances arise which call for modifications of the Agreement these may be by mutual consent given in writing.

Proposals in the respect form one party shall be given due consideration by the other party.

3. INSURANCE

The Contractor shall obtain all insurances required by all relevant NIGERIAN Government regulations.

4. DUTIES OF CONTRACTOR

4.1 The Contractor shall exercise all reasonable skill, care and diligence in the discharge of his duties under the Agreement. The Contractor, his staff, employees shall respect the laws and customs of Nigeria and shall carry out all his responsibilities of his profession.

4.2 The Contractor shall not disclose any information which has been obtained through the construction, without the permission of the Client, during the time of construction and after the termination of the Agreement.

4.3 Subletting

The Contractor shall not assign or sublet whole or any portion of the works without prior consent of the Client to that effect.

5. PAYMENT TO THE CONTRACTOR

5.1 The Client shall effect payments to the Contractor in accordance with Appendix "B" and the construction cost set forth in Appendix "C".

5.2 All payment to the Contractor shall be in US dollar.

6. FORCE MAJEURE

"FORCE MAJEURE" includes wars, riots, or the like beyond control of the Client and the Contractor. In case of such circumstance, the Client may consider to extend the Agreement.

AGREEMENT

This Agreement (hereinafter, with the Conditions of Engagement and the Appendices and all Documents annexed hereto and forming an integral part hereof, called "the Agreement") made in duplicate on the day of July in the year Nineteen Hundred and Eighty Nine (1989) between the JICA Study Team (hereinafter called "the Client" of the one part) and (hereinafter called "the Contractor" of the other part.)

The Client is desirous that model water supply system construction works are rendered by the Contractor for the following project:

The Study for Groundwater Development in Sokoto State.

It is hereby agreed and declared between the parties as follows: The Client hereby appoints the Contractor and the Contractor accepts the appointment on the conditions as laid down in the Conditions of Engagement and Appendices annexed hereto and made a part hereof.

Appendix A : Technical Specification
Appendix B : Payment
Appendix C : Breakdown of Cost

The parties sign :

The Client

The contractor

Dr. Akira Kamata
JICA Team Leader,
Study for Groundwater Development
in Sokoto State

Technical Specification
for
Model Water Supply System Construction
in
Horo Birni, Yabo, Sokoto State

July, 1989

JICA Study Team

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1. GENERAL

This specification has been prepared by the JICA Study Team for the work involving "A Model Water Supply System Construction", which is contained within "The Groundwater Development Study" for "the project of water supply for middle- to large-scale villages in Sokoto State".

The site for the system construction is proposed for Horo Birni, one of the middle-scale villages under the jurisdiction of Yabo Local Government, with a population of about 8,000 and a settlement area of about 36 ha.

All of the construction work including preparation of materials and equipment is to be done by the Contractor under the supervision of the joint party of the Sokoto State Water Board (SSWB) and the JICA Study Team (the supervising party).

2. Scope of Work

In the said Study, three types of water supply system have been proposed for middle- to large-scale villages in Sokoto State, one of which is a simple semi-urban style supply system with a gravity distribution to the several communal faucets and a deep tube well as the water source. The model system construction work in Horo Birni Village is comprised of following major aspects;

- a. Construction of an elevated reservoir tank
- b. Pipe work for distribution and service pipe lines
- c. Faucet installation and platform construction
- d. Housing work for the generator operation and material storage
- e. Installation of a submersible motor pump in an existing deep tube well, of a diesel generator in a generator house, of water meters to the main distribution pipe and to every faucet platform, and the test run of all the systems

3. Materials and equipment

Materials and equipment to be installed or used in the work are specified in the table of "Materials, Equipment and Construction Works" followed by the detailed specification tables 1 to 9.

The Contractor shall submit the more detailed list of materials and equipment, prior to implementation, including descriptions of type, dimension and/or quality for the approval of the JICA Team.

List of Materials, Equipment and Construction Work

Item	Specification	No.	Unit	Detailed Specification
Submersible motor pump	240 l/m, 75mH, 7.5kw	2	sets	No. 1
Diesel engine generator	40-53 kVA	2	sets	No. 2
Reservoir tank	128 m ³ (8 x 8 x 2)	1	set	No. 3
Pump and Generator installation		1	set	No. 4
Elevated reservoir tank installation				No. 5
Housing for generator and storage	4 x 3 x 3 x 2 m or 8 x 3 x 3 x 1	1	set	No. 6
Distribution pipe		1	set	No. 7
Pipe work		1	set	No. 8
Communal faucets	ø25mm x 2	6	sets	No. 9

Detailed specification tables

No. 1 Submersible motor pumps

Item	Specification	Unit	Number
Submersible motor pump	240l/min, 70mH, 7.5kw, 380V/50H	set	2
Accessories	See fig. 23-2	L.S.	

No. 2 Engine Generator

Item	Specification	Unit	Number	
Diesel engine generator set	40 53 kVA, skid mounted along with control panel similar type as shown in fig. 23-2	set	2	
Spare parts (element)	Air cleaner	not specified	PC.	10
	Luboil filter	- do -	PC.	10
	Luboil by pass filter	- do -	PC.	10
	Fuel oil filter	- do -	PC.	10

No. 3 Reservoir tank and steel tower

Item	Specification	Unit	Number
Panel type reservoir tank	Volume 128m ³ (8mW x 8mL x 2mH) G.R.P. made, see fig. 23-3	set	1
Steel Tower	height 7.5m, with platform (9mx9m), with 9 feet, See fig. 23-3	set	1
Accessories	See fig. 23-3 (1 to 10)	L.S.	

G.R.P.: Glassfiber Reinforced Plastic

No. 4 Pump and generator installation work

Item	Specification	Unit	Number
Pump installation	See Section 5-3)	implemen- tation	1
Generator installation	- do -	implemen- tation	1
Test	- do -	day	15
Fuel for engine and generator	Diesel oil (for test operation)	liter	1,000

No. 5 Tower erection and tank installation work

Item	Specification	Unit	Number
Tank and tower fitting	See fig. 23-3	implemen- tation	1
Earth work	9 pits with 60cmW x 60cmL x 80cmD each and others	implemen- tation	1
Base concrete	Iron reinforced concrete with iron 15kg/m ³	m ³	4.5

No. 6 Housing work

Item	Specification	Unit	Number
Generator house building	3mW x 4mL x 3mH each, See fig. 23-2, or combined	implemen- tation	1
Storage house building	house of 3mW x 4mL x 3mH		
Window	not specified		
Door	- do -		
Mortar application	Cement mortaring	m ²	1

No. 7 Distribution pipeline (materials)

Item	Specification	Unit	Number
φ100mm pipe	White steel galvanized pipe, $l=5m$	PC.	66
φ 80mm pipe	- do -	PC.	108
φ 65mm pipe	- do -	PC.	68
φ 50mm pipe	- do -	PC.	19
φ 40mm pipe	- do -	PC.	70
φ100mm sluice valve	FC	PC.	5
φ 80mm sluice valve	FC	PC.	3
φ 65mm sluice valve	FC	PC.	3
φ 50mm sluice valve	FC	PC.	2
φ 40mm sluice valve	FC	PC.	4
φ 25mm sluice valve	FC	PC.	3
Water meter	digital type for φ100 pipe	PC.	1
Water meter	screw type for φ25 pipe	PC.	10
Faucet	for φ25 pipe, long faucet	PC.	24
Stop valve	φ25 screw type	PC.	20
φ25mm service pipe	WSGP $l=5m$	PC.	18
Special pipes such as bend, T-socket, reducer, and others		L.S.	

No. 8 Distribution pipeline (works)

Item	Specification	Unit	Number
Trench excavation	40cm deep trech for φ100 pipes, 30-40	m	280
Pipe laying and fitting, Air pressure test	See section 5-1)		
Valve box construction	Brick made with iron plate cover		

No. 9 Communal faucets with concrete base, drinking
place for cattles, and drainage

Item	Specification	Unit	Number
Concrete base construction	See fig. 23-1	PC.	6
Faucet installation		PC.	12
Drainage construction			6

4. Work schedule

All of the construction work shall be completed within a two month period starting from September 20, 1989, and the system test run and supplemental revision work shall be completed by the 30th of November, 1989.

The Contractor shall submit a detailed work schedule to the JICA Study Team or to SSWB within two weeks after the signing of the Contract. The Schedule shall be in a bar chart being comprised of the following work items;

- a. Preparation mainly for purchasing of major equipment and materials if they are not in stock
- b. Site preparation including transportation
(above 2 items are not necessarily contained in the said 2 months)
- c. Ground work and pipe work, including air pressure tests
- d. Tower foundation work
- e. Tower framing-up
- f. Reservoir tank framing-up, and painting
- g. Tank installation and relevant apparatus setting
- h. Operations house construction
- i. Storage house construction
- j. Generator and control panel installation
- k. Pump installation and test pumping
- l. Concrete base construction for faucets
- m. Test run of facilities and site clearing

5. Construction Works

1) Earth works and pipe work

Excavation for pipeline laying shall be to create open trench with a depth of more than 40 cm for 100mm diameter pipes and 30 to 40 cm for smaller-diameter pipes.

An air pressure test shall be executed as the work progresses, at least in the valve to valve sections, before back-filling of the earth.

2) Housing work

Two houses made of concrete or concrete blocks shall be built just beside the well for generator operation and material storage. The area of the houses shall be 12m^2 (3m x 4m) each, as shown in the fig. 23-2.

The two houses can be connected to each other in order to create one house with an area of 24m^2 (3m x 8m).

3) Elevated reservoir tank construction

3)-1 Foundation works

A reinforced concrete base, no less than 60cm wide and 80cm thick, shall be sunk at every foot of the tower, and the bases shall be connected by iron-reinforced concrete, 15cm thick, at the land surface.

3)-2 Tower erection

The height of the supporting tower shall be 7.5m above the earth's surface, considering the head loss at the end faucet.

The material to be used shall be iron frames thick enough to sustain the weight of a full tank of 128 m^3 by nine legs. The structure of the tower shall be similar to or equivalent to the one shown in fig.23-3. The Contractor shall submit a detailed

structural drawing of the tower for the approval of the supervising party.

3)-3 Tank installation

The panel type reservoir tank with a volume of 128m^3 (8mW x 8mL x 2mH) shall be firmly fixed on the platform of the tower. The material for the tank shall be glassfiber reinforced plastic (GRP or FRP) for easy maintenance.

The tank shall be fully equipped with the necessary attachments listed in the table in fig. 23-3 (from No.2 to No.10).

4) Faucet and concrete base construction

The six concrete bases with two faucets each shall be constructed at the places shown in fig. 23-1. The structure of the faucet base shall not necessarily be the same as the one shown in fig. 23-1, however, as at related facilities, shall be at least composed of the following:

- Drainage surrounding the base
- Drinking pit for cattle with or close to the base
- Water meter box above land behind the base

The Contractor shall submit a detailed drawing of the faucet base for the approval of the supervising party.

5) Pump installation and a test run of the supply system

A submersible motor pump shall be lowered and fixed at a depth of 66 m below ground surface (5m above the top of the screen) in the existing borehole which was completed in November, 1988, and connected to the inlet of the tank.

If something inconvenient or insufficient is found during the test run, the Contractor shall take the necessary measures for the satisfaction of the JICA Study Team.

PAYMENT

1. The Client shall pay an amount of
hereafter referred to as Cost,
to the Contractor.
2. The cost include remuneration, company profits, equipment and material cost, overhead cost social charge, insurance, tax and others.
3. There shall be no rise and fall variations allowed for escalation, inflation or any other reason.
4. The payment of the cost shall be made by the Client to the Contractor as follows;
 - a) Fourty (40) percents of the total contract price shall be paid after the commencement of the work:
 - b) Thirty (30) percents of the total contract price shall be paid after the progress of the work reach over Seventy (70) percents.
 - c) Twenty (20) percents of the total contract price shall be paid after progress of the work reach over Ninety (90) percents.
 - d) The remaining of Ten (10) percents of the total contract price shall be paid after completion of the work and all documents required in this contract submit to the Client.

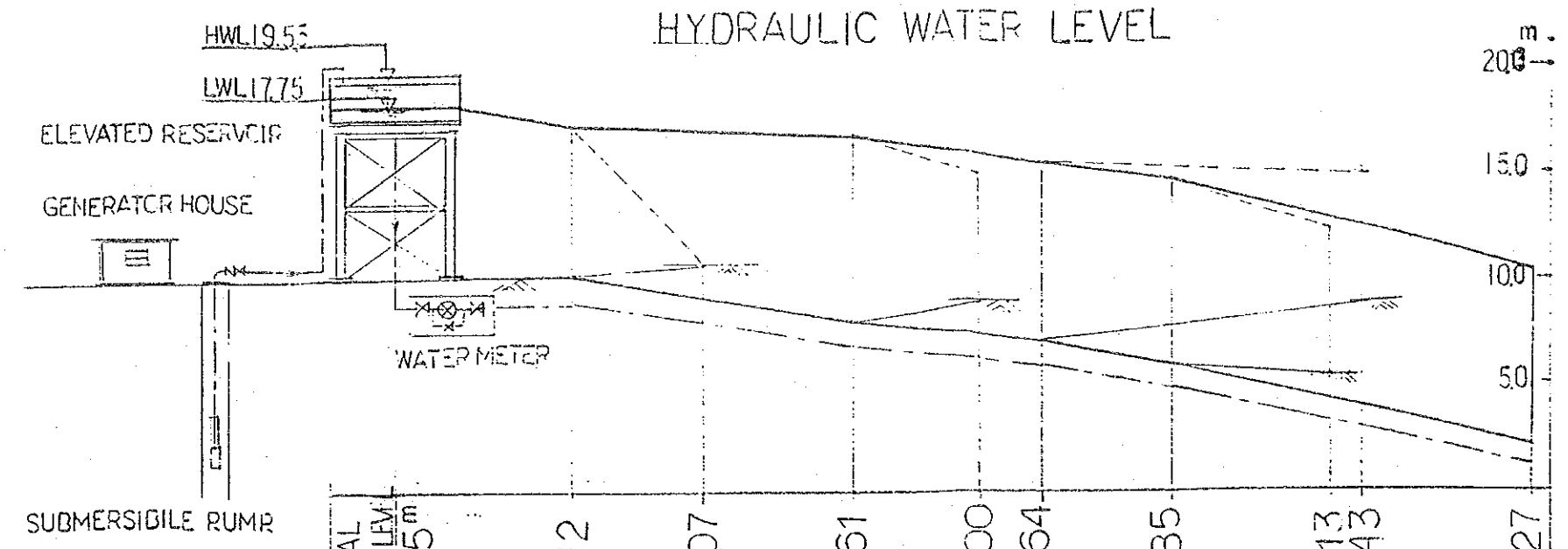
Total

Appendix C

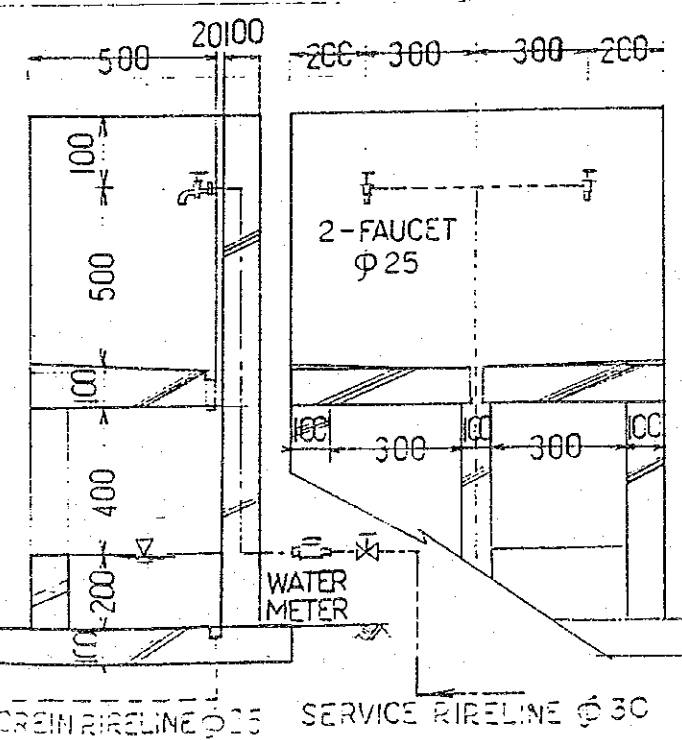
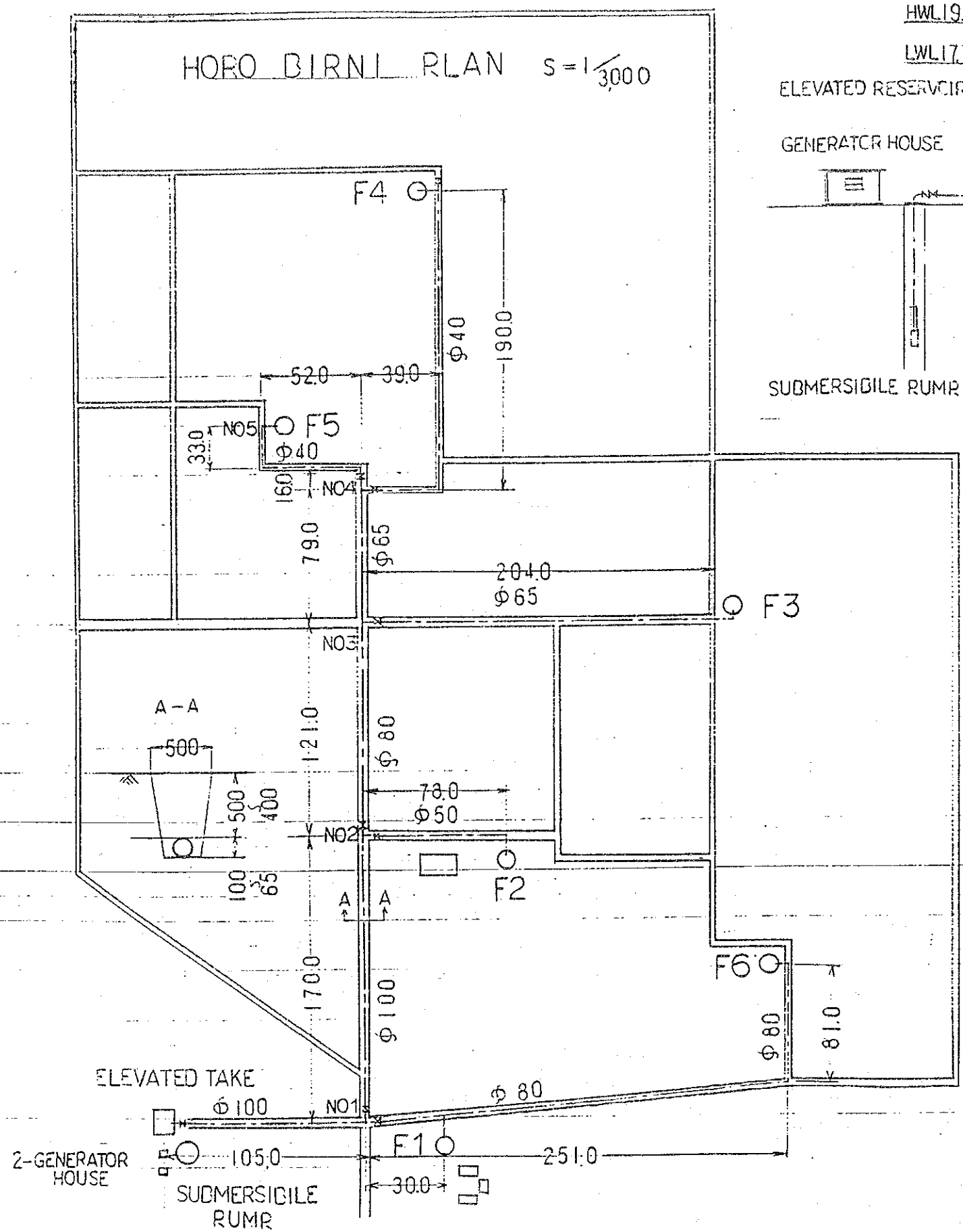
BREAK DOWN OF COST

ITEM	DESCRIPTION	UNIT	NO	AMOUNT (US \$)
1.	Submersible motor pump	sets	2	
2.	Diesel Engine Generator	sets	2	
3.1	Reservoir Tank	set	1	
3.2	Steel tower	set	1	
4.	Pump and generator installation work	set	1	
5.	Tower erection and tank installation work	set	1	
6.	Housing Work	set	1	
7.	Distribution pipeline (material)	set	1	
8.	Distribution pipeline (work)	set	1	
9.	Communal faucets	sets	6	
	Total			

HORO BIRNI PLAN S=1/3000



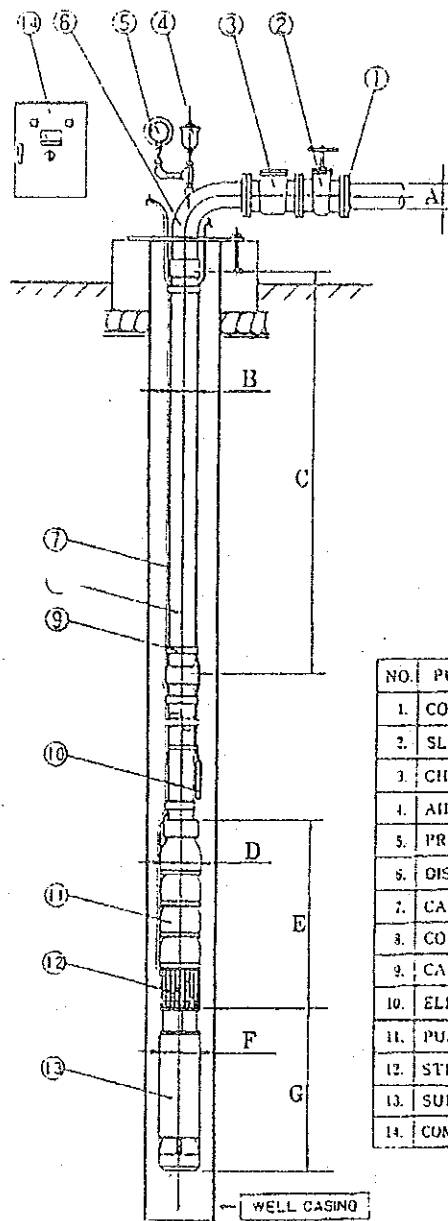
N O	TOTAL LENGTH	HIDRAULIC LEVEL	GROUND LEVEL	ACTUAL WATER LEVEL
0	0	17.75m	10.00m	7.75m
1	105	17.12	10.00	7.12
F6		16.69	10.60	6.07
2	275	16.61	8.00	8.61
F2		15.10	9.10	6.00
3	396	15.64	7.00	8.64
4	475	14.85	6.00	8.85
F5		12.83	5.70	7.13
F3		15.13	8.70	6.43
F4	704	10.27	2.00	8.27



COMMUNAL FAUCET
F1 - F6 S=1/200

Federal Republic of Nigeria				
The Study on Groundwater Development in Sokoto State				
Horo Birni Water Supply System				
Distribution Ripelin and Faucet				
DATE	JUN.1989	SCALE	NONE	DWG
				NC23-1
JAPAN INTERNATIONAL COOPERATION AGENCY				

CONSTRUCTION DRAWING
FOR
DEEP WELL SUBMERSIBLE MOTOR PUMP



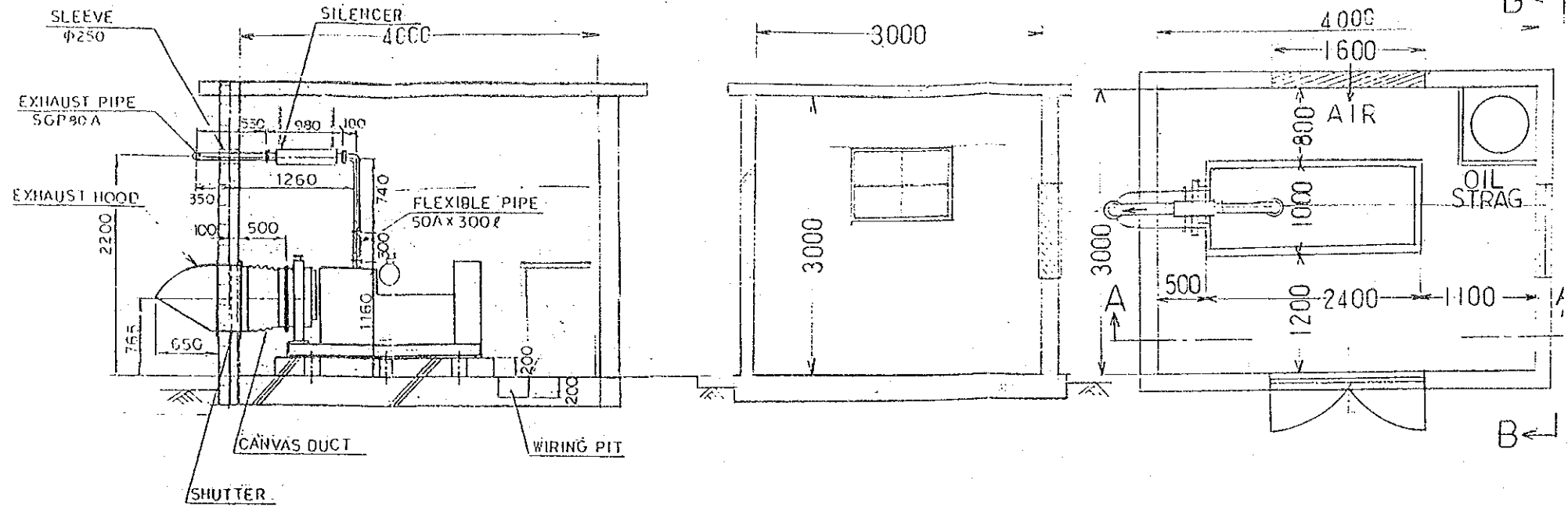
ITEM NO.	PUMP MODEL	DISCH. DIA. A (mm)	VOLUME L/M	HEAD (m)
	3SM 709ZK	65	360	65

DIMENSION			
COLUMN PIPE			
DIAMETER B (mm)	LENGTH C (m)	QUANTITY (PCS)	TOTAL (m)
65	2.75	24	66
PUMP BOWL		MOTOR	
DIAMETER D (mm)	LENGTH E (mm)	DIAMETER F (mm)	LENGTH G (mm)
138	1,305	140	685

NO.	PUMP ACCESSORIES	REMARKS
1.	COMPANION FLANGE	SS φ65 4 Set
2.	SLUICE VALVE	FC φ65 3 Set
3.	CHECK VALVE	FC φ65 3 Set
4.	AIR VENT VALVE	FC φ25 3 Set
5.	PRESSURE GAUGE	3 Set
6.	DISCHARGE FRAME	SS 3
7.	CABLE CLIP	3.5mmsq 75m 2
8.	COLUMN PIPE	CARBON STEEL φ65
9.	CABLE CLIP	2 Set
10.	ELECTRODE	2 Set
11.	PUMP BOWL	
12.	STRAINER	2 Set
13.	SUBMERSIBLE MOTOR	7.5 KW 360V 2 Set
14.	COMBINATION STARTER	2 Set

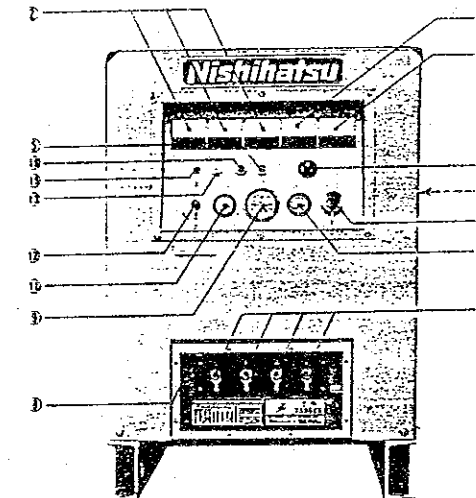
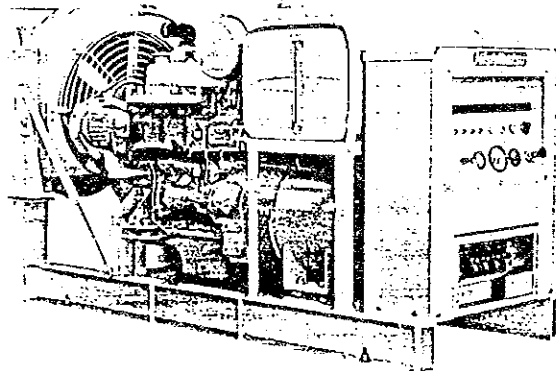
for pump motor and electrode

GENERATOR HOUSE



Generator set for indoor installation, consisting of engine and alternator coupled together, radiator, steel common skidbase and control panel.

Fuel tank, exhaust silencer (suspension type), exhaust flexible pipe and battery are provided as standard accessories.



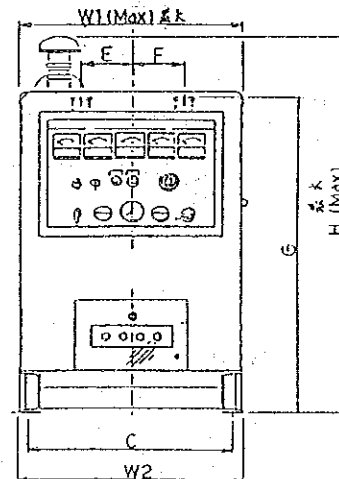
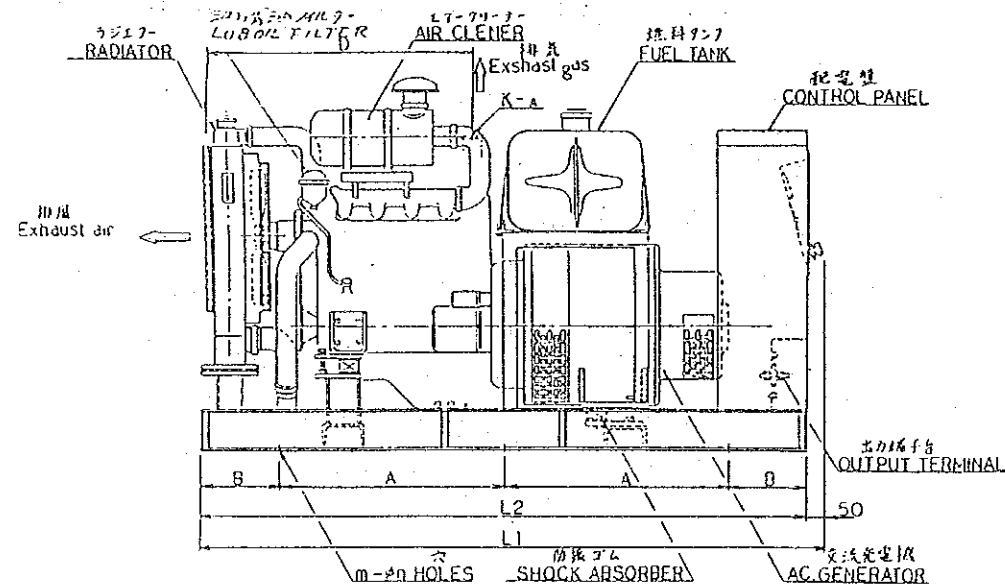
All control instruments and meters are rationally centralized on the incorporated control panel, fully wired to alternator and output terminal board. Standard instrumentation is as shown below.

For Alternator

- ① AC Voltmeter
- ② 3 AC Ammeters (for type PGM) or 1 AC Ammeter with Ammeter Selector Switch (for type PSM-IS)
- ③ Frequency Meter
- ④ Voltage Hand Trimmer
- ⑤ Pilot Lamp
- ⑥ Circuit Breaker
- ⑦ One Set of 3-phase Output Terminal Board
- ⑧ Power Indicator Lamp

For Engine

- ⑨ Tachometer with Hour Meter
- ⑩ Water Temperature Meter
- ⑪ Oil Pressure Meter
- ⑫ Battery Switch
- ⑬ Starter Switch
- ⑭ Speed Control Lever
- ⑮ Charge Lamp
- ⑯ Stop Button



MODEL	DIMENSIONS (mm)			WEIGHT (kg)
	Length	Width	Height	
PGM-20	1750	650	960	555
PGM-30	1840	650	1005	635
PGM-40	1870	700	1005	730
PGM-55	2050	750	1070	840
PGM-80	2380	800	1170	1050
PGM-100	2610	800	1230	1265
PGM-130	2710	960	1400	1700
PGM-150	3000	960	1400	1955
PGM-200	2960	960	1480	2160
PGM-240	3060	960	1480	2210
PGM-300	3140	1200	1670	3040
PGM-350	3410	1100	1590	3440
PGM-400	3520	1100	1620	3690
PGM-570	4170	1250	2090	5410
PGM-750	4350	1600	2150	6170

DIESEL GENERATOR SETS

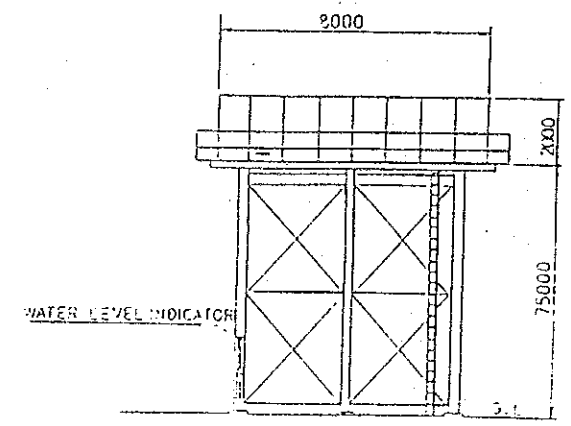
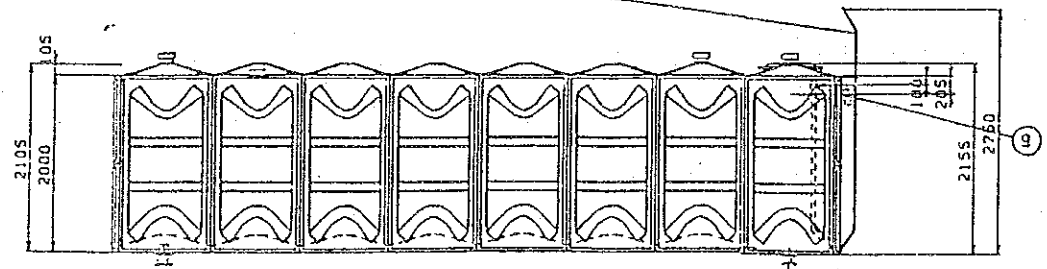
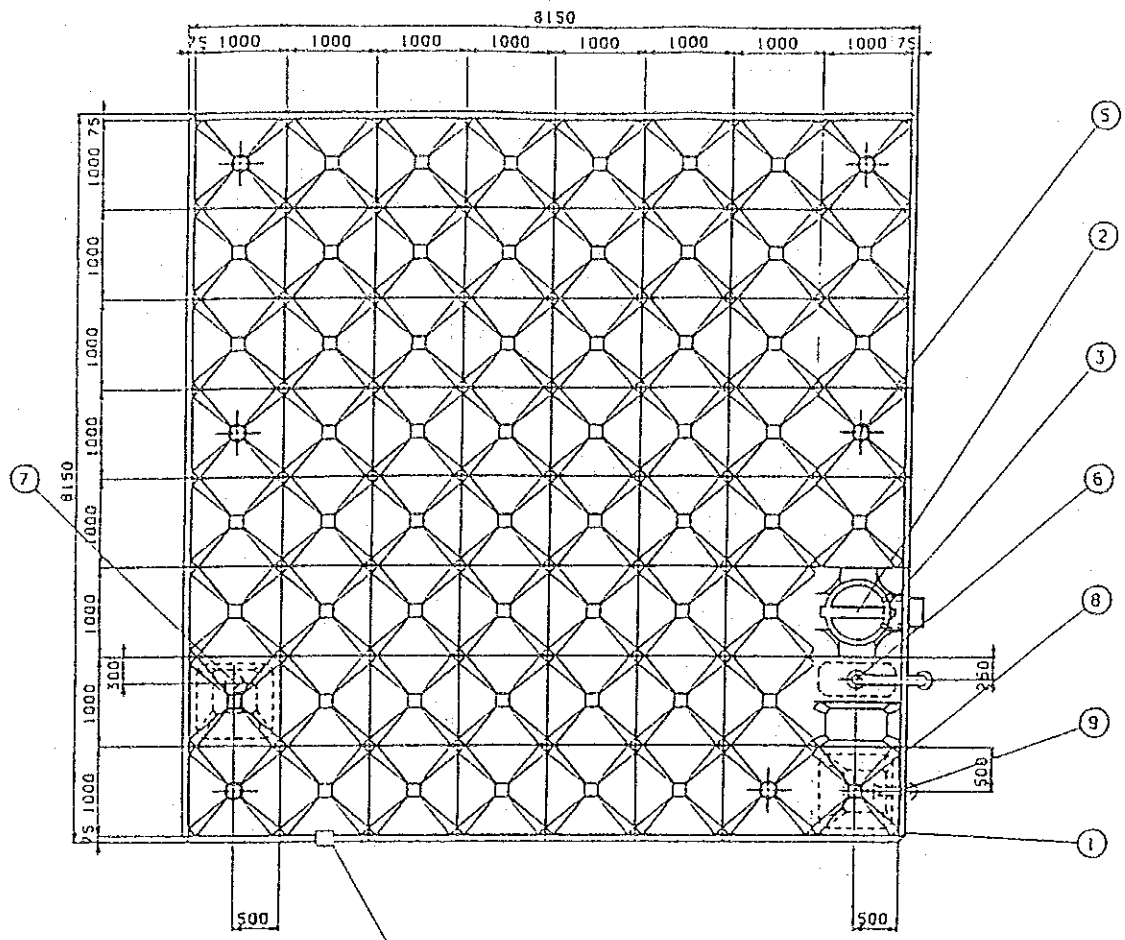
The Study on Groundwater Development in Sokoto State
A Model Water Supply System Construction in Horo Birni

Submersible Pump and Generator

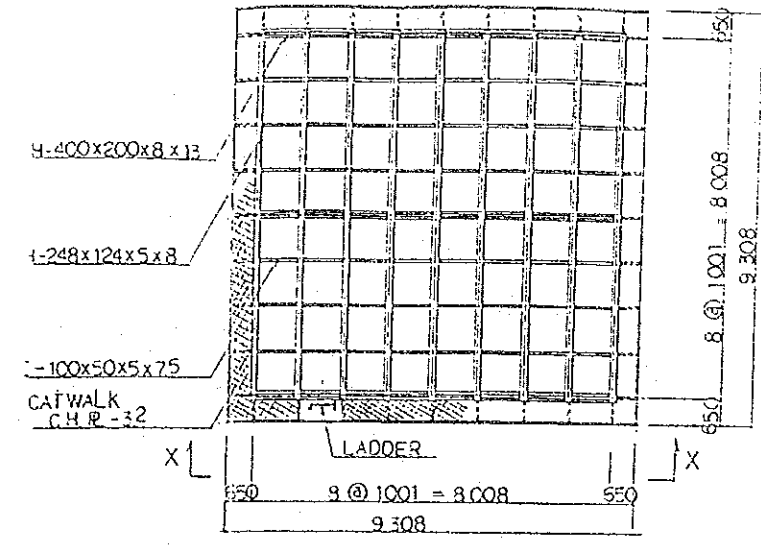
June, 1989 Fig. No. 23 - 2
JICA Study team
(Japan International cooperation Agency)

PANEL TYPE WATER TANK

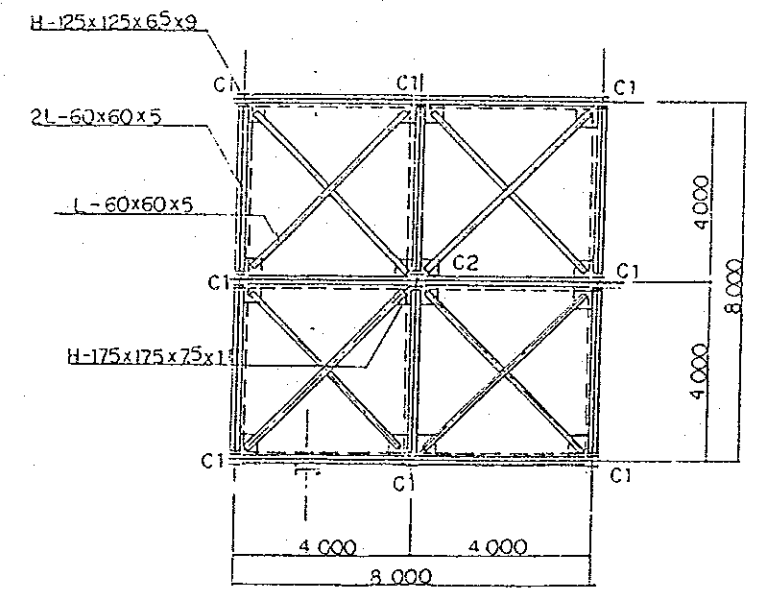
SIZE (8.0X 8.0X2.0M) - 128.0 M³
28154 GAL.U.K.



WATER LEVEL INDICATOR



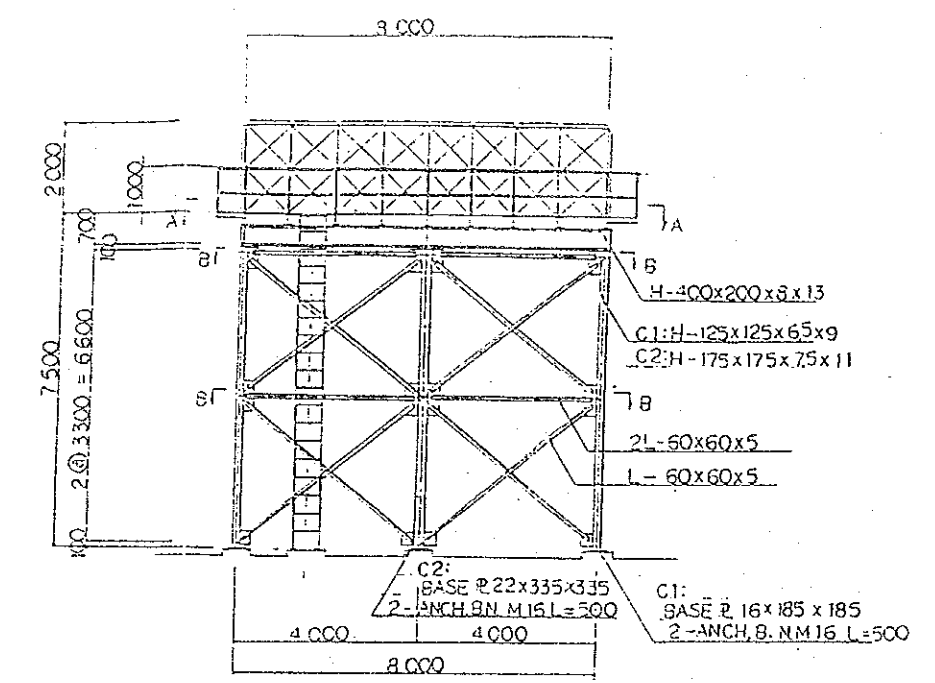
A-A SECTION S=1/100



B-B SECTION S=1/100

SUPPORTING TOWER

FOR 30 X 30 X 2.0 H=7.5M



X-X ELEVATION S=1/100

No.	N	A	M	E	MATERIAL	QUANTITY	REMARKS
10	WATER LEVEL INDICATOR					1SET	
9	OVER FLOW	(4")	STEEL		SCREWED JIS10kg/cm ² FLANGE	1	
8	DRAINAGE	(2")	STEEL		SCREWED JIS10kg/cm ² FLANGE	1	
7	OUTLET	(4")	STEEL		SCREWED JIS10kg/cm ² FLANGE	1	
6	INLET	(4")	STEEL		SCREWED JIS10kg/cm ² FLANGE	1	
5	AIR VENT		P.V.C		4" COVL TYPE	6	
4	EXTERNAL LADDER		S.G.P		HOT DIP GALVANIZED	1	
3	INTERNAL LADDER		P.V.C			1	
2	MANHOLE		G.R.P			1	
1	WATER TANK		G.R.P		COLOUR: GREY	1	

The Study on Groundwater Development in Sokoto State
A Model Water Supply System Construction in Horo Birni

Elevated Reservoir Tank

June, 1989 Fig. No. 23 - 3
JICA Study team
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FLOW MEASURING WATER METRE

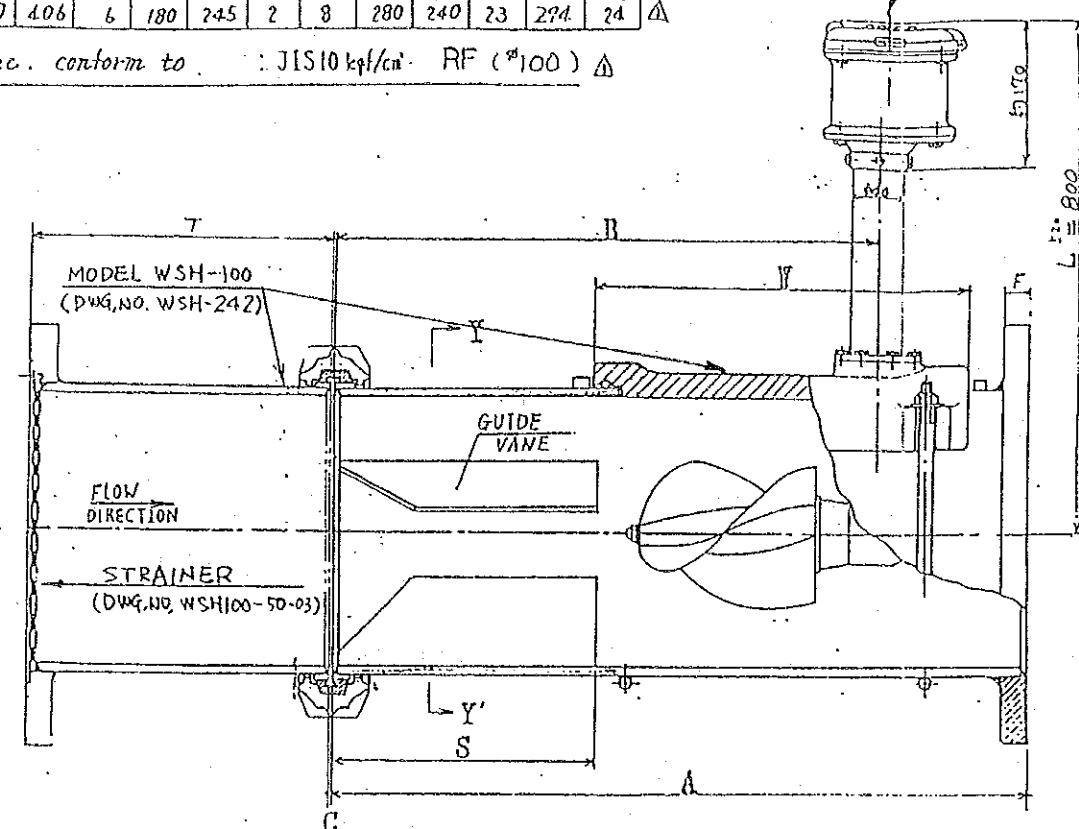
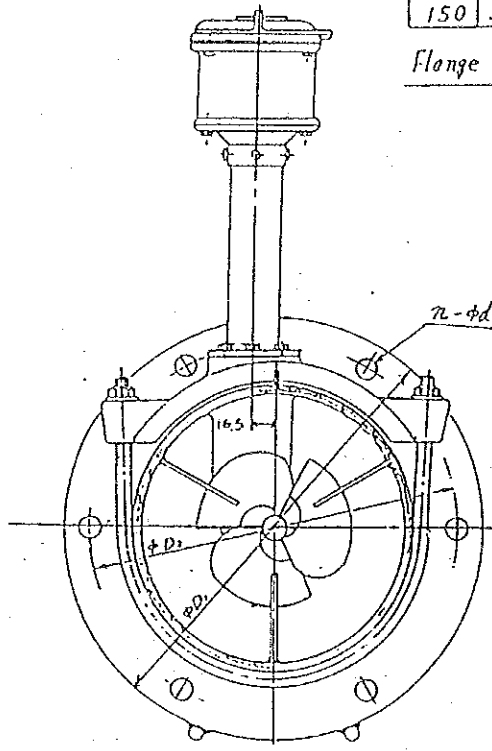
MAIN PIPELINE $\phi 100$

SUVICE PIPELINE $\phi 25$

	A	B	C	S	W	N	π	D_1	D_2	d	T	F
75	380	247	5	89	194	2	8	185	150	19		21
100	410	261	6	120	245	2	8	210	175	19	334	24
125	500	346	6	150	245	2	8	250	210	23		24
150	560	406	6	180	245	2	8	280	240	23	294	24

Flange spec. conform to JIS10 kgf/cm² RF ($\phi 100$) Δ

MODEL WSH-30C
(DWG. NO. WSH-236)



Specification of Woltman Type Water Meter, Model WSH-100-50C, WSH-100-30C Indicated in Cubic Meters and Liter/Second

Material	
Meter Body	Steel
Saddle	Aluminum Alloy
Propeller	Plastic
Register Complete	Aluminum Alloy, Copper Alloy and Plastic
Internal Painting	Chlorinated Rubber Vanish, Aluminum Powder
External Painting	Epoxy resin
External Painting Color	Munsell 7.5BG4/1.5

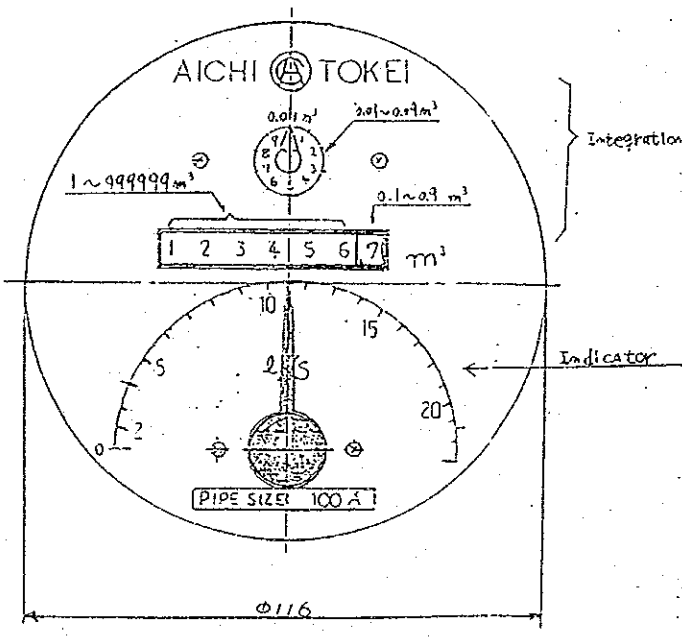
Performance		100(4)	150(6)
Nominal Size	mm(inch)	100(4)	150(6)
Capacity at 1m head loss	(l/s)	33	80
Flow at which meter is within $\pm 4\%$ of accuracy	(l/s)	3.9-19.6	8.8-44.2
Peak Load, temporary up to	(l/s)	11.5	26.5
Guaranteed safe max. capacity for 10 hours service	(m ³ /day)	420	950
for 24 hours service	(m ³ /day)	680	1530
Max. working pressure	(kgf/cm ²)	7.5	7.5
Max. water temperature	($^{\circ}$ C)	40	40
Max. storage temperature	($^{\circ}$ C)	50	50

Registration		100(4)	150(6)
(Integration)			
Smallest scale unit	(m ³)	0.01	0.01
Range of registration up to	(m ³)	999999	999999
(Instantaneous (flow rate))			
Minimum scale	(l/s)	2	6
Maximum scale	(l/s)	22	50

Dimensions		100(4)	150(6)
Length without connection	(mm)	410	360
Height, approx. (L)	(mm)	800	800
Width	(mm)	210	280
Dia. of Flange	(mm)	210	280
Dia. of Bolt circle	(mm)	175	240
Dia. of Bolt hole	(mm)	19	23
Number of Bolt hole		4	4

Note : Flange spec. conform to JIS 10kgf/cm² RF

DIAL



PERFORMANCE

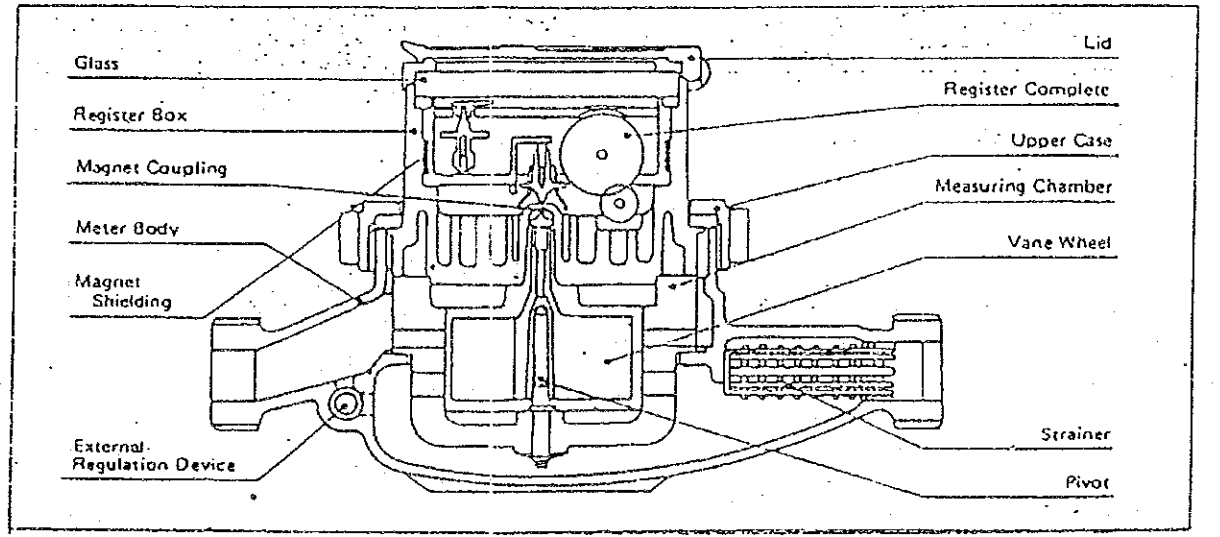
Nominal Size	(mm) (in.)	13	16	20	25
Maximum flow rate at 10 m head loss (Q Max.)		3	4.5	5	7
Nominal flow rate at which Meter is within $\pm 2\%$ of accuracy (m ³ /h) (Q _t)		0.12	0.18	0.2	0.28
Minimum flow rate at which Meter is within $\pm 5\%$ of accuracy (m ³ /h) (Q Min.)		0.03	0.045	0.05	0.07
Starting flow rate (l/h)		18	20	20	25

(ISO class B Spec.)

REGISTRATION

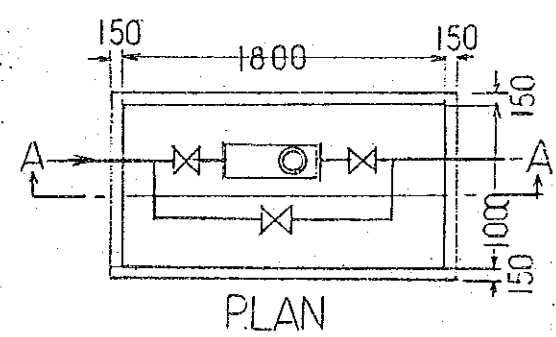
Dial Registration from	(l)	0.1	0.1	0.1	0.1
Dial Registration up to (m ³ /h)		10,000	10,000	10,000	10,000

- Working temperature up to 40 $^{\circ}$ C (50 $^{\circ}$ C preservation)
- Working pressure up to 10 kg/cm² (test pressure 20 kg/cm²)

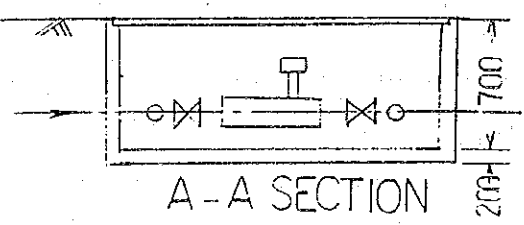


Cut-away View of P.A. Meter

FLOW MEASURE METRE



PLAN



A-A SECTION

The Study on Groundwater Development in Sokoto State
A Model Water Supply System Construction in Horo Birni

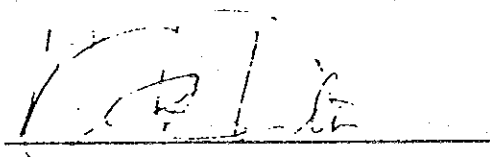
Water Meter

June, 1989 | Fig. No. 23 - 4
JICA Study team
(Japan International cooperation Agency)

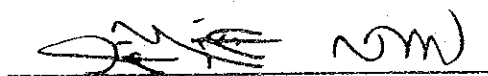
10. Scope of Work

SCOPE OF WORK
ON
THE GROUNDWATER RESOURCES SURVEY
IN
SOKOTO STATE
OF
THE FEDERAL REPUBLIC OF NIGERIA

DONE IN LAGOS, ON 5th FEBRUARY, 1988.



MR. M. SHITU
Secretary for Development Aid
Federal Ministry of Finance and
Economic Development



MR. S. MATSUURA
Leader of
Preliminary Survey Team
Japan International Cooperation
Agency

1. INTRODUCTION

In response to the request of the Government of the Federal Republic of Nigeria (hereinafter referred to as "Nigeria"), the Government of Japan decided to implement the study for Groundwater Development in Sokoto State (hereinafter referred to as "Study") in accordance with the relevant laws and regulations in force of Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with the relevant authorities of Nigeria.

The present document sets forth the scope of work with regard to the Study.

2. OBJECTIVES OF THE STUDY

The objectives of the Study are:

- 1) to evaluate the groundwater resource potential in the Sokoto State
- 2) to prepare groundwater development plan in selected area

3. SURVEY AREA

Survey area is Sokoto State, the Federal Republic of Nigeria.

4. SCOPE OF THE STUDY

The Study shall include following:

- (1) DATA COLLECTION AND REVIEW
 - 1) topography and geology
 - 2) hydrology and meteorology
 - 3) water resources
 - 4) water supply system

(2) FIELD SURVEY

- 1) data collection and analysis
- 2) topographic and geological survey
through reconnaissances, geophysical exploration, boring,
and pumping test.
- 3) hydrology and water balance
through existing wells and groundwater level.
- 4) survey on water quality
- 5) water supply
water supply system on survey area

(3) ANALYSIS AND EVALUATION

- 1) hydrogeology
- 2) hydrology
- 3) water quality

(4) FORMATION ON GROUNDWATER DEVELOPMENT PROJECT IN SELECTED AREA

- 1) potential of groundwater resources
- 2) optimum pumping plan
- 3) water supplying plan
- 4) evaluation of the project

5. STUDY SCHEDULE

The Study, in principle, shall be carried out in accordance with the tentative schedule shown in the attached sheet.

6. REPORT

JICA shall prepare and submit the following reports in English to the Government of Nigeria.

(1) Inception Report

Twenty (20) copies at the commencement of the work in Nigeria.

(2) Progress Report (1)

Twenty (20) copies within 8 months after the commencement of the Study.

(3) Progress Report (2)

Twenty (20) copies within 13 months after the commencement of the Study.

(4) Interim Report

Twenty (20) copies within 20 months after the commencement of the Study.

(5) Draft Final Report

Twenty (20) copies within 23 months after the commencement of the Study.

The Government of Nigeria shall submit their comments within thirty (30) days after receipt of the draft final report.

(6) Final Report

Fifty (50) copies within forty-five (45) days after the receipt of the comments on the Draft Final Report.

7. UNDERTAKING OF THE GOVERNMENT OF THE FEDERAL REPUBLIC OF NIGERIA

1. To facilitate smooth conduct of the Study, The Government of the Federal Republic of Nigeria shall take the following necessary measures:

(1) to secure the safety of the Study Team

(2) to permit the members of the Japanese Study team to enter, leave and sojourn in Nigeria for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,

- (3) to exempt the members of the Japanese Study team from taxes, duties and any other charge on equipment, machinery and other materials brought into Nigeria for the conduct of the Study.
- (4) to exempt the members of the Japanese Study team from income tax and charges of any kind imposed on or in connection with any team for their services in connection with the implementation of the Study.
- (5) to provide necessary facilities to the Japanese Study team for remittance as well as utilization of the funds introduced into Nigeria from Japan in connection with the implementation of the Study.
- (6) to secure permission for entry into private properties or restricted areas for the conduct of the Study.
- (7) to secure permission to take data and documents (including photographs) related to the Study out of Nigeria to Japan by the Study team.
- (8) to provide medical services as needed, its expenses will be chargeable on the member of the Japanese Study team.

2. The Government of the Federal Republic of Nigeria shall indemnify, if any, arises against the member of the Japanese Study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims from gross negligence or willful misconduct on the part of the Japanese Study team.

3. The Federal Department of Water Resources, Nigeria (hereinafter referred as "FDWR") shall act as counterpart agency to the Japanese Study team and also coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. FDWR shall, at its own expense, provide the Japanese Study team with the following, in cooperation with other relevant organizations:

- (1) available data and information related to the Study.
- (2) counterpart personnel, including drivers and laborers.
- (3) suitable office space with equipments in survey area and Lagos.
- (4) credential or identification cards.

8. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

- (1) to dispatch, at its own expense, Study team with equipments to Nigeria.
- (2) to pursue technology transfer to the Nigerian counterpart personnel in the course of the Study.

9. CONSULTATION

JICA and FDWR shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Minutes of the Meeting
on
The Groundwater Resources Survey
in
Sokoto State
of
The Federal Republic of Nigeria

The Japanese Preliminary Study Team organized by the Japan International Cooperation Agency (JICA) visited Nigeria and had a series of discussion with the Authorities of the Federal Republic of Nigeria concerned, in particular with the Ministry of Finance and Economic Development, Federal Ministry of Agriculture, Water Resources and Rural Development and Sokoto State Government.

As a result of the meetings, both sides agreed upon the Scope of Work for the Groundwater Resources Survey in Sokoto State.

The major points of meetings are as follows:-

- (1) The Study area covers Sokoto State. However, detailed study will be assigned to the selected sites from the proposed 47 large villages, which are listed as attached.
- (2) To collect extensive data necessary for the Study, the following survey and monitoring will be carried out by the Nigerian side in close cooperation with the Japanese study team:-
 - (1) Groundwater level observation by water level recorder and manual measure in selected wells.
 - (2) River water monitoring of water level and discharge in existing gauging stations.
 - (3) Level survey of selected wells and existing gauging stations.
- (3) To assure the smooth implementation of the study and promote technology transfer through on-the-job training, Nigerian side will

.../2

designate the following counterparts during field work:-

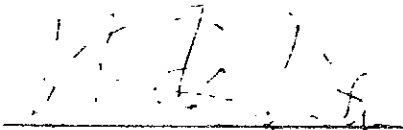
- (1) Two (2) or three (3) of Hydrogeologists
- (2) Two (2) or three (3) of Geophysists
- (3) Two (2) or three (3) of Hydrologists
- (4) One (1) or two (2) of Chemists
- (5) One (1) or two (2) of Water Supply Engineers

(4) Nigerian side requested provision of equipment as follows, and the Japanese team took note of them:-

- (1) Vehicles
- (2) Geophysical investigation equipment
- (3) Hydrological measuring equipment
- (4) Pumping Unit
- (5) Water Quality Analyzer
- (6) Personal Computer
- (7) Other tools and equipment

DONE IN LAGOS, on 5th FEBRUARY, 1988.

SIGNED:



MR. M. SHITU

Secretary for Development Aid
Federal Ministry of Finance
and Economic Development



MR. S. MATSUURA

Leader of Japanese Mission

ATTACHMENT

LIST OF PROPOSED VILLAGES

S/NO. :	SETTLEMENT	LOCAL GOVERNMENT AREA
1.	Unguwar Laya	Anka
2.	Bullakke	Anka
3.	Dandindin	Anka
4.	Ruwan Bore	Gusau
5.	Madawakin Danke	Gusau
6.	Bamanu	Gusau
7.	Dauran	Kaura Namoda
8.	Janbuki	Kaura Namoda
9.	Unguwar Kofa	Kaura Namoda
10.	Maga	Zuru
11.	Bajida	Zuru
12.	Sanchi	Zuru
13.	Illelar Auwal	Gummi
14.	Daki Takwas	Gummi
15.	Zugu	Gummi
16.	Raha	Yauri
17.	Birnin Yauri	Yauri
18.	Takware	Yauri
19.	Gumbai	B/Kebbi
20.	Maruda	B/Kebbi
21.	Chafadi	Bodinga
22.	Kinbar Bawa	Bodinga
23.	Gaukai	Yabo
24.	Takkau	Yabo
25.	Gudale	Argungu
26.	Chibike	Argungu
27.	Kwakwazo	Wurno
28.	Shiyar Dangaladiwa	Wurno
29.	Bakyasuwa	T/Mafara
30.	Jam Bako	T/Mafara
31.	Rahayel	Bagudo
32.	Gendene	Bagudo
33.	Kalgo	Silame
34.	Soro	Silame

ATTACHMENT

- 2 -

S/NO. : SETTLEMENT : LOCAL GOVERNMENT AREA

35.	Sabiyo	Silame
36.	Tozai	Isa
37.	Mayasa	Isa
38.	Sabuwari, Tsamaye	Isa
39.	Shamaji	Gwadabawa
40.	Kalmalo Cikin Gari	Gwadabawa
41.	Arabarcikin Gari	Gwadabawa
42.	Sambawa	Jega
43.	Kimba	Jega
44.	Kuka Kago	Bunza
45.	Giro	Bunza
46.	Malambawa	Sokoto
47.	Samalu	Sokoto

- oOo -

JICA