

1 - 5

MINUTES OF DISCUSSIONS

ON

THE PROJECT

FOR

THE CONSTRUCTION OF N-N IRRIGATION FACILITIES (BLOCK A-1)

IN

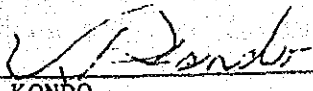
THE PEOPLE'S REPUBLIC OF BANGLADESH


Date: 19th January, 1988

In response to the request made by the Government of People's Republic of Bangladesh, the Government of Japan decided to conduct a basic design study on the Project for The Construction of N-N (Narayanganj - Narsingdhi) Irrigation Facilities - Block A-1 -, (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Bangladesh the study team from September 19 to October 17, 1987.

As the result of the study, JICA prepared a draft report and dispatched a mission, headed by Mr. Sumio Kondo, Construction Department, Chugoku-Shikoku Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries (MAFF) to explain and discuss it from January 14 to January 23, 1988.

Both parties had a series of discussions on the Report and, after clarifying its contents, agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

  
Sumio KONDO  
Leader of Draft Report Mission of  
Basic Design Study  
Japan International Cooperation Agency

  
Shamsur Rahman  
Chief Engineer  
Planning, Bangladesh  
Water Development Board, Dhaka

Major Points of Understanding:

1. The Bangladesh side principally agreed to the basic design proposed in the Draft Final Report subject to corrections to be made in the final report based on comments given by GOB side & the answers given by JICA (copy enclosed)
2. The Bangladesh side understood the system of Japan's Grant Aid Programme and confirmed the measures to be taken by the Bangladesh side towards the realization of the Project, particularly, the provision of land, clearance of Land, construction of access roads when necessary, and other related activities required before the start of the actual construction.
3. Subsequent to this explanation of the draft report on the basic design, additional survey work will be carried out till March 8, 1988 by the JICA team to decide the location of facilities to be constructed in the first stage of the project implementation in order to smoothly realize the project.
4. The Final Report (10 copies in English) on the Project will be submitted to the People's Republic of Bangladesh in April, 1988.

V.K.

19/11

1 - 6 List of Data Collected

No.	TITLE	ISSUE	SECTOR	REMARKS
1	Hydrological and Meteorological Data (Waterlevel, Rainfall and etc.)	Bangladesh Water Development Board	C-1	Copy (Detail: Table-A.1-6-1)
2	Index of Surface Water Hydrological Observation Stations in Bangladesh (as on March '82)	Hydrological Survey of Bangladesh BWDB (May. 1982)	C-1	Copy (1 page only)
3	Reconnaissance Soil Survey Dhaka District (1965)	Department of Soil Survey (G.O.B.) Revised Edit. 1981	C-2 C-4	Original (Borrowing)
4	Materials Testing Report Report No. Soil 58(79) Report No. Soil 128(83)	River Research Institute, BWDB.	C-2	Copy
5	Crop Water Requirements FAO, Irrigation and Drainage Paper 24	FAO (1984)	C-3	Original (Borrowing)
6	Some Information on Rainfall Analysis and Flood Compiled by : H.R. Khan	Rainfall; Agro-Clim Survey of Bangla. by BRRI&IRRI.	C-3	Copy (Borrowing)
7	Dhaka-Narayanganj-Demra Irrigation and Flood Protection Project	BWDB, 1984. Second Edit.	C-3 C-4	Copy
8	Statistical Yearbook of Bangladesh (1986)	Bangladesh Bureau of Statistics	C-4	Original (Borrowing)
9	Upazilla Statistics, Vol.1 Basic Statistics, Land Utilization and Irrigation	B.B.S. (Jan. 1985)	C-4	Original (Borrowing)
10	Upazilla Statistics, Vol.2 Major Crops and Agricultural Inputs	B.B.S. (Sep. 1985)	C-4	Original (Borrowing)

No.	TITLE	ISSUE	SECTOR	REMARKS
11	Proceedings of the Workshop on Experiences with Modern Rice Cultivation in Bangladesh 2-4 Apl '85	Bangladesh Rice Research Institute	C-4	Original (Borrowing)
12	Data on the Demonstration Unit. (Cropping Calenders and etc.)	SDE, NNDP, O&M, BWDB	D	Type (Table-A.1-6-2)
13	Soil Teating Report -Baniadi Regulator - Report No. Soil 52(84)	Soil Mechanics & Materials Direct. RRI, BWDB. (1984)	C-2	Copy
14	Detail of Camps and Buildings	EE, O&M, BWDB	F	Type
15	Data on Construction	EE, O&M, BWDB	E	Copy
16	Price for Financial/Economic Analysis (1985)	Economic Planning Directorate, BWDB, Dhaka	C-4	Copy
17	Requirement of Inputs for Various Crops in Bangladesh (Pre and Post Project)		C-4	Copy
18	Mouza Maps Proposed Pumping Station Utter Rupsi	BWDB	A	Copy
19	Data on Existing Irrigation System /Facilities (1 table, 2maps)	BWDB	C-3	Copy
20	Rules and Rates for the Supply of Electricity-Effectiv from Aug 1 '87	PDB	F	Copy

No.	TITLE	ISSUE	SECTOR	REMARKS
21	Land Acquisition Statement -from UtterRupsi to Kanchan-	BWDB	C-3	Type
22	On the Basis of Primary Units of Crops and Irrigation Programme (N-N Project)	BWDB	D	Copy
23	Project Proforma (PP) on Narayanganj -Narsingdi Irrigation Project , Demonstration Unit	BWDB	D	Copy
24	Project Brief (North Rupgonj)	BWDB	F	Copy
25	Brief of Meghna Dhonagoda Irrigation Project	BWDB	F	Copy
26	Pabna Irrigation and Rural Development Project(Phase-1) Brief Notes on the Project	BWDB. (Oct.1986)	F	Copy

NOTES

- Sector A. Maps
- Sector B. Data of the Project
- Sector C. Present Conditions of the Project Area
- C-1 Meteorology and Hydrology
- C-2 Geology and Soil
- C-3 Irrigation and Drainage
- C-4 Agriculture
- C-5 Socio-Economic Condition
- Sector D. Data on the Demonstration Unit
- Sector E. Data on Construction
- Sector F. Others

Table A.1-6-1 Meteorological and Hydrological Data Collected

DATA	YEAR (Apr ~ Mar)														
	74 ~75	75 ~76	76 ~77	77 ~78	78 ~79	79 ~80	80 ~81	81 ~82	82 ~83	83 ~84	84 ~85	85 ~86	86 ~87	87 ~	
Meteorological Data (Dhaka)	Precipitation	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Temperature	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Humidity	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Evaporation			○	○										
	Duration of Sunshine	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Wind Velo. & Direct.	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Record of Cyclone														
	Record of Heil														
	Lakhya River	Water level (Demra)	○	○	○	○	○	○	○	○	○	○	○	○	○
		Water level (Ghorasal)	○	○	○	○									
Others	Record of Flood Damage														
	Discharge (Demra)	○	○	○	○								○	○	

Table A1-6-2 DATA ON THE DEMONSTRATION UNIT

NO.	INFORMATION	REMARKS
1.	Cropping calendars	Type
2.	Cropped area and irrigation area	
3.	Yield	
4.	Production cost (input supply)	
5.	Farm size and budget	
6.	Operation and maintenance cost in detail	
7.	Farmers' Organization	
8.	Marketing	
9.	Cost for desilting in the intake canal	
10.	Demarcation of maintenance of the facilities	
11.	Record of pump operation	



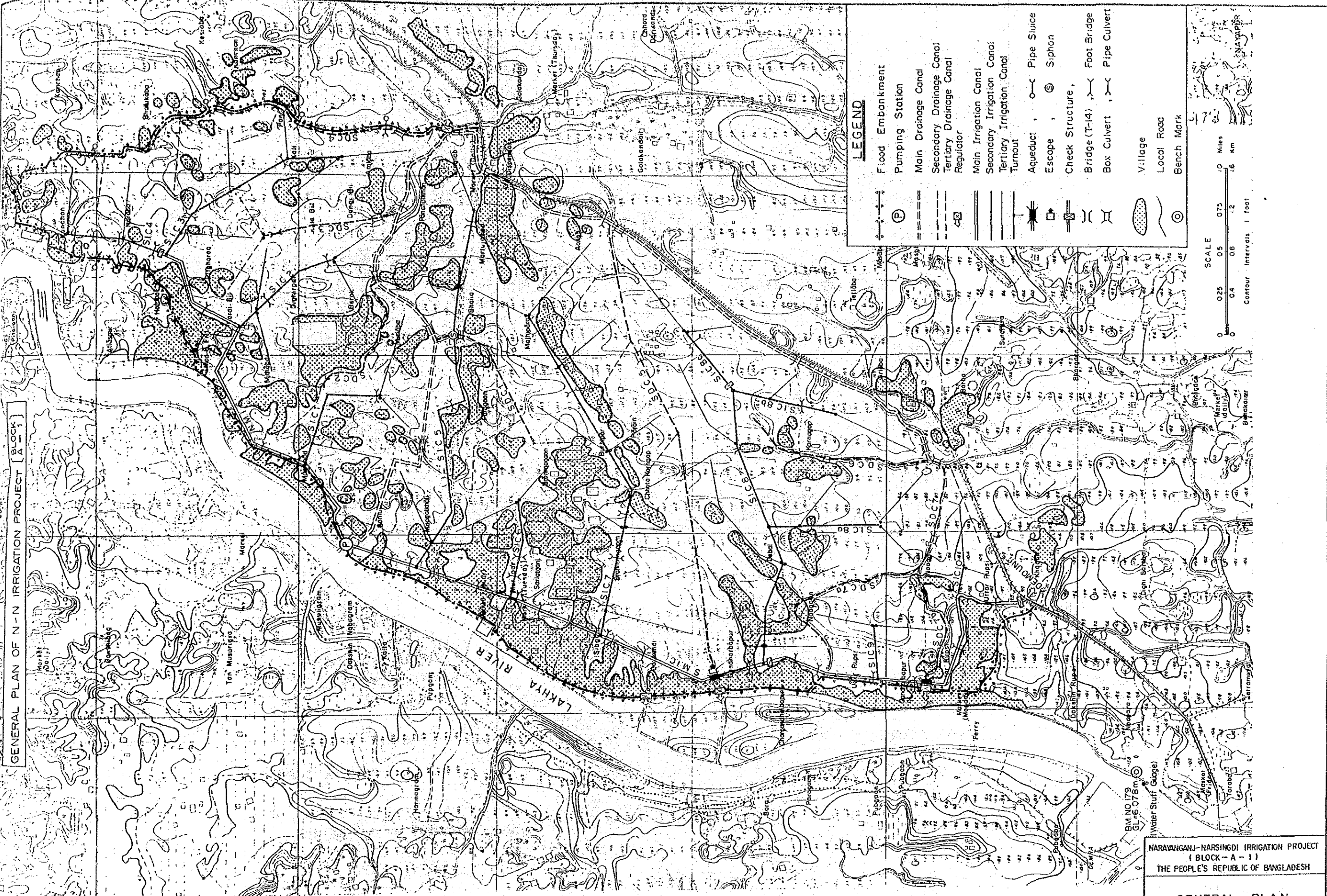


## APPENDIX II

2-1 Drawings

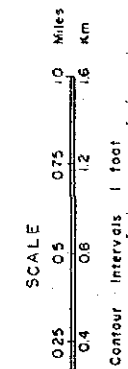
2-2 Tables

GENERAL PLAN OF N-N IRRIGATION PROJECT [ BLOCK - A - 1 ]



LEGEND

- Flood Embankment
- Pumping Station
- Main Drainage Canal
- Secondary Drainage Canal
- Tertiary Drainage Canal
- Regulator
- Main Irrigation Canal
- Secondary Irrigation Canal
- Tertiary Irrigation Canal
- Turnout
- Aqueduct
- Pipe Sluice
- Escape
- Siphon
- Check Structure
- Bridge (T-14)
- Foot Bridge
- Pipe Culvert
- Box Culvert
- Village
- Local Road
- Bench Mark



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
 ( BLOCK - A - 1 )  
 THE PEOPLE'S REPUBLIC OF BANGLADESH

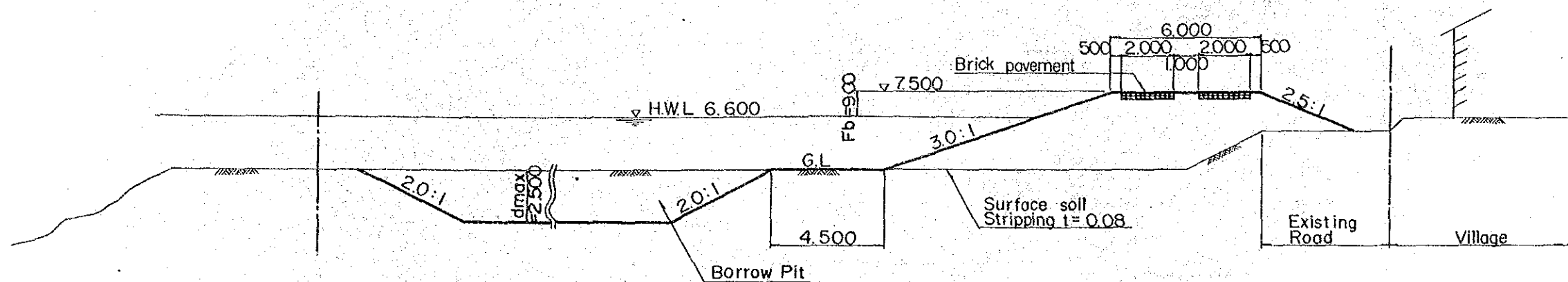
**GENERAL PLAN**

Date: Jan 1988 D.W.G NO. 1

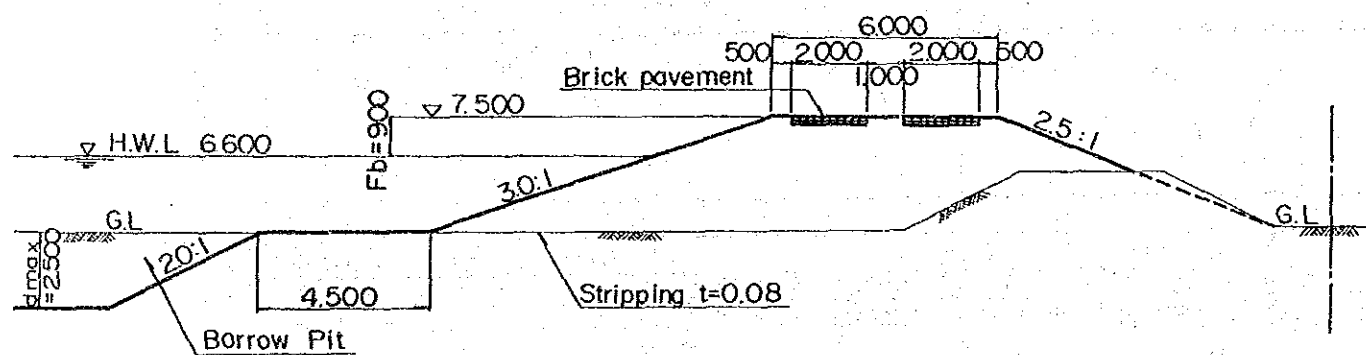
JAPAN INTERNATIONAL COOPERATION AGENCY

# TYPICAL SECTIONS OF FLOOD EMBANKMENT

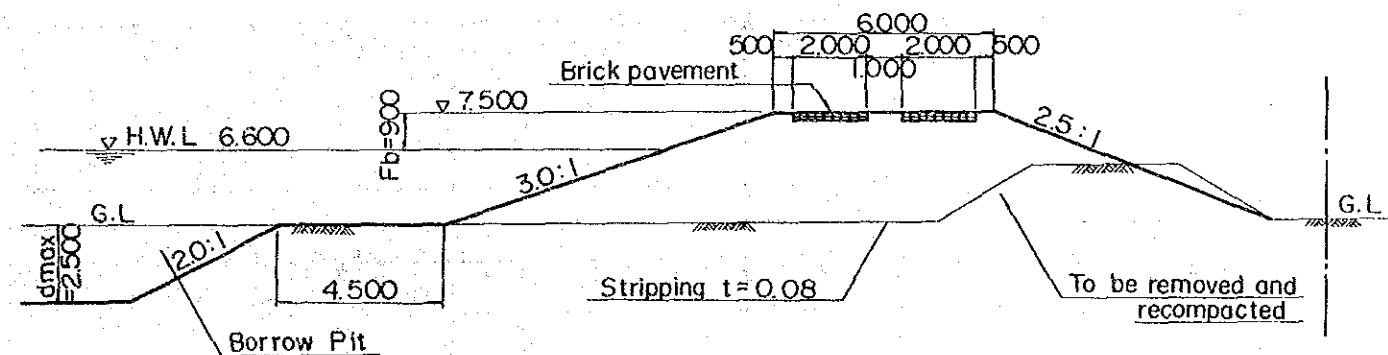
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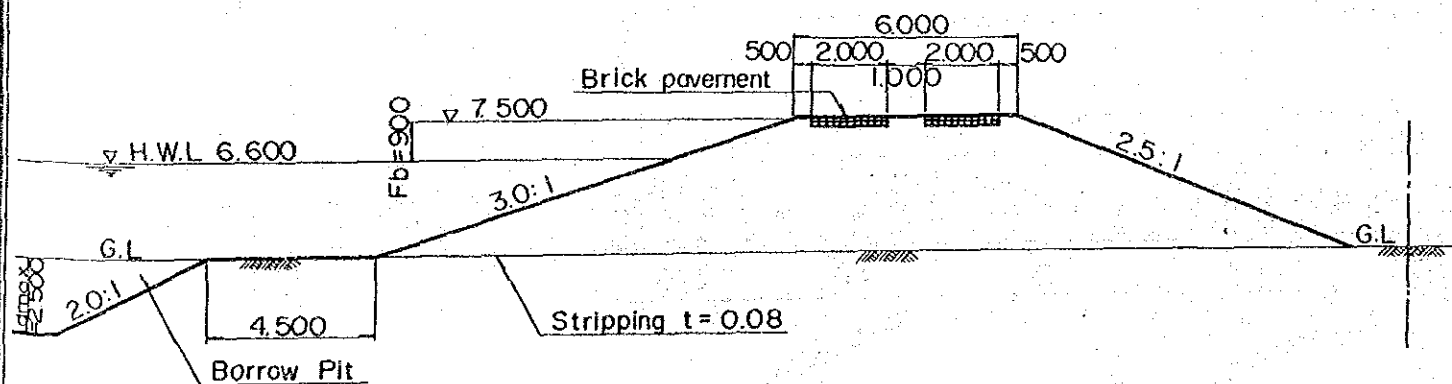
## TYPE - B



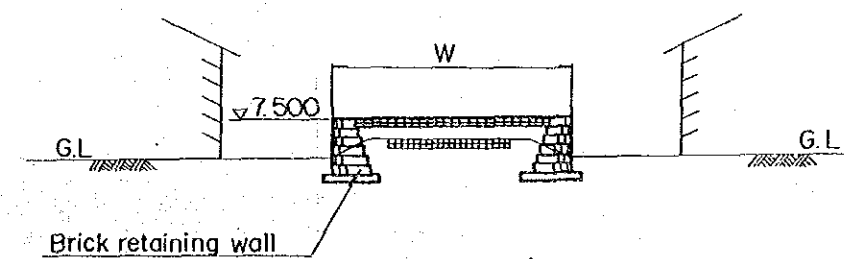
## TYPE - C



## TYPE - D



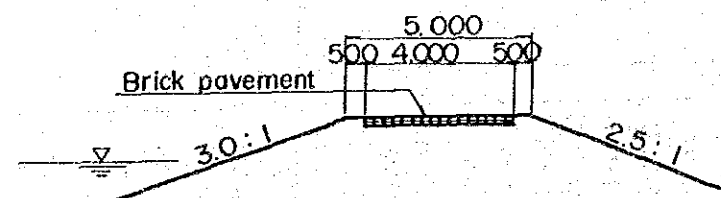
## TYPE - E



\* W is as it is.

- Note 1. Soil compaction will be done by machine.  
 2. Bund top width in the portion of Kanchan road is 5.00m wide.

## Bund Top of Kanchan Road

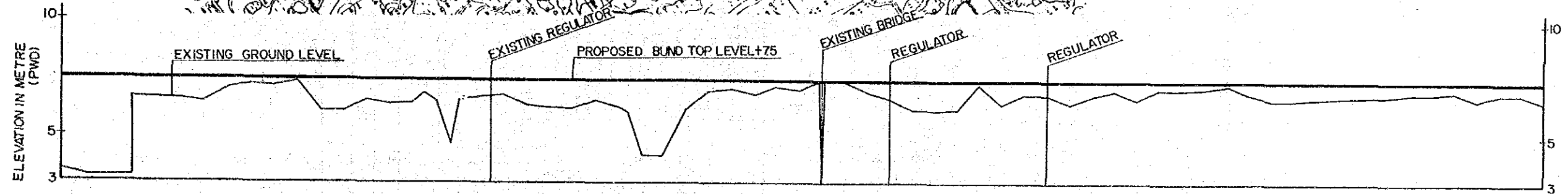
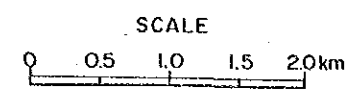


NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
 (BLOCK - A - 1)  
 THE PEOPLE'S REPUBLIC OF BANGLADESH

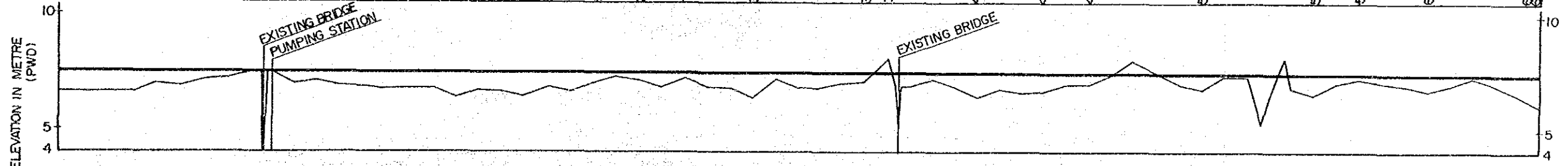
TYPICAL SECTIONS  
 OF FLOOD EMBANKMENT

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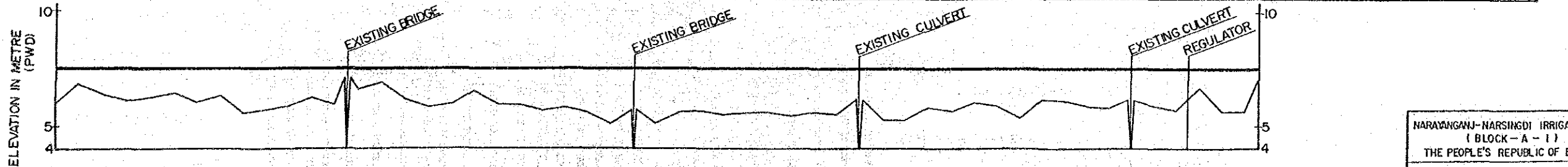
JAFAP INTERNATIONAL COOPERATION AGENCY



TYPE OF EMBANKMENT	(D) l=300m	(B) l=810m	(C) l=1200m	(D) l=390m	(A) l=3000m	(E) l=730m	(A) l=570m															
EXISTING GROUND LEVEL	3.51, 3.20, 3.20, 3.20, 6.59, 6.54, 6.54, 6.40, 7.00, 7.20, 7.10, 7.28, 6.05, 6.05, 6.49, 6.32, 6.40, 6.85, 6.46, 6.53, 6.53, 6.57, 6.70, 6.77, 4.42, 6.28, 6.23, 6.19, 6.55, 6.23, 6.07, 4.15, 4.15, 6.17, 6.92, 7.03, 6.78, 7.13, 6.99, 7.50, 7.46, 6.93, 6.61, 6.21, 6.16, 6.16, 7.24, 6.40, 6.84, 6.83, 6.42, 6.78, 7.02, 6.79, 7.07, 7.05, 7.13, 7.28, 6.89, 6.82, 6.63, 6.69, 6.79, 6.80, 6.82, 6.91, 6.93, 7.08, 6.62, 6.94, 6.94, 6.95, 6.59																					
DISTANCE	0	500	1000	1110	1500	1840	2000	2310	2500	2700	3000	3500	3600	4000	4300	4500	5000	5500	5700	6000	6500	6550



TYPE OF EMBANKMENT	(A) l=570m	(B) l=950m	(A) l=550m	(D) l=1000m	(C) l=2370m	(E) l=460m	(A) l=670m														
EXISTING GROUND LEVEL	6.59, 6.57, 6.59, 6.61, 6.93, 6.89, 7.14, 7.19, 7.46, 7.35, 7.44, 6.93, 7.10, 6.86, 6.86, 6.71, 6.76, 6.75, 6.34, 6.63, 6.63, 6.39, 6.78, 6.60, 6.94, 7.28, 7.15, 6.82, 7.20, 6.78, 6.78, 6.98, 7.08, 8.06, 4.93, 6.81, 7.17, 6.85, 6.39, 6.71, 6.57, 6.67, 6.95, 6.99, 7.33, 7.98, 8.71, 6.97, 6.77, 7.29, 7.29, 5.27, 6.46, 8.07, 6.75, 6.50, 7.01, 7.27, 7.07, 6.92, 6.70, 6.97, 7.29, 6.89, 6.54, 6.00																				
DISTANCE	6500	7000	7500	7600	7950	8000	8500	8600	8900	9000	9600	10000	10500	11000	11500	11670	12000	12350	12500	12500	13000



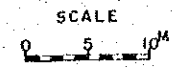
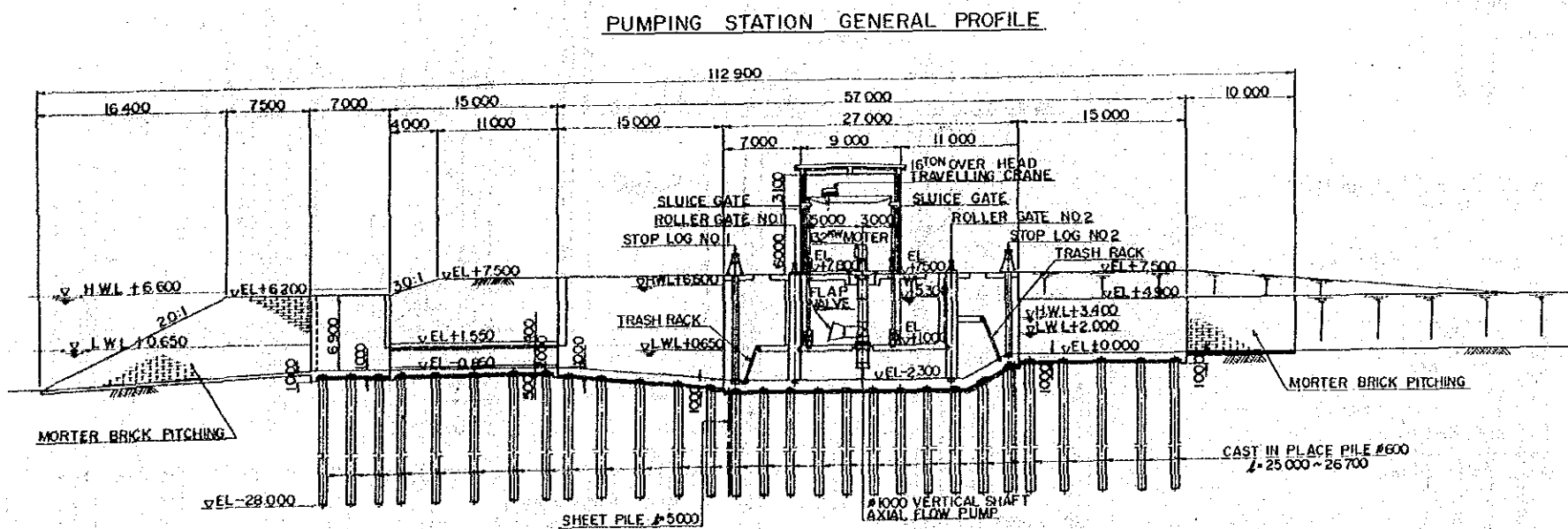
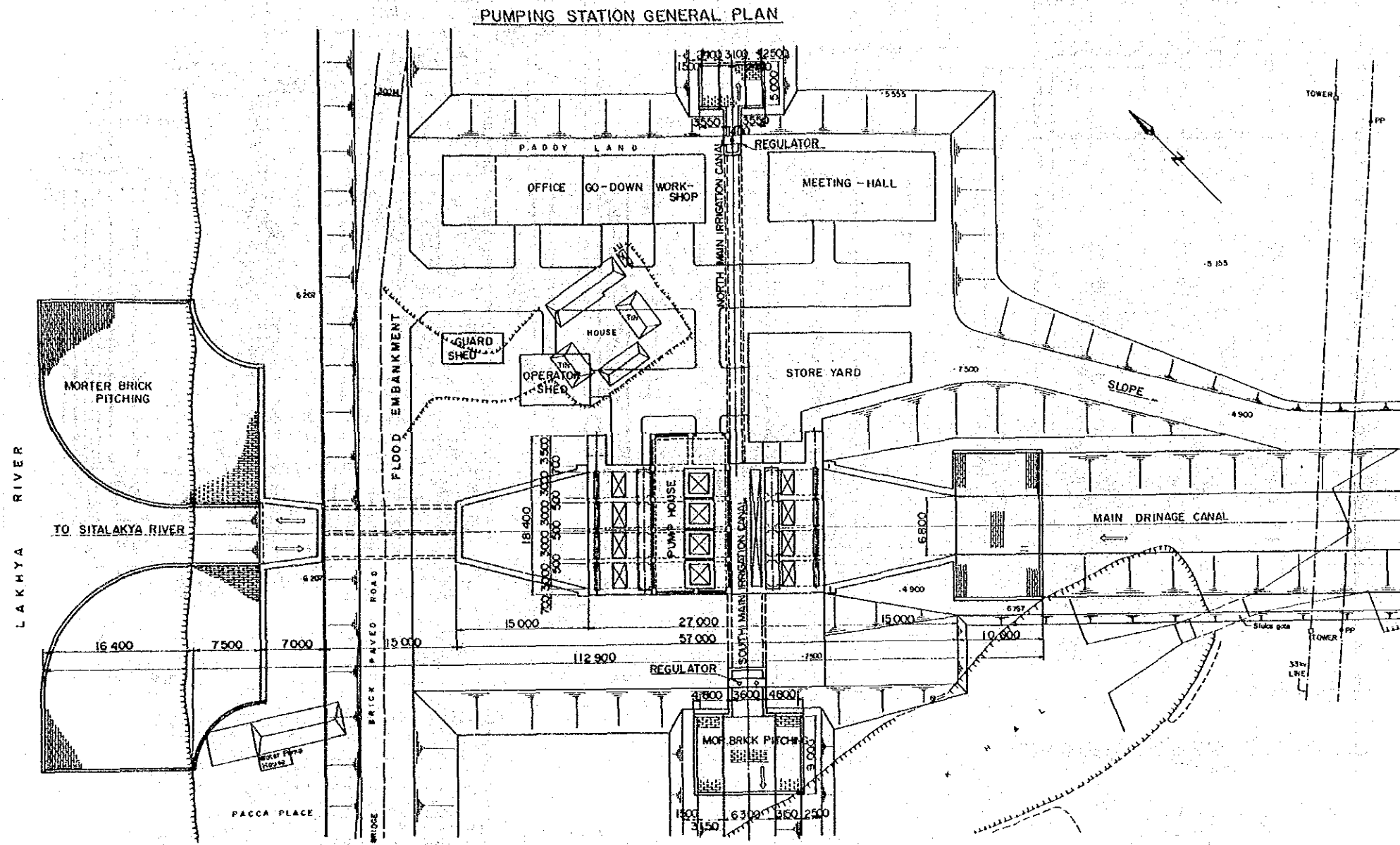
TYPE OF EMBANKMENT	(B) l=4500m	(D) l=780m																				
EXISTING GROUND LEVEL	6.00, 6.84, 6.36, 6.12, 6.24, 6.42, 5.99, 6.32, 5.94, 5.66, 5.87, 6.21, 5.90, 4.00, 6.57, 6.85, 6.10, 5.76, 5.92, 6.47, 5.90, 5.89, 5.63, 5.77, 5.56, 5.04, 5.53, 5.60, 5.45, 5.54, 5.56, 5.44, 5.51, 5.51, 5.60, 5.28, 5.22, 5.76, 5.60, 5.98, 5.85, 5.29, 6.09, 6.05, 5.81, 5.75, 3.70, 5.86, 5.64, 6.15, 6.65, 5.61, 5.65, 7.08																					
DISTANCE	3000	3500	4000	4500	5000	5500	6000	6500	6600	6800	7000	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
( BLOCK - A - 1 )  
THE PEOPLE'S REPUBLIC OF BANGLADESH

PROFILE OF FLOOD EMBANKMENT

Date: Jan 1988 D.W.G NO. 3

JAPAN INTERNATIONAL COOPERATION AGENCY

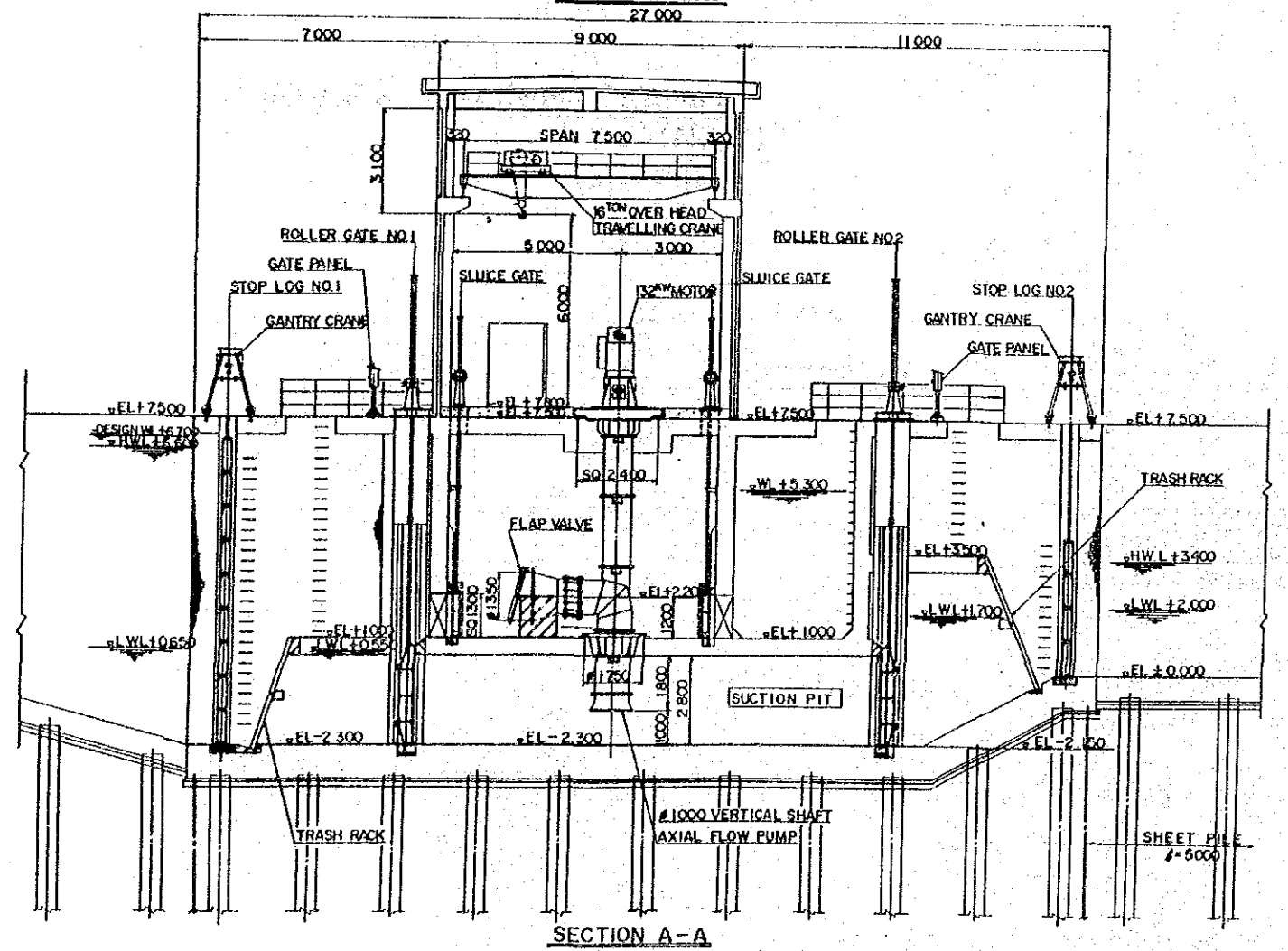
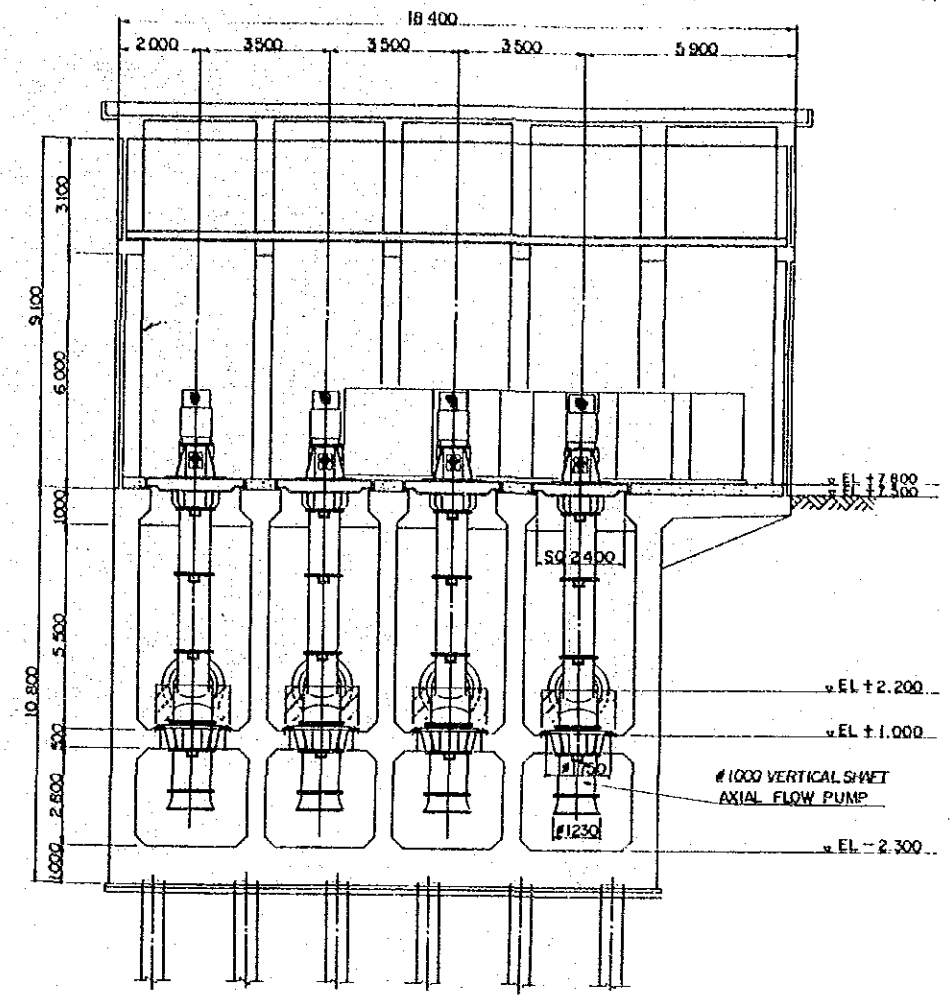
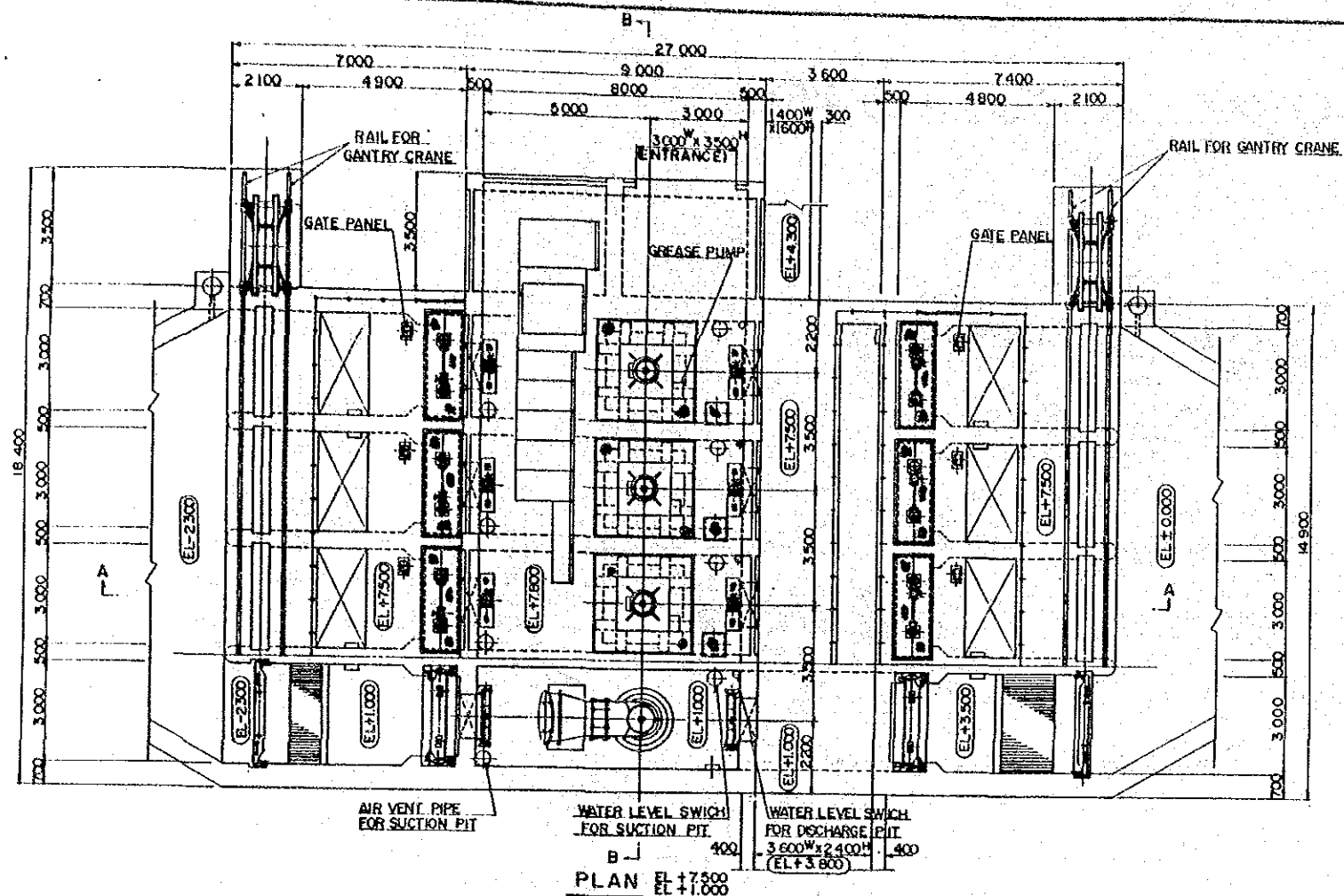


NARAYANGJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

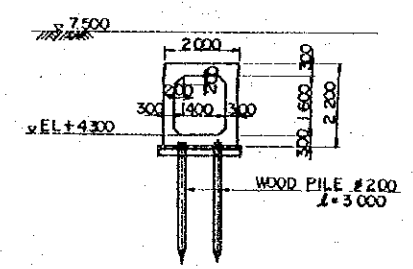
GENERAL PLAN & PROFILE  
OF PUMPING STATION

Date: Jan 1988 D.W.G NO. 4

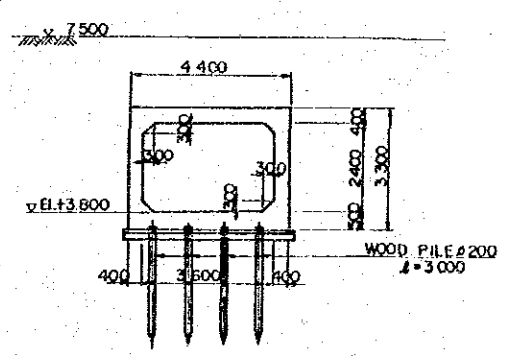
JAPAN INTERNATIONAL COOPERATION AGENCY



NORTH MAIN IRRIGATION CANAL SECTION (Box Culvert)



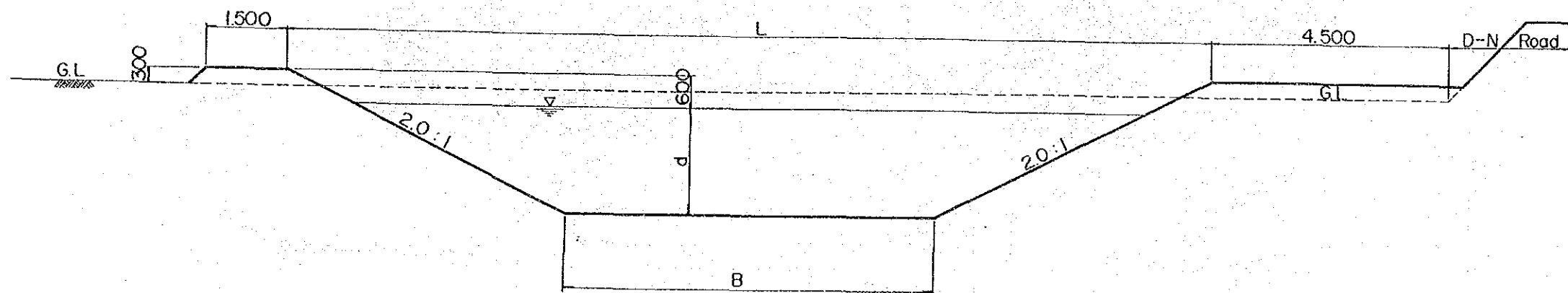
SOUTH MAIN IRRIGATION CANAL SECTION (Box Culvert)



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
 (BLOCK-A-1)  
 THE PEOPLE'S REPUBLIC OF BANGLADESH  
 PLAN AND SECTIONS  
 OF PUMPING STATION  
 Date: Jan 1988 D.W.G. NO. 5  
 JAPAN INTERNATIONAL COOPERATION AGENCY

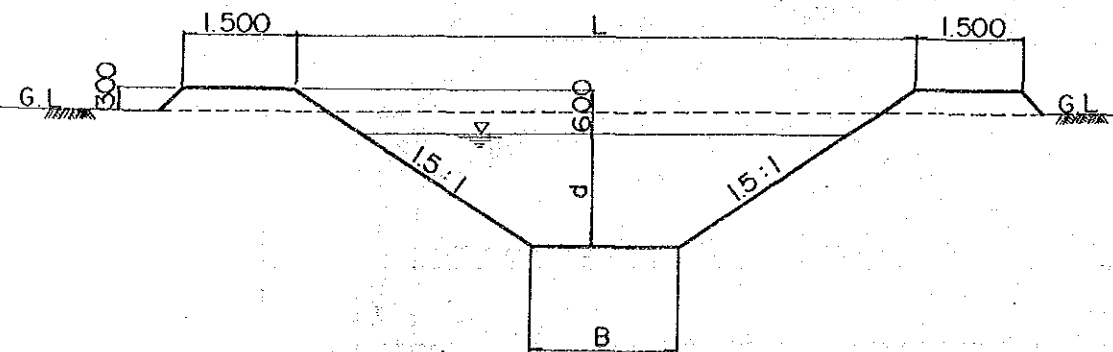
## TYPICAL SECTIONS OF PROPOSED CANALS

### MAIN DRAINAGE CANAL (NEW)



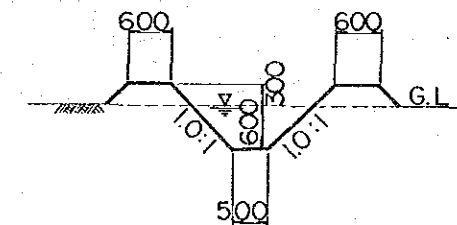
Type	B (m)	d (m)	L (m)
M.D.C I	1.800	1.500	10.200
• II	2.000	2.000	12.400
• III	3.000	2.000	13.400
• IV	4.000	2.000	14.400
• V	4.700	2.000	15.100
• VI	6.800	2.000	17.200

### SECONDARY DRAINAGE CANAL (NEW)



Canal	B (m)	d (m)	L (m)
S.D.C 1	0.500	1.500	6.800
• 2	1.000	1.000	5.800
• 3	1.000	1.000	5.800
• 4	1.000	1.000	5.800
• 5	0.800	1.500	7.100
• 6	0.500	1.000	5.300
• 7	1.500	1.200	6.900
• 7-1	0.500	1.000	5.300
• 7-2	0.500	1.000	5.300

### TERTIARY DRAINAGE CANAL (NEW)



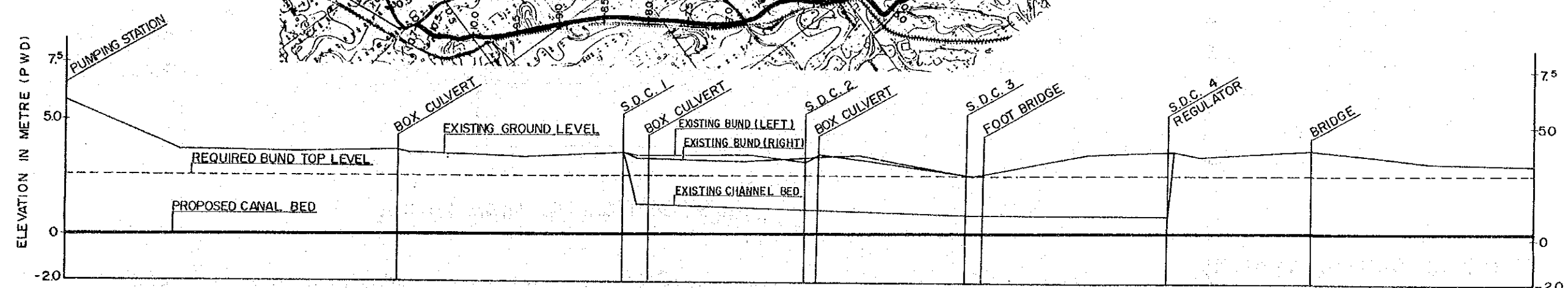
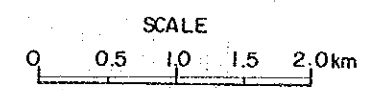
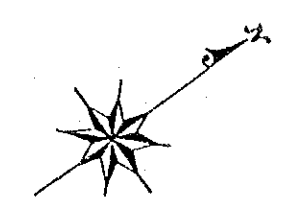
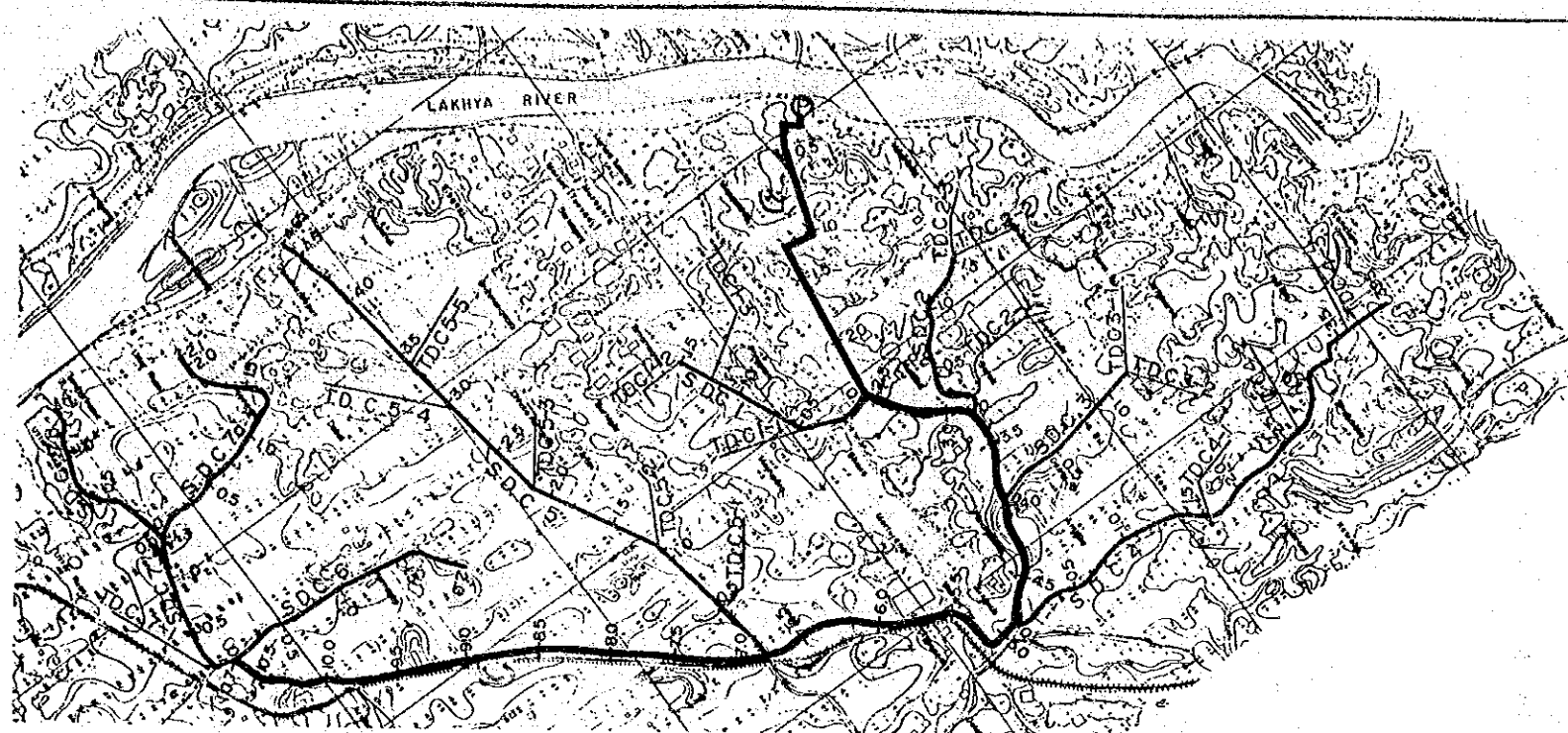
- Note: 1. Existing natural channels will be utilized to the drainage canal as much as possible.  
2. The width of 1.5m will be applied in the portion excepting the portion along D-N road.

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
( BLOCK - A - 1 )  
THE PEOPLE'S REPUBLIC OF BANGLADESH

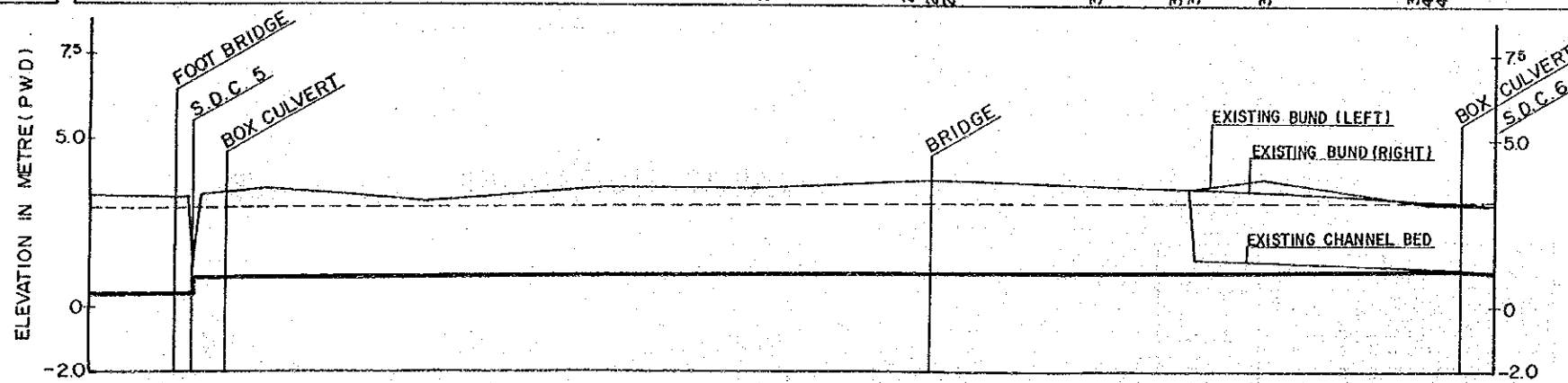
#### TYPICAL SECTIONS OF DRAINAGE CANALS

Date: Jan 1988      D.W.G NO. 6

JAPAN INTERNATIONAL COOPERATION AGENCY

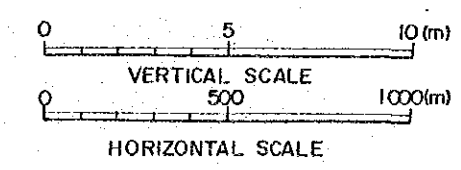


TYPE OF MAIN DRAINAGE CANAL	M. D. C VI $l=2430m$				M.D.C V $l=810m$		M. D. C IV $l=710m$		M. D. C III $l=900m$		M. D. C II $l=1950m$	
BUND TOP LEVEL	6.10	4.08	3.99	4.11	3.96	3.78	4.05	3.90	3.90	3.10	3.10	3.62
CANAL BED LEVEL	0.00	-0.03	-0.05	-0.06	-0.08	-0.10	-0.12	-0.13	-0.16	-0.20	-0.20	-0.33
EXISTING GROUND LEVEL	5.80	3.78	3.69	3.81	3.66	3.48	3.75	3.40	3.19	3.00	3.40	3.32
DISTANCE	0	500	1000	1450	1500	2000	2430	2500	2550	3000	3240	3250



Note: S.D.C.= Secondary Drainage Canal.

TYPE OF MAIN DRAINAGE CANAL	M. D. C II $l=1950m$		M. D. C I $l=3900m$																				
BUND TOP LEVEL	3.62	3.70	3.81	3.84	3.81	4.05	3.87	3.81	4.09	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	
CANAL BED LEVEL	0.33	0.34	0.88	0.90	0.98	0.95	0.96	0.98	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
EXISTING GROUND LEVEL	3.32	3.32	3.51	3.14	3.54	3.75	3.57	3.51	3.51	3.09	3.05	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
DISTANCE	6.500	6.750	6.800	6.900	7.000	7.500	8.000	8.500	9.000	9.500	9.780	9.800	10.000	10.500	10.600	10.700							



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK-A-1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

**PROFILE OF MAIN DRAINAGE CANAL**

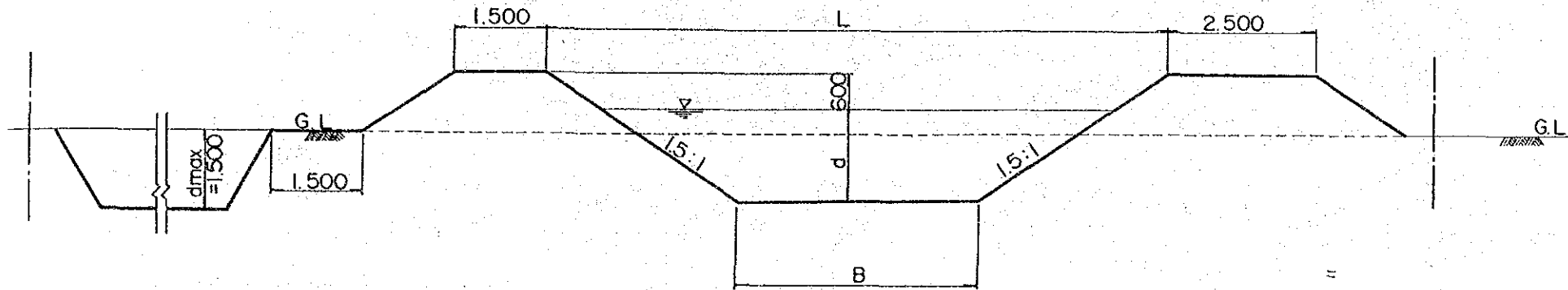
Date: Jan 1988 D.W.G NO. 7

JAPAN INTERNATIONAL COOPERATION AGENCY



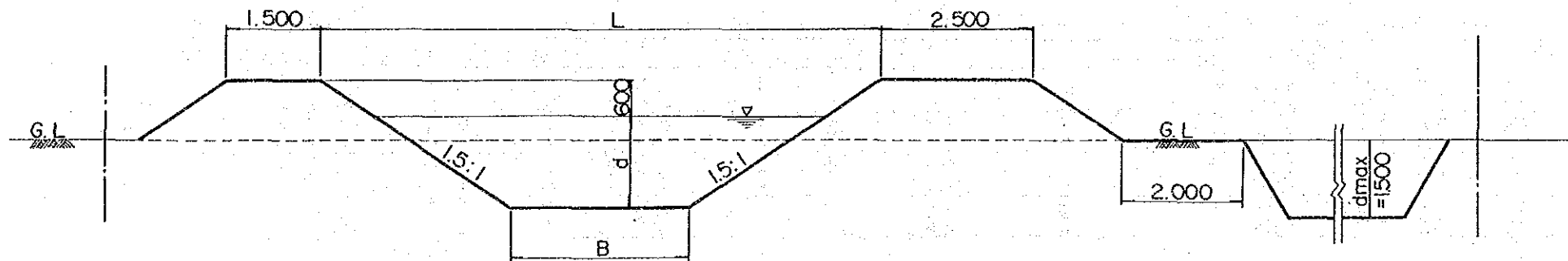
## TYPICAL SECTIONS OF PROPOSED CANALS

### NORTH MAIN IRRIGATION CANAL

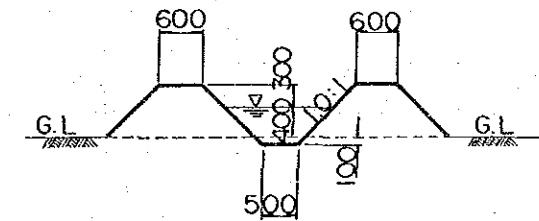


	Type	B (m)	d (m)	L (m)
North	N.M.I.C I	3.100	1.000	7.900
	☞ II	2.200	1.000	7.000
	☞ III	1.200	1.000	6.000
South	S.M.I.C I	6.300	1.500	12.600
	☞ II	5.800	1.500	12.100
	☞ III	5.500	1.500	11.800
	☞ IV	4.300	1.500	10.600
	☞ V	2.700	1.500	9.000
	☞ VI	2.400	1.500	8.700
	☞ VII	2.100	1.500	8.400

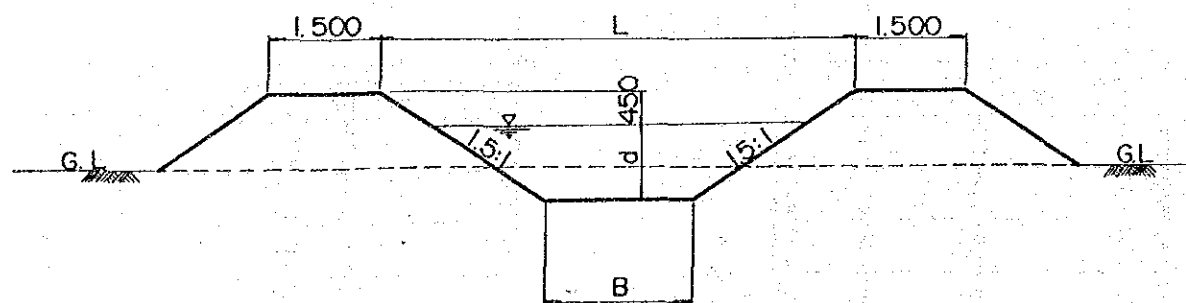
### SOUTH MAIN IRRIGATION CANAL



### TERTIARY IRRIGATION CANAL



### SECONDARY IRRIGATION CANAL



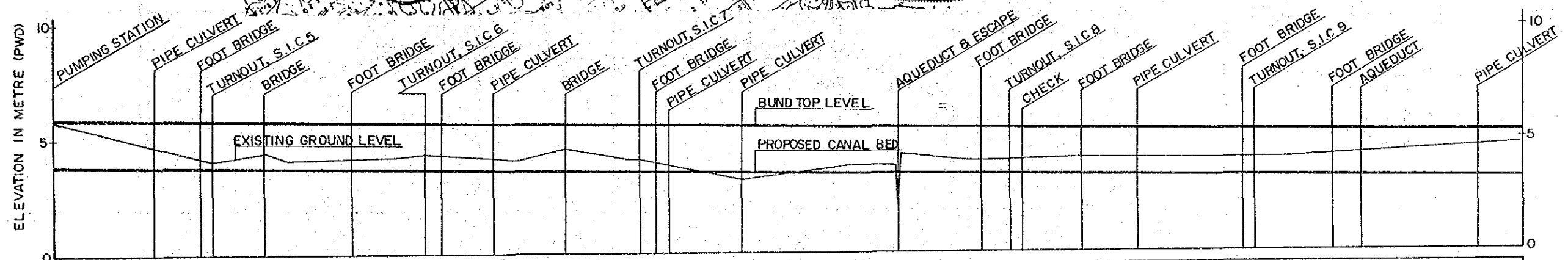
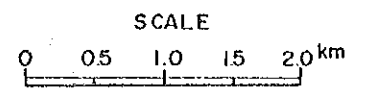
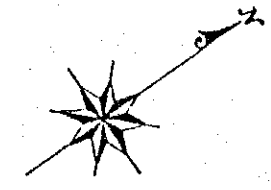
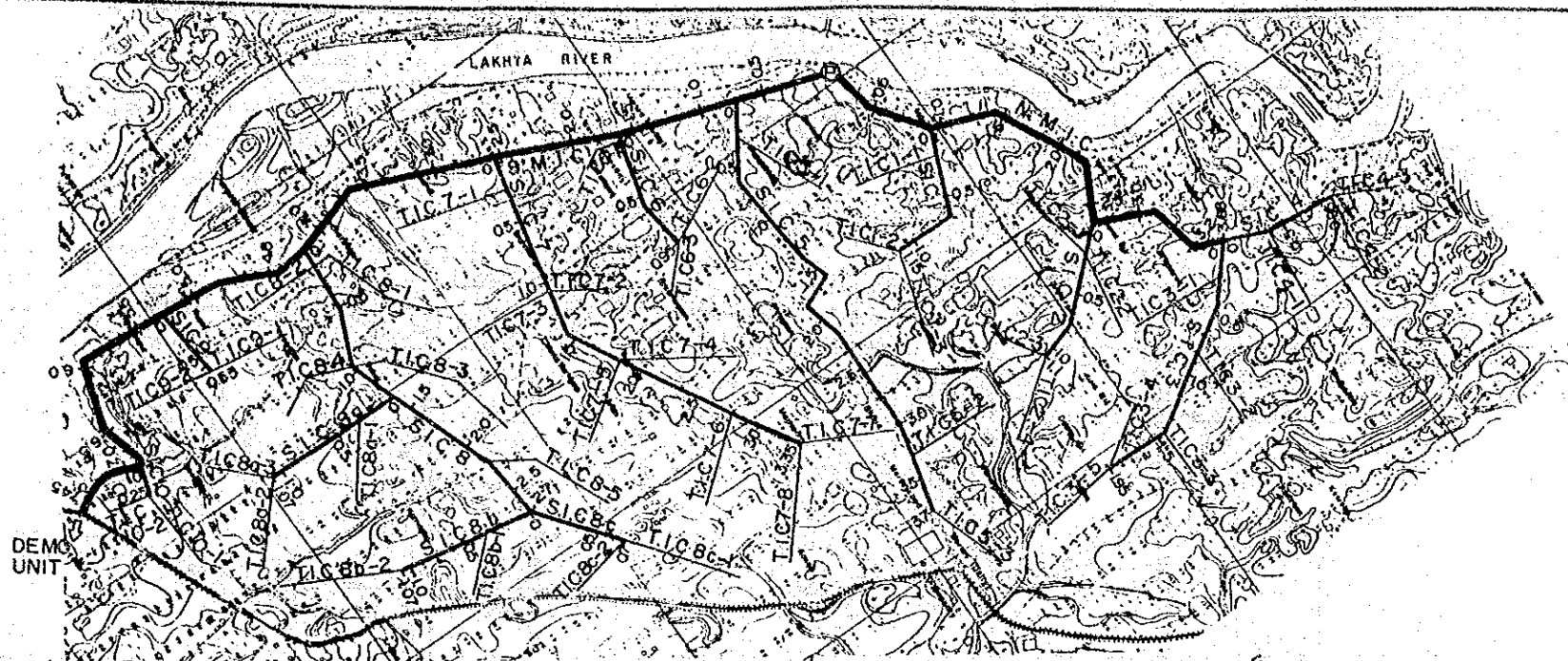
	Canal	B (m)	d (m)	L (m)
North	S.I.C 1	1.100	0.750	4.700
	☞ 2	1.100	0.750	4.700
	☞ 3	1.700	0.750	5.300
	☞ 4	0.600	0.750	4.200
	☞ 5	1.100	0.750	4.700
South	☞ 6	0.600	1.000	4.200
	☞ 7	1.700	1.000	6.050
	☞ 8	2.400	0.750	6.750
	☞ 8-a	0.600	0.750	4.200
	☞ 8-b	0.600	0.750	4.200
	☞ 8-c	0.600	0.750	4.200
	☞ 9	0.600	0.750	4.200
	☞ 10	0.600	0.750	4.200

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

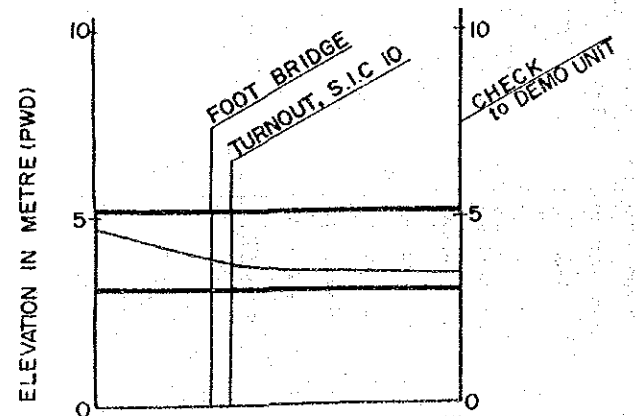
TYPICAL SECTIONS  
OF IRRIGATION CANALS

Date: Jan 1988      D.W.G. NO. 8

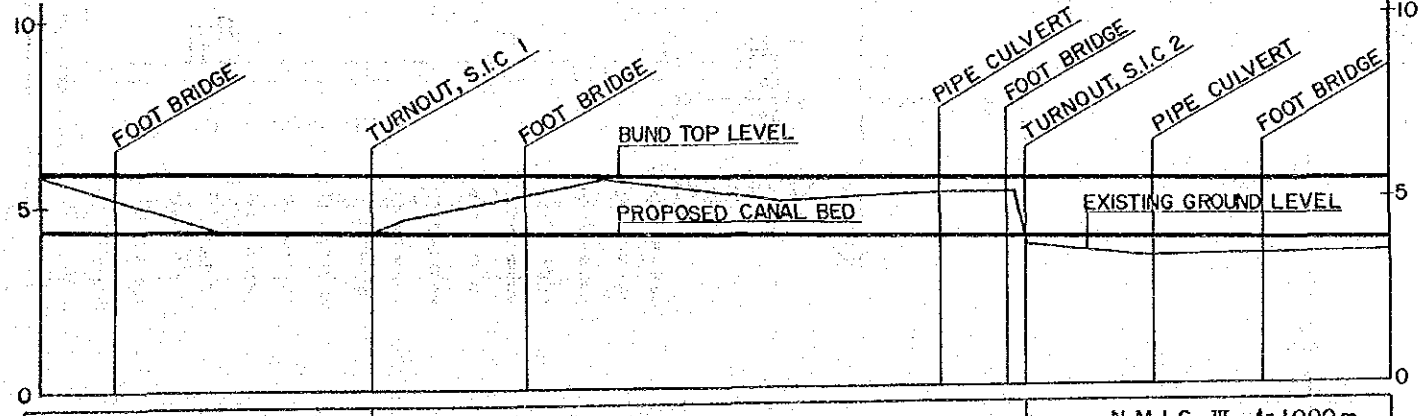
JAPAN INTERNATIONAL COOPERATION AGENCY



TYPE OF MAIN IRRIGATION CANAL	S.M.I.C I $l=680m$	S.M.I.C II $l=920m$	S.M.I.C III $l=950m$	S.M.I.C IV $l=1650m$	S.M.I.C V $l=1100m$	S.M.I.C VI $l=1550m$
BUND TOP LEVEL	3.80-5.90	3.76-5.86	3.61-5.71	3.45-5.55	3.32-5.42	3.25-5.35
CANAL BED LEVEL	3.80-5.90	3.75-5.85	3.60-5.70	3.45-5.55	3.30-5.40	3.22-5.32
EXISTING GROUND LEVEL	4.70-5.84	4.57-5.84	4.39-5.74	4.11-5.65	4.11-5.57	4.20-5.34
DISTANCE	0m	430-500-630-680	900-1000-1280-1500-1600-1670-1900-2000	2220-2500-2600-2620-3000	3500-3690-3700-3710-4000-4070-4200-4250	4500-4520-5000-5250-5300-5500-5650-5780-6000-6300-6500

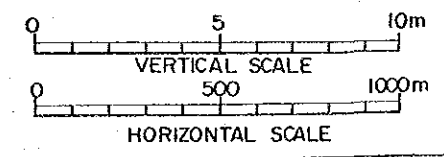


TYPE OF MAIN IRRIGATION CANAL	S.M.I.C VI $l=1550m$	S.M.I.C VII $l=600m$
BUND TOP LEVEL	3.15-5.25	3.12-5.22
CANAL BED LEVEL	3.15-5.25	3.12-5.22
EXISTING GROUND LEVEL	4.72-5.90	3.57-5.20
DISTANCE	5500-6800-6850-7000	7450-7500



TYPE OF MAIN IRRIGATION CANAL	N.M.I.C I $l=900m$	N.M.I.C II $l=1780m$	N.M.I.C III $l=1000m$
BUND TOP LEVEL	4.30-5.90	4.28-5.89	4.06-5.66
CANAL BED LEVEL	4.30-5.90	4.25-5.85	4.06-5.66
EXISTING GROUND LEVEL	5.15-5.81	4.27-5.81	5.15-5.65
DISTANCE	0m-200-500-900-1000-1320-1500	2450-2600-2650-2660	3000-3030-3330-3500-3690

Note : S.I.C = Secondary Irrigation Canal



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

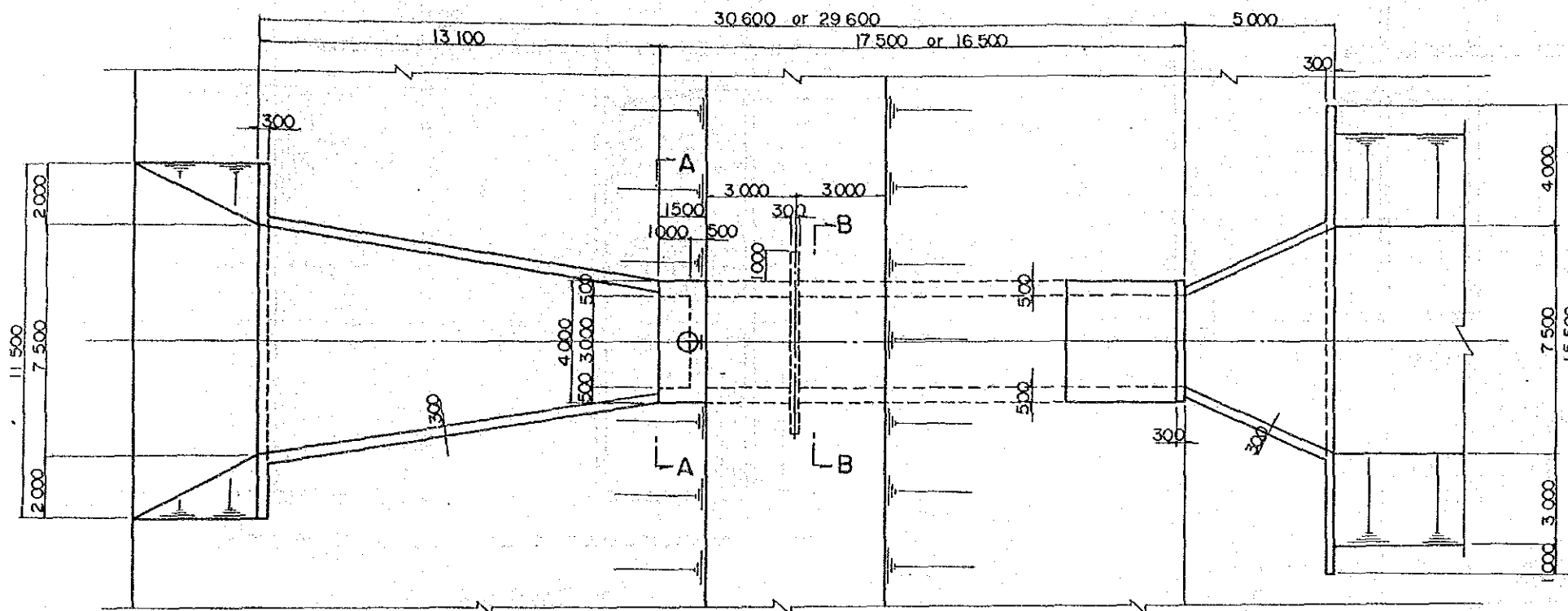
**PROFILE OF MAIN IRRIGATION CANALS**

Date: Jan 1988 D.W.G NO. 9

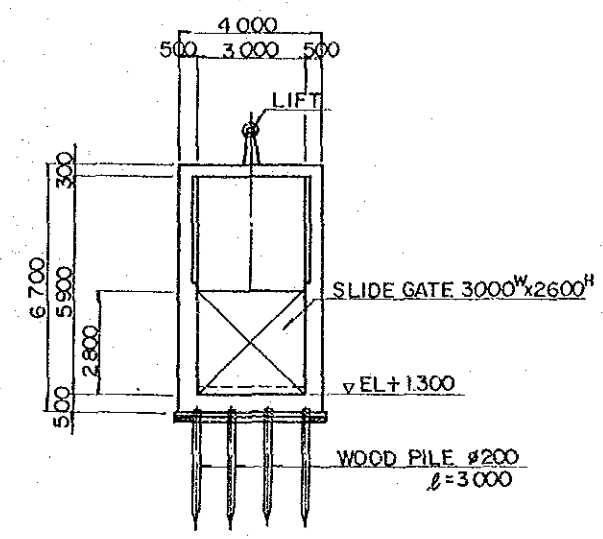
JAPAN INTERNATIONAL COOPERATION AGENCY

# REGULATOR

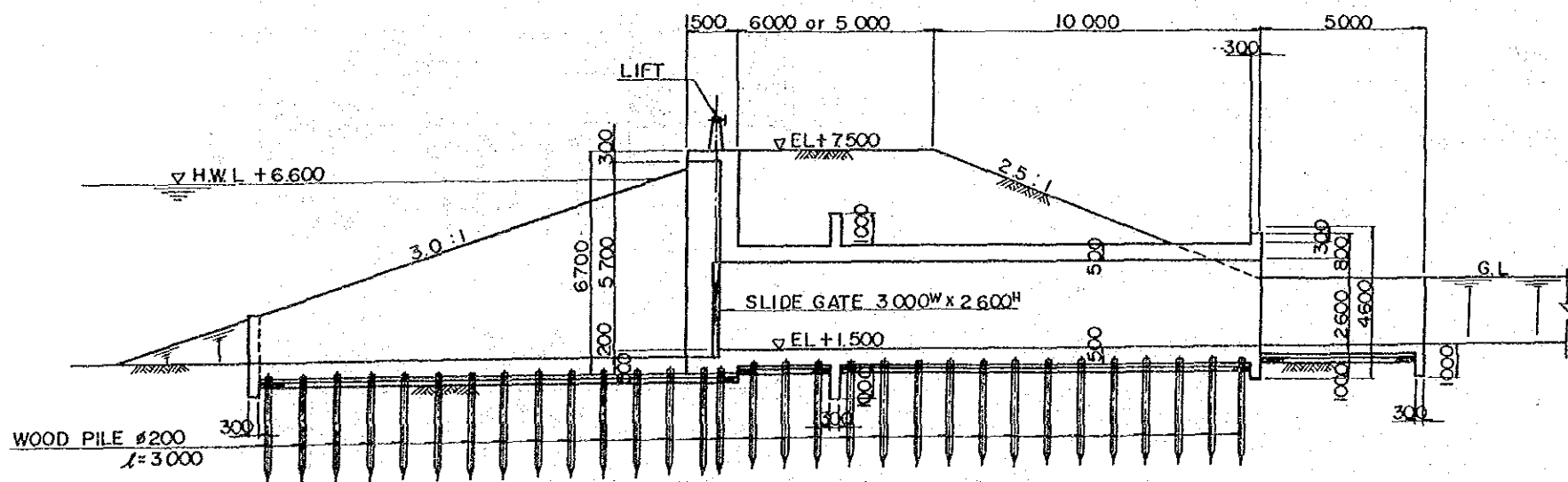
## PLAN



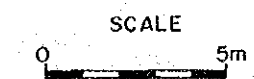
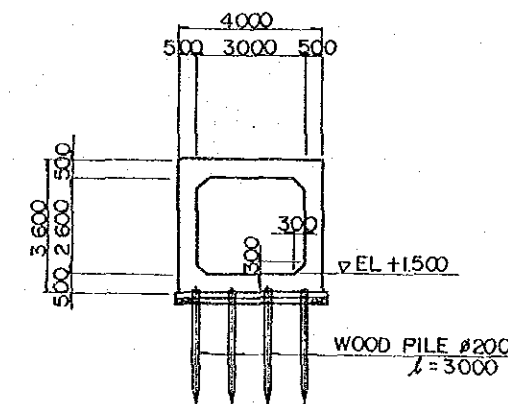
### A - A



## PROFILE



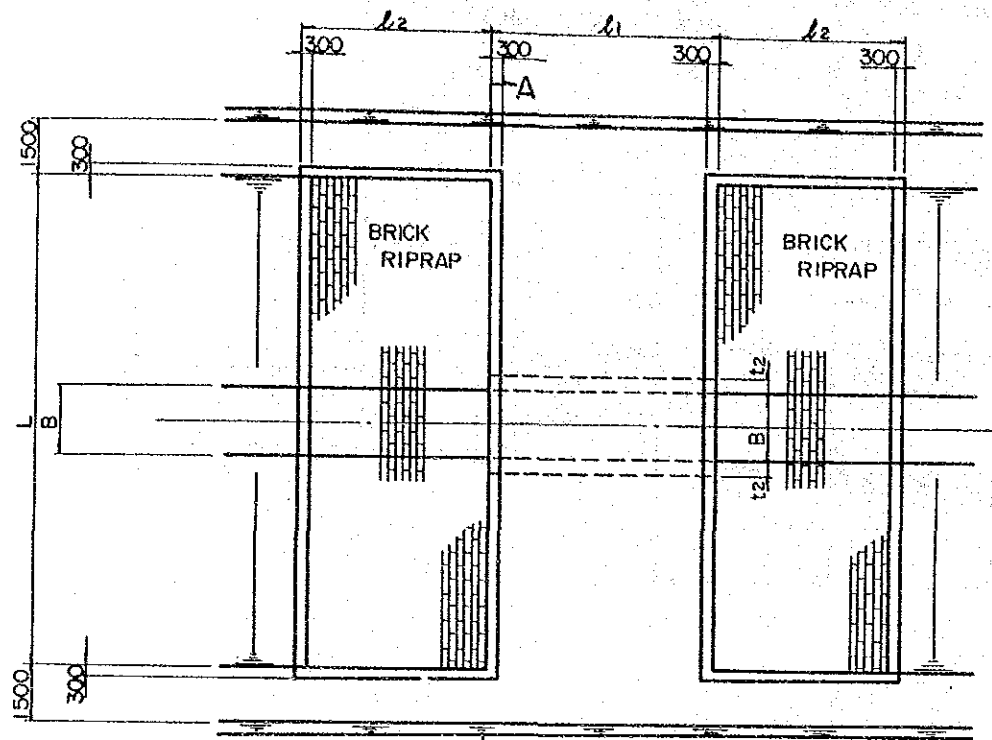
### B - B



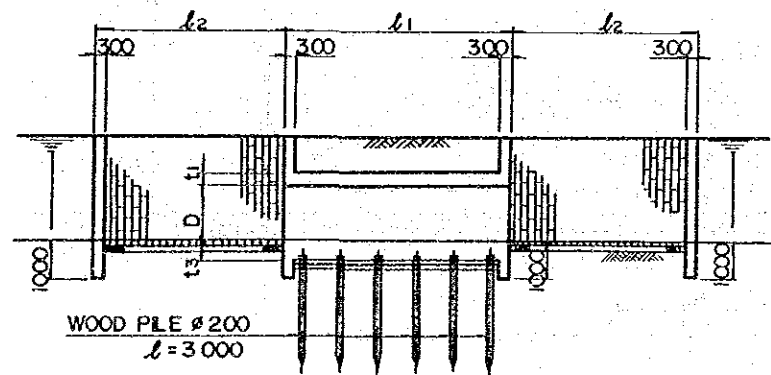
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT (BLOCK - A - 1) THE PEOPLE'S REPUBLIC OF BANGLADESH	
<b>REGULATOR</b>	
Date; Jan 1988	D.W.G NO. 10
JAPAN INTERNATIONAL COOPERATION AGENCY	

# BOX CULVERT

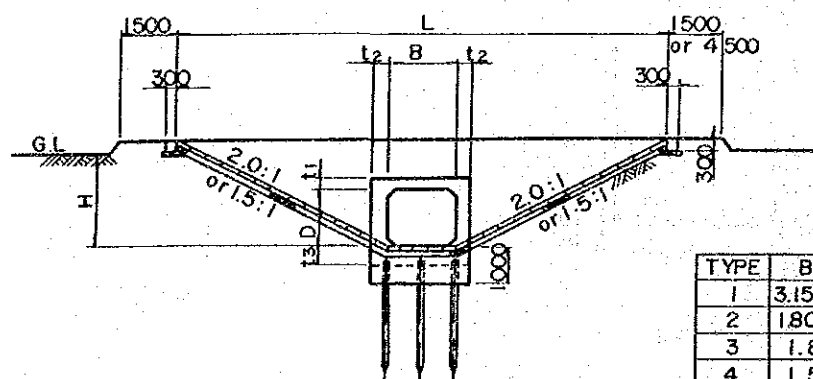
## PLAN



## PROFILE



## A - A

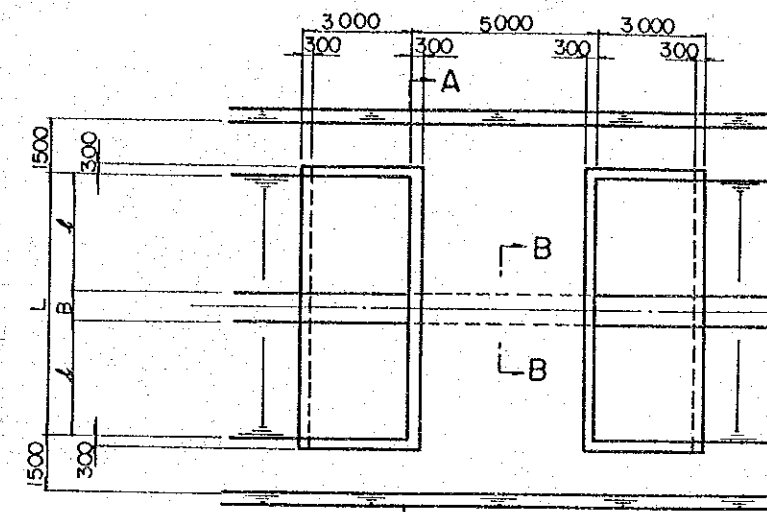


(Dimension : m)

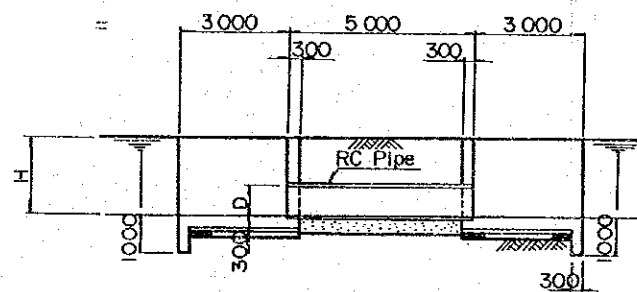
TYPE	B	D	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>	H	L	l <sub>1</sub>	l <sub>2</sub>
1	3.15x2	2.00	0.50	0.50	0.60	3.50	22.00	6.00	20.00
2	1.80x2	2.00	0.40	0.40	0.50	8.50	19.20	6.00	12.00
3	1.80	1.50	0.30	0.40	0.50	2.50	13.00	6.00	5.00
4	1.50	1.20	0.30	0.30	0.30	1.30	6.30	5.00	4.50
5	1.00	1.00	0.30	0.30	0.30	1.50	5.80	5.00	3.00
6	1.50	1.50	0.30	0.30	0.30	1.80	6.80	5.00	1.50

# PIPE CULVERT

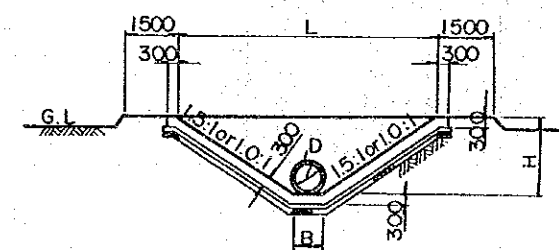
## PLAN



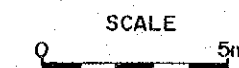
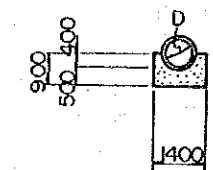
## PROFILE



## A - A



## B - B (D = 800)



(Dimension : m)

TYPE	B	l	L	H	D
1	1.00	2.40	5.80	1.60	0.80
2	0.80	3.15	7.10	2.10	0.80
3	0.50	2.40	5.30	1.60	0.80
4	0.50	0.80	2.10	0.80	0.60

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

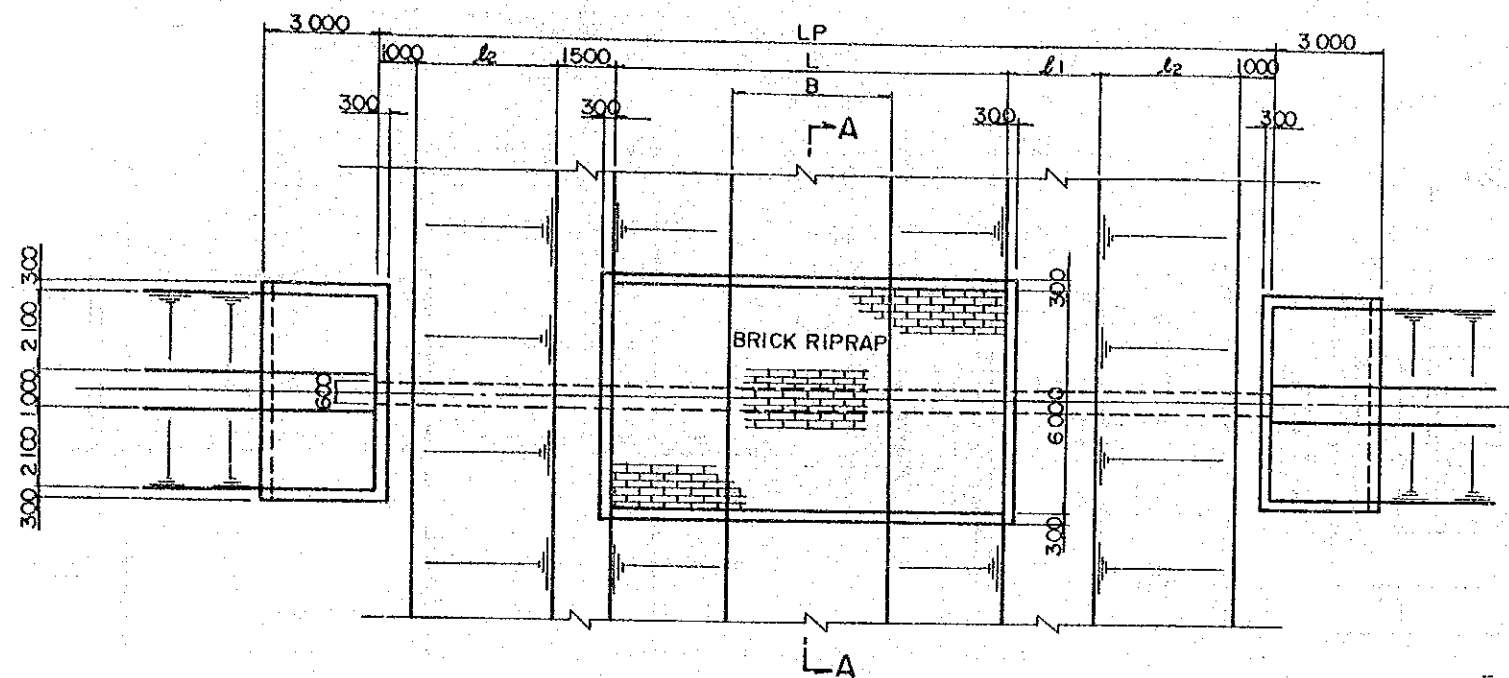
### BOX CULVERT & PIPE CULVERT

Date: Jun 1988 D.W.G NO. 11

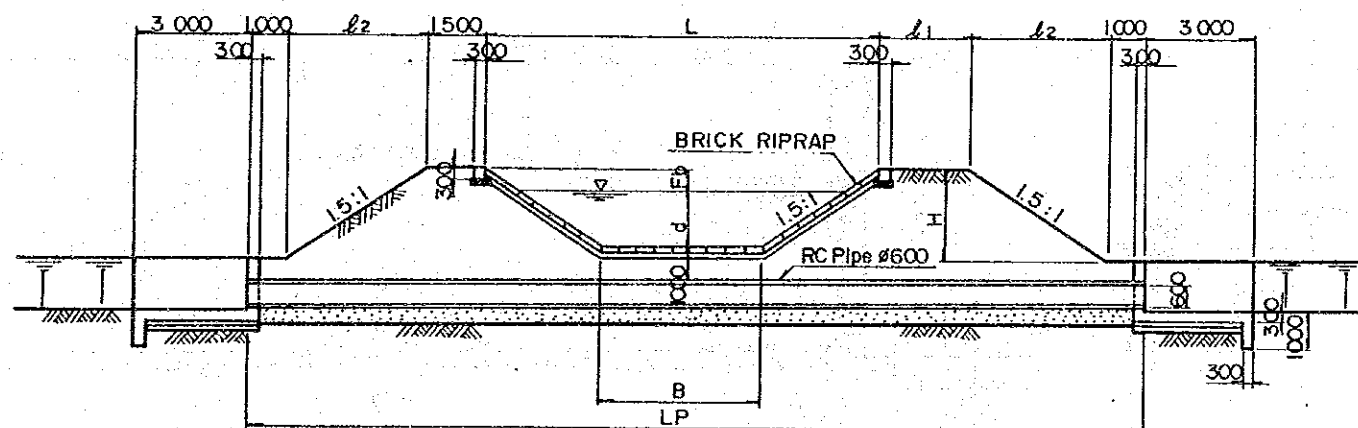
JAPAN INTERNATIONAL COOPERATION AGENCY

# PIPE CULVERT

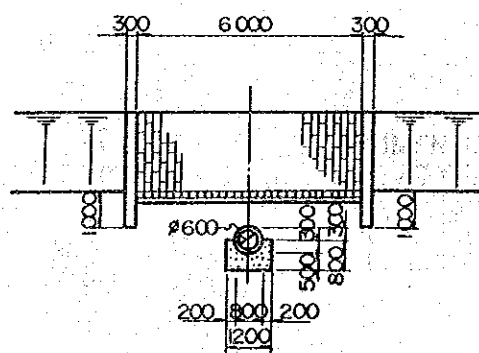
## PLAN



## PROFILE

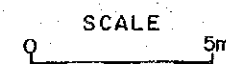


## A - A



(Dimension : m)

TYPE	B	d	Fb	H	L	l <sub>1</sub>	l <sub>2</sub>	LP
1	6.30	1.50	0.60	1.40	12.60	2.50	2.10	22.80
2	4.30	1.50	0.60	2.50	10.60	2.50	3.75	24.10
3	2.70	1.50	0.60	2.60	9.00	2.50	3.90	22.80
4	2.20	1.00	0.60	2.00	7.00	2.50	3.00	19.00
5	1.70	1.00	0.45	1.80	6.05	1.50	2.70	14.35
6	1.20	1.00	0.60	2.70	6.00	2.50	4.05	20.10
7	0.60	0.75	0.45	2.20	4.20	1.50	3.30	12.50



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
( BLOCK - A - 1 )  
THE PEOPLE'S REPUBLIC OF BANGLADESH

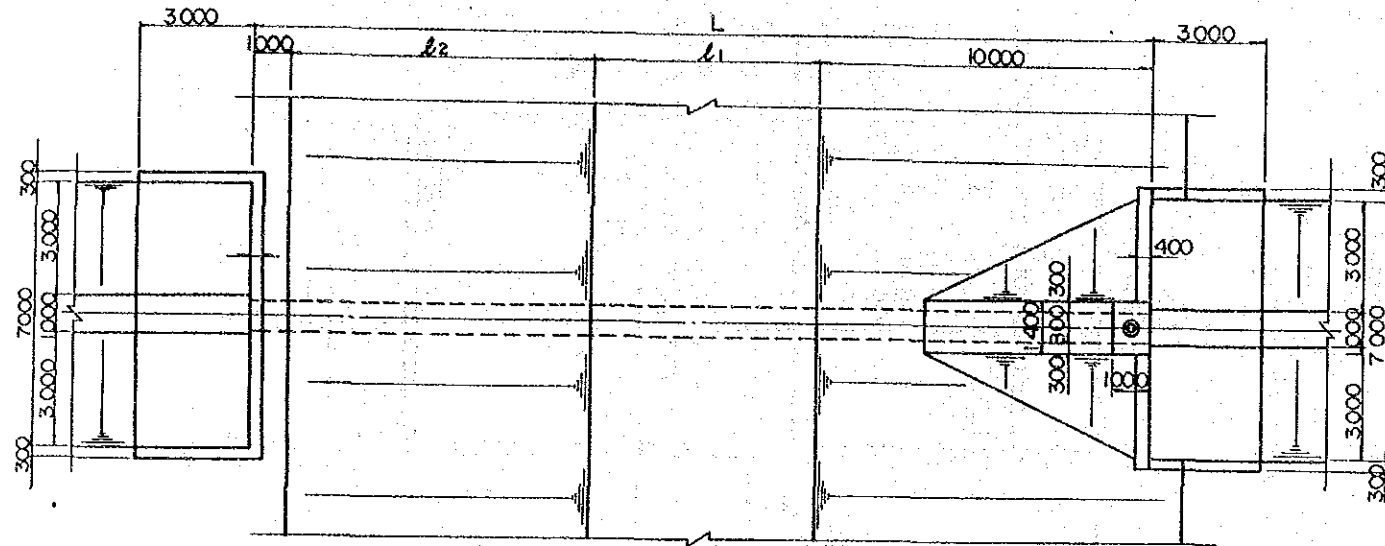
### PIPE, CULVERT

Date: Jan 1988      D.W.G NO. 12

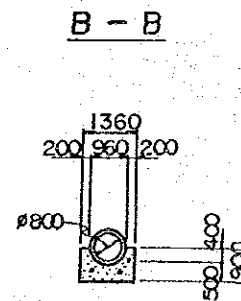
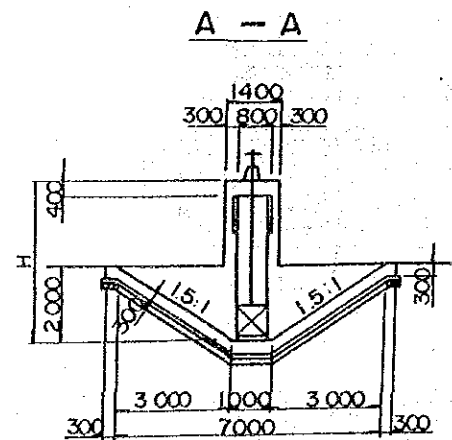
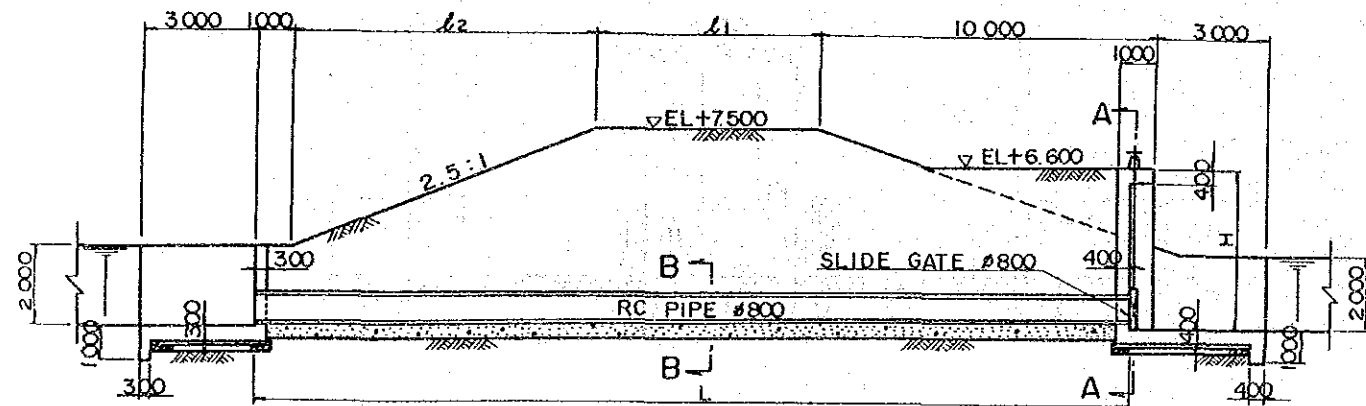
JAPAN INTERNATIONAL COOPERATION AGENCY

PIPE SLUICE

PLAN



PROFILE

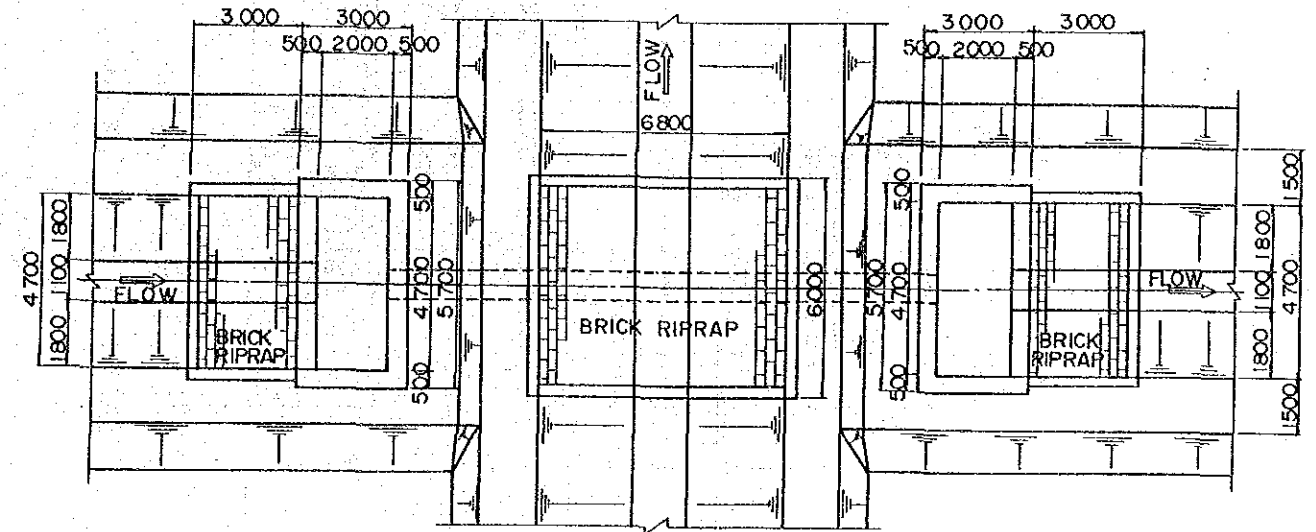


DIMENSION TABLE OF PIPE SLUICE

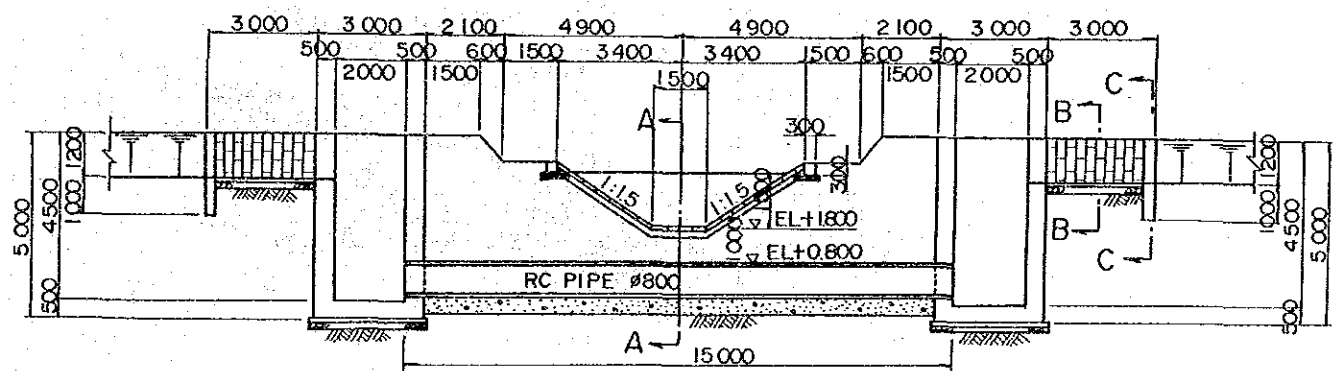
TYPE	l <sub>1</sub>	l <sub>2</sub>	L	H
1	6,000	8,000	24,400	4,300
2	5,000	9,500	24,900	4,900
3	5,000	10,000	25,000	5,100

SIPHON

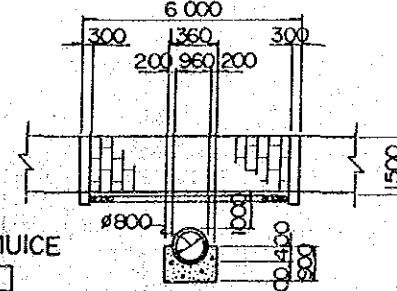
PLAN



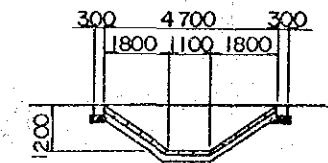
PROFILE



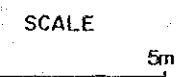
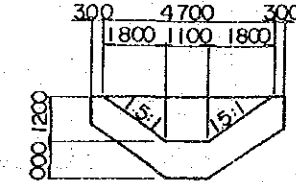
A-A



B-B



C-C



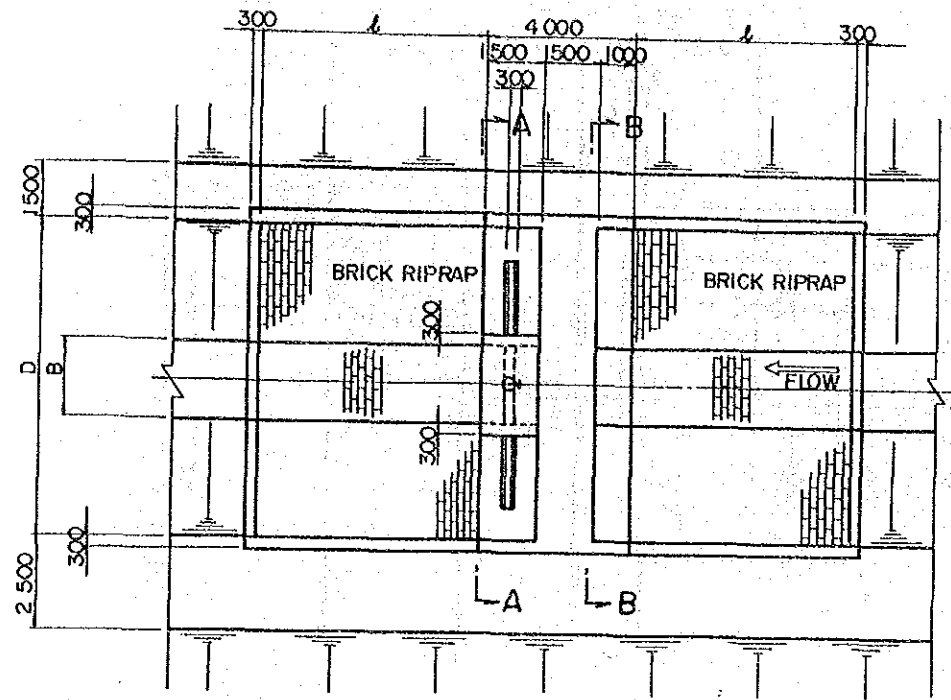
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK-A-1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

PIPE SLUICE & SIPHON

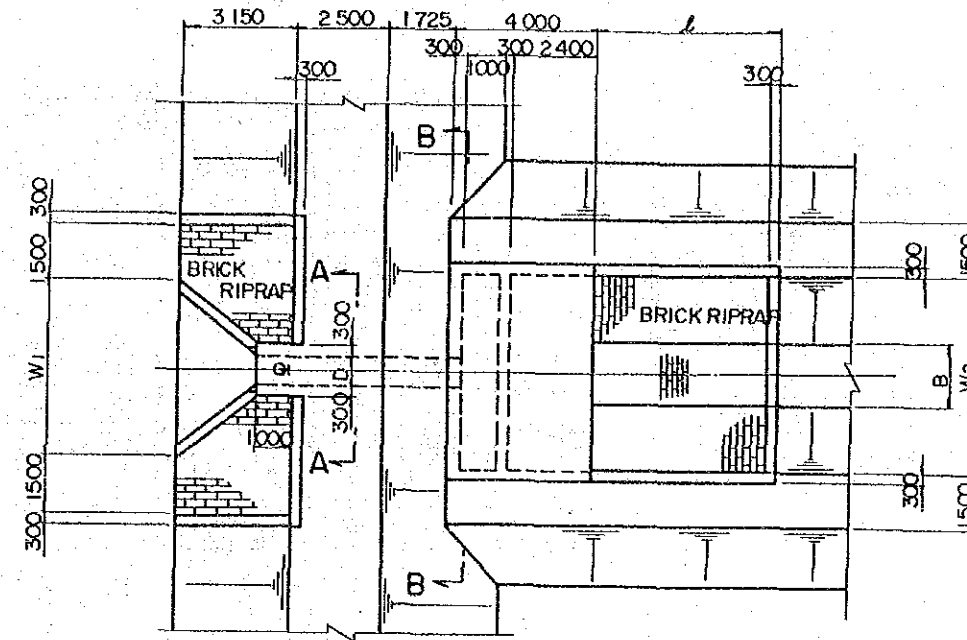
Date: Jan 1988 D.W.G. NO. 13

JAPAN INTERNATIONAL COOPERATION AGENCY

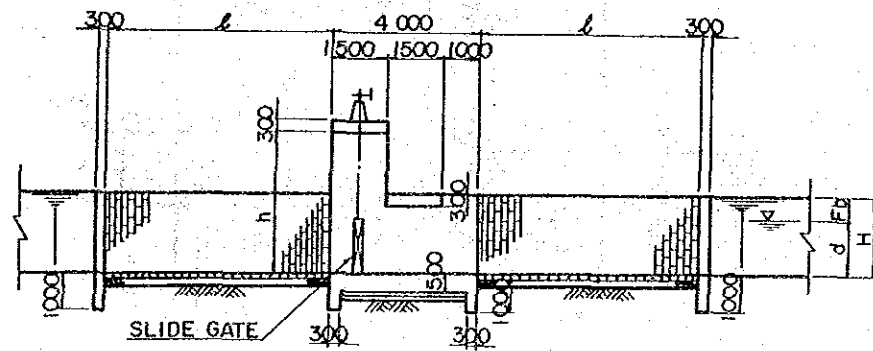
CHECK  
PLAN



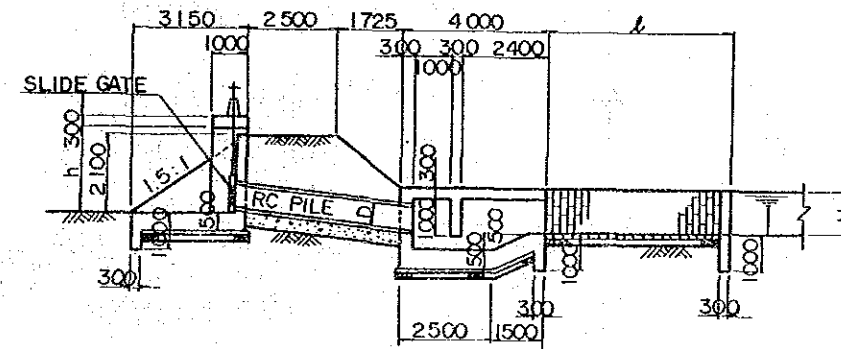
TURNOUT. I  
PLAN



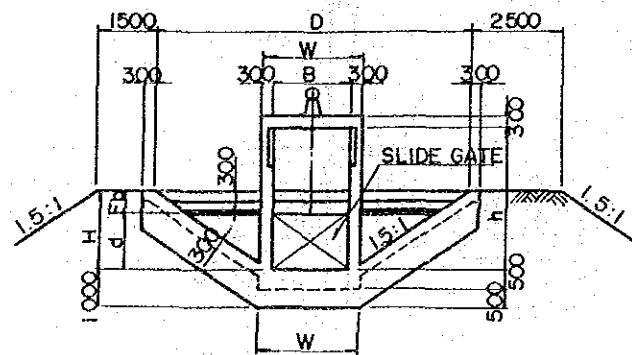
PROFILE



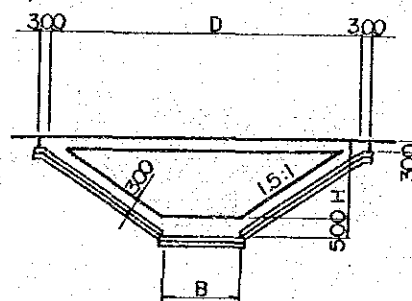
PROFILE



A - A



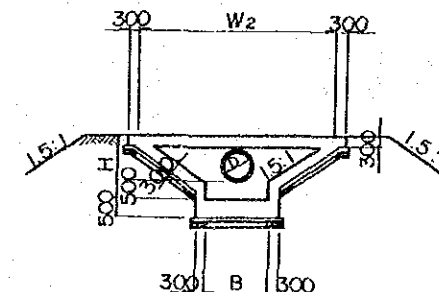
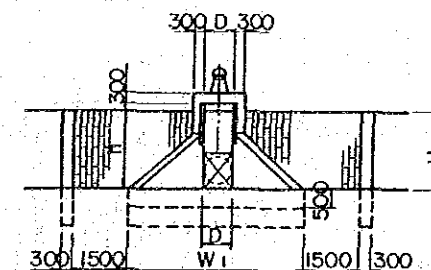
B - B



FRONT ELEVATION

A - A

B - B



(Dimension : m)

TYPE	B	d	F	H	h	D	l
1	2.70	1.50	0.60	2.10	3.80	9.00	6.00
2	2.40	1.00	0.45	1.45	2.65	6.75	6.00
3	2.10	1.50	0.60	2.10	3.80	8.40	6.00
4	0.60	1.00	0.45	1.20	2.15	4.20	3.00

(Dimension : m)

TYPE	B	H	D	W1	W2	h	l
1	2.40	1.45	0.80x2	5.80	6.75	2.30	7.00
2	1.70	1.20	0.80	4.80	5.30	2.30	5.00
3	1.10	1.20	0.70	4.70	4.70	2.00	3.00
4	0.60	1.20	0.60	4.60	4.20	1.80	2.00

SCALE



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK-A-1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

TURNOUT. I & CHECK

Date : Jan 1988 D.W.G NO.14

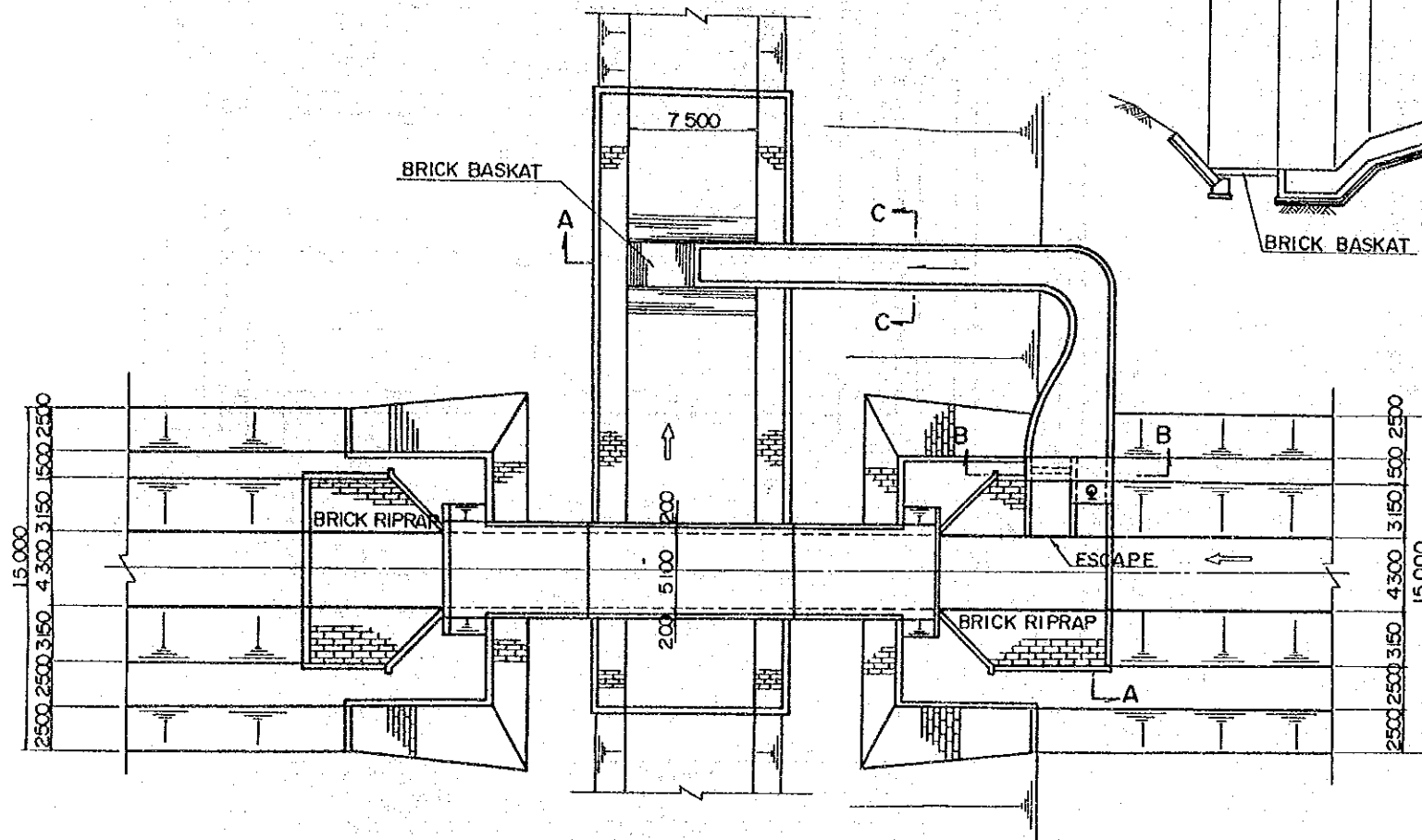
JAPAN INTERNATIONAL COOPERATION AGENCY



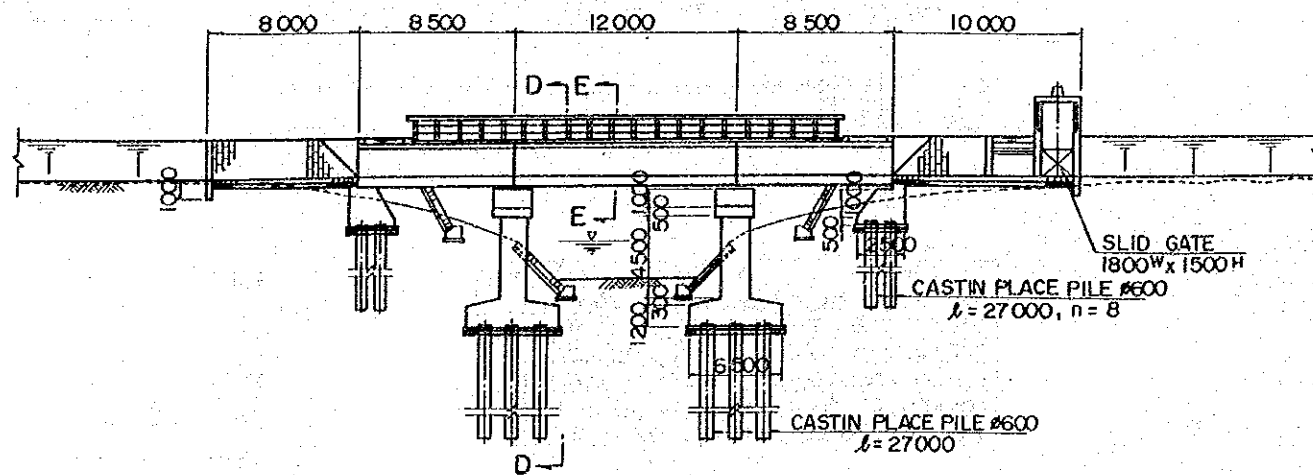


# AQUEDUCT & ESCAPE

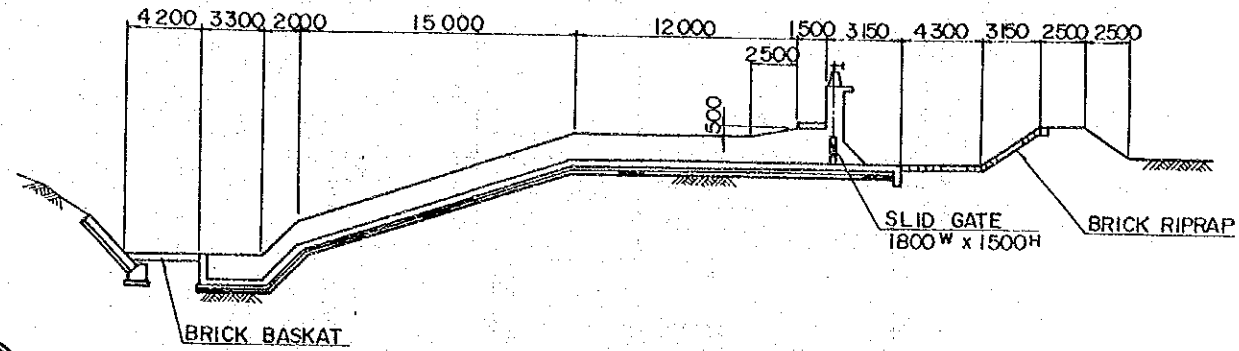
PLAN SCALE: A



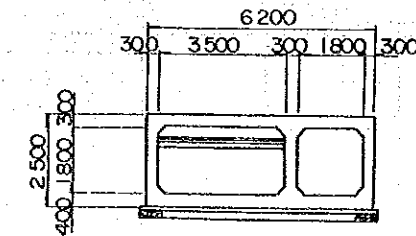
PROFILE SCALE: A



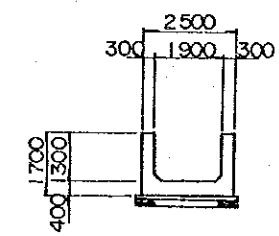
SECTION A - A SCALE: B



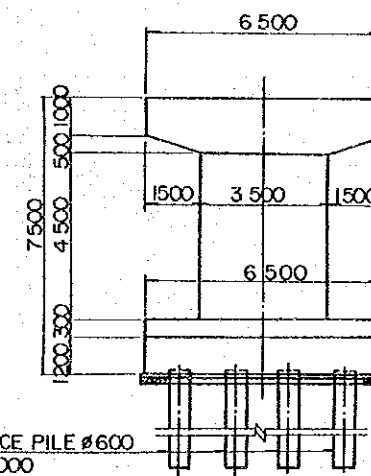
SECTION B - B SCALE: B



SECTION C - C SCALE: B

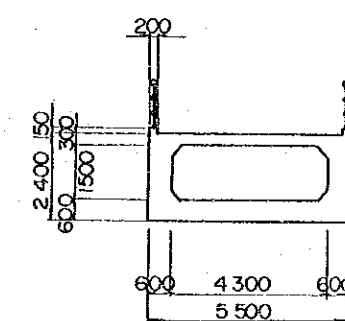


SECTION D - D SCALE: B



CASTIN PLACE PILE #600  
L = 27000

SECTION E - E SCALE: B



SCALE: A  
0 50m

SCALE: B  
0 5.0m

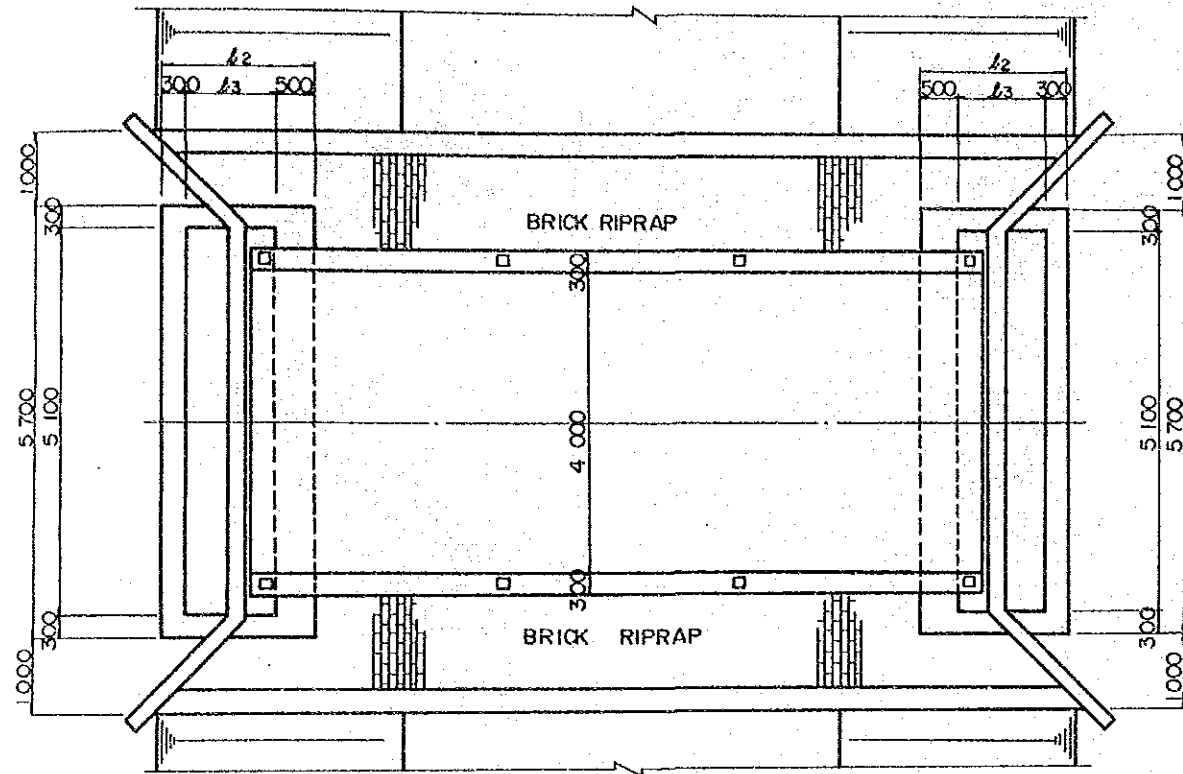
NARAYANGUJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

AQUEDUCT & ESCAPE

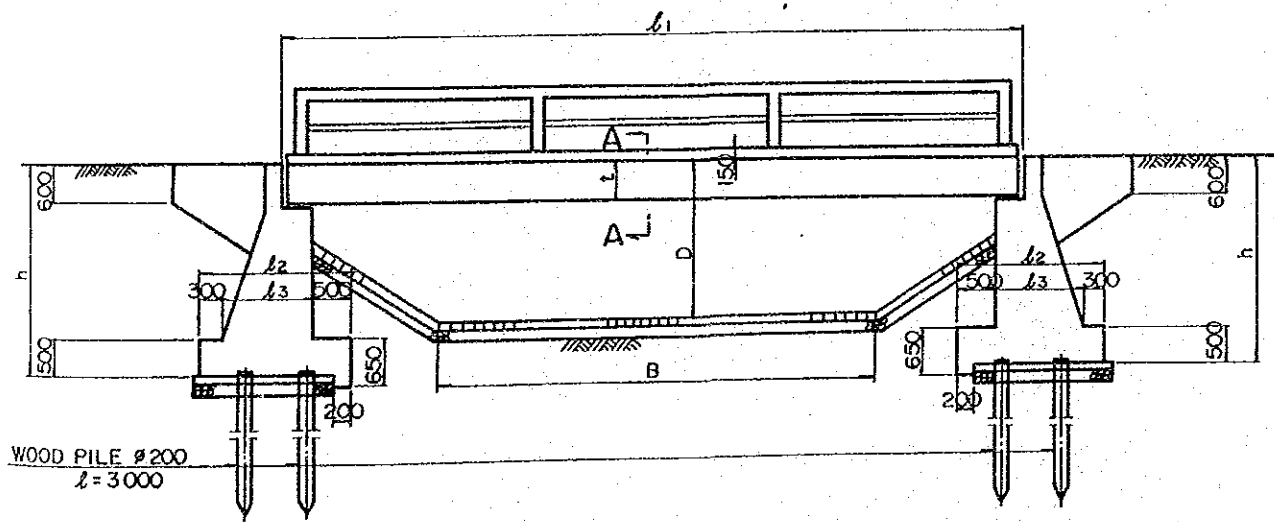
Date: Jan 1988 D.W.G NO. 16

JAPAN INTERNATIONAL COOPERATION AGENCY

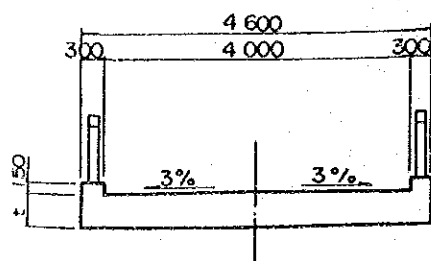
**BRIDGE**  
**PLAN**



**PROFILE**



**A - A**

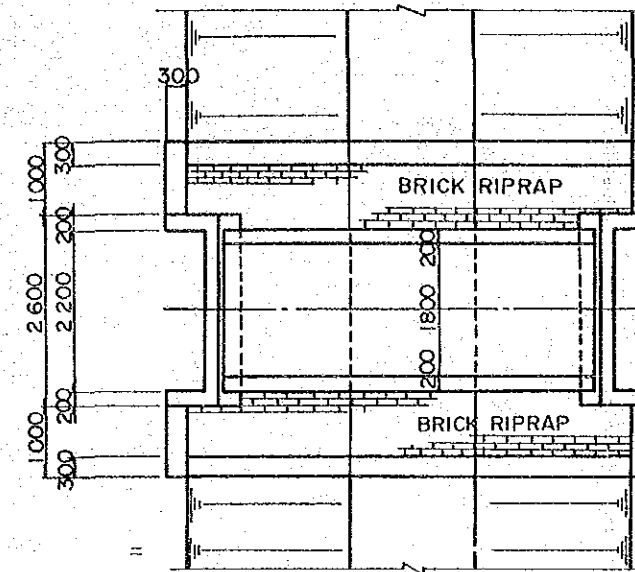


(Dimension: m)

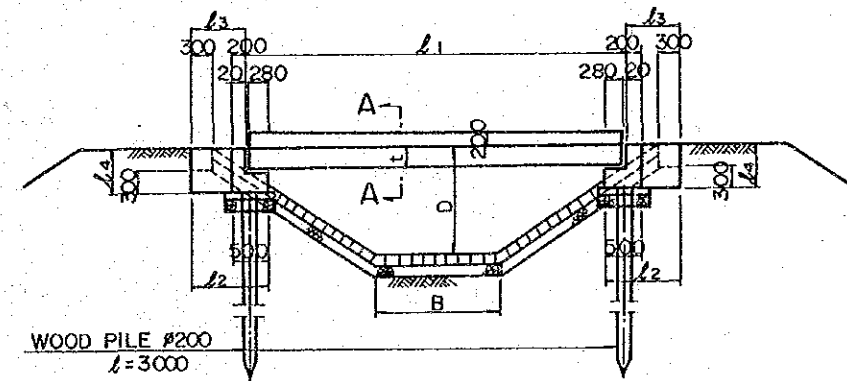
TYPE	B	D	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	h	b	t
1	6800	2600	2800	2200	1400	3300	2200	600
2	5800	2100	2800	2000	1200	2800	2000	550
3	2000	2600	8000	2100	1300	3300	2100	500
4	2400	1450	5500	1900	1100	2150	1900	350
5	1700	1450	4700	1800	1000	2150	1800	300
6	1100	1200	3800	1800	1000	1900	1800	300

**FOOT BRIDGE**

**PLAN**



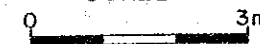
**PROFILE**



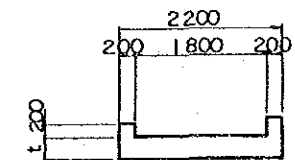
(Dimension: m)

TYPE	B	D	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	h	t	l <sub>4</sub>
1	3000	2600	1600	1500	1200	750	450	750
2	5500	2100	10600	1200	900	700	400	700
3	1700	1450	5150	1050	750	600	300	600
4	1100	1200	4100	900	600	500	200	500
5	600	1200	3600	900	600	500	200	500
6	600	1200	3000	900	600	500	200	500

SCALE



**A - A**



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT  
(BLOCK - A - 1)  
THE PEOPLE'S REPUBLIC OF BANGLADESH

**BRIDGE & FOOT BRIDGE**

Date: Jan 1988 D.W.G NO. 17

JAPAN INTERNATIONAL COOPERATION AGENCY



2-2-1 Hydrological and Meteorological Data

Table A2-2-1-1 High Water Level (Max) in Lakhya River (unit: m PWD)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
1974	-	-	-	2.56	3.46	4.63	6.16	6.60	5.96	5.64	3.70	2.91
1975	2.16	2.18	2.01	2.72	3.26	3.96	5.28	5.60	5.16	4.75	3.63	2.74
1976	2.10	1.96	2.22	2.50	2.96	4.36	5.53	5.39	5.39	4.50	2.80	2.36
1977	2.03	1.86	1.92	2.62	3.52	4.91	5.46	5.76	5.81	4.66	3.22	2.56
1978	1.98	1.92	1.98	2.26	3.69	4.80	5.12	5.43	4.97	4.69	3.84	2.45
1979	2.00	1.71	2.18	-	-	-	-	5.49	5.21	4.62	3.09	2.53
1980	2.01	2.09	2.26	2.18	3.29	4.44	5.48	6.16	6.02	4.85	3.34	2.37
1981	2.05	1.87	2.11	2.75	2.87	3.61	5.42	5.65	5.42	4.61	2.92	2.95
1982	1.95	1.78	1.80	2.70	2.85	4.44	4.89	5.35	5.07	4.68	2.73	2.15
1983	2.03	2.03	2.45	2.81	3.14	4.09	4.89	5.47	5.81	5.54	3.69	2.45
1984	2.23	1.97	2.25	2.68	3.98	4.84	5.87	6.04	6.00	5.71	3.23	2.15
1985	1.87	1.97	2.33	2.55	3.15	4.32	5.37	5.57	5.14	4.74	3.58	2.48
1986	1.98	1.78	2.07	2.77	2.84	3.69	4.87	5.14	5.10	5.00	3.72	2.57
Average	2.03	1.92	2.12	2.59	3.25	4.34	5.36	5.67	5.47	4.92	3.35	2.51

Table A2-2-1-2 High Water Level (Mean) in Lakhya River (unit: m PWD)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1974	-	-	-	2.18	3.08	3.81	5.50	6.30	5.76	4.57	2.99	2.14
1975	1.77	1.67	1.69	2.09	2.62	3.33	4.52	5.24	5.06	4.29	2.92	2.12
1976	1.70	1.62	1.73	2.03	2.60	3.80	5.19	5.06	4.93	3.61	2.50	2.10
1977	1.65	1.52	1.68	2.41	3.18	4.35	4.99	5.48	5.26	4.29	2.73	2.10
1978	1.60	1.54	1.61	1.92	2.93	4.27	4.95	5.23	4.75	3.83	2.52	1.91
1979	1.61	1.38	1.59	-	-	-	-	5.10	4.98	4.22	2.57	2.13
1989	1.68	1.63	1.77	2.14	3.03	3.86	4.73	5.69	5.42	4.21	2.81	2.10
1981	1.70	1.55	1.66	2.19	2.55	3.33	4.82	5.42	5.16	3.64	2.57	1.99
1982	1.57	1.51	1.48	2.14	2.51	3.44	4.70	5.05	4.88	3.40	2.22	1.87
1983	1.66	1.50	1.90	2.15	2.85	3.44	4.58	5.16	5.51	4.76	3.04	2.05
1984	1.75	1.49	1.68	2.16	3.03	4.37	5.20	5.46	5.48	4.43	2.54	1.95
1985	1.56	1.57	1.92	2.23	2.61	3.95	4.88	5.13	4.95	4.32	2.78	2.04
1986	1.65	1.50	1.61	2.06	2.49	2.70	4.40	4.76	4.83	4.57	3.02	1.94
Average	1.65	1.54	1.69	2.14	2.79	3.72	4.87	5.31	5.15	4.16	2.71	2.03

Table A2-2-1-3 High Water Level (Min) in Lakhya River

(unit: m PWD)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
1974	-	-	-	1.69	2.53	3.38	4.68	5.72	5.43	3.66	2.23	1.65
1975	1.43	1.28	1.36	1.44	1.96	2.68	3.87	4.93	4.73	3.47	2.24	1.70
1976	1.37	1.31	1.46	1.66	2.26	2.82	4.42	4.75	4.60	2.80	2.12	1.57
1977	1.19	1.22	1.28	1.86	2.62	3.66	4.60	5.27	4.69	3.34	2/36	1.80
1978	1.34	1.13	1.16	1.59	1.95	3.60	4.83	5.00	4.57	2.90	2.07	1.43
1979	1.28	1.13	1.22	-	-	-	-	4.86	4.56	3.12	2.10	1.68
1980	1.36	1.28	1.31	1.68	2.75	3.31	4.35	5.39	4.95	3.52	1.99	1.59
1981	1.26	1.29	1.35	1.50	2.05	2.92	3.72	5.18	4.17	2.91	2.29	1.53
1982	1.23	1.23	1.15	1.75	2.14	2.40	4.47	4.73	4.72	2.29	1.64	1.61
1983	1.29	1.10	1.35	1.74	2.32	3.04	4.05	4.76	5.13	3.65	2.34	1.67
1984	1.36	0.91	1.22	1.67	2.05	3.85	4.61	4.80	5.00	3.32	1.95	1.53
1985	1.28	1.23	1.48	1.63	2.29	3.11	4.34	4.80	4.68	3.65	2.20	1.70
1986	1.27	1.10	1.19	1.41	2.19	2.06	3.90	4.36	4.65	3.58	2.28	1.53
Average	1.30	1.19	1.29	1.64	2.26	3.07	4.32	4.97	4.76	3.25	2.14	1.61

Table A2-2-1-4 Low Water Level (Max) in Lakhya River (unit: m PWD)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
1974	-	-	-	2.19	3.25	4.57	6.14	6.58	5.96	5.50	3.54	2.29
1975	1.71	1.60	1.43	2.27	2.88	3.77	5.27	5.56	5.13	4.72	3.47	2.16
1976	1.67	1.43	1.58	1.98	2.56	4.33	5.50	5.38	5.39	4.43	2.56	1.94
1977	1.51	1.22	1.43	2.26	3.28	4.85	5.41	5.72	5.79	4.60	3.00	2.10
1978	1.43	1.40	1.34	1.79	3.51	4.81	5.10	5.41	4.95	4.63	2.68	2.09
1979	1.52	1.30	1.51	-	-	-	-	5.46	5.20	4.59	3.05	2.13
1980	1.61	1.49	1.60	2.14	3.17	4.36	5.45	6.14	5.99	4.82	3.22	1.90
1981	1.53	1.23	1.45	2.26	2.47	3.30	3.57	5.63	5.40	4.58	2.61	2.26
1982	1.43	1.28	1.25	2.14	2.50	4.40	4.87	5.31	5.02	4.57	2.37	1.64
1983	1.44	1.27	1.82	2.33	3.00	4.00	4.85	5.43	5.48	5.49	3.55	1.96
1984	1.53	1.28	1.47	2.33	3.65	4.77	5.80	6.01	6.00	5.62	3.07	1.75
1985	1.33	1.34	1.80	2.13	2.56	4.21	5.31	5.53	5.10	4.67	3.37	1.98
1986	1.38	1.21	1.49	2.19	2.29	3.36	4.82	5.08	5.03	4.96	3.50	2.15
Average	1.51	1.35	1.50	2.17	2.93	4.23	5.17	5.63	5.42	4/86	3.08	2.03



Table A2-2-1-5 Low Water Level (Mean) in Lakhya River (unit: m PWD)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
1974	-	-	-	1.78	2.85	3.64	5.45	6.27	5.74	4.52	2.71	1.72
1975	1.33	1.17	1.18	1.61	2.26	3.07	4.40	5.21	5.03	4.23	2.68	1.72
1976	1.26	1.12	1.24	1.57	2.21	3.65	5.14	5.03	4.91	3.41	2.15	1.68
1977	1.19	0.94	1.21	2.05	2.96	4.25	4.94	5.45	5.23	4.21	2.47	1.69
1978	1.15	1.03	1.06	1.39	2.35	3.93	4.92	5.20	4.74	3.70	2.17	1.54
1979	1.16	0.94	1.05	-	-	-	-	5.06	4.95	4.18	2.25	1.71
1980	1.23	1.10	1.23	1.57	2.75	3.73	4.68	5.66	5.40	4.13	2.48	1.64
1981	1.23	1.07	1.14	1.75	2.12	3.08	4.74	5.40	5.13	3.50	2.21	1.62
1982	1.15	1.06	0.99	1.70	2.20	3.17	4.66	5.00	4.83	3.25	1.86	1.41
1983	1.16	0.95	1.36	1.69	2.56	3.25	4.51	5.10	5.48	4.69	2.76	1.62
1984	1.30	1.01	1.13	1.67	2.66	4.25	5.16	5.42	4.69	4.32	2.23	1.51
1985	1.12	1.06	1.41	1.75	2.20	3.78	4.82	5.08	4.90	4.19	2.47	1.66
1986	1.29	0.96	1.05	1.55	2.10	2.63	4.30	4.67	4.75	4.49	2.76	1.56
Average	1.21	1.04	1.16	1.67	2.44	3.54	4.81	5.27	5.06	4.06	2.40	1.62

Table A2-2-1-6 Low Water Level (Mim) in Lakhya River (unit: m FWD)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
1974	-	-	-	1.34	2.13	3.08	4.63	5.70	5.41	3.57	1.98	1.28
1975	1.04	0.88	0.91	1.02	1.63	2.46	3.76	4.87	4.77	3.36	2.07	1.43
1976	0.99	0.85	0.97	1.19	1.74	2.53	4.34	4.72	4.57	2.50	1.87	1.17
1977	0.73	0.76	0.79	1.40	2.23	3.43	4.56	5.24	4.65	3.09	1.98	1.40
1978	0.91	0.79	0.72	1.01	1.88	3.41	4.75	4.98	4.54	2.71	1.79	1.17
1979	0.89	0.79	0.75	-	-	-	-	4.80	4.53	3.08	1.86	1.34
1980	1.01	0.82	0.91	1.47	2.17	3.14	4.27	5.36	4.91	3.43	1.71	1.20
1981	0.95	0.97	0.91	1.04	1.62	2.63	3.52	5.13	4.63	2.61	1.93	1.24
1982	0.90	0.85	0.79	1.30	1.85	2.02	4.43	4.67	4.66	2.17	1.37	1.19
1983	0.93	0.71	0.93	1.30	1.98	2.86	3.96	4.69	5.15	3.57	2.02	1.35
1984	1.03	0.48	0.69	1.22	1.96	3.62	4.56	4.76	4.97	3.19	1.55	1.15
1985	0.94	0.83	1.11	1.23	1.85	2.63	4.23	4.75	4.62	3.44	1.98	1.33
1986	0.85	0.58	0.72	0.9;	1.89	1.93	3.78	4.27	4.58	3.48	2.01	1.21
	0.93	0.78	0.85	1.20	1.91	2.81	4.23	4.92	4.77	3.09	1.86	1.27

Table A2-2-1-1-7 Mean Temperature (°C)

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE
1975	18.7	21.9	26.0	28.1	28.1	28.0	26.3	25.8	27.3	21.5	22.2	17.8	24.8
1976	19.1	21.6	26.3	27.5	27.5	28.4	27.3	27.4	27.6	26.8	23.8	19.0	25.2
1977	18.1	21.3	27.7	27.0	27.0	27.7	28.7	28.5	29.1	25.5	24.4	19.4	25.4
1978	17.5	20.7	25.1	27.6	27.6	28.4	28.5	28.6	28.5	28.2	24.6	19.8	25.4
1979	19.2	20.6	26.4	27.3	27.3	26.5	28.1	28.9	28.7	27.6	25.6	19.8	25.5
1980	18.3	21.6	25.7	27.4	27.4	28.4	28.1	28.4	28.8	26.9	23.6	20.8	25.5
1981	19.2	20.4	25.1	27.8	27.8	29.6	28.3	29.5	28.9	28.0	24.1	19.6	25.7
1982	19.1	21.2	24.4	27.7	29.2	28.9	29.4	28.5	29.0	27.6	23.0	19.7	25.6
1983	17.8	20.6	26.1	28.4	28.4	29.5	29.4	28.7	28.7	27.2	24.9	20.0	25.8
1984	19.0	21.0	27.8	27.9	27.9	28.4	28.5	28.8	28.4	28.7	24.2	20.7	25.9
1985	20.4	22.6	28.4	28.2	28.2	28.9	28.4	29.2	28.9	28.2	24.6	21.7	26.5
AVERAGE	18.8	21.2	26.3	27.7	27.9	28.4	28.3	28.4	28.5	26.9	24.1	19.8	25.5

Table A2-2-I-8 Maximum Temperature (°C)

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANUAL
1975	25.1	28.2	33.1	34.7	32.7	32.0	29.8	31.1	30.4	30.6	27.3	25.2	34.7
1976	25.8	28.0	31.4	34.7	32.1	30.8	30.7	30.3	31.5	31.3	30.1	26.0	34.7
1977	25.0	27.6	33.2	31.3	30.9	30.2	31.1	31.4	32.2	30.0	28.6	25.6	33.2
1978	24.4	27.3	31.9	32.9	31.3	31.1	31.1	31.6	31.3	31.8	30.0	27.1	32.9
1979	26.7	27.2	32.9	34.4	35.1	31.6	31.4	31.5	31.4	31.3	30.3	25.3	35.1
1980	24.6	27.9	31.7	35.2	31.8	31.6	30.9	31.4	31.4	30.4	29.4	26.7	35.2
1981	25.1	26.9	30.4	30.7	31.9	32.8	30.6	32.4	31.7	32.4	30.0	25.5	32.8
1982	26.3	27.3	30.5	32.8	34.6	31.6	32.0	31.0	32.1	32.0	28.1	25.0	34.6
1983	23.7	26.7	31.5	32.9	32.3	32.9	32.0	31.1	31.1	30.6	30.3	25.9	32.9
1984	24.8	27.6	34.5	34.4	31.4	30.9	30.9	31.3	31.4	31.9	29.6	26.8	34.5
1985	26.2	29.2	34.0	33.6	32.3	31.7	30.7	31.4	31.8	32.6	30.3	28.0	34.0
AVERAGE	25.2	27.6	32.3	33.4	32.4	31.6	31.0	31.3	31.5	31.4	29.5	26.2	

Table A2-2-1-9 Minimum Temperature (°C)

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANUAL
1975	12.3	15.5	20.0	23.8	24.5	25.9	25.6	25.7	25.2	24.3	17.9	11.6	11.6
1976	12.3	16.4	21.2	24.1	23.8	25.0	25.8	25.3	25.7	23.2	20.1	12.1	12.1
1977	11.7	14.9	22.1	22.2	23.1	25.2	26.2	26.6	26.0	22.8	20.2	13.2	11.7
1978	10.6	14.1	18.3	22.0	23.9	25.6	25.7	26.6	25.7	24.4	19.2	12.5	10.6
1979	12.5	14.1	19.8	23.9	26.2	26.3	26.5	26.5	26.0	23.8	20.8	14.4	12.5
1980	11.9	15.2	20.7	25.0	22.8	26.3	26.1	26.5	26.2	23.4	17.8	14.6	11.9
1981	13.3	15.4	19.8	21.9	23.6	26.4	26.0	26.5	26.1	23.5	18.1	13.0	13.0
1982	11.9	15.0	19.1	22.8	25.0	25.9	26.8	26.1	25.9	23.3	17.9	13.7	11.9
1983	11.9	14.1	20.6	25.6	24.4	26.1	26.9	26.3	26.2	23.8	19.4	14.1	11.9
1984	13.1	15.0	21.0	24.5	24.4	25.8	26.0	26.2	25.4	25.5	18.5	14.7	13.1
1985	14.5	16.1	22.7	24.6	24.1	26.1	25.9	26.7	25.9	23.9	18.9	15.3	14.5
AVERAGE	12.4	15.1	20.5	23.7	24.2	25.9	26.1	26.3	25.8	23.8	19.0	13.6	13.6

Table A2-2-1-10 Mean Relative Humidity in %

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	69.1	63.2	58.6	71.4	79.5	84.8	89.2	85.5	87.9	86.2	77.6	71.0	924.0
1976	66.7	67.5	64.6	66.9	80.6	90.3	87.3	87.8	83.8	79.5	74.5	71.2	920.7
1977	66.7	66.9	69.0	81.8	83.3	88.5	87.8	84.2	85.1	79.4	78.6	74.2	945.5
1978	67.4	61.6	53.2	73.3	84.6	88.2	87.1	83.7	86.3	81.0	73.0	68.6	908.0
1979	68.5	62.2	57.6	66.2	71.9	83.4	86.2	85.6	85.4	79.7	75.4	77.1	899.2
1980	69.9	66.7	64.5	68.7	81.1	85.6	86.7	85.2	85.2	82.2	70.7	69.5	916.0
1981	70.5	67.7	66.0	76.6	78.9	81.3	88.6	84.4	84.0	70.5	67.1	71.5	907.1
1982	68.9	63.3	63.7	73.0	73.9	86.3	85.1	86.0	84.1	78.4	75.6	73.7	912.0
1983	73.1	64.6	69.9	72.8	80.3	84.6	85.3	86.7	87.7	84.6	70.3	72.6	932.5
1984	69.3	61.6	56.7	70.5	83.7	86.3	86.9	86.1	83.2	79.0	68.5	72.4	904.2
1985	70.9	60.3	69.9	74.5	79.4	85.0	85.3	83.9	84.4	75.4	71.2	70.6	910.8
AVERAGE	69.2	64.1	63.1	72.3	79.7	85.8	86.9	85.4	85.2	79.6	73.0	72.0	916.3

Table A2-2-1-11 Bright Sun-shined Hours in hr/day

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	9.6	9.6	9.6	10.2	8.7	7.3	4.2	7.1	5.4	6.5	8.4	9.6	96.2
1976	9.5	9.5	10.1	10.0	8.4	4.6	5.8	5.7	8.5	9.2	7.8	8.9	98.0
1977	7.5	8.3	9.6	7.8	7.6	4.7	5.1	6.2	7.2	7.8	7.1	8.1	87.6
1978	8.9	9.0	7.5	7.9	5.7	4.1	4.2	6.3	5.1	7.5	8.4	8.6	83.2
1979	7.7	8.8	8.6	8.6	0.0	4.6	4.5	5.4	5.2	8.4	7.0	8.1	76.9
1980	8.1	8.4	8.2	8.8	7.0	4.4	4.0	5.8	5.7	6.7	9.2	7.6	83.9
1981	6.9	8.4	6.7	7.6	7.8	7.0	4.3	6.5	5.1	8.6	8.6	7.8	85.3
1982	7.6	7.2	7.4	7.5	8.2	5.1	5.5	6.2	6.0	8.6	8.3	7.5	84.5
1983	7.5	8.0	7.6	7.3	7.9	5.9	0.0	6.7	5.1	7.8	0.0	8.1	71.9
1984	7.9	8.2	8.6	8.7	6.9	4.5	4.8	4.6	5.9	6.2	9.5	8.3	84.1
1985	7.8	8.6	8.2	7.4	6.8	4.4	4.4	6.1	6.0	8.7	8.2	8.0	84.6
AVERAGE	8.1	8.5	8.4	8.3	7.5	5.1	4.7	6.1	5.9	7.8	8.3	8.2	86.9

Table A2-2-1-12 Wind Speed in Km/day

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	44.4	53.3	62.2	231.1	177.8	133.3	142.2	120.0	66.7	26.7	31.1	17.8	1106.6
1976	35.6	53.3	146.7	182.2	142.2	173.3	182.2	128.9	106.7	53.3	22.2	13.3	1239.9
1977	44.4	71.1	133.3	217.8	155.6	182.2	168.9	186.7	62.2	31.1	22.2	22.2	1297.9
1978	44.4	53.3	84.5	137.8	160.0	173.3	120.0	142.2	62.2	40.0	48.9	40.0	1106.6
1979	26.7	48.9	128.9	120.0	160.0	191.1	168.9	137.8	57.8	53.3	26.7	35.6	1155.7
1980	31.1	44.4	75.6	235.6	151.1	115.6	115.6	106.7	62.2	57.8	4.4	17.8	1017.9
1981	44.4	13.3	66.7	124.5	111.1	102.2	120.0	111.1	57.8	22.2	22.2	17.8	813.3
1982	22.2	53.3	62.2	231.1	133.3	146.7	160.0	217.8	80.0	26.7	17.8	22.2	1173.3
1983	48.9	62.2	182.2	213.4	151.1	200.0	173.3	168.9	133.3	48.9	53.3	26.7	1462.2
1984	22.2	40.0	97.8	182.2	133.3	146.7	111.1	111.1	57.8	53.3	17.8	26.7	1000.0
1985	13.3	40.0	168.9	164.5	142.2	195.6	151.1	111.1	93.3	44.4	13.3	22.2	1159.9
AVERAGE	34.3	48.5	109.9	185.5	147.1	160.0	146.7	140.2	76.4	41.6	25.4	23.8	1139.4



Table A2-2-1-13 Wind Ratio of Daytime/Night

Station: Dhaka

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	1.2	1.3	1.1	1.2	1.3	1.2	1.3	1.0	1.1	1.3	0.8	1.5	14.3
1976	1.3	1.3	1.3	1.4	1.4	1.1	1.1	1.1	1.2	1.6	1.3	1.0	15.1
1977	1.8	1.4	1.4	1.2	1.2	1.1	1.2	1.1	1.1	1.0	2.0	1.3	15.8
1978	1.8	1.3	1.6	1.5	1.2	1.1	1.1	1.0	1.1	1.0	1.4	1.3	15.4
1979	1.0	1.8	1.4	1.0	1.3	1.1	1.2	1.1	1.0	1.1	1.7	1.0	14.7
1980	1.7	1.4	1.4	1.7	1.6	1.3	1.3	1.6	1.1	1.3	1.0	1.5	16.9
1981	1.5	2.0	1.7	1.5	1.6	1.5	1.4	1.5	1.5	2.0	1.3	1.5	19.0
1982	1.3	1.3	1.7	1.6	1.3	1.3	0.9	1.0	1.0	1.0	1.0	0.7	14.1
1983	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.1	1.1	0.8	1.0	1.0	12.4
1984	2.0	1.2	1.2	1.3	1.3	1.1	1.1	1.2	1.0	1.2	1.5	1.3	15.3
1985	1.0	1.2	1.1	1.1	0.9	1.2	1.3	1.4	1.1	0.8	1.0	1.0	13.1
AVERAGE	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.2	1.3	1.2	15.2

Table A2-2-1-14. Annual Rainfall (1967-1986)

(mm)

Year	Annual Rainfall	Rainfall during dry season (Nov - Apr)
1967	1866.4	258.9
1968	1890.0	252.8
1969	1667.8	185.9
1970	2058.7	136.0
1971	—	—
1972	1715.0	272.2
1973	2397.8	357.0
1974	2209.3	265.2
1975	2051.1	191.9
1976	2117.3	165.1
1977	2166.2	496.8
1978	2337.0	203.2
1979	1840.5	175.3
1980	2182.6	225.0
1981	1630.0	454.0
1982	1743.0	251.0
1983	2443.0	598.0
1984	3028.0	145.0
1985	2065.0	381.0
1986	2479.0	435.0

Table A2-2-1-15 Maximum Continuous 5 days Rainfall

(mm)

Year	Month	Rainfall Data					Total
		1st	2nd	3rd	4th	5th	
1964	Jul	0.0	0.0	36.1	80.0	115.3	231.4
1965	Aug	3.6	87.1	7.9	0.0	114.3	212.8
1966	Sep	4.6	16.0	283.2	55.4	0.5	359.7
1967	Aug	73.7	39.9	47.2	55.1	7.4	223.3
1968	Jul	38.9	54.6	23.4	75.7	132.8	325.4
1969	Aug	33.0	44.4	32.5	14.7	74.9	199.6
1970	Oct	49.5	95.2	41.1	31.7	30.5	248.1
1971	Jul	0.0	76.5	195.6	23.4	0.0	295.4
1972	Jun	101.6	34.8	50.8	38.1	38.1	263.4
1973	May	175.3	25.4	20.8	28.4	21.3	271.3
1974	Aug	76.2	106.7	33.0	7.6	12.7	236.2
1975	Jul	158.0	99.1	109.2	30.0	48.8	445.1
1976	Jun	157.5	117.3	62.2	82.6	27.4	447.0
1977	May	4.8	0.8	50.3	0.0	142.5	198.4
1978	May	43.7	59.4	40.6	77.5	23.1	244.3
1979	Jun	0.0	1.3	41.1	127.0	11.0	180.4
1980	Oct	91.0	15.0	84.0	41.0	28.0	259.0
1981	Sep	2.0	81.0	67.0	10.0	8.0	168.0
1982	Jul	1.0	1.0	40.0	46.0	105.0	193.0
1983	Aug	28.0	133.0	66.0	20.0	8.0	255.0
1984	Jun	5.0	44.0	77.0	68.0	102.0	296.0
1985	Aug	69.0	21.0	0.0	68.0	11.0	169.0
1986	Sep	37.0	145.0	176.0	2.0	41.0	401.0
1987							

2-2-2 Data on Agriculture

Table A2-2-2-1

Land utilization.  
( Thousand acres)

Year	Forest	Not available for cultivation	Culturable waste (a)	Current fallows (b)	Net cropped area	Area sown more than once	Total cropped area (c)	
1971-72	...	5507	6566	734	2101	20371	7798	28169
1972-73	...	5507	6572	681	1679	20840	8199	29039
1973-74	...	5507	6575	672	1550	20977	8447	29424
1974-75	...	5466	6576	670	2009	20559	8078	28637
1975-76	...	5438	6622	662	1591	20968	8718	29686
1976-77	...	5449	6626	661	2100	20445	8534	28979
1977-78	...	5425	6669	665	1838	20693	9009	29702
1978-79	...	5423	6674	623	1760	20801	11045	31846
1979-80	...	5427	6686	615	1706	20873	11100	31973
1980-81	...	5416	6712	619	1404	21158	11363	32521
1981-82	...	5298	6837	611	1350	21212	11426	32638
1982-83	...	5296	6876	582	1278	21276	11629	32905
1983-84	...	5205	7156	825	1136	21378	11364	32742
1984-85	...	5297	7193	721	1199	21353	11143	32496

Notes: (a) Culturable waste is the area suitable for cultivation but lying fallow for more than one year.

(b) Current fallow is the area already brought under cultivation, but not cultivated during the year.

(c) Total cropped area is the sum of the net cropped area and the area sown more than once.

Source : B.B.S.

Table A2-2-2-2

Area irrigated under different crops. in Bangladesh 1976-77 to 1984-85  
(Acre)

Crop	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
Rice: Aus	189060	211030	228371	227040	295780	279330	309615	358295	347455
Aman	203370	208045	241439	317765	347030	455437	480050	392480	385855
Boro	2022925	2575285	2436490	2491750	2467500	2574043	2816785	2959685	3175860
Total Rice	2420355	2934360	2906300	3036555	3110310	3308810	3606450	3710460	3909170
Wheat	178620	231805	351927	426225	481320	468478	478225	529915	699950
Other cereals	6025	3960	3549	7975	10795	12605	9040	15850	8230
Pulses	2635	2255	2392	3045	11465	6077	3955	4535	8035
Oilseeds	9710	8010	9354	7880	11595	10481	11890	17785	27955
Potato	139815	156370	164477	159615	176375	189998	180685	182255	172425
Vegetables	94145	103855	121336	98790	107480	115969	123745	109640	121530
Sugarcane	22315	25135	22753	2-065	23215	24194	15940	19570	18740
Cotton	50	472	1067	3035	4315	5746	8220	16120	8565
Others	135400	137120	110619	110125	112970	121979	128170	138345	146845
Grand Total :	3009070	3600042	3693775	3877310	4049840	4264337	4566320	4744475	5121445

Source: B. B. S.

Table A2-2-2-3

Productivity of the modern rice grown in different location  
(1974 - 84)

T Aman

Year	Average yield (t/ha)										
	BR3	BR4	BR5	BR6	BR7	BR9	BR10	RR11	IR5	IR20	Pajam
1974	3.48	3.30	—	—	—	—	—	—	3.71	3.65	—
1975	3.68	3.87	—	—	—	—	—	—	—	3.70	—
1976	5.36	5.40	—	—	—	—	—	—	—	4.74	4.08
1977	3.90	5.00	4.00	—	—	—	—	—	—	—	4.30
1978	3.54	5.33	—	2.80	3.00	—	—	—	—	—	4.26
1979	3.83	4.41	—	—	3.37	2.86	—	—	—	—	4.00
1980	—	4.29	—	—	—	—	4.93	5.52	—	—	4.48
1981	—	3.80	—	—	—	—	3.50	3.85	—	—	—
1982	—	—	—	—	—	—	4.29	4.36	—	—	—
1983	—	3.24	—	—	—	—	3.60	3.40	—	—	—
1984	—	—	—	—	—	—	3.64	4.90	—	—	—
Av. yield	3.96	4.28	4.00	2.8	3.19	2.86	4.00	4.41	3.71	4.03	4.22

Aus

Year	Average yield (t/ha)											
	BR1	BR2	BR3	BR6	BR7	BR8	BR9	BR12	BR14	BR15	BR16	IR8
1975	3.33	2.35	—	—	—	—	—	—	—	—	—	3.28
1977	3.00	—	4.65	—	—	—	—	—	—	—	—	3.60
1978	3.00	—	3.78	2.95	2.57	2.96	3.66	—	—	—	—	—
1979	3.37	—	—	2.54	—	3.55	3.52	—	—	—	—	—
1980	3.34	—	3.92	2.67	2.94	3.14	3.29	—	—	—	—	—
1981	4.31	—	4.68	2.98	3.36	3.70	4.23	—	—	—	—	—
1982	4.13	—	4.48	—	—	4.10	4.60	5.00	—	5.00	4.93	—
1983	3.05	2.17	—	—	—	—	—	—	—	—	—	—
1984	—	—	—	—	—	—	3.46	3.37	3.49	3.19	3.48	—
Av. yield	3.50	2.26	4.30	2.76	2.96	3.49	3.74	4.19	3.49	4.10	4.21	3.44

Boro

Year	Average yield (t/ha)											
	BR1	BR3	BR6	BR7	BR8	BR9	BR12	BR14	BR15	BR16	IR8	Pajam
1975	4.14	5.46	—	—	—	—	—	—	—	—	5.05	—
1976	3.80	5.75	—	—	—	—	—	—	—	—	5.51	4.71
1977	2.92	4.05	2.93	2.97	—	—	—	—	—	—	—	—
1978	4.04	4.48	3.72	4.13	—	—	—	—	—	—	—	4.08
1979	5.20	6.60	—	5.00	5.3	6.3	—	—	—	—	—	6.00
1980	3.86	4.99	—	4.57	4.63	4.74	—	—	—	—	4.51	3.94
1981	4.62	5.26	3.86	4.41	4.60	4.42	—	—	—	—	—	4.34
1982	4.50	4.77	—	—	5.20	4.56	4.13	4.94	4.27	4.72	—	—
1983	—	4.94	4.94	—	—	—	4.95	5.04	5.27	4.24	—	—
1984	—	5.64	—	—	—	—	5.00	5.44	4.65	4.95	—	—
Av. yield	4.14	5.19	3.50	4.22	5.93	5.00	4.69	5.14	5.73	4.64	5.02	4.61

Table A2-2-2-4 Number and Area of Rural Households by Type of Tenancy 1981

Type of Tenancy	Number of households	Percent of Total	Area (acres)	Percent of Total	Land Taken in Area (acres)	Percent of Total
Owner	4211269	64.78	11910962	60.49	-	-
Owner-cum-tenant	2026984	31.18	4341847	22.05	3099593	15.74
Tenant	262831	4.04	-	-	339828	1.73
<b>Total:</b>	<b>6501084</b>	<b>100.00</b>	<b>16252809</b>	<b>82.53</b>	<b>3439421</b>	<b>17.47</b>

- Number of rural households excluding those households which:  
 - do not own land other than homestead;  
 - do not take land in from others.  
 - Owned land excluding homestead land.  
 - Percentages of lands are taken over operated lands.



Table A2-2-2-5 Size Distribution of Total Owned Land in Rural Bangladesh 1981

landsize (acres)	Number of Household	Percent of Total	Number of Persons	Percent of Total	Area of Land (acres)	Percent of Total
Zero	2697283	20.09	14250902	18.27	-	-
0.01-1.00	5408206	40.28	29718325	38.10	1651404.3	7.65
1.01-2.00	2030179	15.12	11358532	14.56	2866751.7	13.28
2.01-3.00	1053790	7.85	6211395	7.96	2599072.9	12.04
3.01-4.00	673766	5.02	4202787	5.39	2262313.6	10.48
4.01-5.00	425703	3.17	2798792	3.57	1850320.7	8.57
5.01-6.00	286662	2.15	2003850	2.57	1560737.8	7.23
6.01-7.00	213486	1.59	1560700	2.00	1379408.2	6.39
7.01-8.00	137989	1.03	1052204	1.35	1021062.4	4.73
8.01-9.00	92627	0.69	733085	0.94	803034.1	3.72
9.01-10.00	63126	0.47	537363	0.69	606848.9	2.81
10.01-11.00	69767	0.52	624914	0.80	738274.5	3.42
11.01-12.00	52341	0.39	497711	0.64	611036.2	2.83
12.01-13.00	28232	0.21	281053	0.36	356185.3	1.63
13.01-14.00	32356	0.24	335931	0.43	436057.1	2.02
14.01-15.00	25377	0.19	273757	0.35	369137.2	1.71
15.01-above	134182	1.00	1561018	2.00	2475330.1	11.47
<b>Total:</b>	<b>13427095</b>	<b>100.00</b>	<b>78002319</b>	<b>100.00</b>	<b>21586975.0</b>	<b>100.00</b>

- Rural Bangladesh exclude only '79 Pourashavas.

Table A2-2-2-6

Sectors		Sectoral shares of gross domestic product of Bangladesh at current price. (Percentage)						
		1980-81	1981-82	1982-83	1983-84	1984-85	1985-86 (p)	
1. Agriculture	...	46.7	45.9	47.1	48.4	50.1	51.6	
i) Crops	...	35.9	35.8	36.2	37.1	36.9	37.8	
ii) Forestry	...	2.5	2.4	3.0	3.4	3.3	3.4	
iii) Livestock	...	5.3	4.8	5.1	4.8	6.4	6.8	
iv) Fisheries	...	3.0	2.9	2.8	3.1	3.5	3.6	
2. Mining and Quarrying	...	0.001	0.002	0.001	0.001	0.001	0.001	
3. Industry	...	9.8	9.7	9.7	8.8	8.3	7.8	
i) Large scale	...	5.7	5.6	5.4	4.9	4.6	4.4	
ii) Small scale	...	4.1	4.1	4.3	3.9	3.7	3.4	
4. Construction	...	5.6	6.0	5.2	5.2	5.4	5.5	
5. Power, Gas, Water and Sanitary Services.	...	0.3	0.4	0.6	0.6	0.6	0.5	
6. Transport, Storage and Communication	...	7.9	8.6	8.7	7.4	6.5	6.0	
7. Trade Services	...	8.9	8.3	8.0	8.1	8.4	7.9	
8. Housing Services	...	7.6	7.4	6.8	7.1	6.7	6.4	
9. Public Adm. and Defence	...	3.5	3.6	3.6	4.0	4.2	4.3	
10. Banking and Insurance	...	1.8	1.6	1.5	1.5	1.6	1.6	
11. Professional and Misc. Services.	...	7.9	8.5	8.8	8.9	8.2	8.3	
12. GDP at Market Prices	...	100.0	100.0	100.0	100.0	100.0	100.0	

Note: (P)—Provisional.

Source: B.B.S.

Table A2-2-2-7

## Acreage, production and yield rate of agricultural crops

Crops	1983-84			1984-85			1985-86		
	Acreage (000)	Production (000 tons)	Per acre yield (ton)	Acreage (000)	Production (000 tons)	Per acre yield (ton)	Acreage (000)	Production (000 tons)	Per acre yield (ton)
Cereals									
Rice- aus	7756	3171	0.41	7260	2739	0.38	7030	2783	0.40
Rice-aman	14845	7811	0.53	14112	7806	0.55	14875	8407	0.57
Rice-boro	3463	3297	0.95	3891*	3847	0.99	3790	3613	0.95
Wheat	1300	1192	0.92	1671	1440	0.86	1335	1026	0.77
Barley	24	6	0.27	20	5	0.26	18	5	0.27
Rabi jower	1	...	0.27	1	...	0.27	1	...	0.27
Bhadol Jower	1	...	0.25	1	...	0.25	1	...	0.27
Bajra	...	...	0.27	...	...	0.26	...	...	0.31
Maize	3	1	0.31	3	1	0.32	2	...	0.34
Cheena	42	16	0.38	39	14	0.35	32	11	0.33
Other rabi cereals	24	8	0.35	23	7	0.31	20	6	0.30
Other bhadoi cereals	24	7	0.28	20	6	0.30	22	6	0.29
Total	27.483	15509		27041	15865		27126	15857	

Table A2-2-2-8 Agricultural production in the D-N-D project

Area Divided	Name of Crop	Acreage	Yield Per Acre in Maunds	Production in Maunds	Cropping Intensity (%)
Area-I	HYV T. Aman	6,510	43.25	281,557.50	-
	LIV T. Aman	1,376	27.50	37,840.00	-
	HYV Boro	7,339	41.25	302,733.75	-
	Local Boro	37	22.00	814.00	-
	Pulses	7	14.00	98.00	-
	HYV T. Aus	2,627	37.50	98,512.50	-
	Local T. Aus	126	27.00	3,402.00	-
	HYV B. Aus	60	35.50	2,130.00	-
	Local B. Aus	307	20.00	6,140.00	-
	Jute	21	17.00	357.00	-
	Summer Vegetables	34	115.00	3,910.00	-
	Total	18,444	-	-	248
Area-II	Deep Water T. Aman	547	16.00	8,752.00	-
	HYV Boro	3,275	42.00	137,550.00	-
	Total	3,822	-	-	n.a.

Notes: (a) Figures in the table are for the year 1981-82.

(b) The cropping intensity in Area-II is not available.



2-2-3 Comparison Study on Number of Pump

Table A2-2-3-1

Comparison of the alternative plan on the number of pumps

Plan	A	B	C	D
Number of units	3	4	5	6
Drainage capacity ratio when one pump fails to operate	67% ▲	75% ○	80% ○	83.3% ◎
Adaptability in terms of the capacity required for irrigation service	△	○	○	◎
Maintenance	◎	○	○	▲
Space (m <sup>2</sup> )	28.7 m × 13.2 m = 378.84 m <sup>2</sup> ◎	27 m × 16.9 m = 456.3 m <sup>2</sup> ○	26.4 m × 16.9 m = 446.16 m <sup>2</sup> ○	25.3 m × 18.3 m = 462.99 m <sup>2</sup> △
Volume of excavation (m <sup>3</sup> )	28.7 m × 13.2 m × ( EL+7.50 - EL-2.65 ) = 3845.226 m <sup>3</sup> ◎	27 m × 16.9 m × ( EL+7.50 - EL-2.15 ) = 3882.195 m <sup>3</sup> ◎	26.4 m × 16.9 m × ( EL+7.50 - EL-1.95 ) = 4216.212 m <sup>3</sup> ○	25.3 m × 18.3 m × ( EL+7.50 - EL-1.65 ) = 4236.359 m <sup>3</sup> △
Equipment cost	100% ○	100% ◎	105% △	110% ▲
Total Evaluation	○	◎	○	△

Table A2-2-3-2

Comparison of the alternative plans on the number of units

Plan	A	B	C	D
Number of units	3	4	5	6
Capacity per unit (m <sup>3</sup> /s)	2.5	1.88	1.5	1.25
Pump nominal diameter (mm)	1200	1000	900	800
Total head (m)	5.4	—	—	—
Rotation speed (r/m)	423	493	493	593
Motor output (kw)	185	132	110	90
Motor	185KW x 14P x AC400V x 50Hz squirrel cage x 3	132KW x 12P x AC400V x 50Hz x 4	110KW x 12P x AC400V x 50Hz x 5	90KW x 10P x AC400V x 50Hz x 6
Overhead travelling crane	20 ton x 1	16 ton x 1	13 ton x 1	13 ton x 1
Roller gate	2500mm <sup>v</sup> x 3150mm <sup>h</sup> x 6	2000mm <sup>v</sup> x 2650mm <sup>h</sup> x 8	1800mm <sup>v</sup> x 2450mm <sup>h</sup> x 10	1600mm <sup>v</sup> x 2150mm <sup>h</sup> x 12
Sluice gate for pump channel	1500mm <sup>v</sup> x 1500mm <sup>h</sup> x 6	1300mm <sup>v</sup> x 1300mm <sup>h</sup> x 8	1200mm <sup>v</sup> x 1200mm <sup>h</sup> x 10	1100mm <sup>v</sup> x 1100mm <sup>h</sup> x 12
Stop log	3600mm <sup>w</sup>	3000mm <sup>v</sup>	2700mm <sup>v</sup>	2400mm <sup>v</sup>
Screen	3600mm <sup>v</sup> x 5300mm <sup>h</sup> x 3 3600mm <sup>v</sup> x 3650mm <sup>h</sup> x 3	3000mm <sup>v</sup> x 4800mm <sup>h</sup> x 4 3000mm <sup>v</sup> x 3150mm <sup>h</sup> x 4	2700mm <sup>v</sup> x 4600mm <sup>h</sup> x 5 2700mm <sup>v</sup> x 2950mm <sup>h</sup> x 5	2400mm <sup>v</sup> x 4300mm <sup>h</sup> x 6 2400mm <sup>v</sup> x 2650mm <sup>h</sup> x 6
Sludge pump	80dia. x 2	—	—	—
Sluice gate for discharge canal	3600mm <sup>v</sup> x 1600mm <sup>h</sup> x 1 1400mm <sup>v</sup> x 1000mm <sup>h</sup> x 1	—	—	—
Flap valve	1500mm dia. x 3	1350mm dia. x 4	1200mm dia. x 5	1000mm dia. x 6
Electrical equipment	H.V. Incoming x 1 Transformer 11 KV/400V x 1 L.V. Incoming x 1 Motor starter panel x 3 Station service panel x 1	x 1 x 1 x 1 x 4 x 1	x 1 x 1 x 1 x 5 x 1	x 1 x 1 x 1 x 6 x 1
Instrument	Water level indicator x 2 Water level switch x 6	x 8	x 10	x 12
Miscellaneous	Cables x 110	—	—	—



Table A2-2-3-3 Equipment Costs of Each Alternative Plan

	A (3 PUMP SETS)	B (4 PUMP SETS)	C (5 PUMP SETS)	D (6 PUMP SETS)
VERTICAL SHAFT AXIAL FLOW PUMP	1200 mm <sup>3</sup> 87,000,000 YEN/SET x 3 SETS = 261,000,000 YEN	1000 mm <sup>3</sup> 82,000,000 YEN/SET x 4 SETS = 248,000,000 YEN	900 mm <sup>3</sup> 54,000,000 YEN/SET x 5 SETS = 270,000,000 YEN	800 mm <sup>3</sup> 47,000,000 YEN/SET x 6 SETS = 282,000,000 YEN
VERTICAL SHAFT OPEN DRIP-PROOF SQUIRREL CAGE INDUCTION MOTOR 400 V - 50 HZ	185 KW - 14 P 19,300,000 YEN/SET x 3 SETS = 57,900,000 YEN	132 KW - 12 P 11,000,000 YEN/SET x 4 SETS = 44,000,000 YEN	110 KW - 12 P 9,000,000 YEN/SET x 5 SETS = 45,000,000 YEN	90 KW - 10 P 6,100,000 YEN/SET x 6 SETS = 36,600,000 YEN
FLAP VALVE	1500 mm <sup>3</sup> 4,700,000 YEN/SET x 3 SETS = 14,100,000 YEN	1350 mm <sup>3</sup> 4,000,000 YEN/SET x 4 SETS = 16,000,000 YEN	1200 mm <sup>3</sup> 2,600,000 YEN/SET x 5 SETS = 13,000,000 YEN	1000 mm <sup>3</sup> 2,300,000 YEN/SET x 6 SETS = 13,800,000 YEN
ELECTRICALLY OPERATED OVERHEAD CRANE	20 TON 37,000,000 YEN	16 TON 33,000,000 YEN	13 TON 29,500,000 YEN	13 TON 29,500,000 YEN
ROLLER GATE	2.5 m x 3.15 m <sup>2</sup> 10,900,000 YEN/SET x 6 SETS = 65,400,000 YEN	2 m x 2.65 m <sup>2</sup> 9,200,000 YEN/SET x 8 SETS = 73,600,000 YEN	1.8 m x 2.45 m <sup>2</sup> 8,800,000 YEN/SET x 10 SETS = 88,000,000 YEN	1.6m x 2.15 m <sup>2</sup> 8,600,000 YEN/SET x 12 SETS = 103,200,000 YEN
SLUICE GATE	1500 mm <sup>3</sup> 5,400,000 YEN/SET x 6 SETS = 32,400,000 YEN	1300 mm <sup>3</sup> 4,600,000 YEN/SET x 8 SETS = 36,800,000 YEN	1200 mm <sup>3</sup> 4,100,000 YEN/SET x 10 SETS = 41,000,000 YEN	1100 mm <sup>3</sup> 3,700,000 YEN/SET x 12 SETS = 44,400,000 YEN
STOP LOGS INCLUDING GANTRY CRANE	46,000,000 YEN	43,000,000 YEN	30,000,000 YEN	32,000,000 YEN
SCREEN	27,000,000 YEN	28,000,000 YEN	30,000,000 YEN	29,000,000 YEN
BILGE PUMP	500,000 YEN/SET x 2 SETS = 1,000,000 YEN	500,000 YEN/SET x 2 SETS = 1,000,000 YEN	500,000 YEN/SET x 2 SETS = 1,000,000 YEN	500,000 YEN/SET x 2 SETS = 1,000,000 YEN
ELECTRICAL EQUIPMENT	53,300,000 YEN	57,500,000 YEN	62,200,000 YEN	65,900,000 YEN
INSTALLATION	123,900,000 YEN	122,100,000 YEN	128,300,000 YEN	134,600,000 YEN
GRAND TOTAL	719,000,000 YEN (102)	703,000,000 YEN (100)	736,000,000 YEN (105)	772,000,000 YEN (110)

2-2-4 Data on Irrigation and Drainage

Table A2-2-4-1 Reference Crop Evapotranspiration  
(Modified Penman Method)

Month	ET <sub>o</sub> (mm/Month)
January	92.0
February	107.0
March	156.0
April	159.0
May	141.0
June	106.0
July	106.0
August	120.0
September	104.0
October	116.0
November	108.0
December	94.0
Total	1,409.0

Table A2-2-4-2  
Effective Rainfall in Design Year

(Unit: mm)

Month	Period	Rainfall	Effective Rainfall For Paddy	Effective Rainfall for Other Crops
January	I	0.0	0.0	0.0
	II	0.0	0.0	0.0
February	I	1.3	0.0	0.0
	II	0.0	0.0	0.0
March	I	0.0	0.0	0.0
	II	66.0	40.6	52.3
April	I	0.0	0.0	0.0
	II	86.1	62.0	73.4
May	I	41.7	26.4	34.0
	II	52.8	22.6	34.3
June	I	148.3	103.9	124.2
	II	100.8	61.7	77.5
July	I	141.0	98.6	108.2
	II	161.8	89.2	67.8
August	I	280.4	227.3	250.0
	II	251.7	201.2	193.5
September	I	48.0	22.9	32.3
	II	152.7	120.4	135.6
October	I	102.6	75.7	85.9
	II	0.0	0.0	0.0
November	I	32.5	26.2	28.7
	II	0.0	0.0	0.0
December	I	0.0	0.0	0.0
	II	0.0	0.0	0.0
Annual		1,667.8	1,178.6	1,297.7

Table A2-2-4-3 Semi-Monthly Crop Factors

Crops	Growing Period	Remarks	1st		2nd		3rd		4th		5th		6th		7th	
			I	II	I	II	I	II	I	II	I	II	I	II	I	II
Boro	days 135*	HIV	1.20	1.25	1.25	1.30	1.35	1.40	1.45	1.50	1.30					
T. Aus	125*	HIV	1.20	1.25	1.25	1.30	1.35	1.40	1.45	1.50	1.35					
T. Aman	140*	HIV	1.20	1.25	1.25	1.30	1.35	1.40	1.45	1.50	1.35					
L. T. Aman	175*	Local	1.20	1.25	1.25	1.30	1.30	1.35	1.35	1.40	1.40	1.45	1.30			
Wheat	105		0.50	0.60	0.70	1.00	1.15	1.25	1.00							
Jute	120		0.50	0.65	0.95	1.15	1.50	1.40	1.40	1.40						
Pulses	90		0.50	0.70	0.95	1.10	1.10	0.95								
Others	90	Winter Crops	0.40	0.50	0.80	0.90	0.90	0.70								
Others	90	Summer Crops	0.40	0.65	0.80	0.90	0.95	0.85								

\* Including nurcery period



Table A2-2-4-5 Calculation of Water Balance

Day	Rainfall (m)	Storage Volume (m3)	Runoff Volume (m3)	Drainage by Pump (m3)	Remaining Volume (m3)	Water Level (m)	Inundated Area (ha)
1	0.005	96,600	41,400	41,400	0	2.600	50
2	0.016	336,000	144,000	144,000	0	2.600	50
3	0.283	4,817,400	3,678,600	594,000	3,084,600	3.291	1,132
4	0.055	0	1,662,000	594,000	4,152,600	3.378	1,276
5	0.001	0	15,000	594,000	3,573,600	3.331	1,198
6	-	-	-	594,000	2,979,600	3.282	1,117
7	-	-	-	594,000	2,385,600	3.234	1,037
8	-	-	-	594,000	1,791,600	3.169	893
9	-	-	-	594,000	1,197,600	3.063	596
10	-	-	-	594,000	603,600	2.957	299
11	-	-	-	594,000	9,600	2.610	53
12	-	-	-	9,600	0	2.600	50
13	-	-	-	0	0	2.600	50

H-A, H-V

H(m)	A(ha)	V(m3)
2.6	50	0
2.9	140	285,000
3.2	980	1,965,000
3.5	1,480	5,655,000
3.8	2,210	11,235,000
4.1	2,540	18,480,000
4.4	2,850	26,610,000
>4.7	3,000	35,355,000

AREA= 3,000ha (Gross)

2,100ha (Paddy Field)

Pump Capacity

7.5(m3/sec)

Maximum

22(hr/day)

Operation Hours

**2-2-5 Data on Economic Evaluation**



Table A2-2-5-1 Input Costs

Unit: ¥/ha

Item	Rice										Wheat	Jute		Potato		Pulses		Oilseeds		
	B. Aman		Mixed Aus/Aman		L. Boro		H. Boro													
	Amt	Value	Amt	Value	Amt	Value	Amt	Value	Amt	Value		Amt	Value	Amt	Value	Amt	Value	Amt	Value	
Labour Required	107	8,025	127	9,525	163	12,225	213	15,975			117	8,775	231	17,325	222	16,650	50	3,750	78	5,850
Seeds	kg																			
Seeds	100	4,600	100	5,200	30	1,560	30	1,560			140	5,600	10	300	1,200	30,000	33	1,782	10	540
Fertilizer	kg																			
Fertilizer	-	-	14	580	50	2,000	54	2,160			248	9,920	50	2,000	170	6,800	-	-	113	4,520
Agro-chemicals	kg																			
Agro-chemicals	-	-	-	-	0.12	216	0.50	900			0.25	450	0.50	900	0.50	900	-	-	0.50	900
Draft Animals	42	6,720	43	6,880	41	6,560	52	8,320			42	6,720	53	8,480	50	8,000	33	5,280	40	6,400
Total		19,345		22,185		22,561		28,915				31,465		29,005		62,350		10,812		18,210
	Without Project																			
	With Project																			
Item	L. T-Aman		T-Aman		T-Aus		H. Boro													
Labour Required	145	10,875	203	15,225	221	16,575	227	17,025			123	9,225	254	19,050	55	4,125	372	27,900		
Seeds	kg																			
Seeds	30	1,380	30	1,560	30	1,560	30	1,560			140	5,600	11	330	35	1,890	8	400		
Fertilizer	kg																			
Fertilizer	78	3,120	280	11,200	423	16,920	311	12,440			315	12,600	75	3,000	-	-	327	13,080		
Agro-chemicals	kg																			
Agro-chemicals	0.30	540	0.75	1,350	0.75	1,350	0.75	1,350			0.40	720	0.75	1,350	-	-	0.25	450		
Draft Animals	43	6,880	48	7,680	52	8,320	54	8,640			43	6,880	58	9,280	35	5,600	54	8,640		
Total		22,795		37,015		44,725		41,015				35,025		33,010		11,615		50,470		

SOURCE; Amount: TECHNICAL REPORT NO14 MPO-AGRICULTURAL PRODUCTION SYSTEM

Value : ECONOMIC PLANNING DIRECTORATE, BWDB (1985) and 1986 STATISTICAL YEARBOOK OF BANGLADESH

Table A2-2-5-2 Project Benefit (Without Project)

Item	Rice											Wheat	Jute	Potato	Pulses	Oil-seeds	Total
	Rainy Season					Dry Season											
	B. Aman	L. T-Aman	T-Aman	Mixd Aus/Aman	T-Aus	L. Boro	H. Boro										
(1) Yield	t/ha	1.10		1.60		1.50	3.00				2.50	1.40	8.94	0.68	0.80		
(2) Price	₹/t	38,100		38,100		38,100	38,100				32,600	23,900	14,040	55,200	55,200		
(3) Gross Production Value (1)x(2)	₹/ha	41,910		60,960		57,150	114,300				81,500	33,460	125,518	37,536	44,160		
(4) Production Cost	₹/ha	19,345		22,185		22,561	28,915				31,465	29,005	62,350	10,812	18,210		
(5) Net Production Value (3)-(4)	₹/ha	22,565		38,775		34,589	85,385				50,253	4,891	63,604	26,724	26,386		
(6) Cropped Area	ha	1,110		170		410	705				50	75	15	50	25	2,610	
(7) Total Net Value (5)x(6)	₹1,000	25,047		6,592		14,181	60,196				2,513	367	954	1,336	660	111,846	

SOURCE; Same as Table A2-2-5-1

Table A2-2-5-3 Project Benefit (With Project)

Item	Rice											Total					
	Rainy Season					Dry Season					Wheat		Jute	Potato	Pulses	Vege- tables	
	B. Aman	L. T-Aman	T-Aman	Mixd Aus/Aman	T-Aus	L. Boro	H. Boro										
(1) Yield	t/ha		3.88	4.14		4.87		4.73		1.80			1.00	12.43			
(2) Price	¥/t		38,100	38,100		38,100		38,100		23,900			55,200	18,720			
(3) Gross Production Value (1)x(2)	¥/ha		147,828	157,734		185,547		180,213		43,020			55,200	232,690			
(4) Production Cost	¥/ha		22,795	37,015		44,725		41,015		33,010			11,615	50,470			
(5) Net Production Value (3)-(4)	¥/ha		125,033	120,719		140,822		139,198		10,010			43,585	182,220			
(6) Cropped Area	ha		223	1,784		446		1,338		223			111	1,004			5,575
(7) Total Net Value (5)x(6)	¥1,000		27,882	215,363		62,807		186,247		2,232			4,838	182,949			706,972
Agricultural Benefit	¥1,000																595,126
Flood Control Benefit	¥1,000																30,000
Transportation Benefit	¥1,000		100vehicles x ¥2,000/hour x (1.0hour/day x 60 + 0.5hour/day x 300) =										42,000		42,000		
Total Project Benefit	¥1,000																667,126

SOURCE: Same as Table A2-2-5-1