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DEPARTAMENTO DE AGRICULTURA

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PEOPLE'S REPUBLIC OF BANGLADESH

**DESIGN REPORT
ON
CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR
THREE COMMUNITY DEVELOPMENT CENTERS
UNDER
THE CENTRAL EXTENSION RESOURCES DEVELOPMENT
INSTITUTE
(CERDI)**

SEPTEMBER 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

The present Report deals with the studies and their outcomes regarding the engineering design of the "Model Infrastructure" called for strengthening the Agricultural Extension Development Project in Bangladesh which has been implemented by the Japan International Cooperation Agency (JICA) under the Agreement with the Government of the People's Republic of Bangladesh. The design work referred to in the Report covers the water supply facilities, the land-consolidation, and the others which will be constructed in the farms which are attached to the three Community Development Centers under the Central Extension Resources Development Institute (CERDI).

This engineering design work was carried out by two of engineers who commenced their work on June 13, 1980 and have completed it with the submittance of this Report, within one hundred days of which sixty days were spent for the Field Operations with the all-out assistance of the Japanese Advisory Group attached to CERDI.

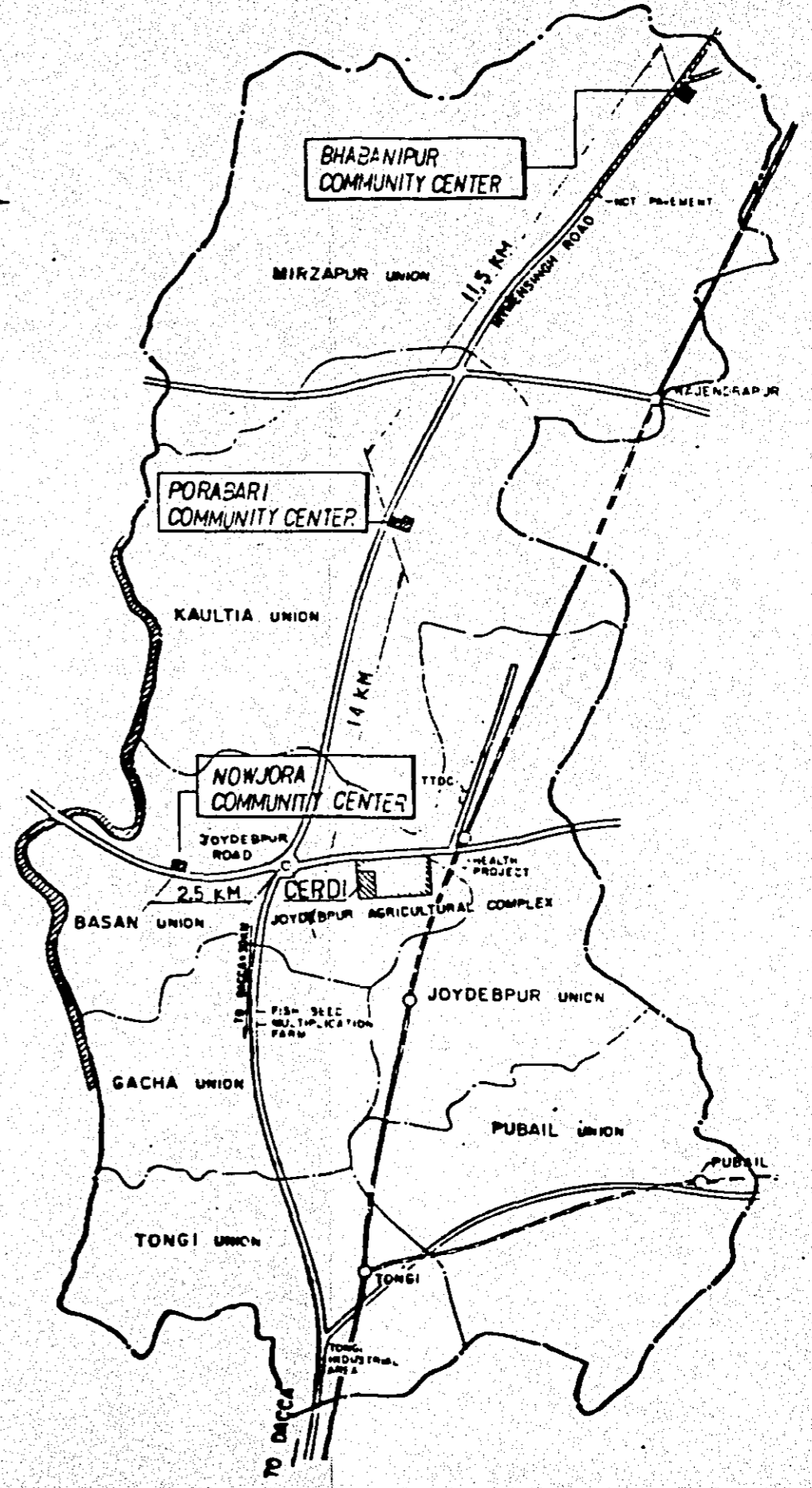
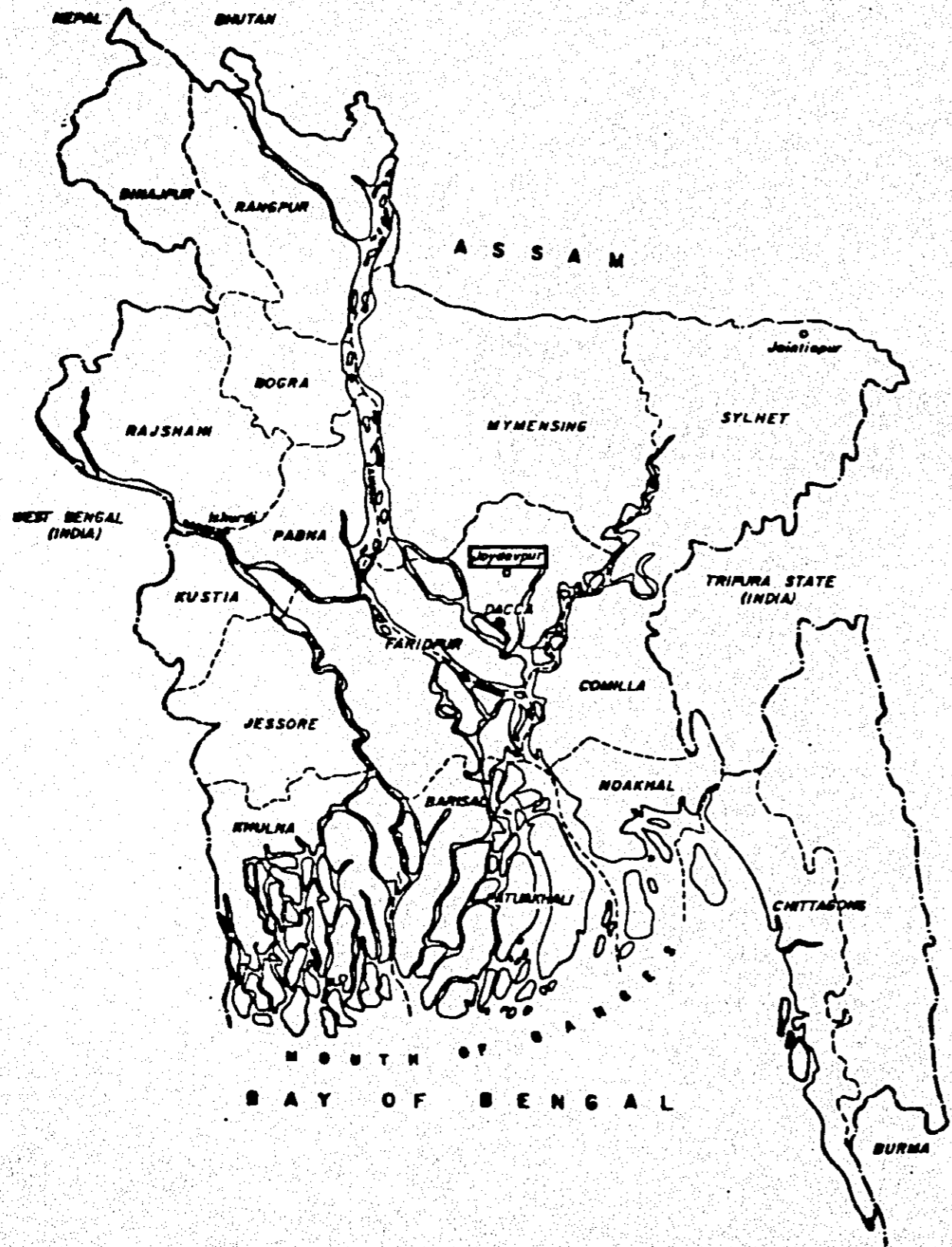
The under-mentioned members of the team believe it their obligation to acknowledge with sincere thanks the cooperation given them for completion of their assignment from the authorities concerned of the Bangladesh Government and the staff of JICA, both its Tokyo HQS and Dacca Office, and the Japanese Embassy in Dacca. Particular thanks are due to Dr. Shoichi Nakata, the Leader, and Mr. Iwao Kudoh, the member, of the Japanese Advisory Group whose guidance was quite valuable for execution of the in duty.

September 20, 1980

Team Members:

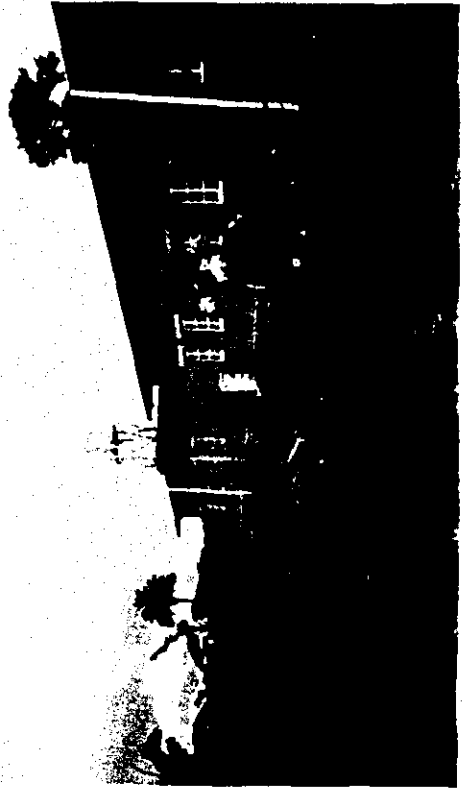
Tsuneo Amano & Masatoshi Higashide
Japan Engineering Consultants Co., Ltd.

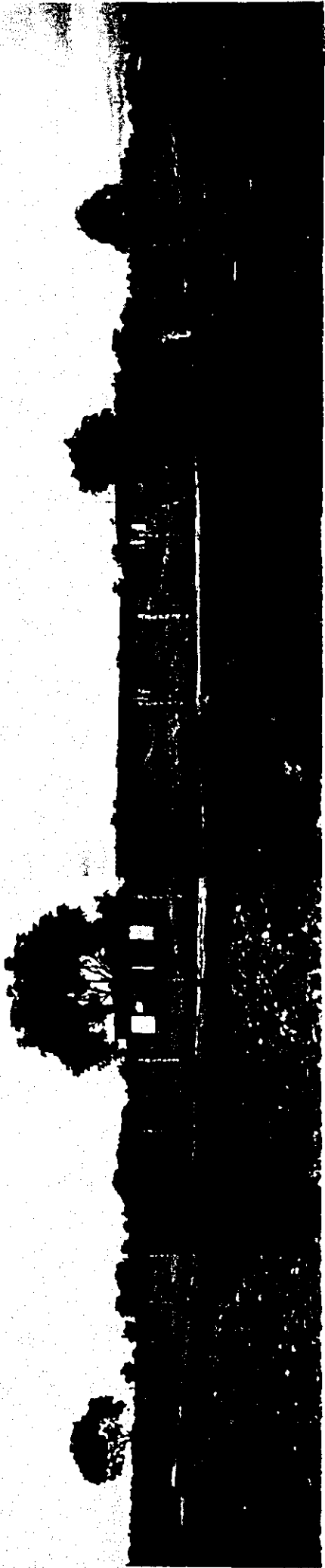
LOCATION MAP





Nawjore Community Development Center



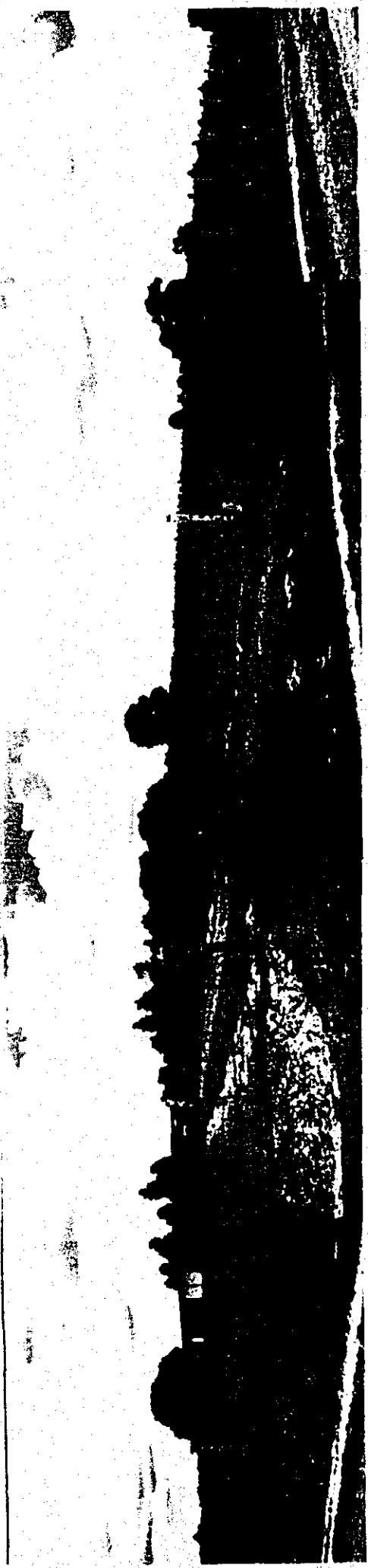


Porabari Community Development Center

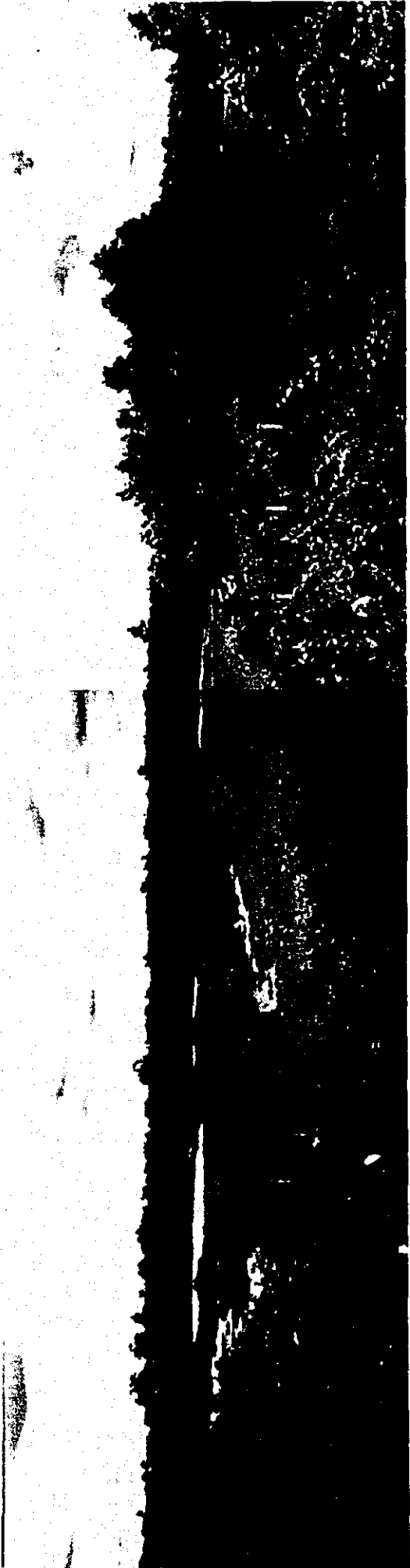




Tank in Porabari C.D.C.



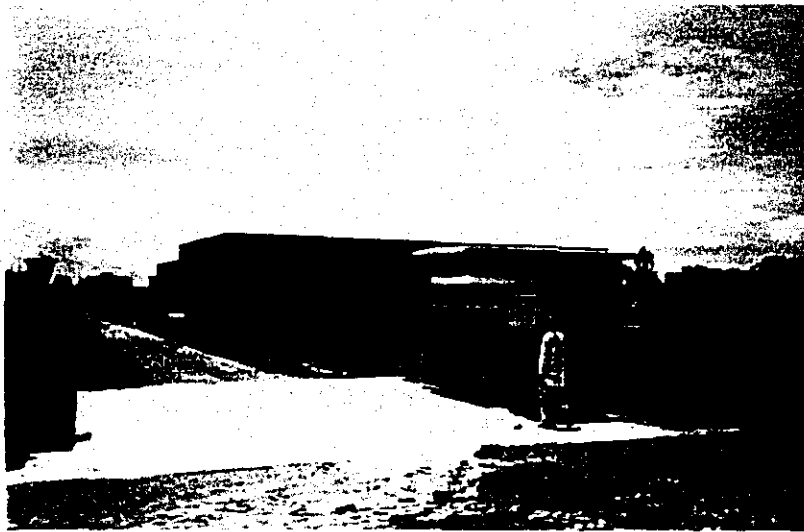
Bhabanipur Community Development Center



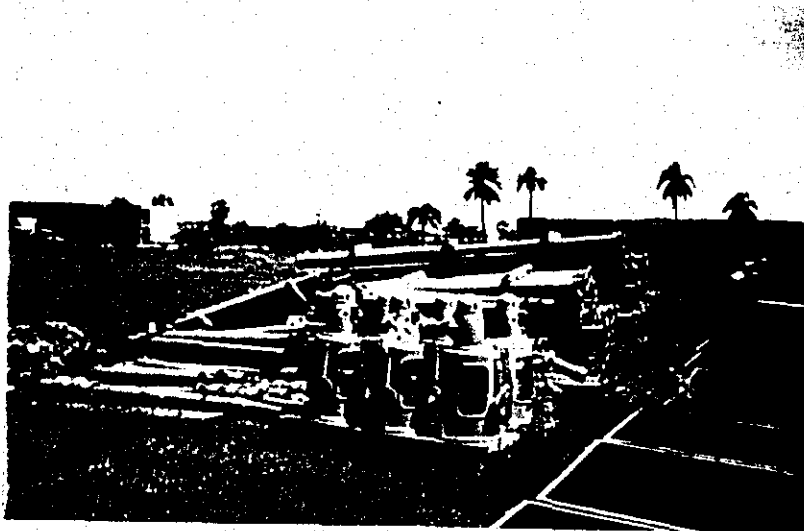
Tank in Bhabanipur C.D.C.



Road to Bhabanipur C.D.C.



CERDI Joydebpur



Pumps for The Deep Tube-wells

People's Republic of Bangladesh
 Design Report
 on
 Construction of Model Infrastructure
 for
 Three Community Development Centers
 under
 The Central Extension Resources Development Institute
 (CERDI)

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CURRENCY EQUIVALENTS

US\$ 1.00 = Tk 15.1 = Yen 225.0

Tk 1.00 = US\$ 0.066 = Yen 14.9

WEIGHTS AND MEASURES

1 acre (ac)	: 0.405 hectare (ha)
1 bigha	: 0.33 ac
1 mile (mi)	: 1.609 kilometers (km)
1 square mile (sq mi)	: 640 ac (259 ha)
1 foot (ft)	: 30.5 centimeters (cm)
1 maund (md)	: 82.3 lbs (37.3 kg) = 40 seers
1 metric ton (ton)	: 26.8 md = 2,205.64 lbs
1 cubic foot per second (cusec)	: 0.0283 cu meters per second
1 seer (sr)	: 2.05725 lbs = = 0.9331 kilograms (kg)
1 hectare	: 2.4711 ac
1 cubic foot (cft)	: 0.0283 cubic meter
1 bale of Jute	: 400 lbs
1 yard	: 36 inches = 0.914 meter

CHAPTER-I: BACKGROUND AND OBJECTIVES

1.1 Background

The Governments of Japan and the People's Republic of Bangladesh jointly signed, in March 1975, the Record of Discussions and, in October 1978, the Agreement on the Technical Cooperation for the Project of the Central Extension Resources Development Institute (CERDI) and the Technical Cooperation by means of advisory activities is being executed by the Japanese technical expertise attached thereto. Thus, the CERDI was constructed and the Japanese Advisory Group consisting of technical experts on such as the team leader, the agricultural extension, the agricultural mechanization, agricultural machinery, the crop production, the soil-analysis and fertilizing, etc., are being stationed there collaborating with the Bangladesh counterparts for betterment of the Bangladesh agricultural extension services.

The CERDI selected three plots of land within Joydebpur Thana, Dacca District for experimentation-cum-demonstration purposes where it can carry out the adaptability tests with various development resources as well as development of the more effective extension methods in a concentrated manner, and to establish the Community Development Center (CDC) on each one of them for the diffusion of the successful cases and examples. Eventually, the three CDCs each covering about 3 acres (1.2 ha) of land, two of them being equipped with irrigation ponds, were established at (i) Nawjore, (ii) Porabari, and (iii) Bhabanipur, and the major buildings for these CDCs were completed by April 1978 and the staff-quarters are currently under construction.

For effective use of these farms, however, many improvement works including land-consolidation, equipment of irrigation/drainage facilities and canals, improvement of the existing irrigation ponds, etc., are not yet done and these works are urgently required. The Bangladesh Government fully realized these needs but unfortunately has not been in a position to undertake such works out of the financial difficulties to which it has been faced so far.

In view of putting the CDCs in proper functional stage and the Agricultural Extension Project on the established rail, it is hertening to say that the construction of these improvement works have now heen decided to be taken up in a course of 1980, in the name of the "Construction of Model Infrastructural".

1.2 Objectives

The present Study is meant for preparation of the engineering designs for the consolidation of the farms, the water supply facilities, the irrigation and drainage canals, and the improvement of the two existing irrigation ponds, and also to confirm the net contents of the construction works designated as the "Construction of Model Infrastructure" on the farms attached to three CDCs under the CERDI.

CHAPTER-II: PRINCIPAL FEATURES OF THE INFRASTRUCTURAL WORKS

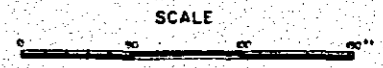
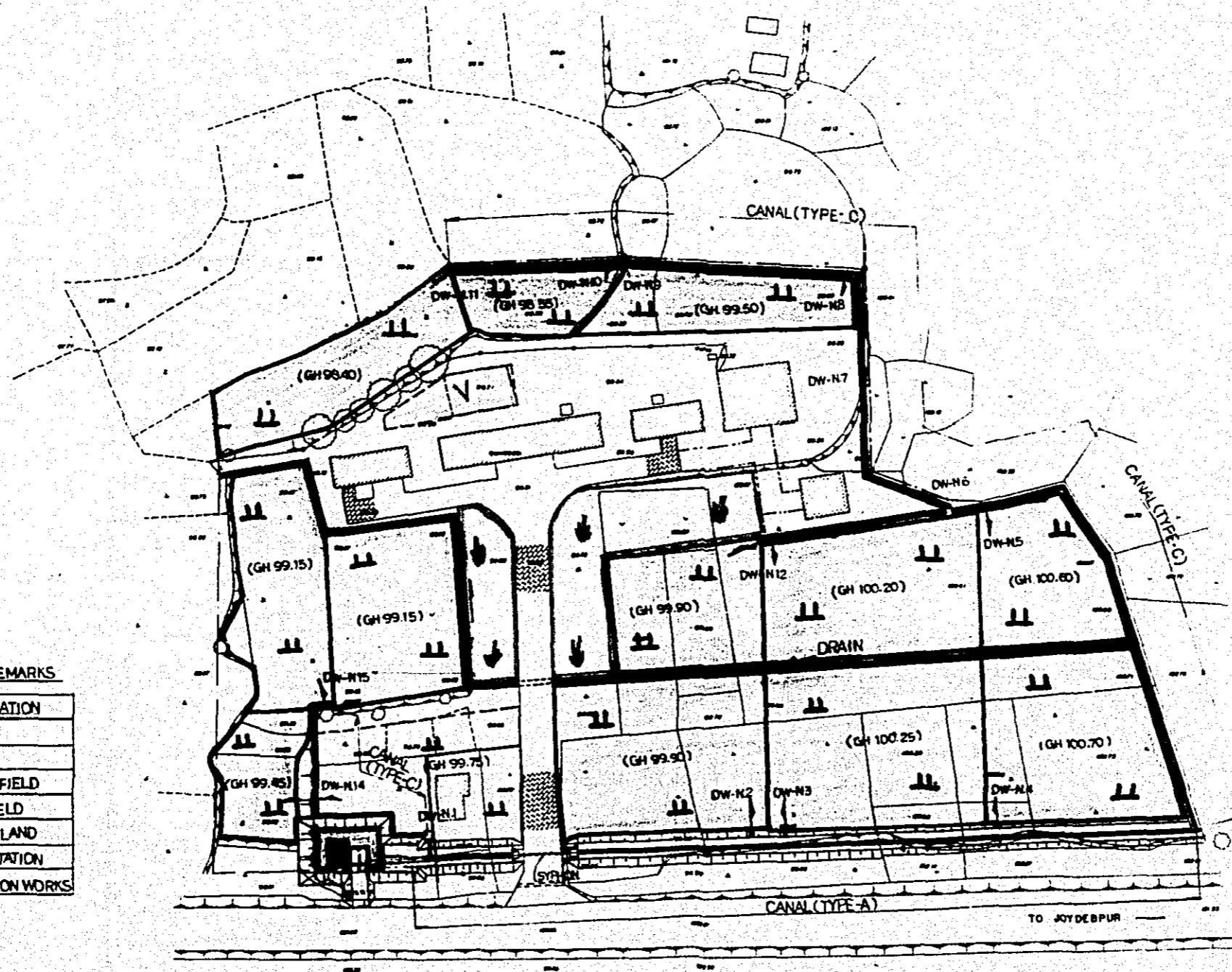
1. Name of the Project: The Bangladesh Agricultural Extension Project.
2. Designation of the Work: Construction of Model Infrastructure of the Three Community Centers under the CERDI.
3. Estimated Construction Cost: Yen 17,000,000 (Tk 11.4 lakh).
4. Location of the Work: In the confines of the three CDCs at Nawjore, Porabari and Bhabanipur in Joydebpur Thana, Dacca District.
5. Contents of the Work: Construction of the water supply facilities (deep tube-wells), consolidation of the farms plus construction of irrigation & drainage canals in the confines of the three CDCs and restoration of the existing ponds attached to the two CDCs. One at Porabari and the other at Bhabanipur.
6. Quantities of the Principal Works:
 - 1) Consolidation of the Farms Paddyfield: 1.97 ha/Upland: 0.64 ha
Earth-moving: 2,300 m³
 - 2) Water-supply Work Deep tubewell + Pumping House + Discharge Box, at three CDCs.
Brick-lined canal: 380 m
Earthen canal: 650 m
Related Structure: 34 L.S.
 - 3) Drainage Facilities Drainage canal (earthen): 670 m
 - 4) Improvement of Ponds (at two CDCs) Earth-moving: 4,400 m³
Spill-way: at one CDC
Outlet works: at one CDC
Spillway-cum-outlet works: at one CDC



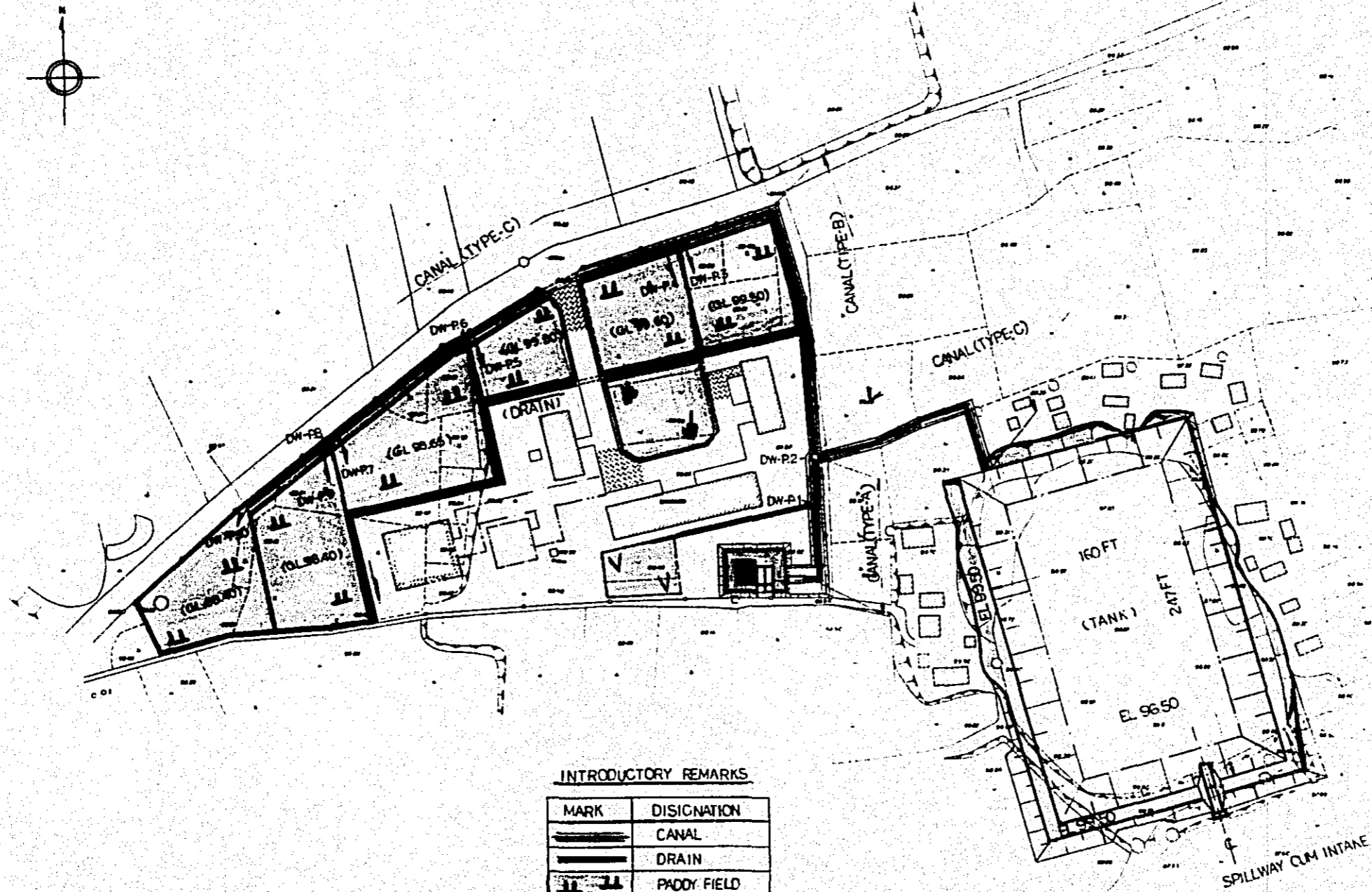
□ Pump house

INTRODUCTORY REMARKS

MARK	DISIGNATION
	CANAL
	DRAIN
	PADDY FIELD
	DRY FIELD
	GRASS LAND
	PUMP STATION
	DIVERSION WORKS



CONSTRUCTION OF MODEL INFRASTRUCTURE FOR THREE COMMUNITY DEVELOPMENT CENTERS UNDER CERD
 GENERAL PLAN OF NAWJORA
 C-D-C
 Date Sept 1980 DWG No 1



INTRODUCTORY REMARKS

MARK	DISIGNATION
	CANAL
	DRAIN
	PADY FIELD
	DRY FIELD
	GRASS LAND
	PUMP STATION
D W	DIVERSION WORKS

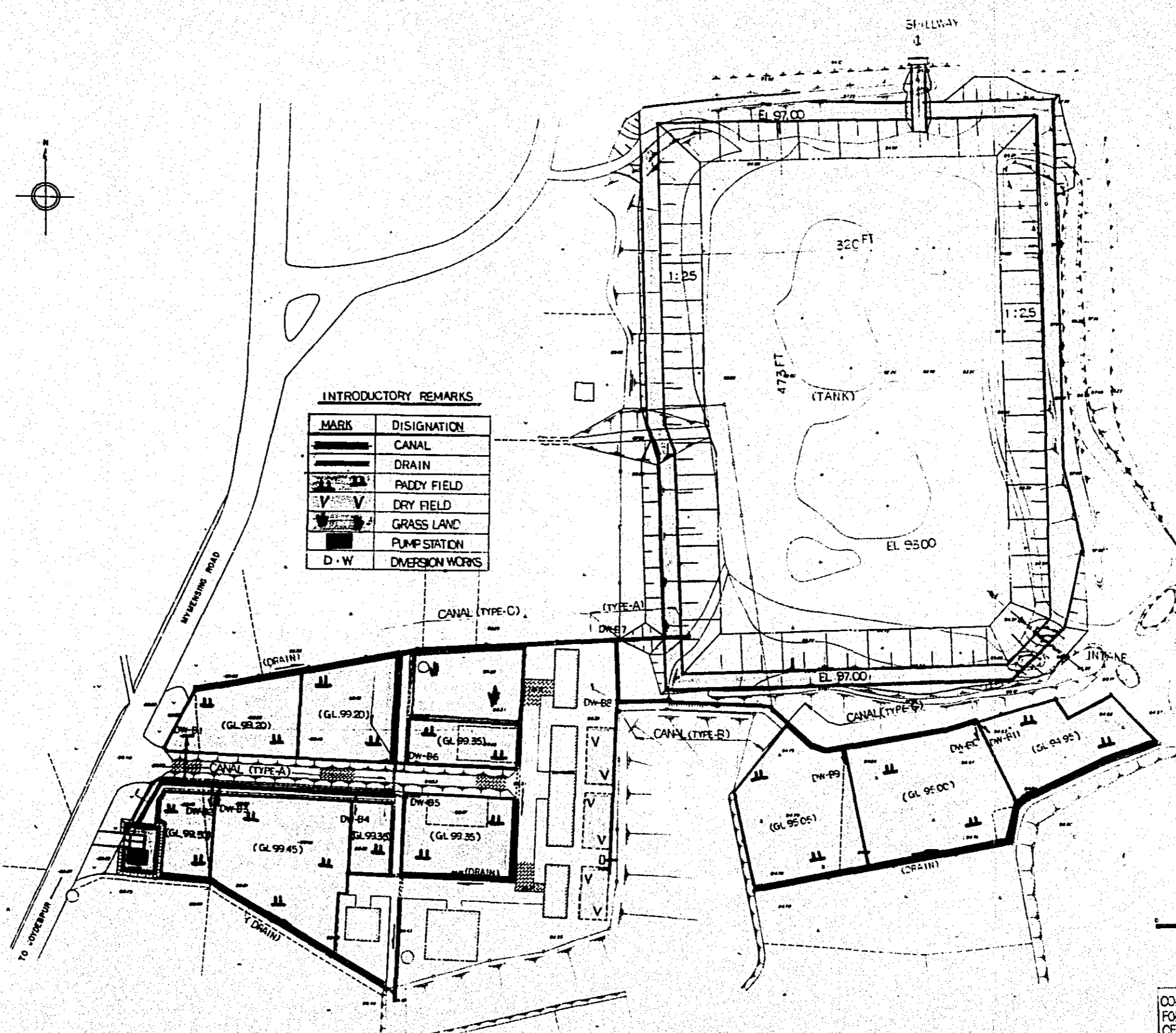
SCALE



CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTERS UNDER CERDI

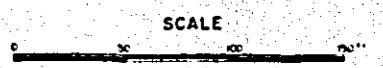
GENERAL PLAN OF PURA PURI
C-D-C

Date: Sept. 1980 | D.W.G. No. 2



INTRODUCTORY REMARKS

MARK	DISIGNATION
	CANAL
	DRAIN
	PADDY FIELD
	DRY FIELD
	GRASS LAND
	PUMP STATION
	DIVERSION WORKS



CONSTRUCTION OF MODEL INFRASTRUCTURE
 FOR THREE COMMUNITY DEVELOPMENT
 CENTERS UNDER CERD
 GENERAL PLAN OF SHABA IP-5
 C.D.C.
 Date Sept 1980 D-WG N. 5

CHAPTER-III: SCHEDULE AND PROCEEDING OF THE STUDY

The present Study has been conducted in the following three stages:

- 1) Preparatory Home Work (3 days from June 13 to 15, 1980)
- 2) Field Operations (60 days from June 16 to August 14, 1980)
- 3) Home Work (37 days from August 15 to September 20, 1980)

- 1) Preparatory Home Work covered the collection of data and information available in Japan, the preparation of the Study Schedule (Table 3-1), and the pre-departure business discussions.
- 2) Field Operations started upon arrival of the two team-members at Dacca on June 17, 1980 via Bangkok. Operational HDQ was established at CERDI Office at Joydebpur since June 18, 1980. The Field Operations were steered according to the Field Operations Program which was worked out immediately after the site-reconnaissance was conducted. Field Operations Program had to be adjusted from time to time because of the interruptions due to rain, Islamic fasting, delay in arrival of the instruments, materials and stationeries from Japan (more than one month). In spite of these and other adverse conditions taxed on the team-members, the study could have been completed within the given time thanks to the all-out support and cooperation offered by the CERDI's Japanese Advisory Group members and the authorities concerned of the Bangladesh Government. Upon submittance of the Interim Report to the Director of the JICA Dacca Office on August 11, 1980, the team-members left Dacca on the following day with "Application Form for the Consturction of the Model Infrastructure" and "Application

Form for Local Procurement of Equipment and Materials" on hand, and returned to Japan on August 14, 1980.

- 3) Home Work was started after the team-members reported back to the JICA HQS, in Tokyo on August 15, 1980 when the above-mentioned Interim Report and two documents were duly submitted to the officers concerned. It has been conducted through the closest liaison with the JICA HQS, and Field Operations, the completion of the final construction designs, the verification of the construction cost estimates, and the preparation of the draft Contract Agreement, the draft Specifications and the Draft Final Report.

The proceeding of the Preparatory Home Work and the Field Operations will be shown as follows:

Proceeding of the Study

<u>Month</u>	<u>Day</u>	<u>Week</u>	<u>Proceeding</u>	<u>Note</u>
June	13	Fri.	<u>Preparatory Home Works</u> Preparation of Study Schedule and Pre-departure discussions	ref. Table 3-1
	14	Sat.	Collection of Data and Preparation for Departure	
	15	Sun.	- do -	
	16	Mon.	<u>Field Operations</u> Flight from Narita(13:55 hrs) to Bangkok(19:45 hrs) - AZ775	Stop-over at Bangkok
	17	Tue.	Flight from Bangkok(11:00 hrs) to Dacca(12:20 hrs) Courtesy Call on Japanese Embassy and JICA Dacca Office	

<u>Month</u>	<u>Day</u>	<u>Week</u>	<u>Proceeding</u>	<u>Note</u>
June	18	Wed.	Reporting at CERDI/Reconnaissance of the three CDCs under CERDI	
	19	Thu.	Working-out of the Field Operation Program	ref. Table 3-2
	20	Fri.	Discussions with CERDI's Japanese Advisory Group members	
	21	Sat.	Greetings to the local officers of CERDI/Discussion on operational program	
	22	Sun.	Colloection of Data & Information	
	23	Mon.	Discussion on the Field Operations Program Collection of Data Request to Omar Sons Ltd. for deep tubewell quotations	
	24	Tue.	Collection and Assimilation of Data	
	25	Wed.	Receipt of Deep Tubewell Quotations Procurement of Surveying Instrument	Telex to Tokyo
	26	Thu.	Discussion with the local officers of CERDI	Report-writing to JICA
	27	Fri.	Meeting with CERDI's Advisory Group Members	
	28	Sat.	Collection and Assimilation of Data	Telex from Tokyo
	29	Sun.	- do -	
	30	Mon.	Surveying work on Bhabanipur site	
July	1	Tue.	- do -	
	2	Wed.	- do -	

<u>Month</u>	<u>Day</u>	<u>Week</u>	<u>Proceeding</u>	<u>Note</u>
July	3	Thu.	Surveying work on Porabari site	
	4	Fri.	Mapping of thw survey results/ meeting with CERDI's Advisory Group	Telex from Tokyo
	5	Sat.	Surveying work on Nawjore site	
	6	Sun.	Mapping of the survey results	
	7	Mon.	Enlargement of Bhabanipur plane	
	8	Tue.	Enlargement of Porabari plane	
	9	Wed.	Collection and assimilation of data Working-out of the Master Plan	
	10	Thu.	Enlargement of Nawjore plane Working-out of the Master Plan	
	11	Fri.	Request for identification of unit construction costs (CERDI Dacca Office) Discussion with CERDI's Advisory Group on the Master Plan	
	12	Sat.	Discussion with CERDI's local officers on the Master Plan Confirmation of Porabari site's boundary	
	13	Sun.	Necessary adjustment to the survey results	
	14	Mon.	Supplementary surveying at Bhabanipur	
	15	Tue.	Supplementary surveying at Porabari	
	16	Wed.	- do -	
	17	Thu.	Mapping of the supplementary survey results	
	18	Fri.	Supplementary surveying at Bhabanipur CDC	

<u>Month</u>	<u>Day</u>	<u>Week</u>	<u>Proceeding</u>	<u>Note</u>
July	19	Sat.	Supplementary surveying at Bhabanipur CDC	
	20	Sun.	Mapping of the supplementary survey results	
	21	Mon.	Supplementary surveying at Nawjore	
	22	Tue.	Supplementary surveying at Nawjore Preparation of survey planes	
	23	Wed.	Preparation of design planes of Nawjore and Porabari Studies on canal cross section	
	24	Thu.	Preparation of Bhabanipur design plane Studies on deep tubewells	
	25	Fri.	Request to Omar Sons Ltd. for deep tubewell detail quotations Meeting with CERDI's Advisory Group	
	26	Sat.	Detail design of Nawjore site	
	27	Sun.	Studies on design planes	
	28	Mon.	Detail design and its mapping of Nawjore site	
	29	Tue.	Detail design of Porabari and Bhabanipur sites	
	30	Wed.	Detail design of Porabari and Bhabanipur sites and their mapping Receipt of detail quotations from Omar Sons Ltd. for deep tubewells and other materials	
	31	Thu.	Bills of Quantities and cost-estimation of infrastructural construction at three CDCs	
August	1	Fri.	- do - Meeting with CERDI's Advisory Group members	
	2	Sat.	Bills of Quantities and cost-estimation of infrastructural construction at three CDCs	

<u>Month</u>	<u>Day</u>	<u>Week</u>	<u>Proceeding</u>	<u>Note</u>
August	3	Sun.	Preparation of notes for the final consultation	
	4	Mon.	Final consultation with CERDI's local officers	
	5	Tue.	Preparation of design planes, cost-estimation and Application Form for this Construction Work	
	6	Wed.	Preparation of design planes and cost-estimation	
	7	Thu.	Drafting of notes	
	8	Fri.	Drafting of the Interim Report	
	9	Sat.	- do -	
	10	Sun.	- do -	
	11	Mon.	Submittance of the Interim Reports to JICA Dacca Office Greetings at Japanese Embassy, JICA Dacca Office and CERDI	
	12	Tue.	Preparations for return journey to Japan	
	13	Wed.	Flight from Dacca(07:30 hrs) to Bangkok(10:50 hrs) - BG 080	Stop-over at Bangkok
	14	Thu.	Flight from Bangkok(13:30 hrs) to Narita(21:20 hrs) - AZ 782	

Home Works

August 15 Fri. - September 19 Fri.
 Review the results of field Operations
 Detailed Design
 Preparation of the Design Report

September
 20 Sat. Submittance of the Design Report

Table 3-1 Work Schedule

Item	1980				
	June	July	August	September	
A. Preparatory Home Work	☐				
B. Field Operations					
1. Reconnaissance					
2. Preparation of Operational Program					
3. Collection of Data and Information					
4. Surveying					
5. Plans for Water Supply, Irrigation and Drainage					
6. Preparation of Master Plan					
7. Designing & Cost Estimation					
8. Preparation of the Interim Report					
C. Home Work					
1. Close Checks of the Field Operation Results					
2. Final Design Work					
3. Computation of Construction Cost					
4. Preparation of Contract Agreement and Specifications (Draft)					
5. Preparation of Final Design Report					
D. Submittance of Reports					
1. Interim Report					
2. Final Design Report					

Table 3-2 Field Operational Program

ITEM	1980		
	June	July	August
Reconnaissance	18 *		
Collection of Data and Information	20 29		
Establishment of the Course and the Scope of Field Operations	19 28		
Surveying and Topographical Mapping	30	12	
Basic Construction Plan	20	5	
Construction Designing		6	2
Cost Estimation			1 5
Construction Programming			3 8
Preparation of the Interim Report			6 11
Discussions	19 *	28 *	5 *
			31 *
			12 *

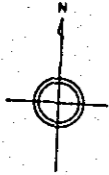
CHAPTER-IV: SURVEYING

Prior to the commencement of the actual surveying work, the team members made reconnaissance trips to the sites belonging to the Community Development Centers at Bhabanipur, Porabari and Nawjore. It was necessary to establish a schedule for surveying works and preparation of topographical maps covering these farms. Simultaneously, the team made an official request to the authorities concerned of the Bangladesh Government for supply of the pertinent topographical maps which were ultimately made available in August but found unfit for design work (refer to Appendix II).

Because of late delivery of the surveying instrument, which is sent from Tokyo, the minimum necessary instrument had to be procured locally; surveying work was commenced from June 30 1980, although the work was often interrupted by rains. Surveying work consisted of the plane table surveying and the leveling on respective sites and their vicinity. It was conducted with the all-out support and cooperation of the Japanese Advisory Group members and the local staff of CERDI. Topographical maps thus prepared are attached as Fig. 4-1, 4-2 and 4-3.

As far as Porabari and Nawjore CDCs are concerned, the land acquisition problems had not been solved by the time of surveying, hence no definite boundary lines could have been entered on the maps.

Surveying work was conducted under adverse conditions particularly due to monsoon rains; the site of Bhabanipur could not be reached by vehicles and the team members had to trek along the muddy road for the distance of about 4 km. These conditions have been taken into consideration in preparing the Construction Plan.



□ Pump house

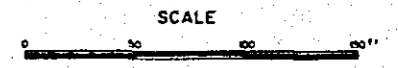
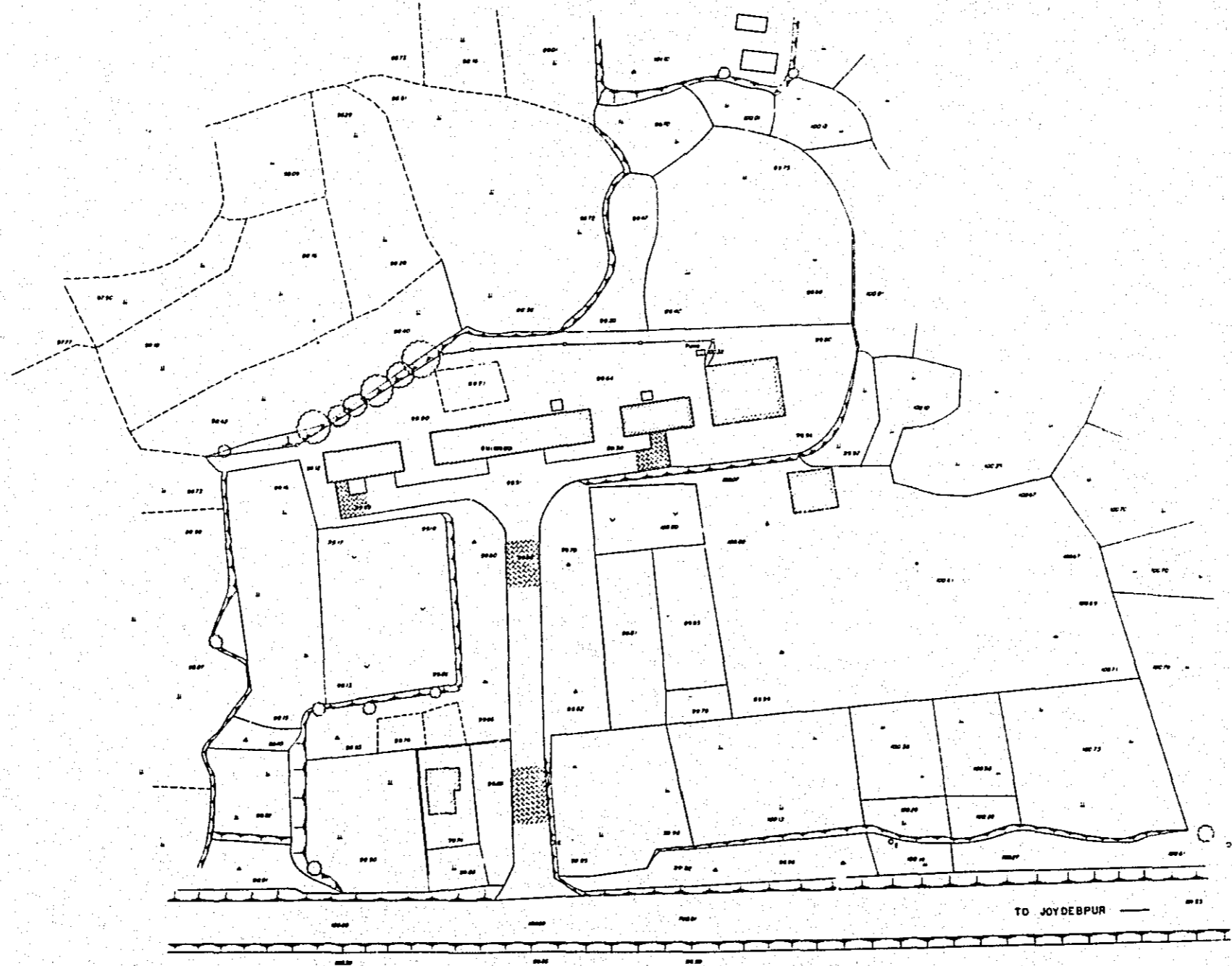


Fig. 4-1
NAWJORA COMMUNITY CENTER
Date: Sept 1980

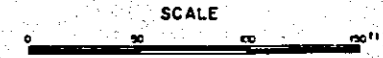
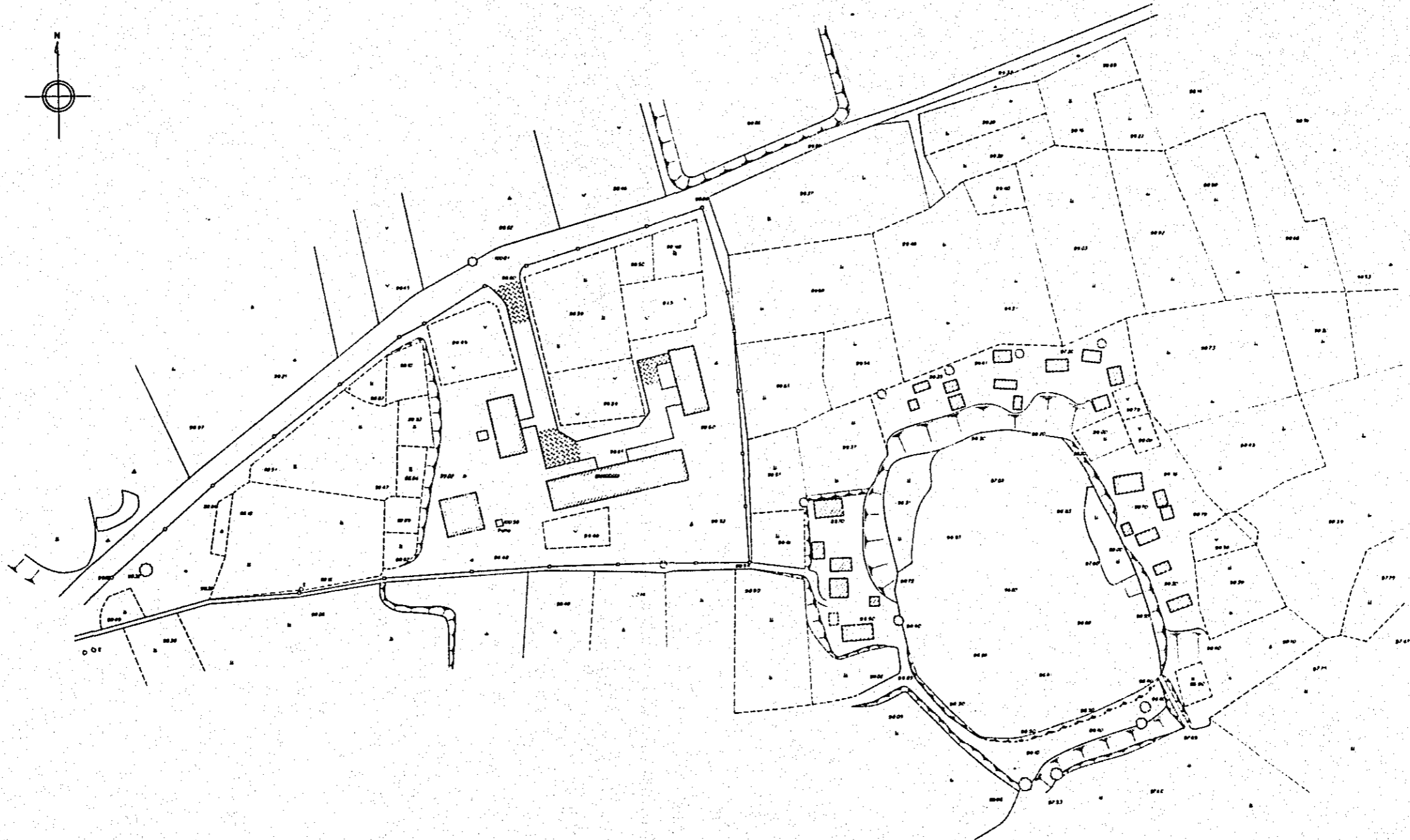


Fig. 4-2

PORABARI COMMUNITY CENTER

Date: Sept 1980

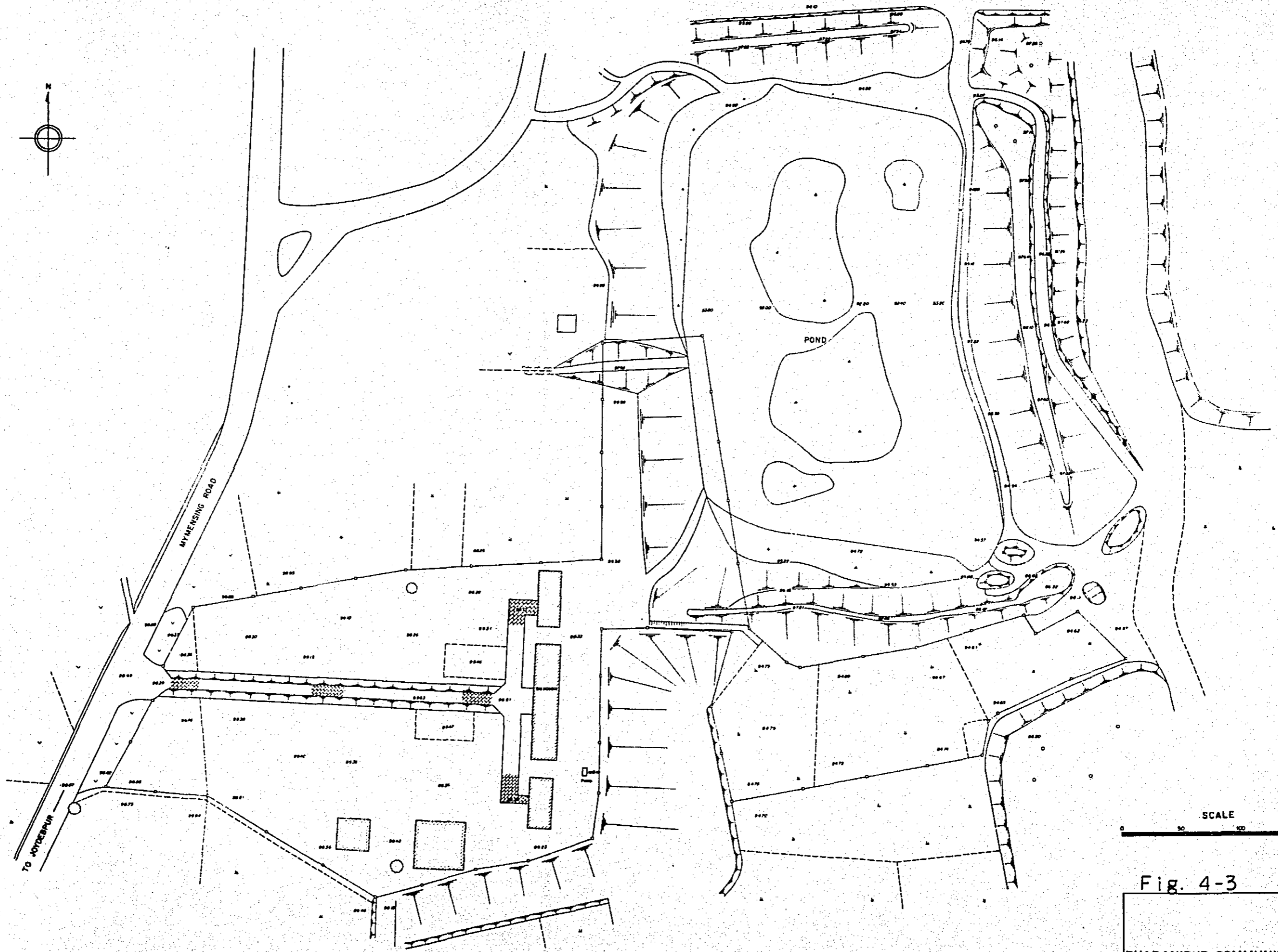


Fig. 4-3

BHABANIPUR COMMUNITY CENTER

Date: Sep 1 1980

CHAPTER-V: DESIGN

5.1 Basic Policy

The crucial point to be pre-decided for designing the infrastructural construction was how to gauge the net contents and the scope of construction work on the limited budget previously allocated for this purpose. As was mentioned in the Proceeding of the Study as arranged in tabular form under Chapter - II, the basic policy to cope with this major premise was developed through deliberate discussions between the CERDI's Advisory Group members, the authorities concerned of the Bangladesh Government, the Director of JICA Dacca Office, and occasional liaison with JICA HQS in Tokyo. Ultimately the basic policy came to comprise of the following five issues:

- 1) The top priority should be given in providing each one deep tubewell with every Community Development Center; the restoration of the existing ponds and the land-consolidation should be attended at by that order;
- 2) The pumping equipment to be installed at the deep tubewells should be those previously supplied from Japan on grant-basis and are currently kept in the custody by CERDI; other necessary materials for sinking deep tubewells such as casing pipes, strainers, etc., could be locally procured by allocating a portion of the budgeted account earmarked for shipment of the equipments and materials to Bangladesh on grant-basis during 1980;

- 3) Land-consolidation should be designed in the simplest manner from the existing topographic conditions and the cost-economization points-of-view;
- 4) Canals should, as a rule, be lined with bricks; and
- 5) Improvement of the existing irrigation ponds should be aimed at rehabilitation of the original shape and slope by utilizing the soil made available from the pond-beds.

5.2 Consolidation of the Farms

The farms belonging to the three CDCs are very much limited in their size and they have been put under cultivation as either paddyfield or upland field during the monsoon seasons. Topographically, they are generally flat, requiring no major consolidation work which complies with the basic policy adopted previously. It was therefore decided to carry out what is actually required; a minor block re-formation and a simple land leveling.

However, the paddyfield located on the southern bank of the pond in Bhabanipur Center is depressed without affording to proper drainage. This requires the only major land improvement work to raise the field-level by one foot with the soil made available from the pond-bed.

The land-use pattern of the farms would remain the same, but design of these farms has been so devised to allow their use either as paddyfield or upland field.

5.3 Water Supply Facilities

5.3.1 Source of Irrigation Water

Nawjore CDC has no source of supply of surface water in its vicinity in terms of river or pond. Cultivation has thus been restricted during the monsoon season alone. Both Porabari and Bhabanipur CDCs have so-called irrigation ponds in their compound, but they are too dilapidated to serve the purpose, leaving their "beneficiary areas" in the same rain-fed conditions as in the case of Nawjore. Moreover, as they are isolated ponds depending for their storage on the rainfall within their own restricted catchment area only, they can be expected to function, even if properly restored, for supplementary irrigation during the monsoon season plus an initial period of the dry season.

On the other hand, the lands belonging to the three CDCs are amply endowed with ground water, as has been confirmed from many working examples in their neighbourhood. Sinking of deep tubewells will obviously guarantee a stabilized supply of irrigation water even during the dry season.

It was therefore unanimously agreed upon among the Japanese Advisory Group members and the authorities concerned of the Bangladesh Government to sink deep tubewells in every CDC farm to tap the ground water as the principal source of irrigation water. This was indeed predicted in the fact of that the pumping equipment for deep tubewell had already been supplied from Japan and have been kept in the custody by CERDI.

5.3.2 Pumps for the Deep Tubewells

The pumping equipment required for installation of the deep tubewells will be supplied out of the stock of CERDI. The specifications of the pumps and engines are as stipulated in the below (also refer to Fig. 5-1 and Appendix III).

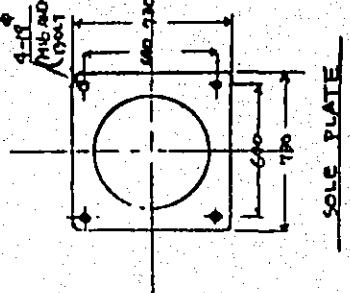
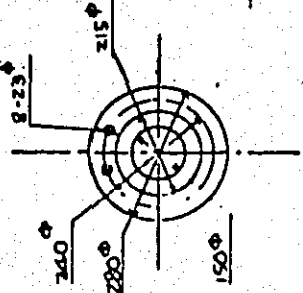
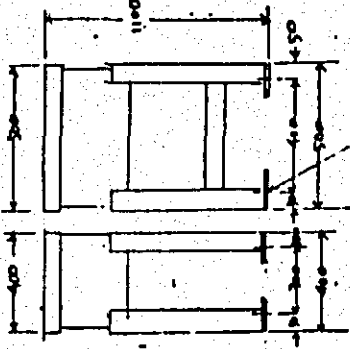
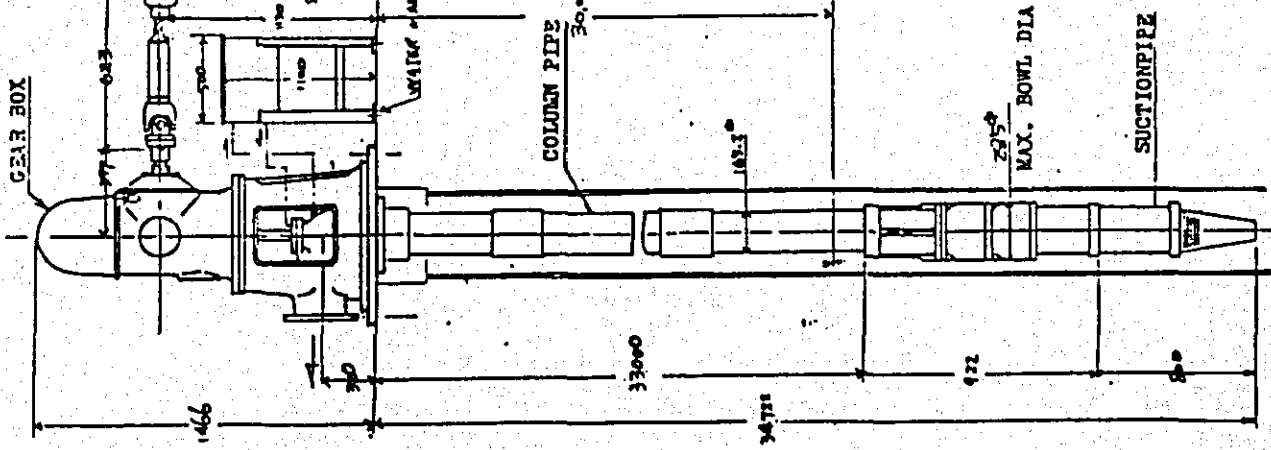
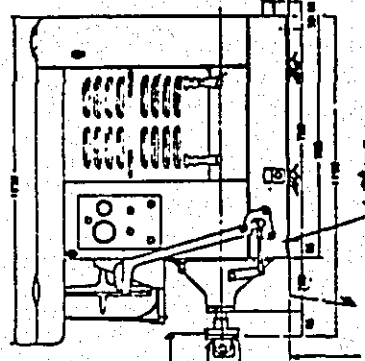
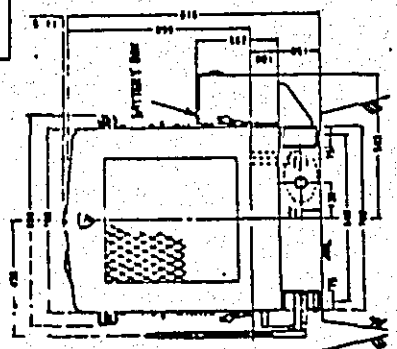
1) Pump

Type : Bore hole pump (Vertical turbine pump)
Discharge size : 150 mm (6 inches)
Discharge : 2.5 m³/min. (1.47 cusec)
Total head : 33 m
Req. power : 32 PS
Revolution : 1,800 r.p.m.
Number of stage : 2 stages
Total length : Approx. 36 m (after installation)

2) Engine

Type : Bonnet type diesel engine (with manual clutch)
Power : 38 PS
Revolution : 2,200 r.p.m.
Cycle : 4 cycles
Cooling system : Water cooling
Starting system : Cell mortar
Piston displacement : 2,369 cc
Compression ratio : 20 to 1

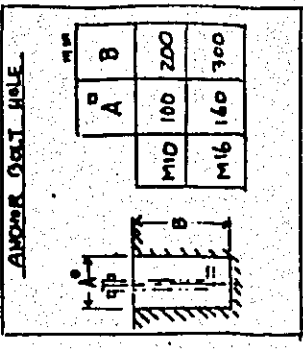
3rd ANGLE PROJECTION
 PLAN RECORD
 ISO METRIC SCREW THREADS



SPECIFICATION

WELL DIA.	12 INCH
COLUMN PIPE	6 INCH
DISCH. SIZE	6 INCH
DISCHARGE	2.5 m ³ /min
TOTAL HEAD	33 m
REVOLUTION	1800 RPM
REQ. POWER	32 PS

ENGINE
 ISUZU DIESEL ENGINE POWER UNIT
 WATER COOLED *Model: UAC 8000A*
 GCR. 11004 2874/2800 rpm



NO.	DESCRIPTION	MATERIAL	NO. REQ'D	UNIT	REMARKS
01	ENGINE	ISUZU	1	UNIT	
02	GEAR BOX	CAST IRON	1	UNIT	
03	WATER MAKE-UP TANK	STEEL	1	UNIT	
04	DISCHARGE FLANGE	STEEL	1	UNIT	
05	SUCTION PIPE	STEEL	1	UNIT	
06	SOLE PLATE	STEEL	1	UNIT	

Fig. 5-1
 TYPE/SP VERTICAL TURBINE PUMP
 (MODEL : NP-6005)

DESIGNER: H. Kato
 CHECKER: R. Sato
 SCALE: 1/2

TAKASAGO TEKAO Y. K. PUMP DIVISION
 T90315-15

5.3.3 Deep Tubewells

The location of the deep tubewells in three CDCs under CERDI is as shown on the Design Plan. The team made a proposal as to their location on the basis of the relative distance between the farms and the ponds (Porabari and Bhabanipur), the topography (ground-height), the possible interference between the existing wells (Nawjore), and the utility for extension activities; the final decision was made after discussions with the Japanese Advisory Group and the authorities concerned of the Bangladesh Government.

In Bangladesh, there have been sunk quite a number of deep tubewells and people have rich experience with their installation and operation. In sinking deep tubewell, the diameter of the casing pipe and the strainer is usually self-same in Japan, but in Bangladesh people generally use blind pipe and strainer of smaller diameter than the casing pipe's below the pump. Therefore, quotations for deep tubewell installation jobs were asked for from the Omar Sons (Bangladesh) Ltd., the firm which had undertaken the construction of the three CDC buildings including sinking of deep tubewells for drinking water.

Diameter and length of the strainer originally proposed by the Omar Sons Ltd., said 6" and 60', respectively. To avoid sand flow around the strainer, its length has been extended to 90' upon deliberation with the engineering staff of the firm.

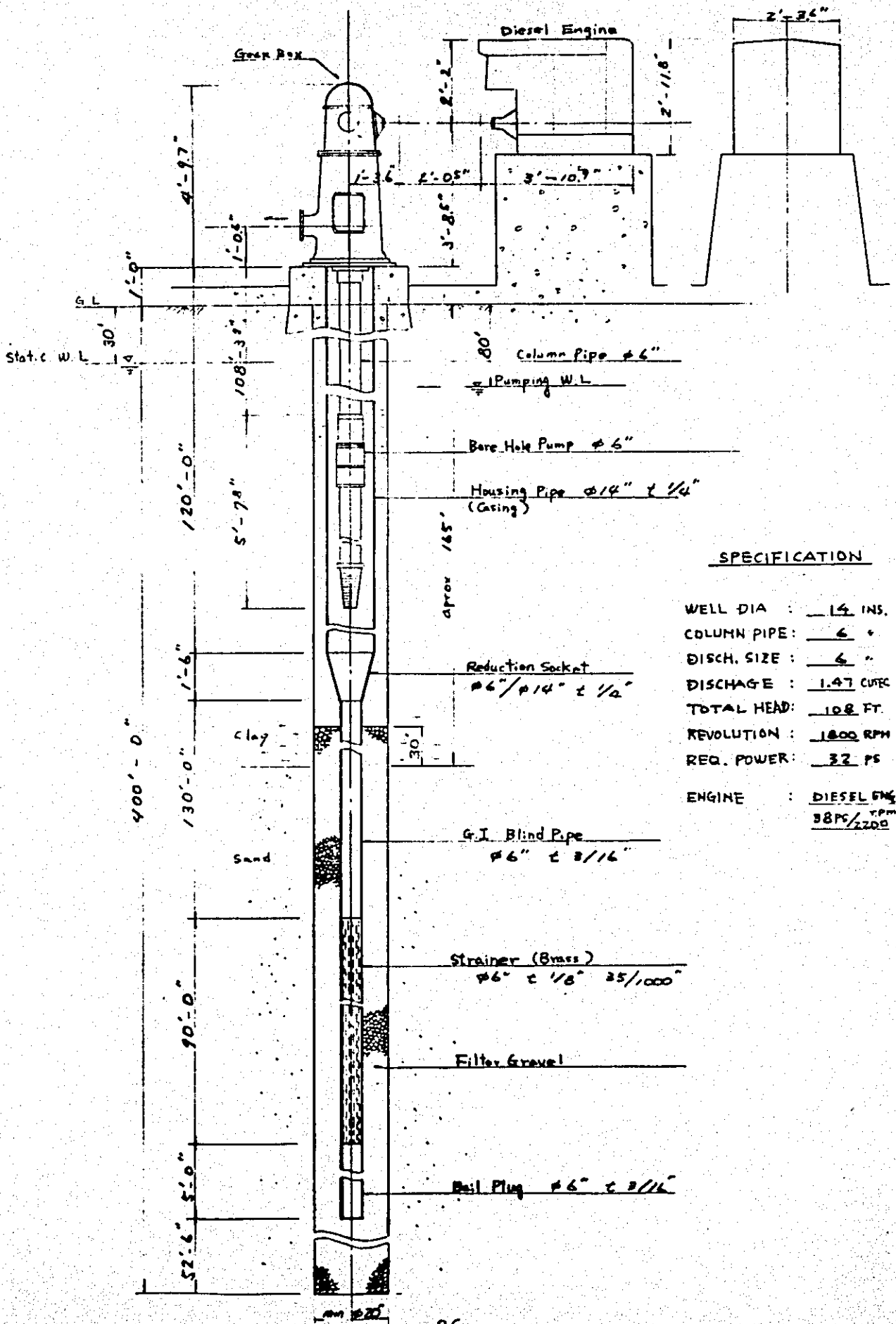
Gravel-filling around the strainer and blind pipe is generally done upto the ground surface in Bangladesh but this practice is undesirable because it may induce infiltration of the polluted water thereby into the water-bearing stratum and/or the well. Thereupon, it was decided that gravel-

filling will have the depth of about 30 feet above the aquifer and clay-filling will be effected further upward.

Specifications of the deep tubewells and the material requirements are given in Fig. 5-2 and Table 5-1, respectively.

The contract will be held responsible as for the amount of discharge and the safety of the wells.

Fig. 5-2 DEEP TUBEWELL



SPECIFICATION

WELL DIA :	14	INS.
COLUMN PIPE :	6	"
DISCH. SIZE :	6	"
DISCHARGE :	1.47	CUSEC
TOTAL HEAD :	108	FT.
REVOLUTION :	1800	RPM
REQ. POWER :	32	PS
ENGINE :	DIESEL ENG	
	38PS	2200 RPM

Table 5-1 Estimate of Materials to be needed for Installation of the Deep Tubewells, except Pump, Engine, Accessories and Filter Gravel

No.	Material	Unit	Quantity	Rate (Tk.)	Amount (Tk.)
1.	Bail plug made out of G.I. sheet, provided with a strong hook for lowering the fixture: ϕ 6", length 5', thickness 3/16"	No.	1	1,000	1,000
2.	Brass strainers complete with sockets: ϕ 6", thickness 1/8", slot opening 35/1000"	Rft.	90	700	63,000
3.	G.I. Blind pipes with selded connections or sockets: ϕ 6", thickness 3/16"	Rft.	160	150	24,000
4.	M.S. Housing pipes with welded connections or sockets (for installation of sub-mersible or deepwell turbine pumps): ϕ 14", thickness 1/4"	Rft.	120	450	54,000
5.	Reduction sockets between blind pipes/housing pipes made out of M.S. Sheets: ϕ 6"/14", length 1"-6", thickness 1/4"	No.	1	800	800
6.	Centralisers made out of M.S. bars to be placed: approx. every 30' ft.	Nos.	8	70	560
Total					143,360
Total (for three tubewell)					430,000
					(Approx. Yen 6,450,000)

5.3.4 Discharge Box

Discharge Box which will be built adjacent to the Pumping House functions as a stilling pool to dissipate the excess energy of the water discharged from the pump and controls the amount of water which flows out of it for irrigation purpose. Its capacity would correspond to five times as much as the pumping discharge ($2.5 \text{ m}^3/\text{min.}$), that is 13 m^3 . The discharge box will be built by bricks and finished by cement plaster (refer to DWG. No.7).

5.3.5 Pumping House

Pumping House will have the minimum necessary space (12' x 16') to accommodate the pumping facilities for deep tubewell, being protected by brick walls in conformity with the local practice. Roofing by concrete slab is preferable but as it would take more than six-months' time due to the local conditions, galvanized iron sheet (corrugated) would be used instead. After construction, tin roof may be temporarily removed when the pump installed in the pumping house need to be lifted out for repair (refer to DWG. No.6).

5.4 Irrigation and Drainage Canals

5.4.1 Irrigation Canals

The size of the farms in the three CDCs being too small in comparison with the irrigability attributable to each deep tubewell (more than 20 ha), there is no need to worry about the crop water requirements.

The cross section of the irrigation canal has been decided to comply with the design discharge of each pump, that is 2.5 m³/min. (1.47 cusec). Surface irrigation system through open canal has been adopted from economic, topographical and farm-management points-of-view. Each plot of field will be provided with individual water management facilities.

Canal will be lined with brick finished by cement plaster for the distance immediately below the intake facilities where flow velocity is expected to be considerably high; otherwise all the irrigation canals will be earthen. Brick-lined portion of the irrigation canal will be structured in a rectangular section with lower invert. This type is preferable to other types from engineering workability, construction conditions and seepage prevention (refer to DWG. No. 8).

5.4.2 Drainage Canals

Drainage canals (farm drain) will be unlined canal and will be so aligned as to run along the fringe of every plot of field (refer to DWG. No. 1 to No. 3 and No.8).

5.5 Improvement of Irrigation Ponds

Both Porabari and Bhabanipur CDCs have so-called irrigation ponds in their compound, but they are too dilapidated such as same parts of the bank had been cut and paddy is planted and/or floating weeds are growing thick inside of the ponds and they cannot serve the purpose at the present.

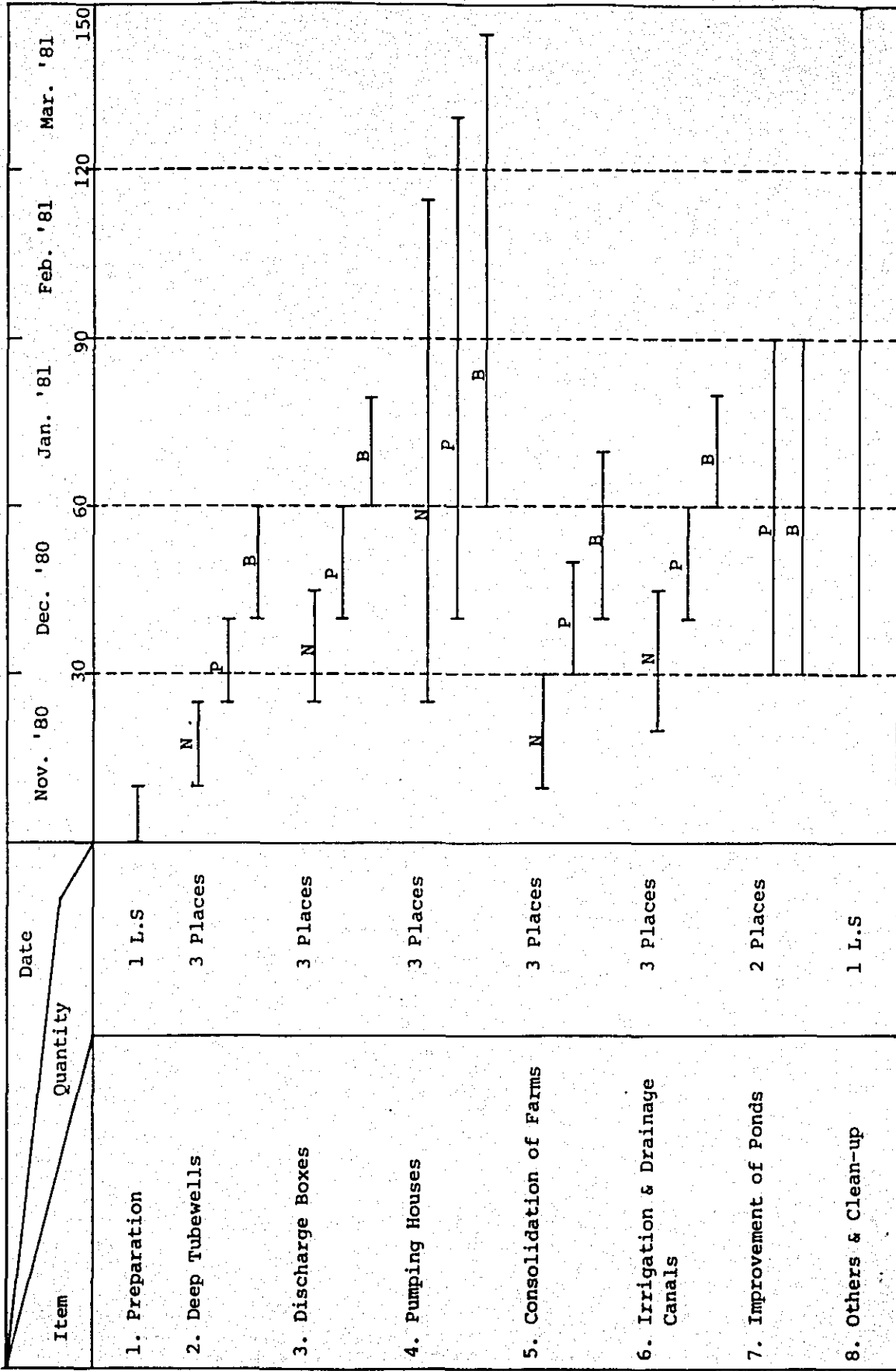
Thus, some of improvement works of the existing ponds should be needed to rehabilitate their original function and to make use of the CDCs' activities. The improvement works will be carried out within the limited budget allocated for the works and the works consist of partial re-construction of the bank, slight height increasing, construction of spillways and outlet works, removal of the floating weeds, and rehabilitation of the original shape and slope.

The earth work will be done by man power and utilizing the soil made available from each pond-bed in conformity with the local practice.

The scale of the ponds after the improvement is shown below.

<u>Ponds</u>	<u>Area at F.W.L.</u>	<u>Effective Water Depth</u>	<u>Effective Storage Capacity</u>
Prarabari Pond	2,800 m ²	0.70 m	1,900 m ³
Bhabanipur Pond	12,300 m ²	1.00 m	12,000 m ³

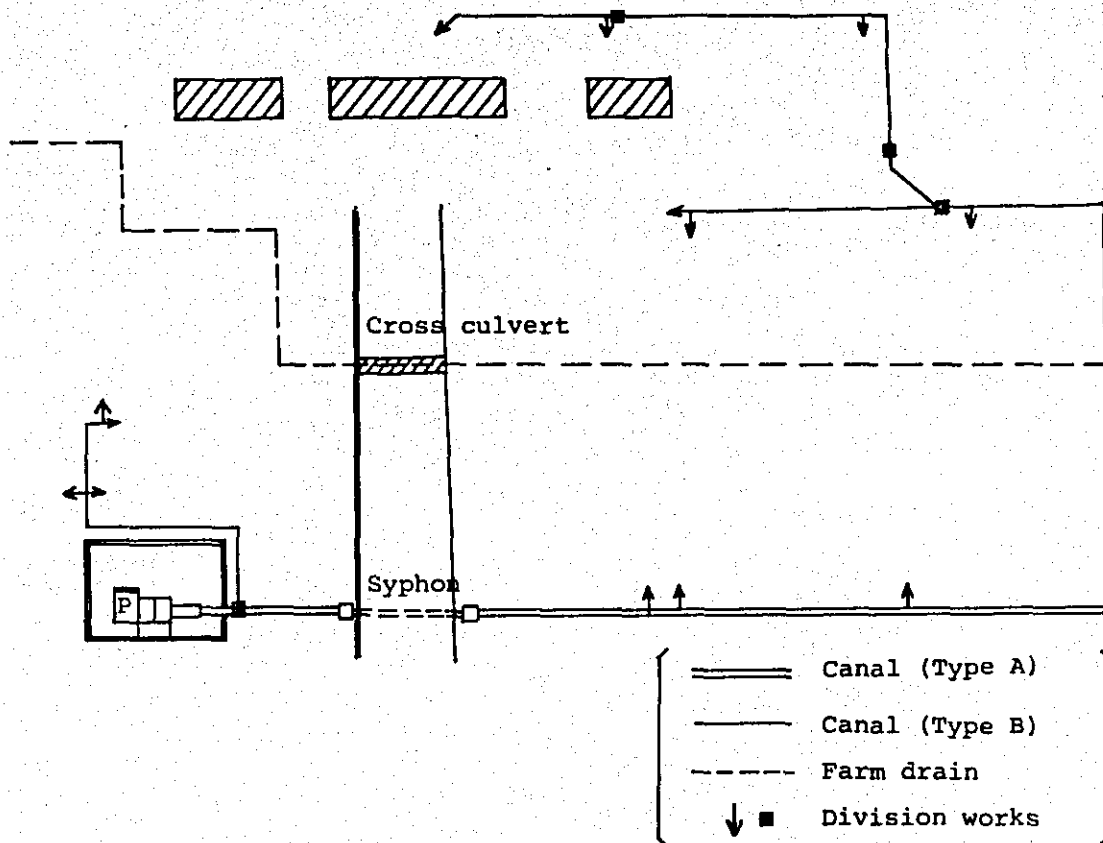
5.6 Summarized Construction Schedule



Note) N Nawjore, P Porabari, B Bhabanipur

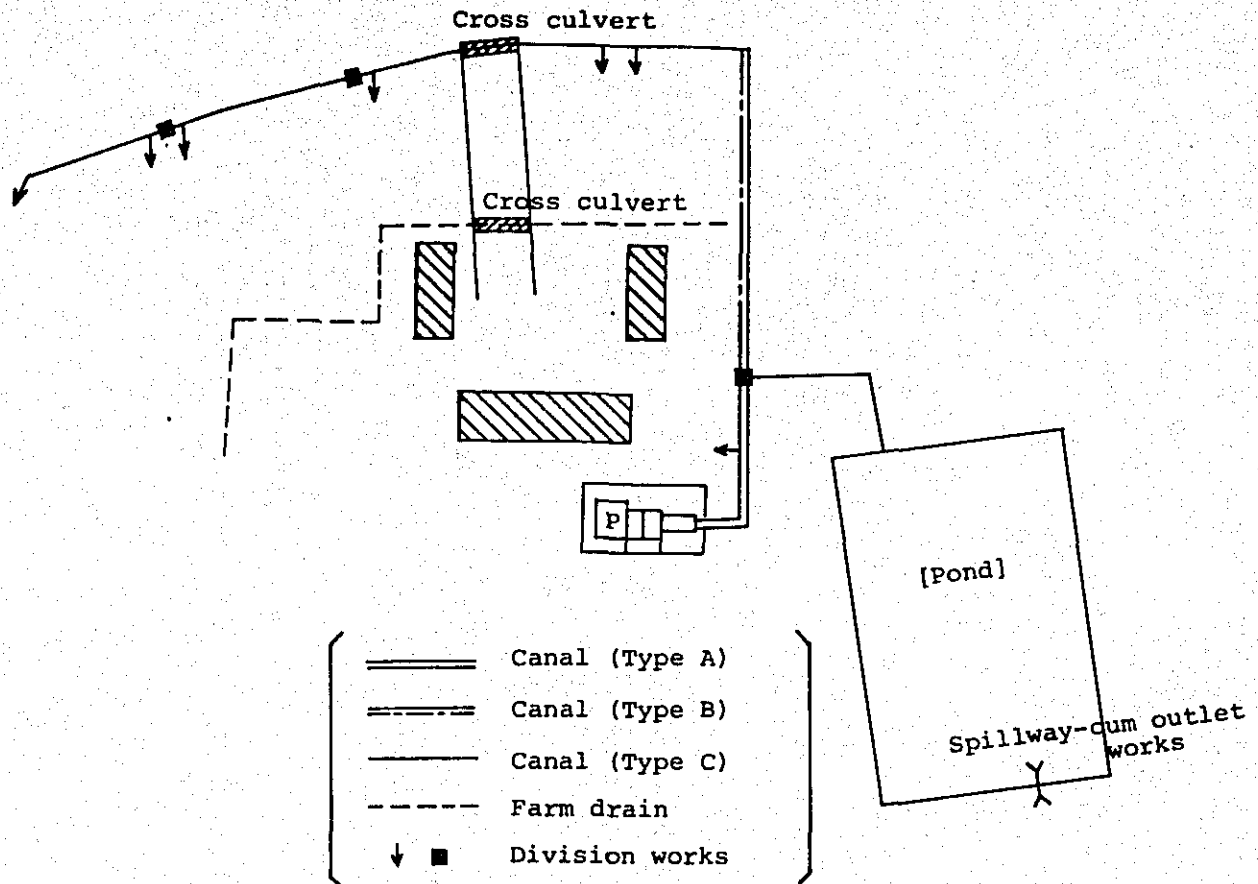
5.7 Summary of Quantities

1) Nawjora Community Center



Item of Works		Unit	Quantity	Note
Water Supply Works	Deep tubewell	No.	1	
	Pump house	sft	192	16' × 12' × 19'
	Discharge box	No.	1	
	Earth work (stripping)	sft	3,100	
	Earth work (filling)	cft	12,800	
	Turfing	sft	1,800	
Consolidation of the Farm	Surface soil treatment	sft	14,000	d = 8'
	Land grading & re-adjustment	cft	5,300	
Canal Works	Canal (Type A)	rft	470	
	Canal (Type C)	rft	1,070	
	Farm drain	rft	690	
	Division works	Nos.	17	
	Syphon	No.	1	
	Cross culvert	rft	23	

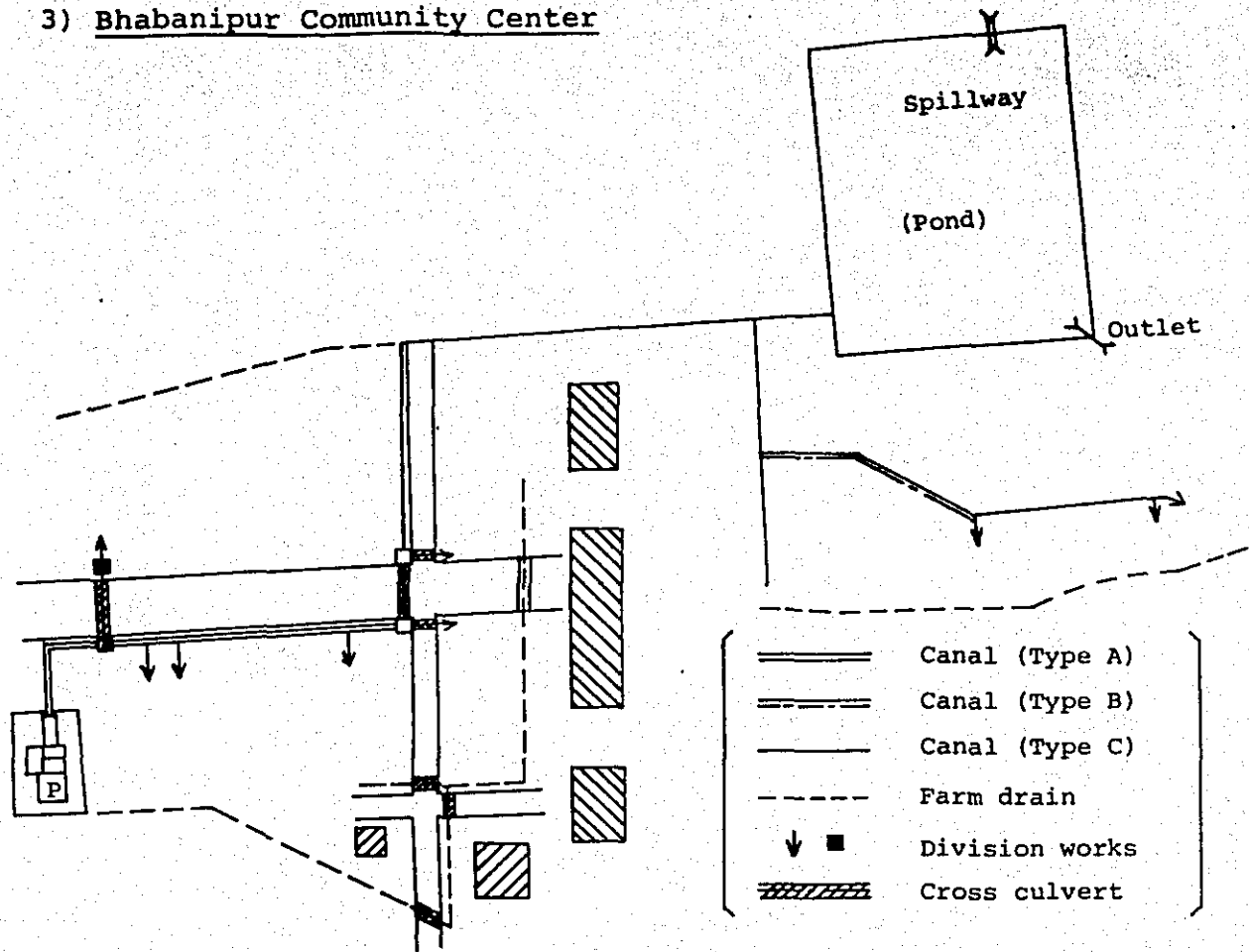
2) Porabari Community Center



Item of Works		Unit	Quantity	Note
Water Supply Works	Deep tubewell	No.	1	
	Pump house	sft	192	16' x 12' x 9'
	Discharge box	No.	1	
	Earth work (stripping)	sft	2,000	
	Earth work (filling)	cft	4,000	
	Turfing	sft	600	
Consolidation of the Farm	Surface soil treatment	sft	8,500	
	Land grading & re-adjustment	cft	4,000	
Canal Works	Canal (Type A)	rft	90	
	Canal (Type B)	rft	170	
	Canal (Type C)	rft	520	
	Farm drain	rft	420	

Item of Works		Unit	Quantity	Note
Canal Works	Division works	Nos.	8	
	Cross culvert	rft	12	
Improvement of Pond	Stripping	sft	8,000	
	Earth works	cft	35,000	
	Turfing	sft	7,700	
	Bailingout water	cft	35,000	
	Single layer brick flat soling	sft	465	
	Mass concrete	cft	210	
	Brick work	cft	303	
	Cement plaster (t = 1/2")	sft	309	
	Reinforced concrete	cft	17	
	Stop-log	cft	2.5	

3) Bhabanipur Community Center



Item of Works		Unit	Quantity	Note
Water Supply Works	Deep tubewell	No.	1	
	Pump house	sft	192	16' x 12' x 9"
	Discharge box	No.	1	
	Earth work (stripping)	sft	2,100	
	Earth work (filling)	cft	4,300	
	Turfing	sft	592	
Consolidation of the Farm	Surface soil treatment	sft	36,000	
	Land grading & re-adjustment	cft	32,000	
Canal Works	Canal (Type A)	rft	230	
	Canal (Type B)	rft	150	
	Canal (Type C)	rft	530	
	Farm drain	rft	1,090	
	Division works	Nos.	8	
	Cross culvert	rft	115	

Item of Works	Unit	Quantity	Note	
Improvement of Pond	Jungle clearing	sft	26,800	
	Stripping	sft	26,800	
	Earth work	cft	96,000	11,000 cft for removal floating weeds
	Turfing	sft	17,400	
	Bailout water	cft	21,600	
	Single layer brick flat soling	sft	1,047	
	Mass concrete	cft	554	
	Brick work	cft	336	
	Cement plaster	sft	422	
	Reinforced concrete	cft	30	
	Gate	No.	1	3' x 3' steel gate
	φ12" pipe	rft	43	

Unit Quantities (1)

Item of Works	Unit	Quantity	Note
Canal (Type A) - per ten running feet -	Single layer brick flat soling	sft	35.8
	Brick work	cft	17.7
	Cement plaster (1/2")	sft	59.1
	Earth work	cft	130.0
	Turfing	sft	64.9
Canal (Type B) - per ten feet -	Single layer brick flat soling	sft	31.7
	Brick work	cft	14.6
	Cement plaster (1/2")	sft	48.3
	Earth work	cft	69.5
	Turfing	sft	55.5
Canal (Type C) - per ten feet -	Earth work	cft	75.0
	Turfing	sft	50.8
Farm Drain - per ten feet -	Earth work	cft	30.0
	Turfing	sft	53.3
Discharge Box - per one number -	Single layer brick flat soling	sft	366.1
	Reinforced concrete	cft	133.8
	Brick work (6:1)	cft	465.4
	Cement plaster (4:1)	sft	843.9
	Mass concrete (6:3:1)	cft	2.0
	R-C pipe (φ12")	rft	10.0
	Steel gate	No.	1
	Reinforcement	cwt	5.1
Division works - per one number -	Single layer brick flat soling	sft	25.2
	Brick work (6:1)	cft	17.0
	Cement plaster	sft	33.5
	Mass concrete	cft	1.5
	Concrete slab-B	Nos.	0.06

} Average

Unit Quantities (2)

Item of Works		Unit	Quantity	Note
Syphon - per one number -	Single layer brick flat soling	sft	98.0	
	Brick work	cft	331.3	
	Mass concrete	cft	65.3	
	Cement plaster (t=1/2")	sft	215.5	
	R.C pipe (φ12")	rft	33.0	
Cross Curbert - per ten feet -	Single layer brick flat soling	sft	35.8	
	Brick work	cft	18.7	
	Cement plaster (t=1/2")	sft	57.5	
	Covering slab	cft	8.3	
	Reinforcement	cwt	0.44	
	Earth work	cft	80	
Spillway-cum-outlet Works (for Porabari CDC)	Single layer brick flat soling	sft	465.2	
	Mass concrete	cft	209.8	
	Brick work	cft	303.6	
	Cement plaster (t=1/2")	sft	309.1	
	Reinforced concrete	cft	16.7	with re-inforcement
	Stop-log	cft	2.5	
Spillway (for Bhabanipur CDC)	Single layer brick flat soling	sft	1006.0	
	Mass concrete	cft	518.2	
	Brick work	cft	291.6	
	Cement plaster (t=1/2")	sft	357.9	
	Reinforced concrete	cft	29.7	with re-inforcement
Outlet Works (for Bhabanipur CDC)	Single layer brick flat soling	sft	40.8	
	Mass concrete	cft	35.7	
	Brick work	cft	44.5	
	Cement plaster (1/2")	sft	64.5	
	Gate (3' x 3')	No.	1	
	R.C. pipe (φ12")	rft	43.0	

CHAPTER-VI: COST ESTIMATION

Construction costs of the Deep tubewell and Pumping house have been estimated on the basis of the quotations prepared by the local contractor (Messrs Omarr Son's Ltd.) (ref. Appendix IV). While the said quotations are made on the assumption that a submergible motor pump will be used, the Pump which has been decided for actual installation is a bore-hole pump run by diesel engine. Hence the estimated cost has been increased by TK.8,000 to meet the contingencies for installation of the engine on its foundation. The local contractor's quotations for construction of the pumping house are made on the assumption of using concrete-slabs for roofing and the total cost amounts to TK.60,000 (TK.223/sft). This unit cost has been reduced to TK.150/sft as the roofing material was switched over from concrete-slab to galvanized iron sheet (corrugated).

For other items, cost estimation has been made in reference to the official documents published by the Public Works Department, named "Schedule of Rates (1/8/'79)" and "Analysis of the Rates (1/8/'79)" and by the Water Development Board, named "Schedule of Rates for Dacca Water Dev. Circle (July '79)". In order to adjust the costs to be used this Cost Estimation to actual current costs, further references were made to the unit costs of the similar construction work whose contracts was awarded to the local contractor on the government agency in July 1980 and same informations concerning with current situations of construction works in Bangladesh.

COST ESTIMATION

Name of the Work: Construction of Model Infrastructure
for Three Community Development Center
under CERDI

CONSTRUCTION COST

<u>No.</u>	<u>Description of Work</u>	<u>Quantity</u>	<u>Unit</u>	<u>Rate</u>	<u>Amount</u>
"Nawjore C.D.C."					
1	Water Supply Works	1	Sum		TK.240,000/
2	Consolidation of the Farm	1	Sum		TK.8,000/
3	Canal Works	1	Sum		TK.63,000/
4	Other Works	1	Sum		TK.10,000/
	Sab-total				TK.321,000/
"Porabari C.D.C."					
5	Water Supply Works	1	Sum		TK.229,000/
6	Consolidation of the Farm	1	Sum		TK.5,000/
7	Canal Works	1	Sum		TK.25,000/
8	Improvement of Pond	1	Sum		TK.32,000/
9	Other Works	1	Sum		Tk.19,000/
	Sab-total				TK.310,000/
"Bhabanipur C.D.C."					
10	Water Supply Works	1	Sum		TK.229,000/
11	Consolidation of the Farm	1	Sum		TK.27,000/
12	Canal Works	1	Sum		TK.48,000/
13	Improvement of Pond	1	Sum		TK.64,000/
14	Other Works	1	Sum		Tk.33,000/
	Sab-total				TK.401,000/
	<u>Total</u>				<u>TK.1,032,000/</u>

TK.50,000/ for the expenses for execution of the Work and
TK.58,000/ for the contingency reserve will be needed for
an additional expenses.

Water Supply Works for Nawjore C.D.C.

TK. 240,000/

(Item NO. 1)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Deep Tube Well	1	No.	171,000	171,000	ref. Item NO.101
Pump House	192	sft	150	28,800	16'X 12'X 9'
Discharge Box	1	No.	23,600	23,600	ref. Item NO.102
Earth Work (Stripping)	3,100	sft	0.24	744	
do (Filling)	12,800	cft	1.22	15,616	
Turfing	1,800	sft	0.13	234	
Total				239,994	
			Say. TK.	240,000	

Consolidation of the Pam for Nawjore C.D.C.

TK. 8,000/

(Item NO. 2)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Surface Soil Treatment	14,000	sft	0.48	6,720	d=8"
Landgrading and Readjustment	5,300	cft	0.30	1,590	
Total				8,310	
			Say. TK.	8,000	

Canal Works for Nawjore C.D.C.

TK. 63,000/

(Item NO. 3)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Canal A	470	rft	71	33,370	ref. Item NO.103
Canal C	1,070	rft	3	3,210	ref, Item NO.105
Farm drain	690	rft	2	1,380	ref. Item NO.106
Gross culvert	23	rft	130	2,990	ref. Item NO.110
Division works	17	No.	580	9,860	ref. Item NO.109
Syphon	1	No.	11,900	11,900	ref. Item NO.111
Total				62,710	
			Say. TK.	63,000	

Other Works for Nawjore C.D.C.

TK. 10,000/

(Item NO. 4)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Preparation and cleaning works	1	No.		10,000	excluding deep tubewell
Total				10,000	

Water Supply Works for Porabari C.D.C.

TK. 229,000/

(Item NO. 5)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Deep Tube-well	1	No.	171,000	171,000	ref. Item NO.101
Pump House	192	sft	150	28,800	16'X 12'X 9'
Discharge Box	1	No.	23,600	23,600	ref. Item NO.102
Earth work	2,000	sft	0.24	480	
do	4,000	cft	1.22	4,880	
Turfing	600	sft	0.13	78	
Total				228,838	
			Say. TK.	229,000	

Consolidation of the Fam for Porabari C.D.C.

TK. 5,000/

(Item NO. 6)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Surface Soil Treatment	8,500	sft	0.48	4,080	d=8"
Landgrading and readjustment	4,000	cft	0.30	1,200	
Total				5,280	
			Say. TK.	5,000	

Canal Works for Porabari C.D.C.

TK. 25,000/

(Item NO. 7)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Canal A	90	rft	71	6,390	ref. Item NO.103
Canal C	520	rft	3	1,560	ref. Item NO.105
Farm drain	420	rft	2	840	ref. Item NO.105
Division Works	8	No.	580	4,640	ref. Item NO.109
Cross Culvert	12	rft	130	1,560	ref. Item NO.110
Canal B	170	rft	58	9,860	
Total				24,850	
			Say. TK.	25,000	

Improvement of Pond for Porabari C.D.C.

TK. 32,000/

(Item NO. 8)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Stripping	8,000	sft	0.24	1,920	
Earth Work (excav. and embank.)	35,000	cft	0.32	11,200	
Turfing	7,700	sft	0.13	1,001	
Bailing out water Single layer	35,000	cft	0.05	1,750	
brick flat soling	465	sft	3.85	1,790	
Mass concrete	210	cft	30.5	6,405	
Brick Work	303	cft	19.5	5,909	
1/2" cement plaster	309	cft	3.06	946	
R.C. Concrete With Reinforcement	10	cft	70	700	
Stop log	2.5	cft	150	375	
Total				31,996	Say. TK. 32,000

Other Works for Porabari C.D.C.

TK. 19,000/

(Item NO. 9)

Item of Works	Quantity	Unit	Rate	Amount	Remark
<Lawn yard>					
Land grading and readjustment	1,400	cft	0.30	420	
Turfing	4,300	sft	0.13	559	
Sub-Total				979	
<Waterpipe connection works>	170	rft	48	8,160	
<Preparation and clowing works>	1	No.		10,000	excluding deep tubewell
Total				19,139	
			Say. TK.	19,000	

Water Supply Works for Bhabanipur C.D.C.

TK. 229,000/

(Item NO. 10)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Deep tube.well	1	No.	171,000	171,000	ref. Item NO.101
Pump House	192	sft	150	28,800	16'X 12'X 9'
Discharge Box	1	No.	23,600	23,600	ref. Item NO.102
Earth Work (Stripping)	2,100	sft	0.24	504	
do (filling)	4,300	sft	1.22	5,246	
Turfing	592	sft	0.13	77	
Total				229,227	
			SAY. TK.	229,000	

Consolidation of the Plan for Bhabanipur
C.D.C.

TK. 27,000/

(Item NO. 11)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Surface soil treatment	36,000	sft	0.48	17,280	
Land grading and road adjustment	32,000				
Total				26,880	
			Say. TK.	27,000	

Canal Works for Bhabanipur C.D.C.

TK. 48,000/

(Item NO. 12)

Item of Works	Quantity	Unit	Rate	Amount	Remark
Canal A	230	rft	71	16,330	ref. Item NO.103
Canal B	150	rft	58	8,700	ref. Item NO.104
Canal C	530	rft	3	1,590	ref. Item NO.105
Para drain	1,090	rft	2	2,180	ref. Item NO.106
Division works	8	No.	580	4,640	ref. Item NO.109
Gross culvert	115	rft	130	14,950	ref. Item NO.110
Total				48,390	
			Say. TK.	48,000	

Deep Tubewell (R. to each only)

TK. 171,000/

(Item NO. 101)

Item of works	Quantity	Unit	Rate	Amount	Remark
Preparation, 1. packing and transportation of one complete tubewell equipment	1	No.	20,000	20,000	
Execution of 2. tubewell boring					by reverse circulation or percussion
a) From 0 ft to 100 ft depth	100	rft	250	25,000	min. boring dia 20"
b) From 100 ft to 200 ft depth	100	rft	200	20,000	
c) From 200 ft to 300 ft depth	100	rft	200	20,000	
d) From 300 ft to 400 ft depth	100	rft	150	15,000	
3. Complete in- stallation of tubewell fixtures and their surrounding with filter gravel	380	rft	50	19,000	excluding the cost of filter gravel and tubewell fixtures at worksite.
4. Developing of ready construction tubewell by const- ractor's special plant	1	No.	8,000	8,000	
5. Installation of constructor's pumping set for test pumping	1	No.	3,000	3,000	
6. Test pumping of the tubewell including measuring of water table in well yield and drawdown and supply of the results	1	No.	8,000	8,000	
7. Installation and drawal of casing to prevent seeping	80	rft	150	12,000	dia 20"
8. Installation of clients pump	1	No.	8,000	8,000	including Engine and their base - concrete
9. Sanitary grout seal	1	No.	1,000	1,000	
10. Supply of wall graded filter gravel for surrounding	800	cft	15	12,000	
Total				171,000	

Canal B (Rate per running foot)

TK.58/

(For 10'ft) (Item NO.104)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	31.7	sft	3.85	122	
Brick work	14.6	cft	19.5	285	
1/2" thick cement plaster	48.3	sft	3.06	148	
Earth work	70	cft	0.32	22	
Turfing	56	sft	0.13	7	
Total				584	
			Say. Rate per 1 rft TK.58		

Canal C (unlined canal)(Rate per running foot)

TK.3/

(For 10'ft)(Item NO.105)

Item of works	Quantity	Unit	Rate	Amount	Remark
Earth work (cutting and filling)	75	cft	0.32	24	
Turfing	51	sft	0.13	7	
Total				31	
			Say. Rate per 1 rft TK.3		

Farm drain (Rate per running foot)
(Unused)

TK.2/

(For 10'ft) (Item NO.106)

Item of works	Quantity	Unit	Rate	Amount	Remark
Earth work	30	cft	0.32	10	
Turfing	53	sft	0.13	7	
Total				17	
			Say. Rate per 1 rft TK.2		

Covering slab A (Rate each only)

TK.130/

(Item NO.107)

Item of works	Quantity	Unit	Rate	Amount	Remark
R.C. concrete	1.77	cft	35.2	62	l=2ft
Rain for cement	0.077	cwt	792	61	
Local carriage	1	No.	7	7	
Total				130	

Discharge Box (Rate each only)

TK.23,600/

(Item NO.102)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	366	sft	3.85	1,409	
Rainforced Concrete	134	cft	35.2	4,717	
Rainforcement	5.1	cwt	792	4,039	
Brick work	465	cft	19.5	9,068	
1/2" thick cement plaster	844	sft	3.06	2,583	
Mass concrete	2	cft	30.5	61	
Steal gate	1	No.	1,000	1,000	12"X 12"
12"Ø dia R.C. pipe	10	rft	75	750	
Total				23,627	
			Say.TK.	23,600	

Canal A (Rate per running foot)

TK.71/

(Item NO.103)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	35.8	sft	3.85	138	
Brick work	17.7	cft	19.2	345	
1/2" thick cement plaster	59.1	sft	3.06	181	
Earth work	130	cft	0.32	42	
Turfing	65	sft	0.13	8	
Total				714	
			Say.TK.	71/rft	

Covering Slab B (Rate each only)

TK.100/

(Item NO.108)

Item of works	Quantity	Unit	Rate	Amount	Remark
R.C. Concrete	1.33	cft	35.2	47	l=2ft
Rain for cement	0.058	cwt	792	46	
Local carriage and fixing	1	No.		7	
Total				100	

Division works (Rate each only)

TK.580/

(Item NO.109)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	25.2	sft	3.85	97	
Brick work	17.0	cft	19.5	332	
1/2" thick cement plaster	33.5	sft	3.06	103	
Mass concrete	1.5	cft	30.5	46	
Covering slab B	0.06	No.	100	6	
Total				584	
			Say TK.	580	

Gross culvert (Rate per running foot)

TK.130/

(For 10'ft) (Item NO.110)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	35.8	sft	3.85	138	
Brick work	18.7	cft	19.5	365	
1/2" thick cement plaster	57.5	sft	3.06	176	
Covering Slab	8.3	cft	35.2	292	
Rain face-ment	0.44	cwt	792	348	
Earth work	80	cft	0.32	26	
Total				1,345	
			Say Rate per 1 rft	TK.130	

Syphon (Rate each only)

(ϕ 12" L 33 ft)

TK.11,900/

(Item NO.111)

Item of works	Quantity	Unit	Rate	Amount	Remark
Single layer brick flat soling	98	sft	3.85	377	
Brick work	331	cft	19.5	6,454	
1/2" thick cement plaster	216	sft	3.06	660	
Mass concrete	65	cft	30.5	1,983	
R.C. pipe 12" ϕ	33	rft	75	2,475	including earth work
Total				11,949	
			Say TK.	11,900	

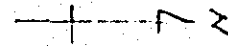
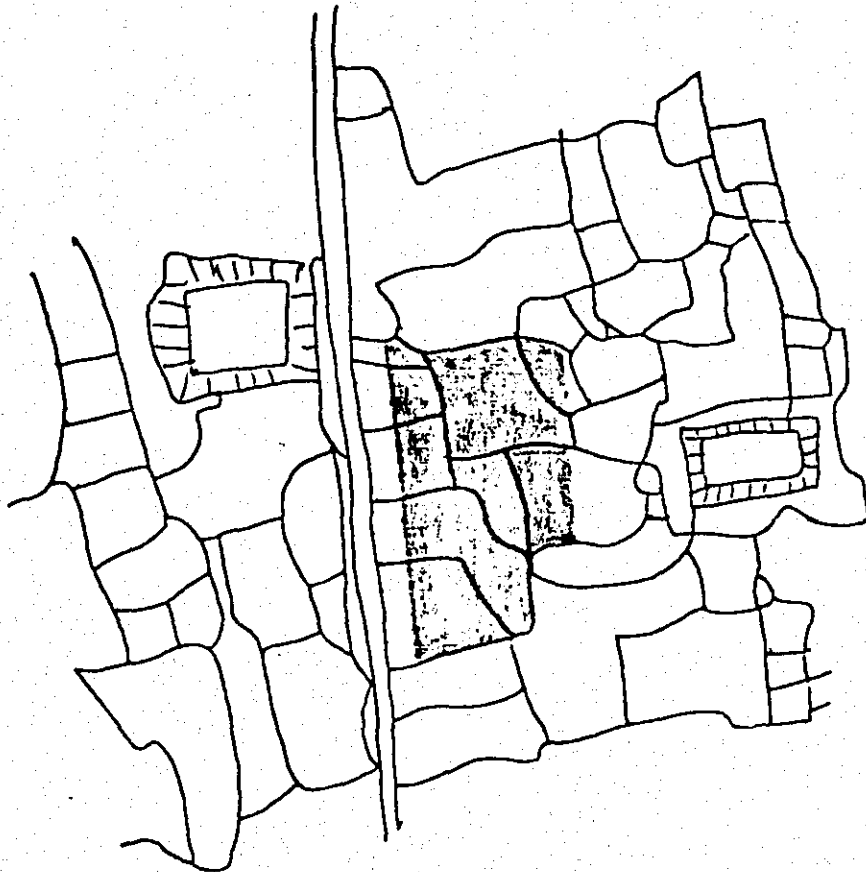
A P P E N D I C E S

APPENDIX I

AVAILABLE TOPOGRAPHIC MAPS

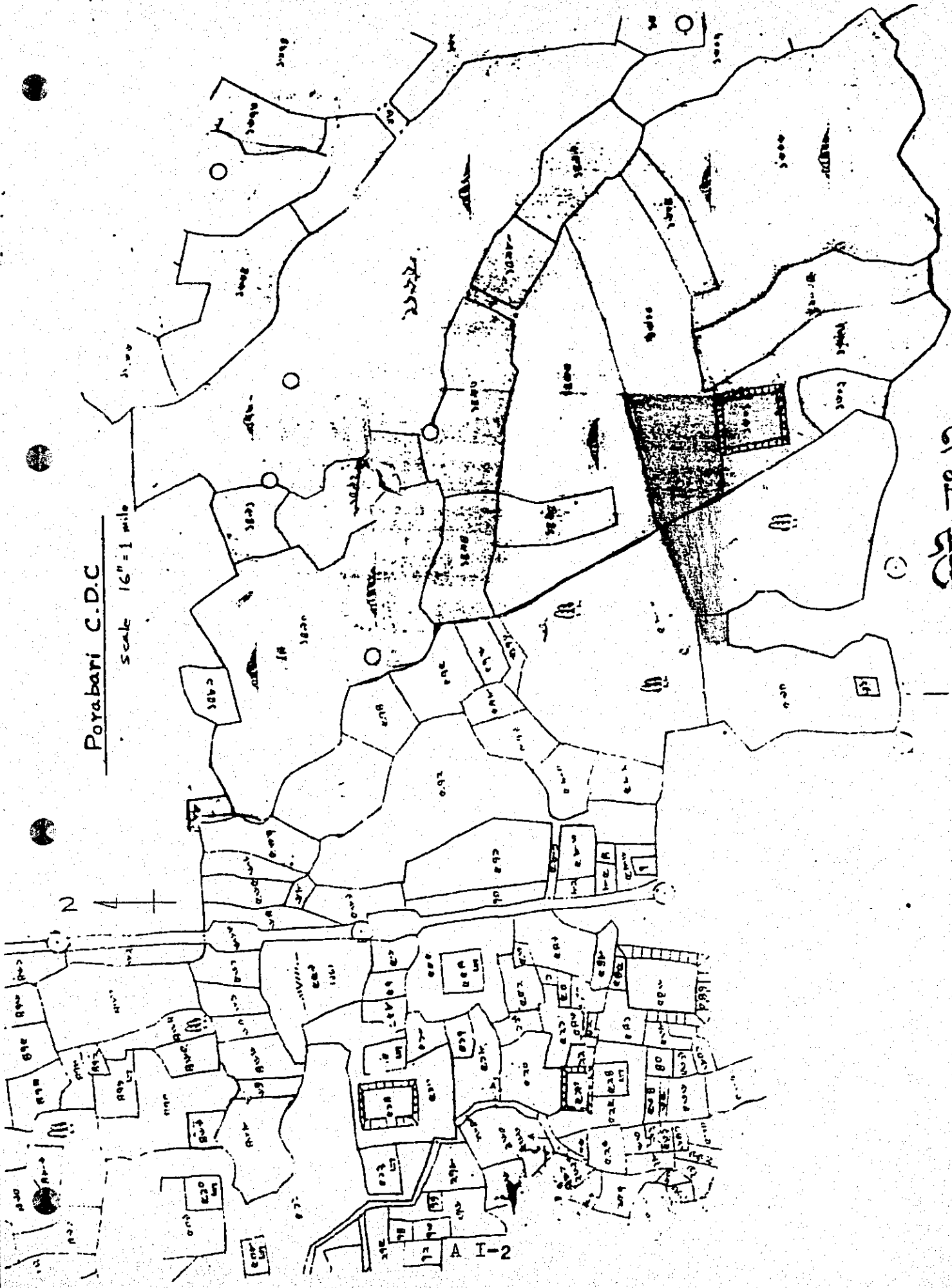
Nawjore C. D. C.

Scale 16" = 1 mile



Porabari C.D.C

Scale 16" = 1 mile

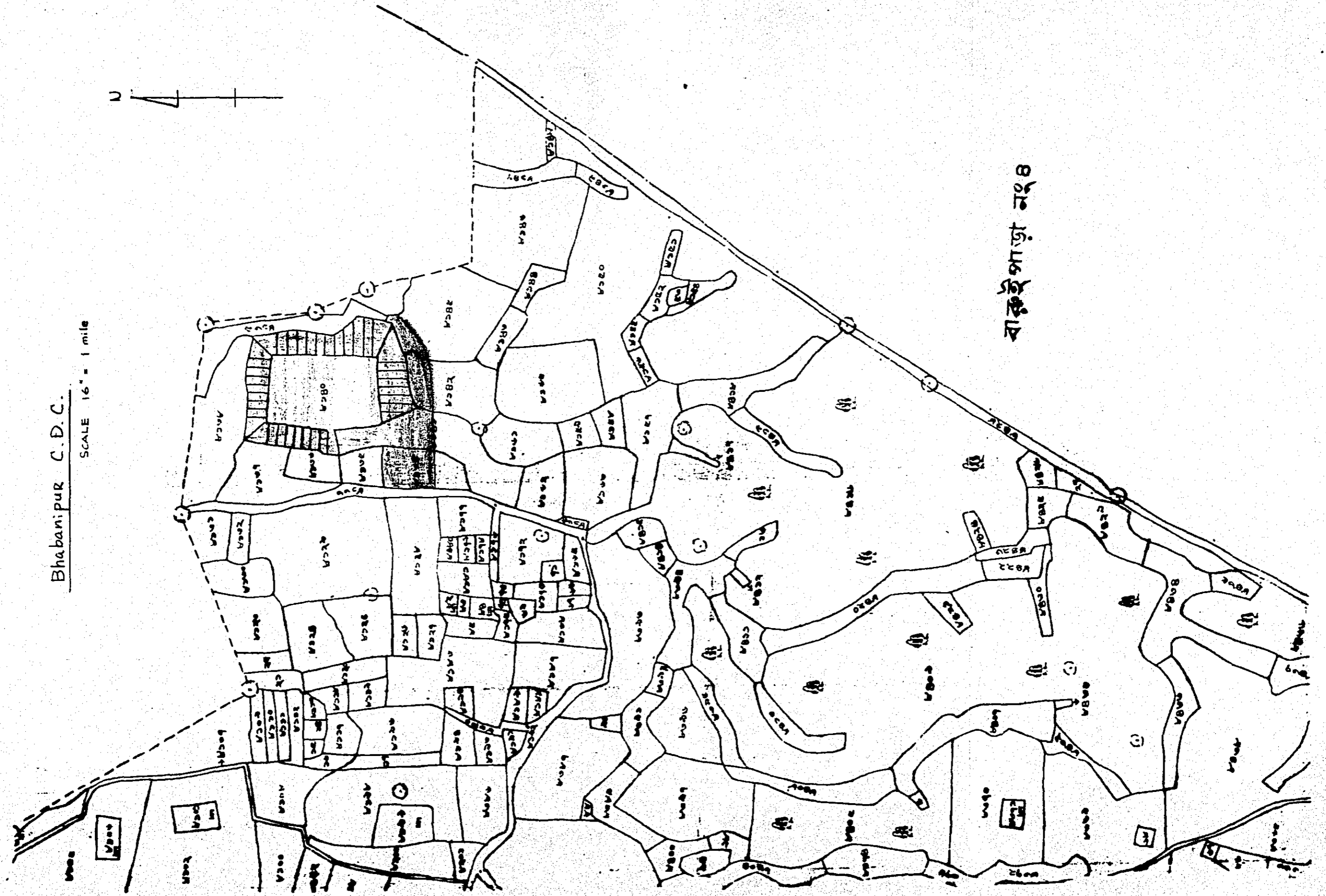
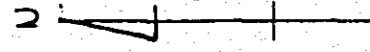


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Bhabani pur C.D.C.

SCALE 16" = 1 mile



बाकई गाँव न० ४

APPENDIX II

MANUFACTURER'S TEST-SHEETS OF THE PUMPS



MANUFACTURER'S TEST SHEET

File No. 33057

Date MAR 16 '79

CUSTOMER MESSRS. _____

TAKASAGO TEKKO Ltd.

NAME and SIZE of PUMP TYPE/BF
150^{mm} 2^{stages} TURBINE PUMP

Date of Test MAR 15 '79

MANUFACTURER'S TYPE BF 6005 MANUFACTURER'S SERIAL No. 936980

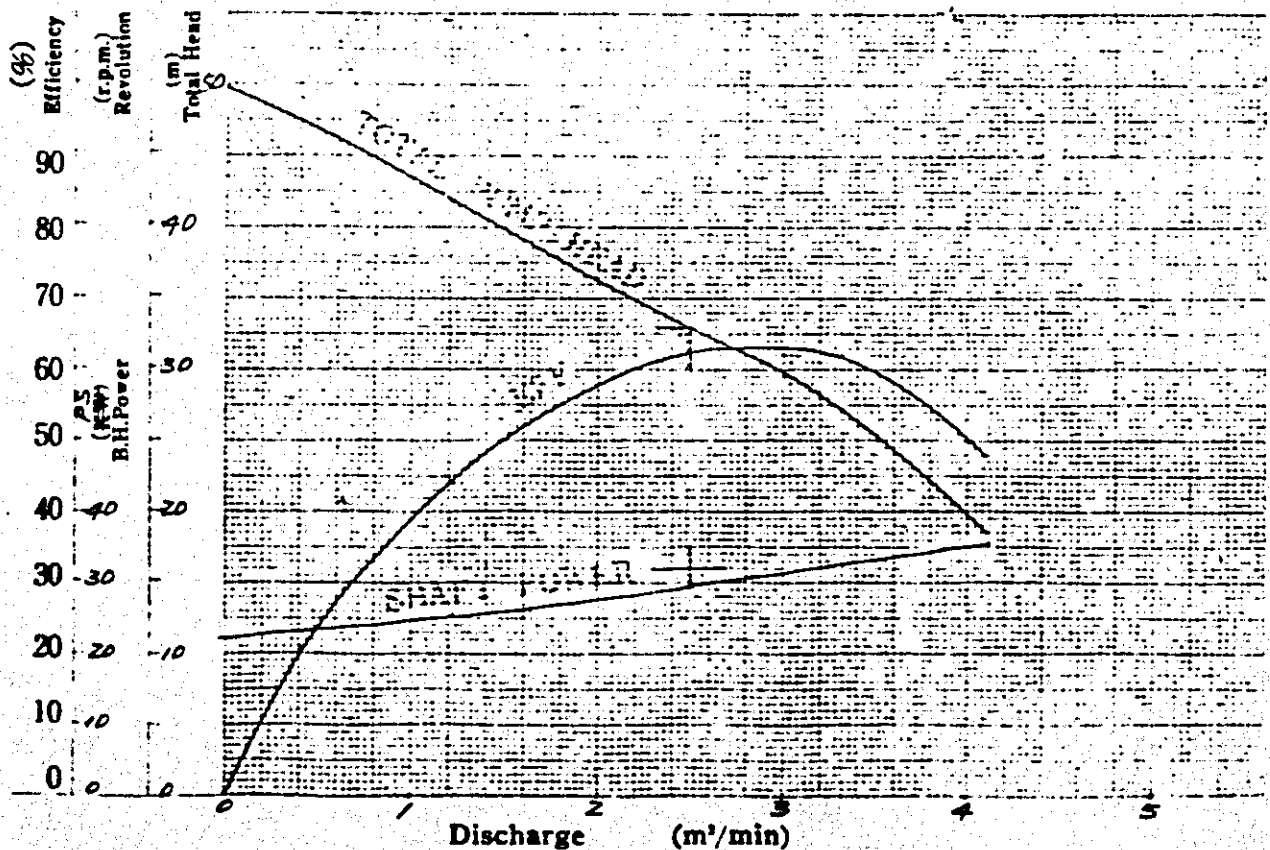
SPECIFICATION of PUMP

Discharge 2.5 m³/min Total Head 33 m
Revolution 1800 r.p.m. Req. Power 32 PS
kW

CHARACTERISTICS at NORMAL REVOLUTION SPEED CALCULATED from TEST RECORD

	Revolution (r.p.m.)	Discharge (m ³ /min)	Total Head (m)	B.H. power (kW) PS	Efficiency (%)	Remarks
1	1830	0	49.80	22.2	0	
2	1830	1.168	45.82	23.9	29.2	
3	1830	1.218	41.87	25.6	44.2	
4	1830	1.720	37.94	27.1	54.9	
5	1820	2.504	33.08	29.4	62.5	
6	1820	3.323	27.30	32.5	61.9	
7	1820	4.119	18.56	35.4	47.9	
8						

CHARACTERISTIC CURVE



Approved By Y. Shimizu

A II-2

Drawn By T. Sakurai



MANUFACTURER'S TEST SHEET

File No. 33258

Date MAR. 16 '79

CUSTOMER MESSRS. _____
TYPE/BF _____

TAKASAGO TEKKO Ltd.

NAME and SIZE of PUMP 150^{mm} 2⁵⁰⁹⁵ TURBINE PUMP

Date of Test MAR 15 '79

MANUFACTURER'S TYPE BF 6005 MANUFACTURER'S SERIAL No. 936981

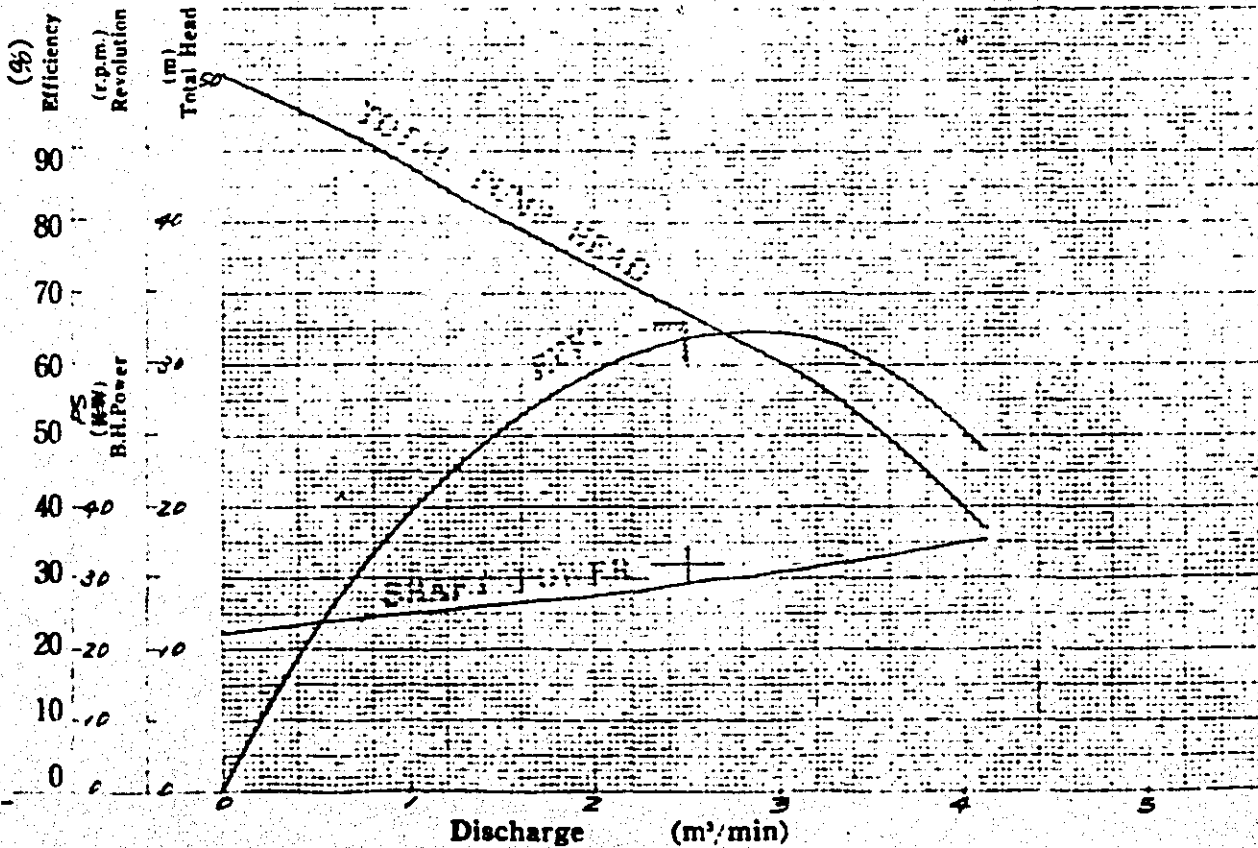
SPECIFICATION of PUMP

Discharge 2.5 m³/min Total Head 33 m
 Revolution 1800 r.p.m. Req. Power 32 ^{PS}/_{kW}

CHARACTERISTICS at NORMAL REVOLUTION SPEED CALCULATED from TEST RECORD

Revolution (r.p.m)	Discharge (m ³ min)	Total Head (m)	B.H. power (kW)	Efficiency (%)	Remarks
1800	0	50.30	22.4	0	
1800	1.741	45.82	29.0	31.4	
1800	1.263	41.87	25.8	45.4	
1800	1.567	37.95	27.2	57.1	
1820	2.590	33.10	29.5	64.4	
1820	3.355	27.31	32.5	62.5	
1820	4.119	18.56	35.4	47.9	
1820					

CHARACTERISTIC CURVE



Approved By Y. Ishihara

A II-3

Drawn By T. Sawada



MANUFACTURER'S TEST SHEET

File No. 23659

Date MAR 11 '79

CUSTOMER MESSRS. _____

TAKASAGO TEKKO Ltd.

NAME and SIZE of PUMP TYPE/BF 150mm 2 stages TURBINE PUMP

Date of Test MAR 15 '79

MANUFACTURER'S TYPE BF 6005 MANUFACTURER'S SERIAL No. 226982

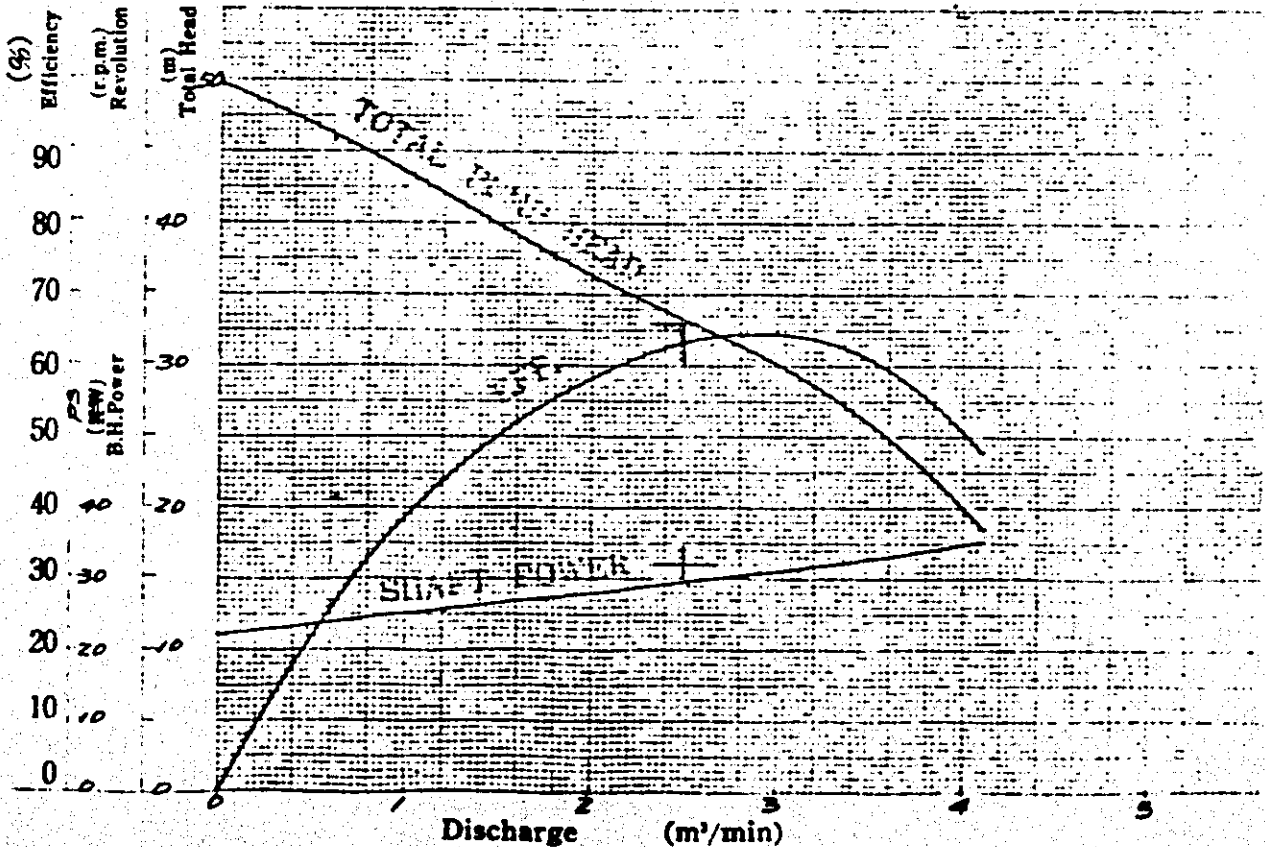
SPECIFICATION of PUMP

Discharge 2.5 m³/min Total Head 33 m
 Revolution 1800 r.p.m. Req. Power 32 PS

CHARACTERISTICS at NORMAL REVOLUTION SPEED CALCULATED from TEST RECORD

	Revolution (r.p.m)	Discharge (m ³ /min)	Total Head (m)	B.H. power (PS)	Efficiency (%)	Remarks
1	1830	0	49.80	22.2	0	
2	1830	0.612	45.82	23.7	26.2	
3	1830	1.218	41.87	25.6	44.2	
4	1830	1.770	37.94	27.1	54.9	
5	1820	2.532	33.09	29.3	63.4	
6	1820	3.355	27.31	32.4	62.7	
7	1820	4.119	18.56	35.3	48.0	
8						

CHARACTERISTIC CURVE



Approved By Y. Ishihara

A II-4

Drawn By I. Sakamoto



MANUFACTURER'S TEST SHEET

File No. 22660

Date MAR. 16 '79

CUSTOMER MESSRS. _____

TAKASAGO TEKKO Ltd.

NAME and SIZE of PUMP TYPE: BF ISO 2 stages TURBINE PUMP

Date of Test MAR 15 '79

MANUFACTURER'S TYPE BF 6005 MANUFACTURER'S SERIAL No. 936983

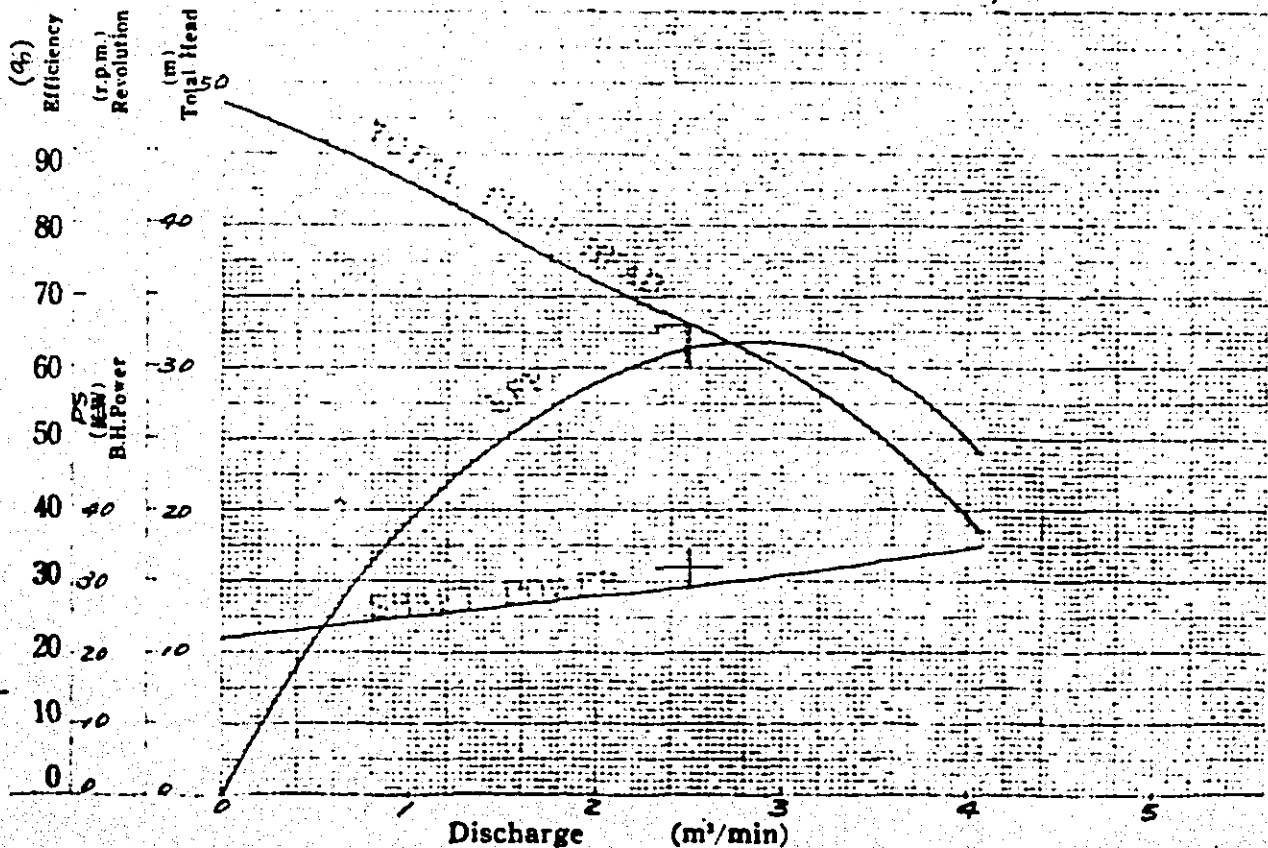
SPECIFICATION of PUMP

Discharge	<u>2.5</u>	m ³ /min	Total Head	<u>33</u>	m
Revolution	<u>1800</u>	r.p.m.	Req. Power	<u>32</u>	PS kW

CHARACTERISTICS at NORMAL REVOLUTION SPEED CALCULATED from TEST RECORD

Revolution (r.p.m)	Discharge (m ³ /min)	Total Head (m)	B.H. power (PS/kW)	Efficiency (%)	Remarks
1830	0	48.60	21.9	0	
1830	1.592	45.81	22.9	23.5	
1830	1.173	41.86	25.4	42.9	
1830	1.745	37.94	27.0	54.4	
1820	2.504	33.08	29.3	62.7	
1820	3.323	27.30	32.3	62.3	
1820	4.084	18.55	35.2	47.7	
8					

CHARACTERISTIC CURVE



Approved By Y. Ishihara

A II-5

Drawn By I. Sakamoto



MANUFACTURER'S TEST SHEET

File No. 33061

Date MAR. 16 '79

CUSTOMER MESSRS. _____

TAKASAGO TEKKO Ltd.

NAME and SIZE of PUMP TYPE/BF 150^{mm} 2^{stages} TURBINE PUMP

Date of Test MAR. 15 '79

MANUFACTURER'S TYPE BF 6005 MANUFACTURER'S SERIAL No. 936984

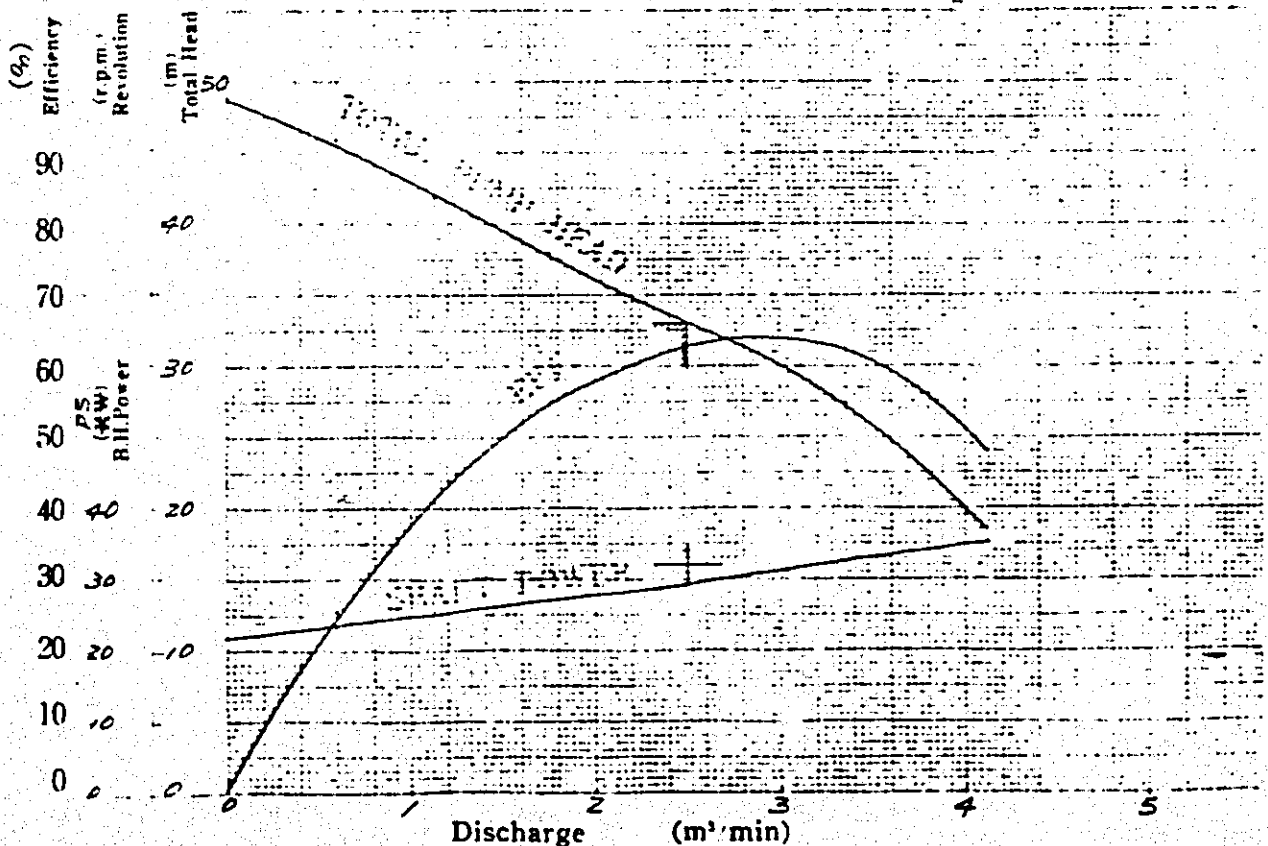
SPECIFICATION of PUMP

Discharge 2.5 m³/min Total Head 33 m
 Revolution 1800 r.p.m. Req. Power 32 $\frac{PS}{kW}$

CHARACTERISTICS at NORMAL REVOLUTION SPEED CALCULATED from TEST RECORD

Revolution (r.p.m.)	Discharge (m ³ /min)	Total Head (m)	B.H. power $\frac{PS}{kW}$	Efficiency (%)	Remarks
1830	0	48.80	22.0	0	
1830	1.594	45.82	23.6	25.6	
1830	1.129	41.86	25.5	41.1	
1830	1.765	37.94	27.0	59.4	
1820	2.517	33.68	29.3	62.7	
1820	3.255	27.31	32.5	62.5	
1820	4.119	18.56	35.3	48.0	
1820					

CHARACTERISTIC CURVE



Approved By Y. Ishihara

A II-6

Drawn By I. Sakurada

APPENDIX III

QUOTATION FOR THE DEEP TUBEWELL CONSTRUCTION

Gram : OMARSONS
OMAR SONS (Bangladesh) LTD
HEAD OFFICE:
BAIT-UL-AMAN
MYMENSINGH ROAD
Dacca—Bangladesh

Telephone : { 282369
 { 242705
Res : 403950

তার : ওমর সন্স

৭৭ ৮
টেলিফোন : ২৮২৩৬৯
 ২৪২৭০৫
বাসা : ৪০৩৯৫০

(বাংলাদেশ সরকারের নিয়ন্ত্রনাধীনে)

ওমর সন্স (বাংলাদেশ) লিমিটেড

প্রধান কার্যালয় :

বায়ু-তুল-আমান, ময়মনসিংহ রোড,
ঢাকা, বাংলাদেশ

Ref No. OSBD/Tube/JICA/80/

Date 30-7-80

The Japan International
Co-operation Agency (J.I.C.A.),
C/o, Embassy of Japan,
1, Shantinagar,
Dacca-17.

Sub:- Quotation of 6" Ø Deep tubewell at
Three Community Centres of CERDI
(Nowjore, Porabari & Bhabanipur)

Attention:- Mr. Amano.

Dear Sir,

We refer the discussion between your representative and the under-
signed on 25-7-80, and have pleasure to enclose herewith our estimate of 6"
dia Deep tubewell both Labour & Materials Cost separately as desired by you.

We hope our rate will be competitive one and the job will be awarded
to us at an early date considering our past performance in your projects at
Joydebpur, Dacca.

Thanking you and looking for ward for your valued order.

Yours faithfully,
For, Omar Sons (Bangladesh) Ltd.

S. A. Salam
(S.A. Salam)
Administrator.

ওমার সন্স (বাংলাদেশ) লিমিটেড

OMAR SONS (Bangladesh) LTD.
MYMENSINGH ROAD, DACCA.

Estimate of Labour Charges for 6" dia
Deep tubewell at Joydebpur, Dacca,
(Nowjore, Porabari & Bhoanipur)

BILL No.

The Japan International Co-operation Agency (JICA),

C/o, Embassy of Japan,
1, Shantinagar,
Dacca-17.

Date: 30-7-80

Item No.	Particulars	Quantity		Rate		Amount
		Figures	Unit	Tk.	Per	
1.	Preparation, packing & transportation of one complete tubewell equipment including all accessories to the work site, installation of site and clearing after completion of work.	1	No.	20,000/-	No.	Tk. 20,000.00
2.	Displacement of the complete tubewell equipments from one bore point to the other.: upto 400 ^{ft} .	1	No.	10,000/-	No.	
3.	Labour charges for execution of tubewell boring by reverse circulation or percussive method with a minimum boring dia 20" inch.:					
	a) From ft to 100 ft depth.	100	Rft.	250/-	Rft.	Tk. 25,000.00
	b) From 100 ft to 200 ft. "	100	Rft.	200/-	Rft.	Tk. 20,000.00
	c) From 200 ft to 300 ft. "	100	Rft.	200/-	Rft.	Tk. 20,000.00
	d) From 300 ft to 400 ft. "	100	Rft.	150/-	Rft.	Tk. 15,000.00
4.	Labour charges for complete installation of tubewell fixtures (Heading pipes, strainers, blind pipes, bail plug, reduction socket, if any etc) and their shrouding with filter gravel, but excluding the cost of filter gravel and tubewell fixtures at the worksite.	380	Rft.	50/-	Rft.	Tk. 19,000.00
5.	Developing of the ready construction tubewell by the Contractor's special plant.	1	No.	8,000/-	No.	Tk. 8,000.00
6.	Installation of Contractor's pump- ing set in each tubewell for test pumping.	1	No.	3,000/-	No.	Tk. 3,000.00
7.	Test pumping of the tubewell including measuring of water table in well yield and drawdown and supply of the results.	1	No.	8,000/-	No.	Tk. 8,000.00
8.	Installation & withdrawal of 20" casing to prevent caving.	80	Rft.	150/-	Rft.	Tk. 12,000.00
9.	Installation of clients pump.	1	No.	...	LS.	Tk. 5,000.00
10.	Sanitary grout seal	1	No.	...	LS.	Tk. 1,000.00
11.	Labour charge for pump House (5H X 5H X 3H)	1	No.	...	LS.	Tk. 15,000.00
				Total Taka.		171,000.00

(Taka One hundred seventy one thousand) only.

For, Omar Sons (Bangladesh) Ltd.

S. A. Salam
(S.A. Salam)
Administrator.

ওমার সন্স (বাংলাদেশ) লিমিটেড

OMAR SONS (Bangladesh) LTD.
MYMENSINGH ROAD, DACCA.

Estimate of Materials for installation of
6" dia Deep tubewell at Joydebpur (Nowjore,
Porabari & Bhobanipur) Dacca, except pump
and its accessories.

BILL No.

The Japan International Co-operation Agency (JICA),
C/o, Embassy of Japan,
1, Shantinagar,
Dacca-17.

Date: 30-7-80.

Item No.	Particulars	Quantity		Rate		Amount	
		Figures	Unit	Tk.	Per	Tk.	Tk.
1.	Cost of tubewell fixtures at the work site: (a) Bail plug made out of G.I. sheet, provided with a strong hook for lowering the fixture: 6" ϕ 5' length 3/16" thickness. 1 No. (b) Brass strainers complete with sockets: 6" ϕ 1/8" thickness 35/1000" slot opening. 60 Rft. (c) G.I. blind pipes with welded connections or sockets: 6" ϕ 3/16" thickness. 190 Rft. (d) M.S. Housing pipes with welded connections or sockets (For installation of submersible or deepwell turbine pumps) 120 Rft. (e) Reduction sockets between blind pipes/housing pipes made out of M.S. Sheets: 6" / 14" ϕ 1'-6" length 3/4" thick 1 No. (f) Centralisers made out of M.S. bars to be placed approx every 30' ft. 8 Nos.	1	No.	1,000/-	No.	Tk. 1,000.00	
		60	Rft.	700/-	Rft.	Tk. 42,000.00	
		190	Rft.	150/-	Rft.	Tk. 28,500.00	
		120	Rft.	450/-	Rft.	Tk. 54,000.00	
		1	No.	800/-	No.	Tk. 800.00	
		8	Nos.	70/-	No.	Tk. 560.00	
2.	Supply of well graded filter gravel at worksite for shrouding the annular space between tubewell fixtures and borehole. 800 Cft.	800	Cft.	15/-	Cft.	Tk. 12,000.00	
3.	2" ϕ Connection pipe from tubewell to overhead water tank 100M 328 Rft.	328	Rft.	45/-	Rft.	Tk. 14,760.00	
4.	Cost of materials for pump House (5M X 5M X 3M) .....	.....	.....	.....	LS.	Tk. 45,000.00	
				Total Taka.		198,620.00	
	(Taka One hundred ninety eight thousand six hundred twenty) only.						
	For, Omar Sons (Bangladesh) Ltd.						
	<i>S. A. Salam</i> (S.A. Salam)						

APPENDIX IV

ORGANIZATION CHART OF CERDI
AND
LIST OF PARTICIPANTS

ORGANISATION CHART OF CENTRAL EXTENSION RESOURCES DEVELOPMENT INSTITUTE
(C E R D I)

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- SOIL/FERTILITY SPECIALIST . . . 1
- AGRI. MECHANISATION SPECIALISTS 1
- AGRI. MACHINERY ENGINEER 1
- EXTENSION EXPERT1
- HORTICULTURE SPECIALIST.1

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3. ACCOUNT OFFICER 1	3. IRRIGATION AGRONOMIST 1	3. TRAINING OFFICER 1	3. AGRICULTURE ENGINEER (ENGINE) 1
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5. P.A. TO DIRECTOR 2	5. HORTICULTURE SPECIALIST 1	5. EDITOR 1	5. FORMAN (ELECTRICAL) 1
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8. BUDGET ASSISTANT 1	8. FARM MANAGEMENT SPECIALIST . . 1	8. TRANSLATOR 2	8. DRAFTSMAN 2
9. STENO - TYPIST 10	9. ASST. AGRONOMIST 1	9. LIBRARIAN 1	9. STORE KEEPER 1
10. CASHIER 1	10. ASST. PLANT PROTECTION SPLT. . 1	10. CATALOGUER 1	10. TRACTOR & PUMP OPERATOR 4
11. BILL ASSISTANT 1	11. ASST. HORTICULTURE SPLT. . . . 1	11. HOME IMPROVING AGENTS 3	11. VEHICLE DRIVER 13
12. L.D.A. 2	12. ASST. SOIL & FERTILITY SPLT. . 1	12. PRINTING MACHINE OPERATOR . . . 1	12. CARPENTER 1
13. STORE KEEPER 4	13. ASST. EXTENSION SPECIALIST. . . 2	13. FILM PROJECTOR OPERATOR 1	13. ELECTRICIAN 1
14. TYPIST 4	14. OVERSEER. 7	14. ASST. FILM PROJECTOR OPERATOR. . 1	14. WORKSHOP HELPER 4
15. COOK 1	15. GARDENER 5	15. ASST. PRINTING MACHINE OPERATOR. 1	
16. ASST COOK 1		16. BOOK BINDER 1	
17. PEON 12		17. ASST. BOOK BINDER 1	
KITCHEN BOY 1			
WATCHMAN/GUARD 17			
		<u>COMMUNITY DEVELOPMENT CENTRE.</u>	
		1. MECHANIC CUM OPERATOR 3	
		2. OVERSEER 3	
		3. HOME IMPROVING AGENT 3	
		4. STORE KEEPER 3	
		5. WATCHMAN/GUARD 9	
		6. GARDENER 3	
		7. PEON 3	

List of Class I Officers of CERDI.

1. Mr. M. A. Mannan Director.
2. Mr. Sekandar Ali Mia, Principal Agronomist & Head of Resources Division.
3. Mr. Nasirullah, Principal Information Officer & Head of Information Division.
4. Mr. Nuruddin Ahmed, Farm Mechanisation Specialist & Head of Mechanisation Division.
5. Mr. Shahidul Islam, Deputy Director (Administration)
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7. Mr. Nurul Alam, Irrigation Agronomist.
8. Mr. M. A. Dewan, Plant protection Specialist,
9. Mr. Kamrul Habib, Horticulture Specialist.
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14. Mr. A. A. Khan, Asstt. Extension Specialist.
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17. Mr. Nanda Lal Das, Training Officer.
18. Mr. Shahiduzzaman, Information Officer.
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6. Mr. Masamichi Numata Agril. machinery Engineer
7. Mr. Iwao Kudo Extention Expert

APPENDIX V

CONTRACT AGREEMENT (DRAFT)
AND
SPECIFICATIONS (DRAFT)

CONTRACT AGREEMENT

between

Japan International Cooperation Agency

and

for

Construction of Model Infrastructure

for

Three Community Development Centers

under

the Central Extension Resources Development Institute

This Agreement made and entered into this -----
by and between Japan International Co-operation Agency (JICA) c/o.
Embassy of Japan in Bangladesh, No.1, Shantinagar, Dacca-17,
hereinafter called the "Owner", and -----
-----, hereinafter called the "Contractor".

Whereas, the Owner is desirous that certain works should be constructed
viz; Construction of Model Infrastructure for Three Community Develop-
ment Centers under the Central Extension Resources Development
Institute, hereinafter called the "Works", and has accepted the
quotation submitted by the Contractor for the completion and maintenance
of such works now this Agreement witnesseth as follows:-

Article - 1(a) (Description of work)

The Contractor shall carry out the Construction of Model Infrastructure for the three Community Development Centers under the Central Extension Resources Development Institute.

Article - 1(b)

The following documents shall be deemed to form, be read and constructed as part of this agreement viz:-

- i) Bill of quantities
- ii) Drawings
- iii) Specifications

Article - 2 (Contract sum of construction)

The contract sum of construction shall be Tk. _____ and be based on the bill of quantities attached here.

Article - 3 (Time limit on construction and its prolongation)

The Contractor start work within seven (7) days of the signing by both parties of this agreement, and complete work by the _____.

Article - 4 (Delays)

In a case where it is clear that the Contractor is failing to fulfil his obligations within the period referred to in the preceding Article, the Contractor shall inform the Owner of this as soon as possible and if the Owner agrees that the delay is due to such causes as natural calamity or others for which the Contractor is not liable, a reasonable extension of time shall be approved. In this case, the sum referred to in Article 15 shall not be collected.

Article - 5 (Process of carrying out of work)

The Contractor shall carry out the work in accordance with the drawings and specifications referred to in Article 1(b) and in cases where it is necessary for the Contractor to carry out such work as is not mentioned therein for the purpose of promoting the present construction or for reasons of established practices shall carry out the said work under the direction of the Owner. In cases where the Contractor finds any doubt in the drawings, the Contractor shall ask the Owner for the necessary directions before commencing work on that part for which there exists some doubt. The Owner must provide such information and details within seven (7) days of the written request from the Contractor.

Article - 6

The Contractor shall follow the direction of the Owner or the supervisor to be appointed by the Owner. As to materials for the construction, the Contractor shall use only those inspected and approved by the Owner or the supervisor appointed by the Owner. In cases where any defective work has been done as a result of such use of materials which have not been inspected by the supervisor, the Contractor shall be liable to change the materials or repair the work at his own responsibility. The construction shall be carried out in accordance with the proper technique and durability shall be the principal aim as regards to the construction.

Article - 7

As to the workman to be hired by the Contractor for the work, the Contractor shall assume the responsibility as entrepreneur or employer, as provided for the Laws and Regulations.

Article - 8 (Transfer of Right and obligation)

The Contractor shall not assign or sublet to a third party the whole or

part of the construction except in cases where the Contractor has obtained written approval from the Owner.

Article - 9 (Damages)

In cases where any damage is caused to the Owner or a third party, materials or buildings, through carelessness on the part of the Contractor during the course of work or transportation of materials, the Contractor shall be liable to repair or compensate such damage at his own expense by the date appointed by the Owner or the third party.

Article - 10

In case where the Contractor fails to repair or compensate such damages referred to in the preceding Article by the fixed date, the Owner may pay for such repair on behalf of the Contractor and collect compensation from the Contractor by deducting the amount from the sum of construction to be paid to the Contractor under the provisions of Article 20, and in cases where the damages exceed the sum of construction the Owner may collect the deficit.

Article - 11(a) (Change of Construction Drawing and Submission of Necessary Documents)

In cases where the Owner feels it necessary to discontinue work owing to unavoidable circumstances or to alter the plan of construction, the Owner may request the Contractor to calculate, on the basis of the unit prices as detailed in the priced bill of quantities referred to in Article - 2, as increase or decrease in the sum of construction resulting from the suspension or alteration of the work and the Contractor shall comply with the request. When the Owner orders such a suspension or alteration, depending on the statement of the above mentioned calculation, the Contractor shall submit a written consent by the date appointed by the Owner.

Article - 11 (b)

Where additional work cannot be properly measured and valued on the basis of the unit prices in the bill of quantities referred to in Article - 2, the Contractor shall be allowed daywork rates in accordance with a written consent by the Owner.

Article - 12(a) (Price Adjustment)

In the case of the costs of materials rising sharply as a result of the fluctuation in the market prices due to an unexpected change in the economic conditions, a reasonable adjustment of the above mentioned sum or the contents of the work, will be made according to a mutual agreement between the Owner and the Contractor.

Article - 12(b)

In case where the Contractor incurs loss or suffers loss unreasonably in some item of Bill of quantities due to the Owner's failure to provide the information and details referred to in Article - 5 of the particular item or work, then reasonable adjustment of the above mentioned losses shall be considered by the Owner on the detailed claim submitted by the Contractor.

Article - 13 (Right to Rescind Contract and Penalty)

In cases where the Contractor fails to fulfil his obligations under this contract the Owner may rescind the whole or part of the Contract. In such a case, the Owner may collect from the Contractor a sum as a penalty of 10 per cent (10%) of the amount which is equivalent to the rescinded. In cases where the damages caused on the Owner, on account of the non-fulfilment of contract by the Contractor, exceed the sum referred to in the preceding paragraph, the Owner may further demand the Contractor to pay the excess.

Article - 14

In cases other than provided for in the preceding Article where the Contractor fails to fulfil his obligations, or in cases where the fulfilment of obligation by the Contractor is regarded to be difficult, the Owner may have a third party fulfil, at the cost of the Contractor, the whole or part of the obligations of the Contractor. Even if liability of the Contractor exceeds the contract sum referred to in Article - 2 in consequence of this, the Contractor may not raise any objection to it.

Article - 15

In cases other than provided for in Article 13, where the Contractor fails to complete the construction at his own responsibility, within the period referred to in Article - 3, the Contractor shall be liable, a period fixed by the Owner, to pay the Owner, per week of delay a sum equivalent to 0.2 per cent (0.2%) of the contract sum referred to in Article - 2.

Article - 16 (Damage caused by Natural Calamity etc.)

In cases where serious damages occur to the completed part of the work, or the materials, tools etc., already carried into the field of construction, the Contractor shall promptly inform the Owner of the circumstances. If such damages are caused by a natural calamity, an earthquake, a flood, a civil war, a war, an epidemic, or a general/trade strike, rioting or other unavoidable reasons, for the occurrence of which no responsibility can be attributed to either the Owner or the Contractor and it is admitted that the Contractor has paid the care of good administrator to avoid the occurrence of such damages, the Owner shall be liable for the amount of the damages which shall be fixed through negotiations between the Owner and the Contractor.

Article - 17(a) (Inspection)

The work at any stage shall be subject to inspection to be conducted by the Owner or the supervisor or an inspector appointed by the Owner, in the presence of the Contractor and necessary labour and articles required for such an inspection shall be provided by the Contractor.

Article - 17(b)

In cases where the work fails to pass the inspection referred to in the preceding paragraph, the Contractor shall carry out necessary repair at his own cost, under the direction of the Owner.

Article - 18 (Date of completion of construction and Obligation thereafter)

The date of completion of construction shall be regarded as that on which the final work, including removal of temporary constructions and cleaning, has passed the inspection referred to in Article - 17 and on that date the object of the total construction shall be delivered to the Owner by the Contractor. For a period of three (3) months thereafter, any defect in the construction, the case of which is judged in the opinion of the Owner to be attributable to faulty or inadequate technique or materials employed by the Contractor shall be immediately repaired or improved at the cost of the Contractor.

Article - 19(a) (Payment & Currency)

The Owner shall pay to the Contractor in Taka currency as follows:-

Payment for the part of the work already complete shall be allowed by the Owner three times during the course of construction at the request of the Contractor, provided that it has passed the inspection referred to in Article - 17.

However, the amount of the payment shall be limited to ninety per

cent (90%) of the work already completed. The final payment will be carried out within one month after the Owner receives the bill which will be submitted by the Contractor on or after the date of completion of construction referred to in the preceding Article.

Article - 19(b)

Ten per cent (10%) of the contract price shall be paid as advance payment for mobilization with order to commence upon production of a refund bond or Bank Guarantee for the same amount as the said advance payment.

Article - 19(c)

This advance payment shall be adjusted from subsequent monthly bills by such sum as the proportionate to the monthly progress stated in the said bills.

Article - 19(d)

The refund bond or bank guarantee as provided in paragraph (b) here of shall be returned to the Contractor by the Owner upon the delivery of the works.

Article - 20 (Interest for the delay of payment)

In cases of the payment referred to in the preceding Article being delayed owing to a cause or causes attributable to the Owner, the Contractor may request the Owner to pay, per week of delay, a sum equivalent to 0.2 per cent (0.2%) of the bill sum on arrears of payment.

Article - 21(a) (Settlement of dispute)

If there arises any dispute with regard to this Agreement or the Drawings or the Specifications referred to in Article - 1(b) it will be settled by a mutual consultation between the Owner and the Contractor.

Article - 21(b)

Should it not be possible to reach a mutual agreement between the Owner and the Contractor on such dispute, then it shall be referred to an Arbitrator or Arbitrators acceptable to both the Owner and the Contractor and the decision of this Arbitrator or/of Arbitrators shall be binding on both the Owner and the Contractor.

The Conclusion of the Agreement:

Two copies of the Agreement shall be prepared with the signature of both parties affixed to each of the copies, one copy to be held by each party.

Date : _____

The Owner for and on behalf of Japan International Cooperation Agency.

Signature _____
(_____)
Resident Representative
JICA, Dacca Office.

The Contractor for and on behalf of _____.

Signature _____
(_____)

Witness : Signed _____
(_____)
Associate Director,
Central Extension Resources
Development Institute

S P E C I F I C A T I O N S

(Draft)

A V-10

Chapter 1. General

1. General

1-1 Application

1) This Specification is applicable to "Construction of Model Infrastructure for Three Community Development Centers under the Central Extension Resources Development Institute".

2) Location of the sites

The sites of the construction works are the three Community Development Centers (hereinafter called the "CDC") under the Central Extension Resources Development Institute viz. i) Nawjore CDC, ii) Porabari CDC, iii) Bhabanipur CDC. The three CDCs are located in Joydebpur, Dacca, Bangladesh.

3) Quantity of major work

<u>Description</u>	<u>Nawjore CDC</u>	<u>Porabari CDC</u>	<u>Bhabanipur CDC</u>
(i) Consolidation (area in sq. m)			
Paddy field	11,120	2,130	6,410
Upland	170	170	300
Lawn	1,170	350	540
(ii) Water supply facilities			
Deep tubewell (with foundation for pump and engine) (No.)	1	1	1
Pumping house (with earthwork for founda- tion) (No.)	1	1	1
Discharge box (No.)	1	1	1

<u>Description</u>	<u>Nawjore GDC</u>	<u>Porabari GDC</u>	<u>Bhabanipur GDC</u>
(iii) Canal works			
Irrigation canal			
Brick-lined canal			
(rft)	470	260	380
Earth canal (rft)	1,070	520	530
Gross culbert (rft)	23	12	115
Syphon (No.)	1	-	-
Division works (Nos.)	17	8	8
Drainage canal			
(earthen) (rft)	690	420	1,090
(iv) Improvement of ponds			
Earth-moving (1,000 cft)	-	40	114
Spillway-cum-			
outlet works (No.)	-	1	-
Spillway (No.)	-	-	1
Outlet works (No.)	-	-	1
(v) Others			
Preparation &			
cleaning (L.S.)	1	1	1
Water pipe connec-			
tion works (rft)	-	170	460

- 4) Specifications entered in the drawing shall be treated in reference to this specification.

1-2 Supervisor

"Supervisor" means the Supervisor who was appointed to supervise the works by the Owner.

1-3 Doubts and Slight Alterations

If there are any differences in the contents of drawing the specification unless clearly stated, all shall be according to the instructions of the Supervisor.

1-4 Progress to be furnished

The Contractor shall submit the working plan and the process chart to the Supervisor for his approval, as soon as practicable before the commencement of works at the site.

In the case of important alteration, the Contractor shall submit an alternative plan to the Supervisor for his approval.

1-5 Site representative

Site representative shall be well qualified in supervised have enough experience of supervision. The Contractor shall submit career history of a site representative to the Supervisor for his approval.

1-6 Exam Measurement or confirmation

The positions those are pointed in the drawings or the specifications or those are instructed by the Supervisor beforehand shall be examined or confirmed by the Supervisor.

1-7 Inspection of work

- 1) Site representative and chief engineer shall attend at the inspection for which any part or whole works has been completed.
- 2) Submission of documents, survey or other disposed necessary for the inspection shall be made according to the instructions of the Supervisor.

- 3) The Contractor with his responsibility shall repair the portion of examination according to the instruction of the Supervisor.

1-8 Construction site maintenance

- 1) The Contractor shall review the laws related to the preservation of public safety and public health etc. and shall make efforts to prevent accident during the execution of the Works.
- 2) The Contractor shall take every reasonable means upon deliberation with the Supervisor in order to prevent damages by the construction works to any of structures in and around the site.
- 3) The Contractor shall set the identification construction at the visible place according to the regulation of law.
- 4) The Contractor shall inform to the Supervisor without delay when and if the accident that exerts a serious influence to the execution of the Works, that injures a person or that causes a damage to the third person occurred or threatens to occur.

1-9 Official procedure

Any necessary procedure that the Contractor usually takes with the authorities in execution of the Works shall be conducted promptly.

1-10 Survey

- 1) The Contractor shall confirm the positions of temporary bench marks, center-line and sections and report to the Supervisor immediately after the contract Agreement. Bench-marks for the settlement of temporary be marks shall be instructed by the Supervisor.

- 2) The Contractor shall not remove or transfer the width temporary bench-mark, and important peg for survey as rule. It could be removed or transfer by the approval the Supervisor, when it is necessary.

1-11 Record on construction

- 1) The contractor shall submit the record on whole process of construction every week to the Supervisor.
- 2) The Contractor shall record the items pointed and deliberated by the Supervisor and shall submit the record to the Supervisor, However, the Contractor could omit immaterial matters.

1-12 Confirmation and Report

The Contractor shall confirm a part of the Work completed if it is acceptable to the condition of the drawings, and shall report the confirmed items to the Supervisor from time to time.

1-13 Cleaning up the work sites

Upon completion of the Works, the Contractor shall clean up the sites within the period of construction.

Chapter 2. Materials

1. General

1-1 Application

All of the materials to be used for the work shall be furnished by the Contractor except the supplies stipulated in the Chapter 3. The materials to be furnished by the Contractor shall be new and subject to this specification except indicated different standard in the drawings.

1-2 Presentation of sample materials

The Contractor shall present the samples of important materials to the Supervisor for his approval before use.

2. Soil

2-1 General

The soil being used for the construction shall fit the purpose of the Work.

2-2 Embankment

Material for embankment should not contain rubbish, shrub, grass root or other corrosive stuff.

3. Stone and Aggregates

3-1 Sand

The sand for the Work shall be good quality with proper grain size, and shall not contain rubbish, mud and organic matters.

3-2 Aggregates

- 1) Aggregate for the Work shall be clean, hard, durable and it shall be free from objectionable quantities of flat or elongated particles, organic matter or other deliterious matter.
- 2) The maximum sizes of coarse aggregates shall be 25 mm in gravel and 20 mm in crushed stone.

4. Cement

4-1 Cement

Cement for the Work shall be normal portland cement except when specified otherwise.

4-2 Water

- 1) All water used in concrete shall be reasonable clean and free of oil, acid, alkali, sugar and vegetable substances.

5. Precasted Concrete Materials

5-1 Precasted Concrete Materials

- 1) The kind, form and size of precasted concrete materials shall be subject to the drawings.

These shall have the stress enough to bear the given load during the work as well as after the completion.

- 2) This material shall be clearly marked of the name of plant or abbreviation.

6. Brick

6-1 Brick

The brick for the work shall be the first class hand-made.

7. Filter gravel

Filter gravel for shrouding the annular space between tubewell fixtures and borehole.

The gravel for the filter shall consist of the best natural materials available. It shall be washed clean, preferably rounded hard siliceous materials containing no iron pyrites, coal, mica, shale or similar laminated flaky or frangible particles and shall conform to the following grading or such grading as may be ordered by the Supervisor.

<u>B.S.410 Sieve No.</u>		<u>Percentage passing</u>
1/4	....	100
1/8	....	75-95
16	....	15-37
25	....	5-20
36	....	0-8

In fact as the slots of the strainers are constant, the different quantity of different sizes of pea-gravels are to be determined by sieve analysis of the sand samples collected from a particular tubewell. This will be arranged by the contractors themselves at their own cost.

Chapter 3. Supplies

Following the Supplies viz pumps, engines, pipes etc. for the deep tubewell will be supplied by the Owner.

<u>Contents</u>	<u>Quantity</u>
a) Vertical tubewell pump:	
6"Ø diameter, 118' length	3 sets
b) Diesel engine:	
38PS/2200rpm	3 sets
c) Tank for lubrication	3 sets
d) Gear box	3 sets
e) 6"Ø Discharge steel pipe	3 sets
f) 6"Ø Sluice valve	3 sets
g) 6"Ø Check valve	3 sets
h) Bolt & Accessories of above	Number required for 3 units
i) 6"Ø G.I. Bail plug:	
5' length	3 Nos.
j) 6"Ø Brass Strainers complete with sockets:	
1/8" thickness 35/1000" slot opening	270 rft
k) 6"Ø G.I. Blind pipes with welded connections or sockets	480 rft

<u>Contents</u>	<u>Quantity</u>
l) 14"Ø M.S. Housing pipes with welded connections or sockets	360 rft
m) M.S. Reduction socket: 6" / 14"Ø, 1'-6" length	3 Nos.
n) Centraliser	24 Nos.

Chapter 4. Deep tubewell

1. Outline of the tubewell to be sank

- a) Depth : The scheduled depth of a tubewell will be 400 ft. The depth may vary according to local condition or as may be determined by the Contractor in consultation with the Supervisor.
- b) Discharge : The discharge of each tubewell should be 1.5 cusec. However, any tubewell giving discharge of upto 1.20 cusec may be accepted by the Corporation subject to a deduction of Tk. 2,500/= for less discharge for every 1/4th cusec or part thereof. Any tubewell giving less than 1.20 cusec discharge will not be acceptable.
- c) Diameter : The diameter of the tubewell shall be 6" with 14" expanded top of 120' length or of any length determined by the site representative with the Supervisor's approval.

- d) Pump & Primemovers : The water from the wells will be lifted by turbine pump driven by diesel engine of required capacity.

2. Tubewall Sinking Equipments

- a) The borehole should be of 20" to 22" inches diameter drilled preferable by reverse circulation rotary method, if not, by jet drilling method as per direction of the Supervisor. No cowdung or bentonite solution can be used in the borehole.
- b) The Contractor shall provide at the sites all necessary construction equipment and tubewell materials for construction and installation of tubewell except the Supplies by the Owner, and shall transport the Supplies and other equipments or materials necessary to the sites.
- c) The contractor must keep technically qualified representative at work site with authority to manage and direct the work. The Contractor shall execute the works strictly in accordance with the specifications and under the directions of the Supervisor.
- d) The contractor shall keep in accurate drilling log of each borehole, including a description of all materials encountered and their location in the bore hole in a manner and form as approved by the Supervisor. The contractor shall deliver to the Supervisor the original of all records and such records shall become the property of the Owner.

- e) Sample containers of adequate size to hold one pound (1/2 seer) of materials shall be provided by contractor, such containers shall be polythelene bags or glass/plastic jars suitable for retaining all the fines that may be in the sample. The detailed information such as depth of stratum, colour etc. must be noted as the drilling progresses and supplied in the form of bore logs. For each tubewell the contractor is required to supply one sample of each different stratum encountered. Where no noticeable change of strata is indicated, sample is to be collected at a maximum of 10' depth intervals.
- f) The construction equipment shall include, but not be limited to drilling equipment of the reverse circulation rotary type or jet drilling type, together with all supporting and additional equipment such as compressor, high speed engine for development and Turbine pump welding set etc. accessories necessary for taking sample, for installing the tubewell, housing pipe, for placing gravel shrouding, for developing the tubewell and for determining straightness and verticality of tubewall, for installing the turbine pumps including avometer for measuring the draw down and inhoff come for measuring sand content. All construction equipment shall be in good, serviceable condition and shall be capable of doing the work. All equipment shall be in good, serviceable condition and shall be capable of doing the work. All equipment shall be maintained in satisfactory operating condition and all necessary repairs shall be promptly made. Any other equipment that the Supervisor feels necessary must be made available to him on demand.

3. Installation of the tubewell

3-1 General

The actual lengths of each size of strainer, blind pipe and housing pipes to be installed will be determined in the field by the contractor with the approval of the Supervisor. It shall be contractor's responsibility to schedule the work and maintain liaison with the Supervisor as required to permit the Supervisor to render timely decisions in these matters.

3-2 Housing pipe

Pump housing pipe shall be assembled by field welding preferably by using fixture to keep the joints straight. The ends of the casing sections shall be leveled and cleaned as per standard practice for welding or butt shrapms may be provided. All field welding shall be performed by the electric arc method after being deposited in 2 or 3 layers and each layer of welding shall be cleaned of slag and shall show uniform sections of smoothness of wold metal. The housing pipe shall be connected to the blind pipe by means of reducing socket.

3-3 Strainer

The length of strainer to be installed is generally 60' to 100' ft. and the depths at which they will installed will be determined in consultation with the Supervisor in the field. The Supervisor will also see that the strainer is placed at the proper depths.

3-4 Blind pipe

The length of blind pipe to be installed shall be decided in consultation with the Supervisor at the site. Blind pipe shall be installed using screwed joints.

3-5 Bail plug

The bottom of the tubewell casing shall be provided with a bail plug.

3-6 Gravel shrouding

The annular space between the outside of the casing assembly and the wall of the drilled hole shall be gravel shrouded by the Contractor from the bottom upto the level of about 30' ft above the aquifer by pouring gravel with constant circulation of water through a hopper fitted at the top of 1¹/₂" pipe having sufficient length to be lowered to the bottom of bore hole.

The length of feeding pipe used for shrouding will gradually decrease with the progress of shrouding from bottom to the top i.e. ground level and there will be no voids other than the intergranular space between the gravel particles. After completion of shrouding the water pipe has to be lowered in to annular space for circulation of water for completion of shrouding.

The depth of the gravel shrouding shall be decided in consultation with the Supervisor at the site.

After completion of the gravel shrouding, the remaining annular space above the top of the gravel shrouded shall be done clay-filling.

3-7 Installation of pump and engine

Pumps, engines and other equipments and/or materials for the deep tubewell will be supplied by the Owner and installation of them will be done by the Contractor. The Contractor shall execute the works strictly in accordance with the attached "HANDLING MANUAL OF TURBINE PUMP" and "INSTRUCTION FOR INSTALLING PUMP" and under the directions of the Supervisor.

4. Development & Testing

Development and tubewell testing will be done by the Contractor according to the directions of the Supervisor.

All plants & equipments for required the development and the testing will be supplied by the Contractor.

Chapter 5. Consolidation

Consolidation area after completion the works is shown in Chapter 1. As a matter of fact, however, area required earth-moving is 14,000 sft in Nawjore CDC, 8,500 sft in Porabari CDC and 36,000 sft in Bhabanipur CDC.

Surface soil at the field required land grading will be done "surface soil treatment".

HANDLING MANUAL

Vertical Turbine Pump

1. SPECIFICATION

1 -1 Pump

Pump model No. :	BF 6005
Pump outlet diameter:	150 mm
Pump discharge:	2.5 m ³ /min.
Net pump head:	33 m
Pump speed:	1,800 rpm
Well diameter:	12 inch
Number of stage:	2 stages
Total length:	Approximate 36 m (Total length after installation)

1 -2 Diesel engine

Engine model:	Isuzu UAC 240 BA, Bonnet type, Equipped with manual clutch
Cycle:	4 cycles
Cooling system:	Water cooling
Starting system:	Cell motor
Number of cylinder -	
Bore x Stroke:	4 - 86 x 102 mm
Piston displacement:	2,369 cc
Compression ratio:	20 to 1
Fuel injection pump:	Bosch type
Generator:	AC12V - 30A
Starter:	12V - 2.2 KW

1 -3 Gear box

Gear box model:	Amarillo S40B
Gear ratio:	6 : 5
Rotational direction:	Input shaft Rightward revolution (Viewing the shaft) Output shaft Leftward revolution (Viewing from the top)
Maximum transmitting horsepower:	40 HP
Service factor:	1.5

2. FOUNDATION AND INSTALLATION

- 2 -1 For the general cautionary instruction of the foundation and the installation for the pump and the engine, refer to the attached "INSTRUCTION FOR INSTALLING PUMP".
- 2 -2 For the foundation dimensions of the pump, engine and tank for lubricating water, refer to the drawing, T90315-15.

3. INSTALLATION OF PUMP (Refer to structural drawing E791002 (English) and E791003 (Japanese))

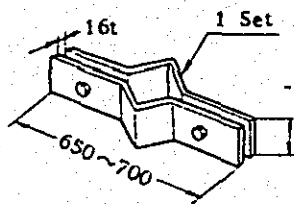
3-1 Preparation for installation

Conduct the following preparation prior to the installation of the pump.

- 1) Since the column piece and the driving shaft are assembled while suspending the pump, and then the pump is put in a well, prepare a crane truck which can suspend the final assembled weight of the pump (approximate 2.5 ton with excess) or its equivalent.

Suspending height:
Maximum 4 m

- 2) Pumping pipe clamp: 2 sets
Made of mild steel



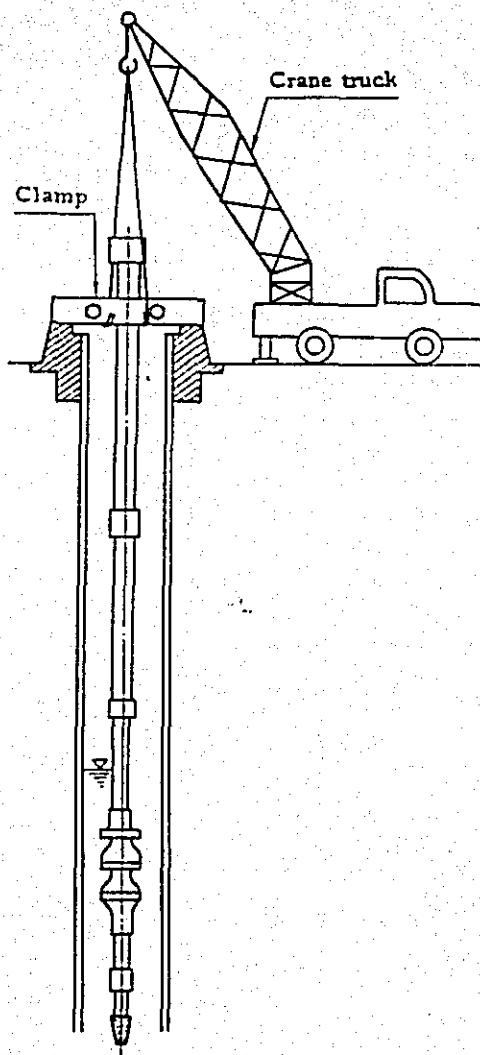
It is a jig on which the outer diameter of the column pipe (150 mm) is placed being clamped with the bolts on the both sides so as to suspend the pump while it is assembled.

- 3) Wire rope for suspension

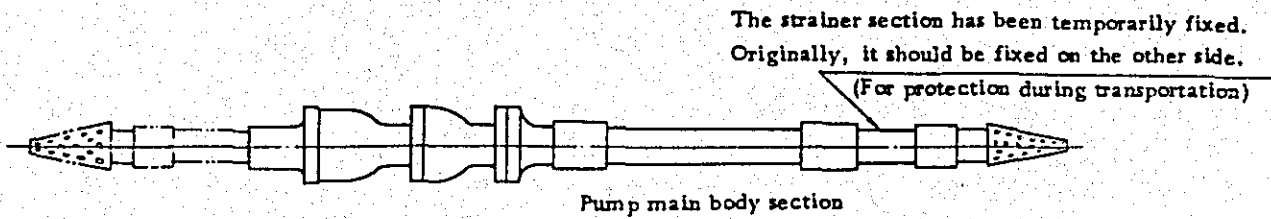
It should be possible to suspend a maximum weight of 2.5 ton.

- 4) Large sized pipe wrench: 2
(or chain tongue)

It is used for the connection of the column pipe of 150 mm.



- 5)* Unpack the packages and take out the pump main body section (C/1), intermediate bearing ass'y (C/2, 3), column pipe, driving shaft (C/6) and main shaft socket (C/6).



* The contents of () show the package case numbers.

Caution

1. Be sure not to permit foreign matters such as sand, etc. adhere on the screw part of the column pipe, the screw part of the driving shaft, the screw part of the main shaft socket, and so on.
2. Avoid denting the intermediate bearing ass'y, the screw part of the column pipe, and so on.

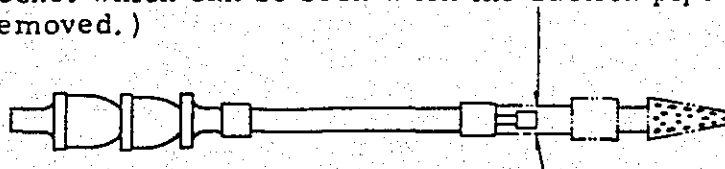
6) Identification of pump

The parts for each pump are identified as follows in accordance with the pump number.

Pump number	Identification mark
936979	C
936980	A
936981	B
936982	E
936983	D
936984	F

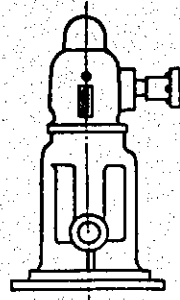
7) Items on which the identification has been given.

- i) Pump main body assembly (End surface of the main shaft socket which can be seen when the suction pipe has been removed.)



This suction pipe has been attached for protection. Attach it on the other side at the time of usage. (Refer to Item 9), ii)

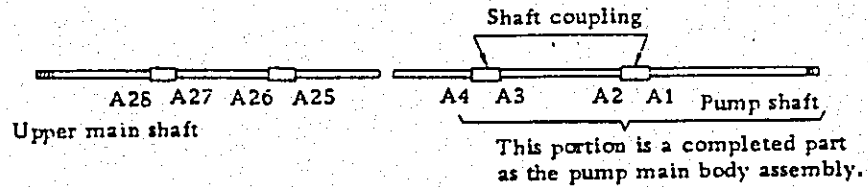
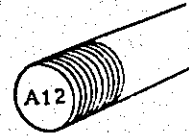
- ii) Above ground section assembly
(Pump number alone)



- iii) Driving shaft

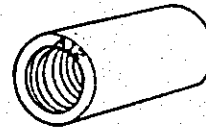
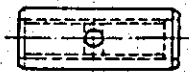


For the driving shaft, the identification has been given on the end surface of the shaft, and its sequence is as follows.



The pump main shaft and the driving shaft at the lowest section have already been incorporated in the pump main body assembly.

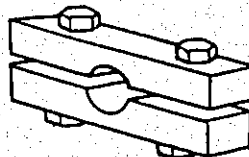
- iv) Shaft coupling



Be sure to have it correspond with the driving shaft by the same type of identification as the driving shaft.

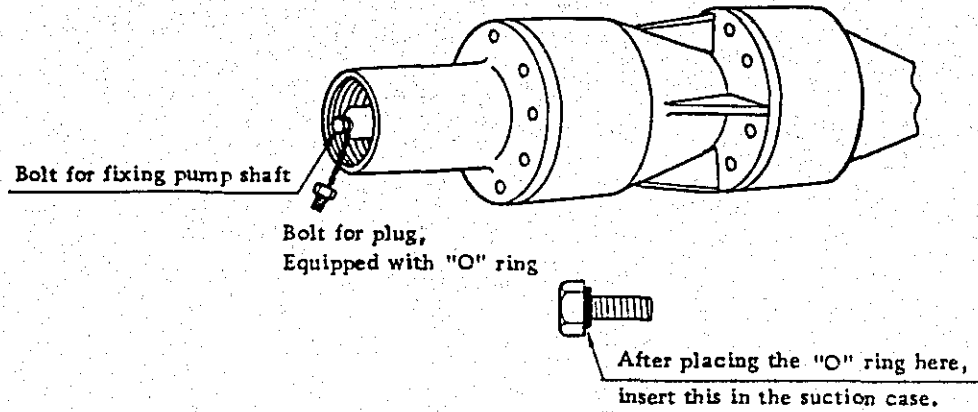
- 8) Jig for clamping of driving shaft

Prepare the jigs for clamping which have been enclosed in C/No. 6. (2 jigs)

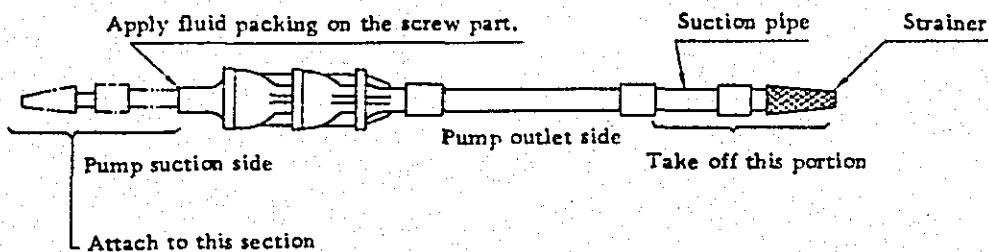


9) Preparation of pump main body assembly

- i) Remove the bolt for fixing the pump shaft which has been fitted on the end of the bearing section of the suction case for the pump, and attach the bolt for plug which has been attached with wire on the bolt for fixing the pump shaft.



- ii) Since a suction pipe and a strainer have been temporarily screwed in the outlet side of the pump for a purpose of fixing, take off these and attach them on the suction side. At this time, apply fluid packing lightly (Three Bond 4001), which has been enclosed in C/No. 1, at the screw part, and clamp up with a pipe wrench.



Caution It is better to perform this attaching work under the pump suspended condition, after completing Item 5-2, 1).

3 -2 Installation

(It is explained using the item with pump identification A as a example.)

- 1) Clamp the pumping pipe clamp on the upper section of the pump main body assembly. and suspend the pump main body by a crane truck.
- 2) Perform the work under the previous item 5-1, 9), ii).
- 3) Get down the pump gradually in the well.

4) When the pump is lowered in the well, pay sufficient attention so that sand or foreign matters may not enter into the screw part of the shaft coupling in the upper section, and the bearing surface between the intermediate bearing assy' and the driving shaft. It is most desirable to perform the work while covering that section with a piece of cloth, etc.

5) When the pumping pipe clamp has been placed on the upper surface of the well, remove the wire rope.

6) Check carefully for the following conditions.

i) There is absolutely no adhesion of foreign matters such as sand, etc. on the (a), (b) and (c) sections.

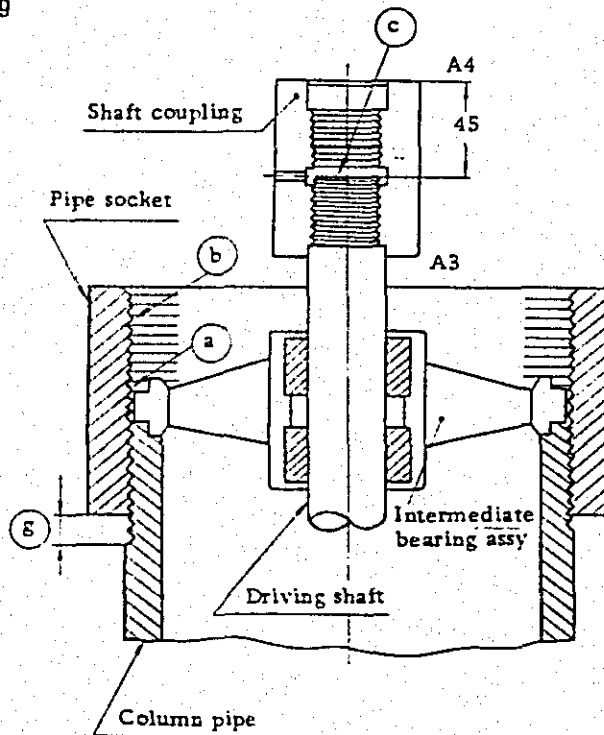
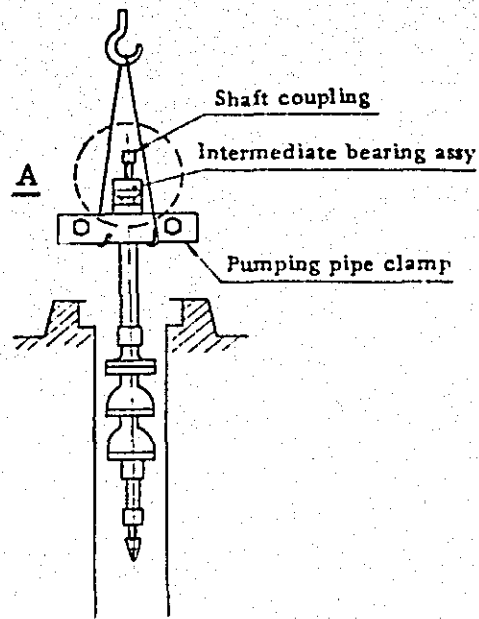
ii) The (g) dimension stays in a range of 0 - 5 mm.

iii) When foreign matter was found on the (a), (b) and (c) sections, remove the big ones by hand, and rinse off sand, earth, and so on with gasoline, etc.

iv) Adjust the related position between the shaft coupling and the driving shaft so that it becomes 45 mm as shown in the right drawing.

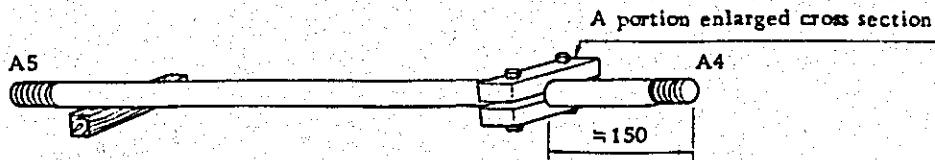
(Pay attention to the left-

hand thread.) Apply the dimension of 45 mm to all the main shaft sockets.

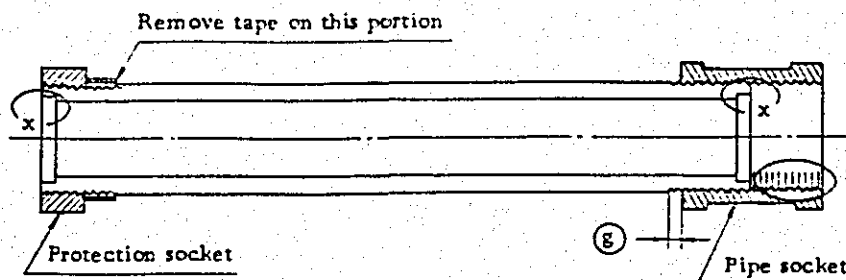


Detail of A section

- 7) Prepare the driving shaft with the stamps of A4 and A5, and remove tapes at the screw part on the both ends. Be sure not to have foreign matters adhere on them. Attach the jig for clamping (Enclosed in C/6) at approximate 150 mm from the end on the side with the stamp, A4.

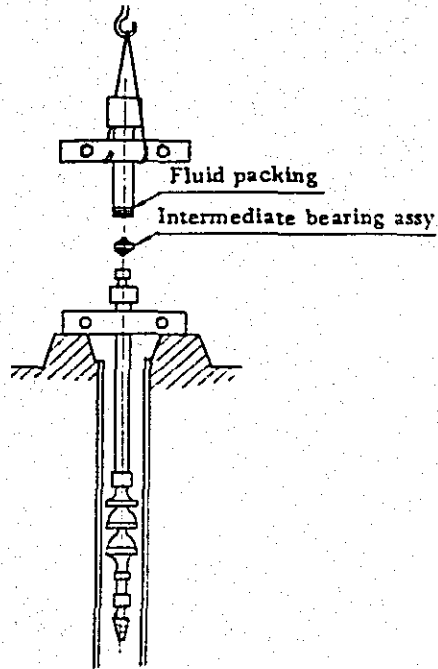
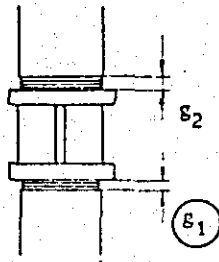


- 8) Fix the jig for clamping on the side of A3 of the driving shaft in the same way.
- 9) Lift up vertically the driving shaft, A4-5A (approximate 15 kg) by hand, and screw in the A4 side in the shaft coupling (left-hand thread). It is better to perform this work by two workers.
- 10) Clamp up the shaft securely in the end using the jig for clamping.
- 11) Prepare the item to be connected next to the column pipe (2,724 m). Check strictly whether foreign matters, paint, and so on have not been adhered at 'x' marked spots on the internal surface at the end of the pipe. Either column pipe may be used.

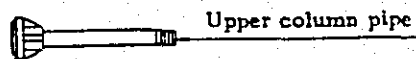


- 12) Determine the position of the pipe socket so that the (g) dimension on the column pipe becomes 0 ~ 5 mm. Attach the pumping pipe clamp on the pipe socket side, and suspend the pipe with a crane.
- 13) Remove the protection socket on the lower part.

- 14) Put in the intermediate bearing assy' on the pipe which is placed on the well by inserting securely the spigot part in it. Apply the fluid packing on the screw part of the pipe to be screwed in, and screw it in securely.



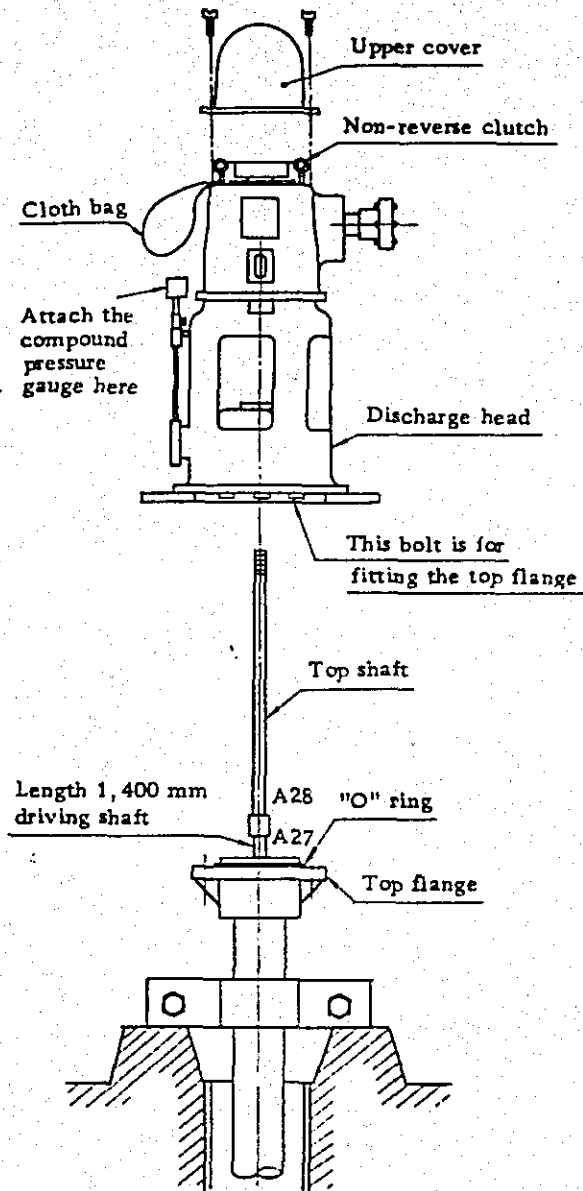
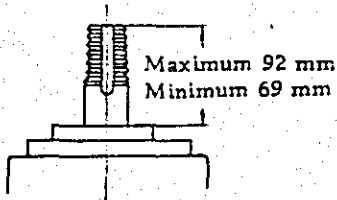
- 15) When the dimension after clamping is not $g_1 + g_2 = 10 \sim 15$ mm, the driving shaft will become short relatively after completed all the connections. Therefore, do it over again so that it becomes $g_1 + g_2 = 10 \sim 15$ mm.
- 16) Place wire rope on the above mentioned pumping pipe clamp, suspend it, remove the lower pumping pipe clamp, and lower it gradually in the well.
- 17) Repeat the procedures under Items 5) through 16), and connect the 11 column pipes. When shafts have been added, make sure at each time by rotating manually.
- 18) Finally, attach the upper pumping pipe (C/1), and screw in the upper main shaft. Remove the bolts on the lower surface of the frame.



19) Remove the upper cover of the gear box, and remove the Non-reverse clutch with a hexagon head bar wrench which is in the cloth bag.

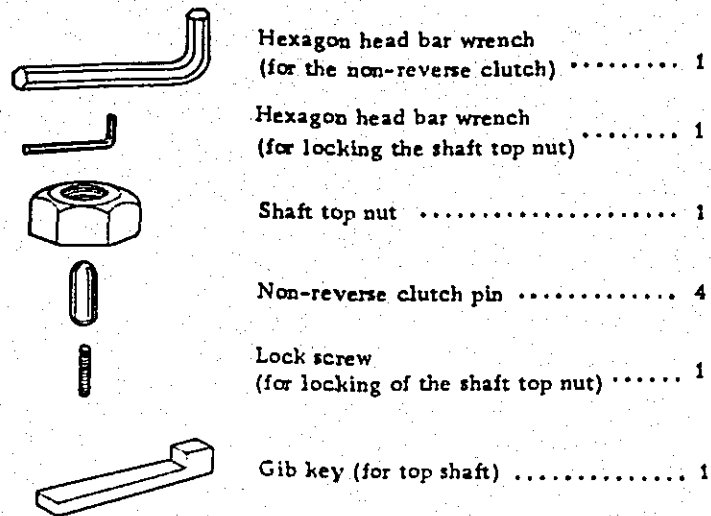
20) Slowly lower the discharge head assemblies (frame + gear box) in such a manner that it may not strike against the screw part of the top shaft, and fasten the top flange to the lower surface of the discharge head with bolts.

21) When the discharge head assemblies have been attached, the allowable length value of the top shaft which protrudes on the upper surface of the gear box should be within the following range.



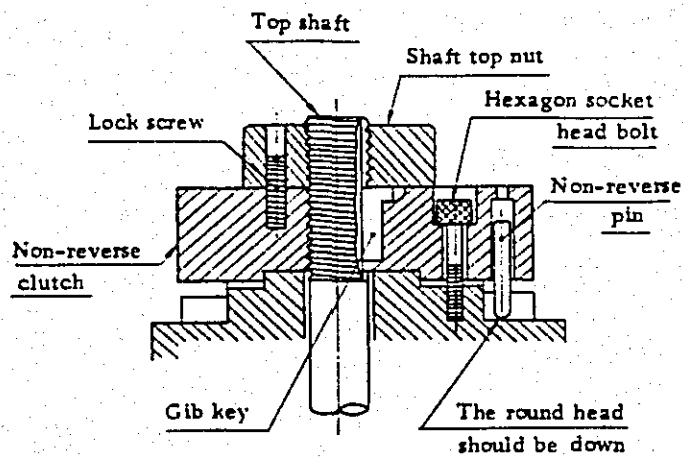
22) When the distance from the upper surface of the gear box to the top shaft end is not within the range shown in the drawing above, a dimensional confusion has occurred on the matters which fall under the Items 11) through 15). Therefore, pull up the pump again in order, and repeat the works on and after Item 11).

23) Contents in cloth bag



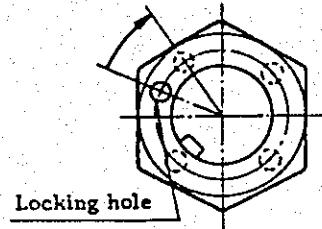
24) Insert the non-reverse clutch pins in the four (4) holes on the non-reverse clutch, set the clutch on the gear box in such a manner that those pins may not drop, and fix it securely with hexagon socket head bolts.

25) Have the key groove of the top shaft meet the key groove of the non-reverse clutch, and put in the key with head.



26) Screw in the shaft top nut to the top shaft, and keep screwing in by hand until the lower surface contacts the upper surface of the non-reverse clutch.

- 27) Tighten up the shaft top nut further by 2 turns using a single ended wrench 46 (it is in the tool set in C/2, 3.). Since the pitch of the screw for the shaft top nut is 2 mm, the whole body of the rotating parts will be raised by 4 mm from the lowest condition. This condition is the most ideal position for the rotating section. At this time, when the locking hole of the shaft top nut does not correspond to the small screw hole on the non-reverse clutch, which is under it, screw up further, and when the locking hole meet the first screw hole, stop the shaft top nut, and fix the lock screws securely using a hexagon head bar wrench.

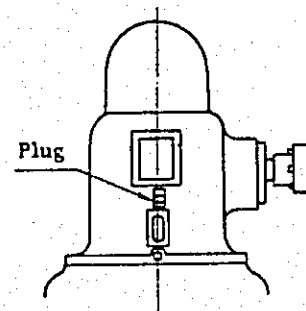


Caution Since the adjustment under this Item 27) is the most important work as adjustments for the vertical turbine pump, conduct it with sufficient attention.

- 28) Remove the cloth bag, and tighten the upper cover.

- 29) Oil feeding to gear box

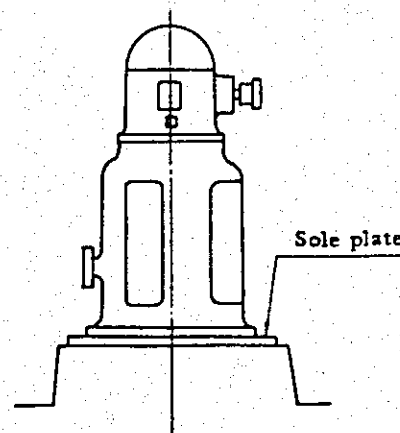
Remove a plug which is located under the name plate of the gear box, and supply oil to the line of "OIL LEVEL" on the level gauge. (4 liters)
The oil is enclosed in C/No. 2, 3.



Caution

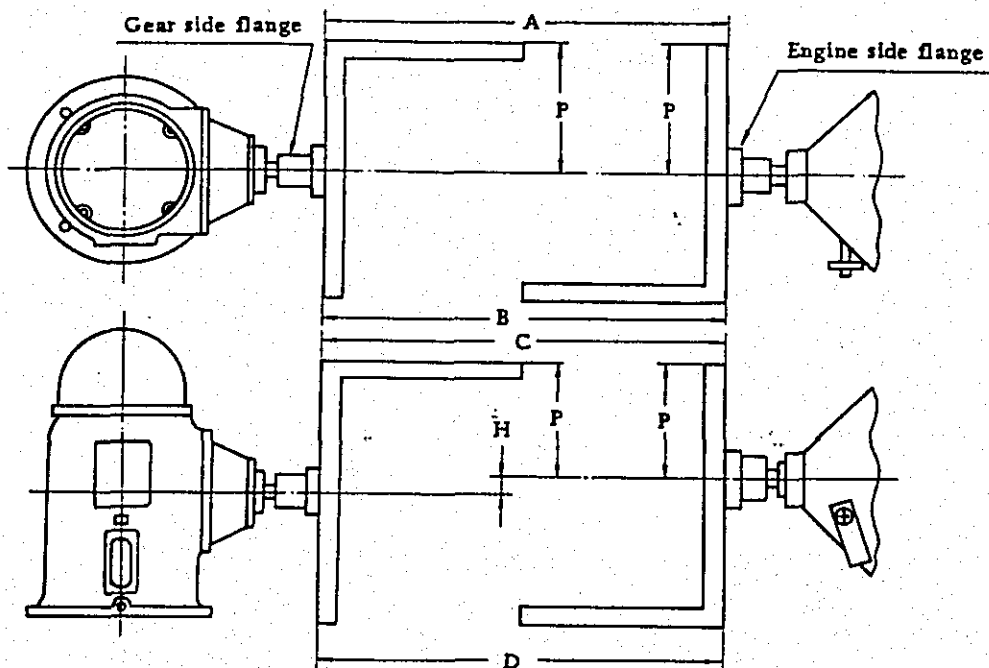
When the oil is charged, pay attention so that foreign matters such as sand, etc. may not enter into the gear box.

- 30) Tighten the foundation bolts in such a manner that the upper surface of the sole plate becomes level.



4. INSTALLATION OF ENGINE

- 4 -1 Install the engine horizontally so that the H dimension shown in the drawing below stays within 10 mm.
(Either positive side or negative side will be OK.)
- 4 -2 Conduct an adjustment by moving the engine so that the dimensional error for A ~ B, and C ~ D stays within 2 mm when the P dimension is $100 \text{ mm} \pm 20 \text{ mm}$, using a carpenter's square, etc.
- 4 -3 The standard value for the dimension of $A = B = C = D$ is $615 \pm 5 \text{ mm}$.



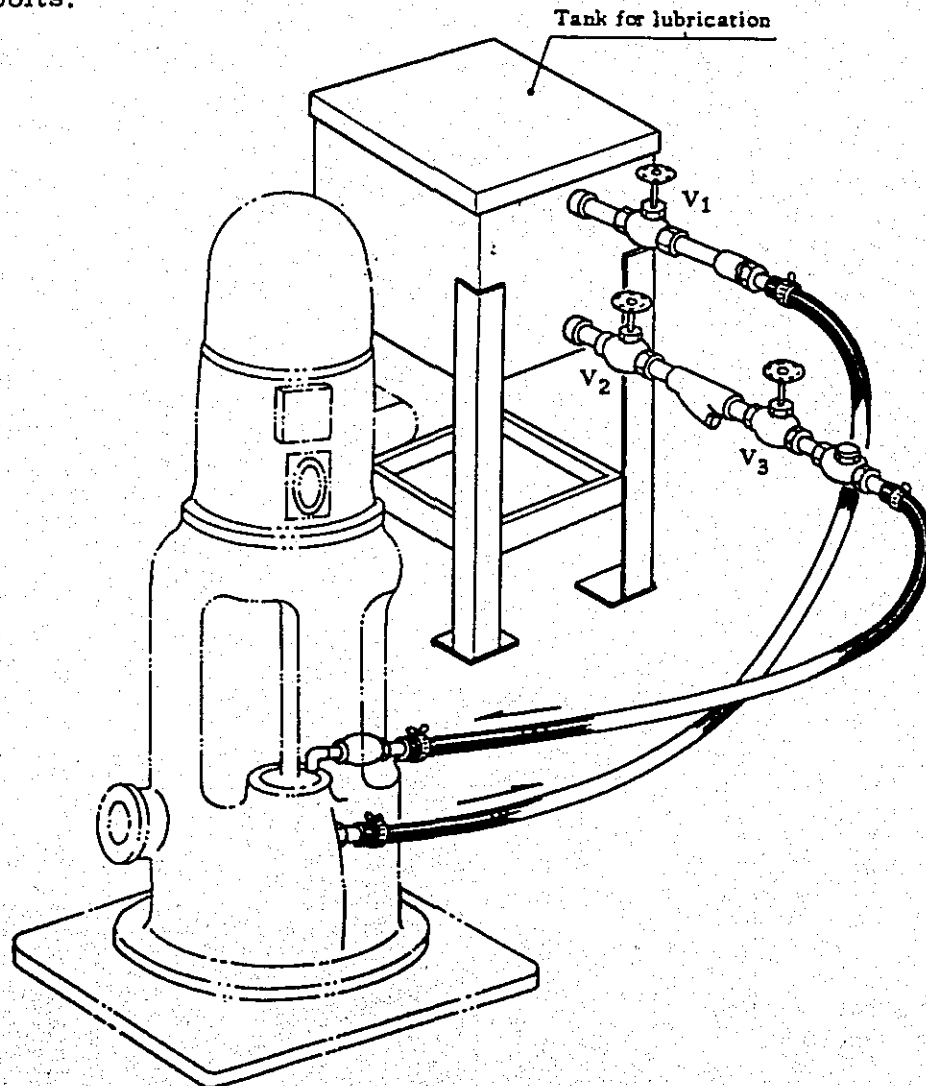
- 4-4 Since battery fluid for the battery of the engine has not added, supply the battery fluid of 18ℓ can which has been packed together with the engine to the determined volume.
- 4-5 Replenish clean water to the radiator of the engine.

5. ATTACHING OF PROPELLER SHAFT

- 1) Remove the bolts which have been fitted on the both flange coupling of the gear box and the engine, and attach the propeller shaft.
- 2) Put the propeller shaft in the center after shortening it by hitting it lightly in the axial direction and having it move at the spline section.
- 3) When the propeller shaft is attached, disengage the clutch lever of the engine so as to have it rotate freely, and then connect it.

6. INSTALLATION OF TANK FOR LUBRICATING WATER

- 1) Connect the piping section to the tank for lubrication using seal tape.
- 2) Clamp the rubber hose securely using hose bends as shown in the right drawing.
- 3) When sand or foreign matter has been mixed in the tank and the piping such as hose, etc., it will give a critically damage the bearing section of the pump shaft. Therefore, pay sufficient attention.
- 4) Fill the tank with clean water.
(Valves, V_1 and V_2 should be totally open, and V_3 should be totally closed.)
- 5) Fix the tank for lubricating water to the floor with the foundation bolts.



A V-40

7. PREPARATION FOR OPERATION

- 1) Attach the check valve, sluice valve and discharging pipes on the outlet of the discharge head. At this time, be sure that the weight of the piping may not be added to the outlet flange.
- 2) Make sure that the oil level of the gear box stays at the determined position.
- 3) Replenish the fuel of the engine (JIS K2204 light oil) in the fuel tank. (The tank capacity is 35 ℓ).
- 4) Make sure that the battery fluid has been sufficiently supplied.
- 5) Make sure that the battery wiring is secure.
- 6) Make sure that the cooling water of the radiator is sufficient.
- 7) Make sure that water has been sufficiently supplied in the tank for lubricating water.
- 8) Make sure that the clutch lever has been disengaged.
- 9) Make sure that the propeller shaft turns smoothly by rotating it by hand (the rotational direction is clearly indicated on the gear box.) under the condition with clutch lever disengaged.
- 10) Open the valve, V₃ of the lubricating water tank, and supply the lubricating water to the main shaft. At this time, turn the propeller shaft by hand in order to have the lubricating water extend thoroughly on the bearing.
Keep this condition until the water level of the lubricating water tank becomes approximate half.
- 11) Keep the sluice valve on the discharge pipe under its closed condition.

8. OPERATION

- 1) Start the engine, and keep warming-up run at a speed of approximate 1,000 rpm until the needle of the thermometer has started moving.
- 2) After the completion of the warming-up, open the throttle under the fuel tank gradually, and increase the speed. And after raising the speed to approximate 1,800 rpm, have the clutch lever engage.
- 3) When the pump shaft has reached its full speed, raise further the revolution number of the engine to approximate 2,200 rpm, and then open the sluice valve on the outlet side immediately.
- 4) Adjust further so that the revolution number of the engine becomes 2,200 ~ 2,250 rpm.
- 5) A continuous operation for 4 ~ 4.5 hours of the engine with full load is available by one fuel charge.

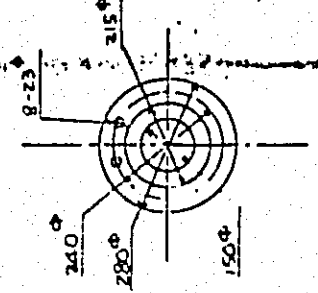
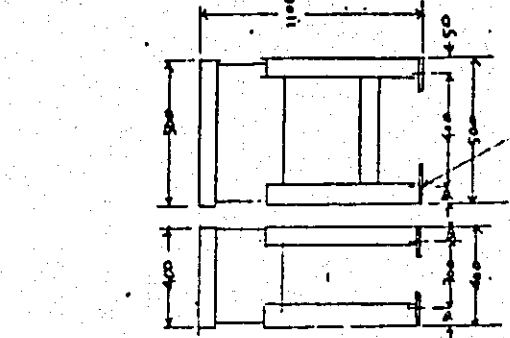
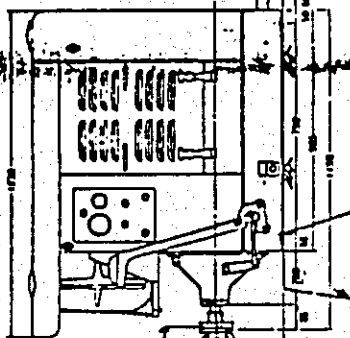
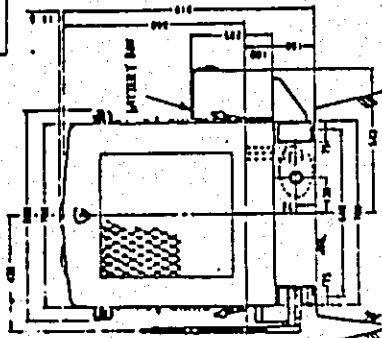
Caution

- 1) A critical failure such as seizure, etc. will occur when the pump section is not immersed in water. Therefore, check the water level prior to the operation of the pump without fail.
- 2) Also, during operation, when the water level descends abnormally, and water shortage condition is given, it will result in failures of the pump. Therefore, pay attention to the water level of the well during operation.

9. MAINTENANCE

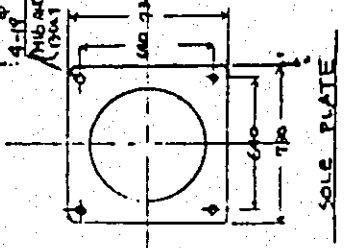
- 1) Conduct the oil change of the gear box every 1,000 ~ 1,500 hours.
- 2) Replace the grand packing of the pump when a leakage at the shaft sealed section can not be stopped any more by fasten up of the grand packing.
- 3) Conduct grease-up of the propeller shaft every 1,000 ~ 1,500 hours with a grease gun, which is an accessory.

PLAN 10000
3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS



DISCHARGE FLANGE
(JIS 10KS/C32)

4-12 (NO. 40) (M16) (M16)
WATER-MAKE-UP TANK



275
MAX. BOWL DIA

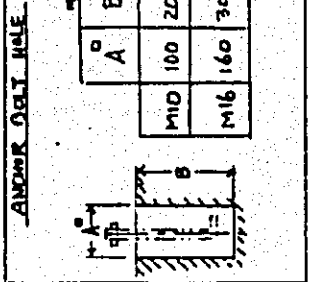
SUCTION PIPE

SOLE PLATE

SPECIFICATION

WELL DIA.	1.2 INCH
COLUMN PIPE	6 INCH
DISCH. SIZE	6 INCH
DISCHARGE	2.5 m ³ /hr
TOTAL HEAD	33 m
REVOLUTION	1200 RPM
REQ. POWER	32 PS

ENGINE
ISUZU DIESEL ENGINE POWER UNIT
WATER COOLED *MODEL: UAC 2000A*
GCR. MIN. 2800/2500 RPM



NO.	DESCRIPTION	MATERIAL	NO. QUANTITY	UNIT	REMARKS
1	ENG. HOUSING	STEEL	1	PC	
2	DESIGN SHEET		1	PC	
3	WARRANTY		1	PC	
4	ORDER		1	PC	
5	SIZE		1	PC	
6	SCALE	1/2	1	PC	

TYPE/SP VERTICAL TURBINE PUMP
(MODEL : BP-6005)

DATE: T90315-15

TAKASAGO TEKKO K.K. PUMP DIVISION

INSTRUCTION FOR INSTALLING PUMP

INSTRUCTION FOR INSTALLING PUMP

(1) Foundation

1. The foundation shall be rigid enough not only to withstand the weights of the pump itself, its attachments and pumping water, but also to enable successfully absorbing various vibrations inherently produced during operation. The foundation shall be constructed in sufficient dimensions, rigidity of the ground being taken into consideration.
2. The weight of foundation itself shall be 3 times or more the machine (pump and drive mechanism) weight for direct motor-driven pump, and 5 times or more for direct engine-driven pump.
3. When the ground is weak, wooden or concrete piles shall be driven in the ground to reinforce.
4. In winter, frozen soil may reduce rigidity of ground. Consequently, the foundation shall be deeper than the frozen soil.
In general, the depth shall be 500 mm or over for comparatively warm regions, and 700 ~ 1000 mm or over for frozen regions.
5. Foundation bolt holes shall be made largely in the foundation according to the Foundation Drawing, or by measuring with the foundation bolts to be used.
The foundation shall be larger by about 75 mm in width and length than the common bed to provide a sufficient room for the foundation bolt holes.
6. The pump shall be installed after foundation mortar is completely solidified.
7. There are many ways to install foundation bolts and the following two methods are the most representative methods.

A. Template method

According to the instruction on the Foundation Drawing, define each position of foundation bolts with a template as shown in Fig.1 .

With the templete, the foundation bolts shown in Fig. 2 (a) can be successfully used.

When a pipe is grounded round foundation bolt, the pipe diameter shall be 3 to 4 times the bolt diameter as shown in Fig. 2 (b).

In mortaring, it is recommended to put a rag round each foundation bolt.

B. Pat method

When constructing foundation, foundation bolt holes can be made by setting wooden box frame and filling the box frame with mortar.

The method is that: hang foundation bolts from the common bed (foundation bolts being passed through holes provided in the common bed) and, keeping the foundation bolts perpendicular, fill the foundation bolt holes with non-contractive mortar.

In order to prevent the foundation bolts from being drawn out when nuts are tightened, the foundation bolt holes shall be thoroughly cleaned and wetted before mortaring to assure good adhesion of mortar.

When all foundation bolts have been securely anchored, the common bed shall be removed.

If foundation bolts are not well aligned, the common bed must be forcedly set with the foundation bolts and the common bed may be deformed.

Consequently, the pat method is highly recommended to assure good accommodation of the foundation bolts with the common bed.

8. A clearance of 10 to 50 mm shall be provided between the common bed and the foundation to make leveling possible.
9. The foundation surface shall remain unfinished.
In order to assure good adhesion in grouting with the common bed, the foundation shall be chipped.
10. When the foundation has been prepared by customer, inspection shall be exercised for level of foundation, location and depth of foundation bolt holes by plotting reference lines (center line) on the foundation and establishing a reference surface.
If any inaccuracy is found on the foundation, it shall be immediately notified to the customer and corrected with discussion.

11. When correcting or chipping the foundation, the all foundation bolt holes shall be protected with a suitable cover to prevent chip from getting in the holes.
12. If water or any other obstacle is found in the foundation bolt holes, it shall be removed and the holes shall be thoroughly cleaned.

(2) Installation of Pump

1. Prior to the installation of the pump, the followings shall be checked.
 - A. Location and dimensions of foundation
 - B. Location, size and upright of foundation bolts
 - C. Reference lines indicated in the Foundation Drawing
 - D. Piping
 - E. Environmental condition
 - F. Preparation and working procedures, etc.
2. Installation shall be correctly performed in respect to the specified direction and location.
3. The foundation surface shall be well cleaned to be free from concrete chip and dust.
4. Liners (Taper liner and straight liner)

- A. 2 types of liner combinations shall be prepared:
 - i) A pair of taper liners and a straight liner
 - ii) A pair of taper liners

The application of the liner combinations shall depend on motor capacity.

For motor of 7.5 kW (4 pole) or larger

A set of liner consisting of taper liners and a straight liner

For motor of 7.5 kW (4 pole) or smaller

Only taper liners

The pair of taper liners shall be made of soft steel

and consist of wedge-shaped upper and lower liners, both of which form parallel when set one upon another in inverse direction.

The degree of taper shall be 1/50 to 1/100 (See Fig. 3).

Taper liner (soft steel made, wedge-shaped)

Straight liner (packer plate)

B. All liners shall be made of soft steel and fitting surface shall be machine-finished.

5. The size of liner shall be determined so that each liner can well support the following loads and permits the machine to be adjusted in height as well as satisfactorily withstand the weight of machine itself (static load) and operating load (dynamic load).

For foundation constructed with usual cement
20 kg/cm²

For foundation constructed with non-contractive
cement 30 kg/cm²

However, when this is specified by customer, the size of liner shall be determined according to the customer's specifications.

6. Straight liners shall be installed before installing the pump with non-contractive mortar.
7. Liners shall be, as a rule, placed at the both sides of the foundation bolts. When the interval or pitch between the foundation bolts is too large, liners shall be placed within the interval.
In general, liners shall be placed within 650 mm of interval. Therefore, when bolt-to-bolt distance is over 700 mm, additional one set of liners shall be placed at the center of this distance.
8. When liners are anchored in the pat method, it shall be performed as illustrated in Fig. 4 .
The liner upper surface shall be horizontal within 5/100. The zone where the pat is constructed shall be thoroughly cleaned and wetted. Water shall be removed from the zone.
9. All straight liners shall be exactly installed in the specified height above the reference surface and checked for

parallelism in each direction by applying a straight edge or level vial.

10. Although at shipping, the pump has been well aligned in connection with the motor, being mounted on the horizontally placed common bed, deformation inevitably occurs with the common bed during transport. Therefore, the pump and motor shall be realigned by utilizing liners when these are installed on the foundation.
11. Before installing the common bed on the foundation, the bottom surface of the common bed shall be cleaned.
12. In this stage of installation, shaft coupling bolts shall be kept removed and stored.
13. Level shall be always measured on the machine-finished perfectly horizontal or perpendicular surfaces. Level shall be measured at two places each in two directions perpendicularly crossing each other. The obtained results at two places shall be compared to assure exact level.
14. Leveling of the pump unit shall be always made by adjusting taper liners placed between the foundation and the common bed, but not rely on tightening of foundation bolts.
15. Care shall be paid to the fact that even rigidly constructed common bed, ununiformly exerted force may cause deformation of the common bed and result in mis-alignment of shafts.
16. Leveling accuracy shall be within ± 3 mm in height and a range from 5/100 to 10/100 of inclination. Leveling shall be made with the foundation bolts tightened as lightly as the common bed can no longer move.
17. Placed taper liners shall be checked for secureness by lightly tapping them with a hammer. Foundation bolts shall not be firmly tightened until the common bed is filled with mortar.
18. After leveling, layered liners shall be welded each other to prevent loosening and slippage.

(3) Grouting

1. Grouting is one of the most important practices in installation of the pump.
Before grouting, oil, sound, dirt and other foreign matter shall be thoroughly removed from the foundation surface.
2. After cleaning, water shall be sprinkled over the foundation and grouting shall be started at least after 30 min. of sprinkling.
If accumulated water is found on the foundation, it shall be removed before grouting.
3. In general practice, wooden frame shall be provided enclosing the common bed to prevent flowing out of the mortar.
The wooden frame is dispensable when non-contractive mortar is used to enclose the common bed. (See Fig. 5)
Usual mortar shall be used for grouting.
The mortar shall be prepared by mixing pure portland cement and cleaned well-sieved sand at a ratio of 1:2 and by adding suitable amount of water.
The mortar shall be mixed to become creamy or soft putty-like viscosity.
Well prepared mortar does not flow out spontaneously, but flows when slight force is exerted.
4. Mortar shall be poured in the spaces below the common bed and the bed inside.
After mortaring, any load shall not be charged to the mortar for 3 to 7 days.
To shorten the solidifying period, the use of rapid solidifying cement or non-contractive cement is recommendable.
In grouting, care shall be taken not to remain any cavity in the bed. To eliminate cavity, the poured mortar shall be rammed.
5. The wooden frame shall be removed after 48 hours of mortaring and a finish coat shall be made over the concrete.
It shall be noted that mortar may come off from the common bed and cause intense vibration, if oil is leaked into the common bed.
6. The foundation bolts shall be securely tightened when the mortar has been completely solidified.
Consideration shall be given for all bolts to be tightened at an equal torque.

7. Even when the shaft coupling girder and the like have been removed, all full-threaded bolts screwed in the common bed shall not be removed when grouting to prevent mortar from adhering on the thread.

(4) Centering and Alignment

1. Centering or alignment shall be performed after the mortar has been completely established.
2. Before centering, pipes and pipe supports shall be installed. In piping and removing blind plates from the inlet and outlet flanges of the pump, care shall be taken not to let foreign matter in the pump.
3. When installing the suction pipe, discharge pipe, valves, etc., care shall be taken that the weights or clamping force of pipes or valves are not charged to the pump unit.
4. Centering error of the shafts shall be within a range from $2/100$ to $5/100$ mm at speeds ranging from 1,000 to 3,600 rpm. Preferably, it shall be within $3/100$ mm. Gap (face to face) in the shaft coupling shall be within $5/100$ mm.
5. To measure the centering accuracy, a dial indicator of $1/100$ mm accuracy or a thickness gauge shall be used. To support the dial indicator, a surface gauge and magnet chuck shall be used. If these are not available, a setting attachment or suitable tool shall be used to securely hold the dial indicator. (See Fig. 6)

Note: For small pumps, instead of the dial indicator, the measurement can be successfully made with a square rule and taper gauge or thickness gauge. (See Fig. 7)

6. The measuring shall be made on the circumference of the shaft coupling or the most protruded outer edges where measuring is possible. To measure, the shaft coupling bolts shall be removed.
7. The motor shall be exclusively moved to adjust alignment of the shafts. A shim plate of 0.1 to 0.6 thick, made of brass, steel or

stainless steel, shall be used to adjust the height of the motor shaft.

The motor shaft shall be slid to adjust the shaft in horizontal directions within the movable range of motor clamp bolts.

It shall be avoided that a number of shim plates are layered to adjust the height of the shaft.

The shim plate shall be as thick as possible and fine adjustment shall be made with a shim plate of 0.1 to 0.2 mm thick.

8. When installation, piping and alignment have been completed, inspection shall be made in the presence of customer's inspector and, after the inspection has been successfully finished, the shaft coupling bolts shall be set.

Before setting the shaft coupling bolts, however, it is recommended to temporarily rotate the motor to see rotating direction.

9. As far as medium or small type water pumps are concerned, alignment or centering can be successfully made only by measuring coincidence of the shaft centers at ambient temperature. However, for the pumps employed with liquid at high temperature or driven by a steam turbine, a "Vertical Gap" shall be provided, as shown in Table 1, in the shaft coupling when centering the shafts to compensate heat expansion due to temperature variation.

10. Centering shall be made in two stages: temporary centering before piping and final centering after piping. Piping shall start from the pump side, and the lead pipes from the pump shall be connected with the main pipe at a place distant from the pump in order to avoid detrimental force to the pump and cause deformation of the pump. For the same reason, the pipe supports shall be installed as near as possible to the pump.

11. When a gear coupling is used, the coupling teeth shall be thoroughly cleaned and well lubricated.

For a gear coupling with a spacer, the matching mark on the spacer shall exactly meet.

(5) Installation of Attachments and Maintenance

1. Small pipes, pressure gauge, thermometer, oil gauge,

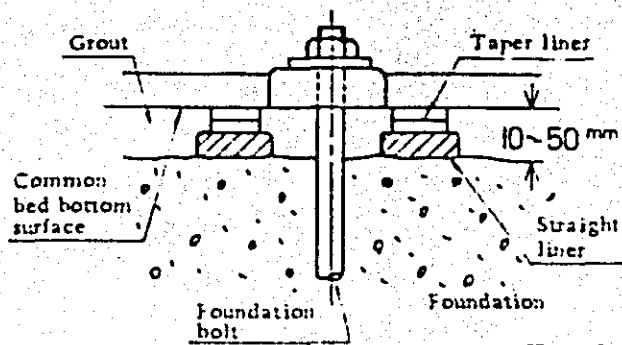
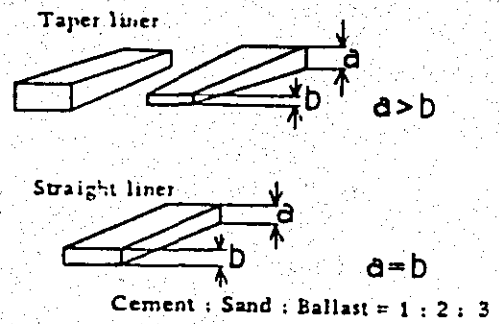


Fig. 3



Pat Method

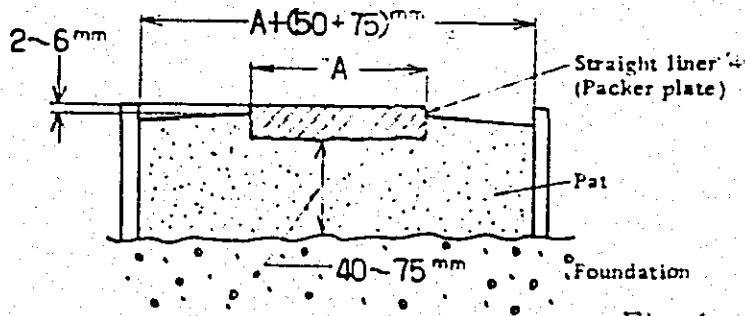


Fig. 4

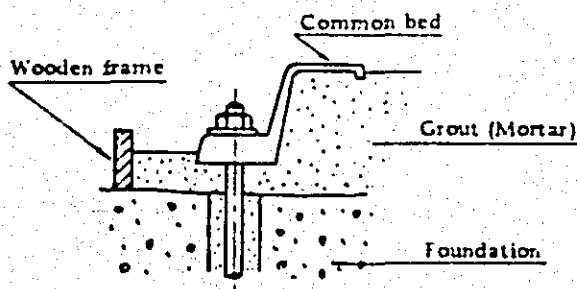


Fig. 5

gauge stand, etc., which have been dismantled for shipping shall be installed.

2. After finishing the all work, the pump and environment shall be put into order and cleaned.

Templete Method

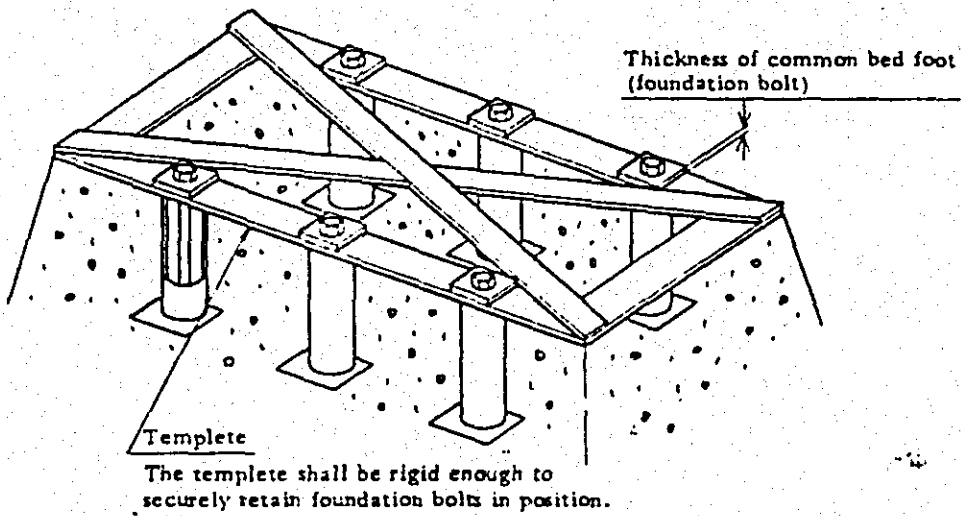


Fig. 1

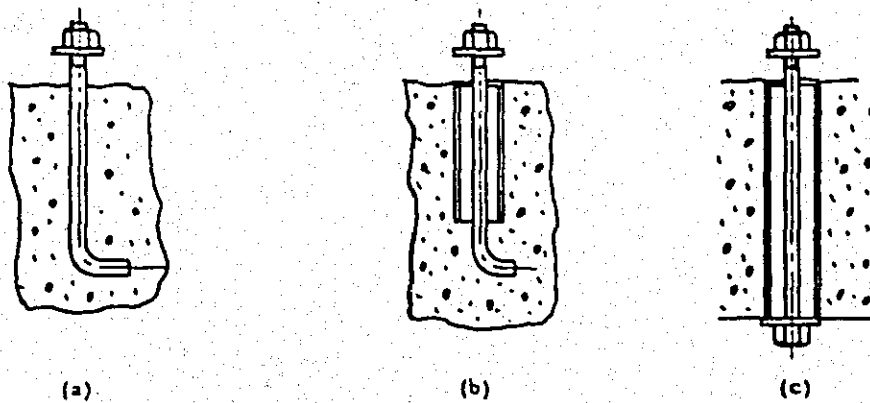
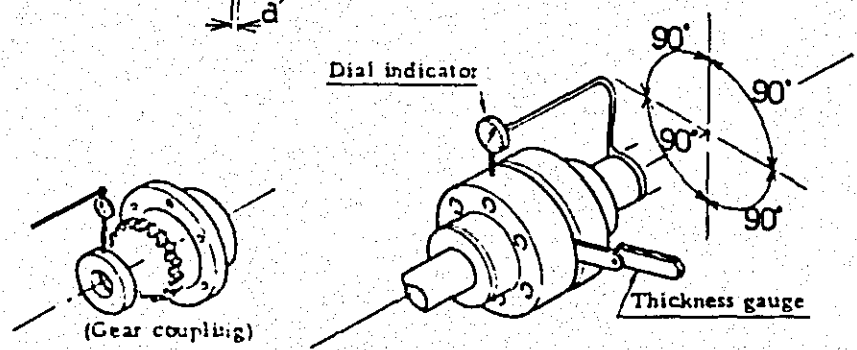
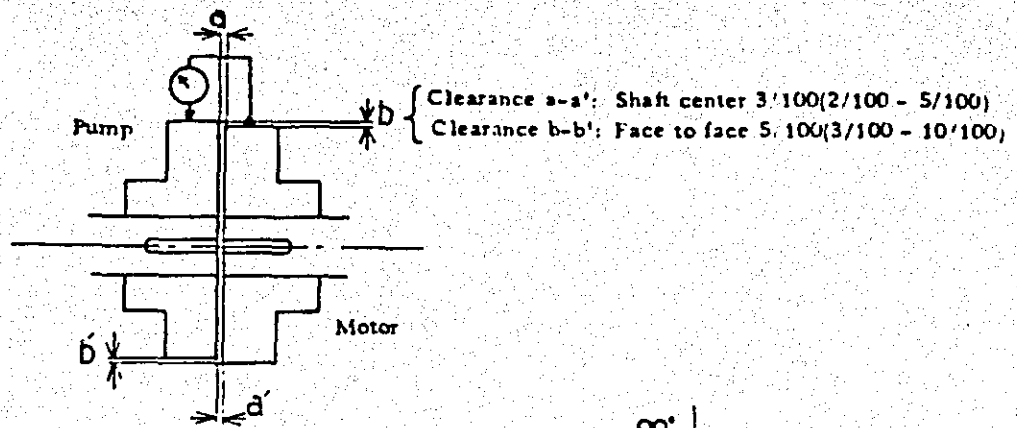
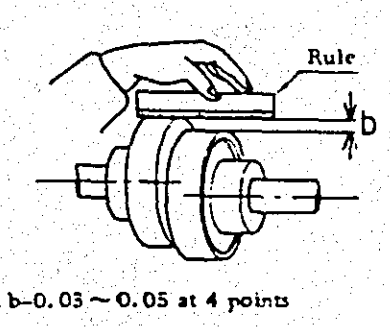


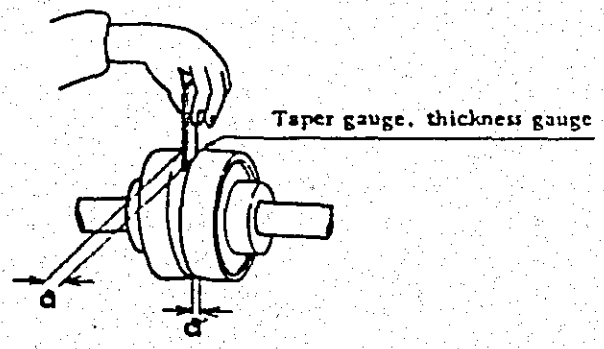
Fig. 2



To measure, turn the shaft at 90° and measure at 4 different points at every 90°. The averaged value shall be within the specified value.



$b = 0.03 \sim 0.05$ at 4 points



$(a - a') = 0.05 \sim 0.10 \text{ mm}$

Fig. 6

Table 1. Vertical Gap in Shaft Coupling (mm)

		Type of drive	Fluid at ambient or low temperature	Fluid at high temperature (120°C)
Usual Pump	Motor or engine		Drive shaft shall be lower than pump shaft by 0.13 ~ 0.20	Drive shaft shall be higher than pump shaft by 0.16 ~ 0.25
	Steam turbine (Center-supported turbine)		Turbine shaft shall be lower than pump shaft by 0.13 ~ 0.20	Turbine shaft shall be higher than pump shaft by 0.20 ~ 0.25
	Steam turbine (Bottom-supported turbine)		Turbine shaft shall be lower than pump shaft by 0.5 ~ 0.6	Turbine shaft shall be higher than pump shaft by 0.30 ~ 0.38
		Type of drive	Fluid at ambient or low temperature	Fluid at high temperature (Max. 450°C)
Center-supported Process Pump	Both sides bearing-supported shaft	Motor or engine	Drive shaft shall be lower than pump shaft by 0.13 ~ 0.20	Drive shaft shall be higher than pump shaft by 0.20 ~ 0.25
		Steam turbine (Center-supported turbine)	Turbine shaft shall be lower than pump shaft by 0.13 ~ 0.20	Turbine shaft shall be higher than pump shaft by 0.20 ~ 0.25
		Steam turbine (Bottom-supported turbine)	Turbine shaft shall be lower than pump shaft by 0.5 ~ 0.6	Turbine shaft shall be higher than pump shaft by 0.30 ~ 0.35
	Single side bearing-supported shaft (Overhung type)	Motor or engine	Drive shaft shall be lower than pump shaft by 0.13 to 0.20.	
		Steam turbine (Center-supported turbine)	Turbine shaft shall be lower than pump shaft by 0.25 to 0.35.	
		Steam turbine (Bottom-supported turbine)	Turbine shaft shall be lower than pump shaft by 0.50 to 0.75.	

APPENDIX VI

DRAWINGS

LIST OF DRAWINGS

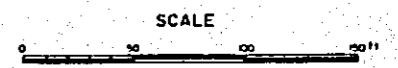
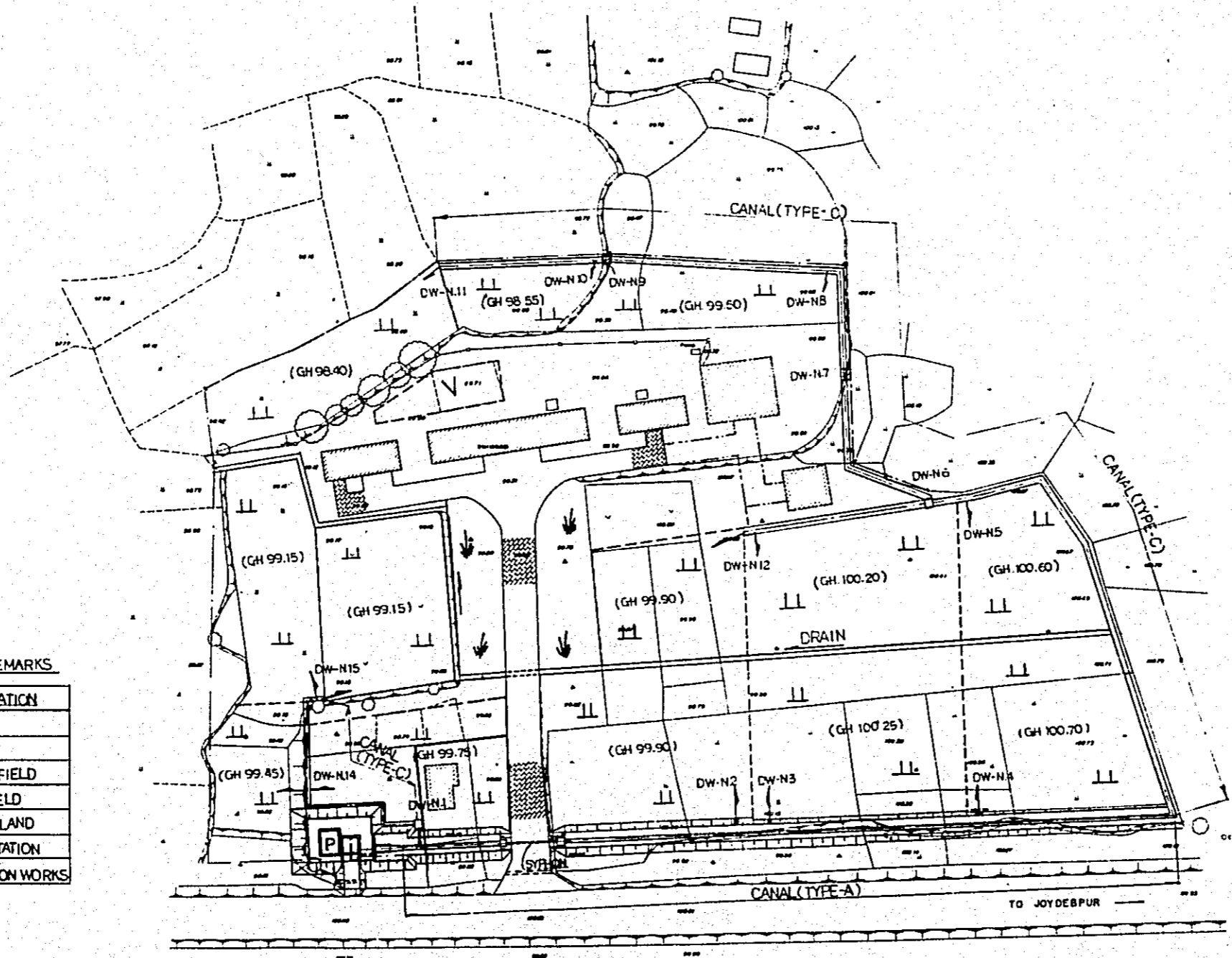
<u>DWG.No.</u>	<u>TITLE</u>
1	General Plan of Nawjore C.D.C.
2	General Plan of Porabari C.D.C.
3	General Plan of Bhabanipur C.D.C.
4	Plan of Pumping Station
5	Deep Tubewell
6	Pumping House
7	Discharge Box
8	Standard Cross Sections of Irrigation & Drainage Canals
9	Profile of Irrigation Canal of Nawjore C.D.C.
10	Profile of Irrigation Canal of Porabari C.D.C.
11	Profile of Irrigation Canal of Bhabanipur C.D.C.
12	Division Works (1)
13	Division Works (2)
14	Division Works (3)
15	Drop & Cross Culvert
16	Syphon
17	Cross Sections of Ponds
18	Spillway-cum-Outlet Works of Porabari Pond
19	Outlet Works of Bhabanipur Pond
20	Spillway of Bhabanipur Pond



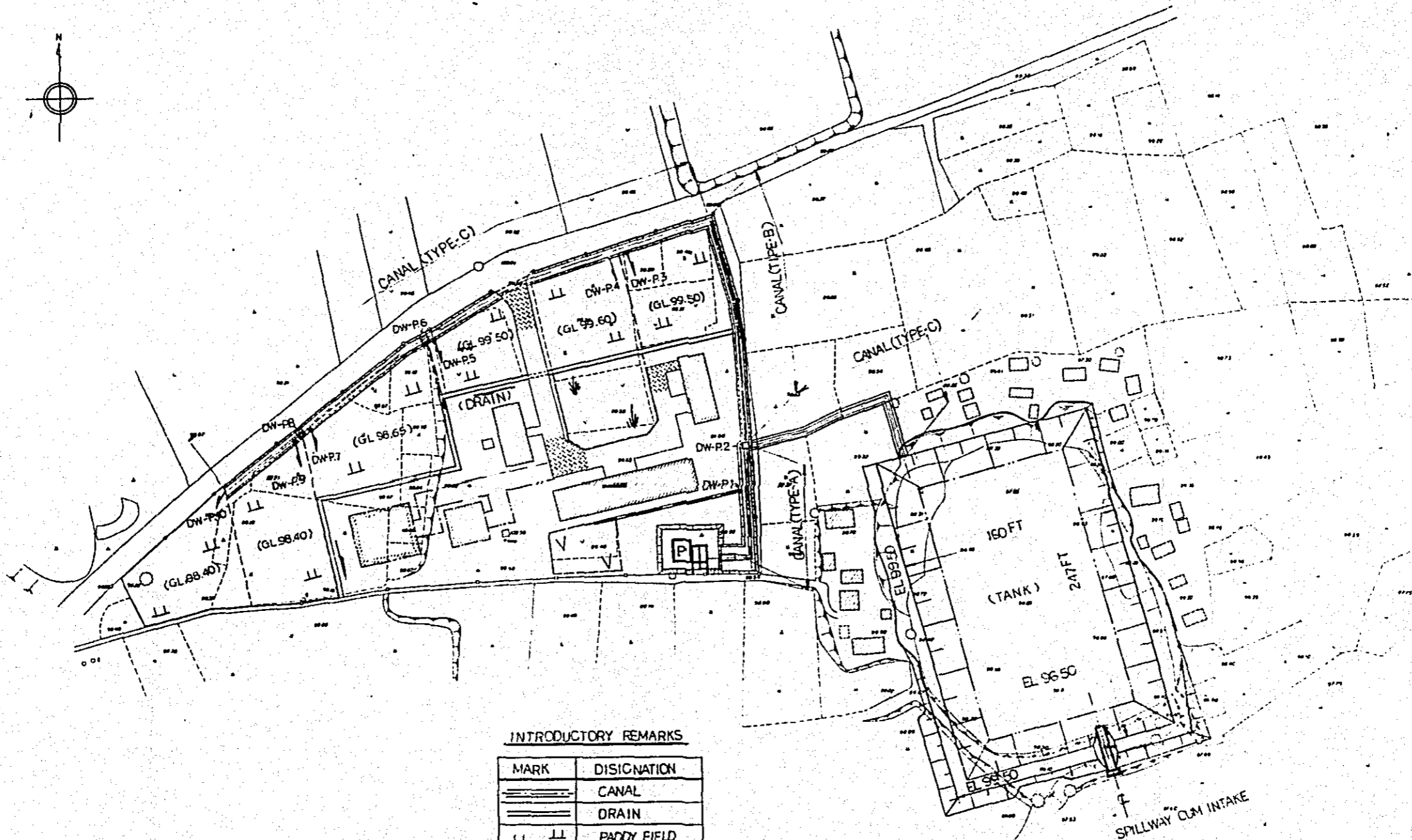
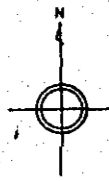
□ Pump house

INTRODUCTORY REMARKS

MARK	DISIGNATION
====	CANAL
====	DRAIN
|| ||	PADDY FIELD
V V	DRY FIELD
↓ ↓	GRASS LAND
P	PUMP STATION
D-W	DIVERSION WORKS

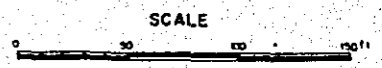


CONSTRUCTION OF MODEL INFRASTRUCTURE FOR THREE COMMUNITY DEVELOPMENT CENTER UNDER CERDI
 GENERAL PLAN OF NAWJORA
 C-D-C
 Date: Sept 1980 | DWG No. 1



INTRODUCTORY REMARKS

MARK	DISIGNATION
====	CANAL
====	DRAIN
|| ||	PADDY FIELD
V V	DRY FIELD
↓ ↓	GRASS LAND
[P]	PUMP STATION
D W	DIVERSION WORKS

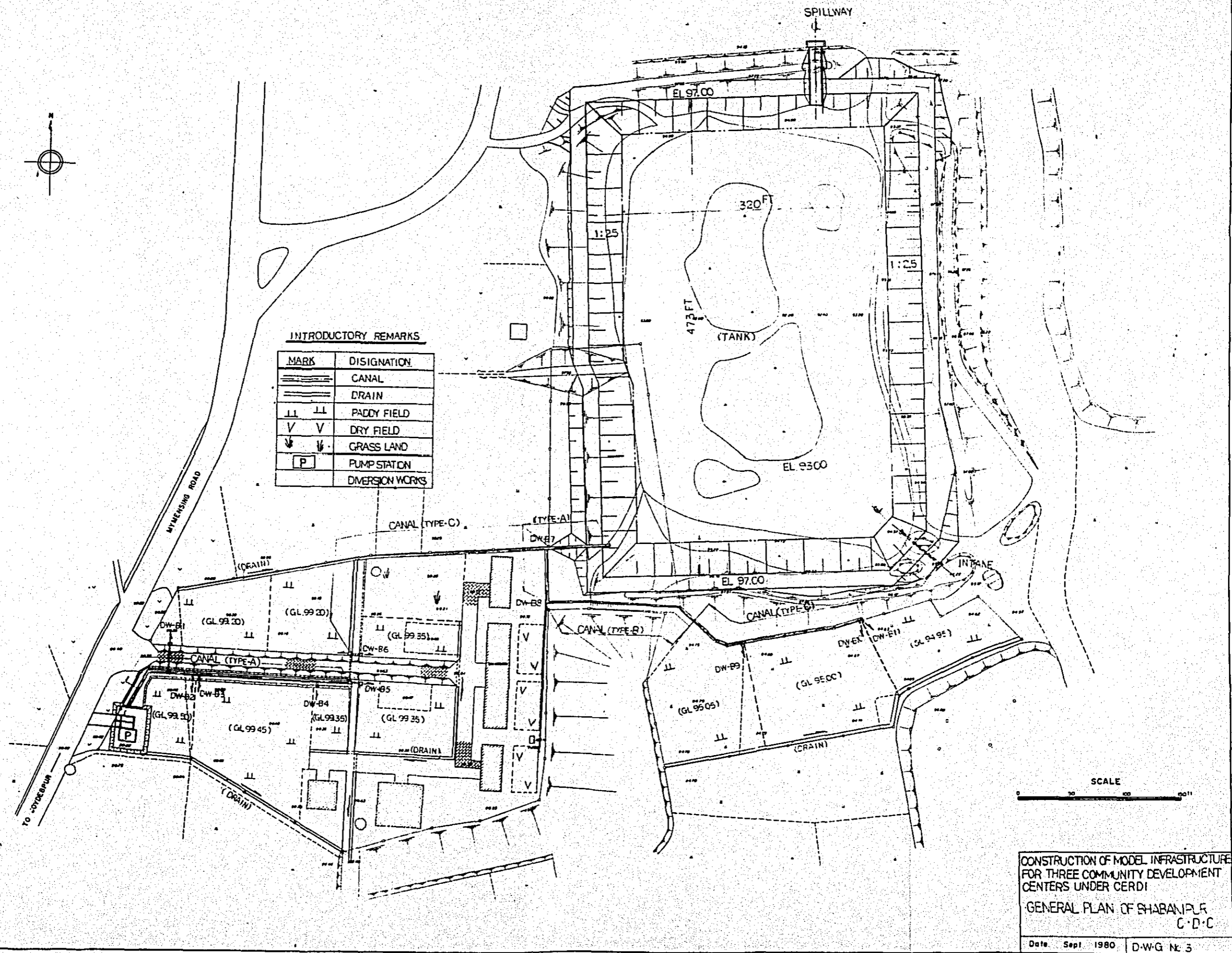


CONSTRUCTION OF MODEL INFRASTRUCTURE FOR THREE COMMUNITY DEVELOPMENT CENTER UNDER CERDI
 GENERAL PLAN OF PORABARI
 C.D.C
 Date Sept. 1980 D.W.G. No 2



INTRODUCTORY REMARKS

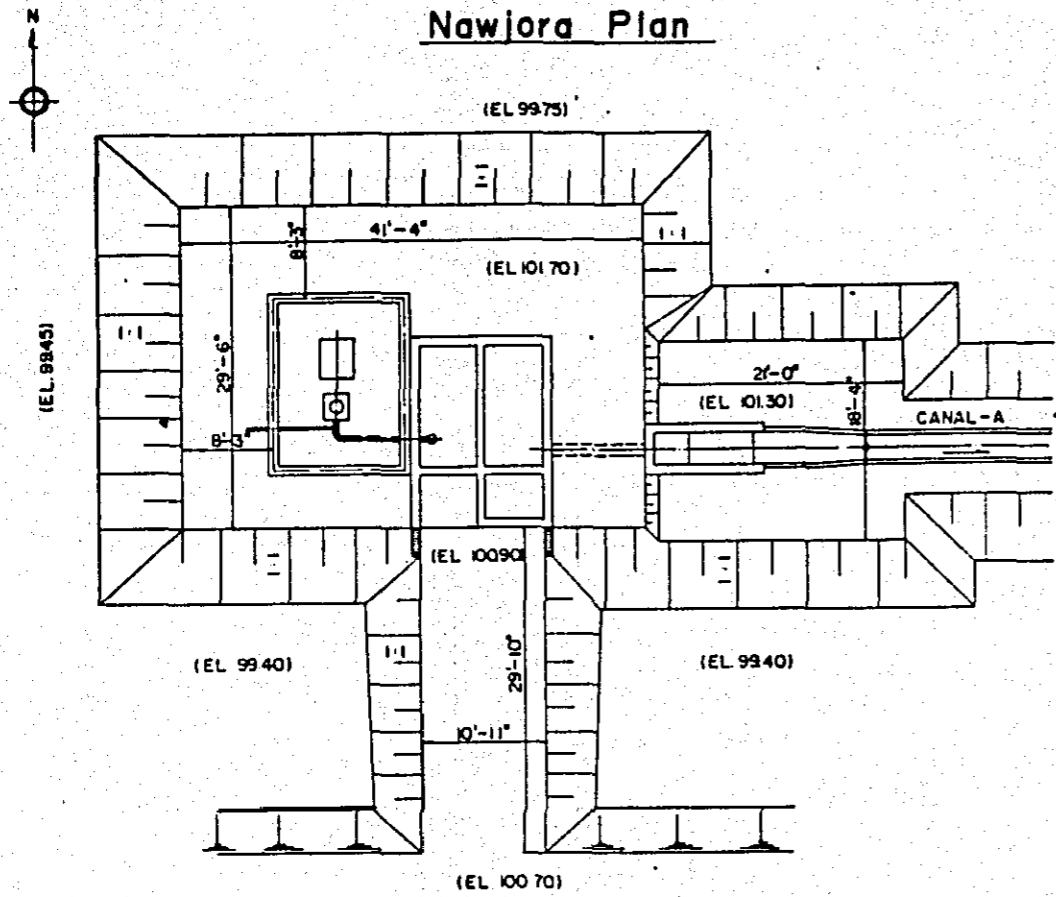
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	CANAL
	DRAIN
	PADY FIELD
	DRY FIELD
	GRASS LAND
	PUMP STATION
	DIVERSION WORKS



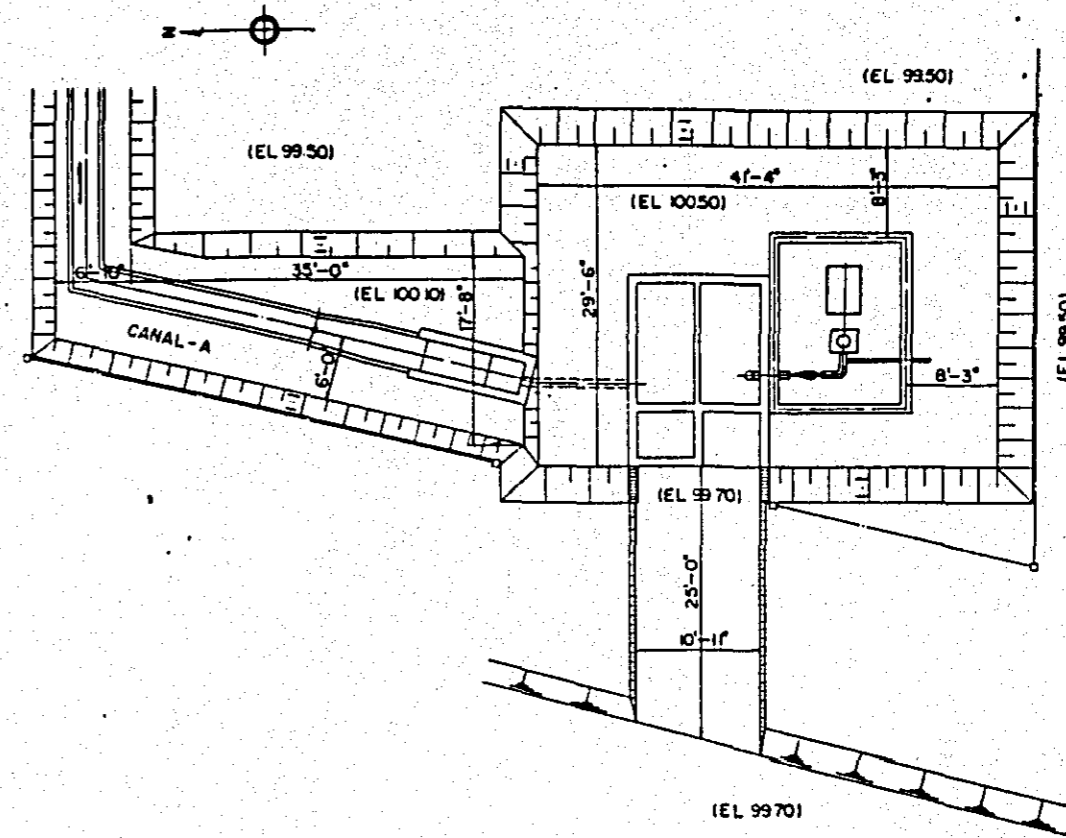
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0 20 40 60 80 100

CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTERS UNDER CERDI
GENERAL PLAN OF SHABANPUR
C.D.C.
Date: Sept. 1980 D-W-G No. 3

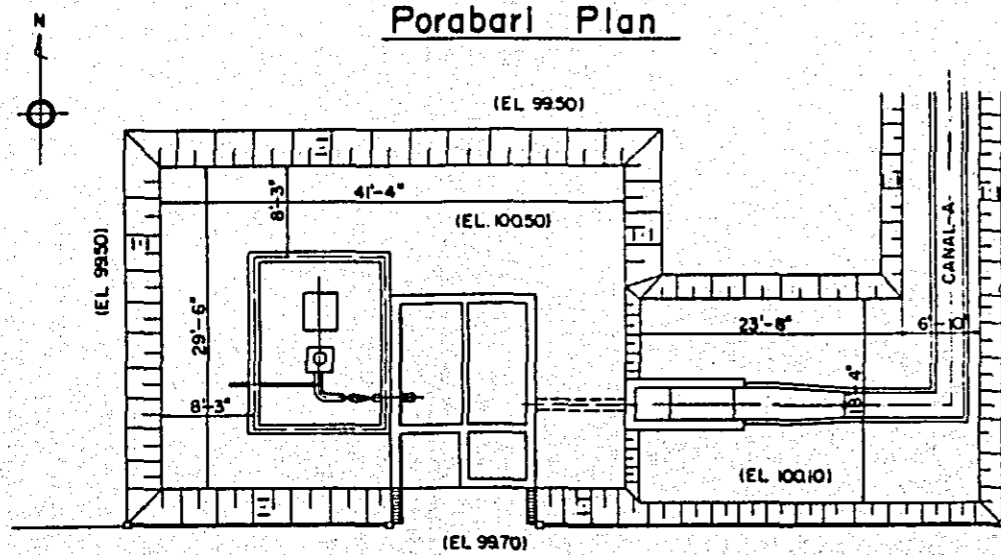
Nawjora Plan



Bhabanipur Plan

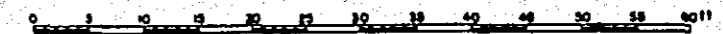


Porabari Plan



* Elevation is shown in Meter

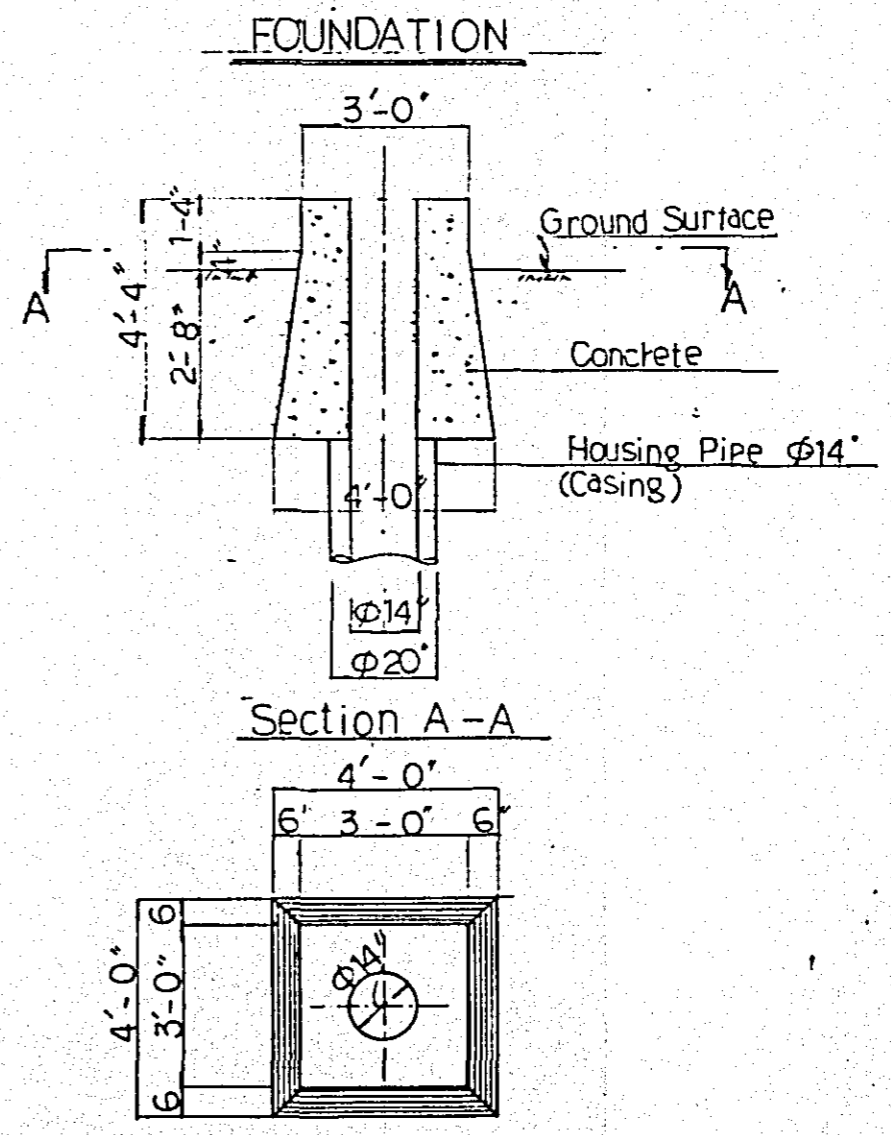
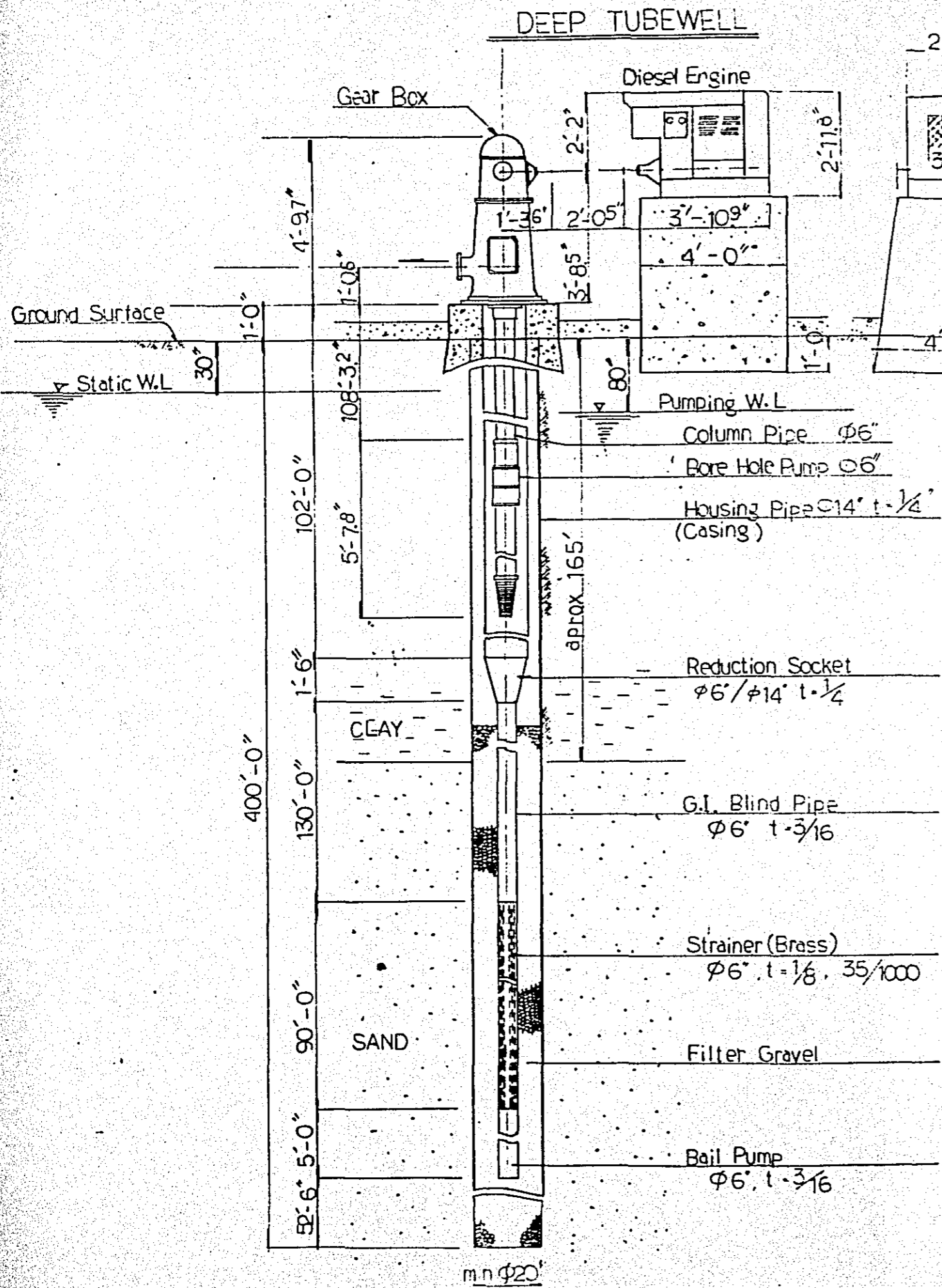
SCALE



CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

PLAN OF PUMPING STATION

Date: September 1980 D.W.G. NO. 4

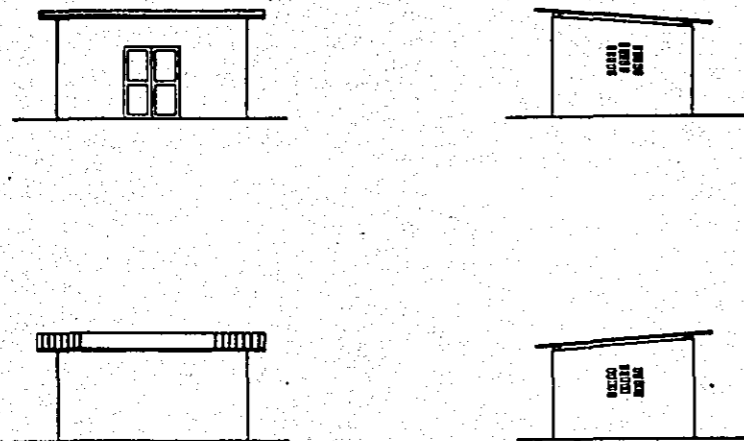


CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTERS UNDER CERDI.

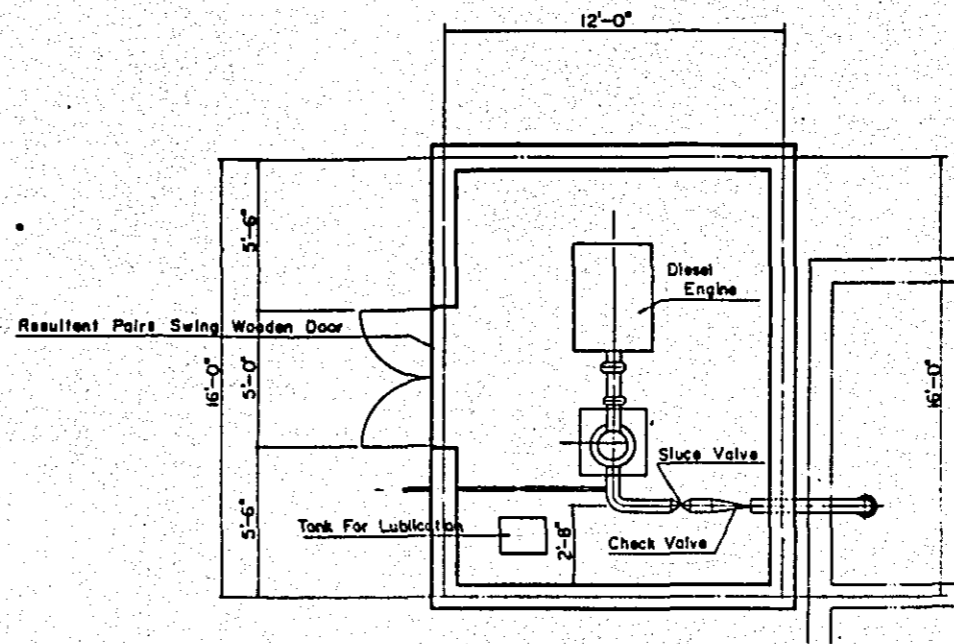
DEEP TUBEWELL

Date: Sep. 1980 D.W.G. No 5

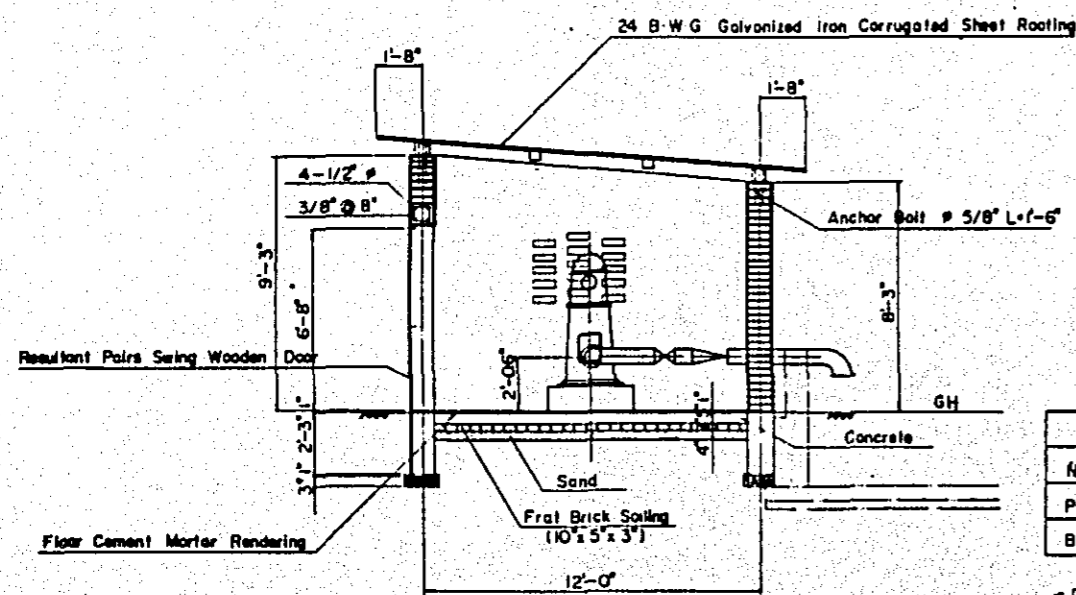
ELEVATION
SCALE-A



PLAN
SCALE-B



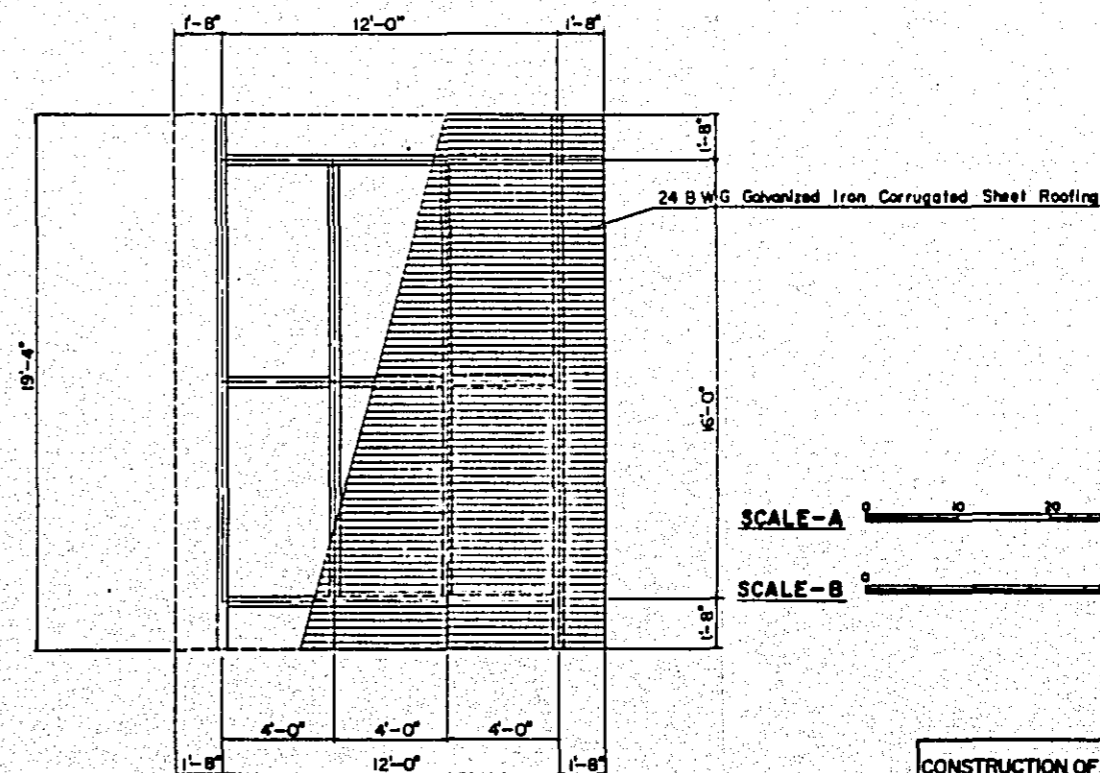
SECTION
SCALE-B



PLACE	G.H
Nawjora C.D.C	101.3
Parabari C.D.C	100.5
Bhabanpur C.D.C	100.5

* Elevation is shown in Meter

ROOF PLAN
SCALE-B



SCALE-A 0 10 20 30 40 50'

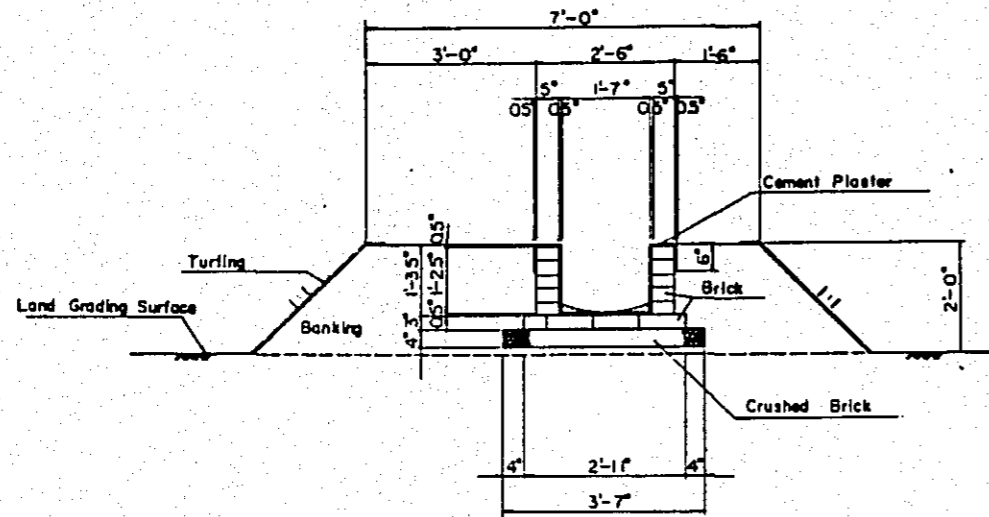
SCALE-B 0 10 15'

CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

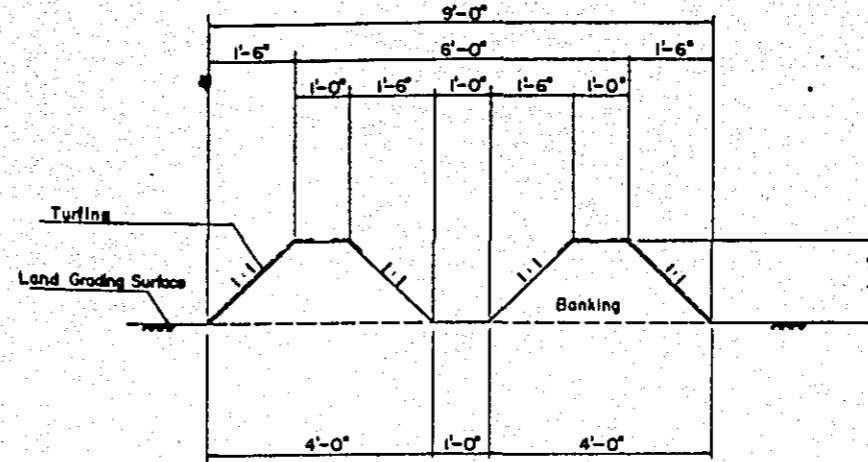
PUMPING HOUSE

Date: September 1980 | D.W.G. NO. 6

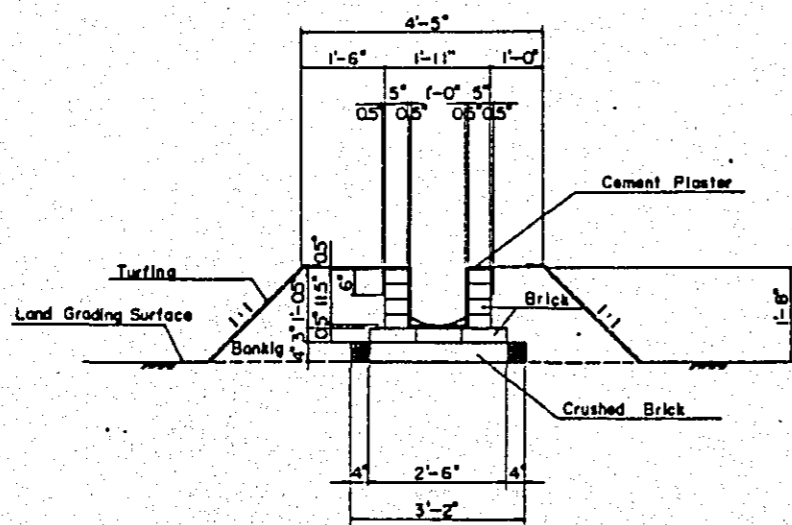
CANAL (Type-A)



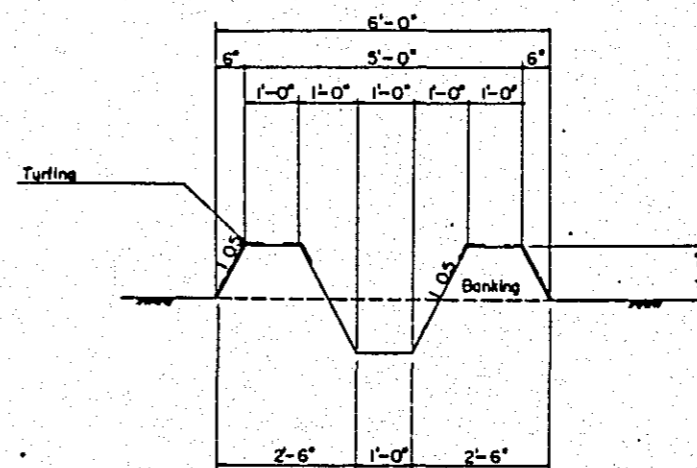
CANAL (Type-C)



CANAL (Type-B)



**DRAIN
(DRAINAGE CANAL)**



CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

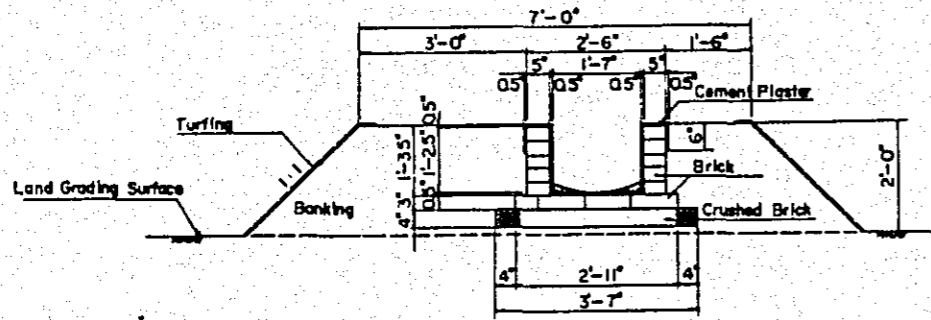
STANDARD CROSS SECTION OF
IRRIGATION & DRAINAGE CANALS

Date September 1980 D.W.G NO.8

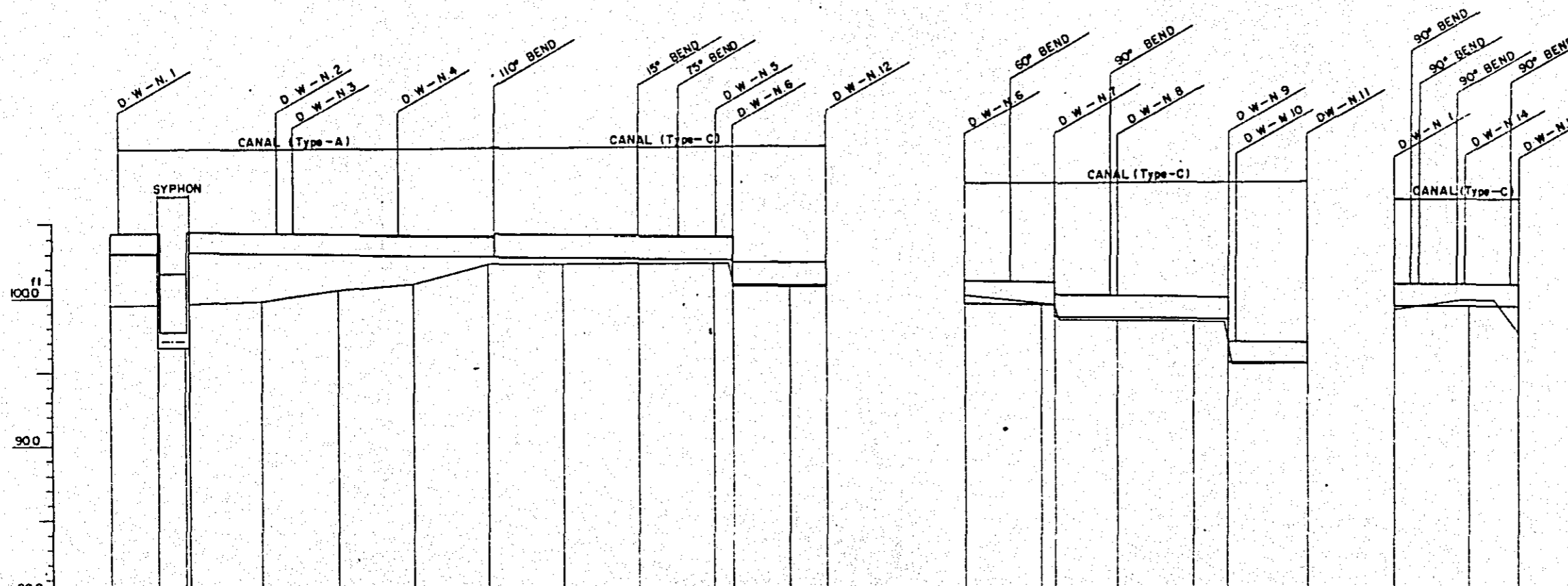
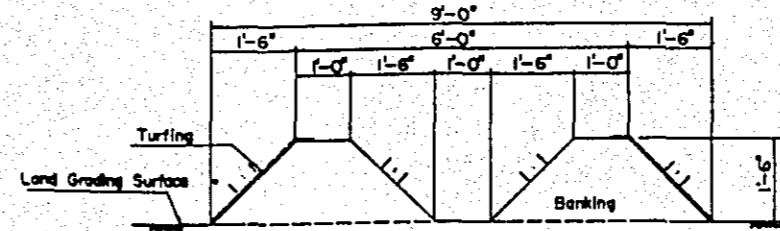
PROFILE OF IRRIGATION CANAL OF NAWJORA C·D·C

SCALE-A

Standard Cross Section (Type-A)
SCALE-B

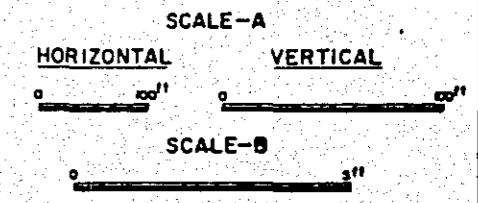


Standard Cross Section (Type-C)
SCALE-B



Station No.	Dist.	Accum. Dist.	Ground Elev.	Bottom of Canal	Top of Bank	Grade
0+00	0.0	0.0	995.0	103.0	104.3	103.0
+63.0	63.0	63.0	994.0	103.0	104.3	103.0
0+300	300.0	300.0	995.0	102.9	104.1	103.0
0+400	400.0	400.0	997.0	102.8	104.1	103.0
0+500	500.0	500.0	997.0	102.7	104.0	103.0
0+600	600.0	600.0	997.0	102.7	104.2	103.0
0+700	700.0	700.0	997.0	102.6	104.1	103.0
0+800	800.0	800.0	997.0	102.5	104.0	103.0
+26.0	26.0	826.0	997.0	102.5	104.0	103.0
0+900	900.0	900.0	997.0	102.2	104.2	103.0
+30.0	30.0	930.0	997.0	102.2	104.2	103.0
1+000	1000.0	1000.0	997.0	99.5	101.0	103.0
1+180	180.0	1180.0	997.0	99.4	100.9	103.0
1+200	200.0	1200.0	997.0	99.4	100.9	103.0
1+410	410.0	1410.0	997.0	99.4	100.9	103.0
1+500	500.0	1500.0	997.0	99.3	100.8	103.0
1+63.5	63.5	1635.0	997.0	99.3	100.8	103.0

E () is Elevation in Meter
B M is assumed 100ft in Feet unit
or 100 Meter in Meter unit

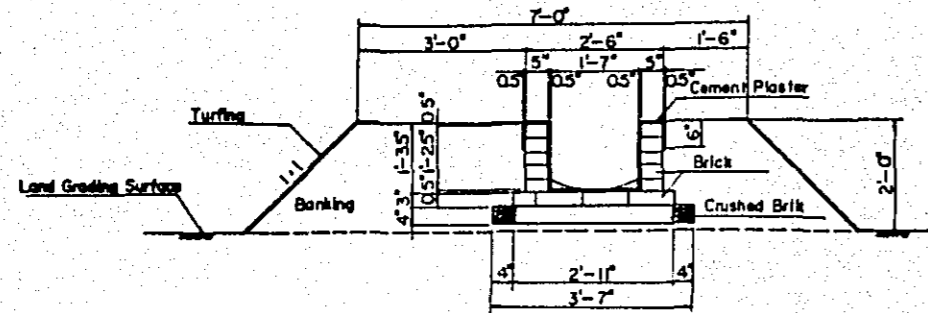


CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI
**PROFILE OF IRRIGATION CANAL
OF NAWJORA C·D·C**
Date September 1980 | D·W·G·NO. 9

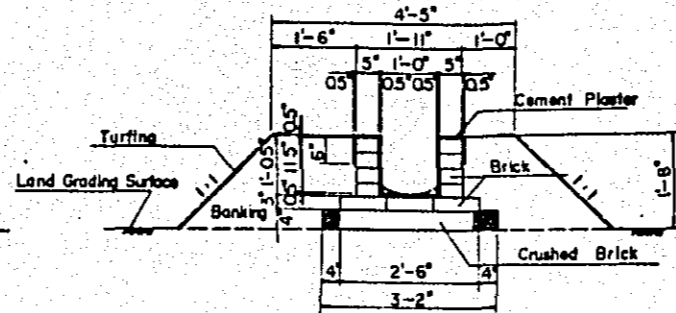
PROFILE OF IRRIGATION CANAL OF PORABARI C.D.C

SCALE-A

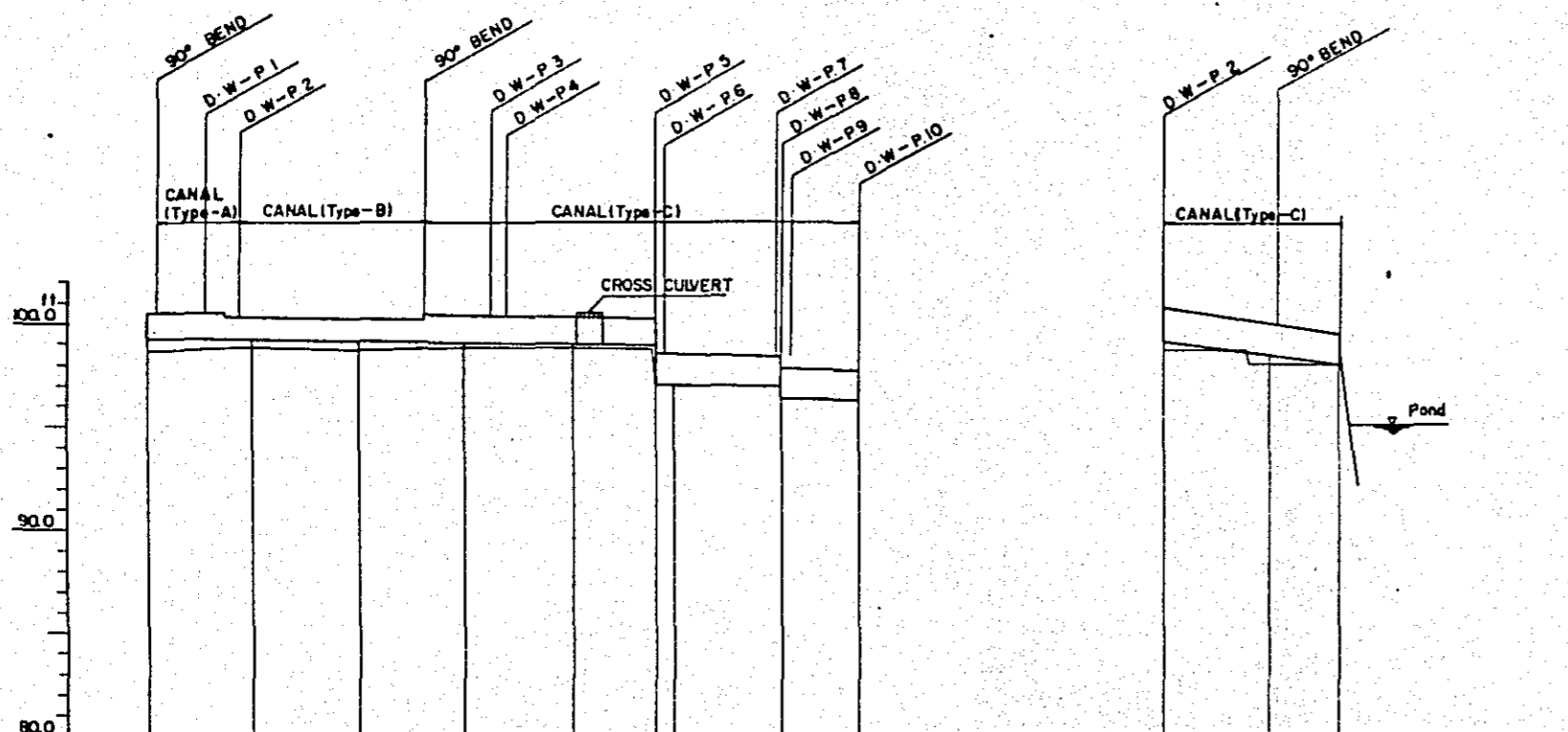
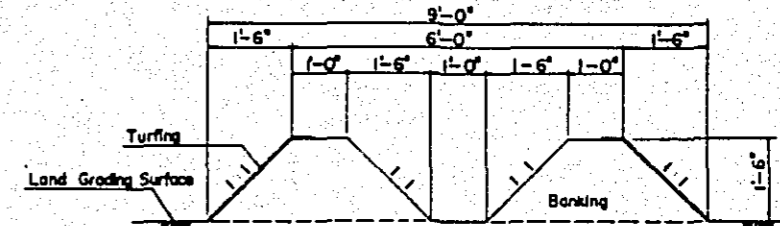
Standard Cross Section (Type-A)
SCALE-B



Standard Cross Section (Type-B)
SCALE-B



Standard Cross Section (Type-C)
SCALE-B



X () is Elevation in Meter
B.M. is assumed 100ft in Feet unit
or 100 Meter in Meter unit.

SCALE-A



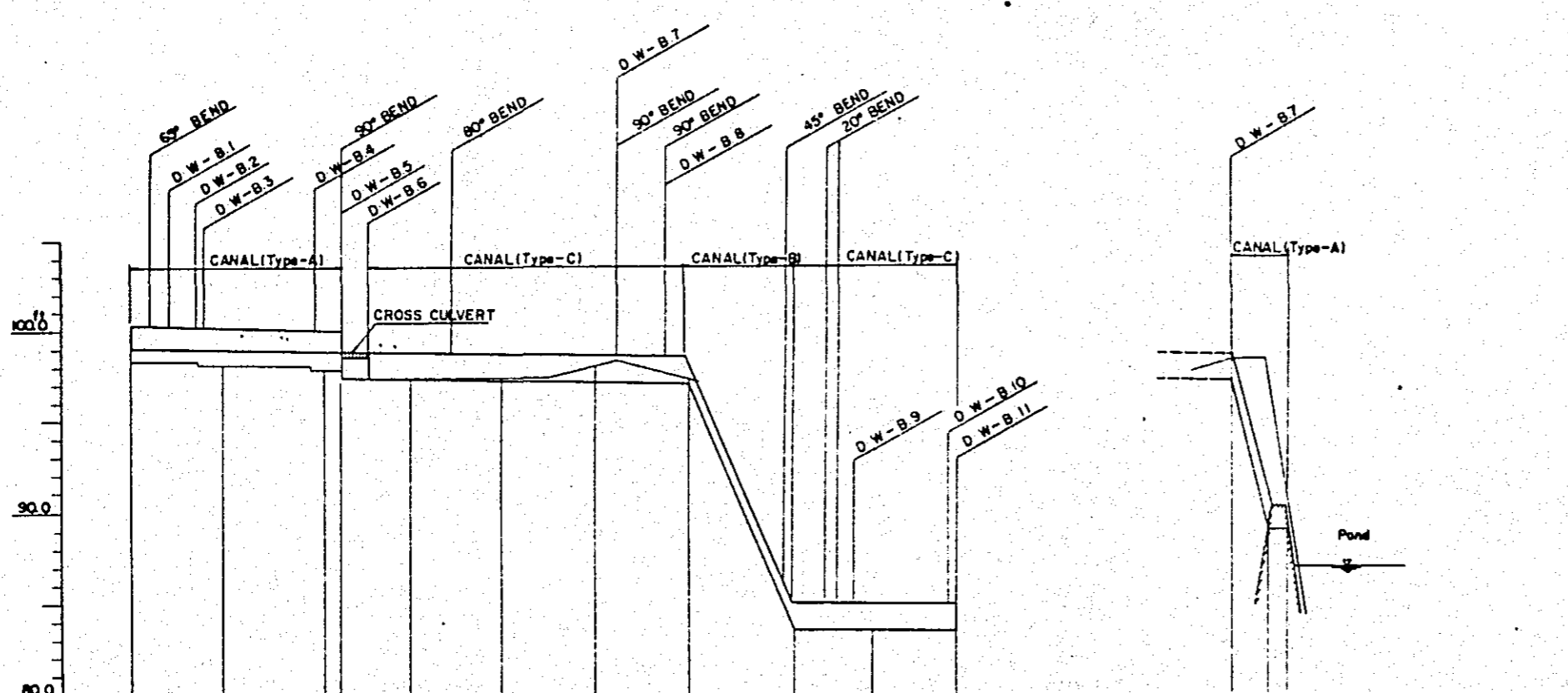
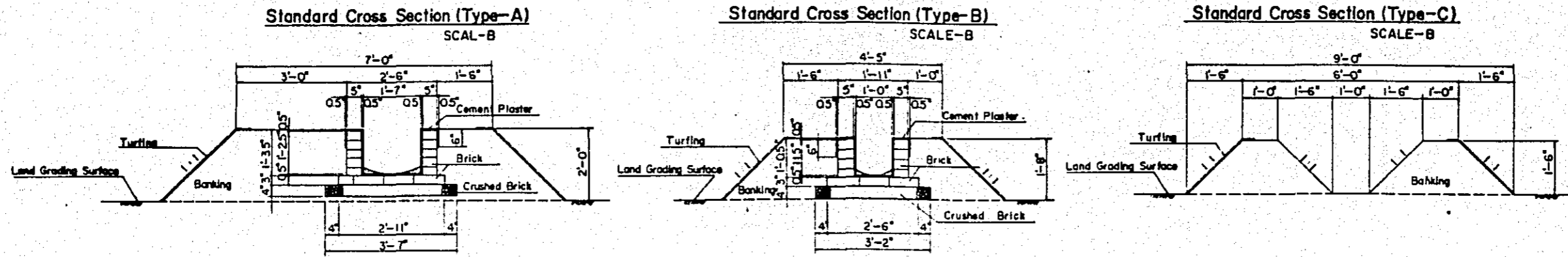
SCALE-B

Station No	Dist	Accum Dist	Ground Elev	Bottom Canal	Top of Bank	Grade
NO.0	0.0	0.0	99.50 98.4	98.2	100.4	99.15
NO.1	100.0	100.0	99.60 98.7	99.1	100.8	
NO.2	100.0	200.0	99.50 98.4	99.0	100.7	
NO.3	100.0	300.0	99.40 98.7	99.0	100.5	
NO.4	100.0	400.0	99.50 98.7	98.9	100.4	
+B2	82.0	482.0	98.8	98.8	100.3	98.82
NO.5	18.0	500.0	99.10 97.0	97.0	98.5	97.00
NO.6	100.0	600.0	98.90 96.4	96.9	97.8	96.82
+T.5	3.5	603.5	96.3	96.3	97.8	96.20
+75.5	74.0	673.5	98.40 94.8	96.2	97.7	96.20
NO.0	0.0	0.0	99.60 98.7	99.1	100.6	99.10
NO.1	100.0	100.0	99.50 98.5	98.3	99.8	
+52.5	52.5	152.5	99.37 97.9	97.9	99.40	97.90

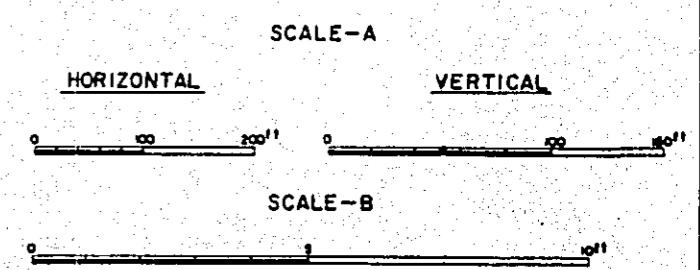
CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI
PROFILE OF IRRIGATION CANAL
OF PORABARI C.D.C
Date September 1980 D.W.G. NO. 10

PROFILE OF IRRIGATION CANAL OF BHABNIPUR C.D.C

SCALE-A



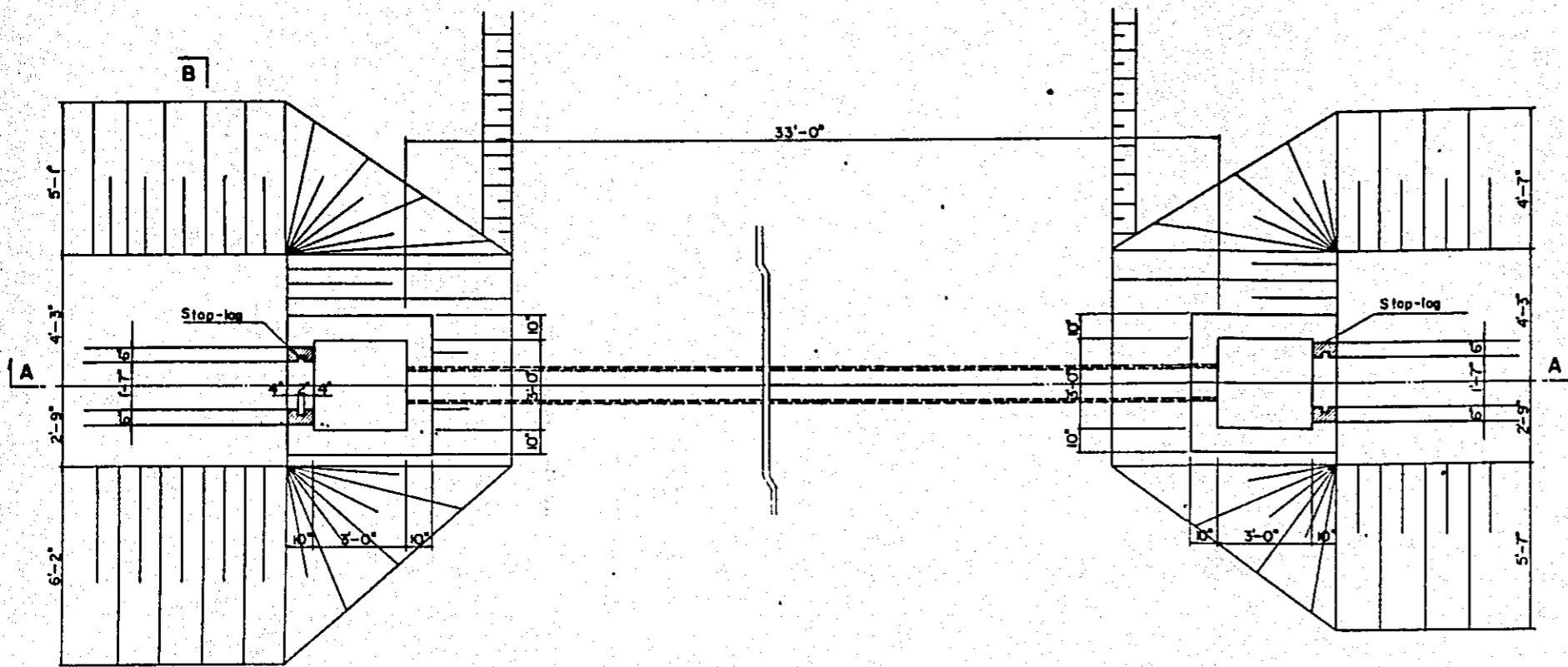
X () is Elevation in Meter
 B.M. is assumed 100ft in Feet unit
 or 100 Meter in Meter unit.



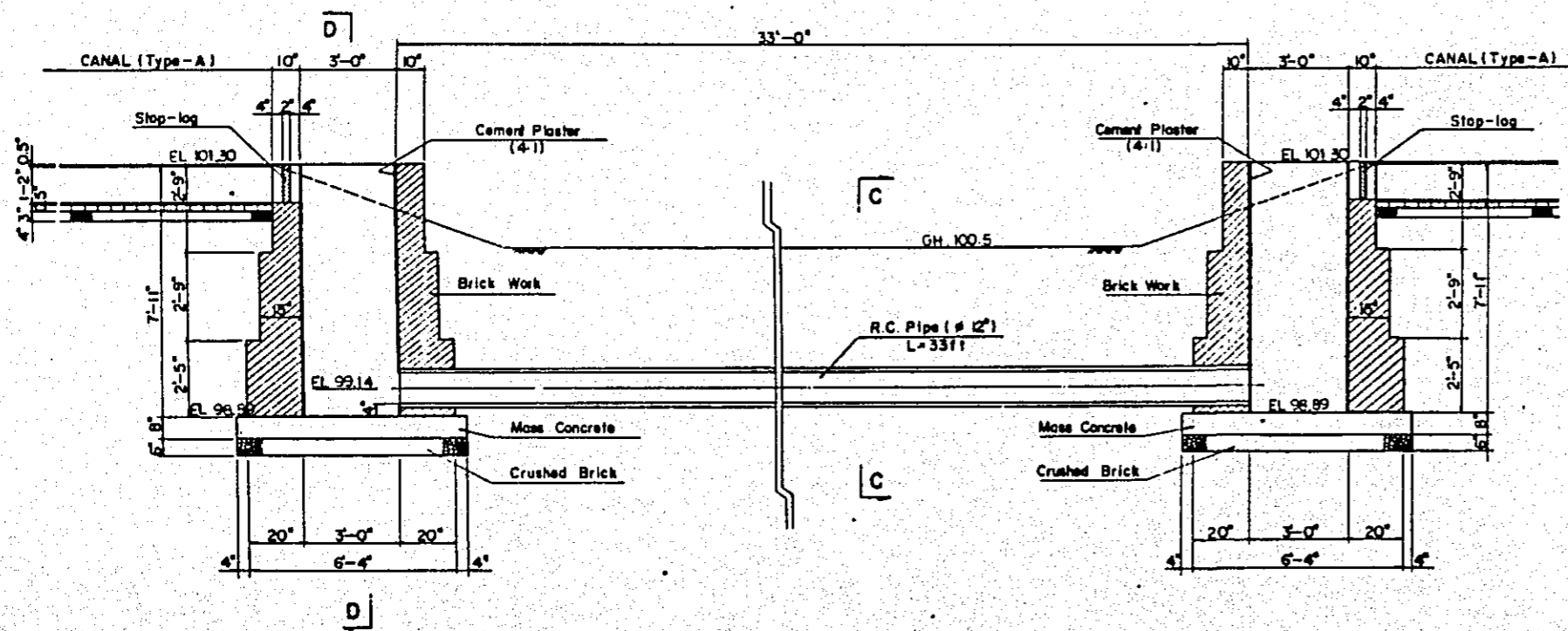
Station No.	Dist.	Accum. Dist.	Ground Elev.	Bottom Canal	Top of Bank	Grade
N0.0	0.0	0.0	99.50 98.4	99.2	100.4	98.25
N0.1	100.0	100.0	99.45 98.2	99.1	100.3	97.40
N0.2	1000	200.0	99.35 97.9	99.1	100.3	
	+200	200		97		
N0.3	800	300.0	99.20 97.4	97.4	98.8	
N0.4	1000	400.0	99.30 97.7	97.3	98.8	
N0.5	1000	500.0	99.50 98.4	97.2	98.7	
	+23	230		97.2	98.7	
N0.6	770	600.0	99.30 97.7	97.2	98.7	
N0.7	000	700.0	99.00 83.8	83.8	85.3	
	+22	22.0				
N0.8	780	800.0	99.00 83.6	83.70	85.2	
	+92	92.0		83.6	85.1	
N0.0	0.0	0.0	99.50 98.40	97.2	98.7	
	+420	420		87.9	89.1	
	+590	590		87.9	89.1	

CONSTRUCTION OF MODEL INFRASTRUCTURE
 FOR THREE COMMUNITY DEVELOPMENT
 CENTER UNDER CERDI
**PROFILE OF IRRIGATION CANAL
 OF BHABANIPUR C.D.C**
 Date: September 1980 | D.W.G. NO.11

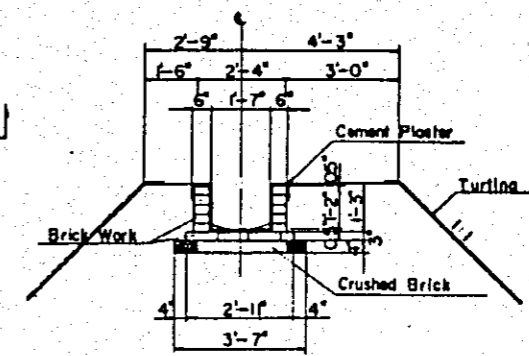
Plan



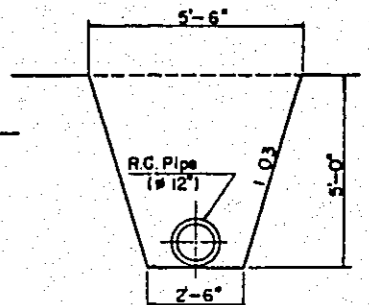
Section A-A



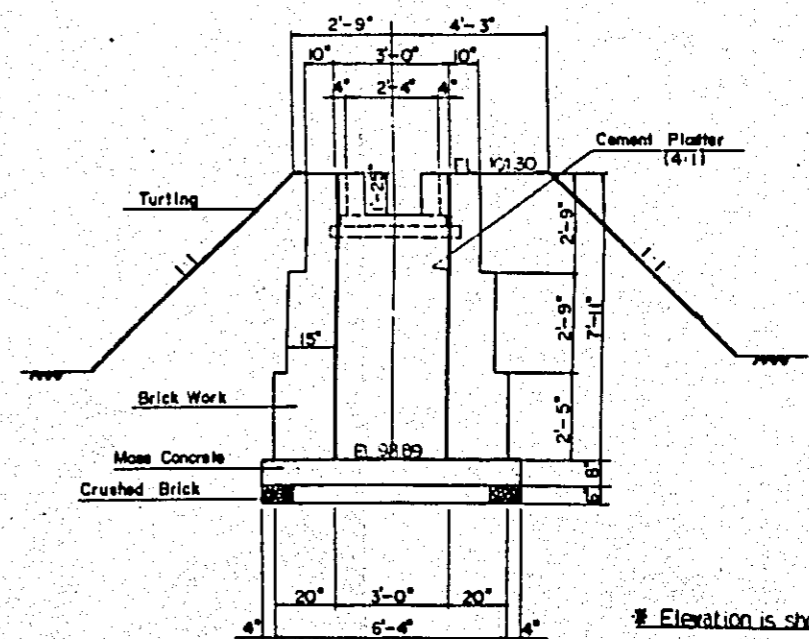
Section B-B



Section C-C



Section D-D



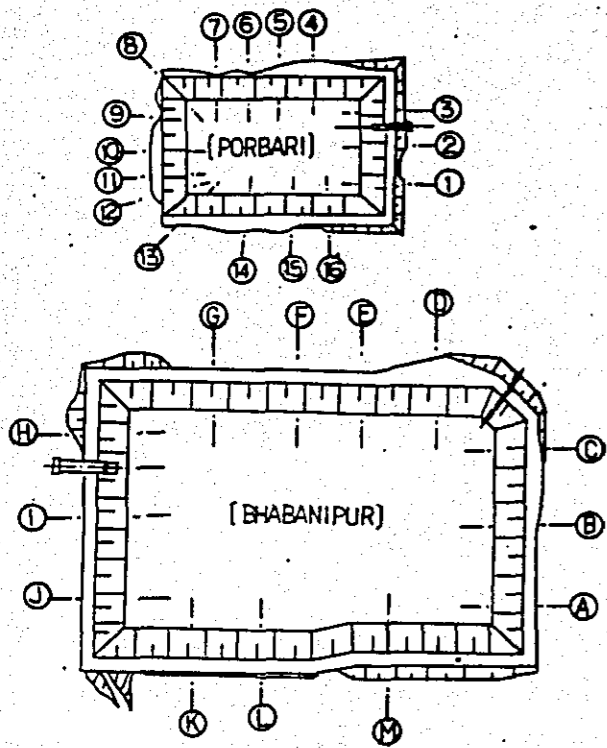
Elevation is shown in Meter

SCALE 0 10 20

CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

SYPHON

Date: September 1980 D. W. G. NO. 16

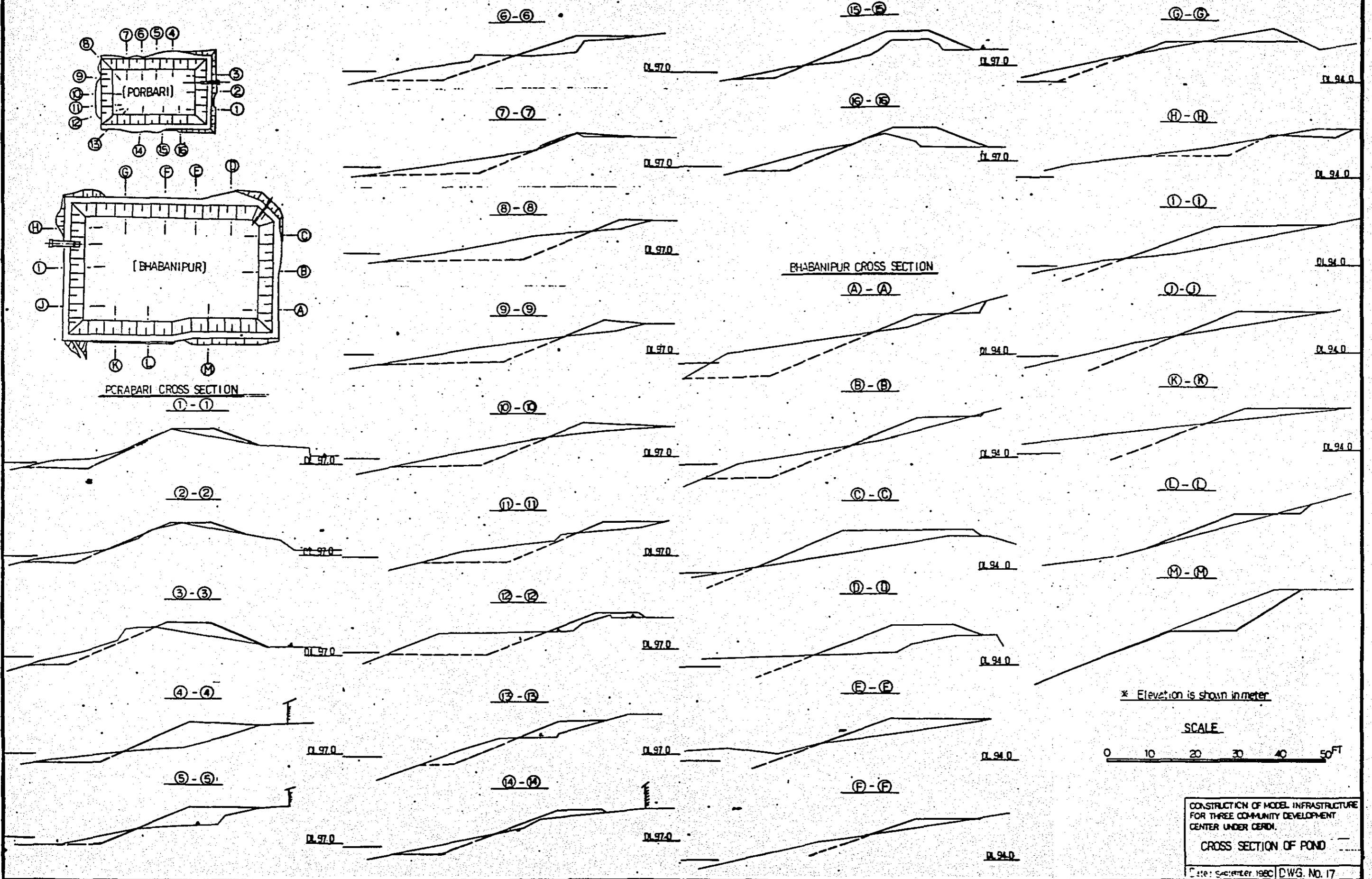


PCRAPARI CROSS SECTION

① - ①

BHABANIPUR CROSS SECTION

(A) - (A)



* Elevation is shown in meter

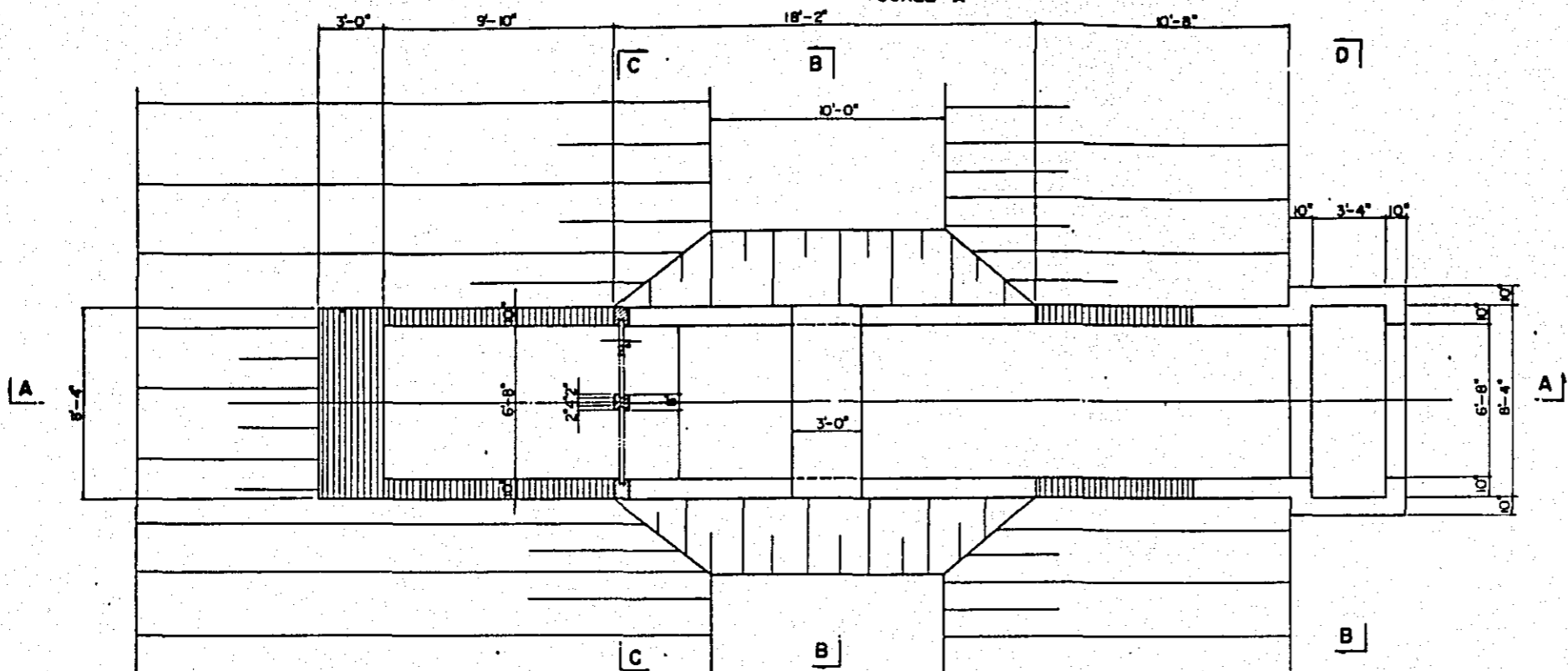
SCALE



CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CENCO.
CROSS SECTION OF POND
Date: September, 1980 DWG. NO. 17

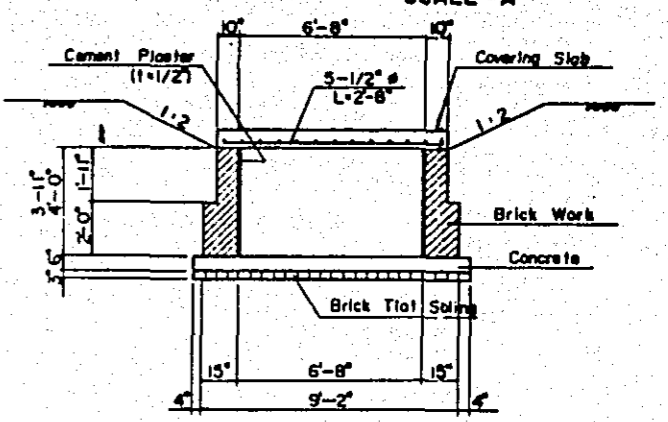
Plan

SCALE-A



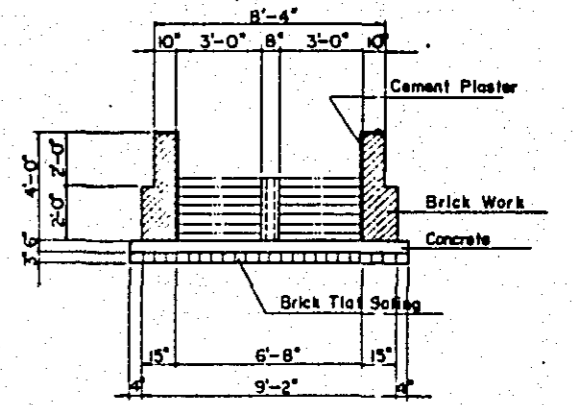
Section B-B

SCALE-A



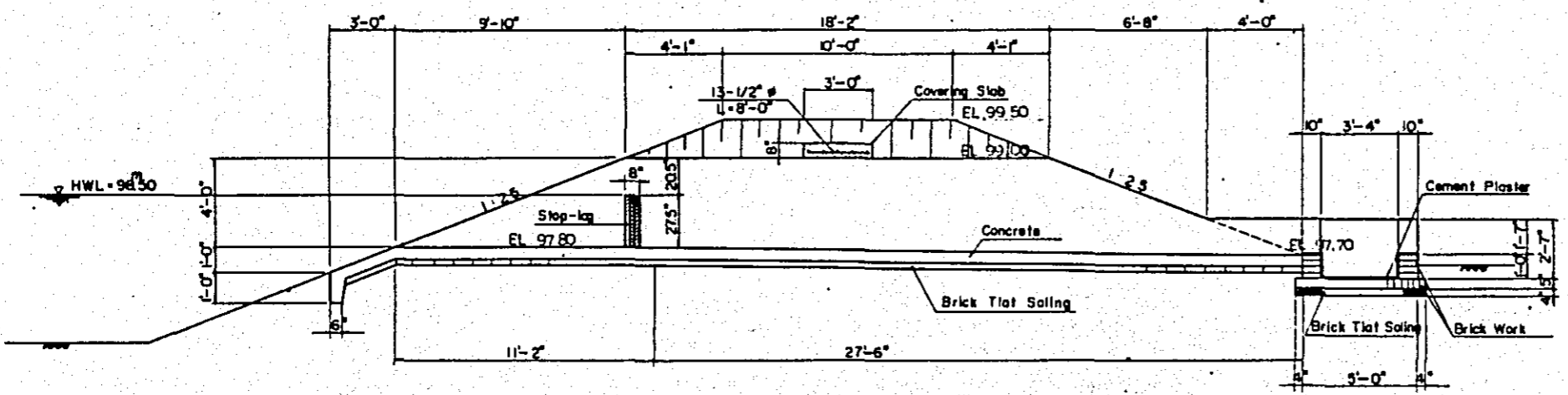
Section C-C

SCALE-A



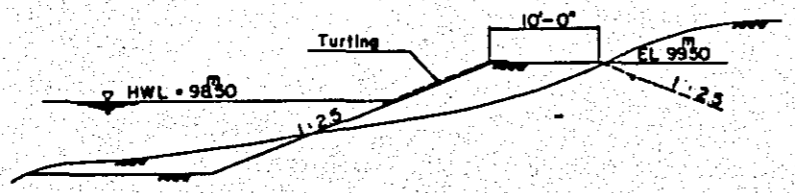
Section A-A

SCALE-A



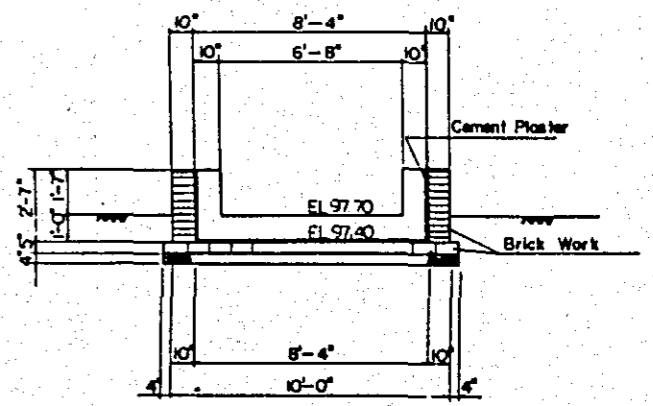
CROSS SECTION OF EMBANKMENT

SCALE-B

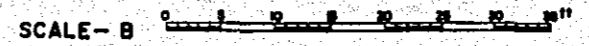
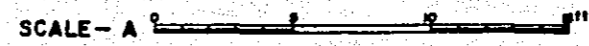


Section D-D

SCALE-A



Elevation is shown in Meter

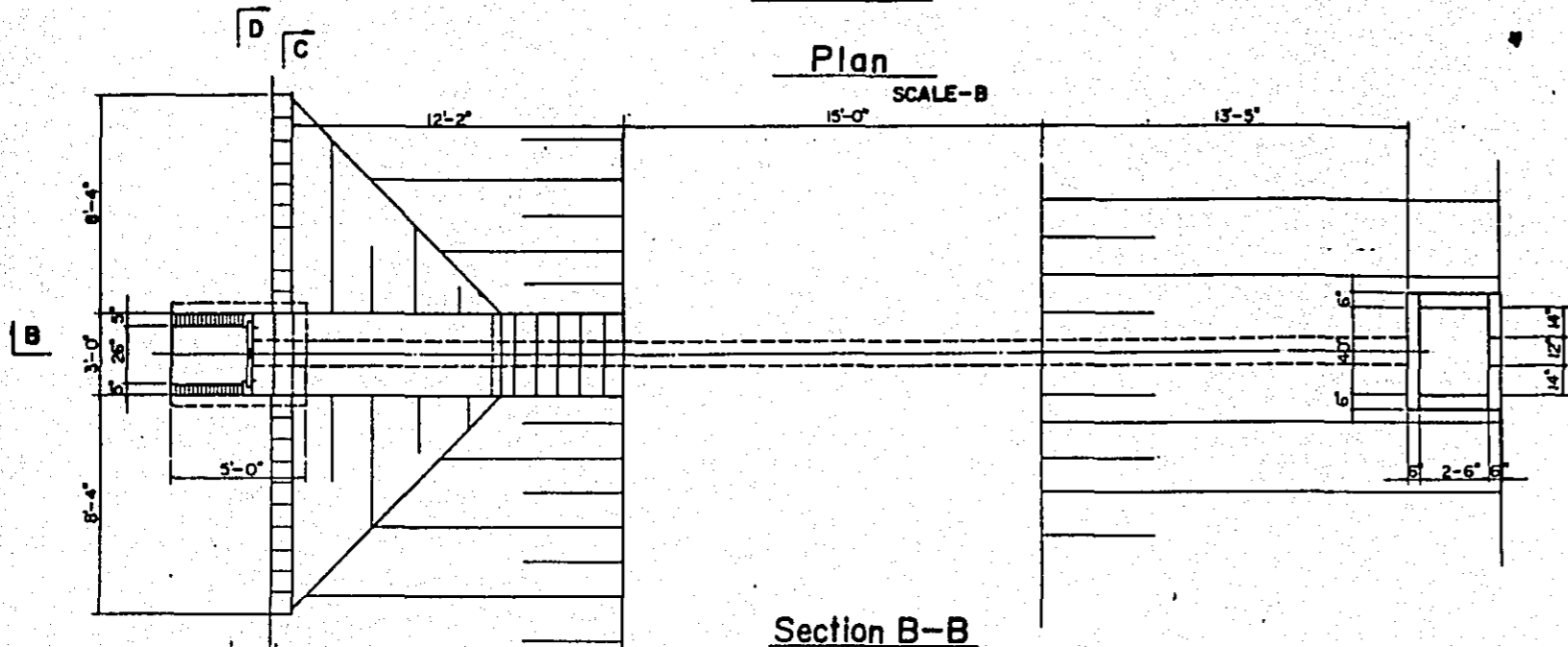


CONSTRUCTION OF MODEL INFRASTRUCTURE FOR THREE COMMUNITY DEVELOPMENT CENTER UNDER CERDI
 SPILLWAY CUM OUTLET OF FORABARI POND
 Date September 1980 D.W.G. NO. 18

OUTLET

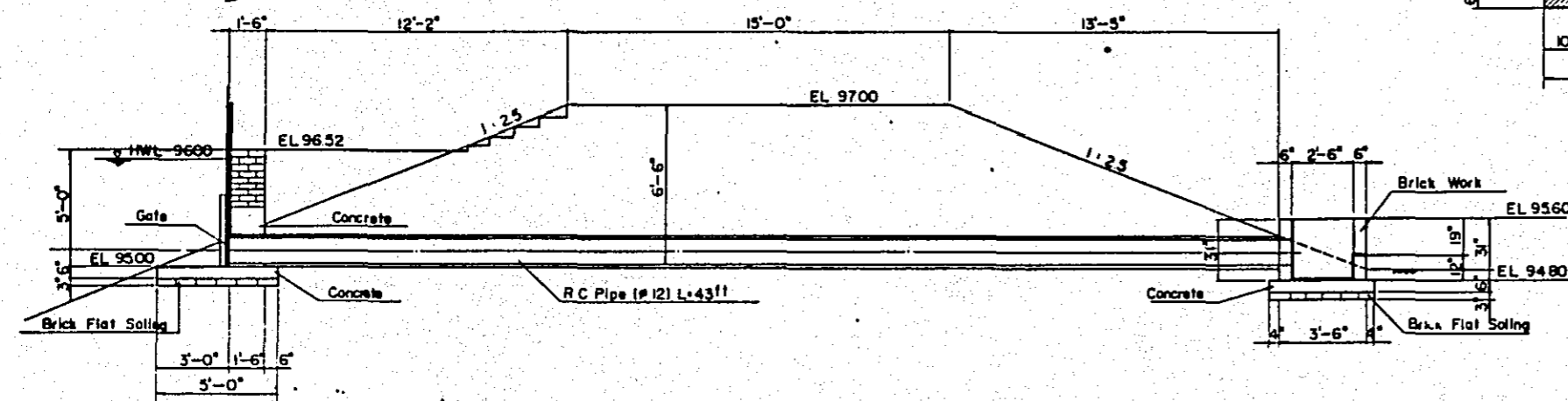
Plan

SCALE-B



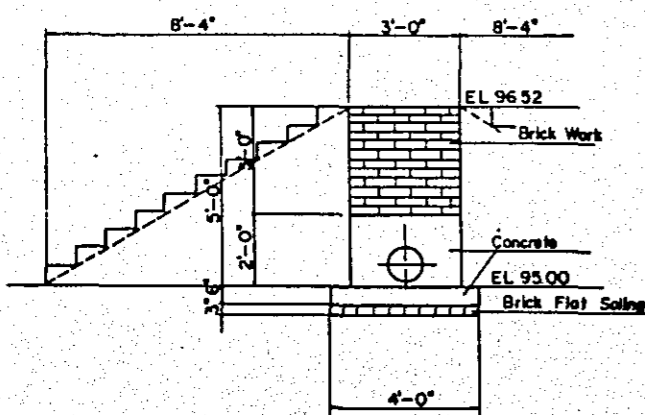
Section B-B

SCALE-B



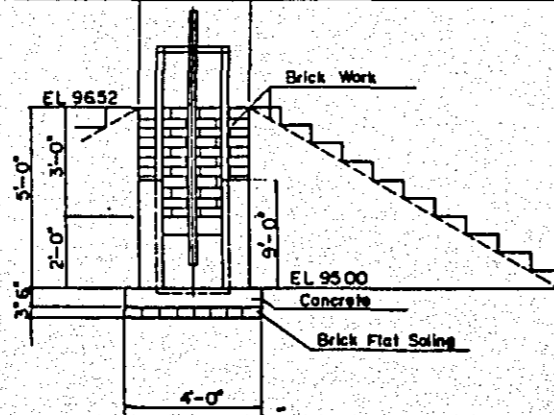
Section C-C

SCALE-C



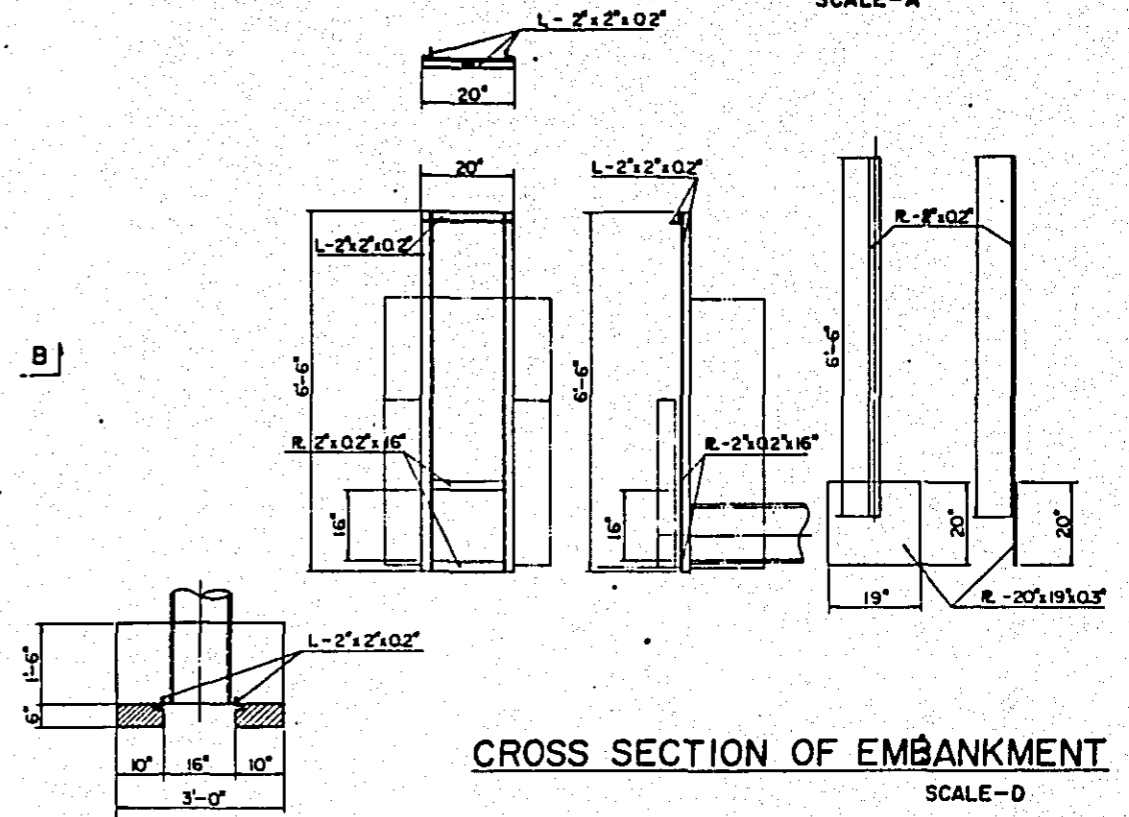
Section D-D

SCALE-C



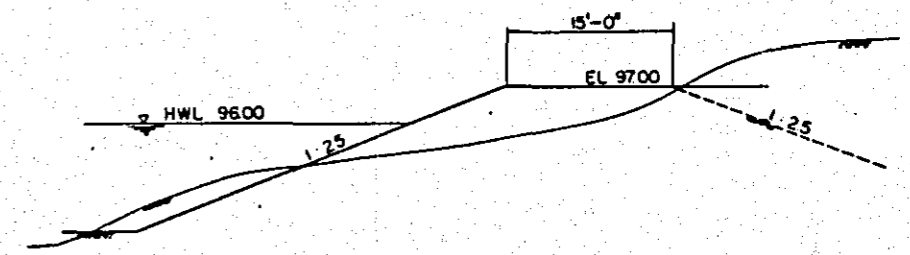
STEEL GATE

SCALE-A

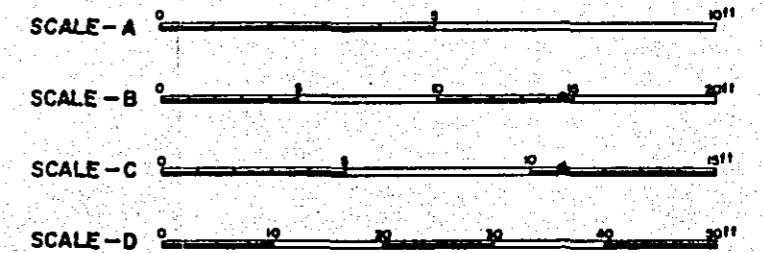


CROSS SECTION OF EMBANKMENT

SCALE-D



⊗ Elevation is shown in Meter

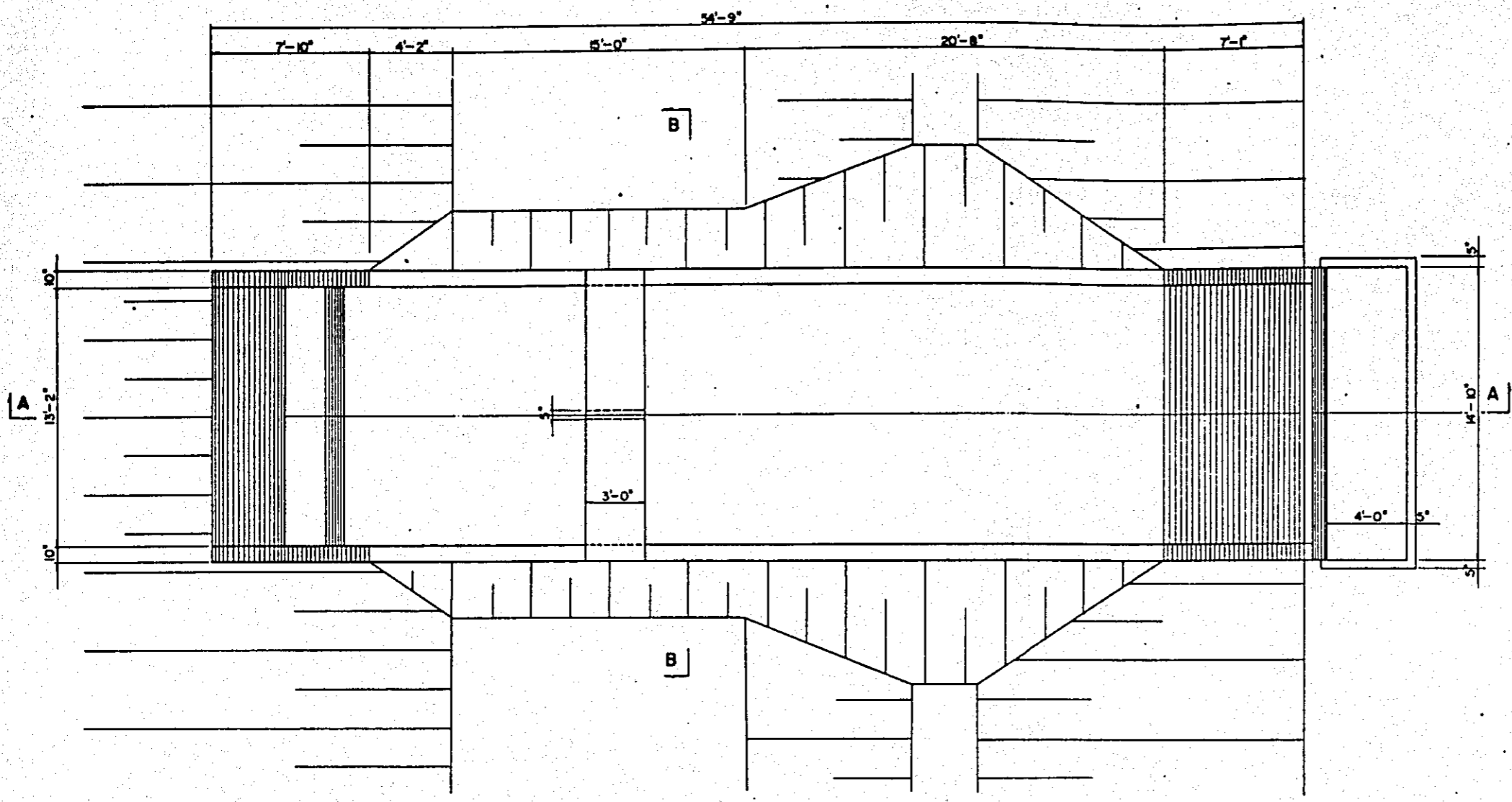


CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

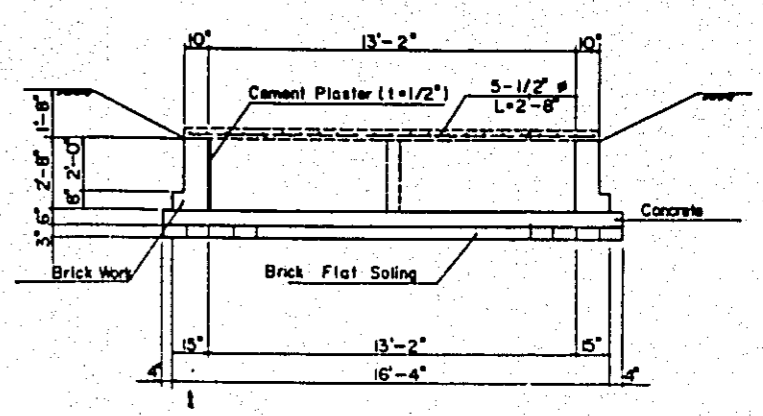
OUTLET OF BHABANIPUR POND

Date: September 1980 D.W.G. NO. 19

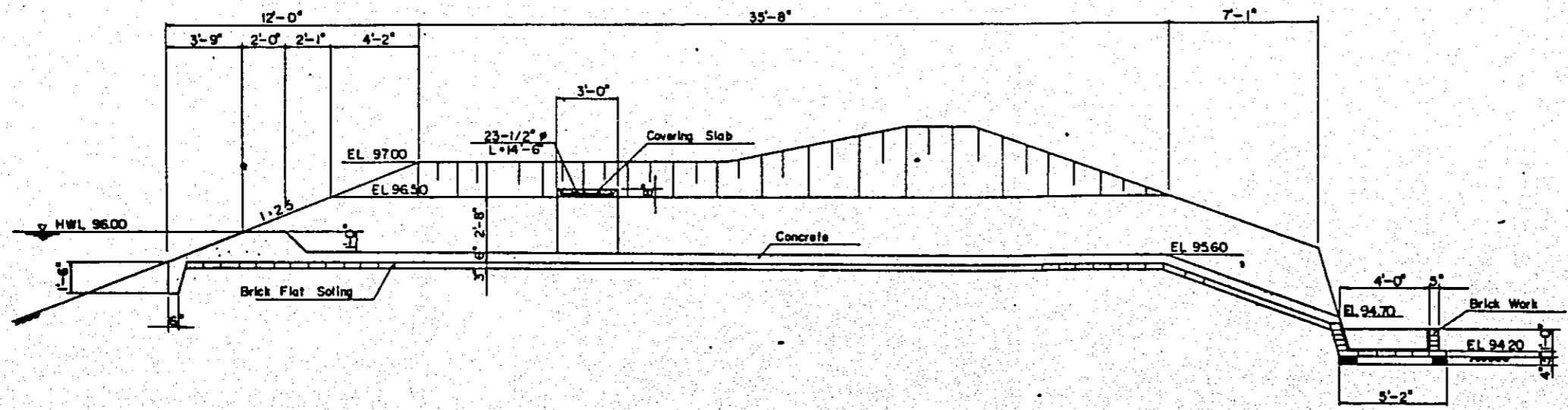
Plan



Section B-B



Section A-A



* Elevation is shown in Meter.

SCALE



CONSTRUCTION OF MODEL INFRASTRUCTURE
FOR THREE COMMUNITY DEVELOPMENT
CENTER UNDER CERDI

SPILLWAY OF BHABANIPUR POND

Date: September 1980 D. W. G. NO. 20

