

5.7.5 Extension Service

The Department of Agriculture (Extension and Management) of the Ministry of Agriculture will be responsible for implementing this project component, in close cooperation with IRDP. As a part of Ministry of Agriculture's effort to upgrade and intensify the agricultural extension services to farmers, a field level working scheme will be adopted in the project area. The scheme will fully utilize the TCCA-KSS infrastructure for furthering the effectiveness of extension to small farmers. Essential steps of the scheme are given below:

Increase of Numbers of Extension Officers and Their Refresher Trainings

The Ministry of Agriculture has begun a sustained programme for training and employing increasing number of officers at the thana and union levels. The plan is to create two new levels of officers: TEO and VEA. Refresher courses for TAO's and UAA's at ATI's and for ATI instructors at BRRRI are being conducted. In the project area, TEO's will be designated as soon as the project starts to be implemented. The unions comprising the project area are expected to be given priority consideration for assigning Village Extension Agents (VEA's). The precise number to be assigned each year will be worked out between the Department of Agriculture (ESM) and IRDP, based on the rate of organizing new KSS's by TCCA's in the project area.

Establishing "Scheduled Visit System" by TEO/TAO/UAA/VEA to TCCA-KSS's

The TEO/TAO's in each concerned thana will discuss with IRDP-TPO's and decide on a time schedule for visiting KSS's on appointed dates. The TEO/TAO/UAA (and later on, VEA's) will divide among themselves the work load of such scheduled visits. Their "scheduled visits" would help each KSS preparing the whole year farm plan and the seasonal farm plan, thus minimizing the errors to be committed (in terms of either surplus or deficit) in allocation of rural credit and farm inputs among the individual member and to the KSS as a whole. Such "Scheduled visits" would also help disseminating the improved farming methods and techniques either through the village model farmer or directly to the village farmers.

Special Extension Items Adaptable to KSS-wide Adaption

From the "Extension Package" information to be supplied by Department of Extension through the normal channel, the following items will be given additional emphasis for TCCA-KSS adoption:

- A. Preparation of good nurseries for T. Aus, T. Aman and Boro, proper way of handling seedlings and proper depth of transplanting.
- B. As a part of good nursery management, nursery pest control will be practiced.
- C. How to keep farmers own seeds pure and viable, multiply their own seeds.
- D. Selection of land for T. Aus HYV. and T. Aman HYV.
- E. Organized main field pest control.

Similarly, from the Intensive Jute Cultivation Scheme's extension package, selection of land for varieties, time of sowing, line sowing and proper spacing would be introduced for KSS-wide adoption. Special emphasis to these topics will be given in model farmer training and officer's "field visits". The IRDP-TPO, DTPO and inspectors should also keep themselves informed on these topics so they could assist the KSS manager and model farmers in organizing KSS-wide adoption.

Coordination of International Assistance Projects in Fields of Agricultural Extension, Information and Training

Several international/bilateral agencies are currently planning projects in Bangladesh to assist the country in improving its agricultural extension and training programmes. Some of the important projects are: UNDP project for "strengthening the Agricultural Extension Service"; project from the Government of Japan for the Central Extension & Resources Development Institute (CERDI); Ford Foundation/IRRI project at BRRI; UNDP/FAO Project on Land Use Advice to the Ministry of Agriculture and the IDA Agricultural and Rural Training Project. These projects will work with the

various agencies of the Ministry of Agriculture and our project can be benefitted if it will approach the National Committee on Rural Training, under the Ministry of Planning which coordinates the work of these agencies and programmes.

Implementation schedules of the programmes meant for strengthening of TCCA-KSS system and intensification of the agricultural extension services are shown in 5.9.4, and the details of their capital investment and O&M costs are given in 5.8.5.

5.8 Project Implementation

5.8.1 Construction Schedule

(1) General

Construction plan has been worked out on the following assumptions:

1) Preparation Period

After the submittance of the feasibility study report till the procurement of the construction machinery, it would take 2.5 years including detailed designing.

2) Construction Period

Construction would take full 6 years. The preparation and construction periods add up to 8.5 years.

3) Construction would be done through the maximum employment of labour.

4) As a principle, the civil works, particularly embankment (filling) work would be done during the dry season from October till April.

5) The entire construction work would be undertaken in two phases, one after another.

(2) Staging of Construction Works

1) Stage 1

The work would be commenced from the flood-protection embankment or dike in the following order:

- (i) New Dike along the Sitalakhya River;
- (ii) Dacca-Chittagong Road; and
- (iii) Narsingdi-Madanganj Railway.

Fig. 5-14 CONSTRUCTION SCHEDULE

Item	Year	Preparatory Period 2.5 year	1st	2nd	3rd	4th	5th	6th	
Preparatory	Appraisal	—							
	Detail Design & Specification	—							
	Procurement of Equipment	—							
	Land Acquisition (Dike Canal)	—							
	Preparatory Works	—							
	Dike								
Stage 1	No.1 Pump Pumping Plant								
	Irrigation Facilities								
	Drainage Facilities								
	On Farm Facilities								
	Transmission Lines								
Stage 2	Land Acquisition								
	No. 2 Pump Pumping Plant								
	Irrigation Facilities								
	Drainage Facilities								
	On Farm Facilities								
	Transmission Lines								
	Extension Area Irrigation Facilities								
	Engineering Survies Supervision								

The embankment, reinforcement, and heightening works would accompany installation of such facilities as check gates and closures to prudently complete the flood-protection works. Construction of Pumping Station No. 1 and power supply work for it would be undertaken simultaneously with the above work. Irrigation-cum-drainage facilities of Pumping Station No. 1 would be equipped at the same time. Stage 1 construction work would be accomplished with the completion of farm networks in the peripheral farms under the command of Pumping Station No.1. Stage 1 construction work takes full 3 years.

2) Stage 2

Construction of Pumping Station No. 2 and power-supply work for it would be done side by side with provision of irrigation-cum-drainage facilities of the same pumping station. Stage 2 construction work, which takes full 3 years, would be accomplished with completion of farm networks in the command area of Pumping Station No. 2.

(3) Work Plans under Different Items

1) Flood Protection Work

(i) New Dike along the Sitalakhya River

Embankment work would proceed by the order of Ghorasal, Kaliganj, Rupganj and Demra, by utilizing the existing roads connecting the work sites along the Sitalakhya River with the D-N Road.

Material earth would be obtained from the borrow pits which would preferably be located on the river side. Excavation depth of the borrow pits would be limited within 6 ft. Both excavation and haulage works would be done by use of manpower. Compaction of the embanked earth would be done by the method usually adopted in Bangladesh, that is by use of sheep-foot roller. The embankment work would be suspended during four-month rainy season from June to September.

(ii) N-M Railway

Reinforcement work along the N-M Railway would be done with the same method as with the new dike, starting from Narsingdi and Araihasar. The slope of the N-M Railway roadbed would be cut off of its surface soil and then additionally embanked with the material earth obtainable from the borrow pits located more than 20 ft away from the foot of the proposed dike alignment. Excavation and haulage works would be done by use of manpower, and compaction work by use of machinery. Best care must be taken of the passage of trains during the work.

(iii) D-C Road

Crest elevation of the D-C Road is nearly equal to the projected flood water level; therefore, the reinforcement work along this road comprises of additional embankment necessary to provide appropriate freeboard. Although reinforcement work is proposed to be done by heightening embankment, brick parapet is an alternative method adoptable for the purpose. The final decision would have to be made at detailed design stage. The embankment work can be started from anywhere convenient with little difficulty as it is done along one of the national highways of Bangladesh.

2) Irrigation and Drainage Works

(i) Pumping Station No. 1

The construction work of Pumping Station No. 1 would be commenced in winter season to make its foundation work easy. The site would need to be protected from inundation either by Tatkir Khal water, rail-water or groundwater. Cofferdams constructed on up- and down-streams of the Tatkir Khal would serve the purpose and underground water should be pumped out.

Machine-driven sheet piles would protect the cut-off walls. After completion of the civil engineering work, pumps and gates would be installed. Control office would be built in the vicinity of Pumping Station No. 1.

(ii) Pumping Station No. 2

Construction methods would be exactly the same as with Pumping Station No. 1. Since the new dike along the Sitalakhya River should have been completed under Stage 1 work, construction materials and machinery can be easily hauled to the site of Pumping Station No. 2.

(iii) Irrigation Canals

Construction work on irrigation canals might be started from anywhere convenient. Judging from the existing topographical map and additional surveys, most of the work would comprise of embankment, requiring cases of not much cutting-off work. Material earth coming from the farmlands nearby the construction-site would be evenly levelled and repeatedly compacted until the designed cross sections could be obtained. Excavation and haulage works would be carried out by use of manpower and the compaction by use of machinery. Even finishing of compaction work would be indispensable to preclude leakage or collapse.

(iv) Drainage Canals

The same construction method as with the irrigation canals would be used. Almost all the work, however, would be done through excavation.

(v) Related Structures

Most of the related structures would be built of brick in view of fuller use of the local products.

(vi) On-Farm Facilities

On-farm facilities of the peripheral farms in the command area of each pumping station would be provided solely by labour. This work should be completed within one year's time.

(4) Employment of Manpower throughout the Construction Period

Stage 1 work meant for construction/reinforcement of flood-protection dike and embankment, Pumping Station No. 1, irrigation/drainage canal systems and on-farm facilities affiliated with Pumping Station No. 1 would take full 3 years, offering daily employment opportunities for 10,000 - 13,000 people (300 working days a year).

Daily employment opportunities provided by Stage 2 work would, however, be 8,000 - 10,000 because its work load is comparatively less heavy only consisting of construction of Pumping Station No. 2, irrigation/drainage canals and related facilities to it.

5.8.2 Agriculture, Livestock and Fisheries

General

- 1) Agricultural development plan proposed under the project can be summarized as follows:

First: Provision of the Supporting Infrastructure

To bring the benefits arising from the construction of the basic infrastructure (related to flood-protection, drainage, irrigation and road network) within the reach of the grass-root farmers in the sense that the potential for increased agricultural production would be fully developed by each one of the area farmers, supporting infrastructure would be provided through RWP and Thana Facilities Programmes. RWP would attend at construction, repair and improvement of pucca-katcha roads, rural markets and fish ponds, while Thana Facilities Programme would look after that of TTDC buildings, TCCA storages and BADC workshop strengthening.

Second: Consolidation of Farmer Organization

As soon as the physical infrastructural works start infusing the area farmers' mind with brighter hopes for the future, a campaign for consolidation of IRDP-TCCA-KSS would be launched; it would be continued for full five years in each project area.

Third: Farmer Services packaged into One

The farmer organization (IRDP-TCCA-KSS) would start preparing to provide the input supply, marketing and credit services combined into a single package to facilitate launching of full-fledged agricultural production programme by its member-farmers within one year's time.

Fourth: Full-fledged Agricultural Production

Agricultural production programme itself would be implemented through the joint efforts of the farmers under the intensive extension services of the Government and IRDP-TCCA-KSS's packaged services of credit, input supply and marketing.

The above process would first take place in Phase I/Stage 1 area, then in Phase I/Stage 2 area, and finally in Phase II area, so that the whole project area (Plan B area) could be fully developed within the given period of time as is illustrated in the Progress Bar Chart.

- 2) The full-fledged agricultural production program which is incorporated with the livestock and fisheries programmes would start in Phase I/Stage 1 area since Year Four, in Phase I/Stage 2 area since Year Seven, and in Phase II area since Year Ten, taking 7 years, 6 years and 5 years respectively in reaching their goals. The difference in the period required for attaining full development reflects the function of spill-over effects of the beneficial results obtainable in the area coming first under the project to other area or areas which would be coming later. Full agricultural (livestock and fisheries inclusive) development would be attained, therefore, in Year Ten in Phase I/Stage 1 area, in Year Twelve in Phase I/Stage 2 area, and in Year Fourteen in Phase II area; Year Fourteen would see the whole project area (Plan B area) fully developed under the project.

- 3) The agricultural production programme would be implemented by the area-farmers on village-basis, according to the farm plans prepared through the good offices of TCCA-KSSs which guarantee timely supply of all the input requirements through the BADC and marketing of surpluses therefrom to the Food Ministry, as arranged by IRDP which acts as the sole agent of the project area TCCA-KSSs in this operation of purchasing and marketing activities through the financial arrangement with the Janata Bank. All through the above-mentioned process of agricultural production, the area-farmers can enjoy thorough technical guidance extended by the Government extension officers of all ranks, either directly or through the village model farmers.

Table 5 - 54 Implementation Progress Bar Chart

Project Works	Project Work Item/Components	Phase/Stage	PROJECT YEAR																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14			
I BASIC INFRA-STRUCTURE	1) Embankment	I/1	1	2	3														
	2) Pumping Stations	I/1	1	2	3	4													
	3) Irrigation/Drainage	I/2				2	3	4											
	4) Road Networks	II							1	2	3	4							
II SUPPORTING FACILITIES	FWP: 1) Pucca Roads 2) Katcha Roads 3) Rural Markets 4) Fish Ponds	I/1																	
	Thana Facilities: 1) TTDC Buildings 2) TCCA Storages 3) RADC Workshops	I/2																	
		II																	
III INSTI-TUTIONAL RE-CON-STRUCTION	Reorganization of Traditional Co-ops to TCCA-KSS & Expansion of TCCA-KSS system	I/1																	
		I/2																	
		II																	
IV SUPPORTING SERVICES	1) Rural Credit	I/1																	
	2) Input Supply	I/2																	
	3) <u>Extension</u>	II																	
	4) Marketing	II																	
V AGRICUL-TURAL PRODUCTION FISHERIES LIVESTOCK		I/1																	
		I/2																	
		II																	

5.8.3 Supporting Infrastructure

Supporting infrastructure would be provided in the project area through implementation of two programmes of RWP and Thana Facilities; construction, repair and improvement of the pucca/katcha road, village markets and fish ponds by the former, and that of TTDC buildings, TCCA storages and BADC workshops, by the latter. Supplementary infrastructural programmes would be completed within 2 years in each project area.

5.8.4 Farmer Services

Farmer services would be enormously strengthened through (a) consolidation of TCCA-KSS system, and (b) intensification of the Government extension services. These two are closely inter-related. The former would take 5 consecutive years, while the latter would be identified with the agricultural production programme, in each project area.

5.9 Cost Estimates

5.9.1 General

Unit costs used for computation of the project costs in this report are as follows:

Construction Costs: Mainly taken from the "Schedule of Rate for Dacca Water Circle (Inforce from December 1977)" issued by BWDB. As for the unit costs not available therein, the relevant lists and tables have been used for computation.

Supporting Infrastructure & Farmer Services Costs: The unit prices which were effective in the last month of 1977 have been used.

These unit prices do not include taxes and duties.

10% physical contingencies have been added to the civil work costs. As for the price contingencies, it has been assumed that the domestic inflationary trends would be hemmed within 8~9% (not more than 10%) per year and abroad, within 5~6% per year, for the foreseeable future. However, the fixed rates of 30% for domestic component and 20% for foreign component have been used purely for the convenience of cost estimation. The explanation on this problem of price contingencies would be made in the corresponding section of the Notes.

While the construction costs are computed for Phase I only, the project costs for agricultural development such as the provision of supporting infrastructure and the strengthening of farmer services are estimated on the whole project area basis. Under the Total Project Costs, however, the costs for agricultural development have been re-computed on regional basis and only the portion related to Phase I area are given.

5.9.2 Total Project Cost

The total project costs are estimated at Tk 910.8 million (US\$60.7 million), comprising of Tk 467.5 million (US\$31.1 million), or about 51% of the total, in the foreign exchange component and Tk 443.3 million (US\$29.6 million) in the local currency. The major elements included in the cost estimates are: civil works (Tk 558.3million or US\$

Table 5-55 Total Project Cost for Phase I Area

Item	Local	Foreign	Total	Dollar Equivalent	% of
	1,000TK			1,000\$	Total
I Land Acquisition	50,025	-	50,025	3,335	5.5
II Civil Works					
Preparatory Works	3,600	900	4,500		
Embankment	27,711	14,257	41,968		
Pumping Station	33,225	169,854	203,079		
Irrigation Facilities	106,359	54,607	160,966		
Drainage Facilities	29,895	7,044	36,939		
Transmission Lines	1,490	14,710	16,200		
On Farm Facilities	45,092	10,564	55,656		
Construction Machinery	6,885	32,100	38,985		
Sub Total	254,257	304,036	558,293	37,220	61.3
III Farm Equipment and Supplies for Agricultural Development					
Livestock Component	47	585	632		
Fishey Component	20	185	205		
Rural Works	12,574	2,958	15,532		
Thana Facilities	2,573	716	3,289		
IRDP/TCCA/KSS Component	81	1,338	1,419		
Agricultural Extension	20	227	247		
Sub Total	15,315	6,009	21,324	1,422	2.3
IV Engineering & Administration	12,215	53,667	65,882	4,392	7.2
Basic Project Cost	331,812	363,712	695,524	46,368	76.3
V Physical Contingencies (10% of II&III)	26,957	31,005	57,962	3,864	6.4
VI Price Contingencies (30% of Local Component 20% of Foreign Component)	84,536	72,742	157,278	10,485	17.3
VII Total Project Cost	443,305	467,459	910,764	60,717	100

37.2 million agricultural development (Tk 21.3 million or US\$1.4 million), land acquisition (Tk 50.0 million or US\$3.3 million), and engineering and administration (Tk 65.9 million or US\$4.4 million). Physical contingencies of Tk 157.3 million (US\$10.5 million) and price contingencies of Tk 157.3 million (US\$10.5 million) are also added. Estimated total project costs divided into foreign exchange component and local currency component are summarized in Table 5-54.

Agricultural development costs whose detailed estimates for the whole project area (Plan B area) are given in 5.9.4 have been computed on regional basis in both the base costs and the engineering and administration costs and only those falling within the Phase I area are given in the summarized Table.

5.9.3 Construction Works

1) Construction Cost

Total construction cost is estimated at Tk 879,102,000 (US\$ 58,607,000), which is made up of Tk 459,206,000 (US\$ 30,614,000) in foreign currency and Tk 419,896,000 (US\$ 27,993,000) in local currency. The exchange rates used for conversion are US\$1.00 = Tk 15 = ¢225. The exchange rates used construction cost are given in Table 5-56.

2) Unit Cost

The unit cost used for estimating the construction costs has been taken mainly from the "Schedule of Rate for Dacca Water Development Circle". Unit costs used in the similar project reports such as the "Feasibility Report on Chenchuri Beel Project, October 1977" and the "Hail Haor Irrigation Project, October 1976" by B.W.D.B., and the "Meghna-Dhonagoda Irrigation Project, November 1977" by A.D.B. have also been referred to.

3) Machinery Cost

Machinery comprise primarily of the compaction machines, and their number is minimized to meet net requirement of construction works. Their prices are given in cif. Chittagong, plus local handling charges (from Chittagong to the project site) rated at 5% of the machinery price. As the construction works for Phase I would take full 6 years, there would be little residual value available of the construction machinery. Repair, maintenance and supervision costs have been added at the rate of 20% of the machinery cost.

4) Physical Contingencies

10% of the civil work costs has been added as the physical contingencies.

5) Price Contingencies

Price contingencies reflecting the inflation rates have been tentatively decided at 30% for the local currency portion and 20% for the foreign currency portion as mentioned in the preceding section. Detailed explanation on this problem would be made in the corresponding Section of the Notes. No price contingencies have been added to the land acquisition cost.

6) Annual Project Cost

The annual disbursement of the construction cost is given in Table 5-57.

7) Details of Foreign Currency Portion

The details of foreign currency portion are given in Table 5-58.

8) Details of Construction Machinery Cost

The details of construction machinery costs are represented in Table 5-59.

9) Annual Maintenance and Operation Costs

Annual maintenance and operation costs are given as follows:

Pumping Station No. 1	17,189,000 Tk
Pumping Station No. 2	16,557,000 Tk
Extension Area	378,000 Tk
Total	34,124,000 Tk

10) Phase-wise Costs of Construction

(i) Construction Cost for Stage 1

Construction cost for Stage 1 is Tk 503,814,000 as shown in Table 5-61.

(ii) Construction Cost for Phase I

Construction cost for Phase I, which is equivalent to the total construction cost of Phase I, is computed at Tk 879,102,000 as shown in Table 5-56.

(iii) Construction Cost for Phase II

Construction costs for Phase II have been computed from the figures related to the similar works under Phase I and estimated at Tk 1,377,632,000 as per Table 5-62.

(iv) Construction Cost for Phase II Only

Construction costs for Phase II works only are estimated at Tk 498,530,000 as per Table 5-63.

Table 5-56 Cost Estimate

(Unit : 1,000TK)

Item	Total	Local	Foreign
I Civil Works	558,293	254,257	304,036
Preparatory Works	4,500	3,600	900
Embankment	41,968	27,711	14,257
Pumping Station	203,079	33,225	169,854
Irrigation Facilities	160,966	106,359	54,607
Drainage Facilities	36,939	29,895	7,044
Transmission Lines	16,200	1,490	14,710
On Farm Facilities	55,656	45,092	10,564
Construction Machinery	38,985	6,885	32,100
II Land Acquisition	50,025	50,025	
III Engineering Service	64,000	10,700	53,000
IV Contingency	206,784	104,914	101,870
Physical (I × 10%)	55,829	25,426	30,403
Prices			
(I + III) × $\begin{cases} \text{Local 30\%} \\ \text{Foreign 20\%} \end{cases}$	150,955	79,488	71,467
Total	879,102 (100.00%)	419,896 (47.76%)	459,206 (52.24%)

Table 5-57 Annual Disbursement of Financial Cost

(unit: 1,000TK)

	Total	Preparatory Period	1st	2nd	3rd	4th	5th	6th
Total	879,102	29,200	163,430	193,130	110,511	155,946	130,529	96,356
Local	419,896	5,200	76,003	99,046	51,447	87,024	58,537	42,639
Foreign	459,206	24,000	87,427	94,084	59,064	68,922	71,992	53,717

Table 5-58 Foreign Exchange Component
of the Construction Cost

No.	Item	Contents	(×1,000) TK	(×1,000) US\$
1.	Construction Machinery		26,535	1,769.0
2.	Foreign Component of Cement and Steel	Cement : 226,800bags Steel : 2,740ton	9,752 13,218	650.1 881.2
3.	Spares for Machinery		565	37.7
4.	Pumping Equipment		122,713	8,180.9
5.	Gates		29,472	1,964.8
6.	Transmission Lines		14,710	980.7
7.	Building and House		6,625	441.7
8.	Other Materials		80,446	5,363.0
9.	Engineering Service		53,300	3,553.3
10.	Contingency		101,870	6,791.3
	Total		459,206	30,613.7

Table 5-59 Cost of Equipment & Machinery

Equipment & Machinery	Size & Capacity	Quantity	Unit Price	Amount
			\$	\$
(1) C.I.P. Price				
Tractor	15t 130p.s.	15	61,000	915,000
Dozer	3,825B x 923H	5	4,000	20,000
Sheep Foot Roller	2.9~5.6t	10	10,000	100,000
Crawler Dragline	0.6m ³	1	100,000	100,000
Truck Crane	14t	1	60,000	60,000
Dump Truck	6t	10	16,000	160,000
Motor Grader	65p.s.	5	25,000	125,000
Tire Roller	3~4t	10	15,000	150,000
Vibro Humer	40kw	1	30,000	30,000
Compressor	52p.s.	1	11,000	11,000
Concrete Mixer	0.28~0.4m ³	10	8,000	80,000
Pump	150mm	10	1,800	18,000
Sub Total				1,769,000\$ =26,535.000TK
(2) Local Handling 5%				1,320.000TK
Total				27,855.000

Table 5- 60 Unit Rate for Item of Works

	Item	Unit	Quantity	Total Unit Price	Local Currency Portion	Foreing Currency Portion
1	Earthwork in excavation(A)	cft	1,000	140	140	
2	" (B)	"	1,000	180	180	
3	" (C)	"	1,000	110	110	
4	Earthwork in filling	"	1,000	110	110	
5	Earthwork of embankment	"	1,000	160	160	
6	Compaction of earth	"	1,000	100	40	60
7	Stone pitching	sft	100	770	770	770
8	Cement concrete(1:3:6) (A)	cft	100	1,731	1,034	697
9	" (1:1 $\frac{1}{2}$:3) (B)	"	100	465	274	191
10	Reinforced cement concrete (1:2:4) (A)	"	100	2,173	1,216	957
11	" (1:2:4) (B)	sft	100	2,500	1,543	957
12	M.S. work for reinforcement	cwt	1	465	201	264
13	Form work (A)	sft	100	400	400	
14	" (B)	"	100	300	300	
15	Cement sand plaster (1:4) ($\frac{1}{4}$ " ~ $\frac{3}{4}$ " think)	"	100	139	92	47
16	Turfing	"	1,000	59	59	
17	1st class brickwork (1:4)	cft	100	1,395	959	436
18	3"thick 1st class brick flat soling	sft	100	250	210	40
19	5"thick 1st class brick on edge herring bone soling	"	100	439	373	66
20	RCC pipe 2'-0" dia	rft	1	120	71	49
21	" 3'-3" dia	"	1	270	159	111
22	Bailing out water by pump	cft	1,000	24	24	
23	Water-tight shuttering	sft	100	500	500	
24	Steel sheet pile					
24	Guardrail	rft	1	60	5	55
25	Cutting and clearing	sft	1,000	11	11	
26	Land acquisition	ac	1	10,000	10,000	
27	Crashed Brick	cft	100	425	361	64
28	Sheet Pile	ton	1	10,800	5,400	5,400

Table 5-61 Cost Estimate(Stage 1)

(Unit:1000TK)

Item	Total	Local	Foreign
I Civil Works	314,789	142,319	172,470
Preparatory Works	4,500	3,600	900
Embankment	41,968	27,711	14,257
Pumping Station(No.I)	99,714	15,966	83,748
Irrigation Facilities	77,222	50,281	26,941
Drainage Facilities	22,634	18,714	3,920
Transmission Lines	8,250	764	7,486
On Farm Facilities	21,516	18,398	3,118
Construction Machinery	38,985	6,885	32,100
II Land Aquisition	26,790	26,790	
III Engineering Service	44,000	7,660	36,340
IV Contingency	118,235	59,226	59,009
Physical(I×10%)	31,479	14,232	17,247
Prices(I+III)× {Local 30% Foreign 20%	86,756	44,974	41,762
Total	503,814	235,995	267,819

Table 5-62 Cost Estimate(Plan B Area)
(Unit:1000TK)

Item	Total	Local	Foreign
I Civil Works	887,163	390,277	496,886
Propavatory Works	6,500	5,200	1,300
Embankment	87,448	44,531	22,917
Pumping Station	317,379	51,925	265,454
Irrigation Facilities	230,266	152,079	78,187
Drainage Facilities	57,159	46,255	10,904
Transmission Lines	42,100	3,890	38,210
On Farm Facilities	86,116	69,772	16,344
Construction Machinery	60,195	10,625	49,570
II Land Acquisition	68,495	68,495	
III Emgineering Service	96,000	16,050	79,950
IV Contingency	325,974	160,924	165,050
Physical(I×10%)	88,709	39,026	49,683
Price(I+III) × { Local 30% Foreign 20%	237,265	121,898	115,367
Total	1,377,632	635,746	741,886

Table 5-63 Cost Estimate (Phase II Area)

Item	(Unit:1000TK)		
	Total	Local	Foreign
I Civil Works	328,870	136,020	192,850
Preparatory Works	2,000	1,600	400
Embankment	45,480	22,820	22,660
Pumping Station	114,300	18,700	95,600
Irrigation Facilities	69,300	45,720	23,580
Drainage Facilities	20,220	16,360	3,860
Transmission Lines	25,900	2,400	23,500
On Farm Facilities	30,460	24,680	5,780
Construction Machinery	21,210	3,740	17,470
II Land Acquisition	18,470	18,470	
III Engineering Service	32,000	5,350	26,650
IV Contingency	119,190	56,010	63,180
Physical (I×10%)	32,880	13,600	19,280
Price (I+III) × { Local 30% Foreign 20%	86,310	42,410	43,900
Total	498,530	215,850	282,680

5.9.4 Improvement of Supporting Infrastructure and Strengthening of Farmer Services

(1) Programmes Incorporated with Agricultural Production Plan

Costs for implementation of the livestock and the fisheries programmes are given in Tables 5-64 and 5-65, respectively.

(2) Improvement of Supporting Infrastructure

Tables 5-66 and 5-67 show costs for implementation of two programmes of Rural Works and Thana Facilities.

(3) Farmer Services

Costs for implementation of two programmes of IRDP/TCCA-KSS and agricultural extension are represented in Tables 5-68 and 5-69, respectively.

Table 5-64 Cost Estimates-Livestock Component

<u>Item</u>	<u>Cost (Tk Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i) Equipment for 5 Thana Veterinary Dispensaries ^{/1}	15	270	285
(ii) Field Equipment and Supplies ^{/2}	22	220	242
(iii) Vehicles and Spares ^{/3}	35	410	445
(iv) O & M Equipment & Vehicles	130	730	860
(v) Chemicals & Medicines for Treatment	105	50	155
(vi) Staff Training	120	-	120
(vii) Cost of Additional Staff	1,000	-	1,000
(viii) Per diem for Field Staff	<u>225</u>	<u>-</u>	<u>225</u>
(ix) Base Cost Estimates (i viii)	1,652	1,680	3,332
(x) Physical Contingencies (10% of ix)	165	168	333
(xi) Price Contingencies (30% of local component) (20% of foreign component)	<u>496</u>	<u>336</u>	<u>832</u>
Total Cost - Livestock Component (ix+x+xi)	2,313	2,184	4,497

/1 : One each per dispensary: kerosene refrigerator, microscope, hand centrifuge, autoclave, laboratory balance, ventilator, laboratory petro burner, treatment set, postmortem set and some miscellaneous laboratory equipment.

/2 Ten sets per thana: Injectors, vaccination kits, insemination kits and portable sterilizers.

/3 Including cycle cabs and 5 Motor Cycles.

Table 5-65 Cost Estimates - Fishery Component

<u>Item</u>	<u>COST (TK Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i) Equipment for surveying the fish ponds ^{/1}	23	65	88
(ii) Vehicles for Staff ^{/2}	7	220	227
(iii) O & M of Vehicles	45	135	180
(iv) Operation cost of trial/demonstration ponds	680	130	810
(v) Operation cost of fish seed ponds	220	-	220
(vi) Staff Training	60	-	60
(vii) Cost of Additional Staff ^{/3}	720	-	720
(viii) Per diem for Field Staff	<u>65</u>	<u>-</u>	<u>65</u>
(ix) Base Cost Estimates (i-viii)	1,820	550	2,370
(x) Physical Contingencies (10% of ix)	182	55	237
(xi) Price Contingencies (30% of local component and 20% of foreign component)	<u>546</u>	<u>110</u>	<u>656</u>
Total Cost - Fisheries (ix+x+xi)	2,548	715	3,263

^{/1} : 2 per Thana: Measuring tapes and sounding rods; Also includes water and soil analysis equipment and chemicals for the Directorate of Fisheries, cost of Maouja maps for villages in 5 thanas and some miscellaneous items.

^{/2} : 1 four-wheel drive vehicle for District Fisheries Officer;
5 Motor cycles: One each for Thana Fisheries Officer;
20 Bicycles: One each for the fieldmen. Provision for replacement after 3 years.

^{/3} : Per Thana: One Thana Fisheries Officer, 2 Fieldmen and 4 Guards; also 2 drivers and 2 motor cleaners for the jeep.

Table 5-66 Cost Estimates - Rural Works

		COST (Tk. Thousand)		
<u>Item</u>		<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i)	<u>Pucca Roads</u>			
	(a) 5 mi (Earthwork + Bituminous ^{/1} carpeting) at Tk 340,000	1,343	357	1,700
	(b) 5 mi (Earthwork + Brick her- ^{/2} ringbone) at Tk 778,000	2,920	970	3,890
	(c) 10 minor bridges at Tk 77,000/ bridge	547	223	770
(ii)	<u>Katcha Roads</u>			
	150 mi at Tk 62,000/mi ^{/3}	8,370	930	9,300
(iii)	<u>Rural Markets</u>			
	30 markets at Tk 187,000/market ^{/4}	3,540	2,070	5,610
(iv)	<u>Fish Ponds</u>			
	250 ac at Tk 10,500/ac	<u>2,625</u>	<u>-</u>	<u>2,625</u>
(v)	Sub-total Rural Works (i)-(iv)	19,345	4,550	23,895
(vi)	Engineering & Administration ^{/5} (10% of v)	<u>1,935</u>	<u>455</u>	<u>2,390</u>
(vii)	Base Cost Estimate (v+vi)	21,280	5,005	26,285
(viii)	Physical Contingencies (20% of vii)	4,256	1,001	5,257
(ix)	Price Contingencies (Local component: 30%, Foreign component: 20%)	<u>7,885</u>	<u>1,001</u>	<u>8,886</u>
(x)	Total Cost Rural Works (vii+viii+ix)	33,421	7,007	40,427

^{/1} : Bituminous carpeting at Tk 232,000/mi; Earthwork 860,000 cu ft/mi at Tk 0.126/cu ft or Tk 108,000/mi.

^{/2} : Brick herringbone, standard 12 ft surface boxcut and sand insulated at Tk 641,000/mi; Earthwork 1,040,000 cu ft/mi at Tk 0.126 or Tk 137,000/mi.

^{/3} : Earthwork for grading and forming at Tk 30,000/mi; Two culverts/mi at Tk 16,000/culvert.

^{/4} : 5,000 sq ft paring at Tk 13.2/sq ft or Tk 66,000/market; 6,500 sq ft GI sheets at Tk 6.5/sq ft or Tk 42,000/market; Woodrframe at Tk 18,000/market; 2,000 ft of frainage at Tk 15.5/ft or Tk 31,000/market; One and one-half cusec tubewell with pucca surrounding pad at Tk 24,000/market; and 10,000 sq ft grading at Tk 0.6/sq ft or Tk 6,000/market.

^{/5} : Also includes funds for supervision by the local consultants.

Table 5-67 Cost Estimates - Thana Facilities

<u>Item</u>	<u>COST (Tk. Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i) Office Quarters (Twin) 7 at Tk 275,000 each	1,640	285	1,925
(ii) 400 ton Fertilizer Godowns ^{/1} 2 nos. at Tk 700,000 each	1,050	350	1,400
(iii) 200 ton General Godowns ^{/2} 4 nos. at Tk 410,000 each	1,245	395	1,640
(iv) Equipment for 5 Thana Workshops Tk 19,000 per workshop	<u>24</u>	<u>71</u>	<u>95</u>
(v) Sub-total (i-iv)	3,959	1,101	5,060
(vi) Engineering & Administration (10% of v)	396	110	506
(vii) Base Cost Estimate (v+vi)	4,355	1,211	5,566
(viii) Physical Contingencies (10% of vii)	436	121	557
(ix) Price Contingencies (Local component: 30% and foreign component: 20%)	<u>1,306</u>	<u>242</u>	<u>1,548</u>
(x) Total Cost (vii+viii+ix)	6,097	1,574	7,671

^{/1} : 3,200 sq ft Storage Area at Tk 125/sq ft or Tk 400,000/godown; 800 sq ft Office-cum-residence for store-keeper at Tk 160/sq ft or Tk 128,000/godown; 300 sq ft Darwan's quarters at Tk 140/sq ft or Tk 42,000/godown; 500sq ft Bookkeeping clerk's quarters at Tk 160/sq ft or Tk 80,000; Site Tk 50,000.

^{/2} : 1,600 sq ft Storage Area at Tk 125/sq ft or Tk 200,000/godown; 800 sq ft Office-cum-residence for store-keeper at Tk 160/sq ft or Tk 128,000/godown; 300 sq ft Darwan's quarters at Tk 140/sq ft or Tk 42,000/godown; Site Tk 40,000.

Table 5-68 Cost estimates- IRDP/TCCA/KSS Component

<u>Item</u>	<u>C O S T (Tk Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i) Office Equipment <u>/1</u>	20.3	157.7	178.0
(ii) Vehicles for Staff: <u>/2</u>			
1 Jeep	2.0	72.0	74.0
11 Motor cycles	7.7	77.0	84.7
652 Bicycles	65.2	782.4	847.6
	<u>74.9</u>	<u>931.4</u>	<u>1,006.3</u>
(iii) Motor Trucks for TCCAs' Use (5 tons)	30.0	970.0	1,000.0
(iv) O & M of Office Equipment & Vehicles during the project life <u>/3</u>	204.3	931.4	1,135.7
(v) Staff Training <u>/4</u>	600.0	-	600.0
(vi) Cost of Additional Staff <u>/5</u>	153.6	-	153.6
(vii) Per diem for IRDP Staff during Field Work	230.0	-	230.0
(viii) Preparation of Land Register and Maps for KSSs <u>/6</u>	200.0	20.0	220.0
(ix) Printing Costs <u>/7</u>	<u>200.0</u>	<u>67.0</u>	<u>267.0</u>
(x) Base Cost Estimate: IRDP/TCCA Component (i-ix)	1,713.1	3,077.5	4,690.6
(xi) Physical Contingencies (10% of x)	171.3	307.8	479.1
(xii) Price Contingencies (30% of local component) (20% of foreign component)	513.9	615.5	1,129.4
Total Cost Estimate IRDP/TCCA Component (x+xi+xii)	2,398.3	4,000.8	6,399.1

Notes:

/1 : Office Equipment with the following distribution among the District Office and 5 Thanas:

	<u>District Office</u>	<u>Thana</u>	<u>Total</u>
Typewriter (English)	1	-	1
-do- (Bengali)	1	5	6
Hand Calculators	1	@ 2 10	11
Mimeographing Machine	1	5	6
File Cabinet	1	5	6

Unit cost as per attached.

/2 : Vehicles for Staff: 1 Jeep for District Project Director
11 Motor-cycles: @ 1 for Deputy District project Director, 5 Thana Project Officers and 5 Deputy Thana Officers.
652 Bicycles; @ 1 for 10 TCCA Chief Inspectors, 15 Inspectors 75 ALs and 150 VAs.
Provision is made for replacement after 3 years. Unit cost as per attached.

/3 : O & M of Office Equipment & Vehicles:
15% of capital costs.

/4 : Staff Training: Includes the cost of additional training requirements only.

/5 : Cost of Additional Staff: An (additional) Deputy Project Director and a Training Officer for each thana.
Assumed average salary Tk 800/month.

/6 : Preparation of Land Register and Maps for KSSs: For _____ KSSs
say 1,000 sets.

/7 : Printing Costs: Printing of the Project work manual by the Project Implementation Committee and of TCCA_KSS account/ record books by IRDP.

Unit Costs

Cost (Tk)

Item	Local	Foreign	Total
<u>Office Equipment</u>			
Typewriter(English)	100	3,300	3,400
" (Bengali)	100	4,000	4,100
Hand Calculator	100	3,500	3,600
Mimeographing Machine	100	4,000	4,100
File Cabinet	1,000	-	1,000
<u>Vehicles</u>			
Motor Trucks			
Jeeps	2,000	72,000	74,000
100cc Motorcycles	700	7,000	7,700
Bicycles	100	1,200	1,300
<u>Annual O & M of Office Equipment & Vehicles</u>			
Motor Trucks			
Jeep(8,000 mi/year)	2,500	8,800	11,300
Motorcycle(6,000 mi/year)	500	1,100	1,600
Bicycle	50	100	150
Office Equipment		1,570 of Capital Costs	
<u>Others</u>			
Preparation of Land Register & Maps/kSS	200	20	220
Printing of TCCA/KSS Account/Record Books	60	20	80

Table 5-69 Cost Estimates-Agricultural Extension

<u>Item</u>	<u>Cost (TK Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
(i) Vehicles for Staff ^{/1}	29.7	349.4	379.1
(ii) O & M of Vehicles during the project life ^{/2}	87.9	167.0	254.9
(iii) Staff Training	70.0	-	70.0
(iv) Per diem for extension staff during field work	<u>470.0</u>	<u>-</u>	<u>470.0</u>
(v) Base Cost Estimates - Agricultural Extention	657.6	516.4	1,174.0
(vi) Physical Contingencies (10% of v)	65.8	51.6	117.4
(vii) Price Contingencies (30% of local component) (20% of foreign component)	197.3	103.3	300.6
Total Cost - Agricultural Extention (v+vi+vii)	920.7	671.3	1,592.0

/1 : 5 Motorcycles: One each for Thana Extention Officer
262 Bicycles: One each for Village Extention Assistant.
Provision is made for replacement after 3 years.

/2 Unit costs as in Cost Estimates - IRDP/TCCA Component.

VI ORGANIZATION AND MANAGEMENT

6-1 General

The project aims at agricultural development in the area through strengthening of both the physical as well as the socio-economic infrastructures, or construction of basic and supporting facilities for increased agricultural production and rural institution building and, for this purpose, utilizes the existing GOB organizations at all levels. The work procedures are given in the corresponding section of the Notes and the detailed organization charts are given as Table 11-1 & 11-2.

6-2 The Project Organization

The organization structure responsible for implementation of the project will consist of the following three to four levels of Committees:

Ministry level	Central Project Evaluation Committee (CPEC)
Department level	Inter-Departmental Project Coordination Committee (IDPCC)
Project area level ...	Project Implementation Committee (PIC)
Thana level	Thana Project Executive Committee (TPEC)

/1

/1 TPEC will start functioning in the second year of the commencement of the basic infrastructural works (flood-protection, drainage, irrigation, etc.) In one-half of Phase I area which comes under the command of Pumping Station No.1 (Phase I/Stage 1 area), TPEC will start from Year Two and in the remaining one-half under the command of Pumping Station No.2 (Phase I/Stage 2 area), from Year Five. In the command area of Pumping Station No.3 (Phase II area), TPEC would start functioning from Year Eight.

The project places the executing responsibility at the Department level and policy-decision and evaluation function to the Ministries concerned: each participating agency has direct line offices in the District (Dacca) and thanas and would implement the project component that falls within its jurisdiction. Since the project is made up of two broadly

divided parts of (a) construction and (b) agricultural development and as the former part has to prepare the physical basis for the latter, the executing responsibility will be heavier on the agencies directly dealing with construction aspect in the early phase of project implementation; that will then be gradually shifted to the agencies concerned with agricultural development.

The progress of the works related to physical infrastructure (both the basic as well as the supporting infrastructures) and institutional re-construction (TCCA-KSS) should be followed by a full-fledged agricultural development programme as soon as possible so as to avoid under-exploitation of the potentialities newly endowed to the improved lands. It is, therefore, proposed that two sub-committees be organized under the Project Implementation Committee: the one being the Project Construction Sub-Committee, and the other, the Project Agricultural Development Sub-Committee, during the construction period of the project implementation. The Thana Project Executive Committees would start functioning from the second year of the basic infrastructural construction. When the Project Construction Sub-Committee would conclude its term after the completion of construction work, the Project Agricultural Development Sub-Committee would continue functioning as the Project Implementation Committee during the remaining period of the project implementation.

It is hoped that the territorial disagreement between the project area and the areas of jurisdiction of the thanas concerned would not create any troubles; the function of the Thana project Executive Committees would rather result at beneficial spill-over of the progress made within the project-covered parts of the thanas to their non-covered parts.

The organization of the Central Project Evaluation Committee is proposed for overall policy-decision and evaluation of the project among such Ministries and agencies like Planning; Power, Water Resources and Flood Control; Local Government, Rural Development and Cooperatives; Agriculture and Forest; Fishery and Livestock; Food; IRDP; BADC; and Bangladesh Bank.

Agency Responsibilities

The Ministry of Power, Water Resources and Flood Control has one agency participating in the project, that is the Bangladesh Water Development Board (BWDB) which is going to play the decisive role in construction, construction supervision, operation and maintenance of the major infrastructural facilities such as embankment, drainage, irrigation and road network. Its Member of Implementation and Chief Engineer would serve as the chairman and member-secretary of the Inter-Departmental Project Coordination Committee and its key engineer appointed as the Project Director, assuming the chairmanship of both the Construction Sub-Committee and the Project Implementation Committee, during the construction period.

The Ministry of Local Government, Rural Development and Cooperatives has four agencies participating in the project:

- (a) IRDP: The IRDP is responsible for organizing and supervising the operation and management of TCCA-KSS in the country. It would be responsible for the day-to-day coordination of project progress at all levels since one year before a full-fledged agricultural production should start in each project area. It is strongly recommended that two thanas: Araihasar and Narayanganj should be brought under the umbrella of IRDP as soon as practicable.
- (b) Rural Works Programme: A Joint Secretary of the Ministry with engineering staff is in charge of the Rural Works Programme. The District Engineer (RWP) under the supervision of Assistant Director Rural Development would prepare designs and estimates, issue tenders, select bids and supervise the construction of the project pucca (paved) roads as well as make payments to contractors. The Thana Circle Officer (Development) assisted by Thana overseers/supervisors would execute the pucca work involved in the construction and rehabilitation of dirt (katcha) roads and rural markets, while the Union Committees for RWP would hire landless people to do earth work.

- (c) Department of Cooperatives: The Department would be responsible for making inventory of outstanding debts by members of traditional cooperatives, rescheduling and causing such debts to be collected, and for cooperating with IRDP in reorganizing the existing non TCCA low-lift pump and shallow tubewell groups and UMCS into TCCA-KSSs. It would also register all new cooperatives, including TCCA-KSSs.
- (d) Local Government Department: supervised by the Local Government Department, the Deputy Commissioner of Dacca District would serve as co-chairman of the Project Implementation Committee and Thana Circle Officers (Development) would serve as chairmen of the Thana Project Executive Committees.

The Ministry of Agriculture & Forest has two agencies participating in the project:

- (a) Agriculture Department (Extension & Management): would be responsible for revitalizing the model farmer training and for implementing the intensified extension programme designed for KSS-wide adoption.
- (b) BADC: would be in charge of allocation of input requirements to the project area farmers through IRDP-TCCA-KSS. The BADC Thana Irrigation Officers would be responsible for reallocating the low-lift pumps and shallow tubewell equipment which would become surplus under the project and the BADC Thana workshop would be kept busy for removal, repair and renovation of the displaced pumps and tubewells.

The Ministry of Fishery and Livestock has two agencies participating in the project:

- (a) The Livestock Department: would supply the vaccines and serum, veterinarians, and implement vaccination, insemination, deworming and forage/fodder demonstration programme.

- (b) The Fisheries Department: would implement the fish pond component of the project.

The Ministry of Food has one agency participating in the project, that is, the Department of Procurement. This Department would collect the foodgrains which should be produced in the project area but beyond the local consumption, through the institutional route of IRDP-TCCA-KSS.

The Janata Bank would be responsible for extending both the short-term credit (linked with both input supply and marketing) and medium-term credit to TCCA-KSS members. The Bangladesh Bank would supervise the project-related activities of the Janata Bank.

6-4 Additional Staff

The following additional staff would be deployed by GOB in the project:

- (a) IRDP: One Deputy Thana Project Officer and one Thana Training Officer would be assigned to each thana involved in the project area (Narsingdi, Rupganj and Baidya Bazar), while introducing IRDP into Araihasar and Narayanganj thanas. Sufficient supporting staff would be provided at IRDP headquarters to assist the Director Extension and Training and the IRDP Dacca District Project Director, in performing their duty as the secretary of the Inter-Departmental Coordination Committee and the Project Implementation Committee, respectively, when the project proceeds to a full-fledged agricultural development stage.
- (b) Extension Officers: One Thana Extension Officer would be assigned to each thana involved in the project area (unless already assigned) and at least 30 Village Extension Assistants to the Unions covered under the project.
- (c) Livestock Officers: Vaccinators would be gradually increased to a total of 50, and inseminators to a total of 25 for the five thanas by Year Ten.

- (d) Fishery Officers: One additional thana fishery officer and two field men would be added to each of the five thanas.
- (e) TCCA: As new KSSs are organized, the number of TCCA Inspectors, Assistant Inspectors (AI) and Village Accountants (VA) would be increased according to the existing TCCA regulations which provide for the hiring of one VA for every six KSSs; one AI for every 12 KSSs, and one Inspector for every five AI. It is projected that the VA would be increased to 150 by the Year Ten; AI to 75, and Inspectors to 15. The salaries and other expenses for the employment of these officers are expected to be met increasingly from the TCCAs' increased incomes from the rural credit and other service commissions during the first two years, and fully beginning the third year after the full-fledged agricultural production programme would have been started.

6-5 Operation and Maintenance

Operation and maintenance (O & M) cost for the embankments, pumping stations, main and secondary canals for irrigation/drainage would be borne by GOB, together with that of thana facilities and roads. The operation and maintenance of the tertiary irrigation/drainage channels should be taken care of by the farmers concerned collectively. The O&M of the processing machines, fish ponds, and rural markets would be borne by the users. O&M cost for equipment and vehicles for the various participating agencies would be provided by the project during the project implementation period. After this period, GOB would provide adequate O&M costs through its regular budgetary appropriations to the concerned agencies.

6-6 Charges

Land Betterment Charges

The Land Betterment Charges would be levied on the land-owning farmers in the project area, after the year-round irrigation would become possible upon completion of the construction work. In a sense, this

charge stands for the water rate and is primarily meant for recovery of a major part of the O&M costs for the embankment, pumping stations, main and secondary canals for irrigation/drainage and, if possible, a part of the capital investment undertaken by GOB for their construction. GOB is requested to determine proper rate(s) of the Land Betterment Charges by taking into consideration (i) terms and conditions for repayment of the bilateral/multilateral loan or loan from the international financial organizations provided for the construction part of the project; (ii) the national rates for low-lift pumps and tubewells rented out to the user groups, plus the cost of diesel oil, spares and the pump driver; (iii) the fact that the values of the land would enormously increase after the project implementation, and other factors. There would be three kinds of the Land Betterment Charges to be introduced: (i) flat rate per ac per year; (ii) differential rates per ac per year fixed according to the size of the holdings (the rate would be fixed progressively higher as the size of the holdings increases); and (iii) differential rates for resident farmers and the absentee landlords (the absentee landlords will have to pay a higher rate than the resident land-owing farmers).

For economic evaluation of the project, the Land Betterment Charges at a flat rate of Tk 100 per ac per year is assumed to be levied on all the land which will become irrigable by gravity irrigation under the project.

Vaccination Fee

Currently, vaccination of animals and poultry is provided free of cost. Partially, this policy reflects the ineffectiveness of the current programme. To promote a rapid acceptance of the mass vaccination and deworming programmes proposed under the project, the existing policy would have to be followed until the project has produced a visible impact at the village level. GOB would then review the situation and determine a fee collection plan from the users to recover at least the O&M costs of the equipment and vehicles in use for the livestock/poultry disease control programme.

Rural Market Fees/Rents

GOB would likewise determine a schedule of fees/rents to be collected from the users of the rural markets to be constructed under the project.

VII PRODUCTION, PRICES AND FARM INCOME

7.1 Production

By using the data assimilated through processes of the feasibility study, agricultural production attainable at full development has been estimated on the assumption that the project would be implemented by stage from Phase I/Stage 1 to Phase I and, in turn, from Phase I to Plan B.

The beneficiary area would therefore expand as follows:

Table 7-1 Beneficiary Area

Project Implementation Area	Its Overage
Phase I/Stage 1	Command area of Pumping Station No.1 = Gross: 29,400 ac Net: 23,800 ac
Phase I	Command areas of Pumping Stations No.1 and No. 2 combined = Gross: 82,900 ac Net: 65,600 ac
Plan B	Command areas of Pumping Stations No.1 No.2 and No.3 combined = Gross:111,600 ac Net: 88,200 ac

Crop-wise agricultural production would increase in each area as follows:

Table 7-2 Crop Production Increases under the Project ^{/1}

	Rice		Wheat		Upland Crops ^{/2}		Jute	
	P	W	P	W	P	W	P	W
Phase I/ Stage 1	13,990	58,760	25	1,610	2,380	7,850	370	1,340
Phase I	33,300	141,100	60	3,800	5,640	17,700	880	3,190
Plan B	49,350	219,400	95	4,700	9,000	25,840	5,500	8,750

^{/1} : Metric tons;

P : Present;

^{/2} : Include pulses, oil seeds, vegetables and Sugar Cane

W : Future with the project.

Each one of the project areas presently has a food grain deficit of 10~20% of the total demand. Substantial increase in production of rice and wheat under the project, however, would turn this deficit into a surplus within five to seven years of project implementation, taking into account the projected population increases. Although production increase of jute is moderate, upland crops would create enough surpluses, bringing in year-round cash earnings through their marketing in the neighbouring consumption centers like Dacca, Narayanganj and Narsingdi.

Moreover, significant production increases in each kind of crops would encourage processing industries to arise in the area(s); medium- and long-term credits required for such purposes would be provided with the enterprising farmers and private dealers by the Janata Bank either directly or through TCCA-KSSs.

7.2 Prices

Prices for the agricultural products and farm inputs used in this report are derived from the World Bank's projected 1985 world market prices expressed in 1977 constant prices. For economic analysis, the official exchange rate of US\$1 = Tk 15 has been adjusted to a shadow rate of US\$1 = TK 18 to reflect the foreign exchange scarcity of the country. The assumptions behind the shadow exchange rate and all projected prices used in the economic analysis are discussed in the Notes.

7.3 Farm Income

Present and projected farm budgets have been analyzed on the basis of three representative farm sizes: 1.5 ac, 4.0 ac and 1.0 ac. each standing for farm operation by the small farmer (having less than 2.5 ac of land), the standard farmer (having between 2.5 ac and 5.0 ac of land), and the large farmer (having lands over 5.0 ac each). This farm budget analysis assumes the following:

- (a) Cropping pattern B which would have the widest coverage in each area is to be adopted;
- (b) Crop yields and input requirements for the projected production would reflect the averages for the entire area;

- (c) The prices used in the farm budgets are the "financial" farmgate prices excluding all subsidies, taxes and duties;
- (d) 1.5 ac farm would be cultivated with the farmer's own family labour. 4.0 ac farm would be cultivated by the farmer's own family labour with 1.0 ac land but through employment of the hired labour with the remaining 3.0 ac. 8.0 ac. farm would be cultivated by the owner with 3 ac, 1 ac of which by his family labour and 2 ac through employment of the hired labour, and the remaining 5 ac would be leased on share-cropping basis with a 50:50 sharing of both the cash inputs and the crops.

The annual net incomes from farming, including the imputed value of produce consumed on the farm (in 1977 prices), for three representative farm types are given below.

Table 7-3 Comparison of Farm Incomes by Farm Size

<u>Farm Size(ac)</u>	<u>Present (Tk)</u>	<u>Future with Project (Tk)</u>	<u>Increase in Percent</u>
1.5	2,822	11,414	404
4.0	7,377	28,429	385
8.0	17,996	38,517	214

VIII BENEFITS AND JUSTIFICATION

8.1 General

This project would have a national significance in demonstrating the degree and extent of capability which the agricultural development project rationally worked out and efficiently implemented in a specific area could contribute in solving Bangladesh food shortage and foreign exchange scarcity, particularly through increased productions in rice and jute. The area farmers would enjoy increased agricultural production which should almost double their annual income, while the landless workers and marginal farmers would be provided with opportunities for quasi-full employment of semi-permanent nature - though on the assumption that migrant labourers could ever be checked from flowing into the project area - due to enormously increased demand for farm labour resulting from doubling of the cropped area and adoption of intensive farming techniques all over the project area, thanks to completion of the basic as well as supporting infrastructures and strengthening of farmer services. Sizeable production increases in upland crops including oilseeds on and above an abundant supply of cereals would help improve the diet of the area people which is expected to be further enriched by increased supply of animal protein through implementation of livestock and fishery programmes, although these are primarily meant to guarantee additional animal power on the one hand and employment, on the other. The rural population in the area would also benefit from improvements in social infrastructure such as village markets and road networks.

Perhaps even more important is the role of this project as a prototype for strengthening and revitalizing the country's rural institutions in such a way as to enable IRDP-TCCA-KSS to formulate farm plans on village basis, provide the member-farmers with input supply and marketing services well linked up with credit. This would help the Comilla model farmer organization make another stride toward perfection in the sense that the ultimate end of the farmer organization's system and function would be fulfilled when the capital is accumulated in the rural society as a common asset of the member-farmers and reinvested for enlarged reproduction on behalf of all of them.

8.2 Production

The project related increases of agricultural production directly contributing to the foreign exchange savings and earnings at full development and their equivalents in US\$ have been estimated in each one of the project areas as follows:

Table 8-1 Step-wise Production Increase by Crops

	Phase I/Stage 1		Phase I		Plan B	
	Production Increases (ton)	Foreign Exchange Equivalent (US\$)	Production Increases (ton)	Foreign Exchange Equivalent (US\$)	Production Increases (ton)	Foreign Exchange Equivalent (US\$)
Rice	44,780	8,404,000	113,110	21,541,000	161,380	28,352,000
Wheat	1,588	366,000	3,720	856,000	4,610	1,060,000
Jute	974	385,000	2,310	762,000	3,250	1,072,000

The project would also have beneficial effects on general upliftment of the socio-economic conditions of the area through such as live-stock and fisheries programmes, etc. However, since the project primarily concentrates on crop production, only the benefits from the above mentioned plus the incremental production of upland crops would be quantified for economic evaluation.

8.3 Employment Opportunities

The prospects for farm employment have been assessed in Phase I area as well as Plan B area, based on the data assimilated through processes of the feasibility study which was conducted with Phase I. The similar effects are also expected to work in Phase I/Stage 1 area.

The estimated (somewhat arbitrary) number of families consisting of landless workers and the lower layer (about 1/4 of the total) marginal farmers (having less than 1.0 ac of land) in Phase I area is about 19,000. Landless workers are presently eking out their living through such

diverse jobs like rickshaw pulling, petty trade, minor construction, etc., and the opportunities for annual gainful farm employment are supposed to be less than three months; the latter are enjoying a little better position as share croppers but because of the absolute smallness of total land brought under management, the poverty of their daily life has little difference from that of the former.

At present, the total annual labour requirements for crop cultivation are estimated at 4,031,000 man days, 80% of which being supplied by the family members and the remaining 20% or 806,200 man-days is hired in terms of share cropping leased to the marginal farmers and seasonal employment of the landless workers. Share cropping does not give permanent tenancy to the cultivators and, therefore, is akin to contract labour verbally made between the landowner and cultivator, season by season, on the basis of different sharing in cash inputs and crop. Hence there is no real difference between seasonal employment and share cropping. It would not be a serious mistake to estimate the farm labour employment opportunities are being equally shared by landless workers and the lower layer of marginal farmers at about 42 man-days/family.

At full development in Year Ten, however, the total estimated farm labour requirement would amount to approximately 9,800,000 man-days in Phase I area. As the intensity of farming techniques increases, so increases the labour intensity of farming. Accordingly, at least 50% of the farm labour requirement or approximately 4,900,000 man-days per year would have to be met by the hired labour. Taking into account the population increases among the landless workers and the lower marginal farmers in the meanwhile, some 25,000 families of them would share 4,900,000 man-days at about 200 man-days per family. It is to be noted that this-much employment is for farming only, while many more employment opportunities would be created in subsidiary branches of agriculture in the course of project implementation, apart from the enormous labour requirements called for the basic and supporting infrastructural construction works.

As far as the upper layer of the marginal farmers are concerned, their annual income analysis has been made with the representative model farm of 1.5 ac under "Farm Income" in the preceding Chapter. They are expected to manage their household economy not too bitterly compared with their neighbours, even if they might lose share cropping contract or temporary farm labour employment opportunities.

8.4 Income Distribution

Deductive inference from the projected farm budget analysis and the general tendency for increased employment opportunities under the project would promise the landless workers and the lower layer of marginal farmers with significant increases in their income, and income incremental effects the project would bring on the land owning farmers including the upper layer of the marginal farmers are supposed to work more favourably toward the smaller than to the larger, thus adhering faithfully to the Government policy of diminishing discrepancies between the richer and the poorer through agricultural development efforts.

8.5 Economic Internal Rate of Return

The project's economic internal rates of return are estimated with each one of the areas where the project is proposed as follows:

Table 8-2 Results of I.R.R.'s

	<u>Phase I/Stage 1</u>	<u>Phase I</u>	<u>Plan B</u>
I.R.R.	14.9%	19.9%	20.2%
Sensitivity Test Results	-	14 ~ 20%	-

The above estimated are based on the following assumptions:

- (a) a 50 year project life including the project implementation periods;
- (b) project implementation would take three years for the basic infrastructural construction and five to seven years for agricultural development;

- (c) only the increased farm production due to the project is included in the benefit;
- (d) World Bank's projected 1985 world market prices (economic) in terms of 1977 dollars for inputs and outputs; all the prices do not include subsidies, taxes and duties;
- (e) allowance for the shortage of foreign exchange by using a shadow rate of US\$ 1 = Tk 18; and
- (f) all farm labour valued at 50% of the market wage and construction labour at the market wage.

Sensitivity tests have been made under a variety of assumptions and the results from some of the important tests are given below:

<u>Alternative</u>	<u>Internal Rate of Return</u>
(a) Basic case	19.9%
(b) A decrease of 20% in net benefit	16.0%
(c) An increase of 10% in construction costs	18.7%
(d) An increase of 10% in farm production costs	19.6%
(e) Combination of (b) and (d)	15.6%
(f) Combination of (b), (c), and (d)	14.6%

IX RECOMMENDATIONS AND OUTSTANDING ISSUES

9.1 Construction Works

(1) Project Implementation

The surveys and geological and hydrological studies to be completed before the detailed design would be as follows:

(a) Hydrology: River water levels and discharges of both the Sitalakhya River and the Meghna River during the dry season, and the water levels inside the project area during the rainy season need to be properly observed and recorded.

(b) Boring and Soil Tests:

(i) Installation of Bench Marks: Most of the bench marks along the existing D-N Road are either broken or buried under ground; they need to be properly replaced and replenished. Bench marks need to be installed, at one-mile interval, along the Sitalakhya River, the T-N Railway, the N-M Railway and the D-C Road.

(ii) The present topographical map (1:15840 4 in to 1 mi does not indicate elevations of the roads, railways and other structures; clear indication of their elevations are badly needed on the topographical map.

(2) Engineering Services

The engineering service costs are given for the detailed design and the supervision on the construction works; 20% of each costs would be in the local currency which can be appropriated for surveys, geological studies and other purposes and, if necessary, for supervision. The foreign exchange portion of the engineering service costs would be as follows:

(a) Detailed Design: Job classification of the expatriate experts and the amount of their engineering services required for detailed design of this project are shown in Table 9-1: Schedule of Engineering Services (Foreign). Their services

would comprise of the surveys, geological studies, hydro-
logical analysis, designing, cost estimation and work
schedules and specification, etc., and total to 144 man-
months, during one year or so.

- (b) Supervision: Supervision services would last for the whole period of construction work that in 6 years. Except three engineers who should be resident, other specialists would return to the site as often as required (each time for about 3 months). The total man-months required for construction supervision would be approximately 252. Their services would comprise of the completion of the construction work according to the detailed design, alterations to the design, work management, planning on the supplies and labour allocation as well as advices and suggestions to B.W.D.B.

Engineering services for detailed design and supervision would be estimated as follows:

(i) Detailed Design

Personnel Expenses	
144 m/m x ¥1,800,000/m =	¥259,200,000
Travelling Expenses, etc.	40,800,000
Total	300,000,000

(ii) Construction Supervision

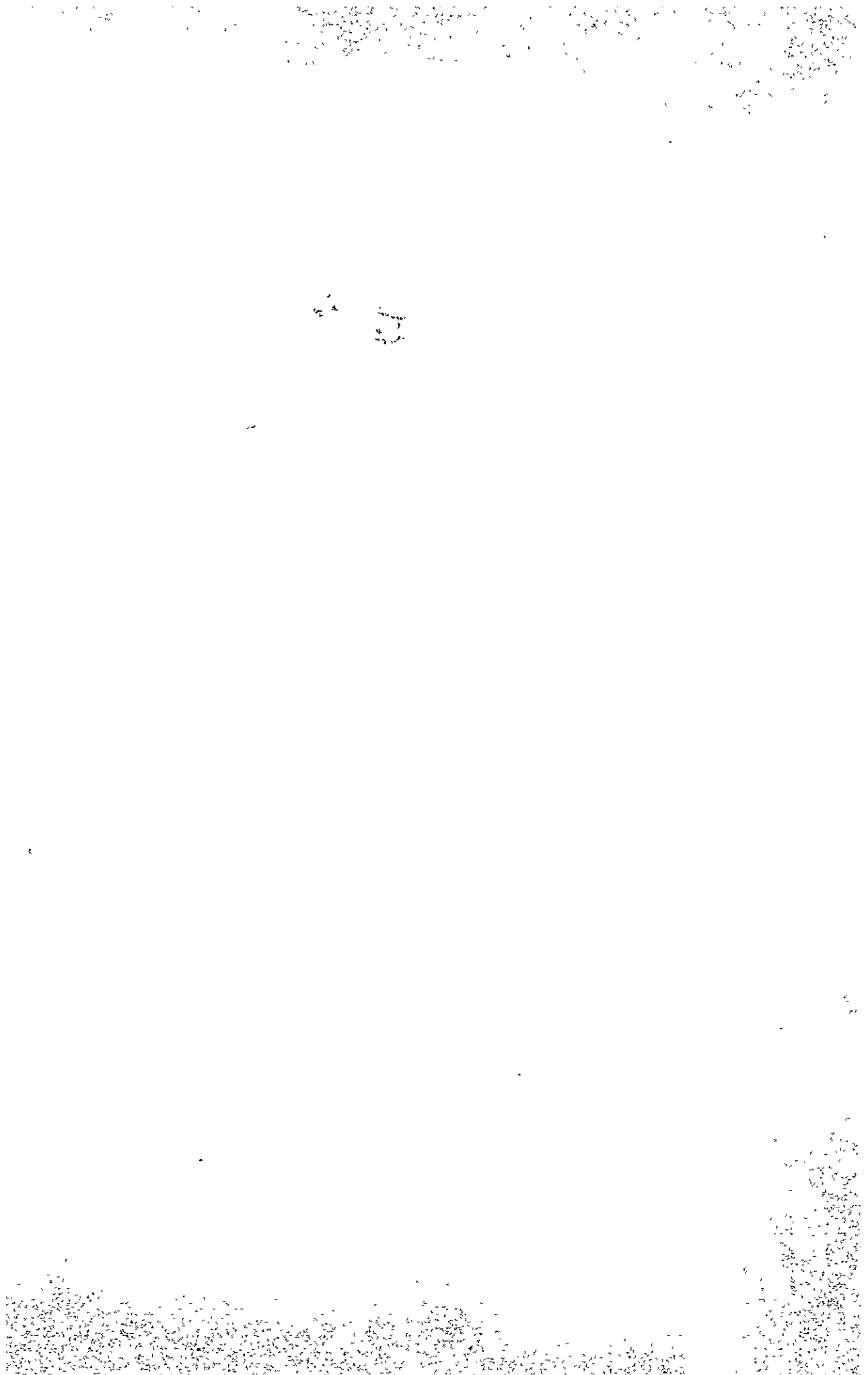
Personnel Expenses	
252 m/m x ¥1,800,000/m =	¥453,600,000
Travelling Expenses, etc.	46,400,000
Total	500,000,000
Grand Total:	¥800,000,000
Local Currency Portion	(¥160,000,000)

Table 9 - 1 Schedule of Engineering Services (Foreign)

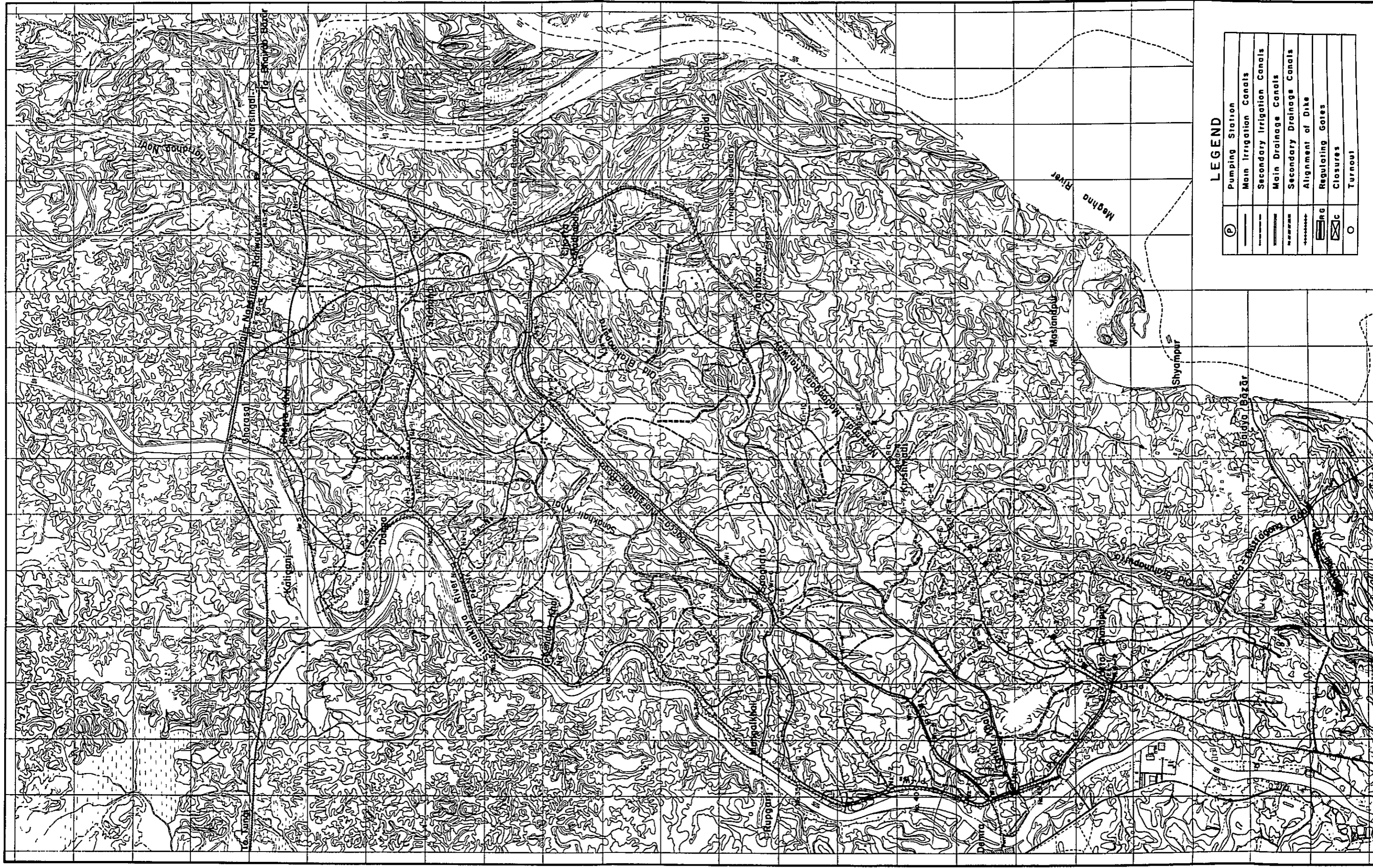
Position	M/M	Preparatory Period	Construction Period					
			1st	2nd	3rd	4th	5th	6th
1. Detailed Design								
Team Leader (1)	12	_____						
Irrigation Engineer (2)	24	_____						
Structural Design Eng. (3)	36	_____						
Hydrologist (1)	12	_____						
Geologist (1)	6	_____						
Agronomist (1)	6	_____						
Agro-Economist (1)	6	_____						
Mechanical Engineer (1)	6	_____						
Electric Engineer (1)	6	_____						
Surveyor (3)	30	_____						
Sub-total (15)	144							
2. Supervision								
Team Leader (1)	72							
Construction Eng. (2)	144							
Mechanical, Electric & Other Engineer (3)	36		_____	_____	_____	_____	_____	_____
Sub-total (6)	252							
Total (21)	396							

9.2 Agricultural Development

- A. The agricultural development strategy adopted in this project is in broad conformity with the IRDP which has been established as the national policy for agricultural development in Bangladesh. It is strongly recommended to bring the two project thanas of Araihasar and Narayanganj under the umbrella of IRDP at the earliest possible opportunity to spread the agricultural development benefits all over the whole project area.
- B. Project Implementation
- 1) For the effective implementation of the agricultural development programmes, particularly the strengthening of the farmer services in terms of linking-up of input supply with marketing services with credit through IRDP-TCCA-KSS system, the expatriate technical assistance might prove very helpful. Job specifications, number of personnel and term of services which would be required under such technical assistance programme could be determined through discussions with the authorities concerned of the Government of Bangladesh at the detailed design stage of the project.
 - 2) Agricultural development programmes chalked out in this report remain in their skeleton forms because of the lack of the basic data on socio-economic conditions prevailing in the project area. It is very much hoped for that the detailed design would be made not only in the construction sector but also in the agricultural development sector on the basis of reliable data and information which would have been collected in due course of time.

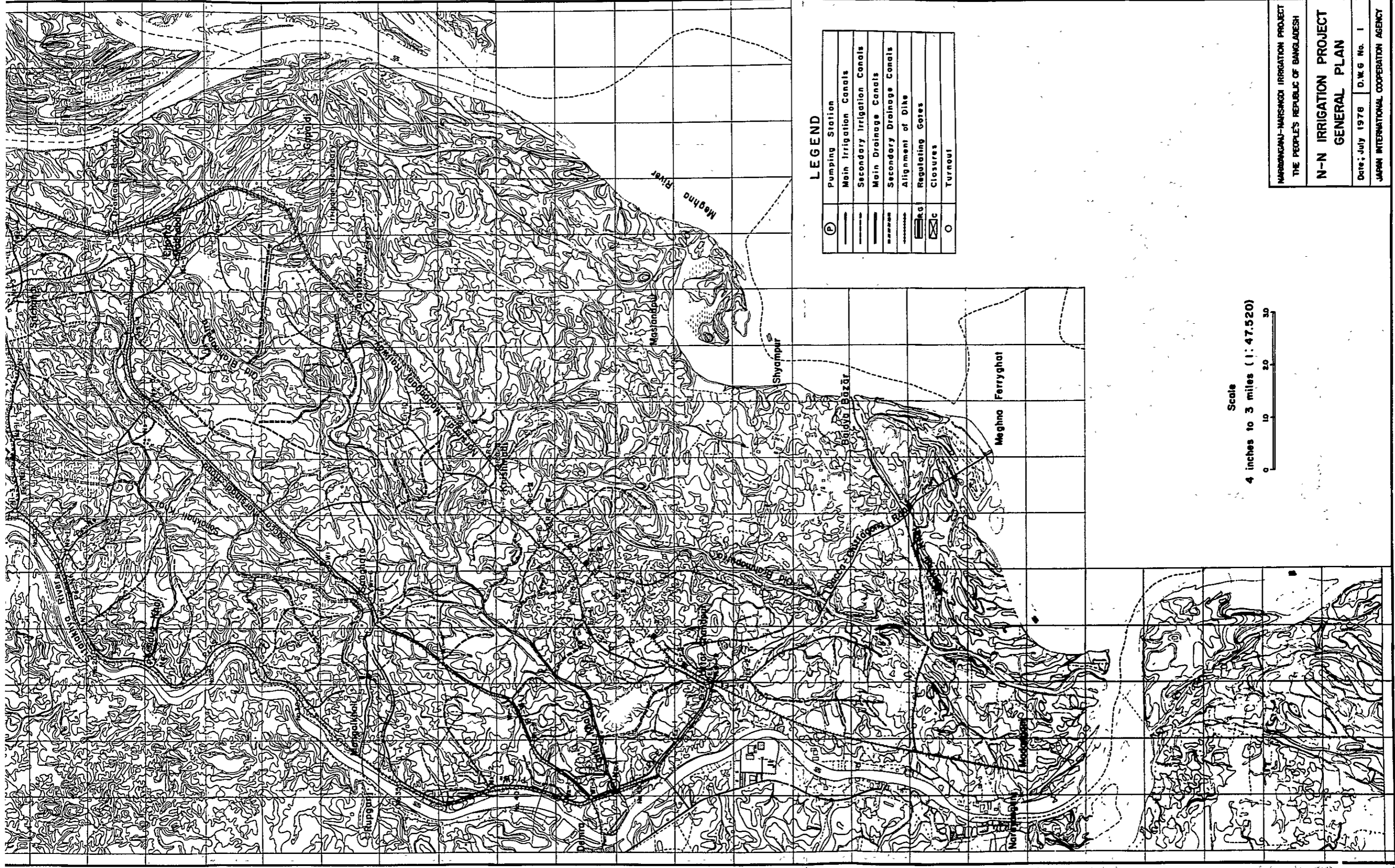


BANGLADESH · N-N IRRIGATION PROJECT



LEGEND

⊙	Pumping Station
—	Main Irrigation Canals
—	Secondary Irrigation Canals
—	Main Drainage Canals
—	Secondary Drainage Canals
—	Alignment of Dike
—	Regulating Gates
⊗	Closures
○	Turnout

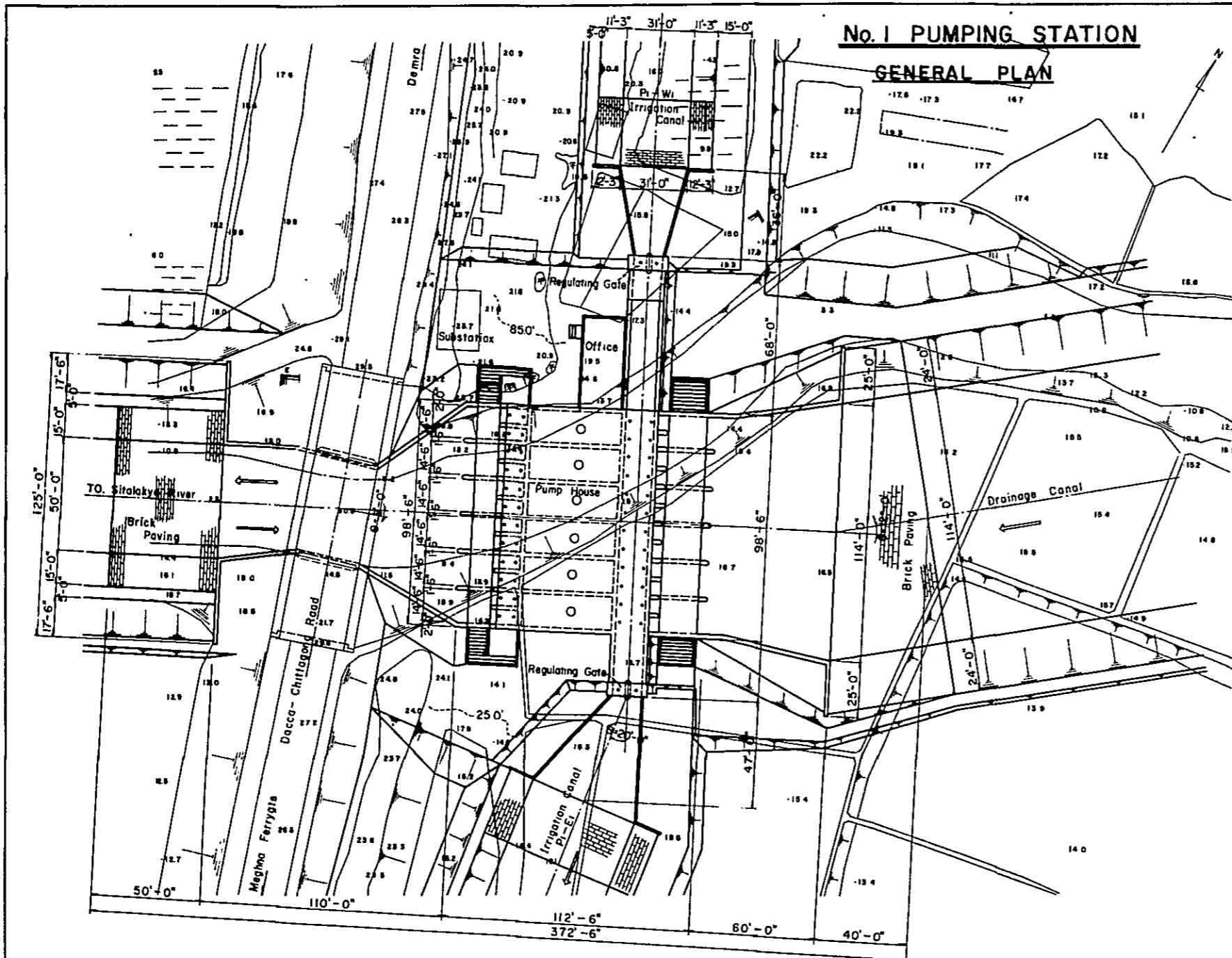


LEGEND

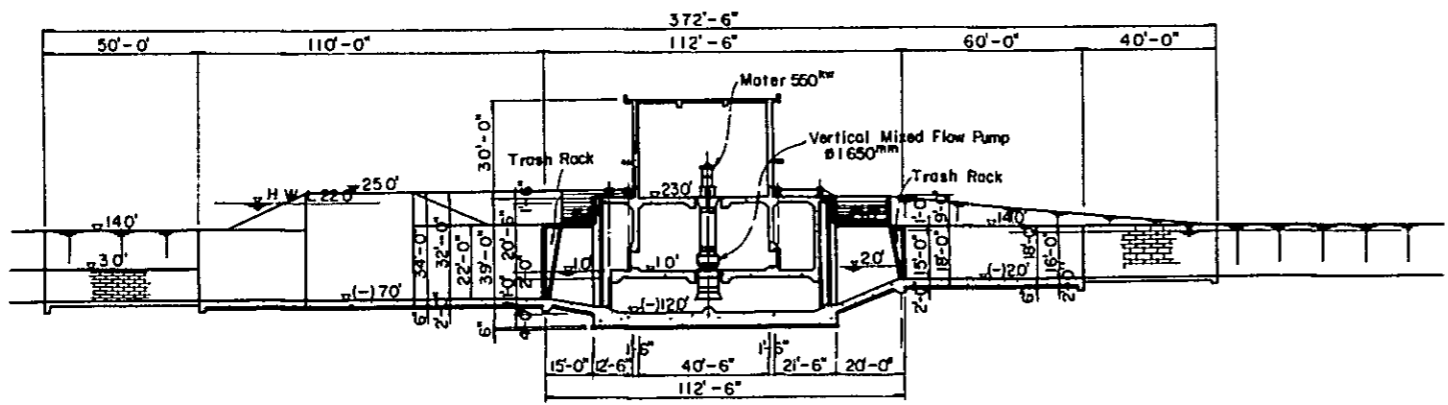
⊙	Pumping Station
—	Main Irrigation Canals
- - - - -	Secondary Irrigation Canals
—	Main Drainage Canals
- - - - -	Secondary Drainage Canals
—	Alignment of Dike
▬	Regulating Gates
⊠	Closures
○	Turnout

Scale
 4 inches to 3 miles (1:47,520)

BARBANGALI-NARAYANGI IRRIGATION PROJECT
 THE PEOPLE'S REPUBLIC OF BANGLADESH
**N-N IRRIGATION PROJECT
 GENERAL PLAN**
 Date, July 1978 D.W.G No. 1
 JAPAN INTERNATIONAL COOPERATION AGENCY



GENERAL PROFILE

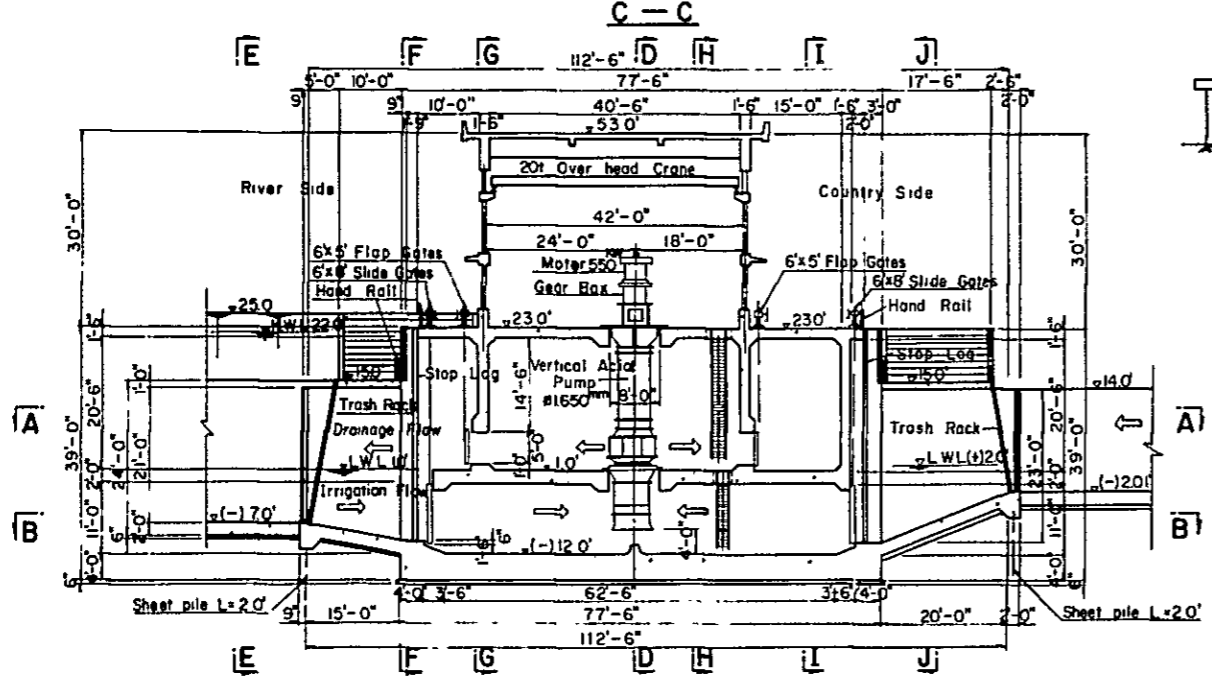
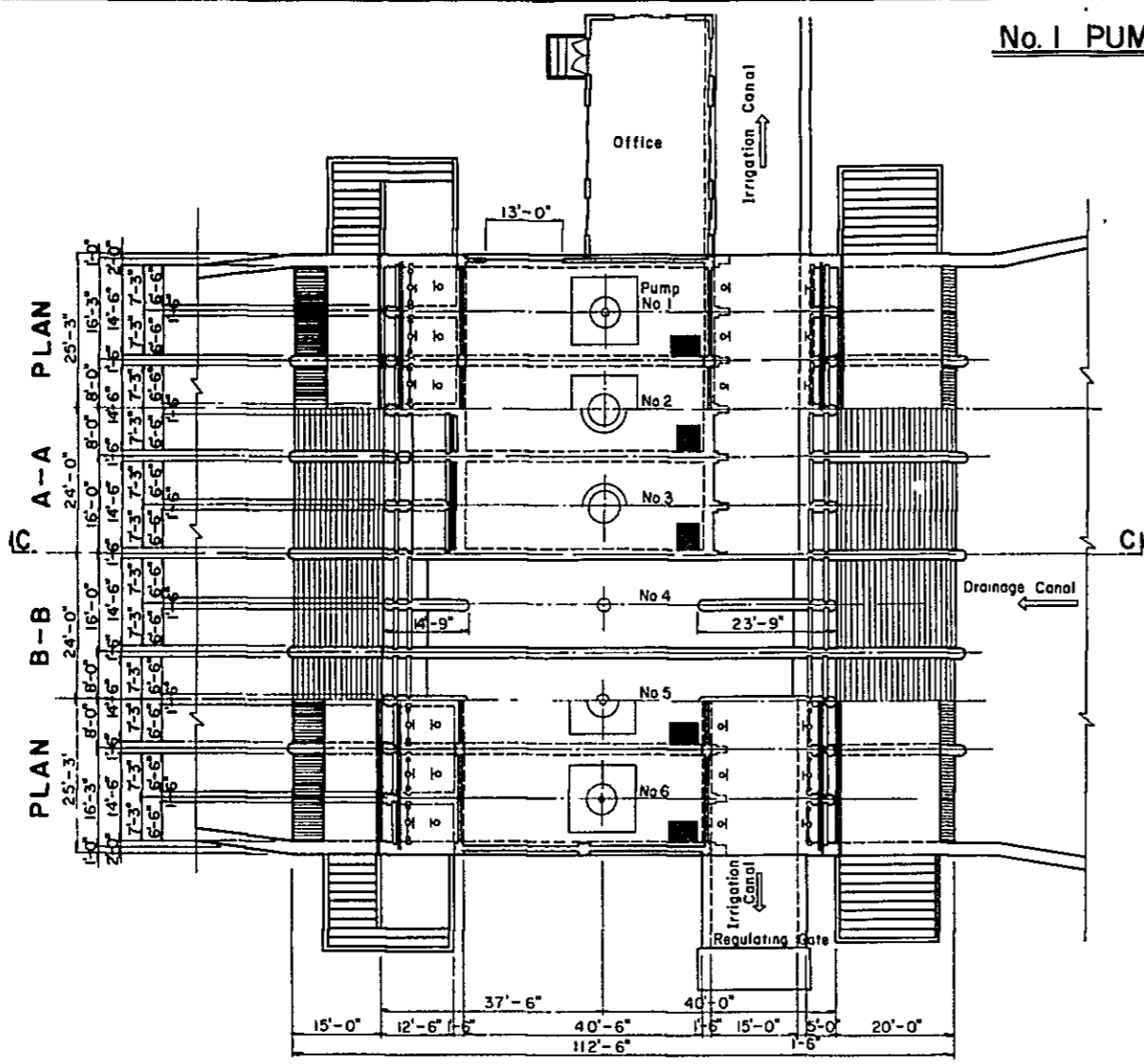


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SCALE OF FEET

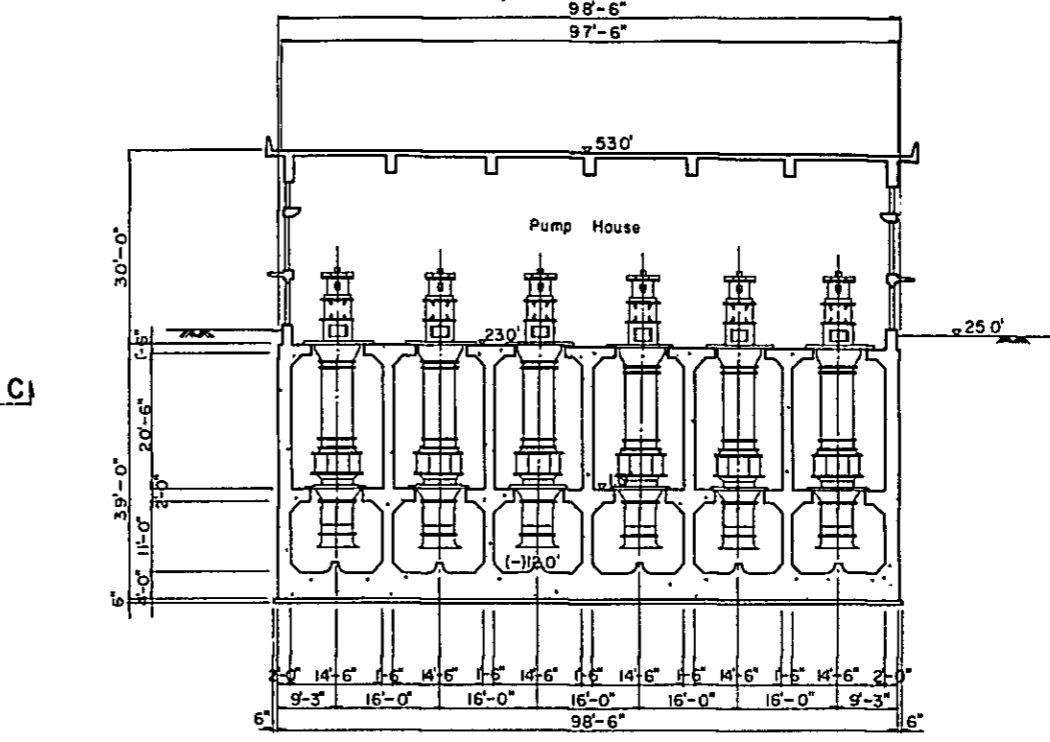
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NO.1 PUMPING STATION GENERAL PLAN	
Date: July 1978	D.W.G NO 2
JAPAN INTERNATIONAL COOPERATION AGENCY	

No.1 PUMPING STATION

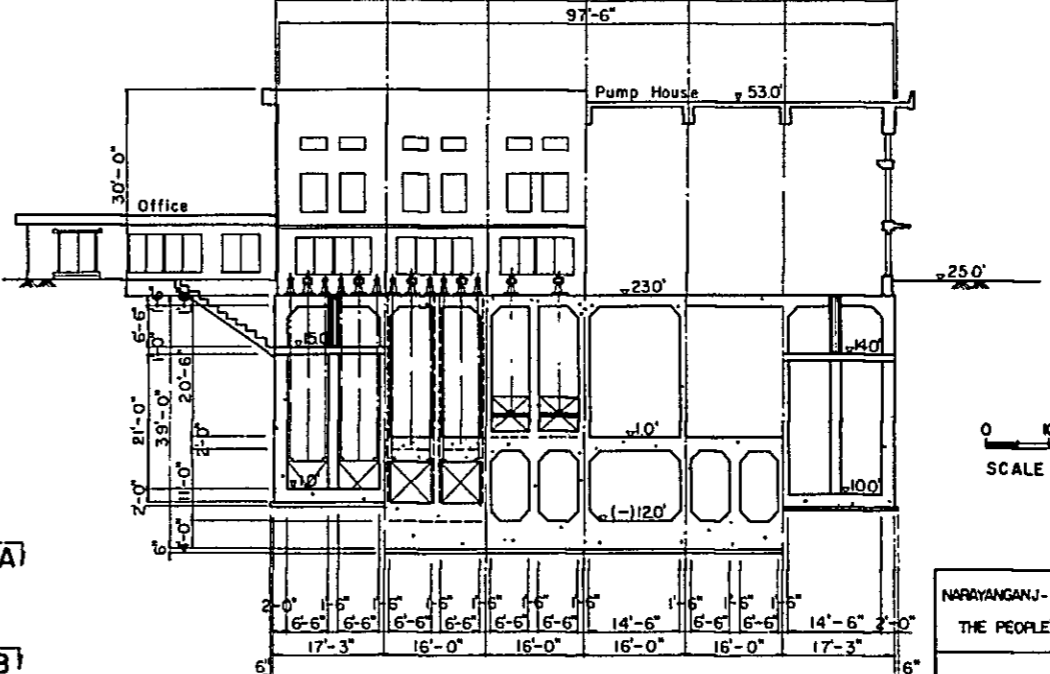
PLAN
A-A
B-B
C-C



D-D



E-E F-F G-G H-H I-I J-J

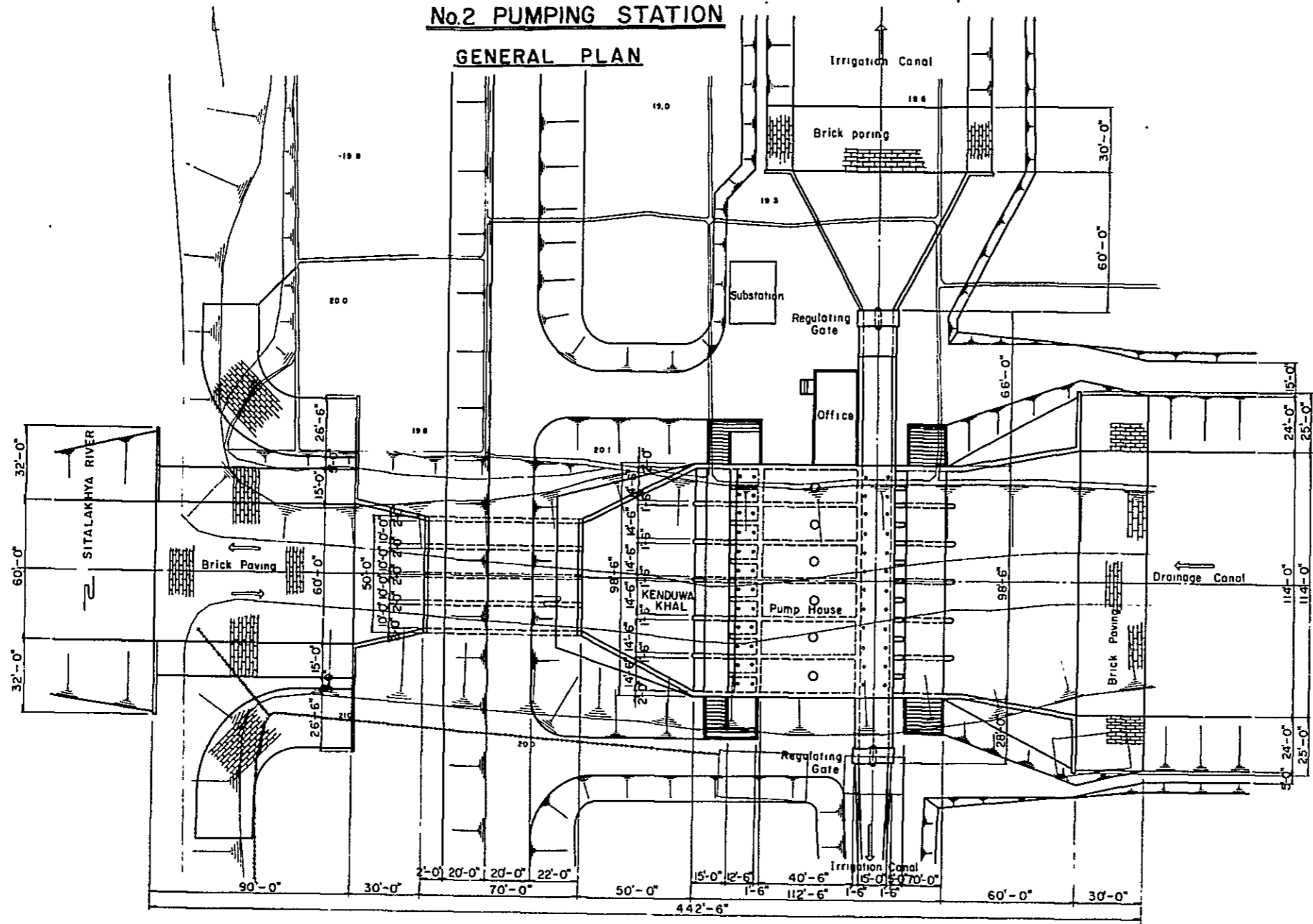


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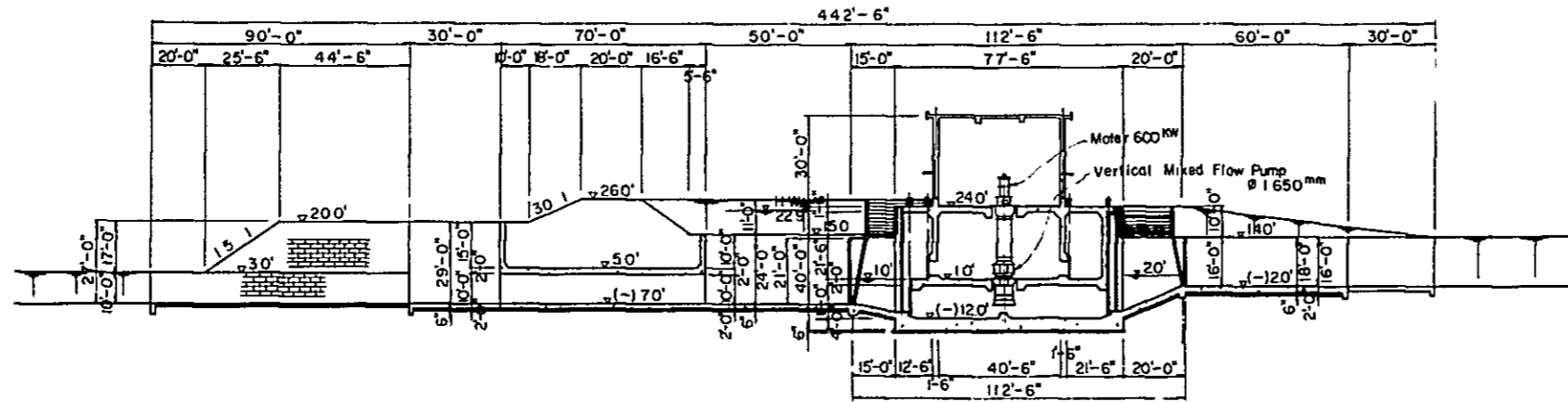
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 THE PEOPLE'S REPUBLIC OF BANGLADESH
NO.1 PUMPING STATION
PLAN AND SECTIONS
 Date: July 1978 DWG NO 3
 JAPAN INTERNATIONAL COOPERATION AGENCY

No.2 PUMPING STATION

GENERAL PLAN



GENERAL PROFILE

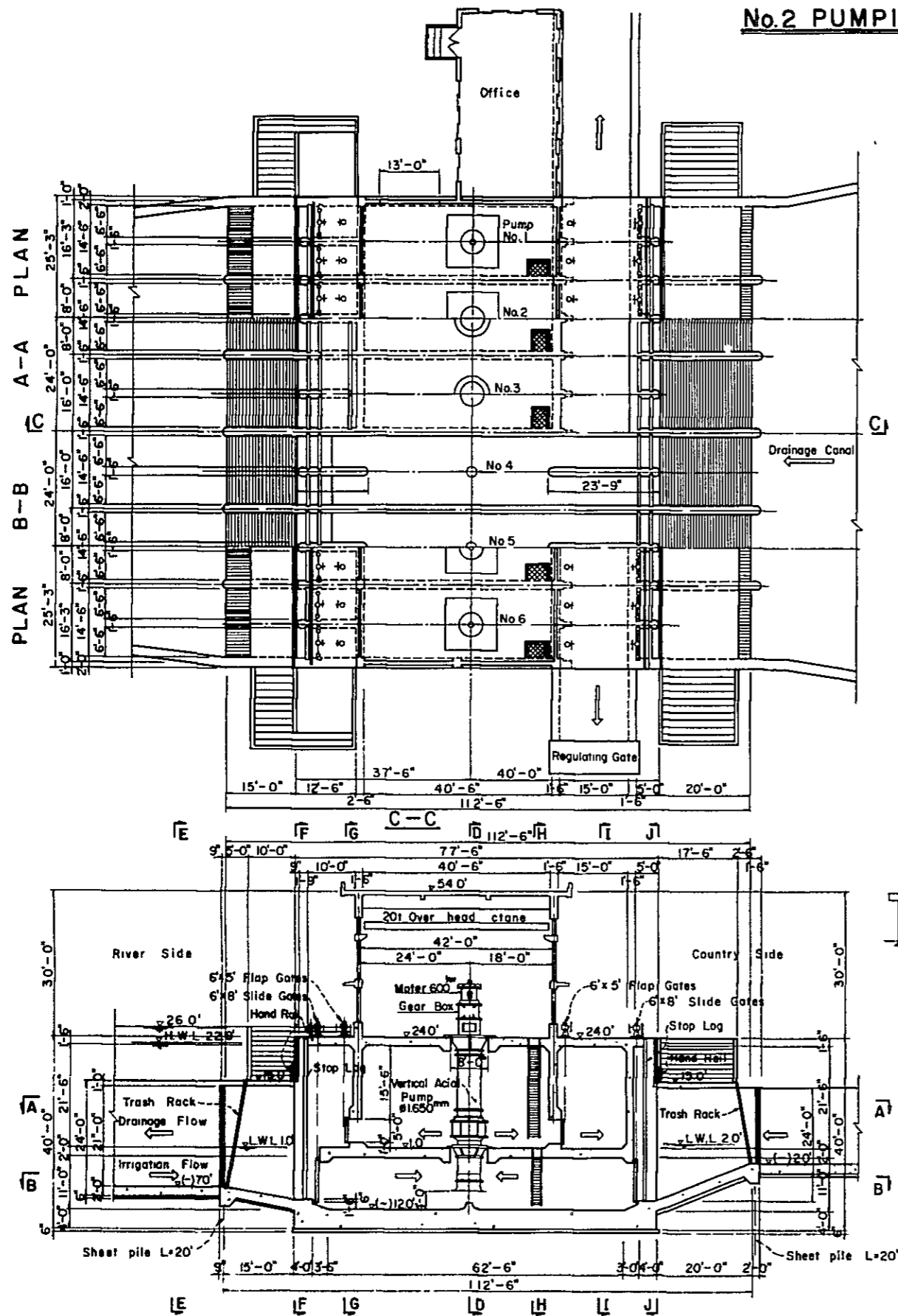


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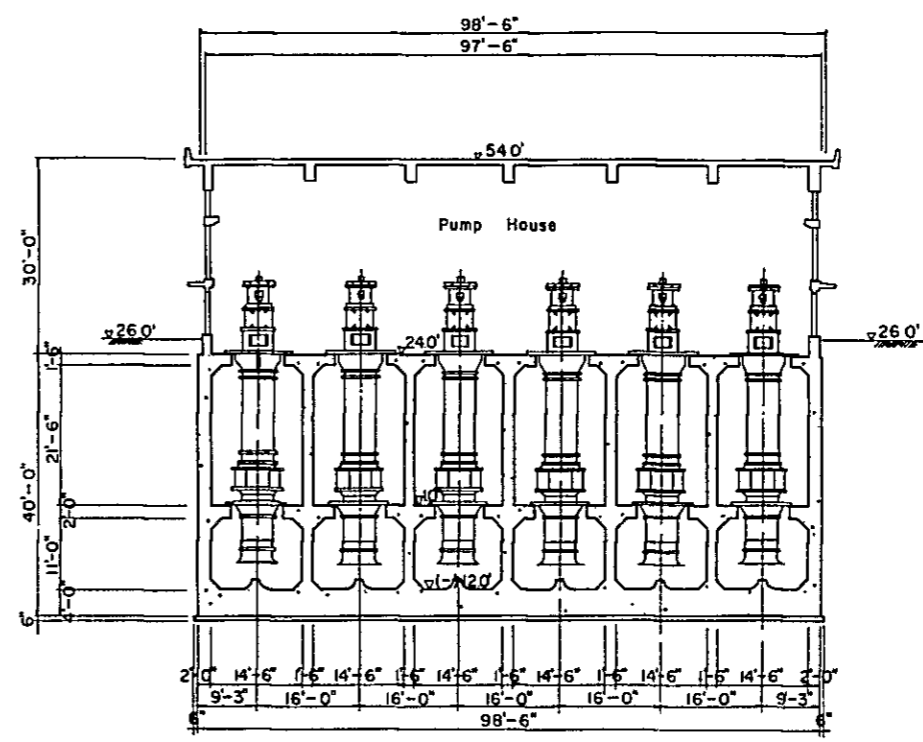
MAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
NO. 2 PUMPING STATION GENERAL PLAN	
Date; July 1978	DWG NO. 4
JAPAN INTERNATIONAL COOPERATION AGENCY	

No.2 PUMPING STATION

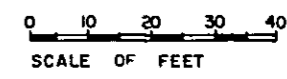
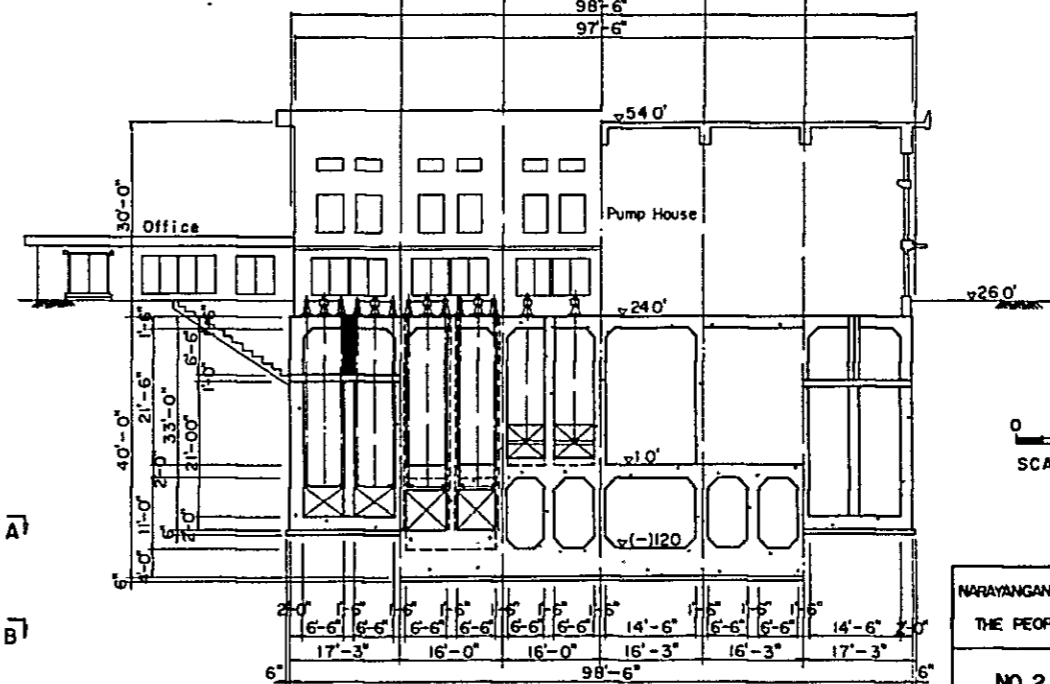
PLAN A-A PLAN B-B PLAN C-C



D-D

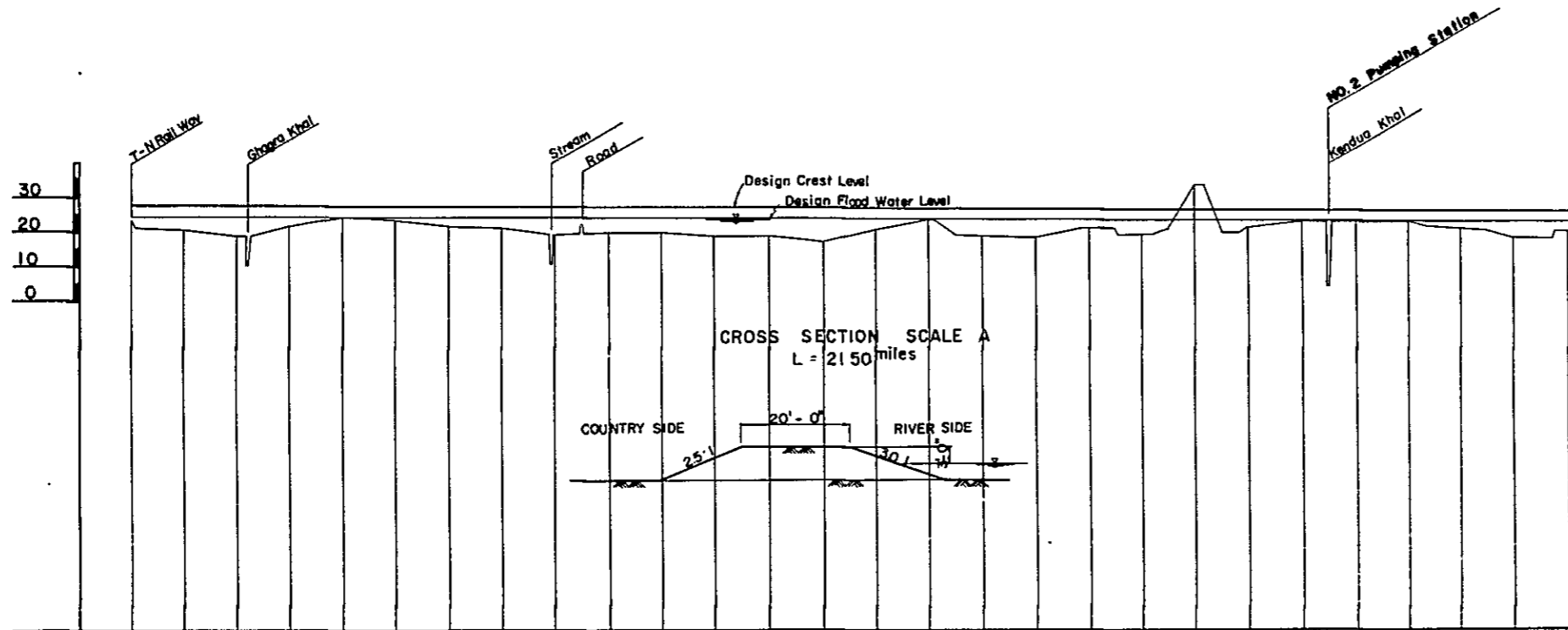


E-E F-F G-G H-H I-I J-J

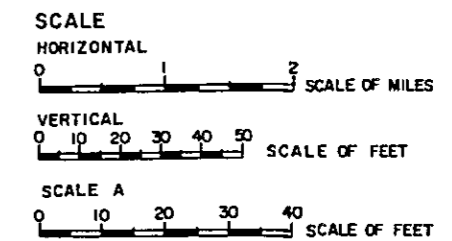


NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
 THE PEOPLE'S REPUBLIC OF BANGLADESH
NO.2 PUMPING STATION
 PLAN AND SECTIONS
 Date: July 1978 D.W.G NO. 5
 JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF SITALAKHYA RIVER DIKE 1/2



Station No.	Dist	Accum Dist	Ground Elev	Water Surf	Top of Bank	Height of Embankment	Depth of Exca	Grade
0	0.0	0.0	23.5	23.60	26.60	3.10		1:1.80,000
1	0.5	0.5	20.5	23.57	26.57	6.07		1:21,500
2	0.5	1.0	18.6	23.53	26.53	7.93		
3	0.5	1.5	21.1	23.50	26.50	5.40		
4	0.5	2.0	23.9	23.47	26.47	2.57		
5	0.5	2.5	23.0	23.43	26.43	3.43		
6	0.5	3.0	21.5	23.40	26.40	4.90		
7	0.5	3.5	21.1	23.37	26.37	5.27		
8	0.5	4.0	19.0	23.34	26.34	7.34		
9	0.5	4.5	19.5	23.30	26.30	6.80		
10	0.5	5.0	19.5	23.27	26.27	6.77		
11	0.5	5.5	18.5	23.24	26.24	7.74		
12	0.5	6.0	18.5	23.20	26.20	7.70		
13	0.5	6.5	17.0	23.17	26.17	9.17		
14	0.5	7.0	20.2	23.14	26.14	8.94		
15	0.5	7.5	23.1	23.10	26.10	3.00		
16	0.5	8.0	18.5	23.07	26.07	7.57		
17	0.5	8.5	18.2	23.04	26.04	7.84		
18	0.5	9.0	20.5	23.01	26.01	5.51		
19	0.5	9.5	19.0	22.97	25.97	6.97		
20	0.5	10.0	33.5	22.94	25.94			
21	0.5	10.5	20.7	22.91	25.91	5.21		
22	0.5	11.0	22.6	22.87	25.87	3.27		
23	0.5	11.5	22.5	22.84	25.84	3.34		
24	0.5	12.0	22.5	22.81	25.81	3.31		
25	0.5	12.5	20.2	22.77	25.77	5.57		
26	0.5	13.0	17.5	22.74	25.74	8.24		
27	0.5	13.5	19.5	22.71	25.71	6.21		



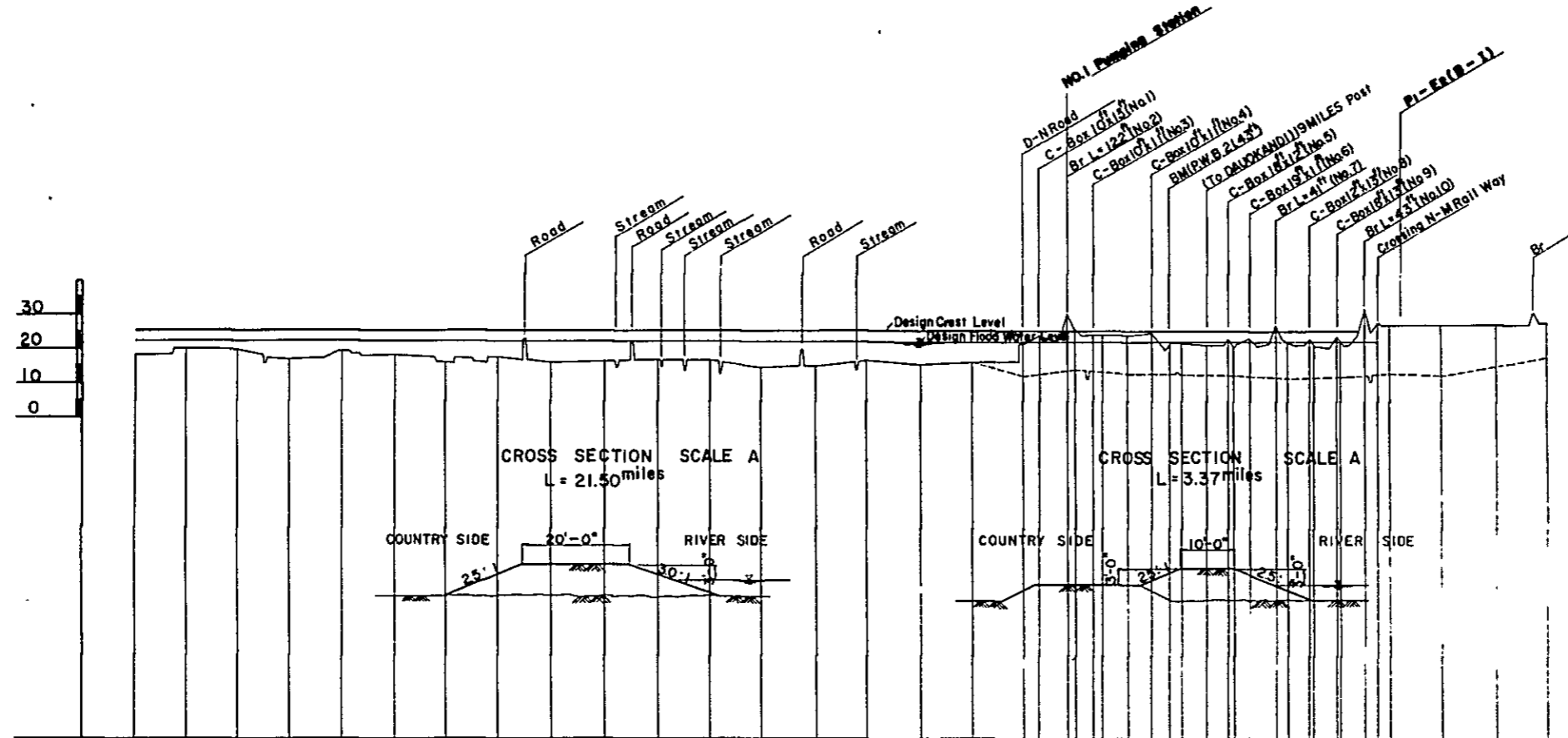
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

SITALAKHYA RIVER DIKE
PROFILE AND CROSS SECTIONS (1/2)

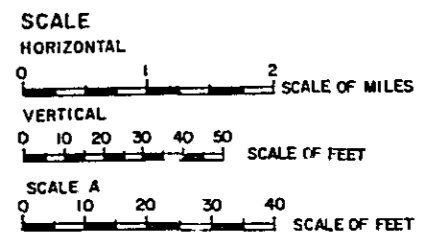
Date: July 1978 D.W.G No 6

JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF SITALAKHYA RIVER DIKE 2/2



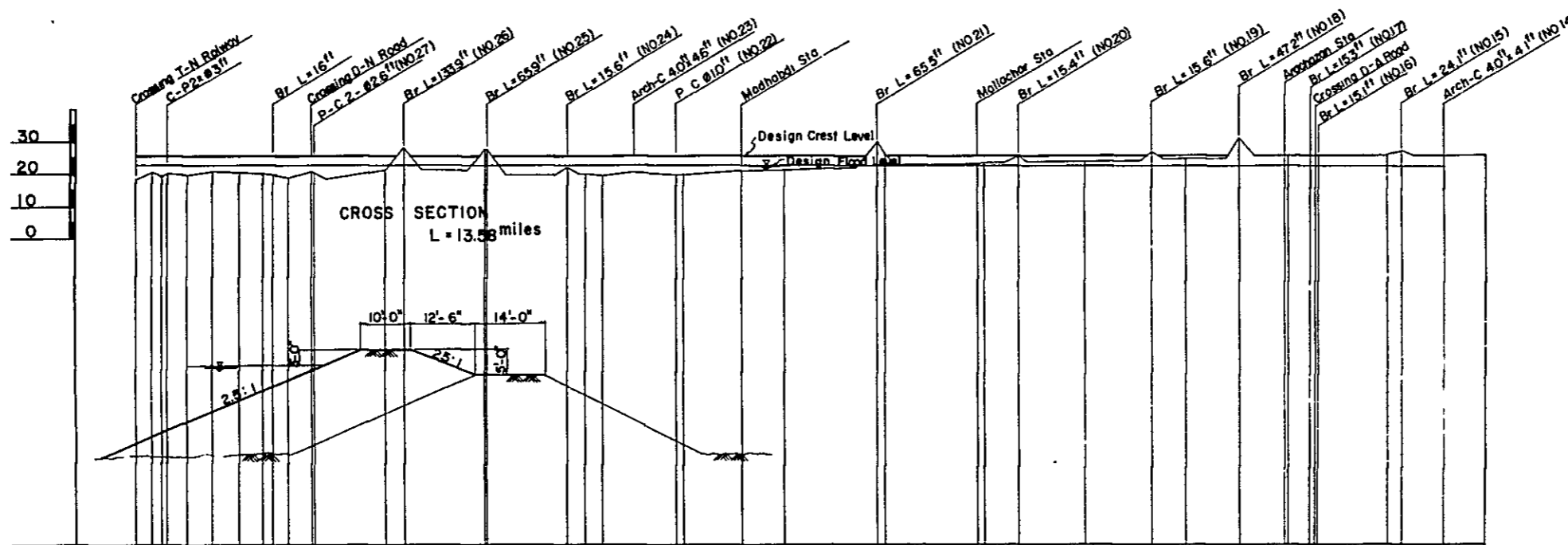
Station No.	Dist	Accum Dist	Ground Elev	Water Surf	Top of Bank	Height of Embankment	Depth of Exca	Grade
26	0.5	13.0	17.5	22.74	25.74	8.24		
27	0.5	13.5	18.5	22.71	25.71	6.21		
28	0.5	14.0	19.0	22.66	25.66	6.66		
29	0.5	14.5	18.3	22.64	25.64	7.34		
30	0.5	15.0	18.9	22.61	25.61	7.11		
31	0.5	15.5	17.5	22.58	25.58	8.08		
32	0.5	16.0	15.5	22.54	25.54	10.04		
33	0.5	16.5	17.1	22.51	25.51	8.41		
34	0.5	17.0	15.5	22.48	25.48	9.98		
35	0.5	17.5	15.8	22.44	25.44	9.64		
36	0.5	18.0	16.4	22.41	25.41	9.01		
37	0.5	18.5	16.0	22.38	25.38	9.38		
38	0.5	19.0	14.0	22.35	25.35	11.35		
39	0.5	19.5	14.7	22.31	25.31	10.61		
40	0.5	20.0	16.6	22.28	25.28	8.68		
41	0.5	20.5	15.1	22.25	25.25	10.15		
42	0.5	21.0	15.9	22.21	25.21	9.41		
43	0.5	21.5	21.4	22.18	25.18	3.78	5.38	1:1/100,000 L=21.50 miles
43	0.16	21.66	23.9	22.18	25.18	1.28	0.39	
44	0.28	21.94	25.5	22.12	25.12	0.87		
44	0.28	22.0	25.5	22.11	25.11	0.89		
45	0.09	22.09	24.2	22.07	25.07	0.87		
45	0.25	22.5	24.1	22.03	25.03	0.93		
46	0.10	22.60	24.9	21.93	24.93	3.01	1.97	
46	0.10	22.70	21.8	21.81	24.81	3.01		
47	0.20	22.90	23.0	21.78	24.78	1.78		
47	0.20	23.0	23.0	21.78	24.78	1.78		
48	0.05	23.05	23.5	21.74	24.74	2.24		
48	0.05	23.10	23.5	21.74	24.74	2.24		
49	0.25	23.35	31.8	21.70	24.70	3.00	6.90	
49	0.25	23.40	24.8	21.69	24.69	2.99	3.11	
50	0.13	23.53	27.0	21.69	24.69	3.11		
51	0.5	24.0	27.2	21.69	24.69	3.11		
52	0.5	24.5	27.2	21.69	24.69	3.11		
53	0.5	25.0	28.0	21.69	24.69	3.11		



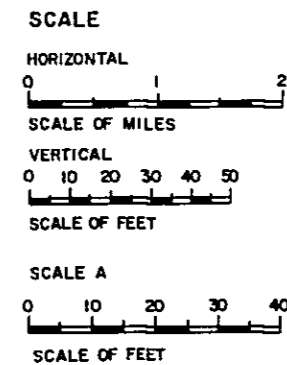
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
 THE PEOPLE'S REPUBLIC OF BANGLADESH

SITALAKHYA RIVER DIKE
PROFILE AND CROSS SECTIONS(%)
 Date; July 1978 DWG NO 7
 JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NARSINGDI-MADANGANJ RAILWAY 1/2



Grade	1:1/40,000 L = 13.58 Miles																				
Depth of Exca																					
Height of Emban	8.50	8.88	8.97	7.25	5.83	6.30	6.88	7.36	8.64	5.47											
Top of Bank	25.70	25.70	25.70	25.85	25.83	25.80	25.98	25.96	25.84	25.47											
Water Surf	22.70	22.70	22.70	22.85	22.83	22.80	22.98	22.96	22.84	22.47											
Ground Elev	17.2	18.3	18.4	18.4	18.8	19.3	19.9	19.2	18.8	20.0											
Accum Dist	-1.58	-1.58	-1.58	-1.00	-0.75	-0.50	-0.25	0	8.67	1.00											
Dist	-0.25	-0.09	-0.07	-0.25	-0.25	-0.25	-0.25	0	8.67	0.72											
Station No.	-0.58	-0.33	-0.27	0	-0.75	-0.50	-0.25	0	+8.67	+0.19											



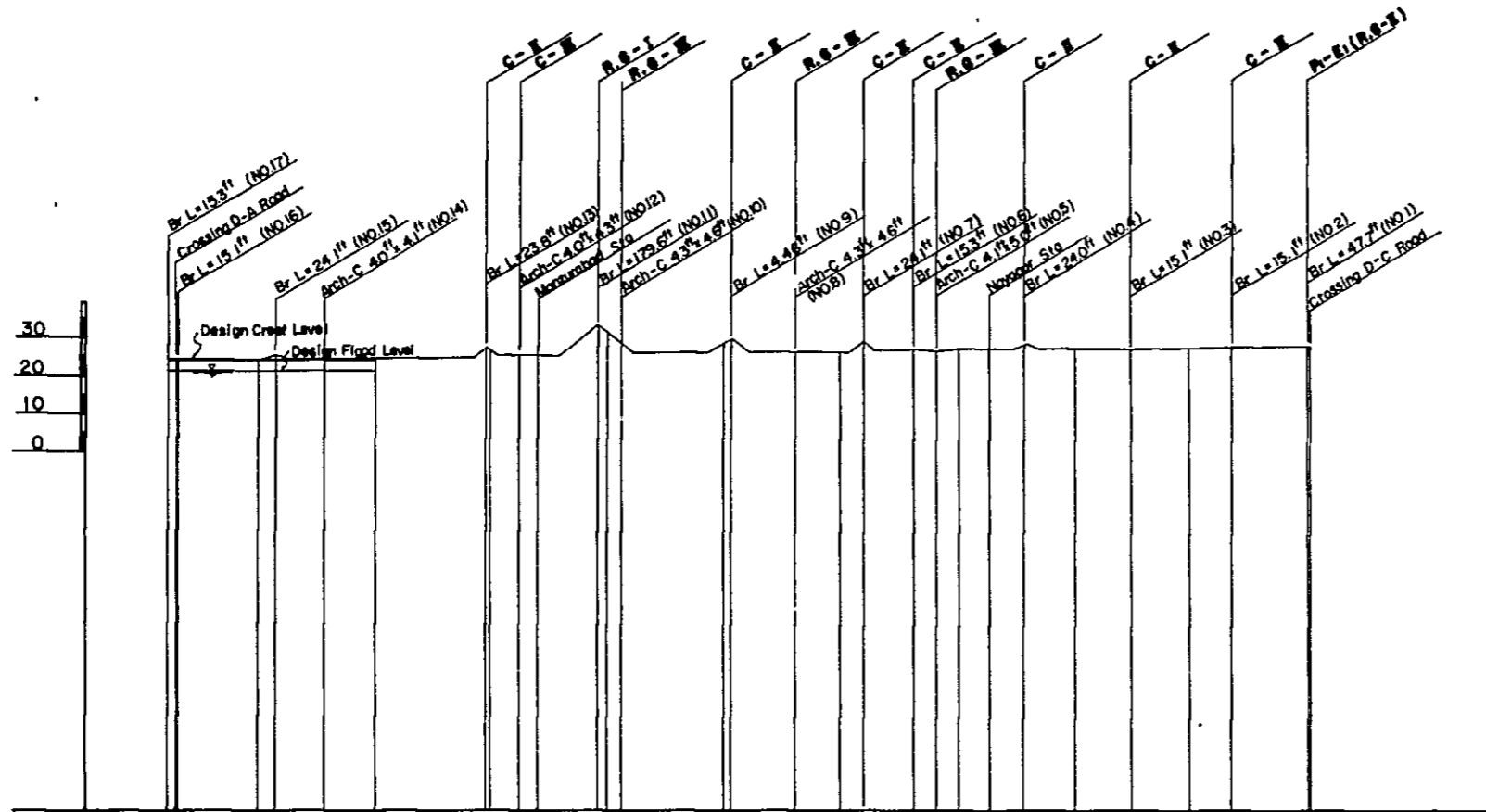
NARSINGDI-MADANGANJ IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**N - M RAILWAY BANK
PROFILE AND CROSS SECTIONS**

Date: July 1978 DWG NO 8

JAPAN INTERNATIONAL COOPERATION AGENCY

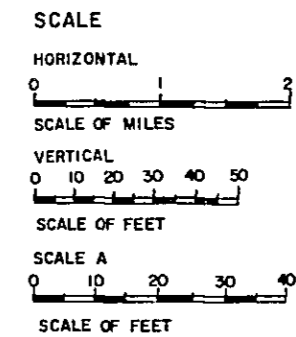
PROFILE OF NARSINGDI-MADANGANJ RAILWAY 2/2



LEGEND

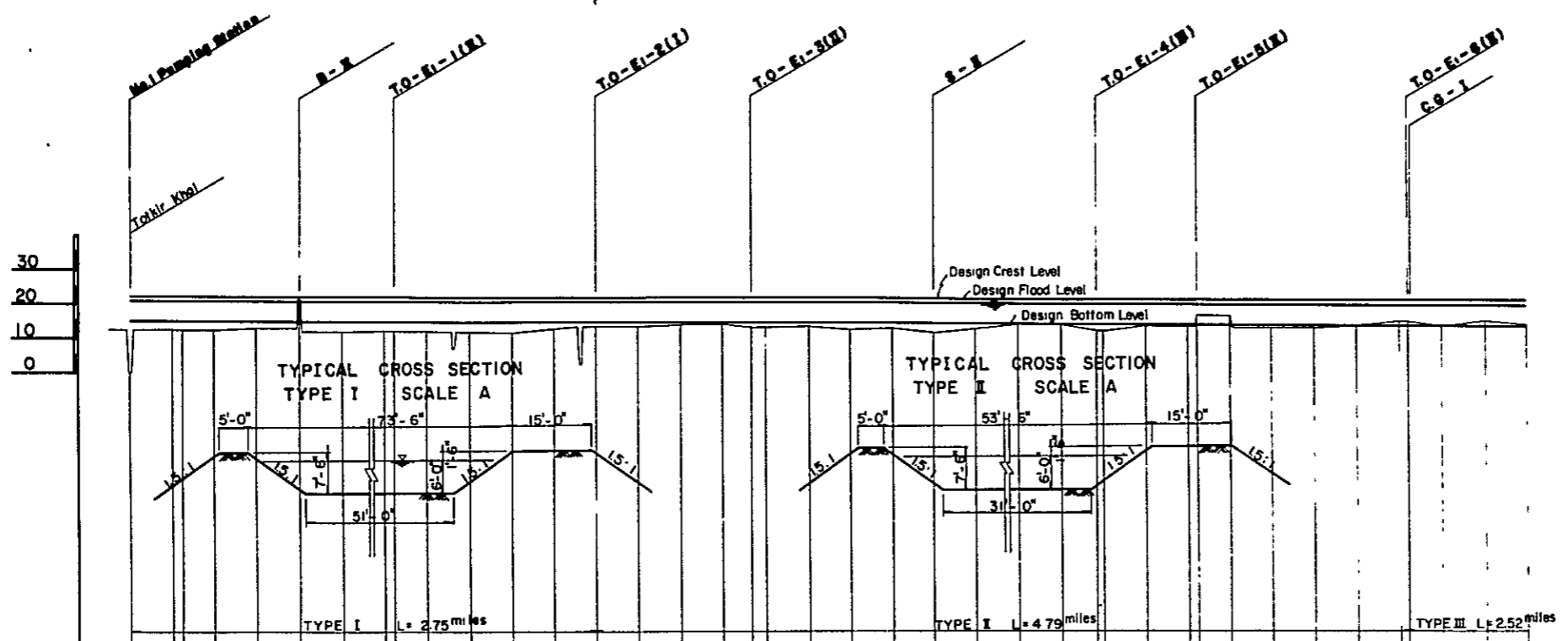
T.O.	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
C.G.	CHECK GATE
R.G.	REGULATING GATE

Grade		
Depth of Exca	0.96	0.72
Hight of Emben	1.08	0.98
Top of Bank	24.68	24.58
Water Surf	21.68	21.58
Ground Elev	23.6	24.0
Accum Dist	10.00	11.00
Dist	0.02	0.70
Station No.	10	11



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
N - M RAILWAY BANK	
PROFILE AND CROSS SECTIONS (2/2)	
Date: July 1978	D.W.G. NO. 9
JAPAN INTERNATIONAL COOPERATION AGENCY	

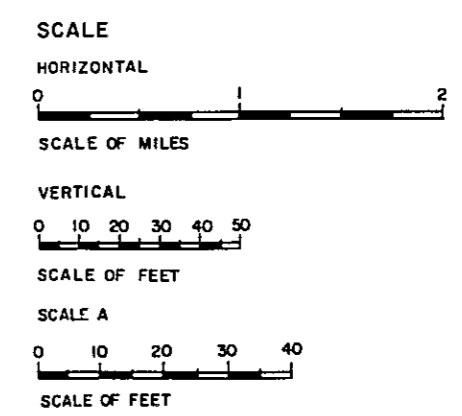
**PROFILE OF NO.1 PUMPING STATION
P₁-E₁ MAIN IRRIGATION CANAL 1/2**



LEGEND

- T.O. TURNOUT
- A. AQUEDUCT
- S. SIPHON
- B. BRIDGE
- C.G. CHECK GATE
- R.G. REGULATING GATE

Station No.	Grade		Depth of Exca	Height of Emban	Top of Bank	Water Surf	Bottom of Canal	Ground Elev	Accum Dist	Dist
	(ft)	(m)								
0	15.00	4.57		15.00	22.50	21.00	15.00	0	0	0
1	14.83	4.52	0.17	2.32	22.42	20.92	14.83	0.17	0.17	0.26
2	14.87	4.54	0.13	2.27	22.37	20.87	14.87	0.50	0.19	0.45
3	14.80	4.51	0.20	1.80	22.30	20.80	14.80	0.75	0.25	0.70
4	14.74	4.49	0.26	1.60	22.24	20.74	14.74	1.00	0.25	1.25
5	14.67	4.46	0.33	2.97	22.17	20.67	14.67	1.25	0.25	1.50
6	14.60	4.44	0.40	2.70	22.10	20.60	14.60	1.50	0.05	1.55
7	14.54	4.43	0.46	2.54	22.04	20.54	14.54	1.75	0.20	1.75
8	14.47	4.42	0.53	2.57	21.97	20.47	14.47	2.00	0.25	2.00
9	14.41	4.40	0.59	2.91	21.91	20.41	14.41	2.25	0.25	2.25
10	14.34	4.39	0.66	1.84	21.84	20.34	14.34	2.50	0.25	2.50
11	14.27	4.37	0.73	0.97	21.77	20.27	14.27	2.75	0.25	2.75
12	14.21	4.35	0.79	0.71	21.71	20.21	14.21	3.00	0.25	3.00
13	14.14	4.33	0.86	0.64	21.64	20.14	14.14	3.25	0.25	3.25
14	14.08	4.32	0.92	0.38	21.58	20.08	14.08	3.50	0.25	3.50
15	14.03	4.31	0.97	1.33	21.53	20.03	14.03	3.67	0.17	3.67
16	14.01	4.30	1.01	1.21	21.51	20.01	14.01	3.75	0.08	3.75
17	13.94	4.29	1.06	1.04	21.44	19.94	13.94	4.00	0.25	4.00
18	13.88	4.28	1.12	1.68	21.38	19.88	13.88	4.25	0.25	4.25
19	13.81	4.27	1.19	1.51	21.31	19.81	13.81	4.50	0.25	4.50
20	13.75	4.26	1.25	2.75	21.25	19.75	13.75	4.75	0.25	4.75
21	13.68	4.25	1.32	1.58	21.18	19.68	13.68	5.00	0.25	5.00
22	13.61	4.24	1.37	0.51	21.11	19.61	13.61	5.25	0.25	5.25
23	13.55	4.23	1.42	0.25	21.05	19.55	13.55	5.50	0.25	5.50
24	13.48	4.22	1.47	2.08	20.98	19.48	13.48	5.71	0.11	5.71
25	13.42	4.21	1.51	2.08	20.92	19.42	13.42	6.00	0.25	6.00
26	13.35	4.20	1.57	0.95	20.85	19.35	13.35	6.25	0.25	6.25
27	13.33	4.19	1.60	2.67	20.83	19.33	13.33	6.31	0.06	6.31
28	13.28	4.18	1.64	2.12	20.78	19.28	13.28	6.50	0.19	6.50
29	13.22	4.17	1.68	0.72	20.72	19.22	13.22	6.75	0.25	6.75
30	13.15	4.16	1.72	0.65	20.65	19.15	13.15	7.00	0.25	7.00
31	13.09	4.15	1.75	0.09	20.59	19.09	13.09	7.25	0.25	7.25
32	13.02	4.14	1.88	0.55	20.52	19.02	13.02	7.50	0.04	7.50
33	12.82	4.11	2.18	0.18	20.39	18.89	12.82	8.25	0.25	8.25



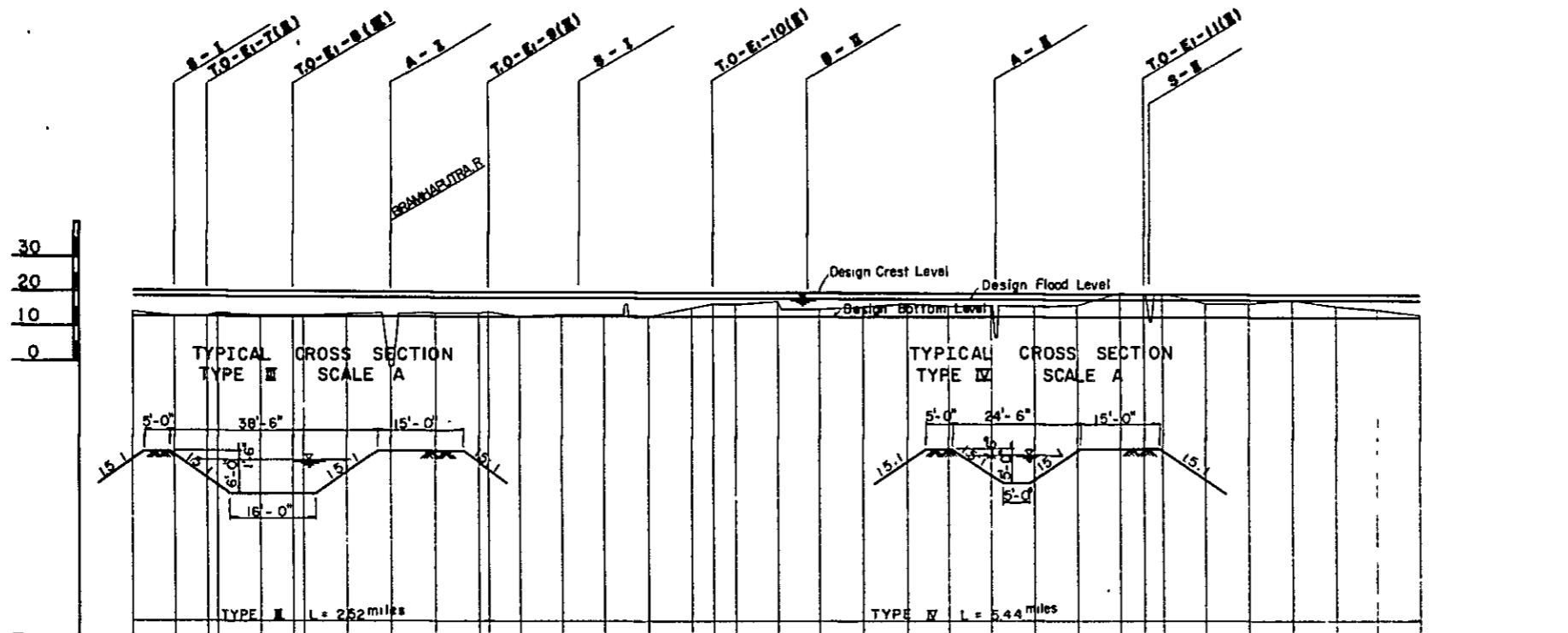
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

P₁-E₁ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (1/2)

Date; July 1978 DWG NO 10

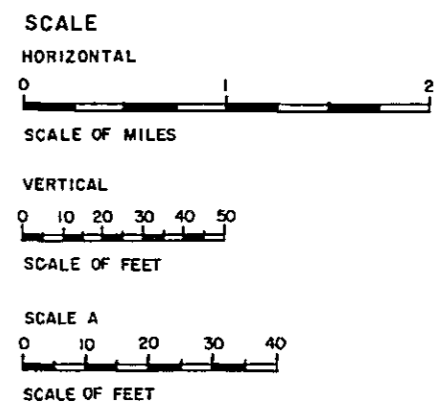
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.1 PUMPING STATION P-E₁ MAIN IRRIGATION CANAL ½



- LEGEND**
- T.O. TURNOUT
 - A. AQUEDUCT
 - S. SIPHON
 - B. BRIDGE
 - CG. CHECK GATE
 - RG. REGULATING GATE

Grade	I = 20,000 L = 15.30 miles																																		
Depth of Exca	1.11	0.18	0.03	0.74	0.31	0.48	0.64		1.37	1.34	1.46			1.97	3.20	3.04	4.10	1.67	2.53	3.30	2.77	3.03	2.90	3.57	6.63	6.17	6.70	3.76	4.13	5.10	3.16	2.53	0.59		
Height of Emban								10.99			0.99																								
Top of Bank	20.39	20.32	20.27	20.28	20.19	20.14	20.12		19.99	19.93	19.85			19.53	19.50	19.46	19.40	19.33	19.27	19.20	19.13	19.07	19.00	18.93	18.87	18.83	18.80	18.74	18.67	18.60	18.54	18.47	18.41		
Water Surf	18.89	18.82	18.77	18.78	18.69	18.64	18.62		18.49	18.43	18.35			18.03	18.00	17.96	17.90	17.83	17.77	17.70	17.63	17.57	17.50	17.43	17.37	17.33	17.30	17.24	17.17	17.10	17.04	16.97	16.91		
Bottom of Canal	12.89	12.62	12.77	12.78	12.69	12.64	12.62		12.49	12.43	12.35			12.03	12.00	11.96	11.90	11.83	11.77	11.70	11.63	11.57	11.50	11.43	11.37	11.33	11.30	11.24	11.17	11.10	11.04	10.97	10.91		
Ground Elev	14.0	13.0	12.8	13.5	13.0	13.1	13.2		13.8	13.7	13.6			15.0	16.2	16.0	17.0	14.5	15.3	16.0	15.4	15.6	15.4	16.0	18.0	18.5	19.0	16.0	16.3	17.2	15.2	14.5	12.5		
Accum Dist	0.00	8.23	8.44	8.50	8.75	8.94	9.00		9.50	9.75	10.00			11.25	11.37	11.50	11.75	12.00	12.25	12.50	12.75	13.00	13.25	13.50	13.75	13.90	14.00	14.25	14.50	14.75	15.00	15.25	15.50		
Dist	0.25	0.25	0.18	0.06	0.25	0.19	0.06		0.25	0.25	0.25			0.25	0.12	0.13	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.10	0.25	0.25	0.25	0.25	0.25	0.25		
Station No.	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	EP				



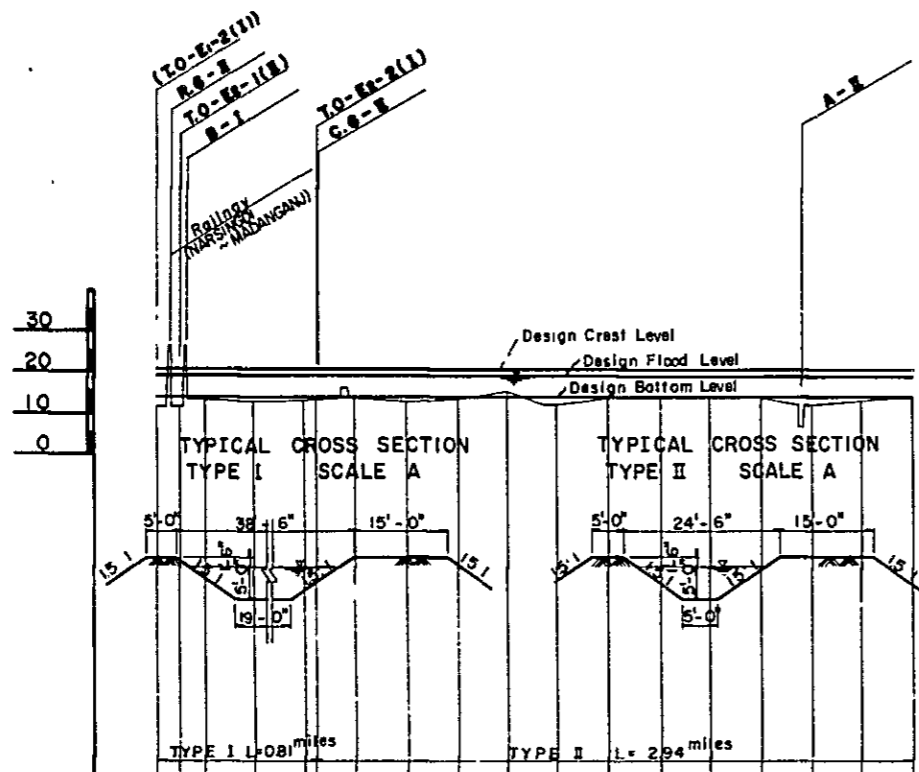
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**P-E₁ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (½)**

Date: July 1978 DWG NO 11

JAPAN INTERNATIONAL COOPERATION AGENCY

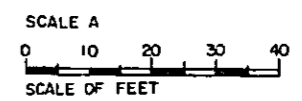
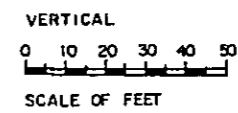
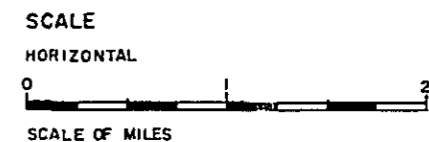
PROFILE OF NO.1 PUMPING STATION
P₁ - E₂ MAIN IRRIGATION CANAL



Grade	(1+00)	$L = 1/20,000$ $L = 3.75$ miles																(1+00)									
Depth of Exca																			0.96					0.16			
Height of Emban		0.70	2.47	0.73	1.17	0.70	0.89	0.24	0.60		1.87	0.41	0.27	0.21	1.84	0.36	0										
Top of Bank		20.50	20.47	20.43	20.37	20.30	20.28	20.24	20.10		19.97	19.91	19.84	19.77	19.71	19.64	19.58	0									
Water Surf		19.00	18.97	18.93	18.87	18.80	18.79	18.74	18.60		18.47	18.41	18.34	18.27	18.21	18.14	18.08	18.00	19.50								
Bottom of Canal		14.00	13.97	13.93	13.87	13.80	13.79	13.74	13.60		13.47	13.41	13.34	13.27	13.21	13.14	13.08	13.00	19.50								
Ground Elev		13.3	11.5	13.2	12.7	13.1	13.1	13.5	13.0		11.6	13.0	13.5	13.0	13.0	11.3	12.5	13.0	19.50								
Accum Dist		0	0.11	0.25	0.50	0.75	0.81	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75								
Dist		0	0.11	0.14	0.23	0.25	0.06	0.19	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25								
Station No		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	EP										

LEGEND

TO	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
C.G	CHECK GATE
R.G	REGULATING GATE



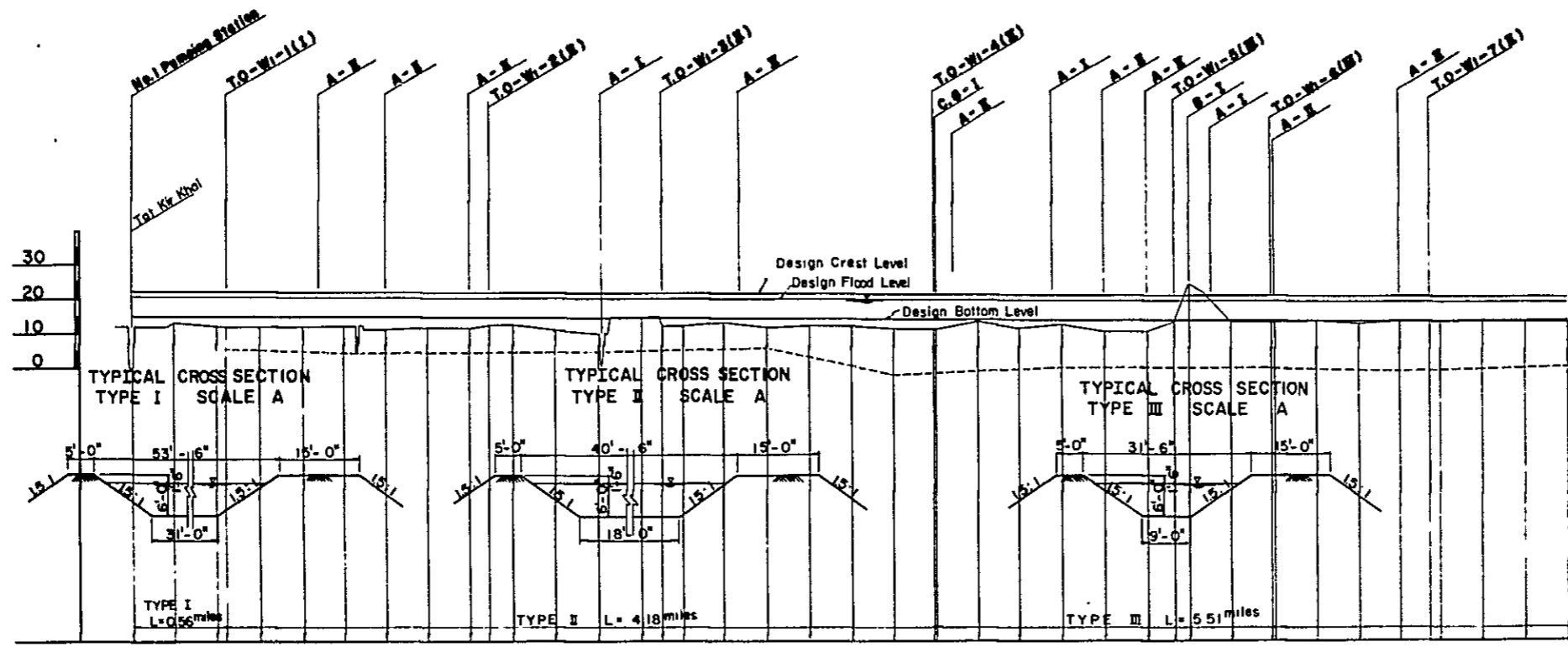
NARAYANGANJ-NARSINGI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

P₁-E₂ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS

Date: July 1976 DWG NO 12

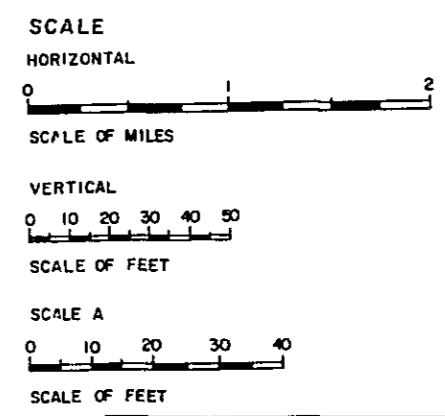
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.1 PUMPING STATION P₁-W₁ MAIN IRRIGATION CANAL 1/2



- LEGEND**
- T.O TURNOUT
 - A AQUEDUCT
 - S SIPHON
 - B BRIDGE
 - CG CHECK GATE
 - RG REGULATING GATE

Grade	15.00	
Depth of Exca		0.28
Height of Embank	15.00	2.03
Top of Bank	22.50	22.43
Water Surf	21.00	20.93
Bottom of Canal	15.00	14.93
Ground Elev	0	12.9
Accum Dist	0	0.25
Dist	0	0.25
Station No	1	2



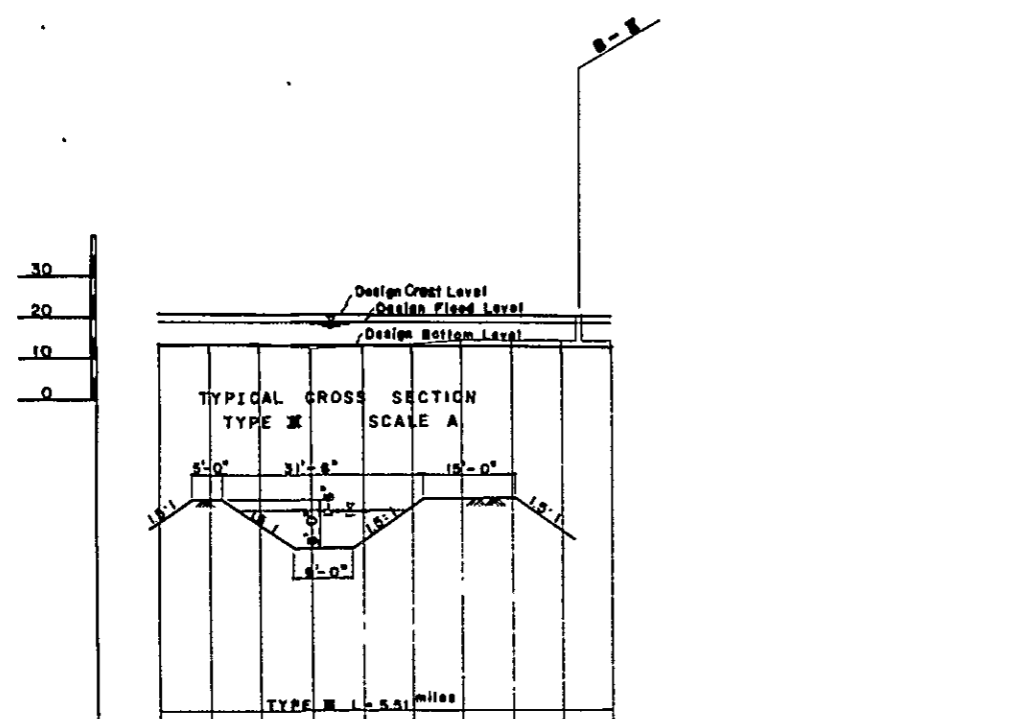
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**P₁-W₁ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (1/2)**

Date: July 1978 O.W.G. NO 13

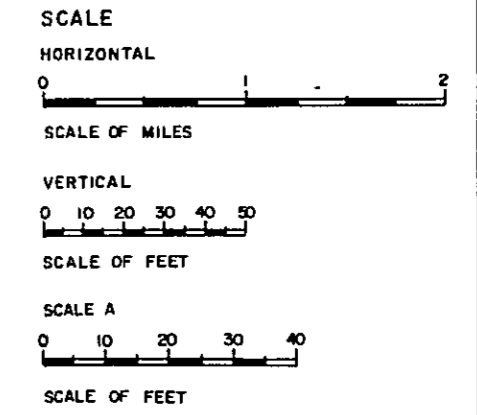
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.1 PUMPING STATION P₁-W₁ MAIN IRRIGATION CANAL ½



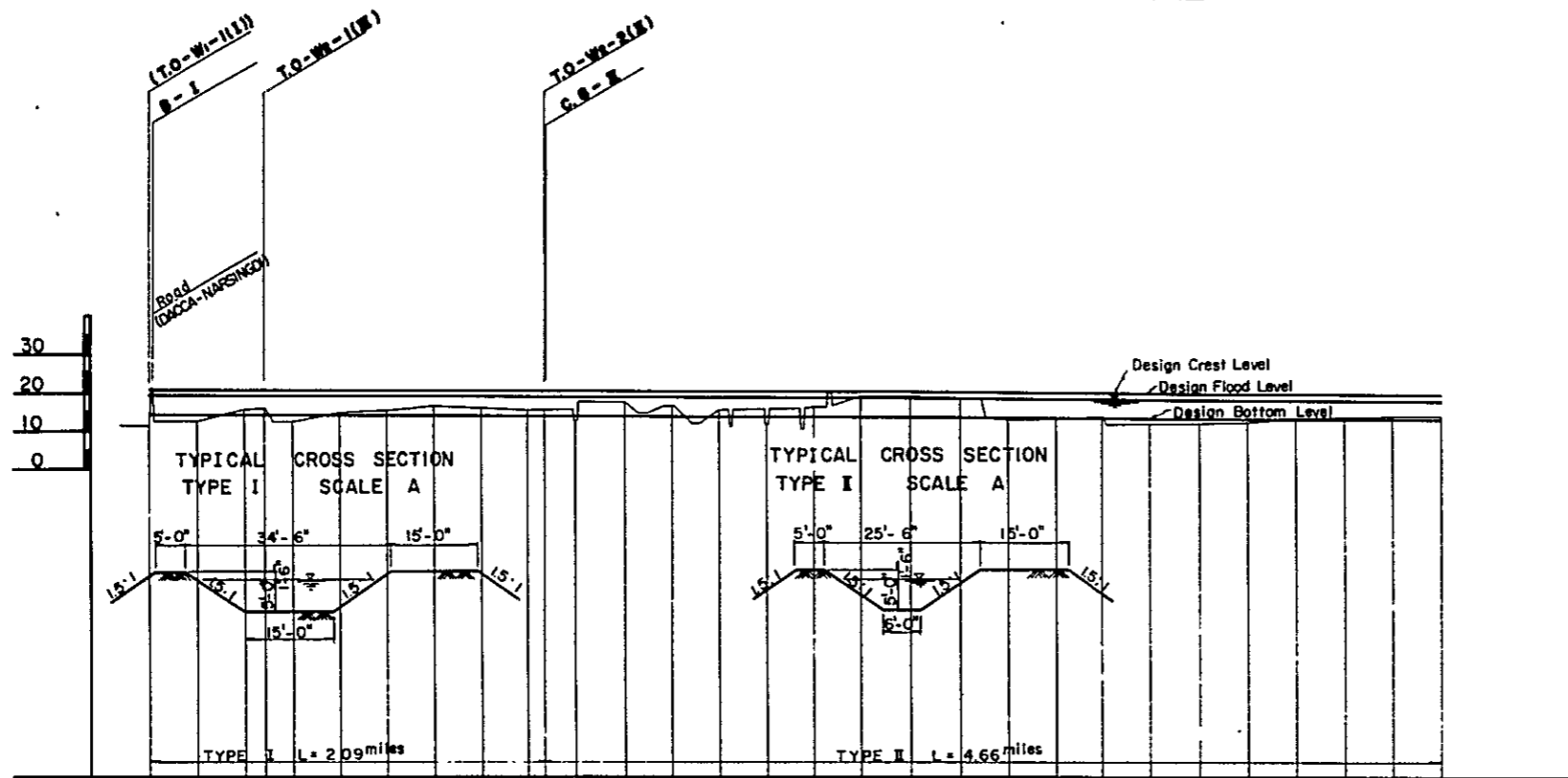
Grade										
Depth of Exce	0.31	0.16	0.44	0.89	0.08	0.44	1.51	1.17	1.34	1.31
Height of Embank										
Top of Bank	20.39	20.32	20.26	20.19	20.12	20.06	19.99	19.93	19.86	19.79
Water Surf	18.89	18.82	18.76	18.69	18.62	18.56	18.49	18.43	18.36	18.29
Bottom of Canal	12.89	12.82	12.76	12.69	12.62	12.56	12.49	12.43	12.36	12.29
Ground Elev	13.2	13.0	13.2	12.0	12.7	13.0	14.0	13.6	13.7	13.6
Accum Dist	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25
Dist	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Station No	No 32	33	34	35	36	37	38	39	40	EP

- LEGEND**
- T.O TURNOUT
 - A AQUEDUCT
 - S SIPHON
 - B BRIDGE
 - C.G CHECK GATE
 - R.G REGULATING GATE



NARAYANGANJ - NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
P₁-W₁ MAIN IRRIGATION CANAL	
PROFILE AND CROSS SECTIONS (½)	
Date: July 1978	DWG NO. 14
JAPAN INTERNATIONAL COOPERATION AGENCY	

PROFILE OF NO.1 PUMPING STATION P₁-W₂ MAIN IRRIGATION CANAL

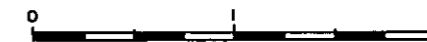


LEGEND

- TO TURNOUT
- A AQUEDUCT
- S SIPHON
- B BRIDGE
- C.G. CHECK GATE
- R.G. REGULATING GATE

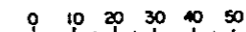
SCALE

HORIZONTAL



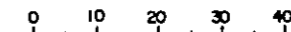
SCALE OF MILES

VERTICAL



SCALE OF FEET

SCALE A



SCALE OF FEET

Grade																												
Depth of Exca			1.13	1.66	0.26	1.23	2.40	1.96			3.66	2.73	1.59			2.72	5.59	5.46	5.12			0.32				0.15	0.42	0.68
Height of Embank	2.70	1.63		1.90												0.14				0.31	0.05		1.11		0.85	0.58	0.02	
Top of Bank	21.00	20.93	20.87	20.84	20.80	20.54	20.47	20.42	20.41	20.34	20.27	20.21	20.14	20.08	20.01	19.94	19.88	19.81	19.75	19.68	19.61	19.55	19.48	19.42	19.35	19.28	19.22	
Water Surf	19.50	19.43	19.37	19.34	19.30	19.04	18.97	18.92	18.91	18.84	18.77	18.71	18.64	18.58	18.51	18.44	18.38	18.31	18.25	18.18	18.11	18.05	17.98	17.92	17.85	17.78	17.72	
Bottom of Canal	14.50	14.43	14.37	14.34	14.30	14.04	13.97	13.92	13.91	13.84	13.77	13.71	13.64	13.58	13.51	13.44	13.38	13.31	13.25	13.18	13.11	13.05	12.98	12.92	12.85	12.78	12.72	
Ground Elev	11.8	12.8	13.5	14.0	14.5	15.4	16.5	17.5	18.5	19.1	19.5	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	
Accum Dist	0.0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75
Dist	0.0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Station No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	EP

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT

THE PEOPLE'S REPUBLIC OF BANGLADESH

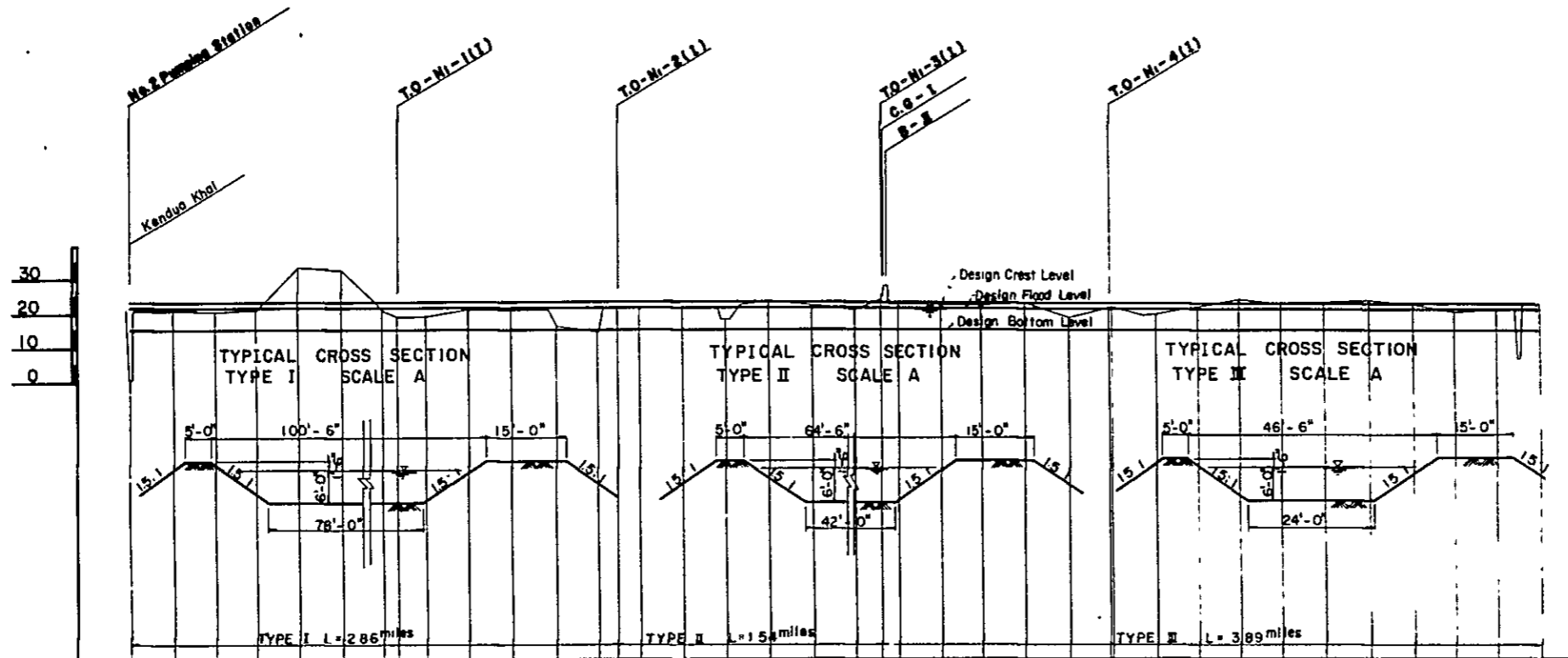
P₁-W₂ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS

Date: July 1978

D.W.G NO 15

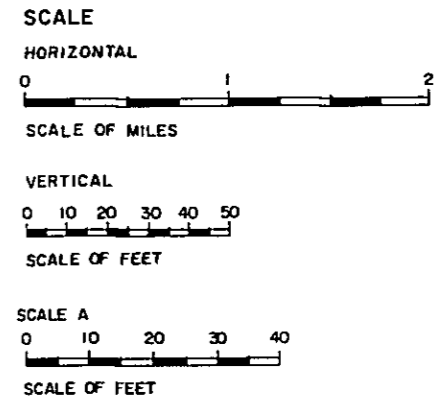
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.2 PUMPING STATION P₂-N₁ MAIN IRRIGATION CANAL 1/2



- LEGEND**
- TO TURNOUT
 - A AQUEDUCT
 - S SIPHON
 - B BRIDGE
 - CG CHECK GATE
 - RG REGULATING GATE

Grade	16.00																																					
Depth of Exca		5.07	4.43	5.20	17.26	16.33	5.40	3.52	3.56	5.53	5.59	0.66	5.75	5.79	5.86	2.92	6.09	6.66	5.52	8.56	7.49	7.35	7.32	7.67	3.85	6.32	4.66	6.65	6.72	7.68	8.05	8.41	7.48	5.55	6.11	7.48		
Height of Embank	15.90									1.27																												
Top of Bank	23.50	23.43	23.37	23.30	23.24	23.17	23.10	23.08	23.04	22.97	22.97	22.84	22.77	22.75	22.71	22.64	22.58	22.51	22.44	22.36	22.34	22.31	22.25	22.18	22.11	22.05	21.98	21.92	21.85	21.78	21.72	21.65	21.59	21.52	21.45	21.39	21.32	
Water Surf	22.00	21.93	21.87	21.80	21.74	21.67	21.60	21.58	21.54	21.47	21.41	21.34	21.27	21.25	21.21	21.14	21.08	21.01	20.94	20.88	20.84	20.81	20.75	20.68	20.61	20.55	20.48	20.42	20.35	20.28	20.22	20.15	20.09	20.02	19.95	19.89	19.82	
Bottom of Canal	16.00	15.93	15.87	15.80	15.74	15.67	15.60	15.58	15.54	15.47	15.41	15.34	15.27	15.25	15.21	15.14	15.08	15.01	14.94	14.88	14.84	14.81	14.75	14.68	14.61	14.55	14.48	14.42	14.35	14.28	14.22	14.15	14.09	14.02	13.95	13.89	13.82	
Ground Elev	0.5	21.0	20.3	21.0	33.0	32.0	21.0	19.1	19.1	21.0	21.0	15.0	14.0	21.0	21.0	18.0	23.1	21.6	20.4	23.4	22.3	22.1	22.1	22.5	22.0	18.4	21.0	19.1	21.0	23.0	21.9	22.2	22.5	21.5	19.5	20.0	21.3	
Accum Dist	0	0.25	0.50	0.75	1.00	1.25	1.50	1.58	1.75	2.00	2.25	2.50	2.75	2.86	3.00	3.25	3.50	3.75	4.00	4.25	4.40	4.50	4.75	5.00	5.25	5.50	5.74	6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.75	8.00	8.25	
Dist	0	0.25	0.25	0.25	0.25	0.25	0.25	0.08	0.17	0.25	0.25	0.25	0.25	0.11	0.14	0.25	0.25	0.25	0.25	0.15	0.10	0.25	0.25	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Station No	No 0	1	2	3	4	5	6	6+0.08	7	8	9	10	11	11+0.11	12	13	14	15	16	17	17+0.15	18	19	20	21	22	22+0.24	24	25	26	27	28	29	30	31	32	33	



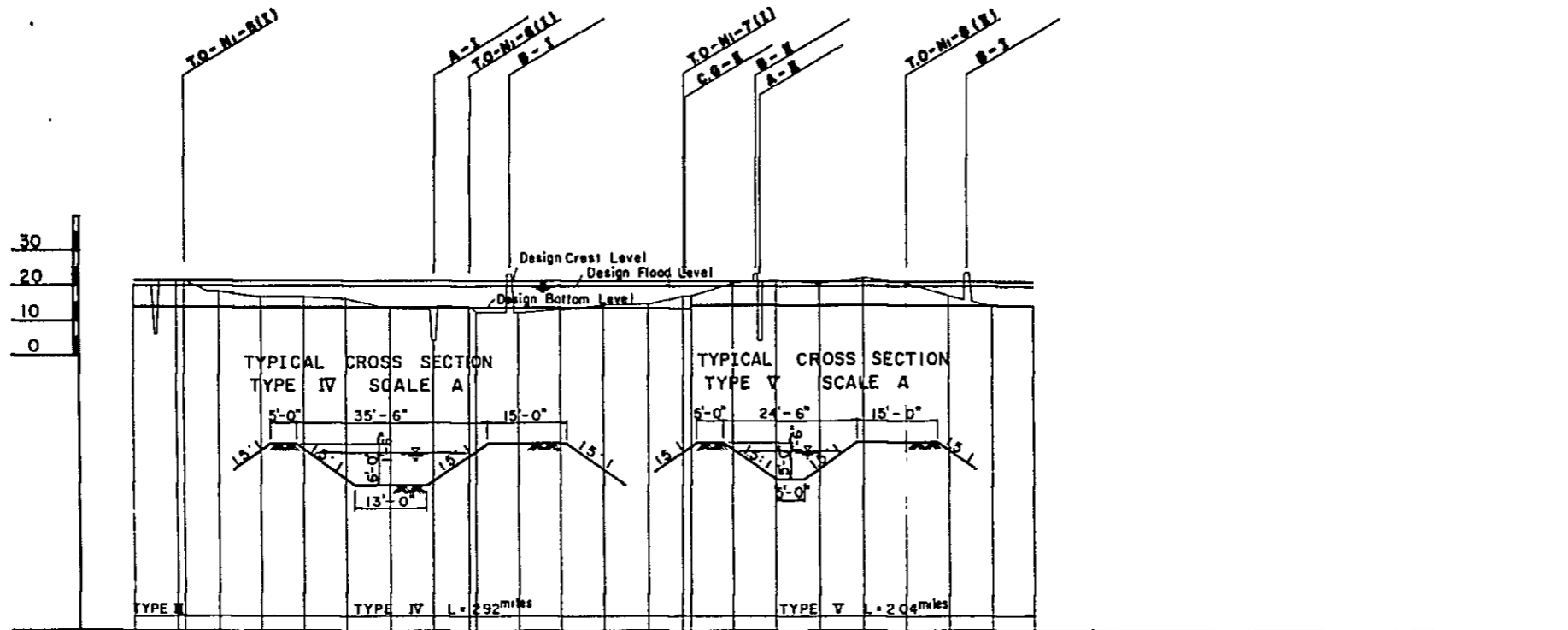
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**P₂-N₁ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (1/2)**

Date: July 1978 D.W.G NO 16

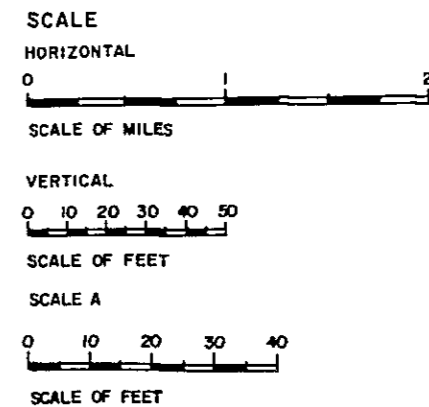
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.2 PUMPING STATION P₂-N MAIN IRRIGATION CANAL ½



- LEGEND**
- T.O. TURNOUT
 - A AQUEDUCT
 - S SIPHON
 - B BRIDGE
 - C.G. CHECK GATE
 - R.G. REGULATING GATE

Grade	1" = 1/20,000 1" = 1/325 miles																							
Depth of Exca	6.11	7.48	7.59	4.24	2.71	2.88	2.44																	
Hight of Emban					0.49	0.43	1.36	1.39	0.63												0.17	0.30		
Top of Bank	21.39	21.32	21.31	21.26	21.19	21.12	21.06	20.99	20.93	20.86	20.79	20.73	20.66	20.60	20.53	20.46	20.40	20.33	20.27	20.20	20.13	20.07	20.00	
Water Surf	19.89	19.82	19.81	19.76	19.69	19.62	19.56	19.49	19.43	19.36	19.29	19.23	19.16	19.10	19.03	18.96	18.90	18.83	18.77	18.70	18.63	18.57	18.50	
Bottom of Canal	13.89	13.82	13.81	13.76	13.69	13.62	13.56	13.49	13.43	13.36	13.29	13.23	13.16	13.10	13.03	12.96	12.90	12.83	12.77	12.70	12.63	12.57	12.50	
Ground Elev	20.0	21.3	21.4	18.0	16.4	16.5	16.0	13.0	4.0	12.0	11.9	12.6	14.0	14.1	18.5	20.0	21.0	20.0	21.4	20.0	16.6	13.4	13.2	
Accum Dist	8.00	8.25	8.29	8.50	8.75	9.00	9.25	9.50	9.75	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25	12.50	12.75	13.00	13.25	
Dist	0.25	0.25	0.04	0.21	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Station No.	No 32	33	+0.04	34	35	36	37	38	39	+0.20	40	41	42	43	44	+0.25	46	47	48	49	50	51	52	E.P.



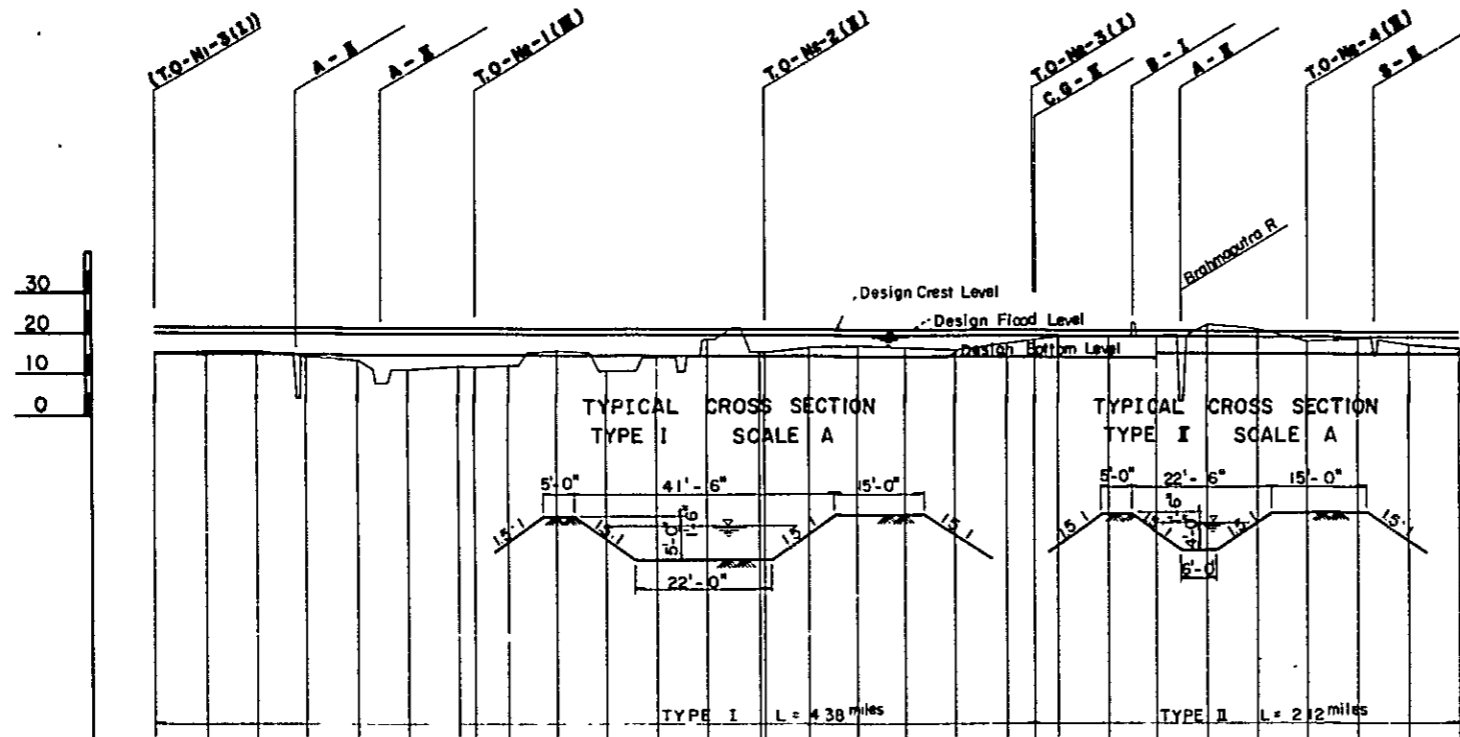
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**P₂-N₁ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (½)**

Date: July 1978 DWG No 17

(JAPAN INTERNATIONAL COOPERATION AGENCY)

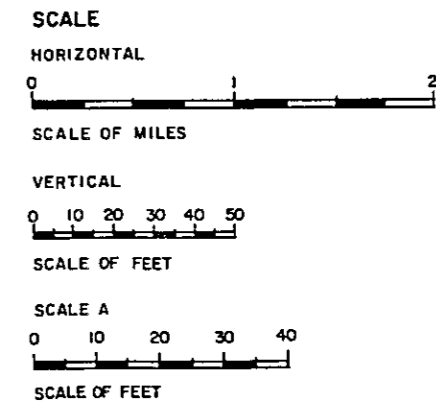
PROFILE OF NO.2 PUMPING STATION P₂-N₂ MAIN IRRIGATION CANAL



LEGEND

T.O	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
C.G	CHECK GATE
R.G	REGULATING GATE

Grade	1:1/20000 L = 650 miles																												
Depth of Exca	8.40	0.57	0.73																										
Hight of Emban				0.80	1.24	3.67	3.10	3.08	2.54			1.03																	
Top of Bank	21.50	21.43	21.37	21.30	21.24	21.17	21.10	21.08	21.04	20.97	20.91	20.84	20.77	20.71	20.64	20.58	20.51	20.44	20.38	20.34	20.31	20.25	20.18	20.11	20.05	19.98	19.92	19.85	19.78
Water Surf	20.00	19.93	19.87	19.80	19.74	19.67	19.60	19.58	19.54	19.47	19.41	19.34	19.27	19.21	19.14	19.08	19.01	18.94	18.88	18.84	18.81	18.75	18.68	18.61	18.55	18.48	18.42	18.35	18.28
Bottom of Canal	15.00	14.93	14.87	14.80	14.74	14.67	14.60	14.58	14.54	14.47	14.41	14.34	14.27	14.21	14.14	14.08	14.01	13.94	13.88	13.84	13.81	13.75	13.68	13.61	13.55	13.48	13.42	13.35	13.28
Ground Elev	23.4	15.5	15.6	14.0	13.5	11.0	11.5	11.5	12.0	15.5	10.3	14.0	18.1	13.0	16.0	16.5	16.0	15.5	17.0	17.8	18.5	19.0	19.0	21.8	20.5	17.5	18.0	16.5	15.5
Accum Dist	0	0.25	0.50	0.75	1.00	1.25	1.50	1.58	1.75	2.00	2.25	2.50	2.75	3.02	3.25	3.50	3.75	4.00	4.25	4.38	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50
Dist	0	0.25	0.25	0.25	0.25	0.25	0.25	0.08	0.17	0.25	0.25	0.25	0.25	0.02	0.02	0.23	0.25	0.25	0.25	0.13	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Station No	0	1	2	3	4	5	6	+0.08	7	8	9	10	11	+0.02	13	14	15	16	17	+0.13	18	19	20	21	22	23	24	25	E.P.



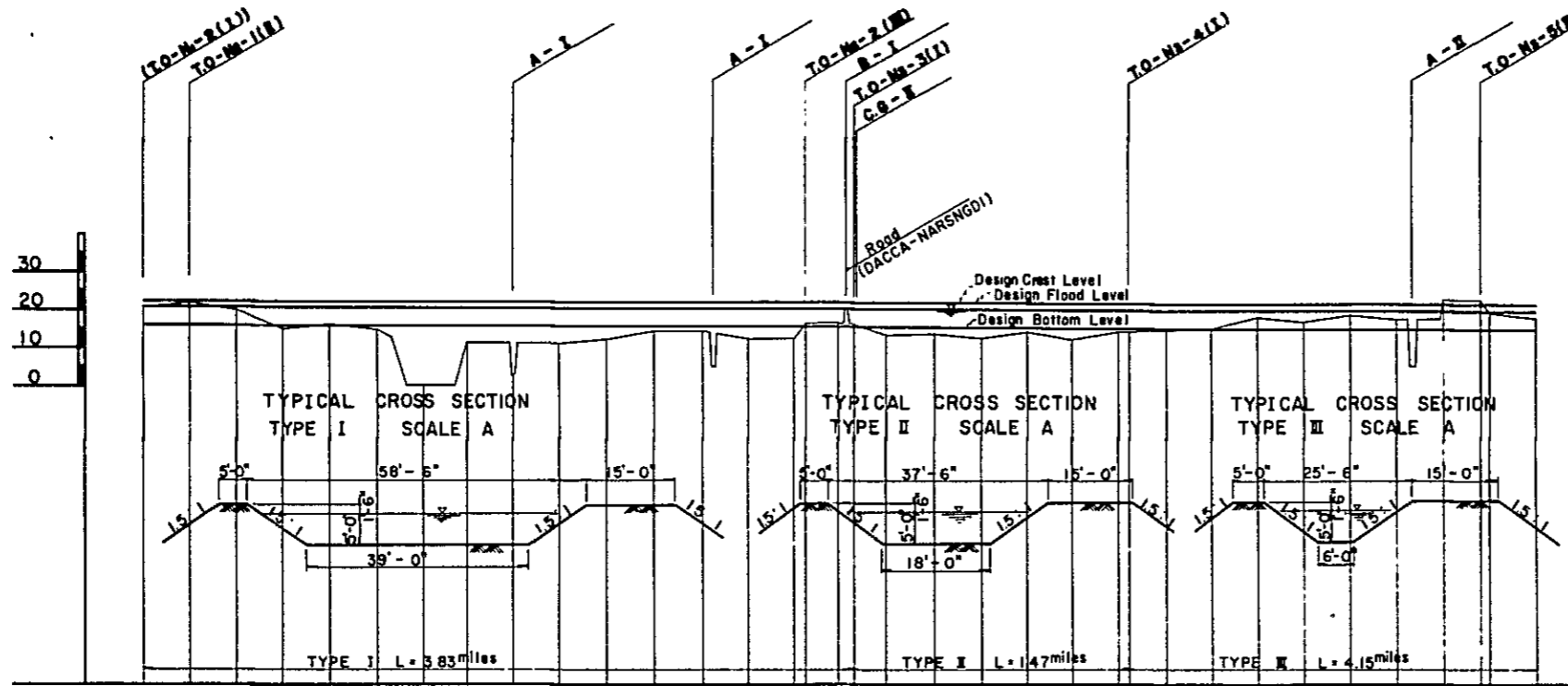
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

P₂-N₂ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS

Date: July 1978 D.W.G NO 18

JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.2 PUMPING STATION
P₂-N₅ MAIN IRRIGATION CANAL 1/2

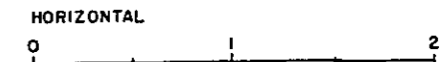


LEGEND

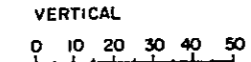
- T.O. TURNOUT
- A AQUEDUCT
- S SIPHON
- B BRIDGE
- C.G. CHECK GATE
- R.G. REGULATING GATE

Grade	18.00																																				
Depth of Exca	5.00	6.07	4.13	0.46																																	
Height of Emban				0.80	0.67	1.50	4.14	12.47	4.41	3.04	0.87	0.81	2.84	2.68	1.34	1.39	1.01	1.44	1.38	2.31	0.85	2.78	0.22	3.18	2.05	3.72	2.78	7.85	7.70	4.31	3.48						
Top of Bank	22.50	22.43	22.37	22.30	22.24	22.17	22.10	22.04	21.97	21.91	21.84	21.77	21.71	21.64	21.58	21.56	21.51	21.49	21.44	21.38	21.31	21.25	21.18	21.11	21.10	21.06	21.05	21.00	20.98	20.92	20.85	20.78	20.72	20.65	20.60	20.59	20.52
Water Surf	21.00	20.93	20.87	20.80	20.74	20.67	20.60	20.54	20.47	20.41	20.34	20.27	20.21	20.14	20.08	20.06	20.01	19.99	19.94	19.88	19.81	19.75	19.68	19.61	19.60	19.57	19.53	19.48	19.42	19.35	19.28	19.22	19.15	19.10	19.09	19.02	
Bottom of Canal	16.00	15.93	15.87	15.80	15.74	15.67	15.60	15.54	15.47	15.41	15.34	15.27	15.21	15.14	15.08	15.06	15.01	14.99	14.94	14.88	14.81	14.75	14.68	14.61	14.60	14.57	14.53	14.48	14.42	14.35	14.28	14.22	14.15	14.10	14.09	14.02	
Ground Elev	21.0	22.0	20.0	15.0	16.2	15.0	0.1	11.4	3.0	11.0	12.3	14.4	14.4	12.3	12.4	16.4	16.4	16.0	13.5	13.5	12.5	13.9	11.9	14.1	14.0	14.4	14.7	17.6	16.4	18.0	17.0	22.0	21.8	18.4	17.5		
Accum Dist	0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.56	3.75	3.83	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.20	7.25	7.50		
Dist	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.06	0.06	0.19	0.08	0.17	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.05	0.25		
Station No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14.06	15	15.08	16	17	18	19	20	20.52	20.57	22	23	24	25	26	27	28	28.20	28.25	30		

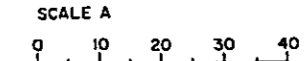
SCALE



SCALE OF MILES



SCALE OF FEET



SCALE OF FEET

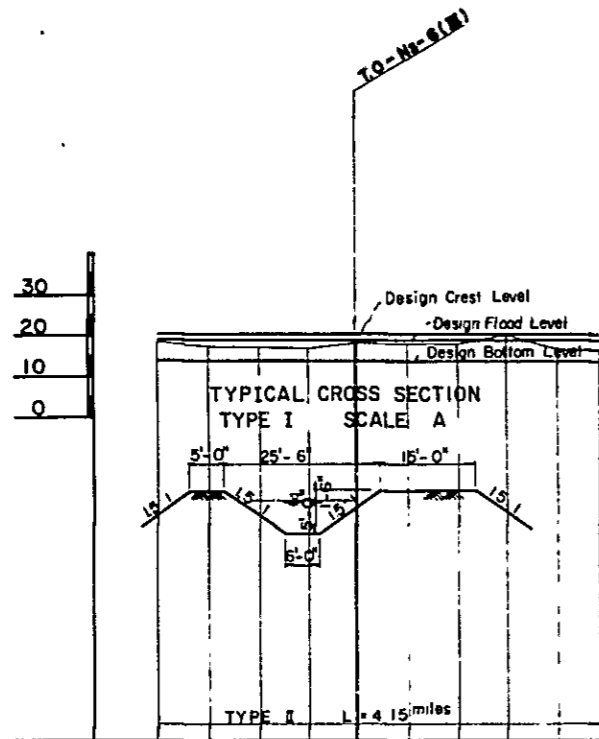
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

P₂-N₅ MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS (1/2)

Date: July 1978 D.W.G NO 19

JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.2 PUMPING STATION P₂-N₃ MAIN IRRIGATION CANAL ½



LEGEND

T.O.	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
CG	CHECK GATE
RG	REGULATING GATE

Grade											
Depth of Exca	4.31	3.46	3.05	3.11	4.18	4.18	4.24	4.11	6.28	2.94	2.80
Height of Emban											
Top of Bank	20.59	20.52	20.45	20.39	20.32	20.32	20.26	20.19	20.12	20.06	20.00
Water Surf	19.09	19.02	18.95	18.89	18.82	18.82	18.76	18.67	18.62	18.56	18.50
Bottom of Canal	14.09	14.02	13.95	13.89	13.82	13.82	13.76	13.69	13.62	13.56	13.50
Ground Elev	18.4	17.4	17.0	17.0	18.0	18.0	18.0	17.6	19.9	16.5	16.3
Accum Dist	7.25	7.50	7.75	8.00	8.25	8.50	8.50	8.75	9.00	9.25	9.45
Dist	0.05	0.25	0.25	0.25	0.07	0.07	0.25	0.25	0.25	0.25	0.20
Station No.	No. 29	30	31	32	33	34	35	36	37	E.P.	

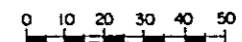
SCALE

HORIZONTAL



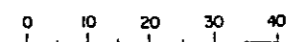
SCALE OF MILES

VERTICAL



SCALE OF FEET

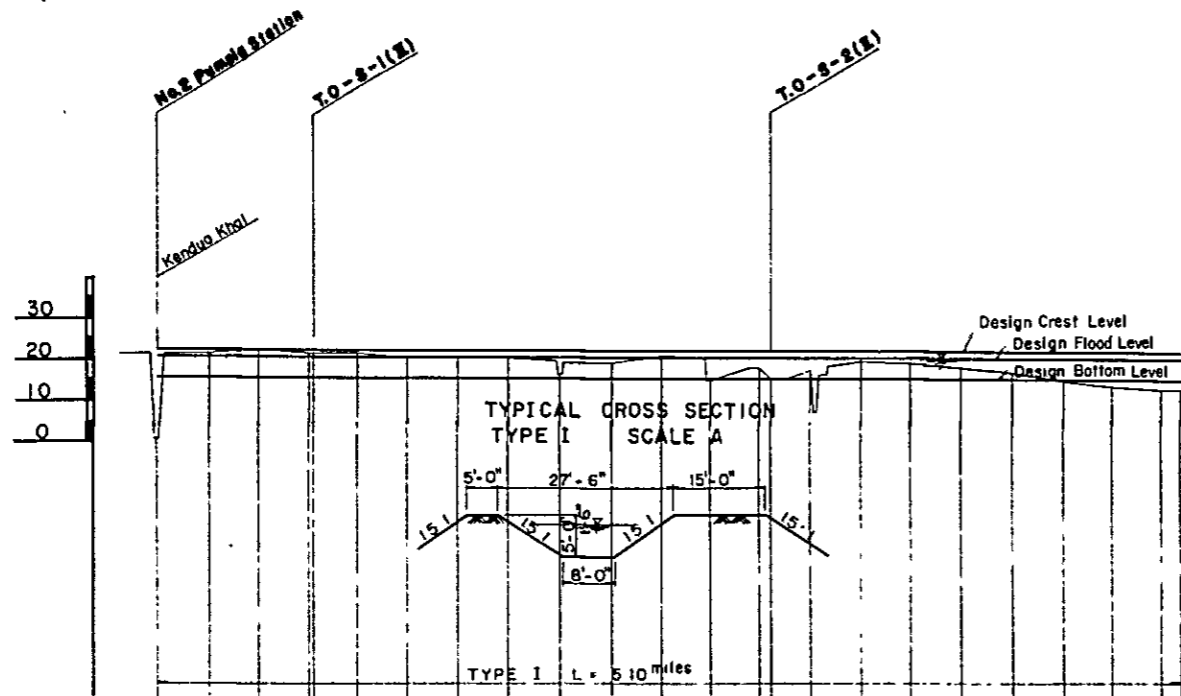
SCALE A



SCALE OF FEET

NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
P₂-N₃ MAIN IRRIGATION CANAL	
PROFILE AND CROSS SECTIONS (½)	
Date: July 1978	DWG NO 20
JAPAN INTERNATIONAL COOPERATION AGENCY	

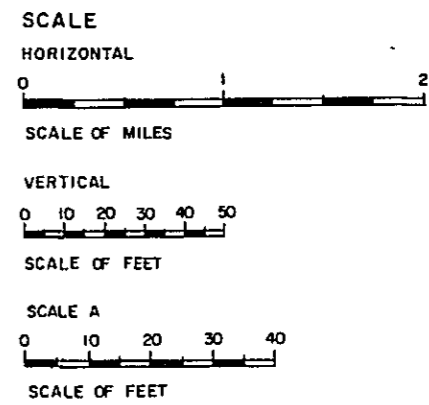
PROFILE OF NO.2 PUMPING STATION P₂-S MAIN IRRIGATION CANAL



LEGEND

T.O.	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
C.G.	CHECK GATE
R.G.	REGULATING GATE

Grade	(16.00) $\frac{1}{L=5.10 \text{ miles}}$ $\frac{1}{L=20.00}$ (14.65)																						
Depth of Exca		5.57	6.63	5.91	5.76	4.53	4.40	4.46	0.53	3.59	4.96	2.29	1.76	4.22	3.79	2.66	1.52						
Height of Emban	15.50								0.57			0.19					0.61	1.75	2.18	2.15			
Top of Bank	22.50	22.43	22.37	22.30	22.24	22.17	22.10	22.04	21.97	21.91	21.84	21.77	21.64	21.58	21.51	21.44	21.38	21.31	21.25	21.18			
Water Surf	21.00	20.93	20.87	20.80	20.74	20.67	20.60	20.54	20.47	20.41	20.34	20.27	20.14	20.08	20.01	19.94	19.88	19.81	19.75	19.68			
Bottom of Canal	16.00	15.93	15.87	15.80	15.74	15.67	15.60	15.54	15.47	15.41	15.34	15.27	15.14	15.08	15.01	14.94	14.88	14.81	14.75	14.68			
Ground Elev	05	21.5	22.5	21.5	20.2	20.0	20.0	20.0	16.0	19.0	20.8	14.7	17.5	15.0	18.8	17.6	16.4	14.0	13.0	12.5			
Accum Dist	0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50	3.75	4.00	4.25	4.50	4.75	5.00			
Dist	0	0.25	0.25	0.25	0.22	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.19	0.25	0.25	0.25	0.25	0.25	0.25	0.10			
Station No	0	1	2	+0.03	4	5	6	7	8	9	10	11	+0.06	12	13	14	15	16	17	18	19	20	E.P.



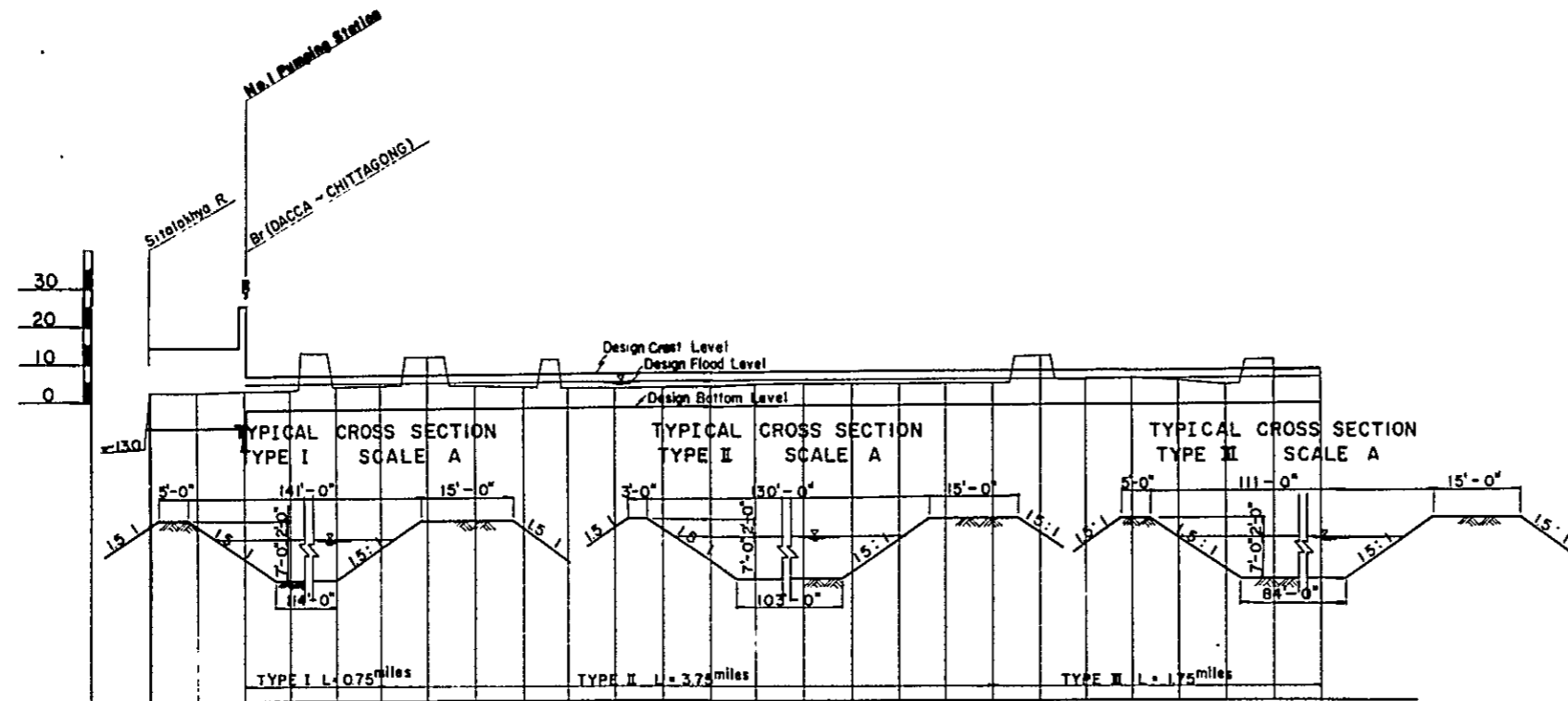
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**P₂-S MAIN IRRIGATION CANAL
PROFILE AND CROSS SECTIONS**

Date: July 1978 D.W.G NO 21

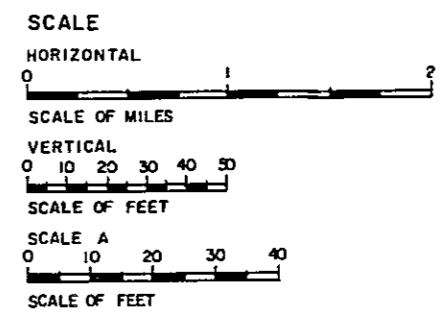
JAPAN INTERNATIONAL COOPERATION AGENCY

PROFILE OF NO.1 PUMPING STATION MAIN DRAINAGE CANAL



- LEGEND**
- T.O. TURNOUT
 - A AQUEDUCT
 - S SYPHON
 - B BRIDGE
 - C.G. CHECK GATE
 - RG REGULATING GATE

Grade	Level		Scale	
	700	200	1:1/20,000	1:5,75
Depth of Exca	3.80	9.80	14.80	4.93
Height of Embank				
Top of Bank	14.88	14.00	25.00	7.07
Water Surf			15.00	5.07
Bottom of Canal	7.00	7.00	12.88	1.87
Ground Elev	2.8	2.6	3.0	4.0
Accum Dist	0.30	0.25	0	0.25
Dist	0.25	0.25	0	0.25
Station No	0.01	1	2	3



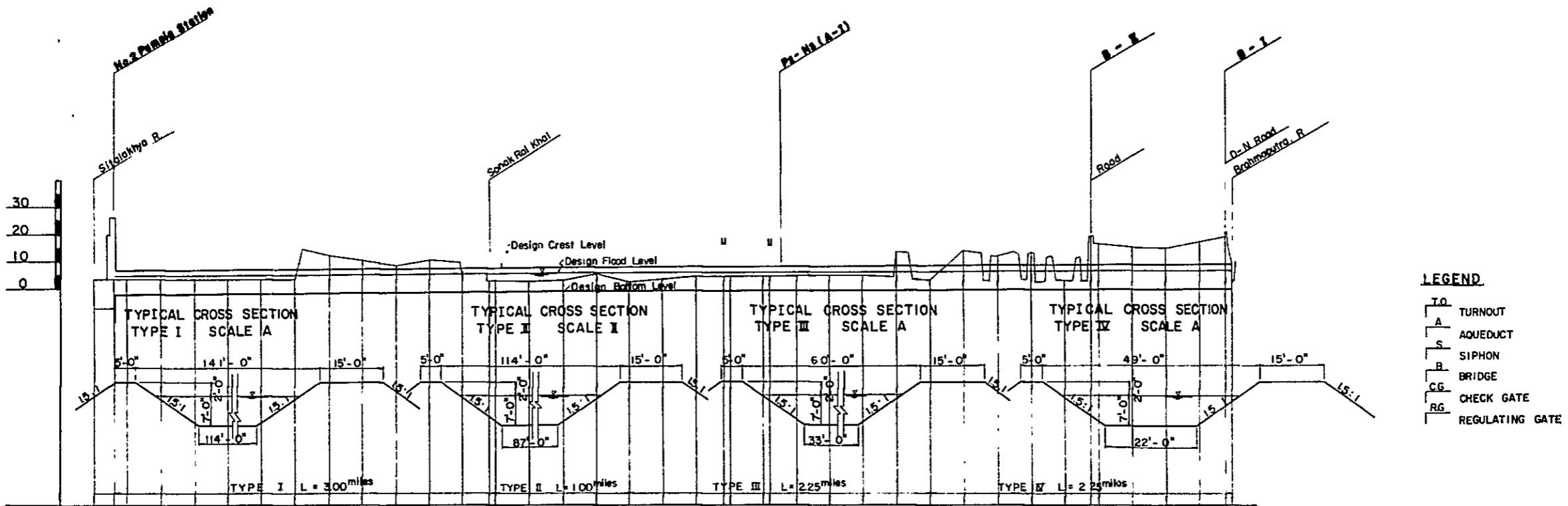
NARAYANGANJ - NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**MAIN DRAINAGE CANAL
(NO.1 PUMPING STATION)
PROFILE AND CROSS SECTIONS**

Date: July 1978 DWG NO. 22

JAPAN INTERNATIONAL COOPERATION AGENCY

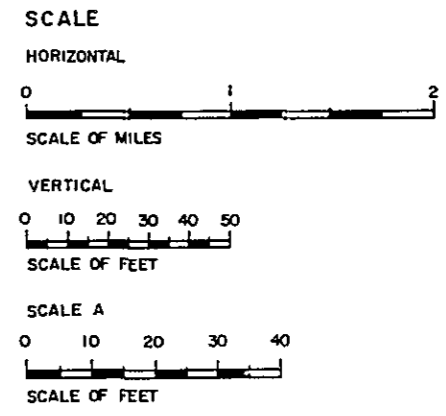
PROFILE OF NO.2 PUMPING STATION
MAIN DRAINAGE CANAL



LEGEND

T/O	TURNOUT
A	AQUEDUCT
S	SIPHON
B	BRIDGE
CG	CHECK GATE
RG	REGULATING GATE

Grade	-2.00		0.20																																								
Depth of Exca	10.90	16.00	8.97	6.01	5.84	5.78	5.71	12.85	14.08	12.21	10.65	12.38	5.31	4.26	4.45	4.25	4.22	6.55	3.48	4.32	5.15	5.30	5.38	5.02	5.25	5.69	5.72	13.96	3.39	14.32	12.46	12.19	3.33	19.07	16.46	15.51	14.93	17.06	29.20				
Height of Emban																																											
Top of Bank	3.00	26.00	7.03	7.09	7.16	7.22	7.29	7.39	7.42	7.49	7.55	7.62	7.69	7.74	7.75	7.82	7.88	7.95	8.02	8.08	8.15	8.20	8.21	8.29	8.35	8.41	8.48	8.54	8.61	8.66	8.74	8.81	8.87	8.93	8.94	9.07	9.14	9.14	9.14	9.20			
Water Surf		15.00	5.00	5.09	5.16	5.22	5.29	5.39	5.42	5.49	5.55	5.62	5.69	5.74	5.75	5.82	5.88	5.95	6.02	6.08	6.15	6.20	6.21	6.29	6.35	6.41	6.48	6.54	6.61	6.66	6.74	6.81	6.87	6.93	6.94	7.07	7.14	7.14	7.20				
Bottom of Canal	-7.00	-1.00	-1.97	-1.91	-1.84	-1.78	-1.71	-1.63	-1.58	-1.51	-1.45	-1.38	-1.31	-1.26	-1.25	-1.18	-1.12	-1.05	-0.96	-0.92	-0.85	-0.80	-0.79	-0.72	-0.65	-0.59	-0.52	-0.46	-0.39	-0.32	-0.26	-0.19	-0.13	-0.07	0.00	0.07	0.14	0.14	0.14	0.14	0.14		
Ground Elev	3.8	4.0	4.0	4.1	4.1	4.0	4.0	3.8	3.8	4.0	4.0	4.0	4.0	3.9	3.9	3.1	3.1	3.5	2.5	3.4	4.3	4.5	4.5	4.3	4.6	5.1	5.2	3.5	3.2	14.0	12.2	12.0	3.2	19.0	18.4	15.5	15.0	17.2	29.2				
Accum Dist	0	0.15	0.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Dist	0	0.15	0.10	0.25	0.25	0.25	0.25	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.21	0.25	0.25	0.25	0.25	0.25	0.25	0.20	0.25	0.25	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Station No.	0	0.15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34							



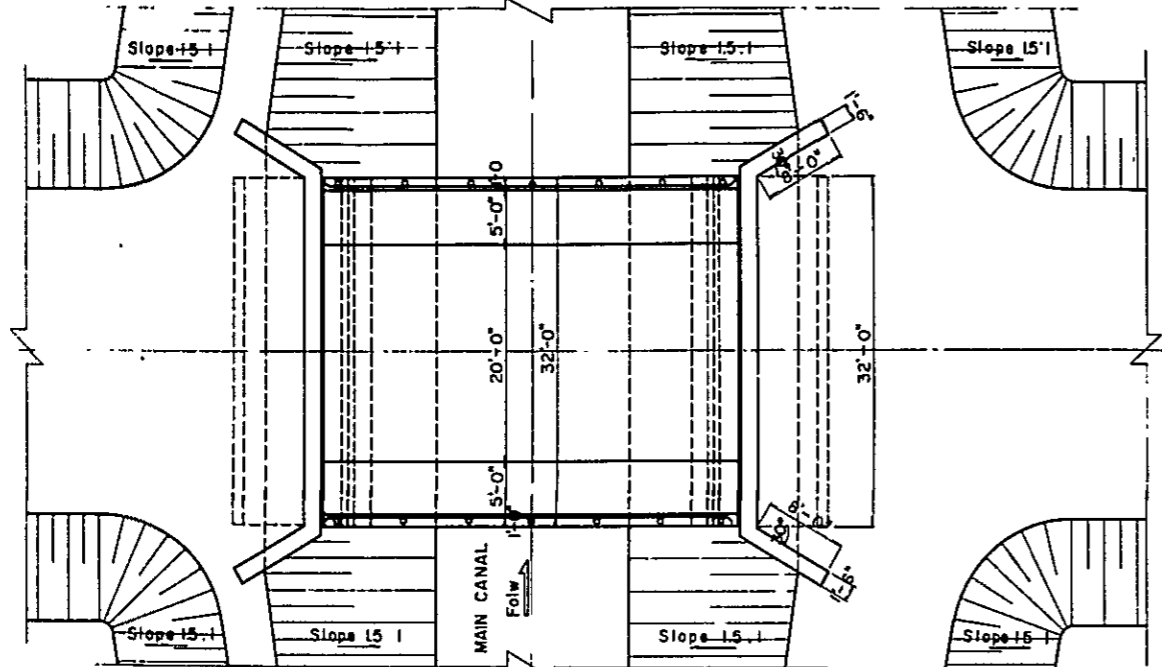
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLES REPUBLIC OF BANGLADESH

MAIN DRAINAGE CANAL
(NO.2 PUMPING STATION)
PROFILE AND CROSS SECTIONS

Date: July 1978 | D.W.G NO 23

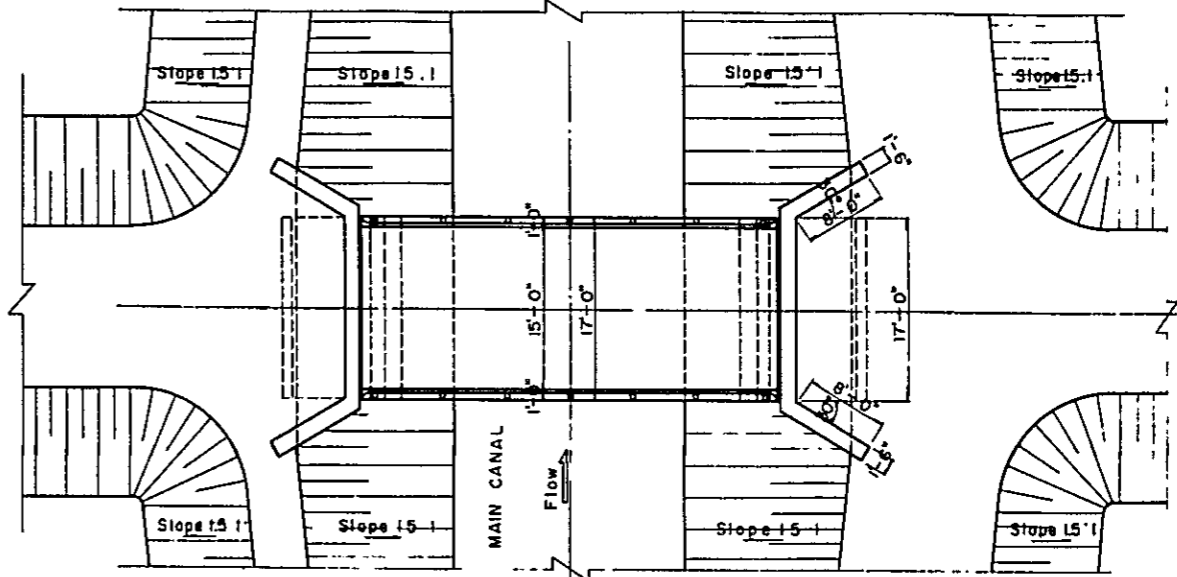
JAPAN INTERNATIONAL COOPERATION AGENCY

**TYPE I
PLAN**

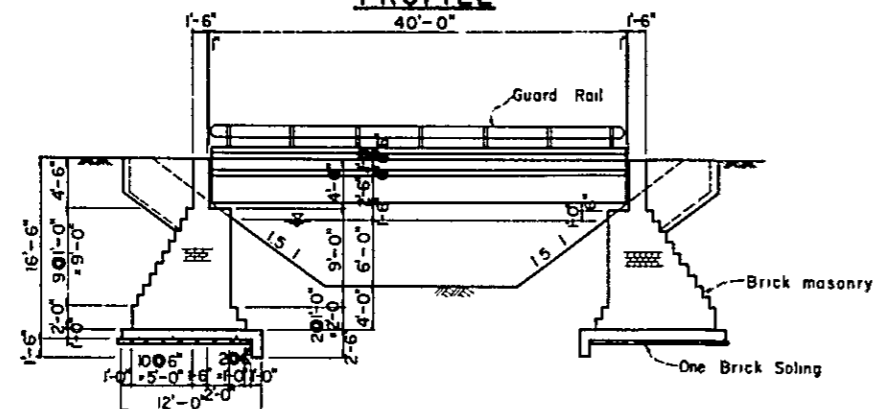


BRIDGE

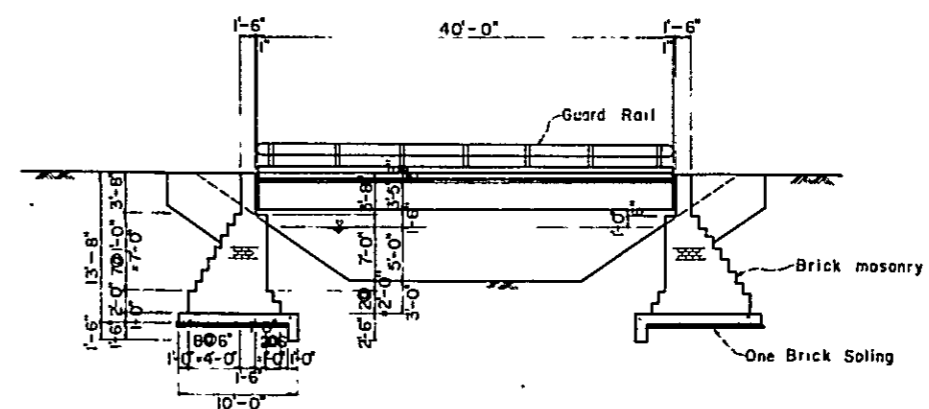
**TYPE II
PLAN**



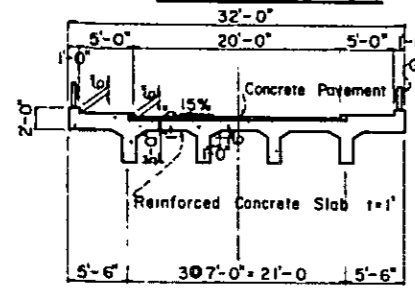
PROFILE



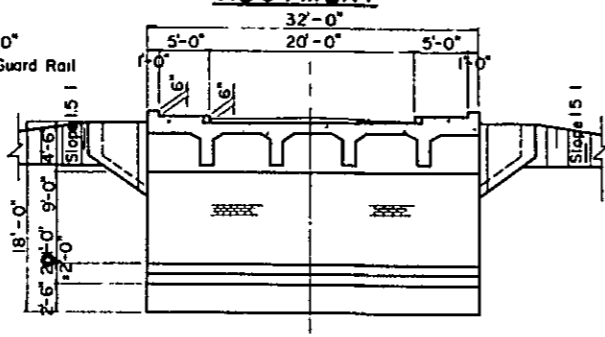
PROFILE



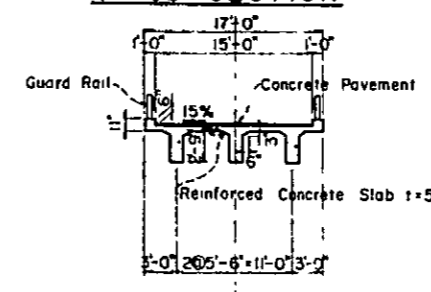
CROSS SECTION



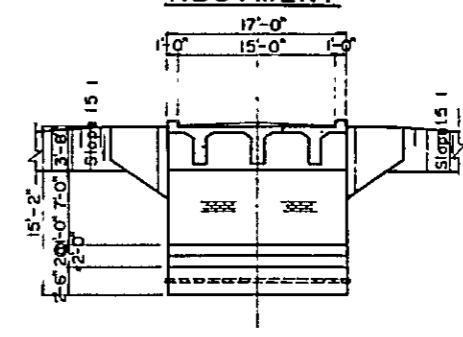
ABUTMENT



CROSS SECTION



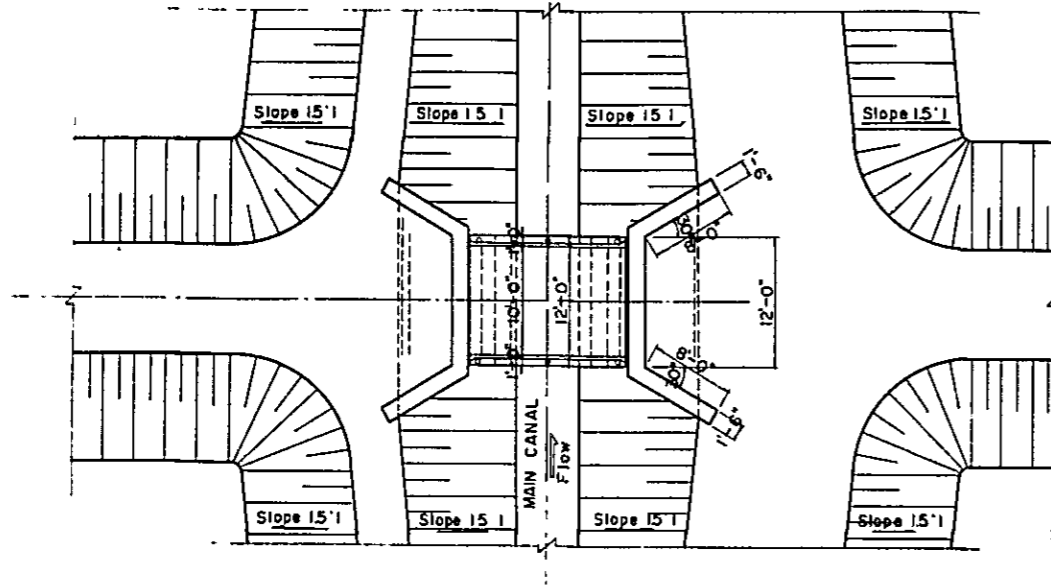
ABUTMENT



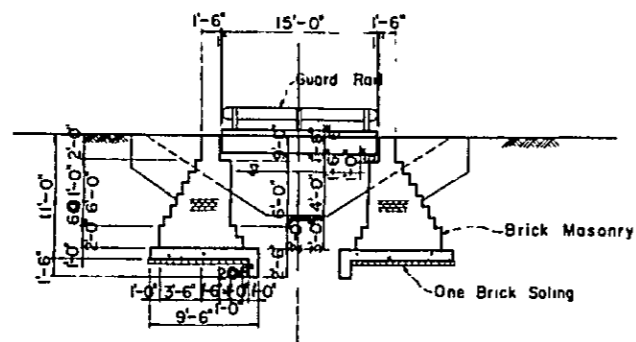
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
 THE PEOPLE'S REPUBLIC OF BANGLADESH
**BRIDGE TYPE I AND II
 PLAN AND SECTIONS**
 Date: July 1978 DWG NO 24
 JAPAN INTERNATIONAL COOPERATION AGENCY

**TYPE III
PLAN**

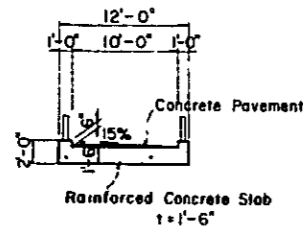
BRIDGE



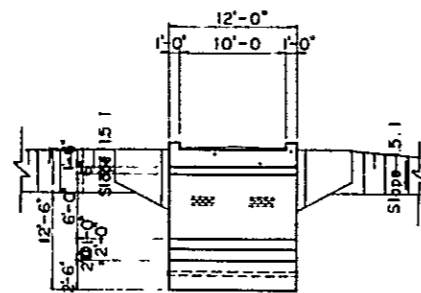
PROFILE



CROSS SECTION



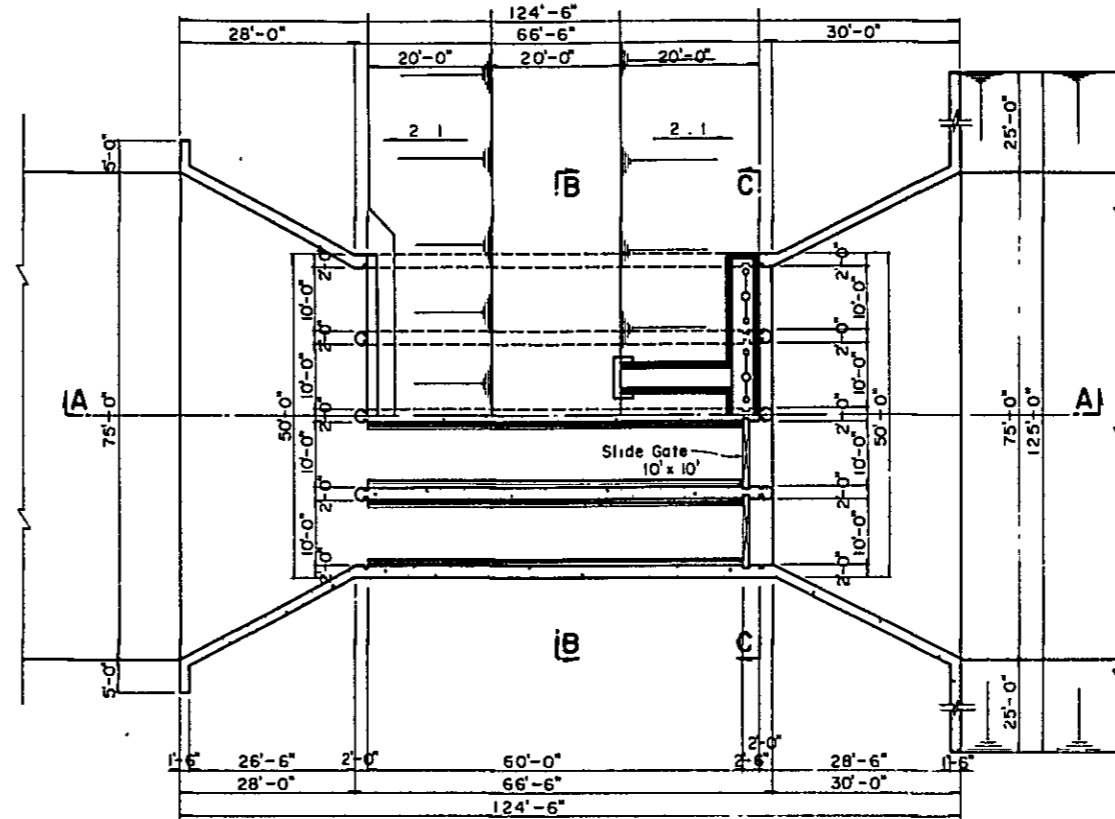
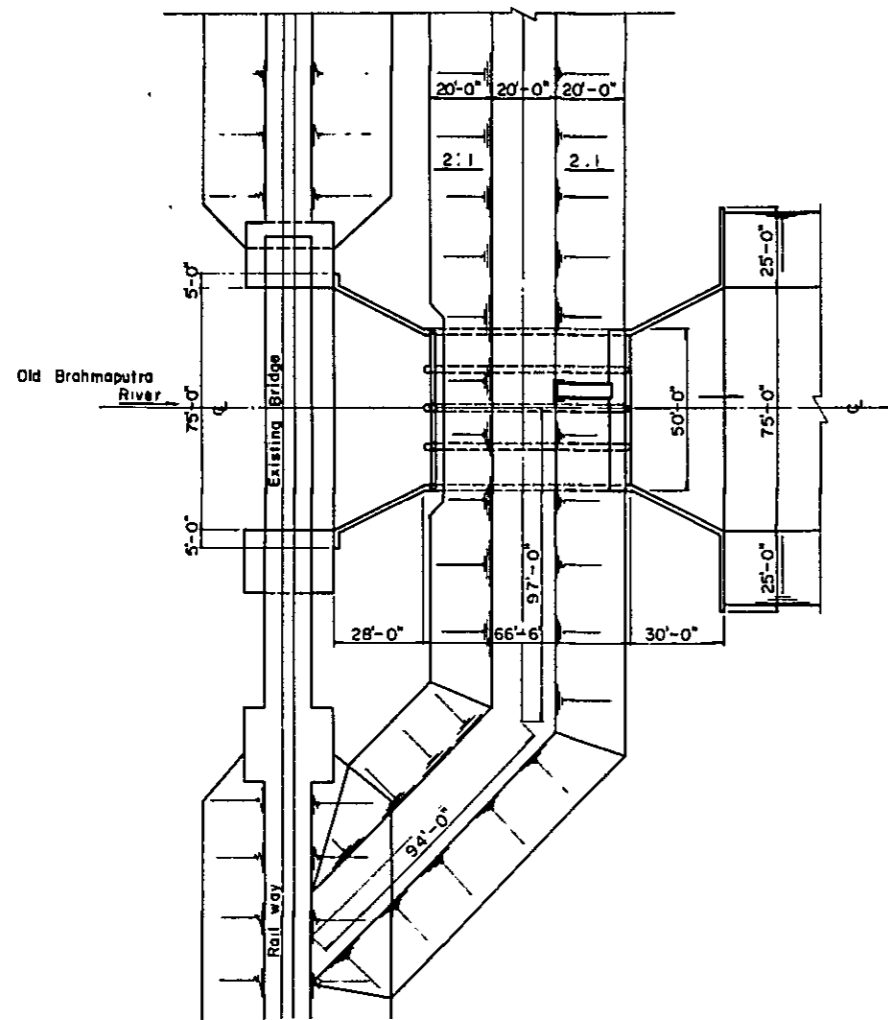
ABUTMENT



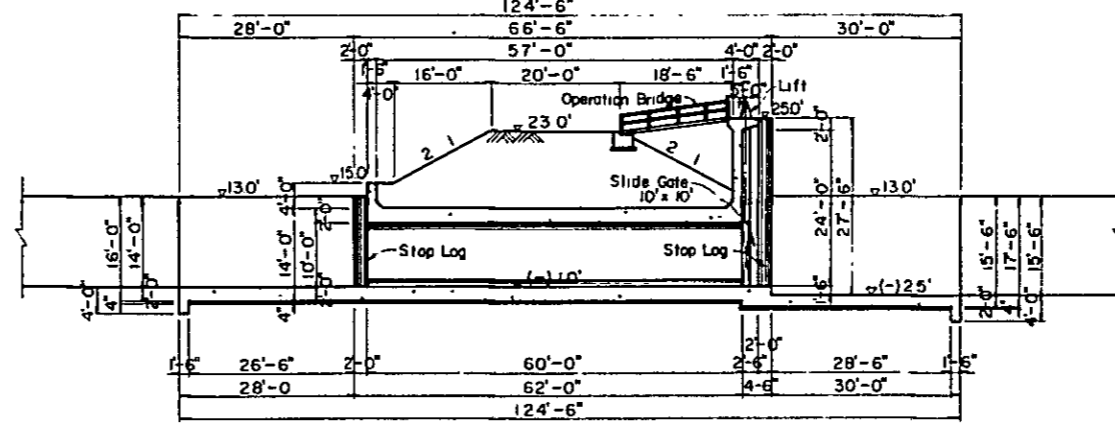
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
BRIDGE TYPE III	
PLAN AND SECTIONS	
Date: July 1978	DWG NO. 25
JAPAN INTERNATIONAL COOPERATION AGENCY	

REGULATING GATE TYPE I PLAN SCALE B

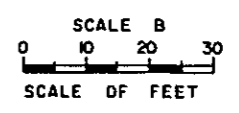
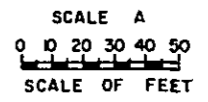
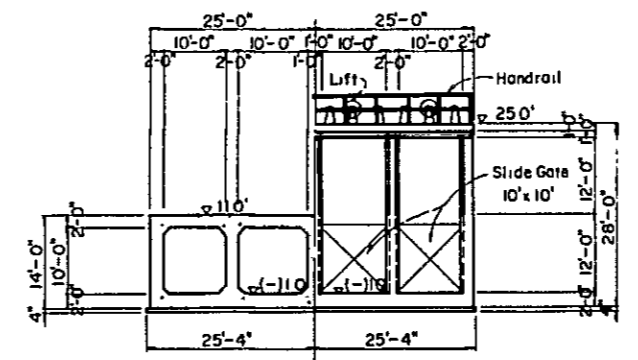
PLAN OF LAYOUT SCALE A



A-A SCALE B



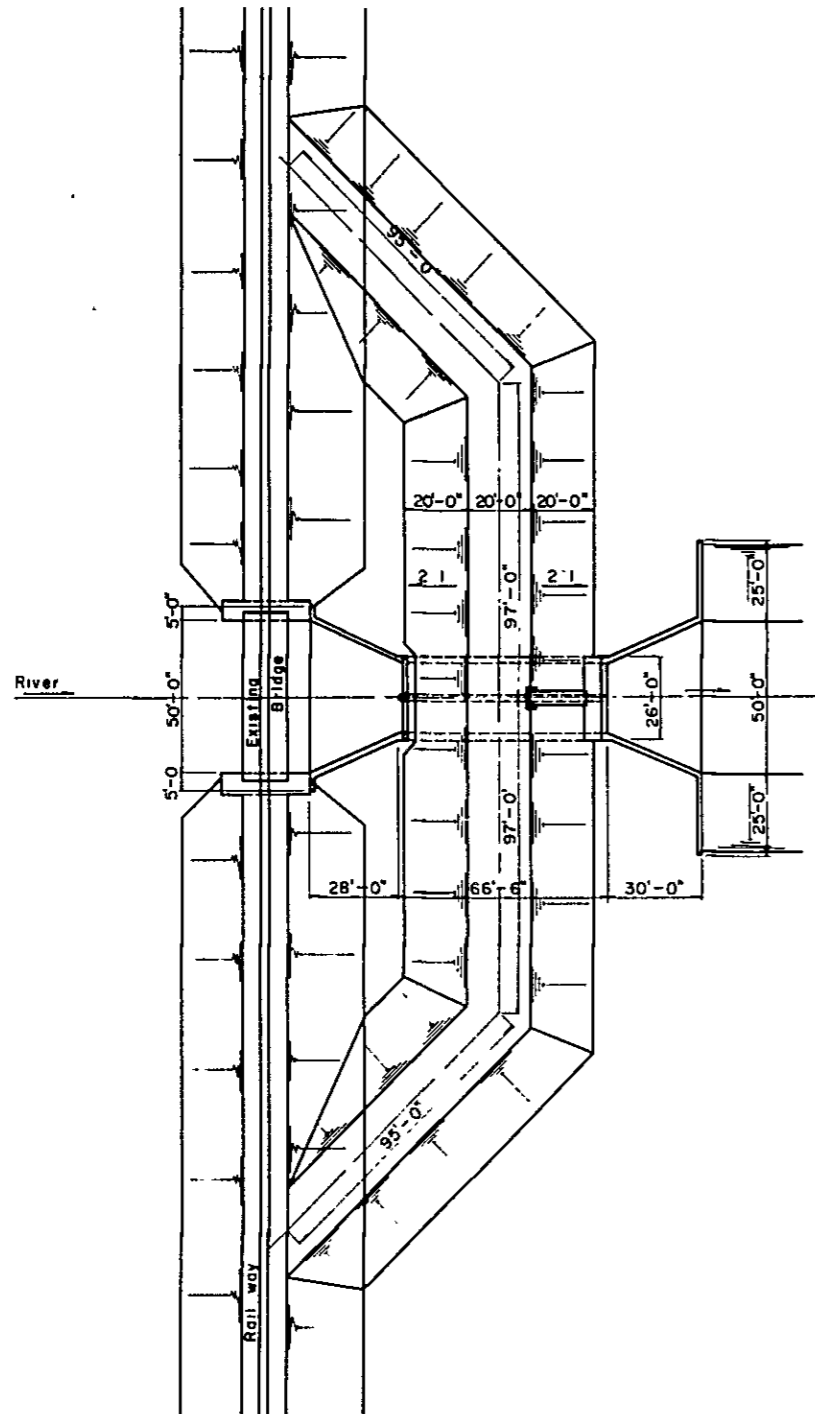
B-B C-C SCALE B



NARYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
REGULATING GATE TYPE I	
PLAN AND SECTIONS	
Date: July 1978	DWG NO 26
JAPAN INTERNATIONAL COOPERATION AGENCY	

PLAN OF LAYOUT

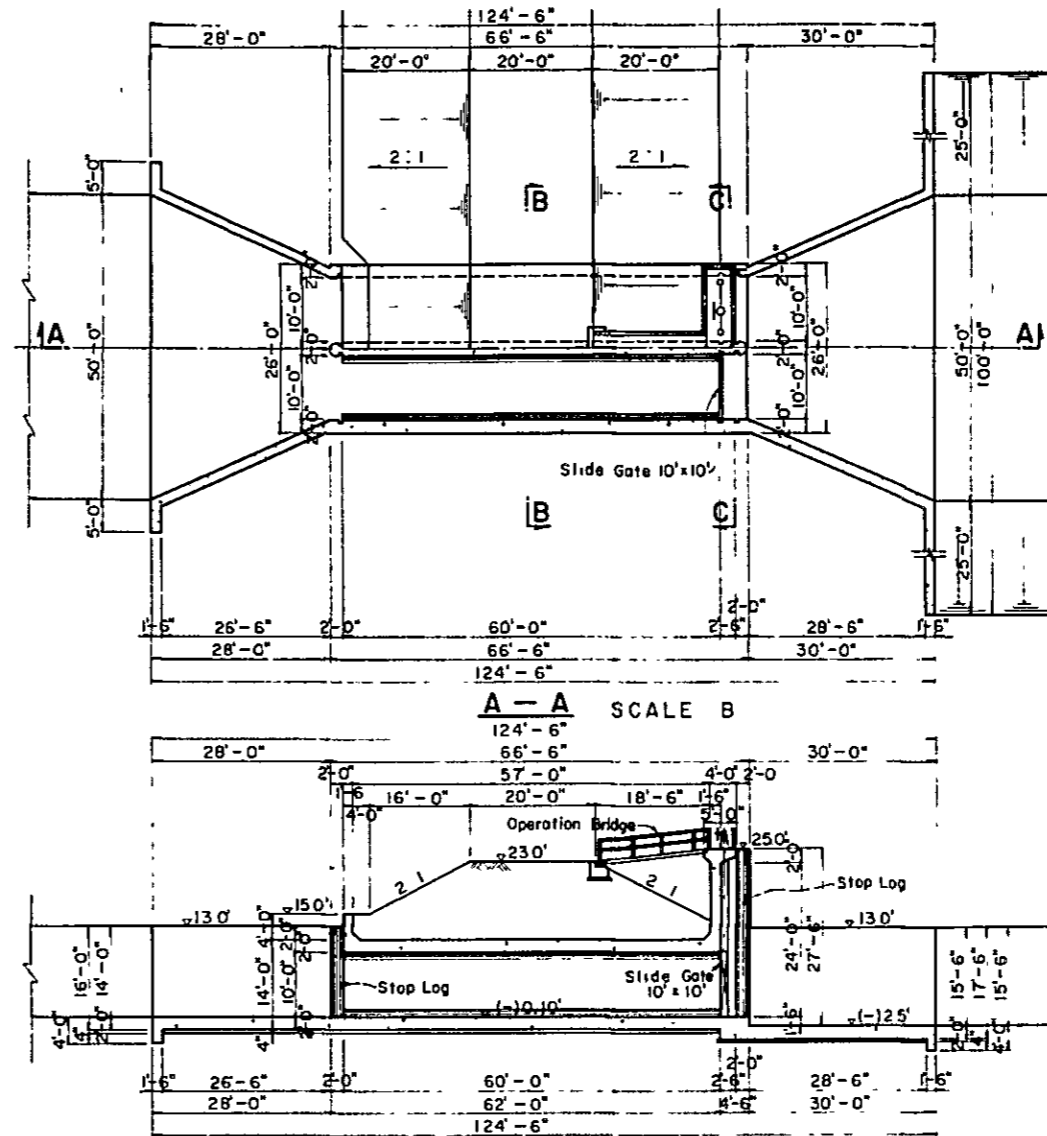
SCALE A



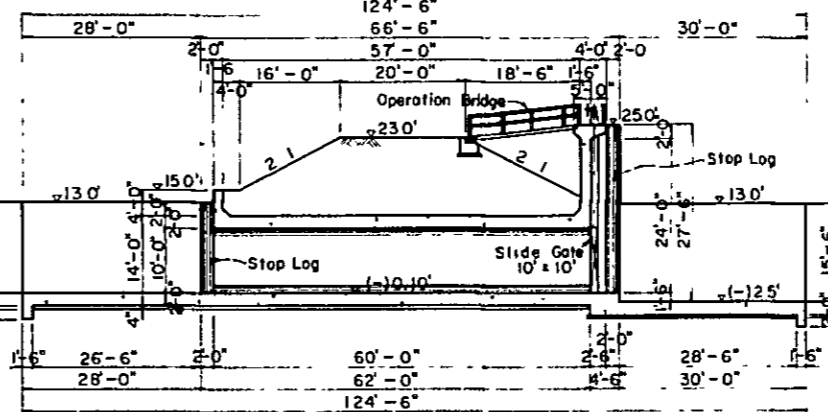
REGULATING GATE TYPE II

PLAN

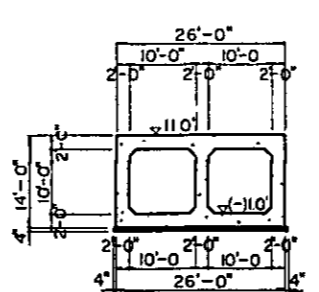
SCALE B



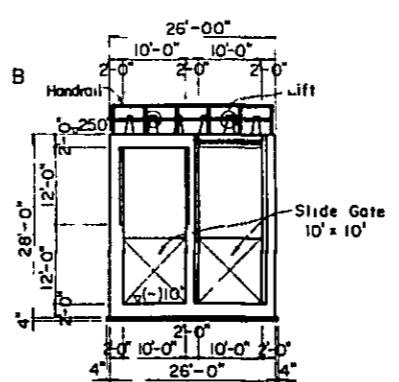
A - A SCALE B



B - B SCALE B



C - C SCALE B



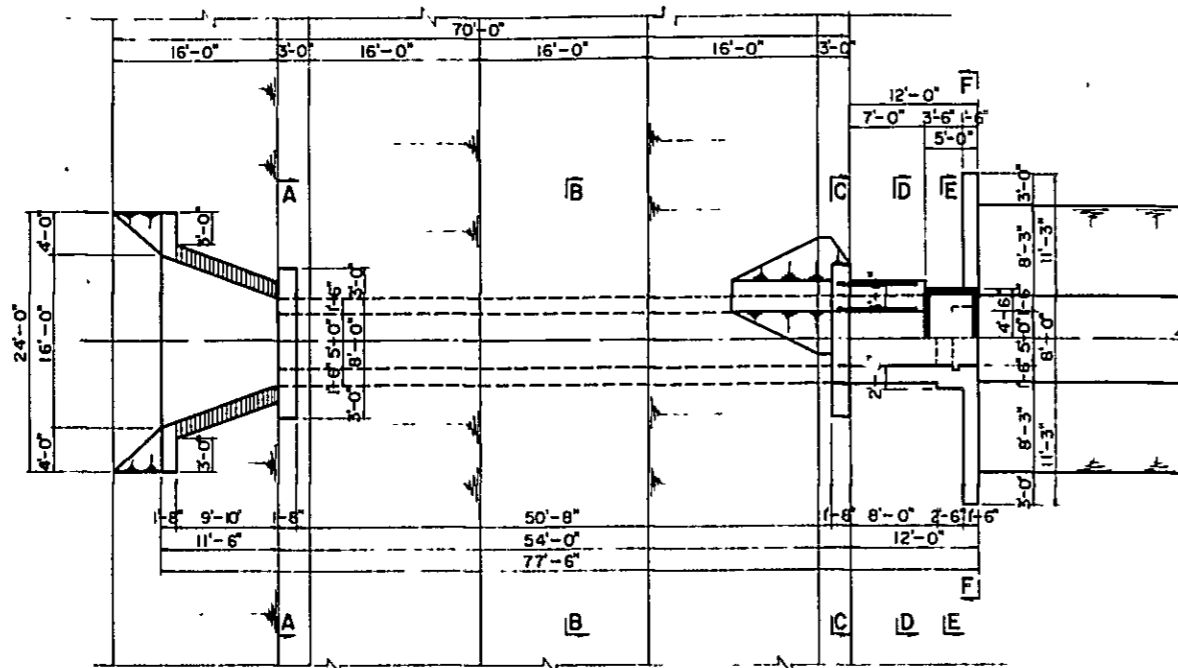
SCALE A
0 10 20 30 40 50
SCALE OF FEET

SCALE B
0 10 20 30
SCALE OF FEET

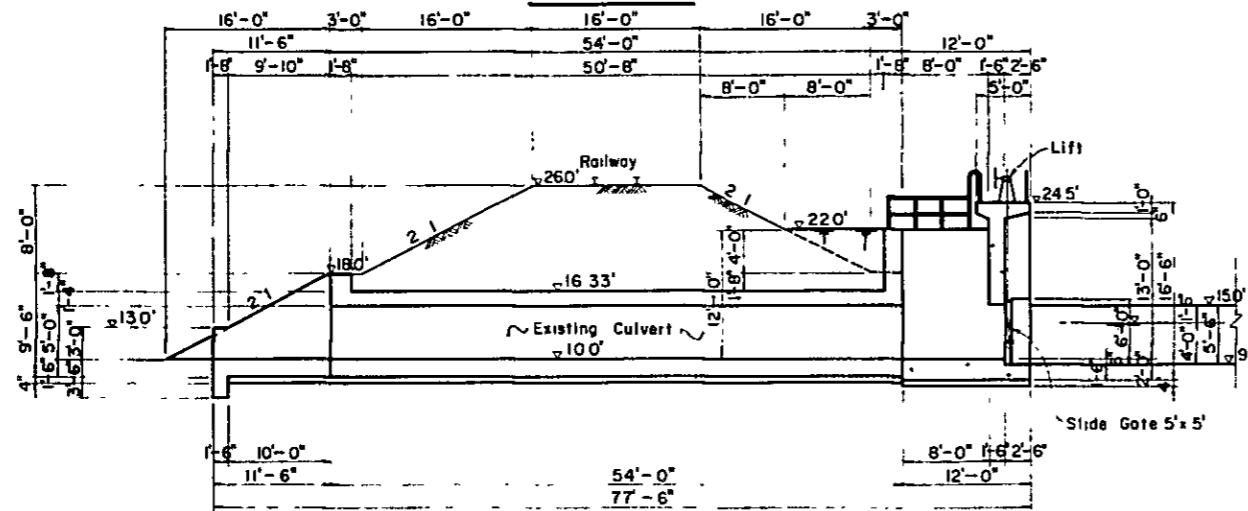
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
REGULATING GATE TYPE II	
PLAN AND SECTIONS	
Date: July 1978	DWG NO 27
JAPAN INTERNATIONAL COOPERATION AGENCY	

REGULATING GATE TYPE III
(IRRIGATION CANAL)

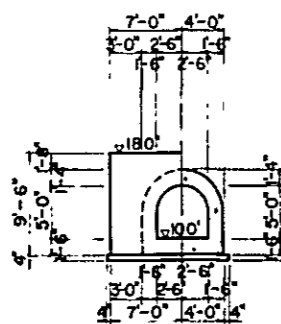
PLAN



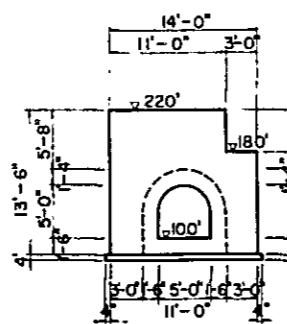
PROFILE



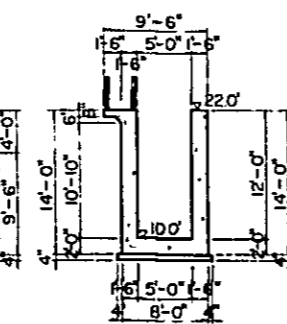
A-A B-B



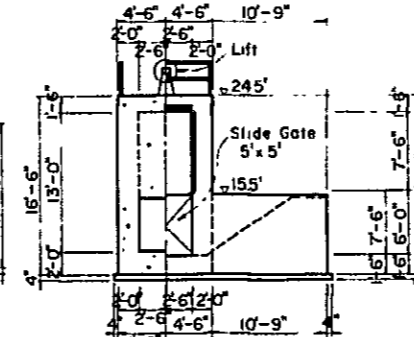
C-C



D-D

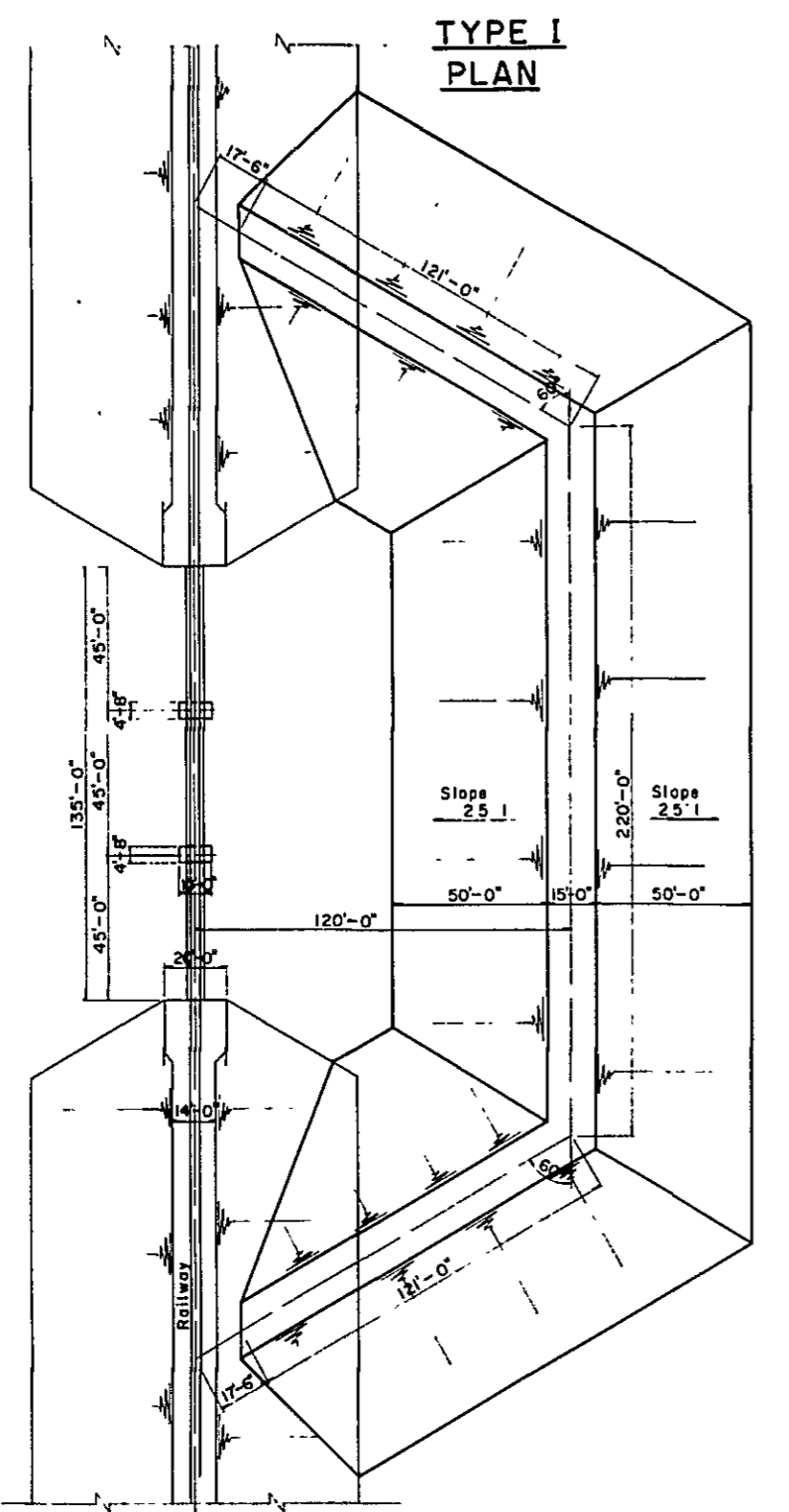


E-E F-F

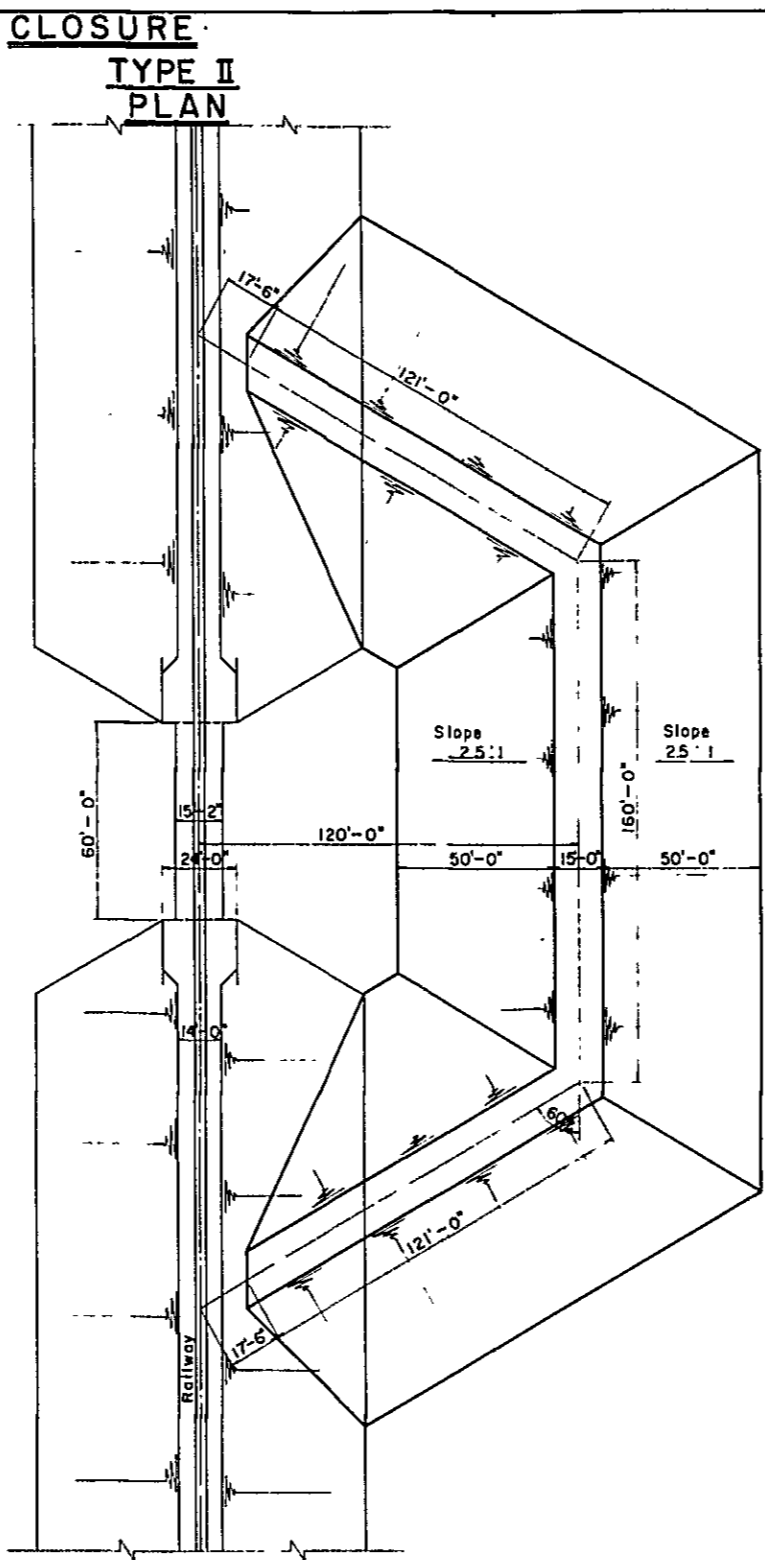


0 10 20 30
SCALE OF FEET

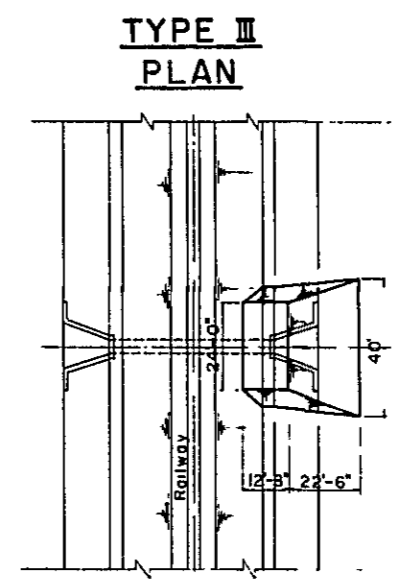
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
REGULATING GATE TYPE III	
PLAN AND SECTIONS	
Date: July 1978	DWG NO 28
JAPAN INTERNATIONAL COOPERATION AGENCY	



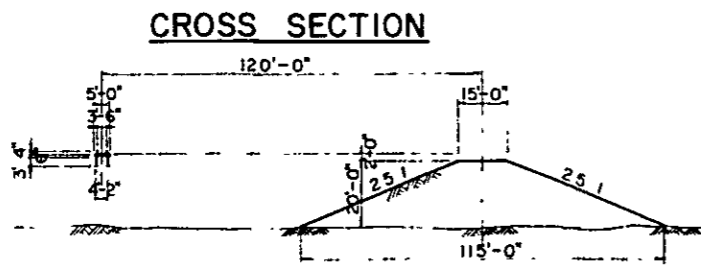
**TYPE I
PLAN**



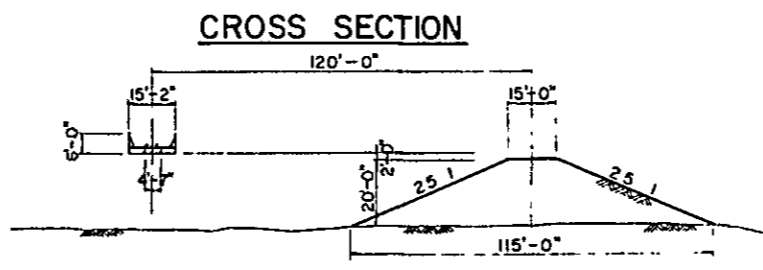
**TYPE II
PLAN**



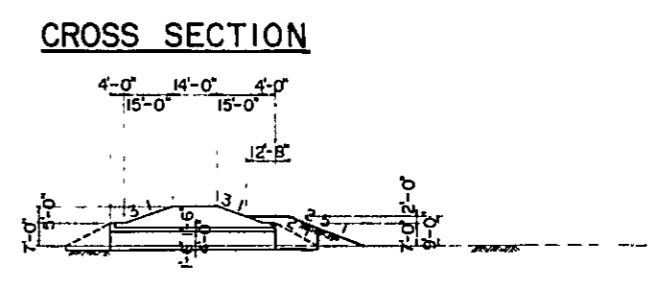
**TYPE III
PLAN**



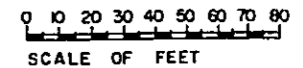
CROSS SECTION



CROSS SECTION



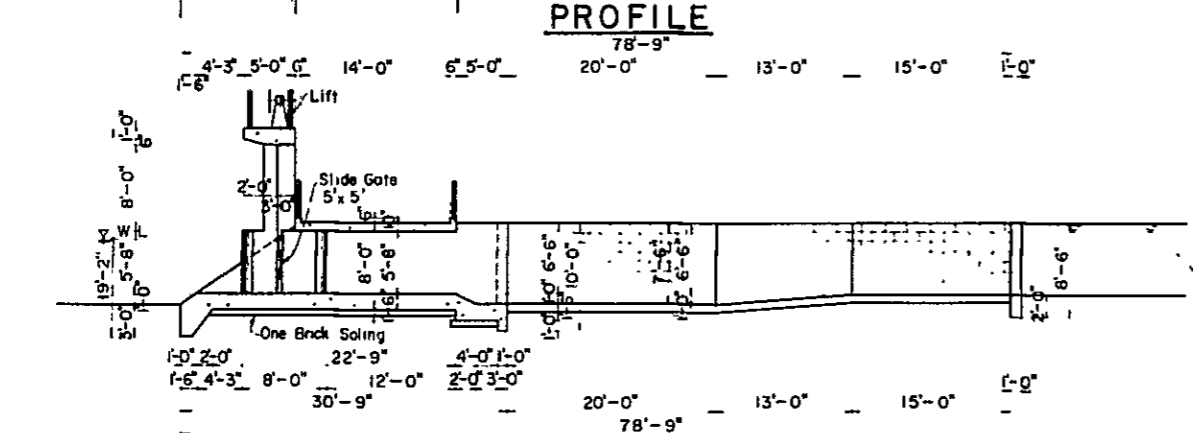
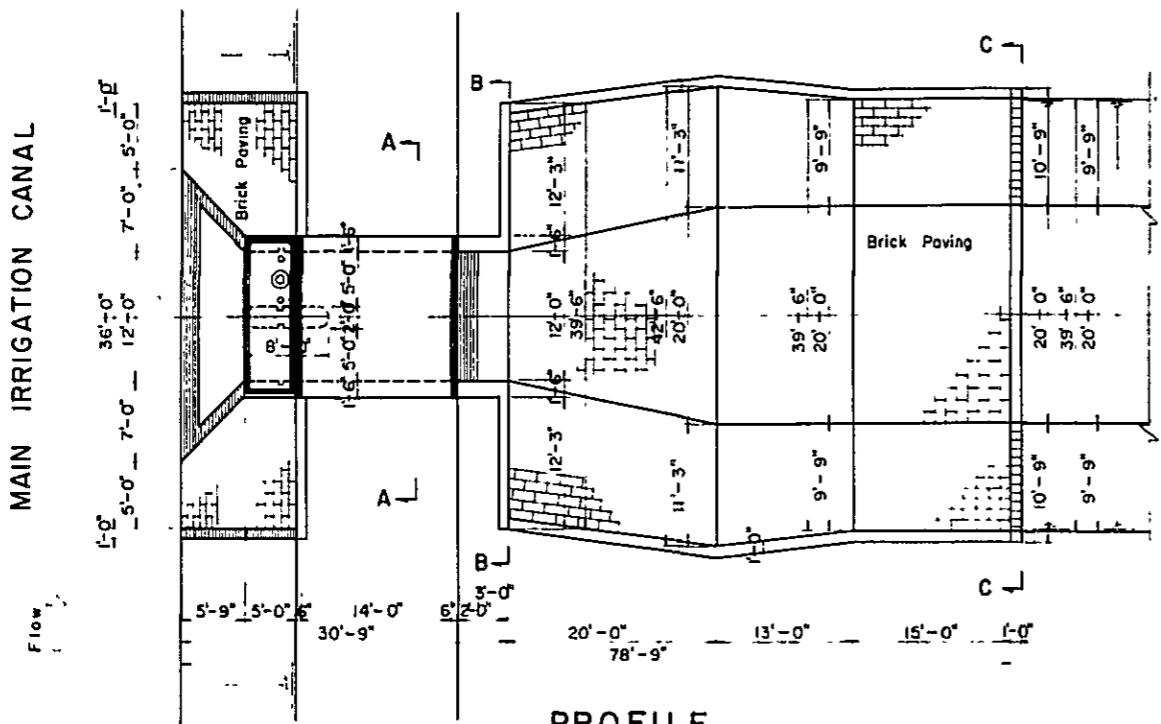
CROSS SECTION



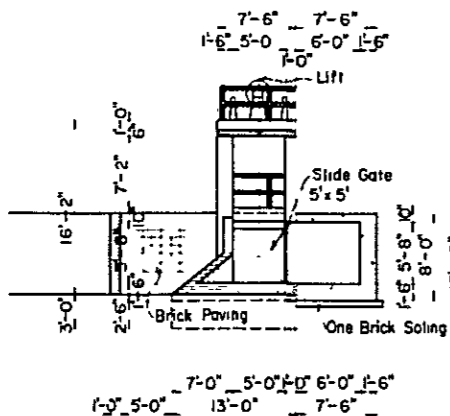
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
 THE PEOPLE'S REPUBLIC OF BANGLADESH
**CLOSURE TYPE I, II AND III
 PLAN AND SECTIONS**
 Date: July 1978 DWG NO 29
 JAPAN INTERNATIONAL COOPERATION AGENCY

TURNOUT

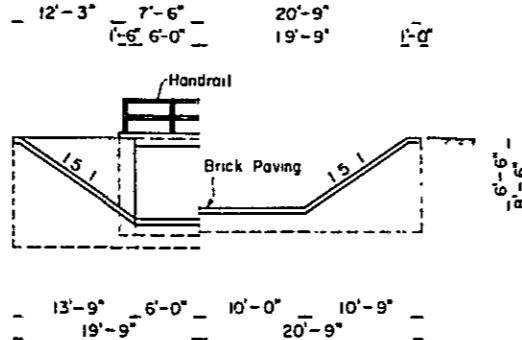
**TYPE I
PLAN**



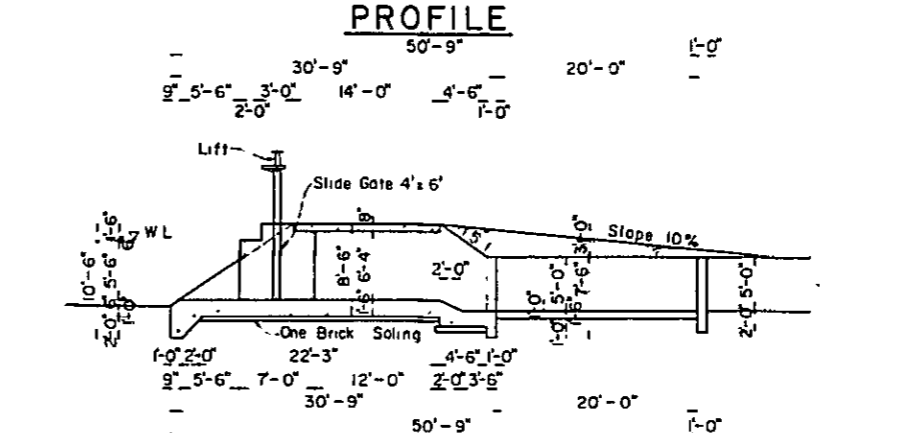
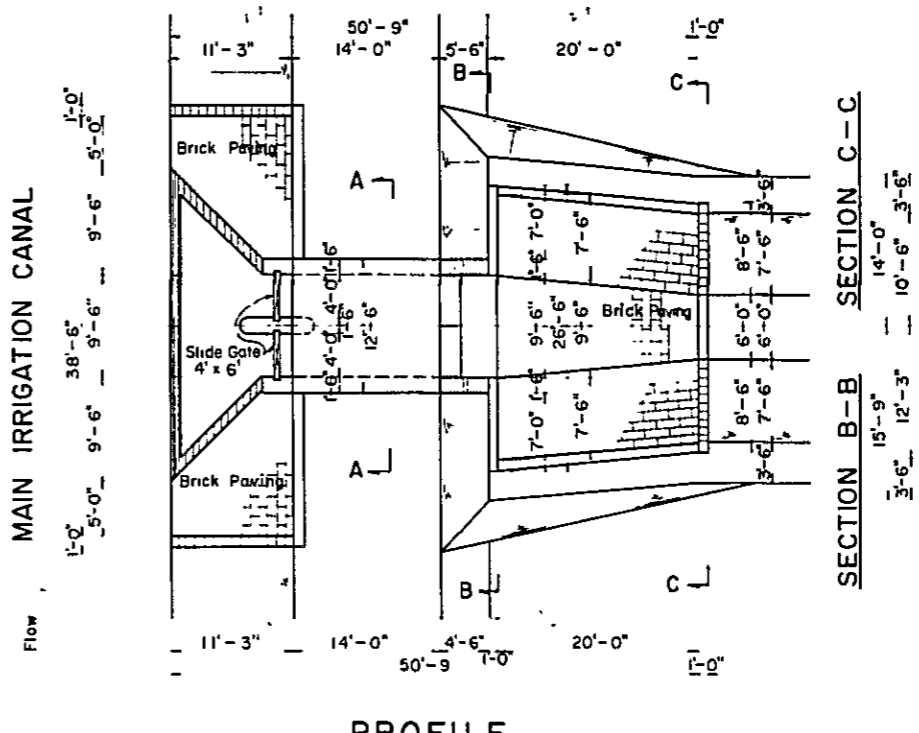
FRONT ELEVATION SECTION A-A



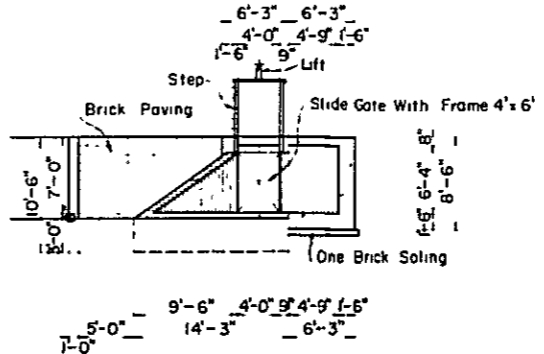
SECTION B-B SECTION C-C



**TYPE II
PLAN**



FRONT ELEVATION SECTION A-A

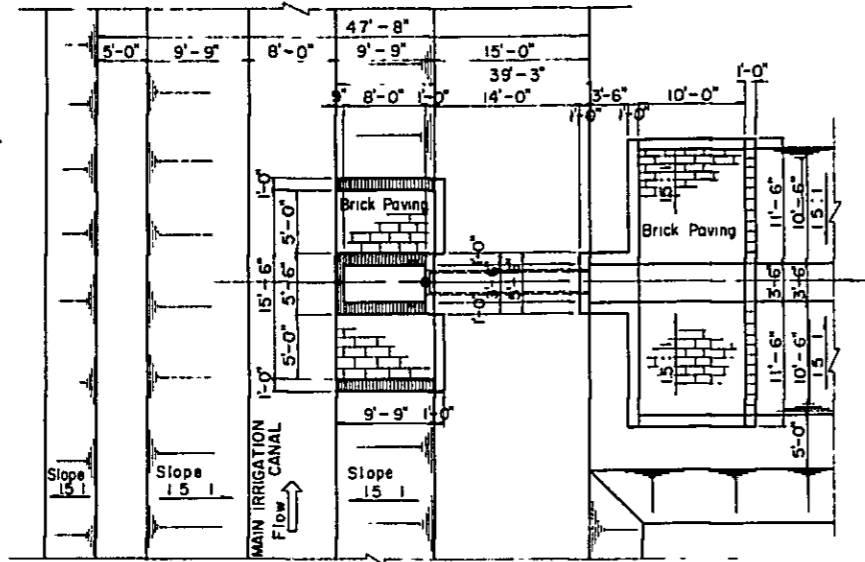


0 10 20 30
SCALE OF FEET

NARYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
TURNOUT TYPE I AND II	
PLAN AND SECTIONS	
Date: July 1978	DWG NO 30
JAPAN INTERNATIONAL COOPERATION AGENCY	

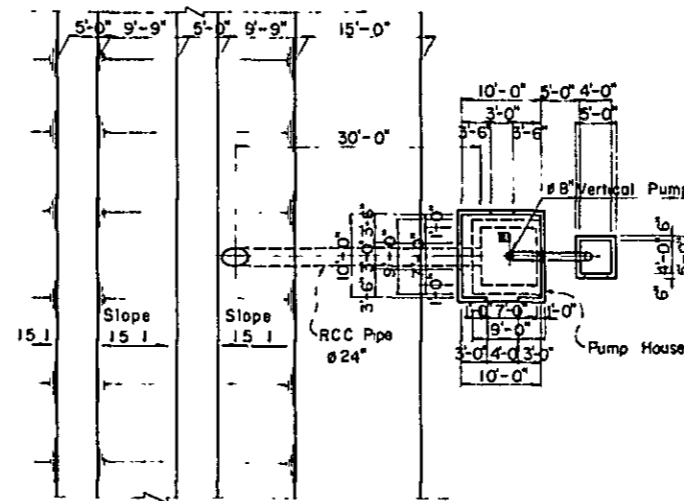
TURNOUT TYPE III

PLAN SCALE B

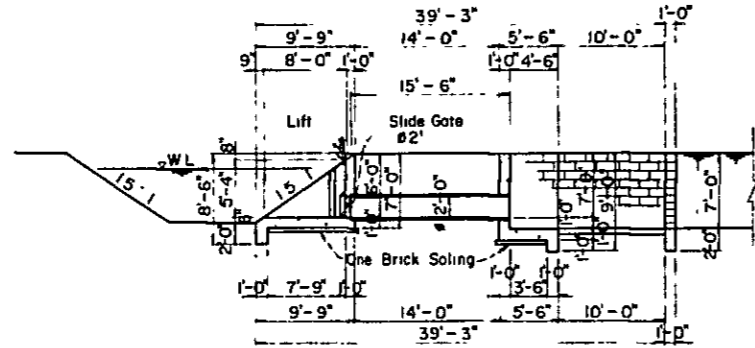


LOW LIFT PUMPING STATION

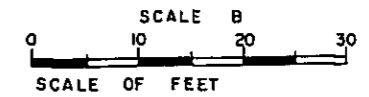
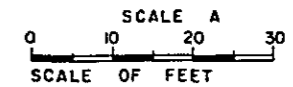
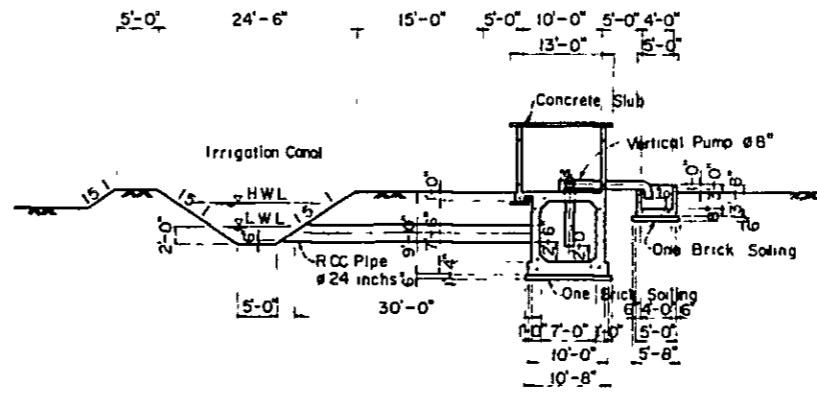
PLAN SCALE A



PROFILE SCALE B



PROFILE SCALE A



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
THE PEOPLE'S REPUBLIC OF BANGLADESH

**TURNOUT TYPE III AND
LOW LIFT PUMPING STATION
PLAN AND SECTIONS**

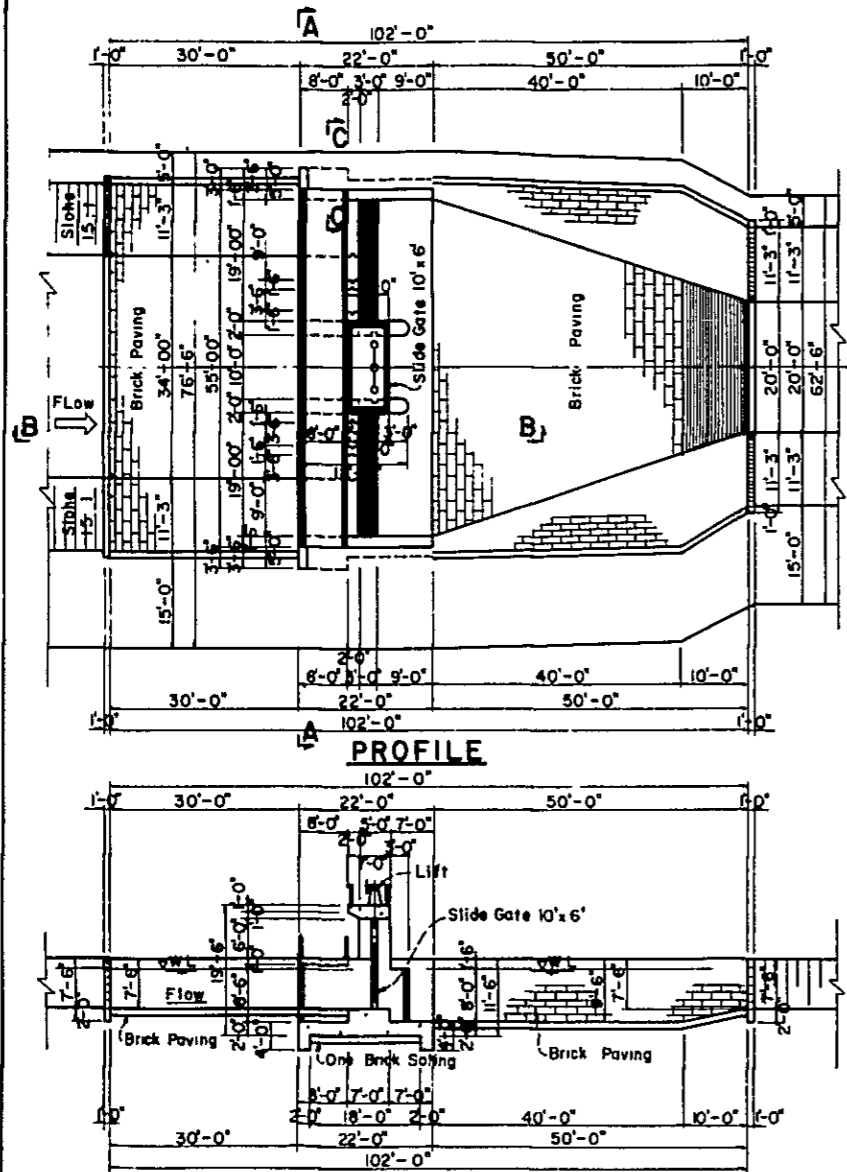
Date: July 1978 DWG NO 31

JAPAN INTERNATIONAL COOPERATION AGENCY

CHECK GATE

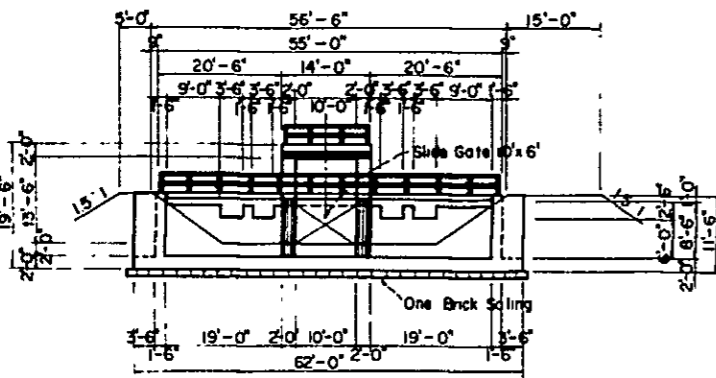
TYPE II

TYPE I

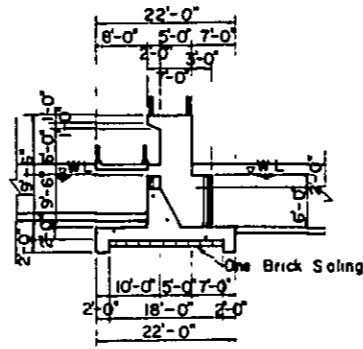


PROFILE

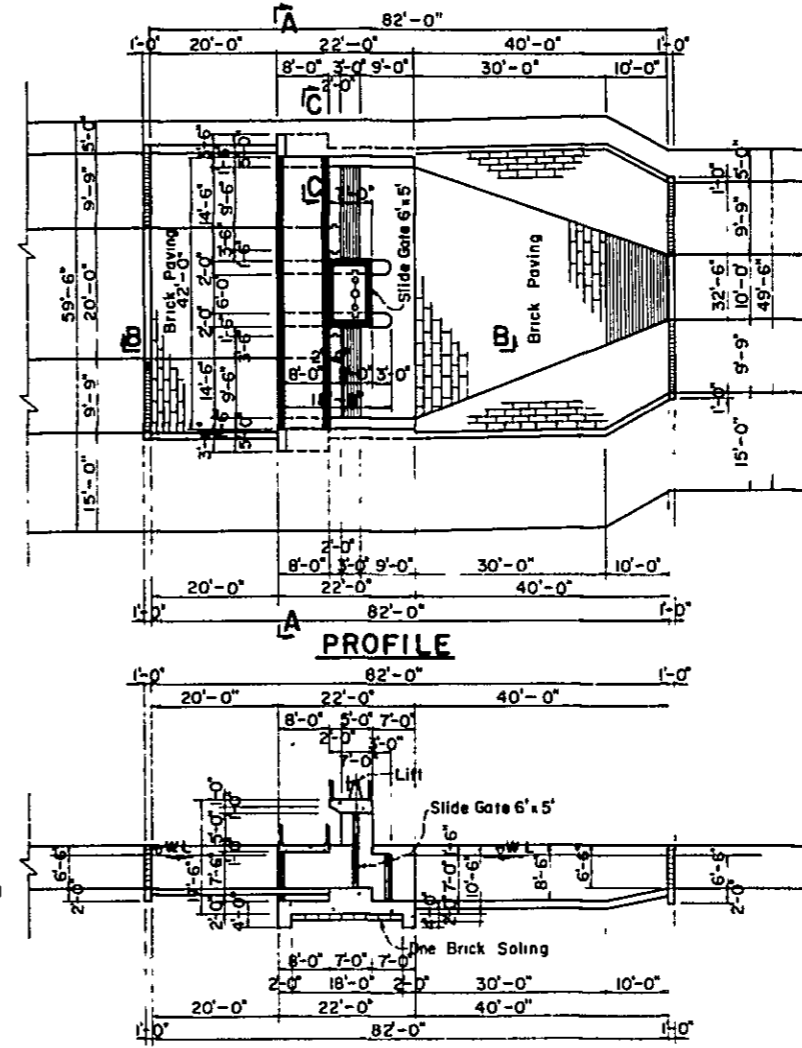
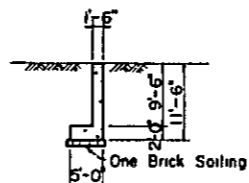
SECTION A-A



SECTION B-B

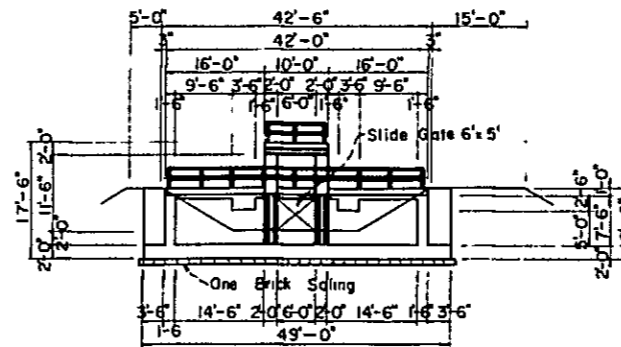


SECTION C-C

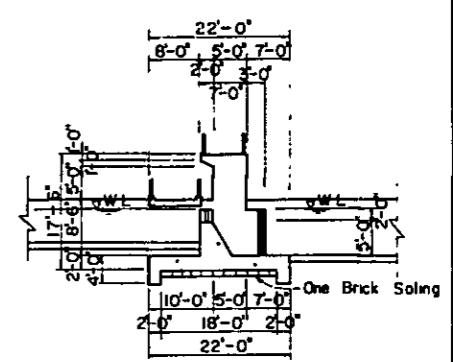


PROFILE

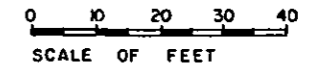
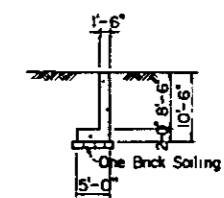
SECTION A-A



SECTION B-B



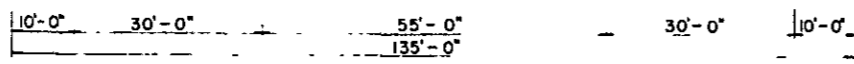
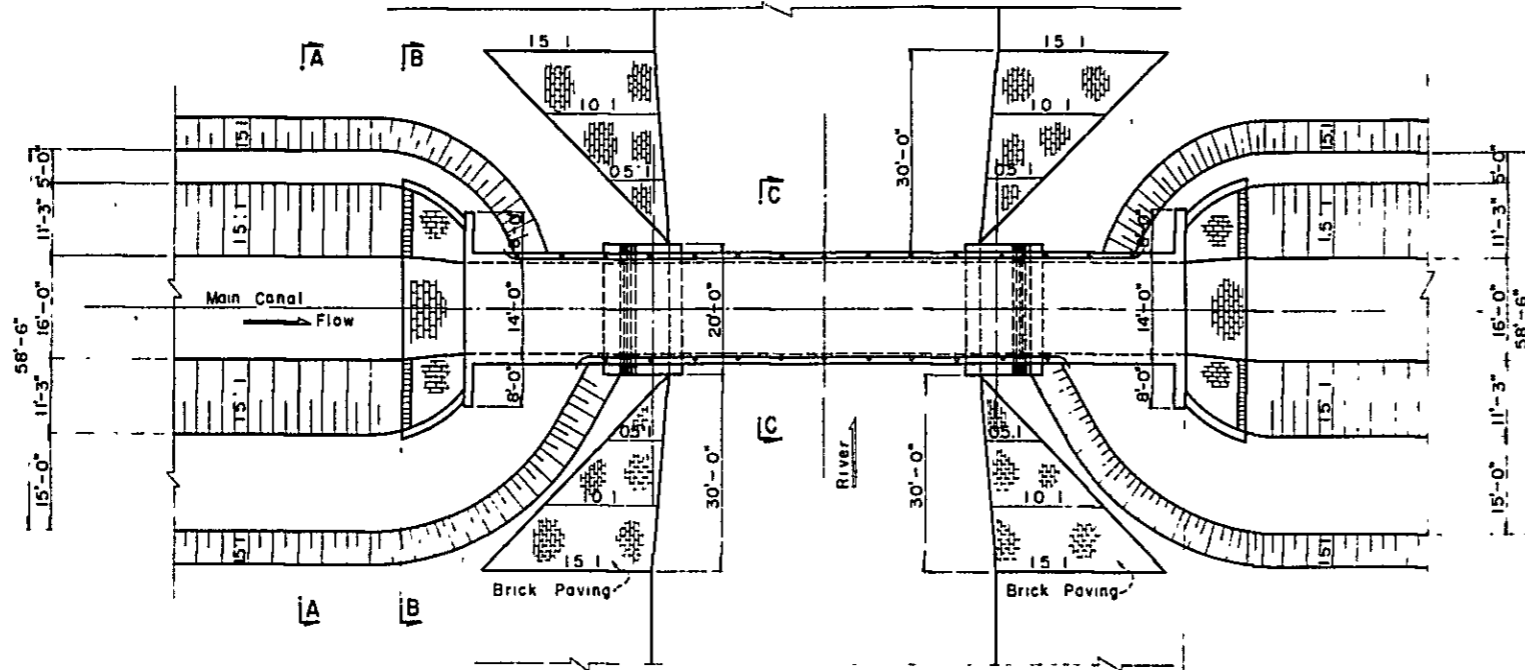
SECTION C-C



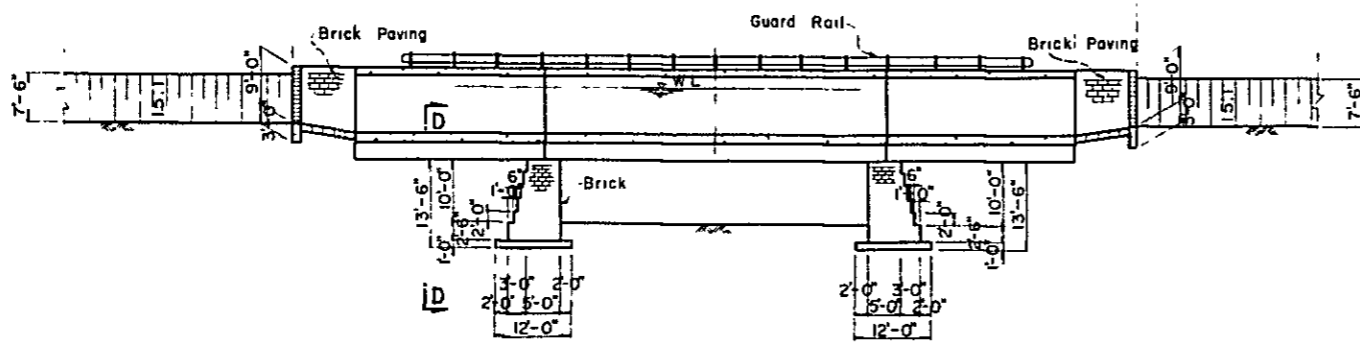
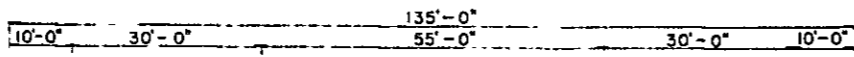
NARAYANGANJ-NARSINGDI IRRIGATION PROJECT	
THE PEOPLE'S REPUBLIC OF BANGLADESH	
CHECK GATE TYPE I AND II	
PLAN AND SECTIONS	
Date: July 1978	DWG NO. 32
JAPAN INTERNATIONAL COOPERATION AGENCY	

AQUEDUCT TYPE I

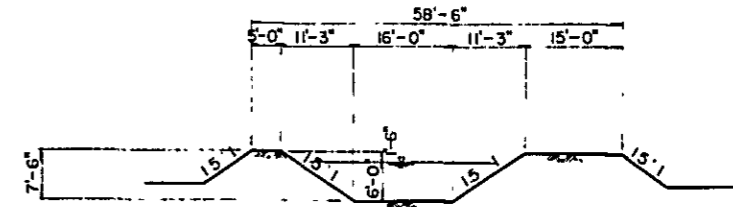
PLAN



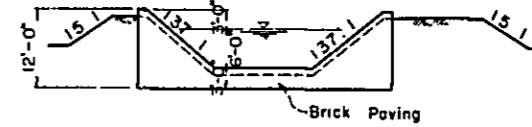
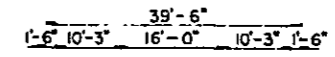
PROFILE



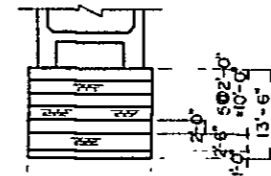
SECTION A-A



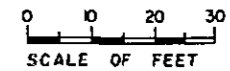
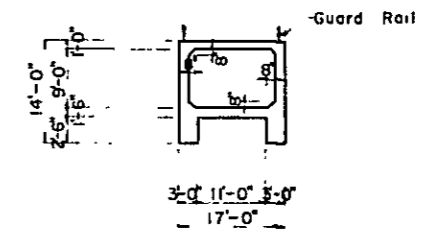
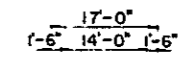
SECTION B-B



SECTION D-D



SECTION C-C



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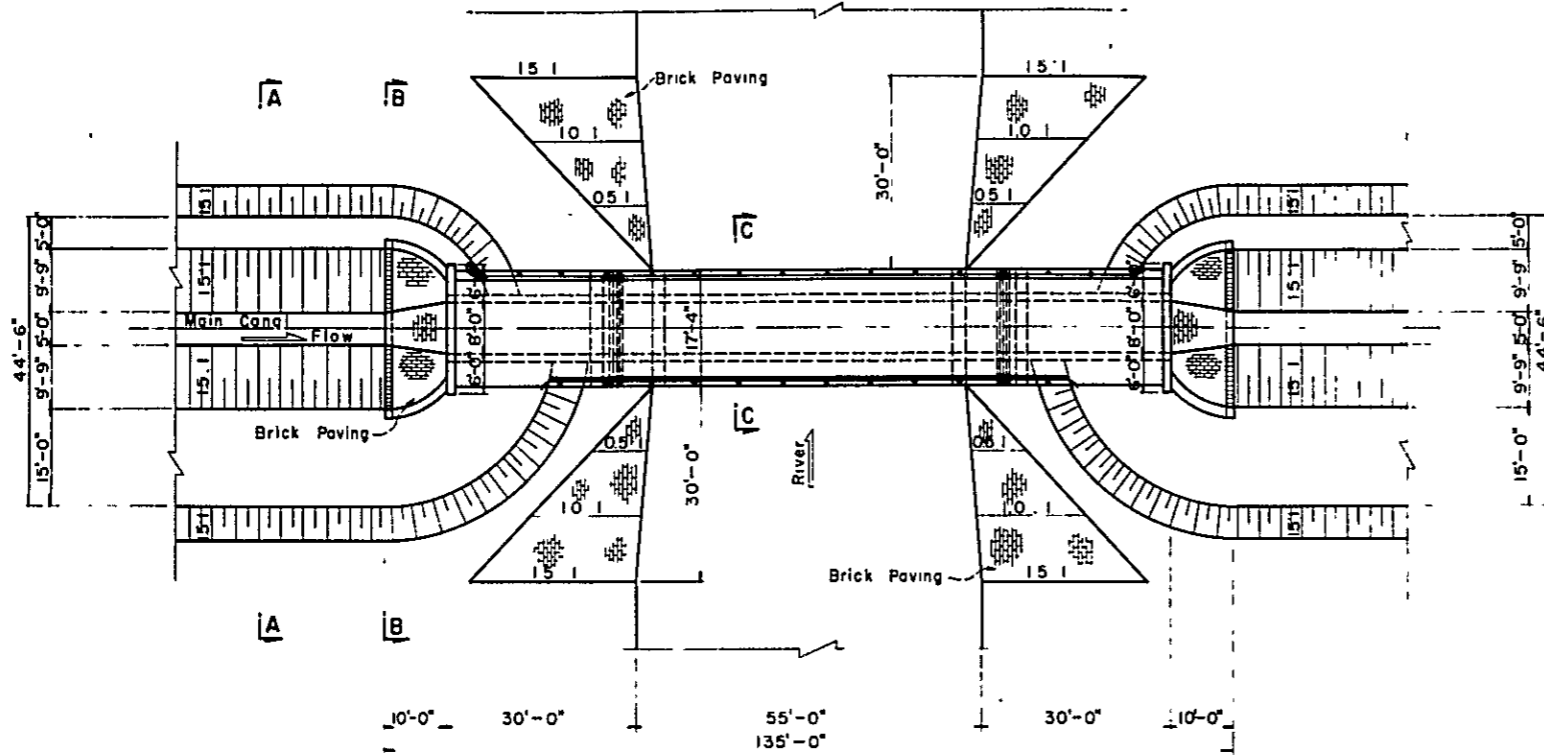
**AQUEDUCT TYPE I
P.L.A. AND SECTIONS**

Date: July 1978 DWG NO 33

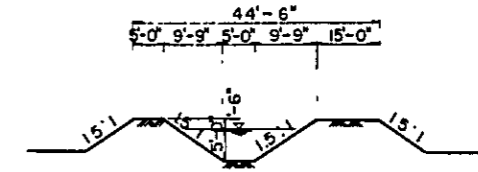
JAPAN INTERNATIONAL COOPERATION AGENCY

AQUEDUCT TYPE II

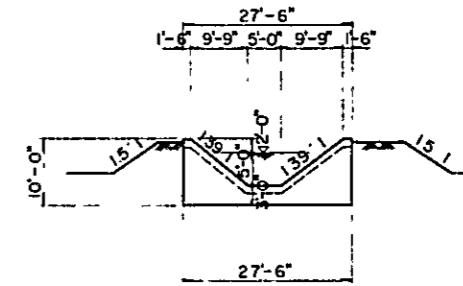
PLAN



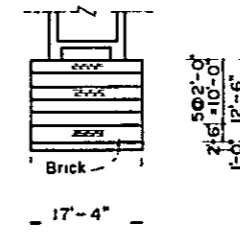
SECTION A-A



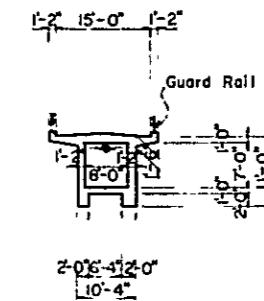
SECTION B-B



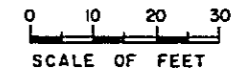
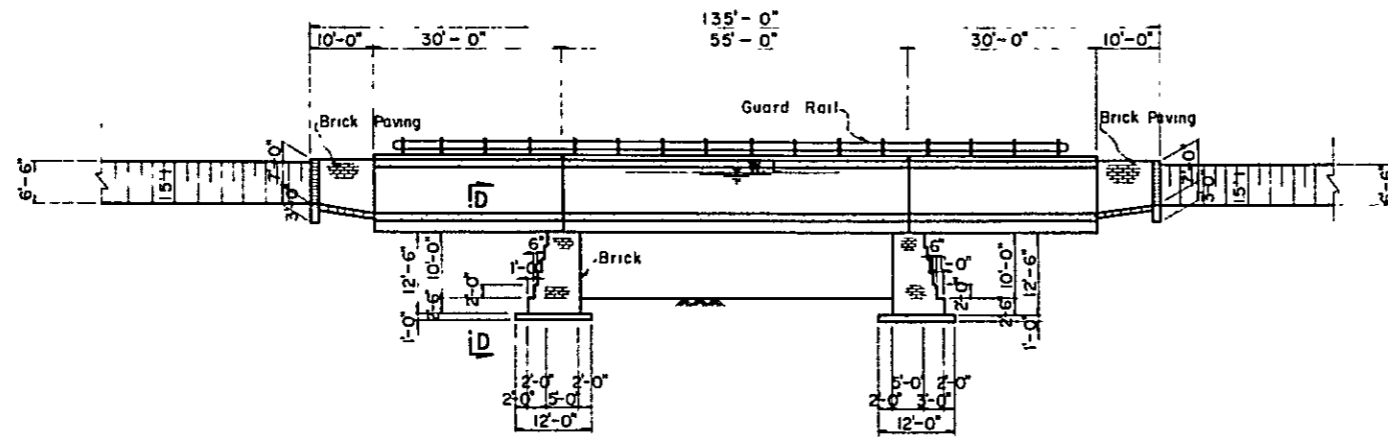
SECTION D-D



SECTION C-C



PROFILE



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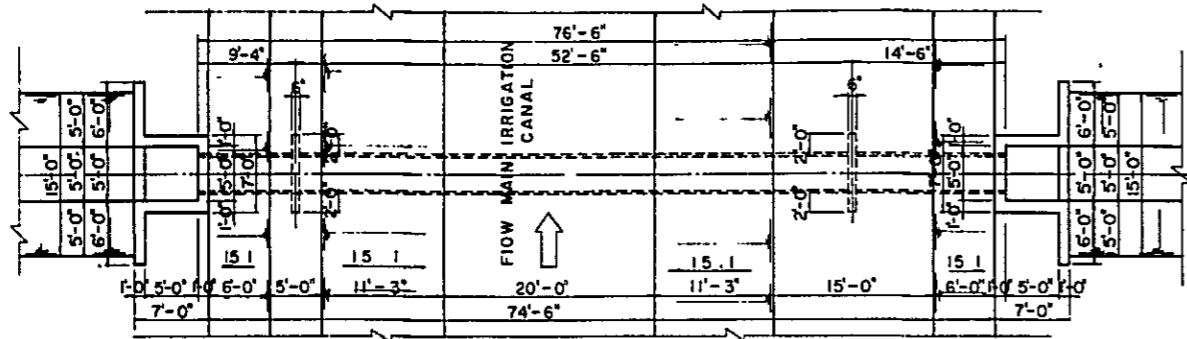
AQUEDUCT TYPE II
PLAN AND SECTIONS

Date: July 1978 DWG NO 34

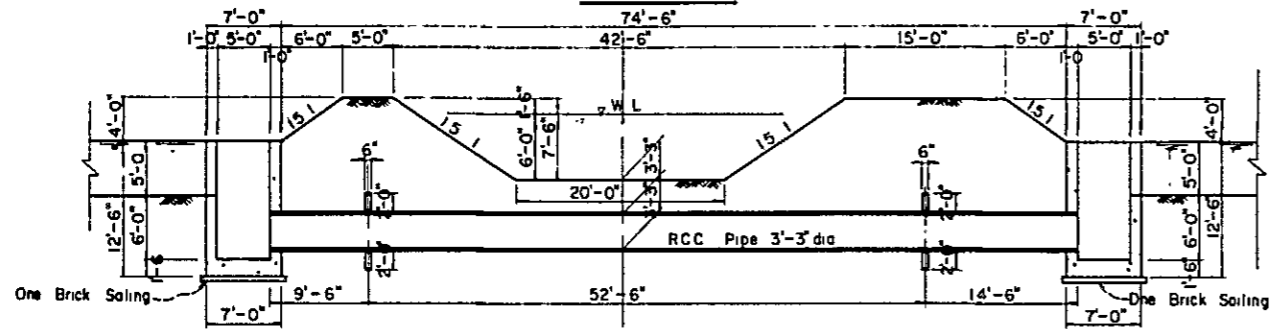
JAPAN INTERNATIONAL COOPERATION AGENCY

CROSS SIPHON

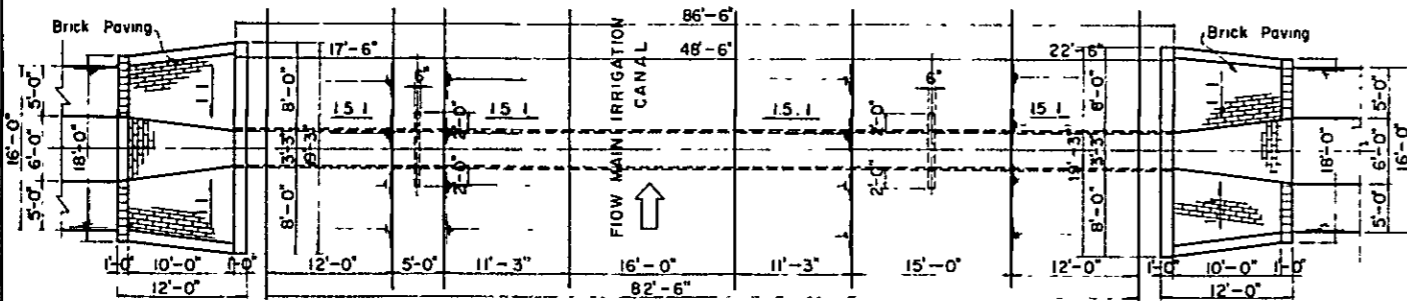
**TYPE I
PLAN**



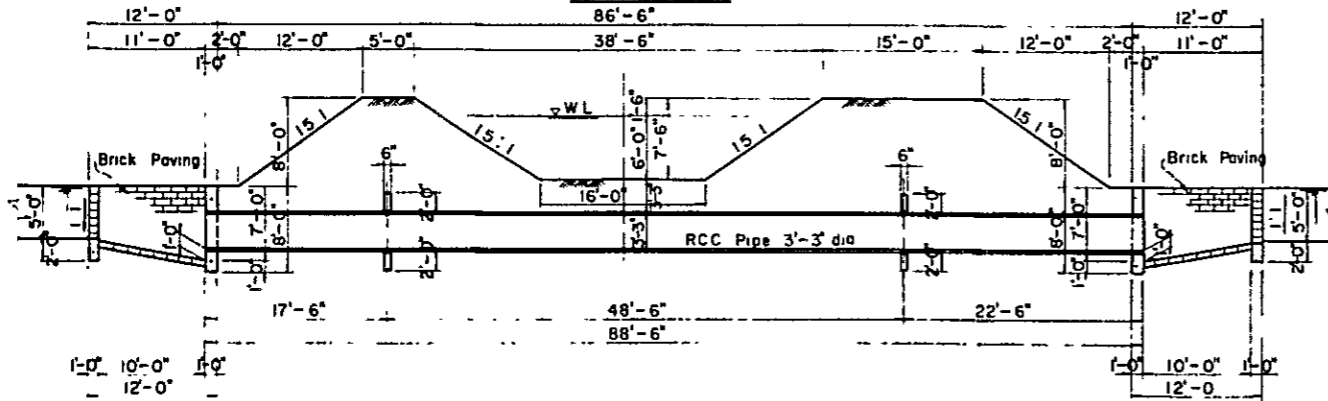
PROFILE



**TYPE II
PLAN**



PROFILE



NARAYANGANJ-NARSINGDI IRRIGATION PROJECT
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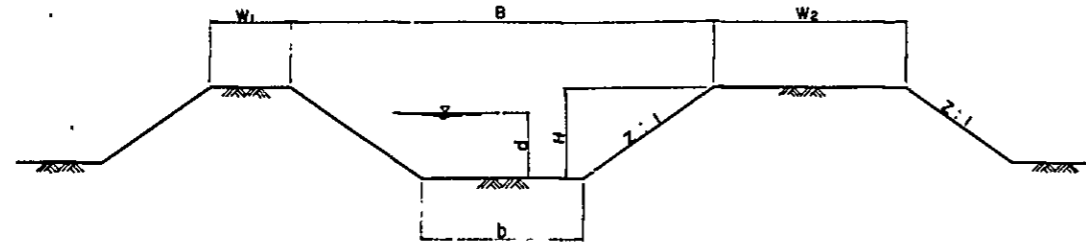
**CROSS SIPHON TYPE I AND II
PLAN AND SECTIONS**

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STANDARD CROSS SECTION

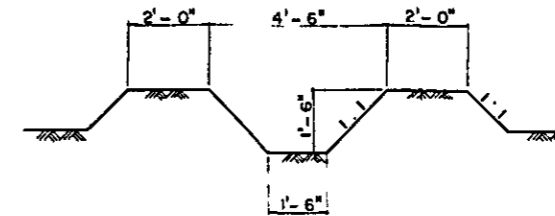
SECONDARY IRRIGATION CANAL



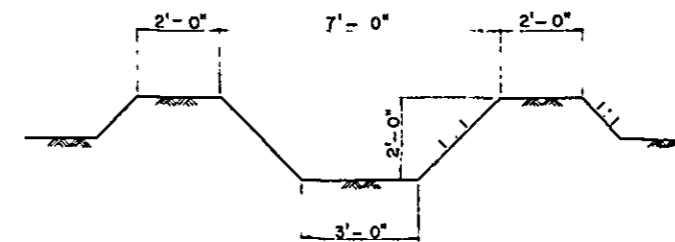
(Dimension ft x mile)

TYPE	Q	b	B	Z	d	H	W	W	LENGTH
1	70	10.0	26.5	1.5	4.0	5.5	50	120	10.70
2	50	6.0	22.5	1.5	4.0	5.5	50	120	6.80
3	40	5.0	21.5	1.5	4.0	5.5	50	120	37.90
4	30	8.0	16.0	1.0	3.0	4.0	50	120	11.90
5	20	5.0	13.0	1.0	3.0	4.0	50	120	83.10

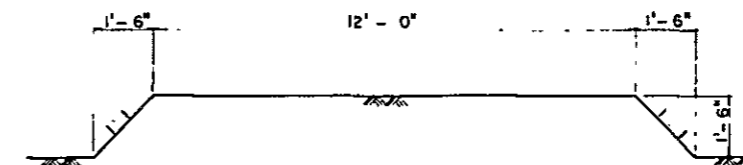
FARM DITCH



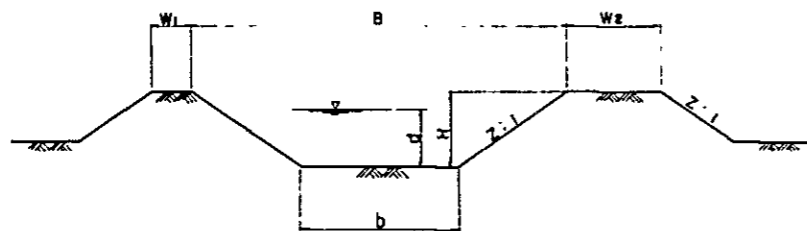
FARM DRAIN



FARM ROAD



SECONDARY DRAINAGE CANAL



(Dimension ft x mile)

TYPE	Q	b	B	Z	d	H	W	W	LENGTH
1	920	84.0	111.0	1.5	7.0	9.0	50	120	2.70
2	132	13.0	37.0	1.5	6.0	8.0	50	120	36.30

0 1 2 3 4 5
SCALE OF FEET

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**SECONDARY IRRIGATION CANAL
AND FARM ROAD
STANDARD CROSS SECTIONS**

Date: July 1978 D.W.G NO. 36

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