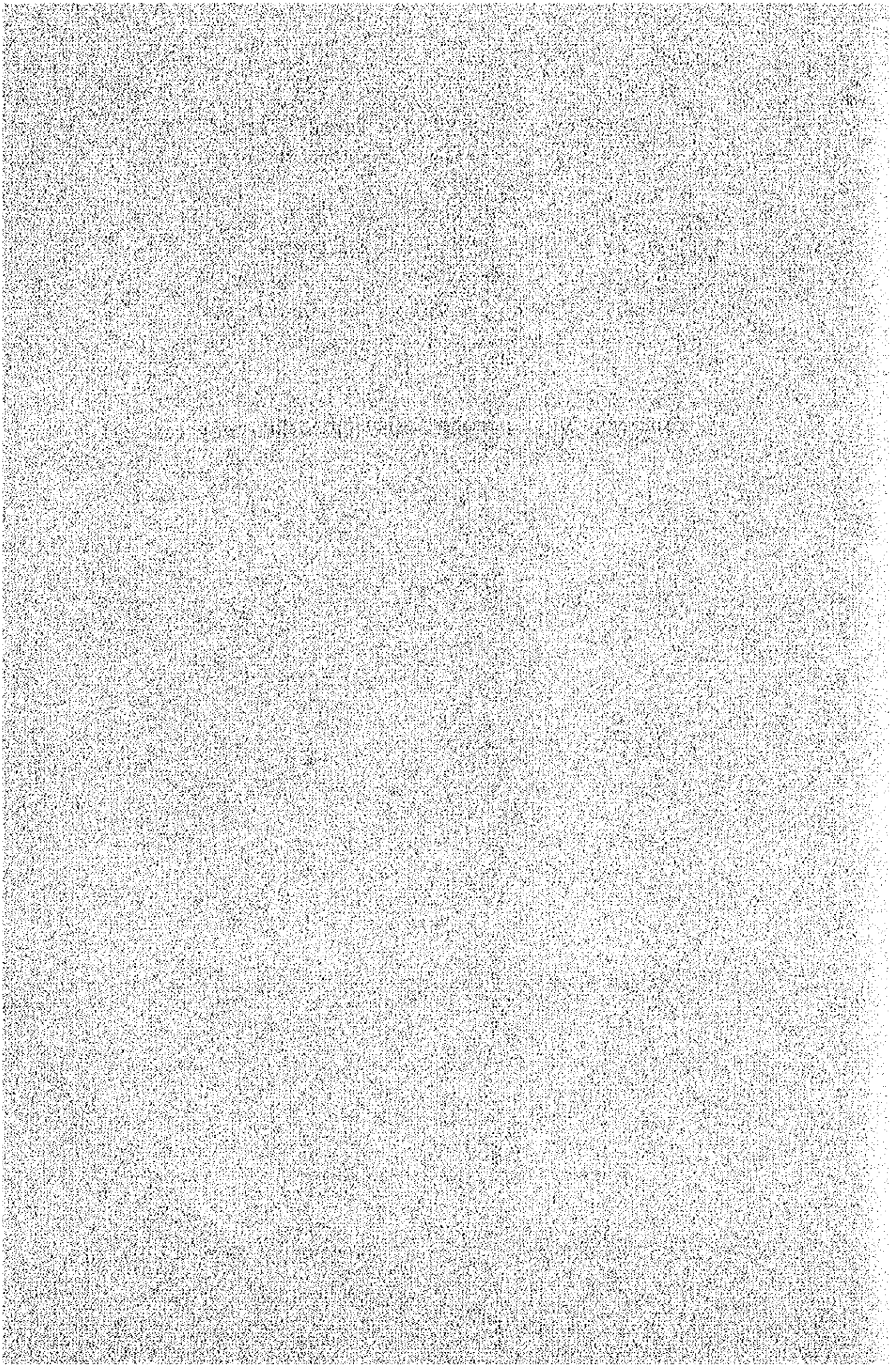
CHAPTER VI. PROJECT JUSTIFICATION



CHAPTER VI. PROJECT JUSTIFICATION

A. General

This Project was planned to meet the needs of national economy such as the supply of staple food, redress of income inequality, increase of employment and relief of energy constraint.

To answer these national purpose, the project components as mentioned in the previous chapter were schemed. The construction of Pamacsalan Dam and Malinao Diversion would make possible to convert a lot of grass-lands and rainfed paddy field into irrigated paddy and to built hydroelectric plant.

This Project was decided through the alternative study on a optimum use of water and land resources which had been kept along the Wahig-Pamacsalan basin. This basin locate in the central district of the Bohol Northeast Basin Development Project studied by CCC.

B. Premise of Benefit Estimation

Economic appraisal of the project has two objectives: One is to evaluate the project's contribution to the national economy, and the other to measure the benefits which would accrue to the project's immediate beneficiaries.

Direct benefits which would be measured in monetary terms are evaluated, but a number of indirect benefits are not accounted.

C. Method of Economic Evaluation

The measurable economic benefits and costs are expressed in monetary terms and the both streams of benefits and costs in annual forms over the evaluation period are converted to the respective

present worth values. Under the present evaluation standard, a fifty-year limit may be well justified. The internal rate of return (IRR) is used as the main indicator for the economic evaluation of a project.

Generally speaking, from an economic point of view, the project is defined as the difference between the development envisaged if the proposed project are executed, viz the "with the project" case, and the development if no such project are taken, viz. the "without the project" case. Thus, the project evaluation deals with incremental benefits and costs.

D. Evaluation of Benefits

This Project's direct benefits consist of agricultural benefit and hydroelectric power-benefit. Agricultural benefits are estimated as annual incremental Net Production Value. Annual power benefits are generally evaluated using the standard capacity-energy approach.

1. Net Agricultural Benefit

(a) The formation of annual benefited areas must be decided to match enough with the annual construction schedule. Because a fiscal year of construction term is 12-month from January to December and cropping year is May to April of next year. Then both terms do not overlap.

Annual benefits are obtained from three kinds of fields, namely, the new paddy field reclaimed, existing irrigated paddy and irrigated paddy converted from rainfed. In the first time, the completion of Malinao Diversion Dam Construction would bring about the benefits from dry season palay in 1982. Until the completion of Pamacsalan Dam in 1985, June, the irrigable area by Malinao Diversion would be even. Full irrigable benefited area causing by Pamacsalan Dam would start from a dry season in 1985.

Formation of benefited area is shown as follows.

Table 6-1. Benefited Area

(unit: ha)

	1982	1983	1984	1985	1986	1987
Benefited Paddy						
Wet season	-	1,365	2,757	3,013	5,176	5,176
Dry season	1,365	2,757	2,757	5,320	5,320	5,320
Total	1,365	4,122	5,514	8,333	10,496	10,496

Note: Detail schedule is explained in Appendix 6D-1.

(b) Annual benefited area multiplied by target yield give Gross Products with the Project. This target yield would be reached in terms of five years. On-farm works would be executed from 1982 to 1985, then constructed farms are decided into 4 blocks. The third and fourth field block's palay which benefits will grow in the latest time would be benefited from wet season in 1986 and reach to the target yield by wet season in 1990.

In general it will be projected in 9 years from dry season of 1982 to wet 1990 that palay production reach to target yield over all benefited area.

On an evaluation of Gross Production without the Project the cropping pattern at present was assumed to continue still in future. But annual yield would be estimated moderately considering a technical progress of some extent. (See Appendx 6D-1)

(c) Gross Production Value and Production Cost are computed annually, then annual input volume with and without the Project and commodities price must be evaluated.

Cost items consist of seeds, fertilizer, pesticides, herbicides, cultivating cost and threshing cost. Cultivating cost is counted based on annual cultivating area by animal and machinery and threshing cost based on annual threshing area by power, pedal and feet. (See Appendix 6D-1)

Labor problem would be explained subsequently.

(d) Deduction of Production Cost from Gross Production Value make Net Production Value. A difference between NPV with and without the Project correspond to annual incremental benefits.

(e) Economic Evaluation of Commodities and Labor Price

Traded goods to be evaluated to shadow price are palay, corn, fertilizer and oil. Foreign exchange rates to be used is US$1.00 = ₱7.5 as official exchange rate.

Farm gate price of paddy may be evaluated at the export price of Thai 25 - 30 % broken rice, f.o.b. Bangkok forecasted by World Bank, 245 US$/ton of 1977 and 281 US$/ton of 1985. A selling center where the increased rice would be sold is projected at Cebu City. Transportation cost to selling center is evaluated at shipping from Taribon Port.

Table 6-2. Rice Price Structure, 1977 and 1985

	1977		1985	
	₱/ton	US$/ton	₱/ton	US$/ton
1. Export Price of Tahi 25-35 % broken, f.o.b. Bangkok	1,840	245	2,110	281
2. Price of Rice, Cebu	1,975	270	2,310	307
3. Price Milled Rice, Area	1,915	262	2,250	299
4. Paddy Equivalent project, Area	1,205	165	1,420	188
5. Farm Gate Price of Paddy	1,160	159	1,375	182
(Financial Farm Gate Price)	(1,020)		(1,375)	
6. Price per Cavan	58		69	
(Financial Price)	(51)		(69)	

Note: ₱/ton and US$/ton values at constant 1977 prices

Fertilizer is also the traded goods as mentioned above. The distribution center of fertilizer for Bohol is located in Cebu City. Farm Gate Price of fertilizer would be evaluated on such projection as

the distribution center will stay in Cebu City in future. International price of Urea, TSP and Potash are based on the World Bank's forecasting prices at constant 1977 prices. But Farm gate price of Urea was estimated using cheaper ASEAN Urea price than Europe Urea. (See Appendix 6D-2)

A distinction is commonly made between farm family labor and wage labor. Wage labor is counted as an input, then the cost of wage labor valued at the shadow price must be deducted from the gross value of output. For farm family labor, no such deduction is made, because the return to farm family labor is taken as the net farm return.

After completion of this Project, average size of farm and cropping intensity would extend, then labor peak season would grow more harder. According to the farm labor analysis, labor demand in peak month with and without the Project would increase 34,000 to 171,000 mandays in July and 33,000 to 176,000 in December. (See Appendix 6D-3) As mentioned above, the unemployed laborers living in adjacent area to the Project amount to about over 3,000 persons at present. In future, a part of such unemployment would be employed in a labor peak season.

The difference of hired labor demand with and without the Project would be counted as incremental production cost. The unit labor cost is evaluated using the shadow wage rate which is counted by making of the opportunity cost curve.

2. Annual Power Benefit

Annual power benefits are generally evaluated using the standard capacity-energy approach. The dependable capacity and the average annual energy production were evaluated based on the cost of an alternative oil-fired steam or diesel turbine generating plant.

The thermal plant represents a definite alternative with relatively well-known costs of construction and operation. In this study, the Bohol Diesel Electric Power Plant with capacity of 11.07 MW which is

under construction in Tagbilaran City was used as the alternative plant.

The capacity cost (kw, value) from this Project Power Plant was assumed to be equal to the annual fixed costs associated with the construction of an equivalent capacity of Bohol Diesel Electric Power Plant. Items of fixed cost consist of interest, depreciation and O & M etc.

The energy cost (KWH value) was assumed to be equal to the annual cost of fuel and variable maintenance of the alternative thermal plant. This value was multiplied by the adjustment factor which was estimated in consider with the difference of transmission loss, forced outage, auxiliary power use and etc. between Hydro and Diesel Power. Fuel cost of diesel was estimated based on the cost of fuel per Mbtu and heat rate per KWH of NPC data.

The unit power values are:

Capacity Cost (₱/KW)	640	₱/kw (85.4 US$)
Energy Cost (₱/KWH)	0.1935	₱/KWH(0.0258 US$)

E. Evaluation of Construction Cost

1. Irrigation

Direct cost to be used in the estimation of internal rate of return consist of the engineering design, property and construction cost of the project, not including interest during the period of construction. Operating and Maintenance costs are meant by only the amount of labor and materials that are required to make the project function as designed over its life period. Both interests and taxes are considered transfer payments which have no real effect on the resources used by the project from a social point of view. Construction equipment cost was estimated using the purchasing prices in Chapter IV-E. In economic evaluation, the economic cost of such equipment would be estimated using depreciation cost. Depreciation cost of farm machines would be included in the production cost of palay.

Unskilled labor cost and oil cost used in the estimation of financial project cost should be re-estimated using opportunity cost. Compensation cost of reservoir area and land acquisition cost for construction of canals would be re-estimated in the economical point of view.

2. Power

The total capital investment for power would include the cost of power facilities and cost of joint facilities to be allocated to power.

Cost allocation of joint facilities is computed using the Separable Costs Remaining Benefits Methods. Economic analysis is based on the comparison of incremental or separable cost including power as a project purpose with the estimated power benefits.

The separable cost for power consists of construction cost, O & M cost and replacement cost. This construction cost include the allocated cost on the Pamacsalan Dam and Malinao Diversion Dam.

3. Project Economic Life

Project economic life will be calculated at 50 years. The present value of the future benefit and cost beyond 50 (or even 30) years would be too small to make any real difference in the final result.

4. Escalation Factor

Escalation factor would be used by 8 percent decided in reference to World Bank's International Inflation Index and Philippines Economic Indicator and other project's rates. (See Appendix 6E-1)

F. Annaul Economic Cost and Benefit

1. Annual Cost

Annual economic cost was evaluated according to the procedure

entioned above. Financial project cost of 225.7 million peso (30.1 million US$) excluding escalation factor is scheduled as Table 6-3. About 40 percent of total cost would be disbursed in 1981. A great part of such cost is construction equipment of 59.5 million peso (7.9 million US$). This disbursement which would be considered as disadvantage in economic evaluation was re-estimated using the annual depreciation cost. Thus, financial project cost of 198.7 million peso (26.5 million US$) excluding tax were re-estimated on the costs of unskilled labor, fuel and oil, land acquisition and compensation under the economical view point. (See Appendix 6F-1)

The economic cost to be used for evaluation of internal rate of return was estimated at 184.8 million peso (24.6 million US$). This integrated investment consists of both section of irrigation and electric power. Pamacsalan Dam and Malinao Diversion Dam are the joint facilities to be allocated in the both section. Joint cost was allocated to irrigation and electric power using the Separable Costs Remaining Benefits Methods. The ratio of allocation are 91.5 percent to irrigation and 8.5 percent to electric power. (See Appendix 6F-1)

Price escalation was enumerated by computing the estimated rate (8 percent per annum for both the foreign and local currency) of price increase in prior year and one half of the rate of increase in the year concerned.

2. Annual Benefit

(a) Agriculture

Annual incremental net production value (NPV) was evaluated according to the procedure mentioned above. Table 6-4 indicate the annual NPV. Labor cost is estimated on hired labor cost which was assumed in the labor study. (See Appendix 6D-3)

Table 6-3. Evaluation of Economic Cost

(unit: 10^3 Peso (USx10^3$)

	1979	1980	1981	1982	1983	1984	1985	Total	Note
(1) Project Cost excluded Escalation	6,450	5,960	89,790	26,500	39,260	38,870	18,860	225,690	
(2) Construction Equipment	-	-	59,530	-	-	-	-	59,530	
(3) Depreciation Cost of Equipment	-	-	6,900	6,900	6,900	6,900	6,900	34,500	
(4) Project Cost depreciated Equipment	6,450	5,960	37,160	33,400	46,160	45,770	25,760	200,660	(1)-(2)+(3)
(5) Tax	30	10	190	440	380	540	330	1,920	
(6) Project Cost excluded Tax	6,420	5,950	36,970	32,960	45,780	45,230	25,430	198,740	(4) - (5)
(7) Component Cost to be re-estimated (Unskilled Labor, Fuel and Oil, Land Acquisition and Compensation)									
(7a) Financial Cost	360	80	6,200	5,930	5,470	6,770	3,540	28,350	
(7b) Economic Cost	160	40	3,540	2,720	2,640	3,310	1,990	14,400	
(8) Economic Cost	6,220	5,910	34,310	29,750	42,950	41,770	23,880	184,790	(6)-(7a)+(7b)
	(830)	(790)	(4,580)	(3,970)	(5,730)	(5,570)	(3,180)	(24,650)	
of which:									
(a) Irrigation	6,220	5,910	32,360	28,290	28,630	38,810	21,210	161,430	
	(830)	(790)	(4,320)	(3,800)	(3,850)	(5,200)	(2,860)	(21,650)	
(b) Electric Power	-	-	1,950	1,460	14,320	2,960	2,670	23,360	
			(260)	(170)	(1,880)	(370)	(320)	(3,000)	

Note: 1. Figures in the parenthesis indicate US$.

2. Economic cost of electric power include the cost allocated on the joint facilities.

Table 6-4. Incremental NPV

Unit: 10^3 Peso (US$x10^3)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
With Project									
G.P.V	10,819	20,420	27,230	40,593	50,813	54,165	56,397	57,541	57,767
G.P.C (excluding labor cost)	2,316	4,524	5,738	8,069	9,827	10,012	10,135	10,135	10,135
N.P.V	8,503	15,897	21,492	32,524	40,986	44,153	46,262	47,406	47,632
Without Project									
G.P.V	7,920	8,478	8,694	8,983	9,913	9,403	9,506	9,717	9,717
G.P.C (excluding labor cost)	1,298	1,324	1,333	1,346	1,346	1,346	1,346	1,346	1,346
N.P.V.	6,622	7,155	7,361	7,637	8,567	8,057	8,160	8,371	8,371
Incremental NPV including Labor Cost	1,881	8,742	14,131	24,887	32,419	36,096	38,102	39,035	39,261
Labor Cost	-	-	-	162	188	156	156	156	156
Incremental NPV	1,881	8,742	14,131	24,725	32,231	35,940	37,946	38,879	39,105
	(251)	(1,166)	(1,884)	(3,297)	(4,297)	(4,792)	(5,059)	(5,184)	(5,214)

(b) Electric Power

Reservoir operation studies for the period of record (1956/57 - 1975/76) indicate that the Pamacsalan Power Plant would generate a firm peaking capacity (installed capacity) of 850 x 2 kilowatts and dependable capacity of 1,225 kilowatts and an average annual energy of 4,968 megawatts-hours when operated on a six hours daily peaking schedule.

Using the unit values of power and energy, the annual power benefits would be:

KW value	785 ₱ x 10^3 (105 US$ x 10^3)
KWH value	961 ₱ x 10^3 (128 US$ x 10^3)
Total	1,746 ₱ x 10^3 (233 US$ x 10^3)

G. Internal Rate of Return

Present worth value of the economic cost and benefit was estimated based on Table 6-3 and 6-4. The following Table indicates the present worth values for integrated project with irrigation and electric power.

Table 6-5. Present Worth Value of Cost and Benefit
- Irrigation and Electric Power -

Discount Rate		5%	10%	15%	20%
Benefit	₱x10^6	508.7	207.3	103.8	58.7
	(USx10^6$)	(67.8)	(27.6)	(13.8)	(7.8)
Cost	₱x10^6	175.5	121.5	91.1	71.0
	(USx10^6$)	(23.4)	(16.2)	(12.1)	(9.5)

Internal rate of return amount to 17.0 percent by Figure 6-1 which was drawn using the figures in Table 6-5. This integrated project would be considered justifiable in the economical view point. (See Appendix 6G-1)

As already found in the alternative study, the economy of isolated

FIGURE 6-1 INTERNAL RATE OF RETURN
-- Irrigation and Electric Power --

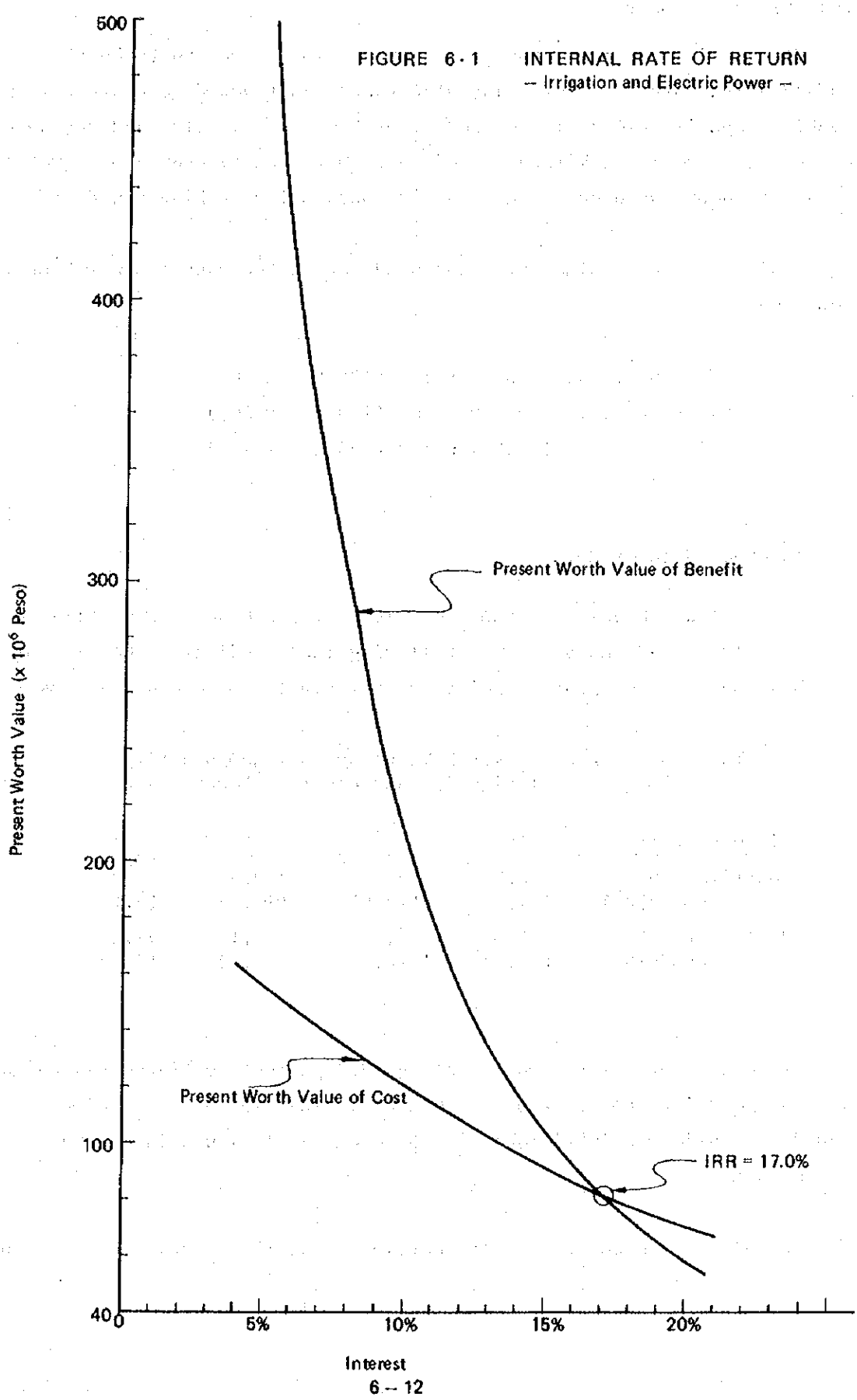


Table 6-6. Present Worth Value of Cost and Benefit

— Electric Power —

Discount Rate	5%	10%	15%	20%
Benefit ₱x10^6	20.64	8.02	3.80	2.03
(US$x10^6)	(2.75)	(1.07)	(0.51)	(0.27)
Cost				
Case 1. ₱x10^6	24.67	15.52	11.14	8.38
(US$x10^6)	(3.29)	(2.07)	(1.49)	(1.12)
Case 2. ₱x10^6	19.08	11.3	7.83	5.79
(US$x10^6)	(2.54)	(1.51)	(1.04)	(0.77)

Note: 1. Case 1 include the cost allocated on joint facilities.
Case 2 exclude the cost allocated.

2. Cost item of Power are turbine and generator, crane, electric works, (IF and delivery to site, civil works transmission line and contingency and cost allocated.

Table 6-7. Present Worth Value of Cost and Benefit

— Irrigation —

Discount Rate	5%	10%	15%	20%
Benefit ₱x10^6	488.67	199.30	99.95	56.70
(US$x10^6)	(65.16)	(26.57)	(13.32)	(7.56)
Cost ₱x10^6	150.97	106.11	80.14	62.77
(US$x10^6)	(20.13)	(14.15)	(10.69)	(8.37)

project on electric power is not feasible. Present worth value of cost and benefit of the isolated power are shown in Table 6-6. In the case that power project does not bear the allocated cost, IRR will reach to only 5.7 percent. (See Appendix 6G-1) Present worth value of cost and benefit of isolated irrigation project are shown in Table 6-7. Because of separation of electric power project with lower IRR from the integrated project, IRR of isolated irrigation project go up to 18.2 percent. (See Appendix 6G-1) However, the IRR of the integrated project is high enough to absorb disadvantage of the electric power.

H. Sensitivity Analysis

Sensitivity analysis is the effective measures of testing for the riskness of this project. Analysis were studied in the following items:

(1) Prices:

Prices of palay occupied all share of NPV should be used to test the effect on the IRR.

(2) Cost Increase:

This Project involve the significant construction costs which are spread out over a number of years. Then sensitivity tests should be made for increase of Project Costs.

(3) Yields:

Mean yield of palay (rough rice) in the Philippines was 1.158 ton per ha in 1961 and 1.599 ton in 1975 according to the Statistical Year Book, Philippine, 1977. On annual growth rate, it is about 2.2 percent over above terms. However, in recently years, the growth rates are tend to easy going. This means the difficulties on the adoption of improved technology for farmers. In this analysis a slower built-up on the target yield in the gestation period was made in a time lag from 1990 to 1995.

(4) Delay in Construction

Many projects may not be implemented as schedule envisaged in the feasibility study. The effect of sensitivity analysis on this indicator will be estimated in case of one and two years.

(5) Costing Farm Labor

In a estimation of the annual incremental NPV the labor cost was estimated on hired labor which was assumed in the labor study. In this analysis the family labor also would be accounted.

(6) Costing Construction Equipment

The economic cost evaluated in Table 6-3 include the depreciation cost of construction equipment. In this analysis the purchasing value would be used.

Table 6-8. I.R.R. in Sensitivity Analysis

Items	I.R.R. (%)
1. Price falling in Palay	
10%	14.7
20%	12.6
2. Project Costs increase	
10%	15.6
20%	14.1
3. Slower built-up in Yield of Palay 1/	14.4
4. Delays in Construction	
4-1. Construction schedule of Dam delay in one year from 3.5 year to 4.5 year	17.0
4-2. Stage Development Project(Stage I+II)	16.4
Start of Stage II is deferred for one year	16.0
two year	15.7
5. Costing farm labor	16.3
6. Costing construction equipment	15.4

Note: 1/ In slower built-up of yield, arrival period to target yield be late five years.

I. Cost Recovery

NIA is the authority to collect irrigation fees from users of irrigation systems. Collection of fees and the percentage rate of fees collected have been increased in the past few years. Irrigation fees on the national irrigation systems have been recently raised to the equivalent of two cavans of paddy per ha in the wet season and three cavans in the dry season to be applied uniformly to all national irrigation systems.

As an exception to the uniform rate policy, the Government has agreed to raise rates on the World Bank - assisted Central Luzon projects and on the Magat project to the equivalent of 3.5 cavans of paddy/ha in the wet season and 4.4 cavans in the dry season.

Irrigation fees on the Bohol project would be estimated as a equivalent value to the operation and maintenance cost for irrigation system at the maximum rate. The 60 US$ of operation and maintenance cost per ha corresponds to 7.5 cavans per year of irrigation fees.

In determining the extent of cost recovery, cost recovery index is used for the Project. This index is measured at the ratio of incremental water charges paid by all project beneficiaries to incremental project construction and operation and maintenance costs. This method due to the consideration that the question of water charges is part of the much issue of overall tax, subsidy and pricing policy both within agriculture and between agriculture and other sectors.

Water charges and costs are measured at present values discounted at 10% annual rate of interest over the 50 year life of the project.

For the Bohol Project, the proposed fee charges (7.5 cavans) would result in a cost recovery index of 12%. This rate is less percent than 29% of the World Bank - assisted Chico project.

In this cost recovery study, costs represent financial flows from the public sector and are net of taxes and other transfer payments.

At present, subject farmers to pay income tax and real property tax are almost neglected. But after completion of the Bohol project

the tax to be levied would increase because of plenty of incremental benefit as is mentioned in the next farm budgets analysis. Then, in a view point of the Government fiscal and irrigation sector policies, the tax to be levied in future would contribute to cost recovery of this Project.

Irrigation fee by both seasons would be decided by the dependable valume of irrigation water to the Dam and Diversion dam. Irrigation fee of 7.5 cavans per year would be divided in 3.0 cavans of paddy per ha in the wet season and 4.5 cavans in the dry season.

J. Farm Budgets Analysis

Farm budgets for the average size of farm at present is represented by the farmer of 1.5 ha. The size represents the 66 percent of total number of farms (25 percent of area).

A great part of beneficial area are occupied by the grass lands. Then new paddy field would be reclaimed from these grass lands. In overall Project area the average size of farm of 1.5 ha at present would extend to 2.5 ha in future after completion of the reclamation.

Then farm budgets are estimated for a tenant farmer, an owner operator who received a land transfer and a full owner operator reclaimed cogon-land by himself.

The budgets are presented in terms of cash flows and therefore, include an estimate of hired labor costs, excluding family labor.

Cropping pattern is represented by that in Pilar and Dagohoy Municipalities which occupy about 70 percent of present land use in the Project area.

Table 6-10 indicates farm budgets on 1.5 ha and 2.5 ha farmer. Water charges were estimated in equivalent values to 7.5 cavans per ha. This charge are counted at about six percent of Net Value of Production for 1.5 ha and 2.5 ha farmer with the Project.

In future, the remaining values deducted water charges, annual payment for land and to landlord, and amortization for reclaimed land would be enough to pay living allowance.

Table 6-10. Farm Budges

	Present	Future w/Project	
Size of farm (ha)	1.5	1.5	2.5
Cropping area (ha)			
Irrigated 1st	0.19	1.41	2.41
2nd	0.19	1.41	2.41
Rainfed 1st	0.78	-	
2nd	0.78	-	
Upland palay	0.22	-	
Corn	0.18	-	
Coco. and Banana	0.13	0.09	0.09
Total	2.09	2.91	4.91
Cropping intensity (%)	139	194	196
Total Paddy Production (ton)	3.45	11.28	19.28
Gross value of Project (₱)	3,668	15,510	26,510
Production Costs (₱) (excluding labor)	675	2,790	4,760
Cost of hired farm labor (₱)	350	220	380
Net Value of Projection (₱) (before water charge)	2,643	12,500	21,370
Water charges[1]	-	730	1,250
Net Crop income	2,643[5]	11,770	20,120
(a) Annual payment for land[2]	945	945	
Net crop income (owneroperator who received a land transfer)	1,698	10,825	
(b) Annual payment to landlord[3]	910	3,940	
Net crop income (tenant farmer)	1,733	6,885	
(c) Annual amortization for reclaimed land[4]			95
Net crop income (Full owner operator reclaimed himself congonland)			20,025

Note: 1/ Based on 207 Pesos and 310 Pesos of equivalent values to 3.0 cavans in the wet season and 4.5 cavans in the dry season.

2/ Based on amortizing owner with annual payments over 15 years at 6% in the unpaid balance; based on price of land of 2.5 times present gross value of production. This farmer received a land transfer of 1.5 ha.

3/ Based on 30% for present and 25% for future of gross value of production minus seed, harvesting, and water costs.

4/ Based on amortizing full owner with annual payments over 25 years at 12% on 450 Pesos per ha of on-farm work. Amortizing cost of on-farm works include in water charge.

5/ According to farm Management Survey, average non farm income of share tenant amount to 200 Pesos and living allowance reach 1,480 Pesos. The, (a) and (b) type farmer are capable to take the surplus income.

K. Socio-Economic Impact

Benefits which have been counted in the economic evaluation are limited to the tangible benefits accrued from the crop production and electric generation directly.

However, the following indirect effects would be able to expect from the Project.

1. Contribution to the self-sufficiency of staple food

The government forecasted that a self-sufficiency in basin food commodities will be attained in the next five years, 1978-1982. As of November 1977, the government approved a first rice export of 15,000 metric tons to Indonesia. It was made possible by a good palay harvest in the Philippines. However, the staple food still rely upon the corn-grains as substitution for rice and the nutrition improvement is not sufficient to solve malnutrition.

According to the grain industry development plan of NGA, the forecasting on a balance of demand and supply for rice in the Central Visayas indicate still shortage in 1990 years.

After completion of the Project, production of rice was estimated to increase from about 7,000 tons without Project to 42,000 tons with Project. These increment would contribute to the progress of self-sufficiency of staple food and trade in a provincial base directly.

2. Increase of Employment

The farming labor demand was projected to increase from the total man-days of 283,000 without Project to 1,067,000 with Project, in spite of farm mechanization to some extent. The labor analysis was presumed at labor days per month of average 26 days for the full time farmer. As the result, labor to be hired was estimated at about 45,000 man days. This figure would be minimum labor days. If the farmer operate less labor days than presumption, labor to be hired would increase greater.

This Project would create many job opportunities for the unemployment labor who live in the adjacent municipalities.

3. Redress of income inequality

Per capita family income in Bohol was taken at 447 peso per annum in 1971, which was below the country's per capita family income of 646 peso per annum.

According to the farm budgets analysis as mentioned above, per capita net crop income in the Project area was estimated at 447 peso at present and 1,465 peso with Project.

The country's per capita family income in 1985 would be estimated at about 1,350 peso per annum using the growth rate per capita GNP of 5 percent at constant prices of 1972. Thus, per capita family income in the Project area would almost correspond to the country's value.

4. Ease of energy constraint

About 90 percent of the country's energy requirements are based on imported petroleum. Then, an upsurge in oil prices strains the country's balance of payments. Construction of hydroelectric power instead of alternative oil-fired thermal plant would save the importable volume of petroleum in country's economic activities. The oil consumption volumes correspond to annual energy of 4,968 MWH are roughly estimated at 1.24 million liter of petroleum. The saving of foreign currency would be expected at about 1.15 million peso (153,000 US$) per annum.

5. Improvement of Transportation network

The transportation net work created by the Project would speed up to carry in and out the input and output materials respectively. And daily activities of inhabitants would get much convenience.

6. Effect of Supporting Services

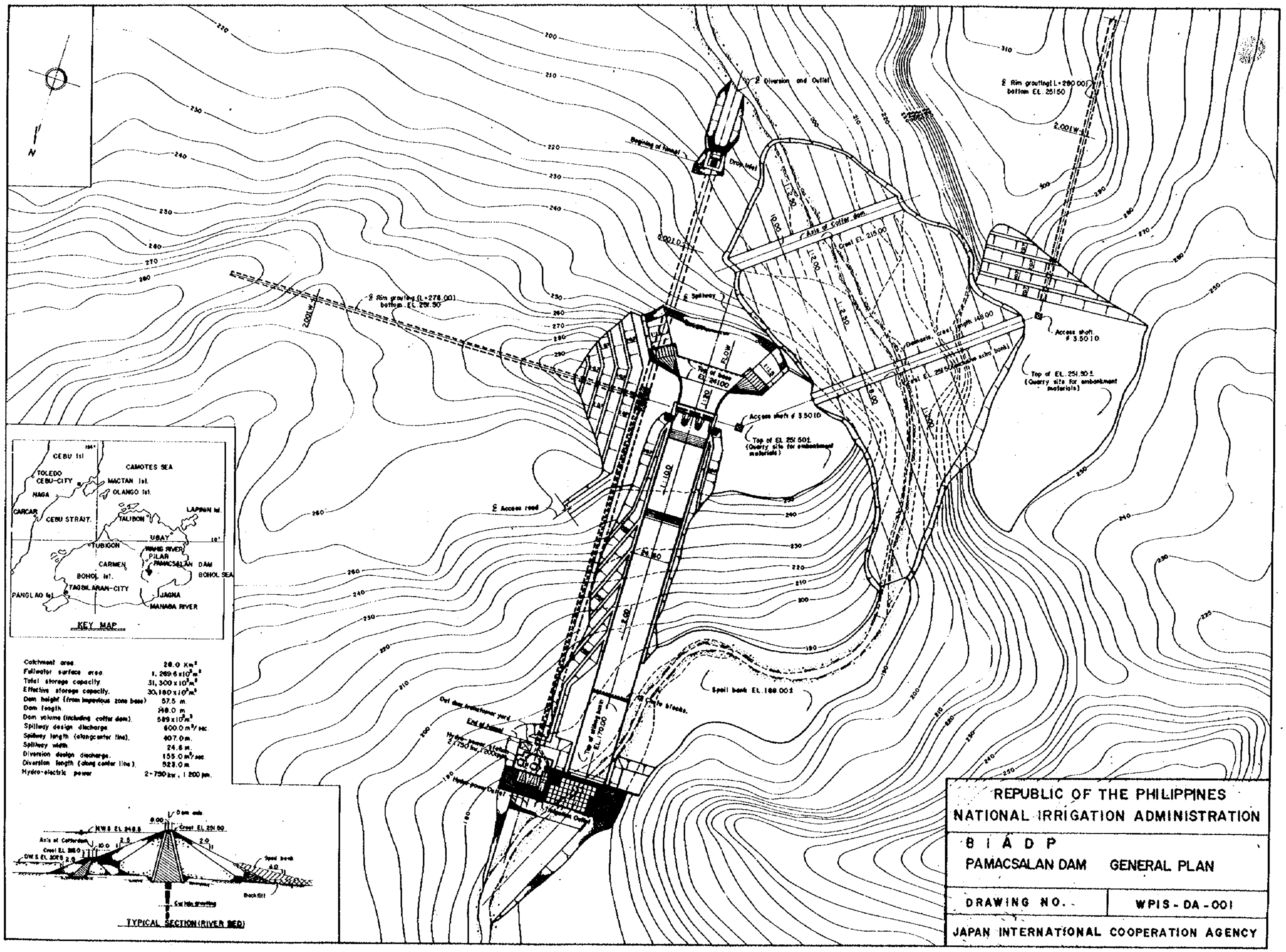
Samahang Nayon and Kilusang Bayon organized would contribute for

farmers to buy agricultural inputs and sell their products at reasonable prices. Farm mechanization would improve the labor custom on the harvesting and threshing operation which are executed by hired labor paid in kind.

7. Income Increase during Construction

Many farmers will be employed during the construction of the Project. Required unskilled labor and wages are estimated at about 550 thousand mandays and about 9.5 million peso excluding escalation which are needed from 1979 to 1985 years. Labor wages at peak amount to about 2.7 million peso in 1984 year. This income is about 37 percent of gross net production value without Project.

	DRAWINGS	NO.
1.	PAMACSALAN DAM, GENERAL PLAN	WPIS – DA – 001
2.	PAMACSALAN DAM, TYPICAL SECTION	WPIS – DA – 002
3.	PAMACSALAN DAM, SPILLWAY AND DIVERSION TUNNEL	WPIS – DA – 003
4.	MALINAO DIVERSION DAM, GENERAL PLAN	WPIS – DD – 004
5.	MALINAO DIVERSION DAM, TYPICAL SECTION	WPIS – DD – 005
6.	WAHIG DIVERSION DAM, GENERAL PLAN	WPIS – DD – 006
7.	PAMACSALAN DIVERSION DAM GENERAL PLAN	WPIS – DD – 007
8.	PROFILE OF MAIN CANAL (1)	WPIS – IC – 008
9.	PROFILE OF MAIN CANAL (2)	WPIS – IC – 009
10.	PROFILE OF LATERAL C	WPIS – IC – 010
11.	TYPICAL SECTION OF IRRIGATION CANAL	WPIS – IC – 011
12.	TYPICAL BOX SIPHON WITH CROSSING	WPIS – IC – 012
13.	TYPICAL RCP SIPHON WITH CROSSING	WPIS – IC – 013
14.	TYPICAL ROAD CROSSING WITH CHECK AND DROP	WPIS – IC – 014
15.	TYPICAL RCP CROSSING	WPIS – IC – 015
16.	TYPICAL CHECK AND VERTICAL DROP	WPIS – IC – 016
17.	TYPICAL SUB-LATERAL DROP	WPIS – IC – 017
18.	TYPICAL HEADGATE WITH BOX CULVERT	WPIS – IC – 018
19.	TYPICAL HEADGATE WITH PIPE CULVERT	WPIS – IC – 019
20.	TYPICAL PARSHALL FLUME	WPIS – IC – 020
21.	TYPICAL DRAINAGE CULVERT (DOUBLE ROW)	WPIS – IC – 021
22.	TYPICAL DRAINAGE CULVERT (SINGLE ROW)	WPIS – IC – 022
23.	TYPICAL DRAIN INLET	WPIS – IC – 023
24.	TYPICAL DRAINAGE CANAL SECTION	WPIS – DC – 024
25.	TYPICAL DRAINAGE DROP	WPIS – DC – 025
26.	TYPICAL ROAD SECTION	WPIS – RW – 026
27.	LAY-OUT OF ON-FARM FACILITY B (1)	WPIS – OF – 027
28.	LAY-OUT OF ON-FARM FACILITY B (2)	WPIS – OF – 028
29.	LAY-OUT OF ON-FARM FACILITY N–2	WPIS – OF – 029
30.	LAY-OUT OF LAND PARCELLING	WPIS – OF – 030
31.	TYPICAL TURN-OUT	WPIS – OF – 031
32.	TYPICAL FARMDITCH SECTION AND DIVISION BOX	WPIS – OF – 032
33.	GENERAL PLAN OF HYDRO POWER PLANT	WPIS – OF – 033



Catchment area.	28.0 Km²
Fullwater surface area.	1,269.6 x 10³ m²
Total storage capacity.	31,300 x 10³ m³
Effective storage capacity.	30,180 x 10³ m³
Dam height (from impervious zone base)	57.5 m.
Dam length.	48.0 m
Dam volume (including coffer dam).	589 x 10³ m³
Spillway design discharge.	600.0 m³/sec.
Spillway length (along center line).	407.0 m.
Spillway width.	24.6 m.
Diversion design discharge.	155.0 m³/sec.
Diversion length (along center line).	523.0 m
Hydro-electric power	2-750 kw, 1 200 pm.

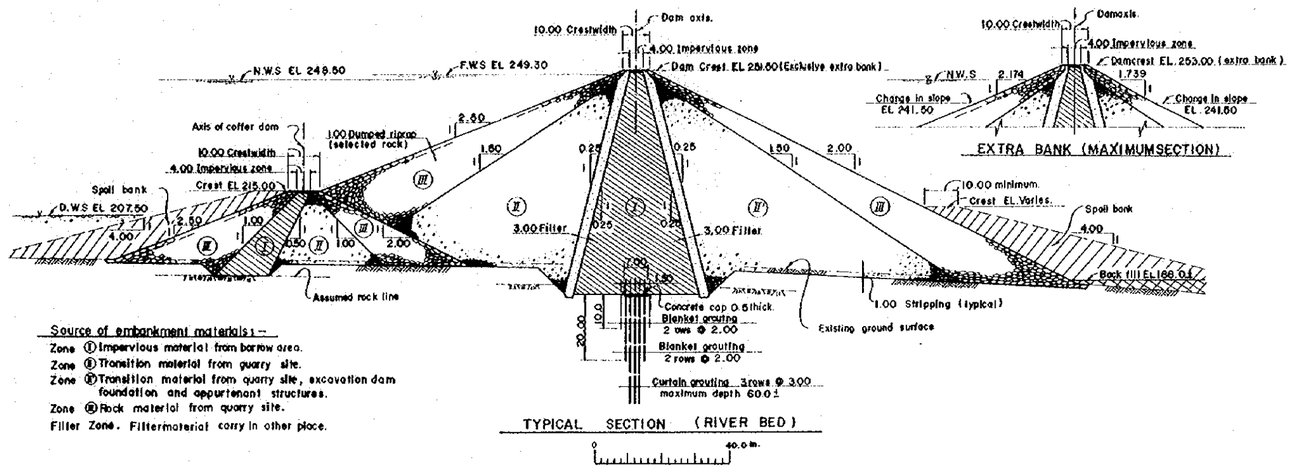
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

PAMACSALAN DAM GENERAL PLAN

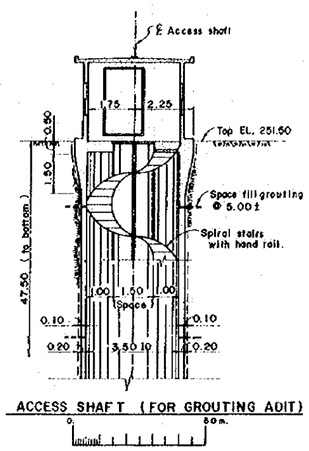
DRAWING NO. WPIS-DA-001

JAPAN INTERNATIONAL COOPERATION AGENCY



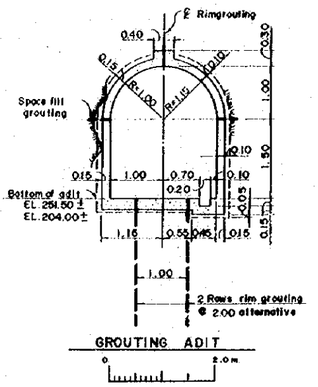
TYPICAL SECTION (RIVER BED)

EXTRA BANK (MAXIMUMSECTION)



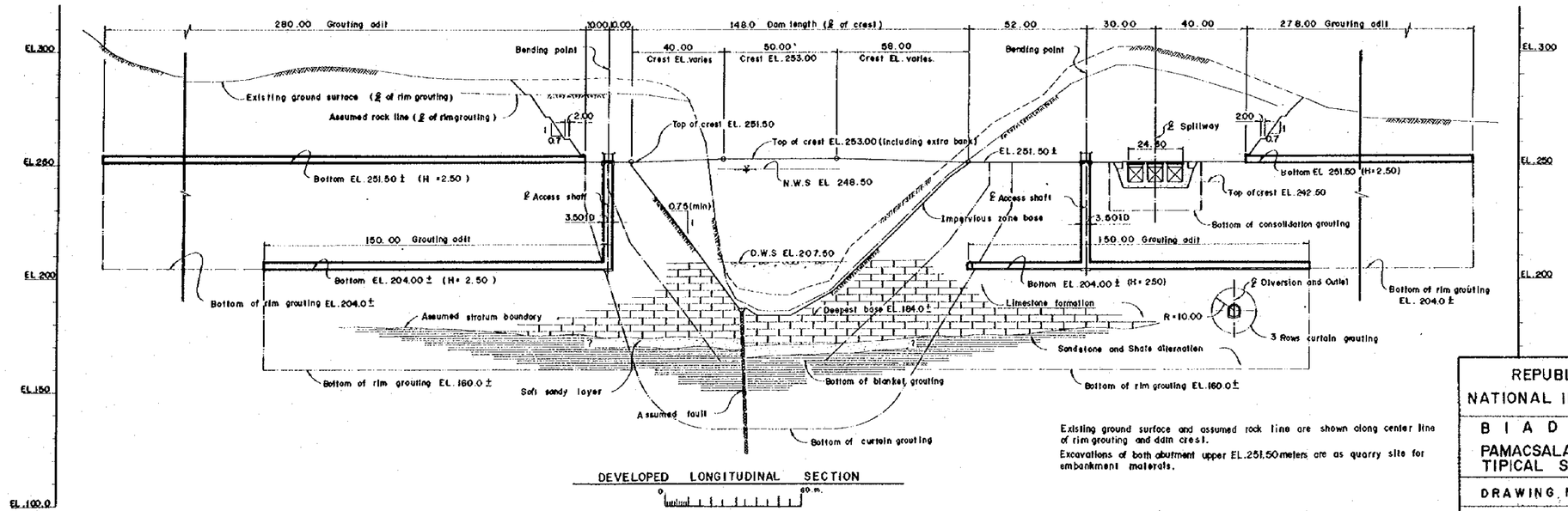
ACCESS SHAFT (FOR GROUTING ADIT)

0 5.0 m.



GROUTING ADIT

0 2.0 m



DEVELOPED LONGITUDINAL SECTION

0 60 m.

Existing ground surface and assumed rock line are shown along center line of rim grouting and ddm cres1.

Excavations of both abutment upper EL.251.50 meters are as quarry site for embankment materals.

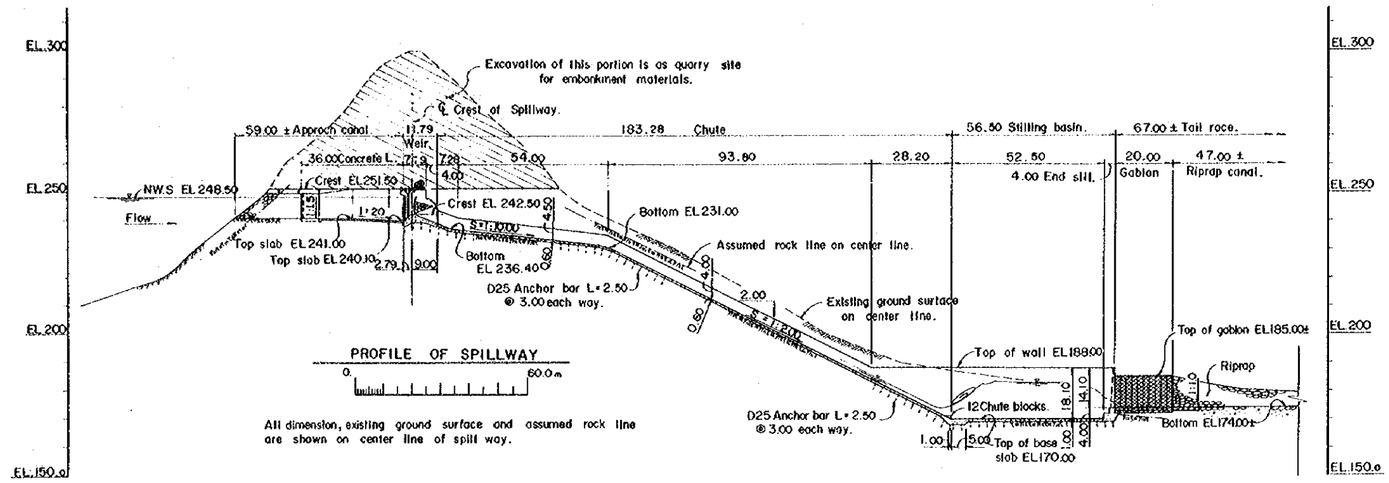
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

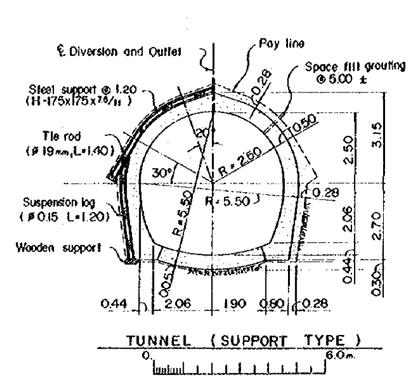
B I A D P

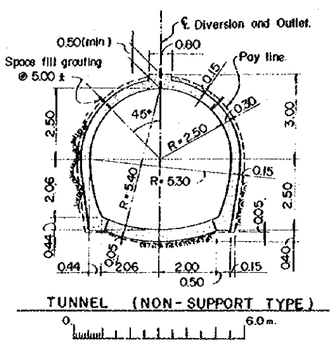
PAMACSALAN DAM
TIPICAL SECTION

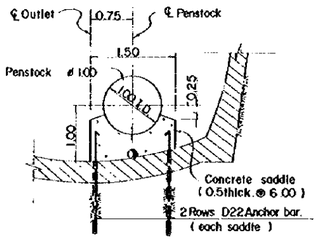
DRAWING NO. WPIS - DA - 002

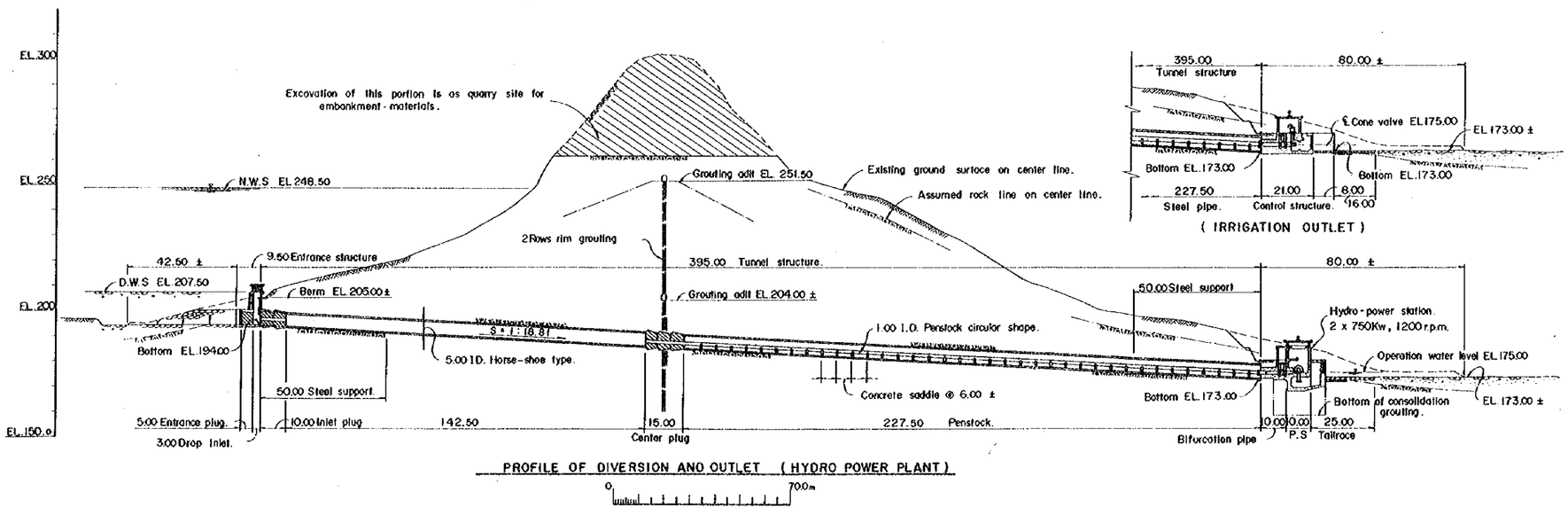
JAPAN INTERNATIONAL COOPERATION AGENCY



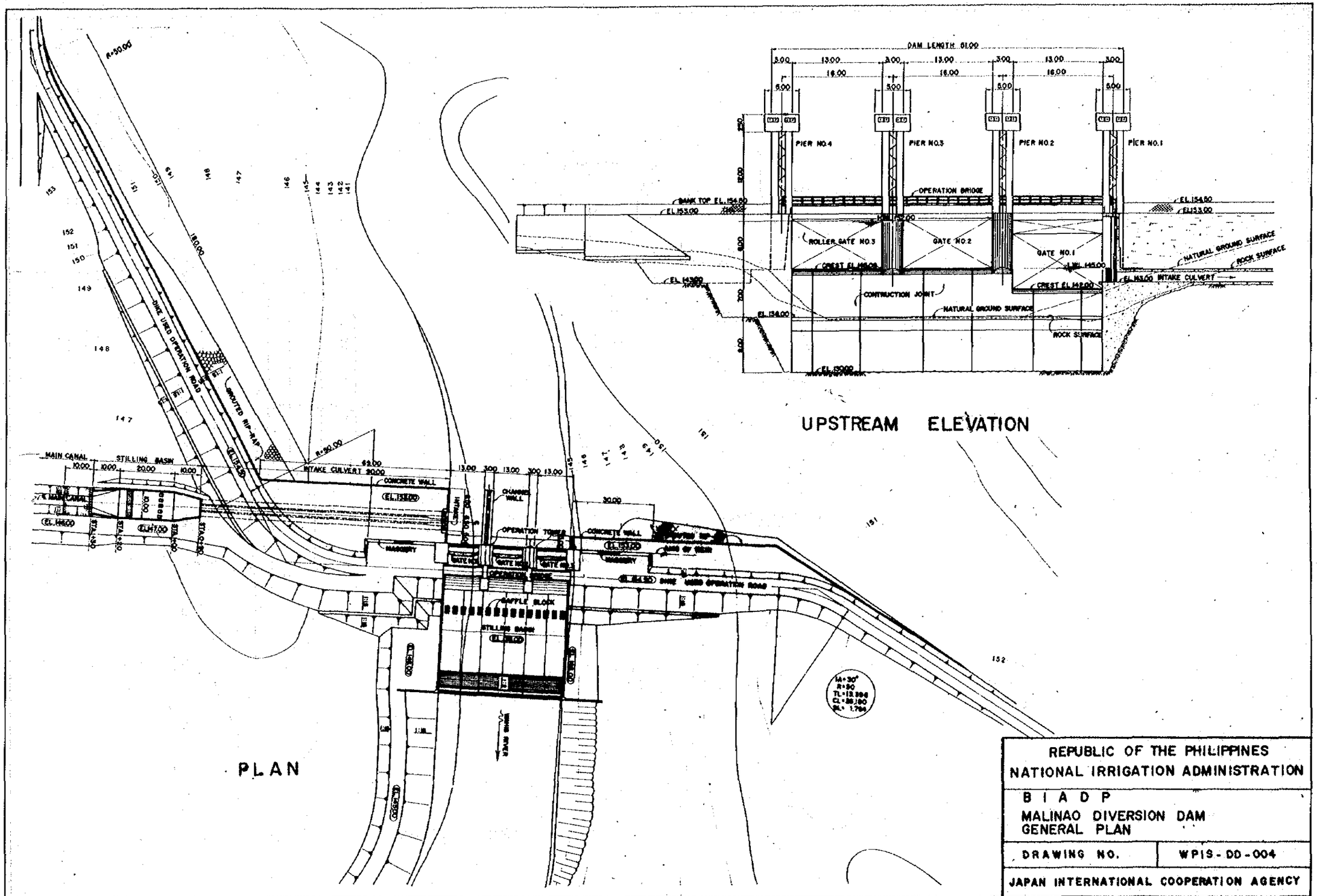








REPUBLIC OF THE PHILIPPINES	
NATIONAL IRRIGATION ADMINISTRATION	
B I A D P PAMACSALAN DAM SPILL WAY AND DIVERSION TUNNEL	
DRAWING NO.	WPIS - DA - 003
JAPAN INTERNATIONAL COOPERATION AGENCY	



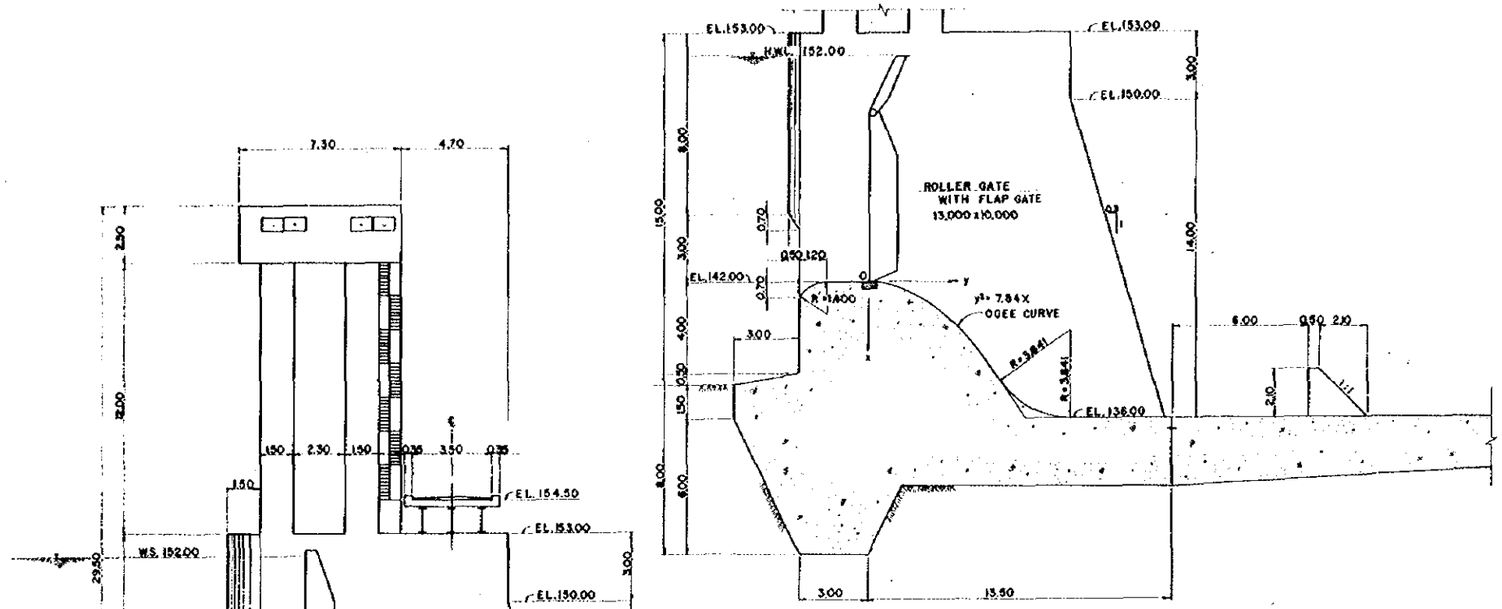
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

MALINAO DIVERSION DAM
GENERAL PLAN

DRAWING NO.	WPIS-DD-004

JAPAN INTERNATIONAL COOPERATION AGENCY



FLASHWAY SECTION
SCALE 1:100

OGEE CURVE							
y	0	1.0	2.0	3.0	4.0	5.0	5.6
x	0	0.134	0.540	1.148	2.041	3.189	4.000

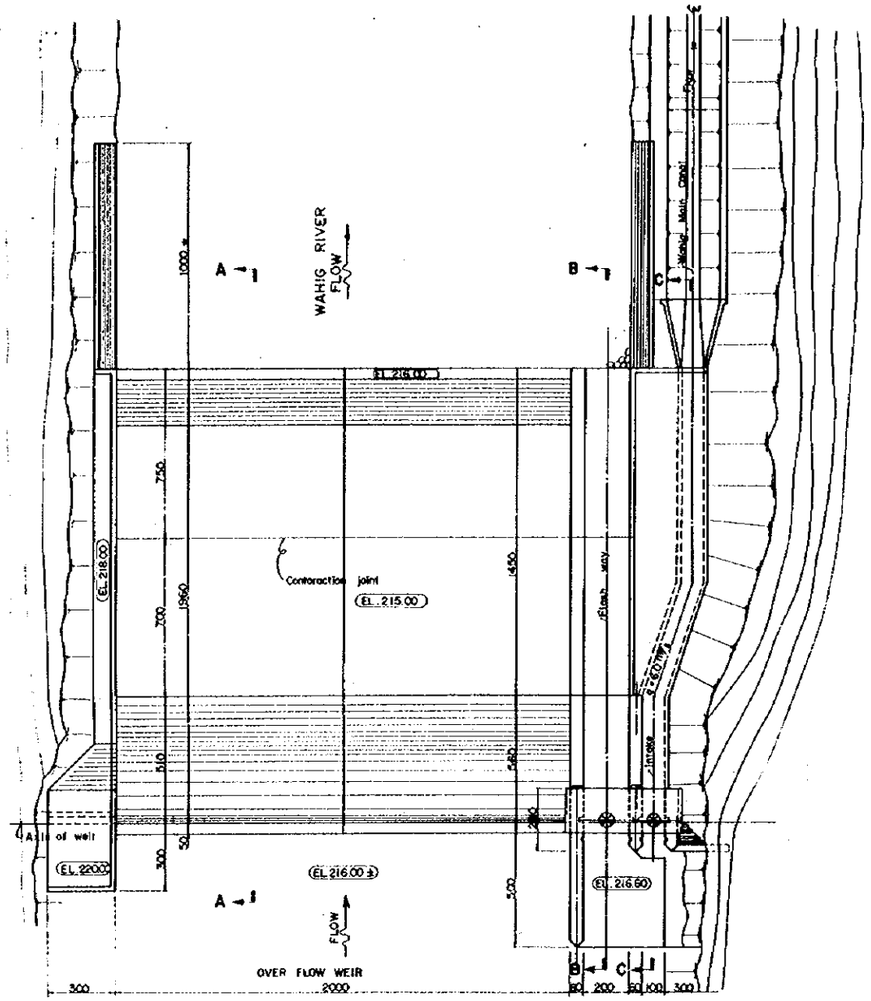
FLOODWAY SECTION
SCALE 1:100

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

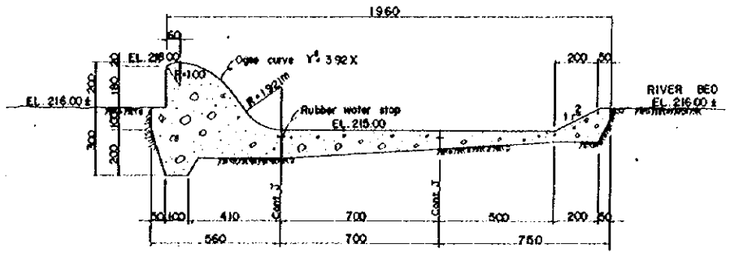
B I A D P
MALINAO DIVERSION DAM
TYPICAL SECTION

DRAWING NO.	WPIS - 00 - 005

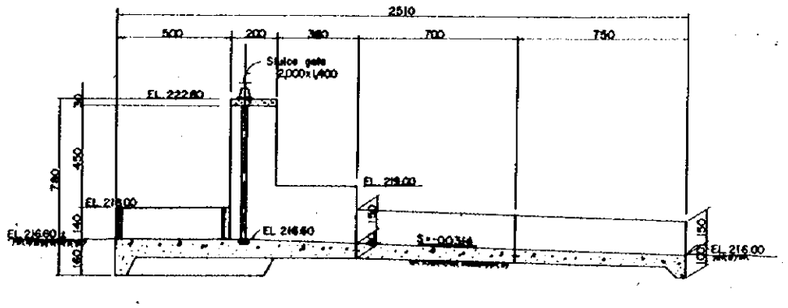
JAPAN INTERNATIONAL COOPERATION AGENCY



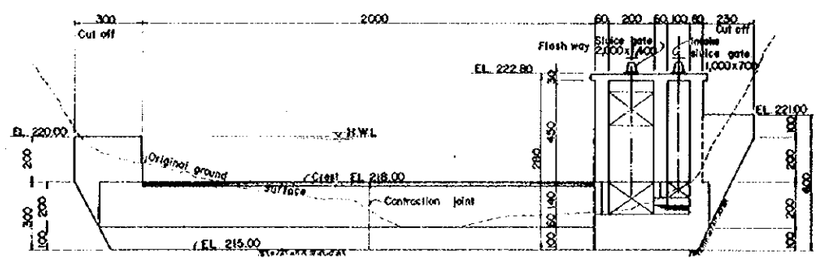
PLAN
SCALE 1:100



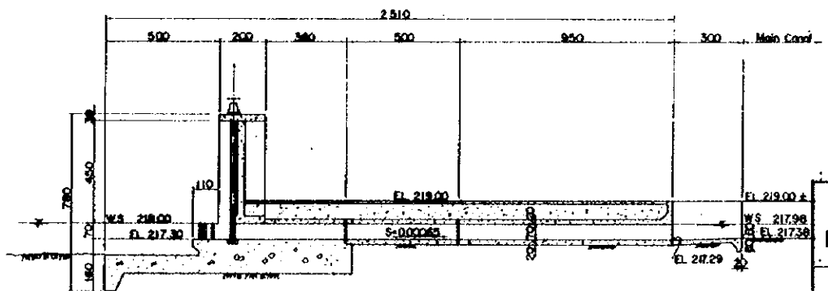
SECTION A-A
SCALE 1:100



SECTION B-B
SCALE 1:100



UPSTREAM ELEVATION
SCALE 1:100



SECTION C-C
SCALE 1:100

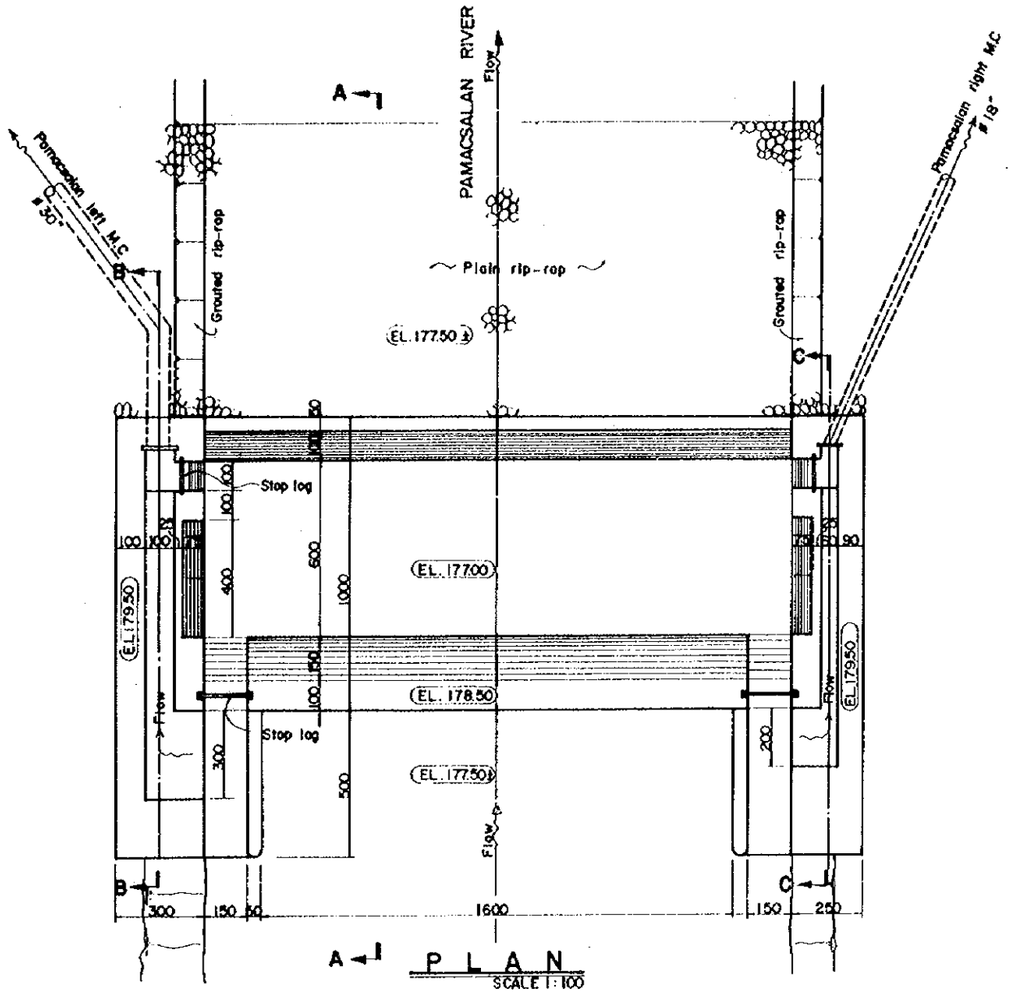
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

WAHIG DIVERSION DAM GENERAL PLAN

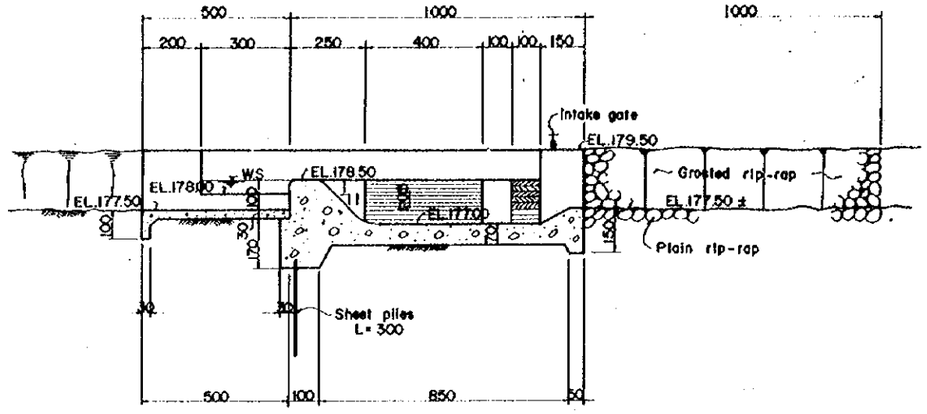
DRAWING NO.	WPIS-DD-006

JAPAN INTERNATIONAL COOPERATION AGENCY



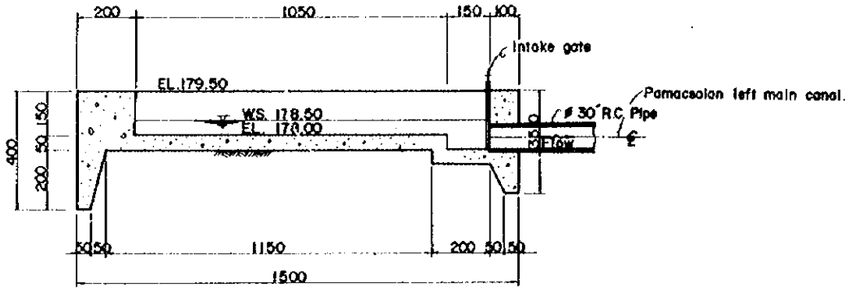
A ◄ I P L A N

SCALE 1:100



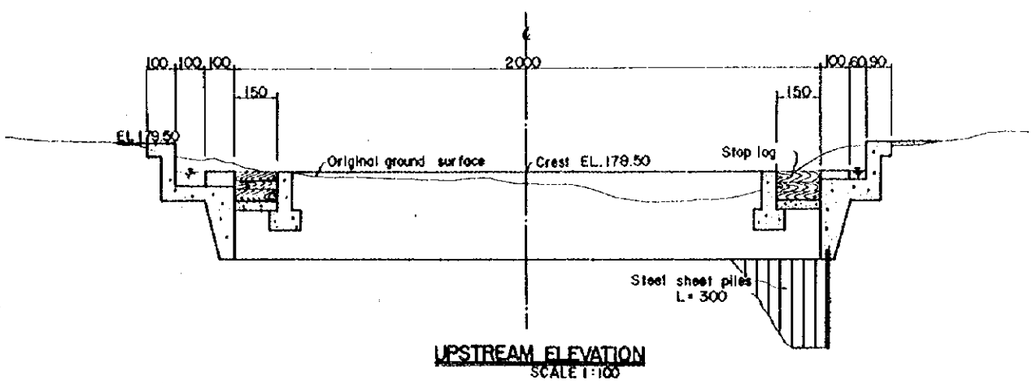
SECTION A-A

SCALE 1:100



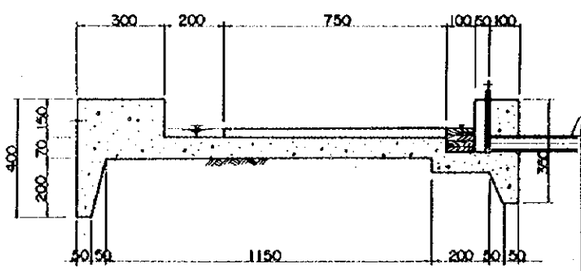
SECTION B-B

SCALE 1:100



UPSTREAM ELEVATION

SCALE 1:100



SECTION C-C

SCALE 1:100

REPUBLIC OF THE PHILIPPINES

NATIONAL IRRIGATION ADMINISTRATION

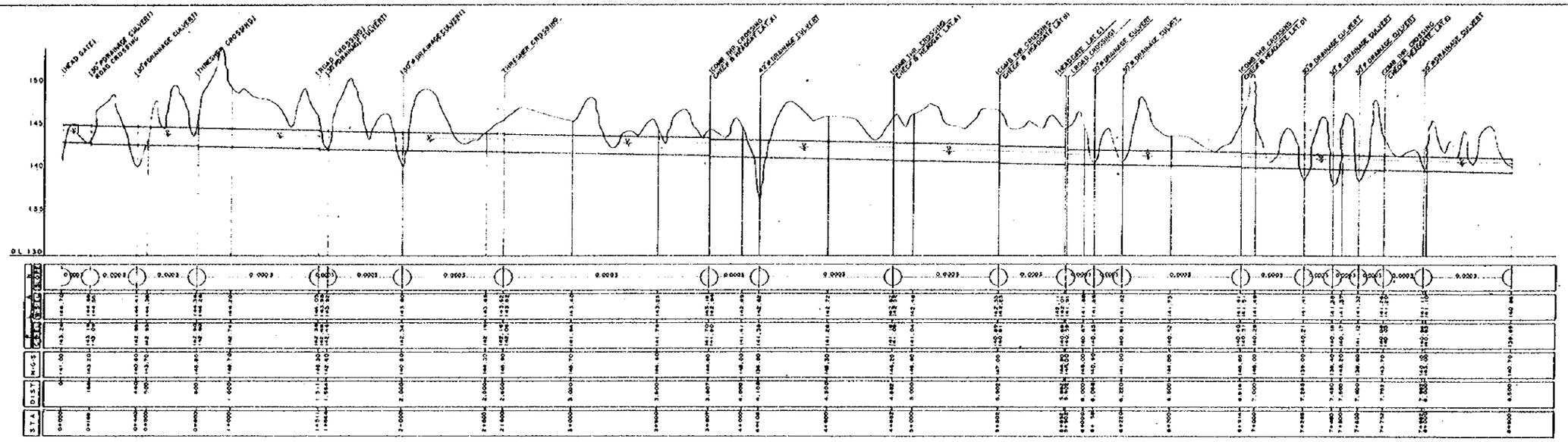
B I A D P

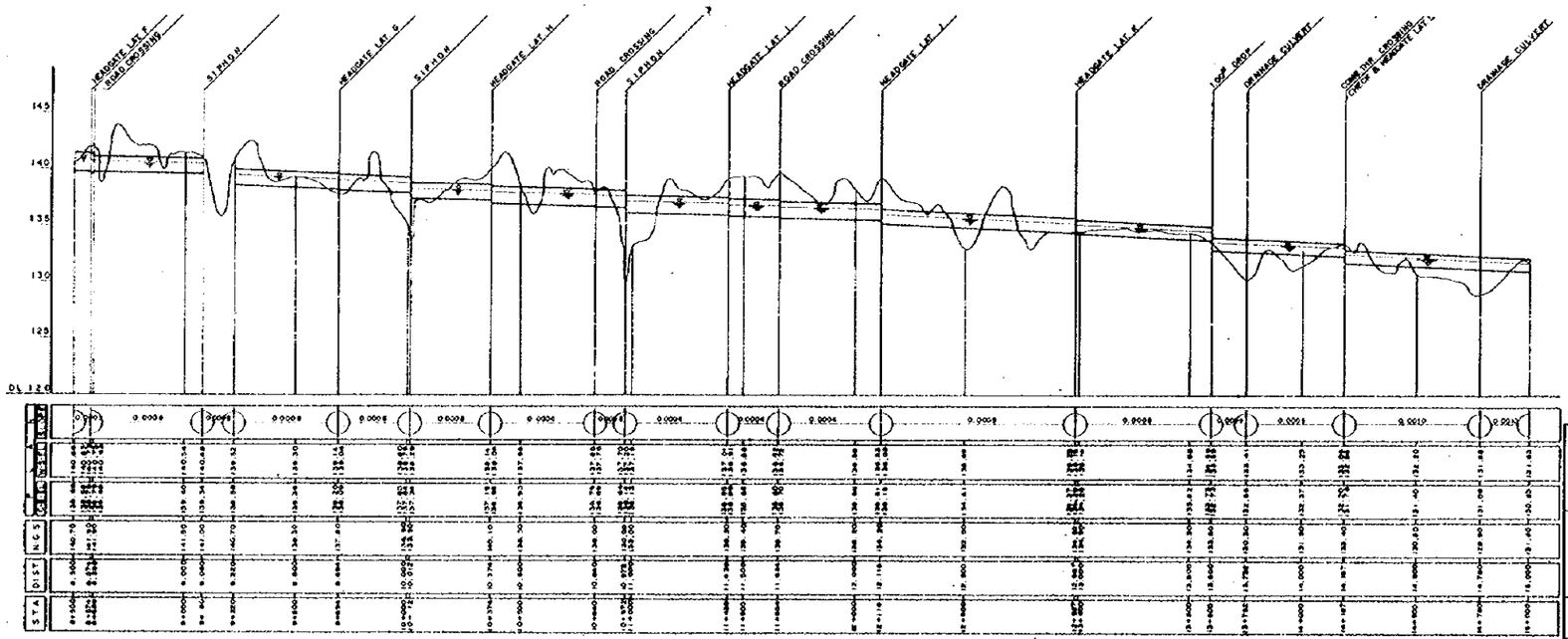
PAMACSALAN DIVERSION DAM

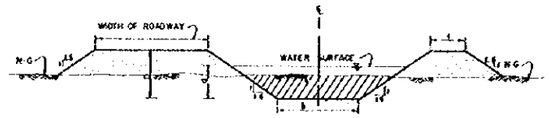
GENERAL PLAN

DRAWING NO.	WPIS-DD-007

JAPAN INTERNATIONAL COOPERATION AGENCY







TYPICAL CANAL SECTION

STATION		CANAL ELEMENTS								
FROM	TO	Q	V	A	b	d	D	I	n	s
00000	31807	5.74	.676	8.599	3.70	1.46	2.10	1.50	.025	.0003
31807	61862	5.60	.669	8.438	3.70	1.44	2.10	1.50	.025	.0003
61862	91502	5.57	.667	8.394	3.60	1.44	2.10	1.50	.025	.0003
91502	91914	5.57	.662	8.137	3.60	1.42	2.00	1.50	.025	.0003
91862	61914	5.51	.535	5.847	3.10	1.21	1.70	1.30	.025	.0008
61914	71752	3.38	.590	5.760	3.00	1.20	1.70	1.20	.025	.0003
71752	91574	3.14	.580	5.446	2.90	1.17	1.70	1.20	.025	.0008
91574	91884	2.92	.623	5.561	2.40	0.94	1.40	1.00	.025	.0008
91884	101374	2.87	.577	5.329	2.40	0.95	1.30	1.00	.025	.0008
101374	111439	2.82	.629	4.347	2.20	1.06	1.50	1.10	.025	.0004
111439	121188	2.58	.613	4.217	2.60	1.02	1.50	1.10	.025	.0004
121188	121987	2.33	.831	3.090	2.20	0.88	1.30	0.90	.025	.0009
121987	141187	2.46	.821	3.001	2.20	0.85	1.20	0.90	.025	.0009
141187	154252	2.15	.820	2.649	2.10	0.80	1.20	0.85	.025	.0010

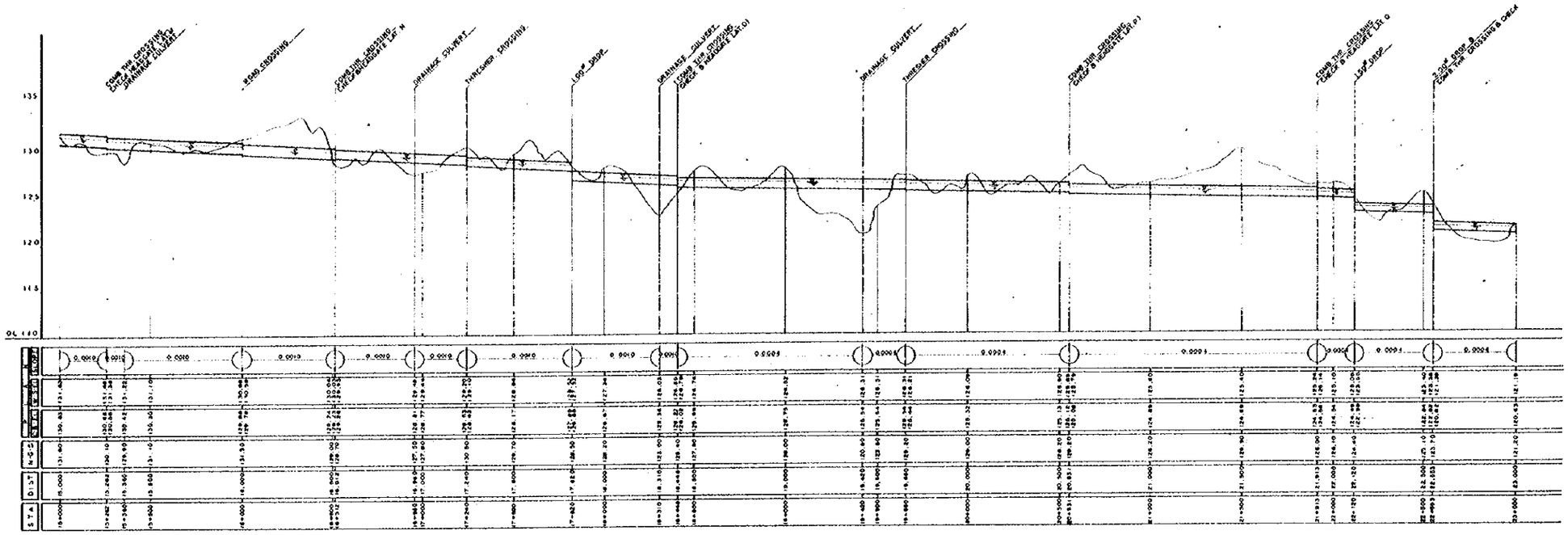
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

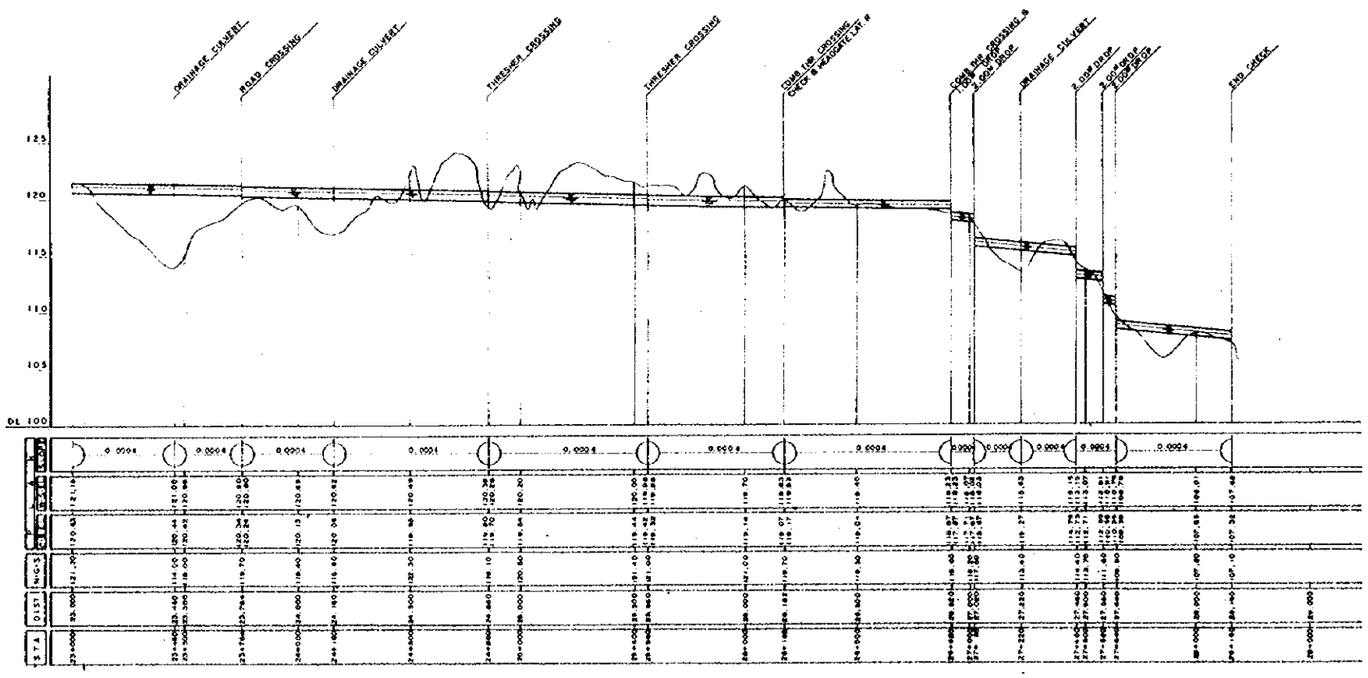
B I A D P

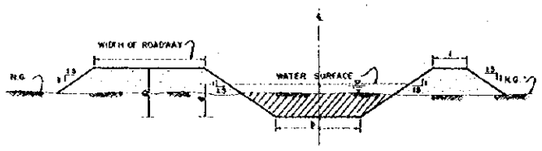
PROFILE OF MAIN CANAL (1)

DRAWING NO.	WPIS-IC-008

JAPAN INTERNATIONAL COOPERATION AGENCY







TYPICAL CANAL SECTION

STATION		CANAL ELEMENTS								
FROM	TO	Q	V	A	b	d	D	t	n	s
141197	151262	2.16	.828	2.640	2.10	0.80	1.20	0.80	.025	.0010
151262	161512	2.06	.823	2.580	2.00	0.80	1.20	0.80	.025	.0010
161512	181448	1.31	.453	2.812	1.70	0.67	1.00	0.70	.025	.0010
181448	201531	1.22	.510	2.429	2.00	0.37	1.10	0.80	.025	.0004
201531	211913	0.98	.481	2.034	1.80	0.71	1.10	0.80	.025	.0004
211913	251182	0.55	.414	1.310	1.50	0.56	0.90	0.60	.025	.0004
251182	281160	0.12	.3000	.492	0.80	0.36	0.70	0.60	.025	.0004

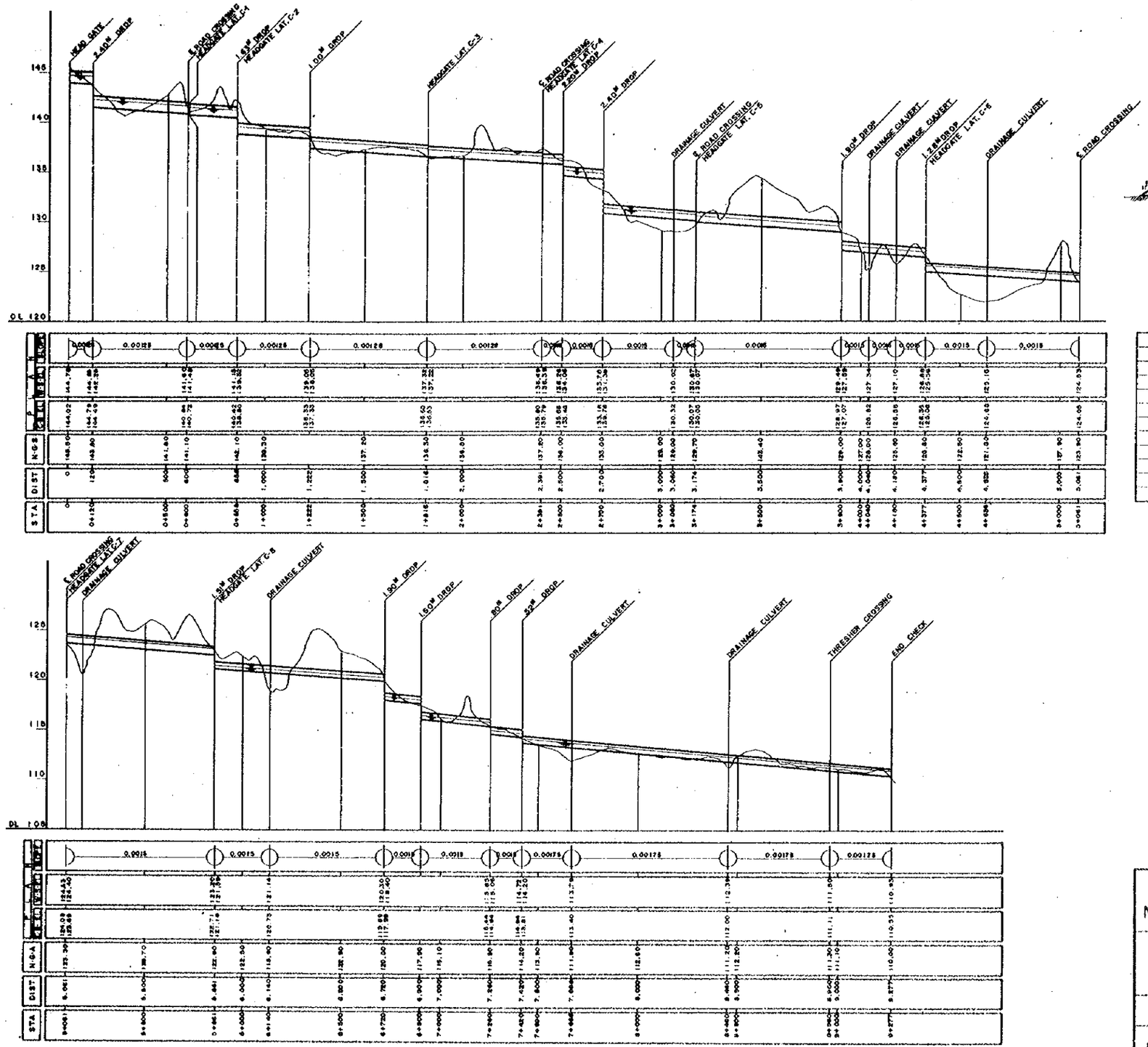
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

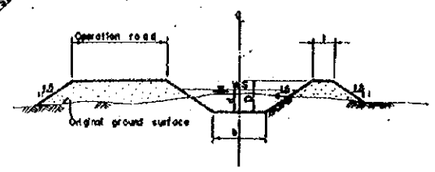
B I A D P

PROFILE OF MAIN CANAL (2)

DRAWING NO.	WPIS - IC - 009

JAPAN INTERNATIONAL COOPERATION AGENCY





TYPICAL CANAL SECTION

STATION		CANAL ELEMENTS							
FROM	TO	Q	V	A	b	d	D	f	n	s
01000	01614	2.02	.880	2.310	1.90	0.76	1.10	0.80	.022	.00128
01614	01650	1.85	.880	2.146	1.90	0.73	1.10	0.80	.026	.00128
01650	11900	1.78	.857	2.048	1.80	0.72	1.10	0.90	.025	.00125
11900	21391	1.62	.883	1.956	1.80	0.69	1.00	0.70	.025	.00125
21391	31174	1.24	.837	1.500	1.60	0.60	0.90	0.60	.025	.00150
31174	41377	0.81	.708	1.062	1.30	0.52	0.90	0.80	.025	.00150
41377	51061	0.64	.717	0.922	1.20	0.48	0.80	0.60	.025	.00150
51061	51861	0.46	.632	0.703	1.10	0.41	0.80	0.60	.025	.00150
51861	71420	0.36	.618	0.616	1.00	0.39	0.70	0.60	.025	.00150
71420	94260	0.35	.636	0.559	0.90	0.36	0.70	0.60	.025	.00175

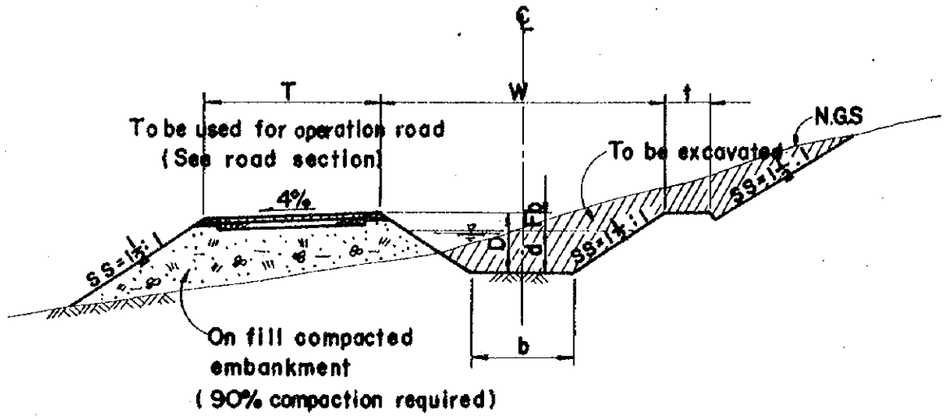
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

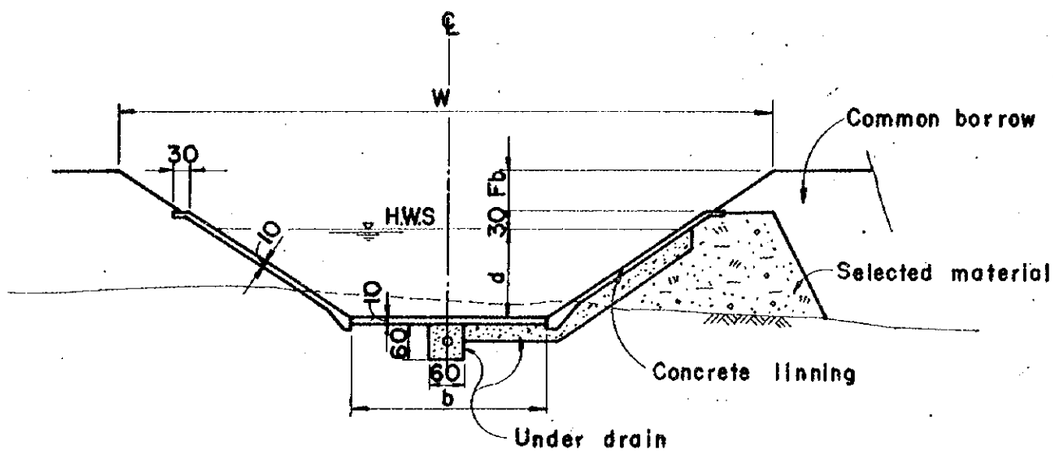
PROFILE OF LATERAL C

DRAWING NO.	WPIS - IC - 010

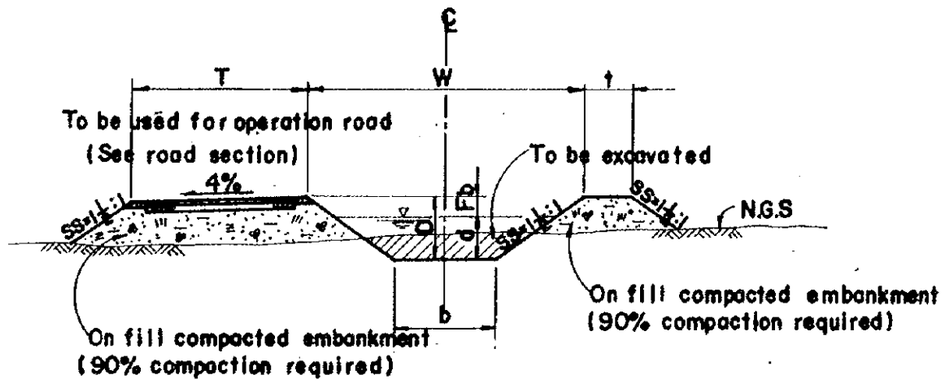
JAPAN INTERNATIONAL COOPERATION AGENCY



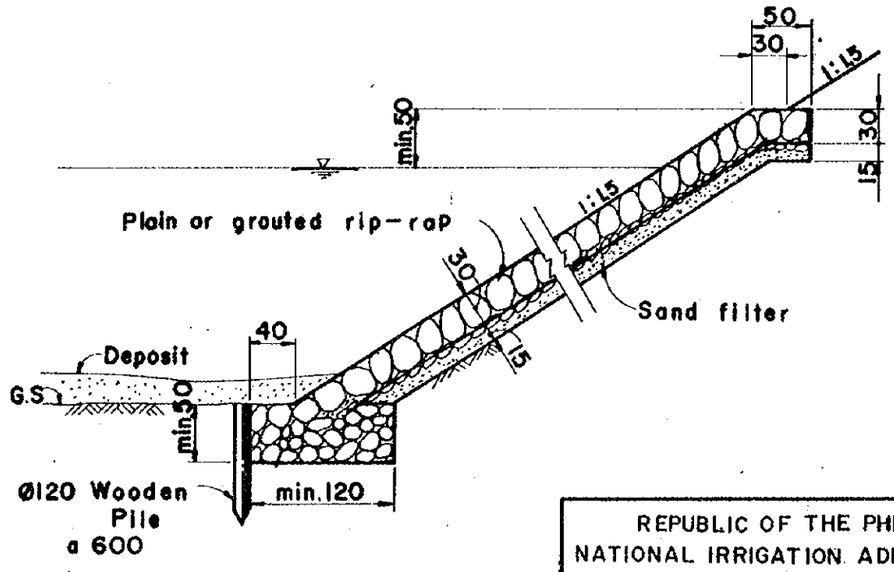
TYPICAL SECTION FOR INCLINED GROUND SURFACE



CONCRET LINNING

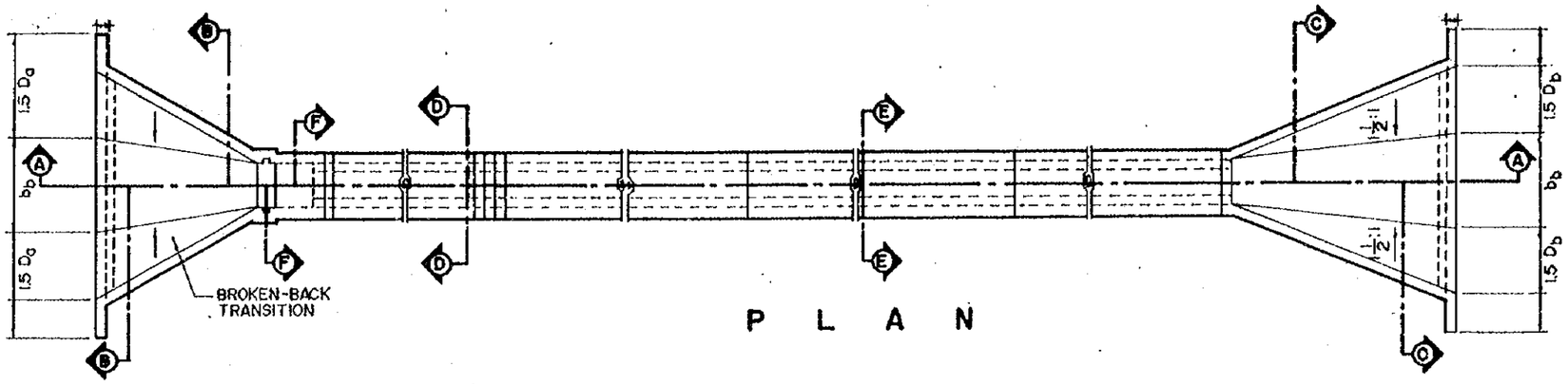


TYPICAL SECTION FOR FLAT GROUND SURFACE

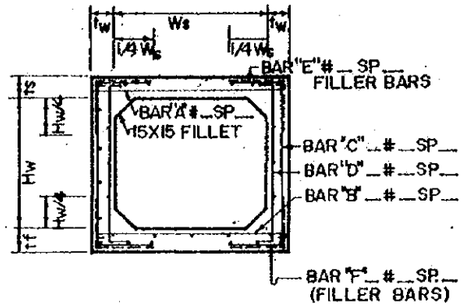


GRAVEL PAVEMENT

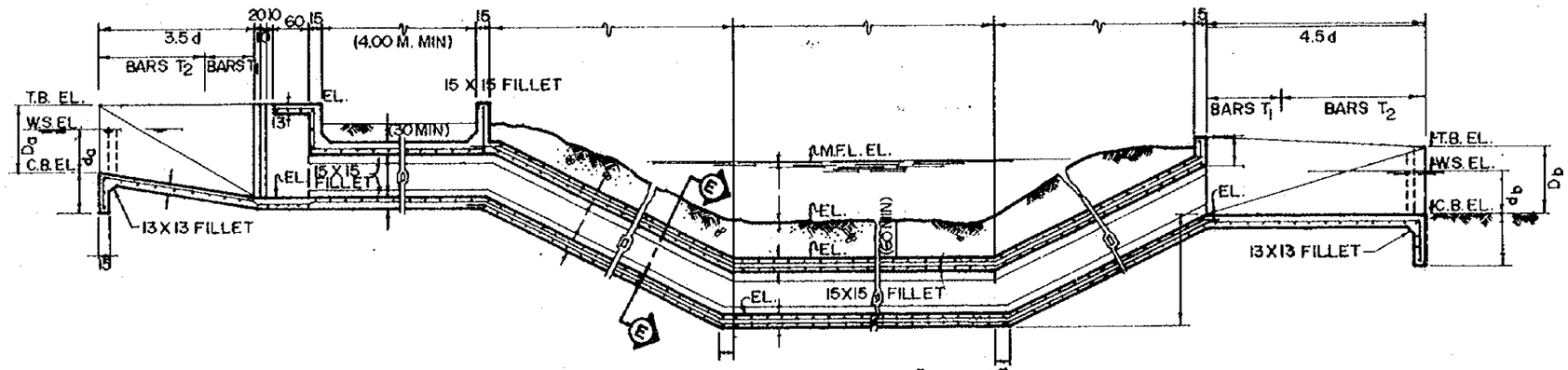
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL SECTION OF IRRIGATION CANAL	
DRAWING NO.	WPIS-IC-011
JAPAN INTERNATIONAL COOPERATION AGENCY	



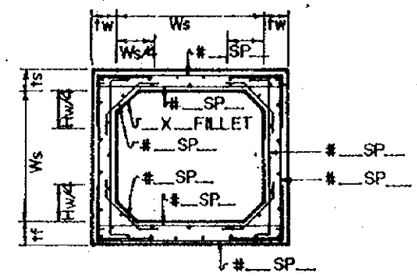
PLAN



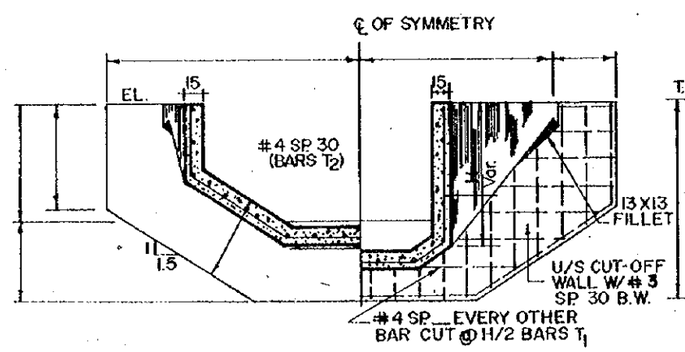
SECTION "D - D"



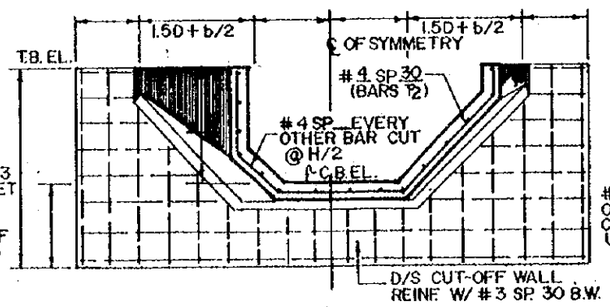
SECTION "A - A"



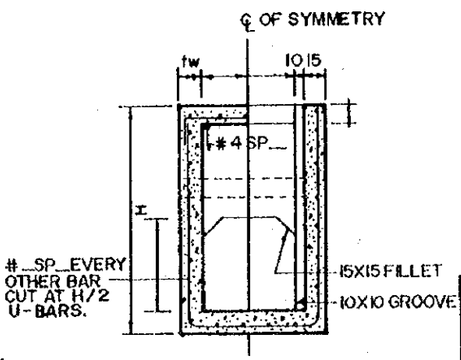
SECTION "E - E"



SECTION "B-B"



SECTION "C - C"



SECTION "F - F"

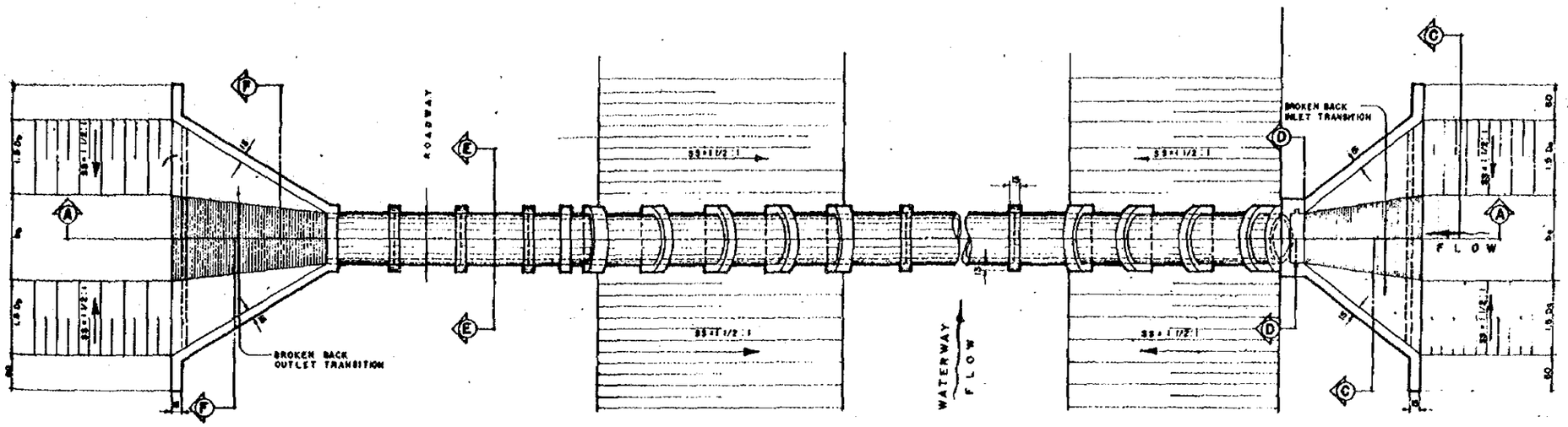
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

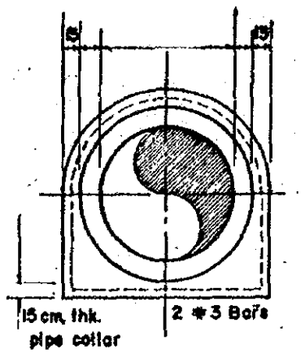
TYPICAL BOX SIPHON WITH CROSSING

DRAWING NO.	WPIS-1C-012

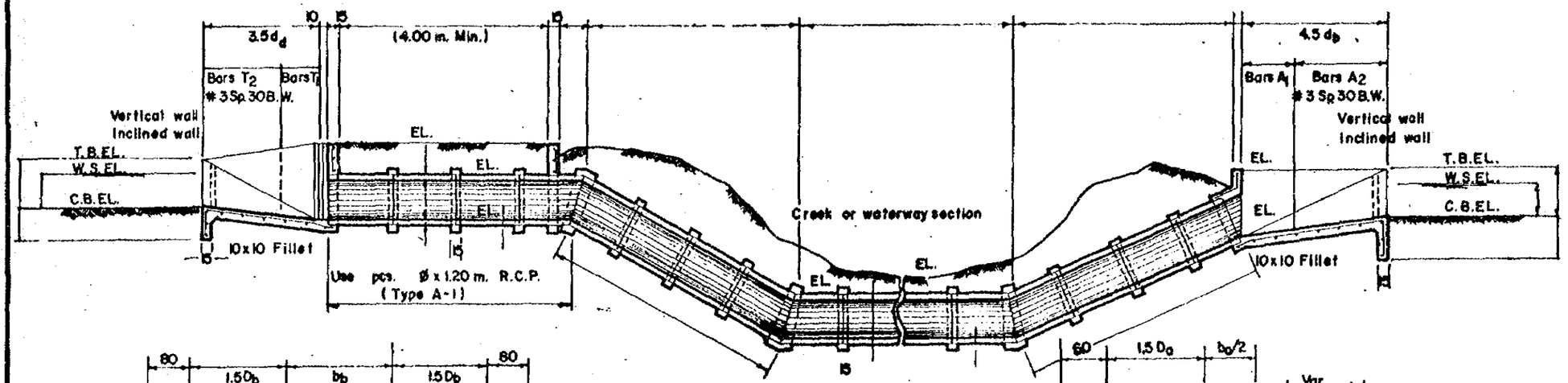
JAPAN INTERNATIONAL COOPERATION AGENCY



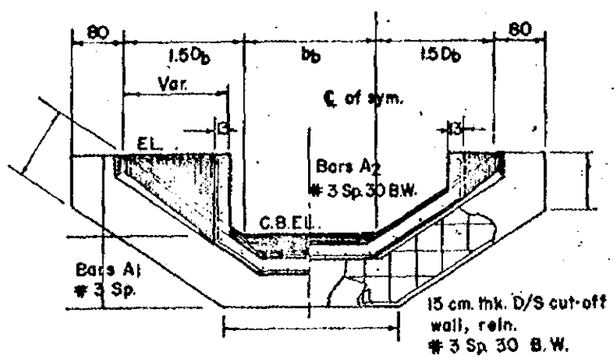
P L A N



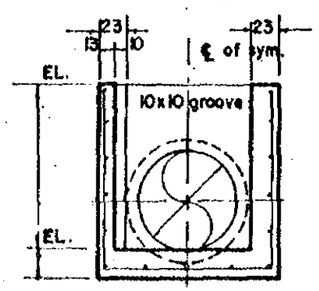
SECTION "E-E"



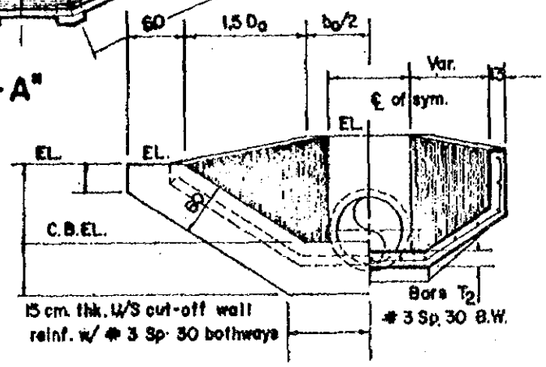
SECTION "A-A"



SECTION "F-F"

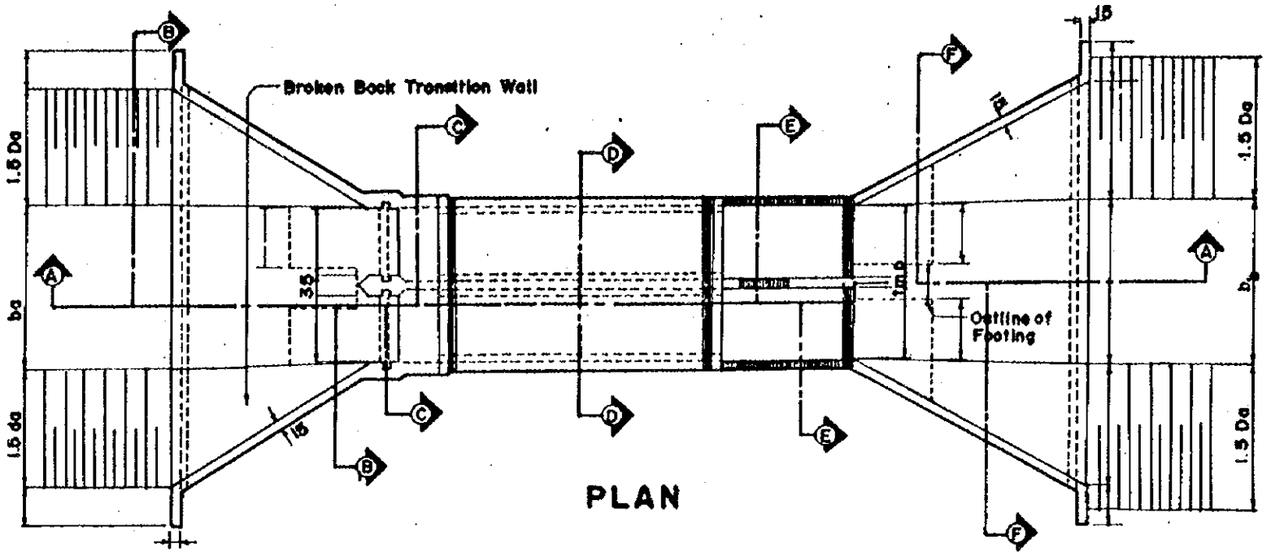


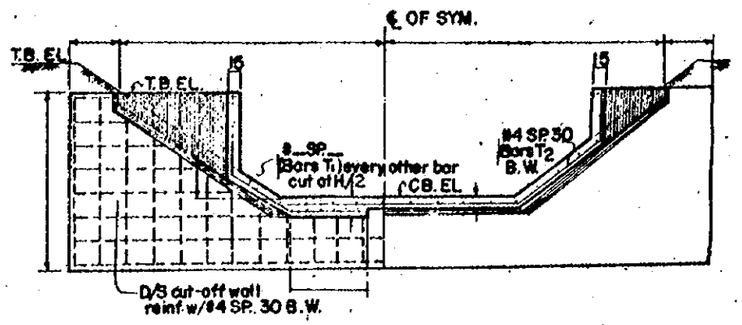
SECTION "D-D"



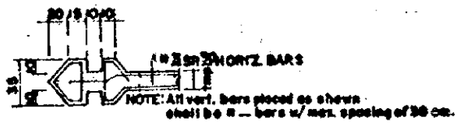
SECTION "C-C"

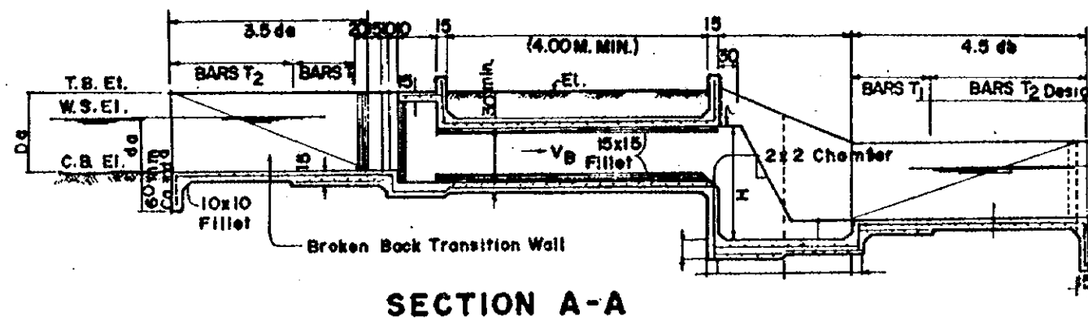
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL RCP SIPHON WITH CROSSING	
DRAWING NO.	WPIS-IC-013
JAPAN INTERNATIONAL COOPERATION AGENCY	



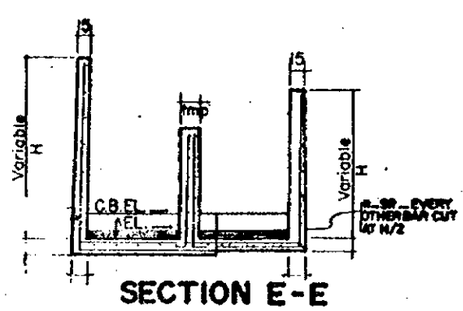


SECTION F-F

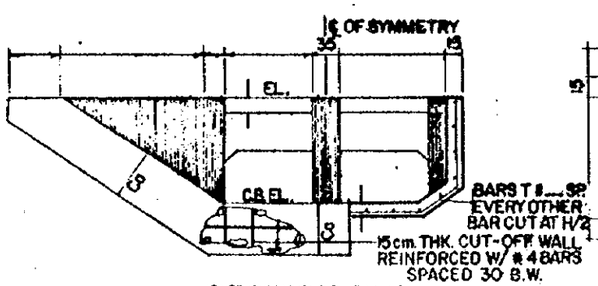




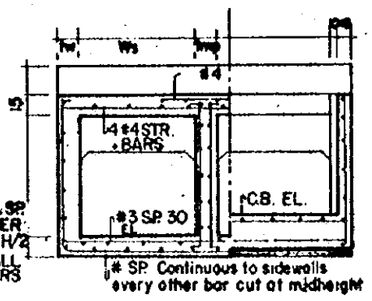
SECTION A-A



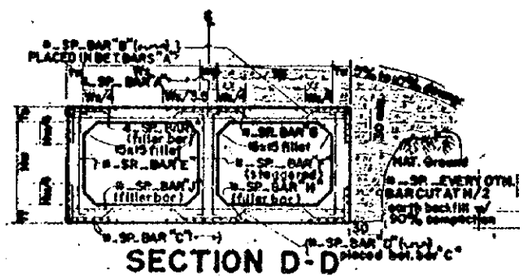
SECTION E-E



SECTION B-B



SECTION C-C



SECTION D-D

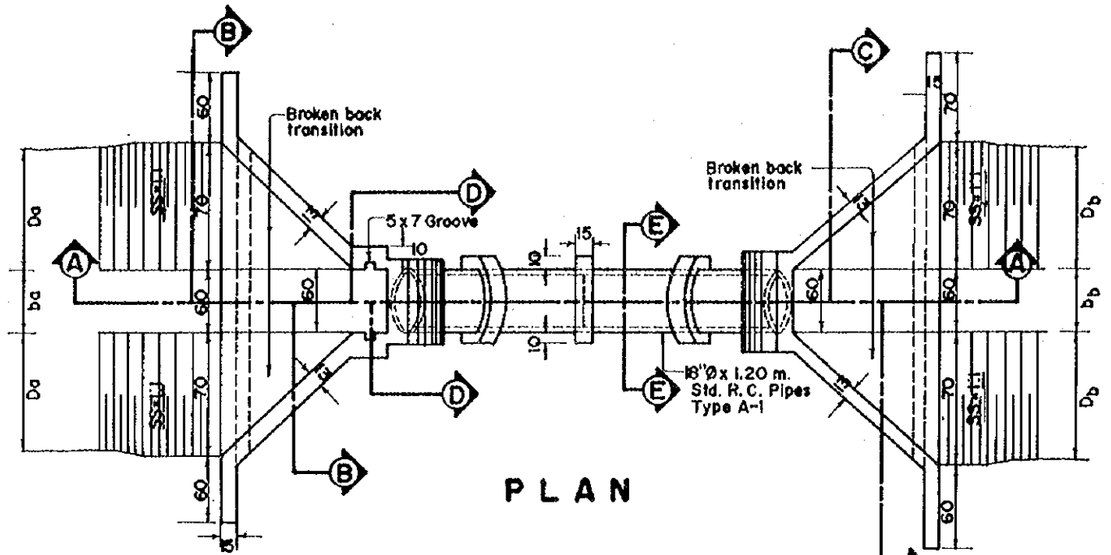
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

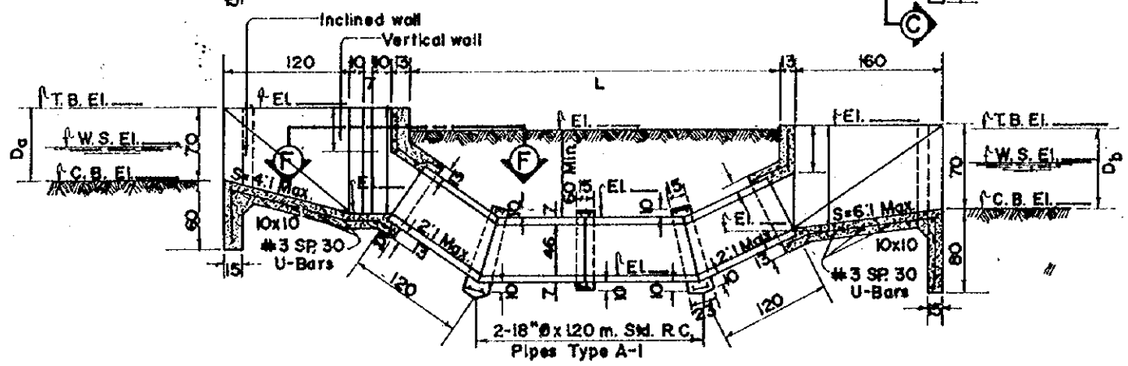
TYPICAL ROAD CROSSING WITH CHECK AND DROP

DRAWING NO.	WPIS-1C-014

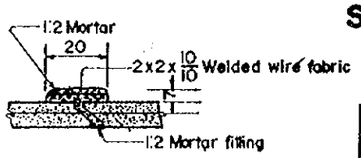
JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN

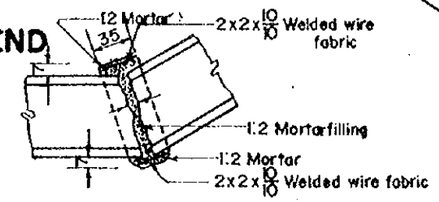


SECTION 'A-A'

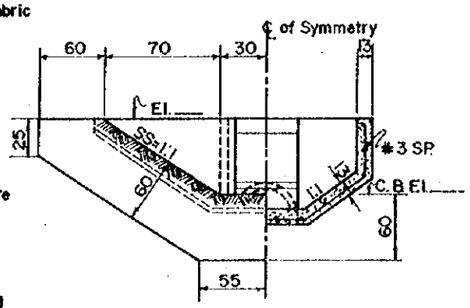


FOR HORIZONTAL JOINT

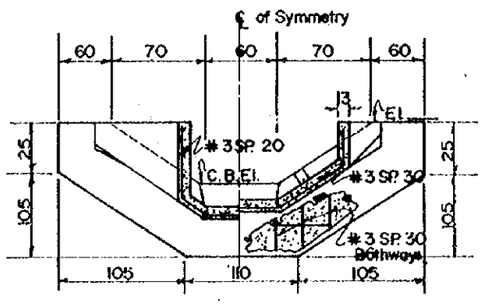
AT BEND



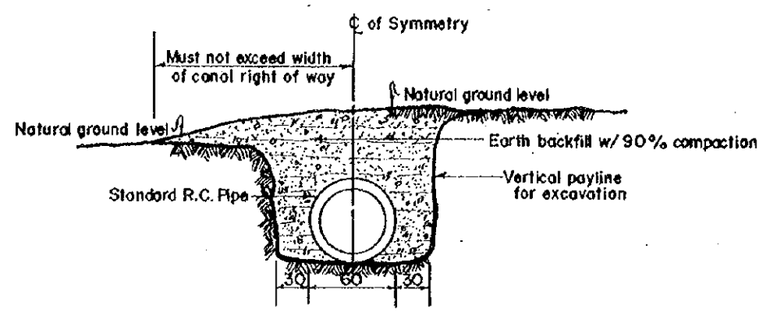
ALTERNATE PIPE COLLAR



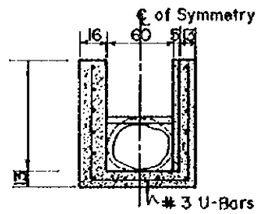
SECTION 'B-B'



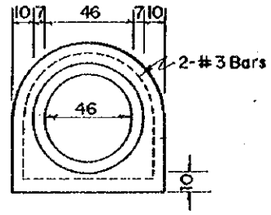
SECTION 'C-C'



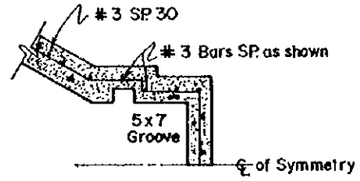
TYPICAL SECTION FOR LAYING PRECAST R. C. PIPE



SECTION 'D-D'



SECTION 'E-E'



HALF SECTION 'F-F'

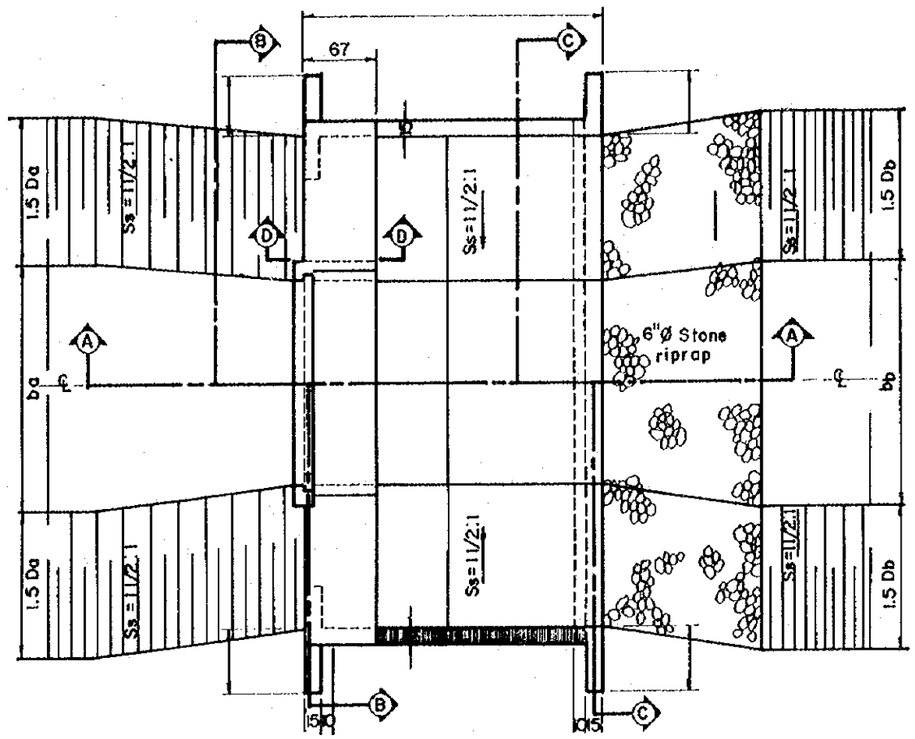
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

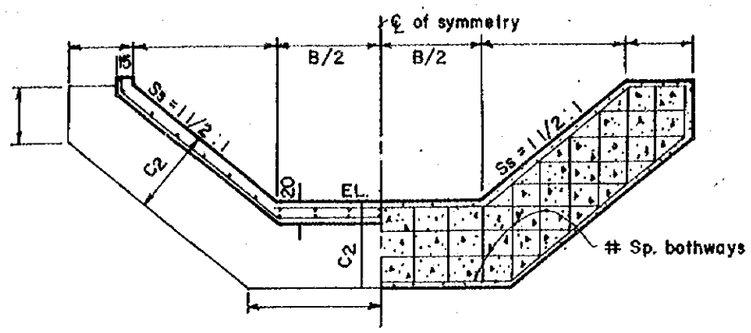
TYPICAL RCP CROSSING

DRAWING NO. WPIS-IC-016

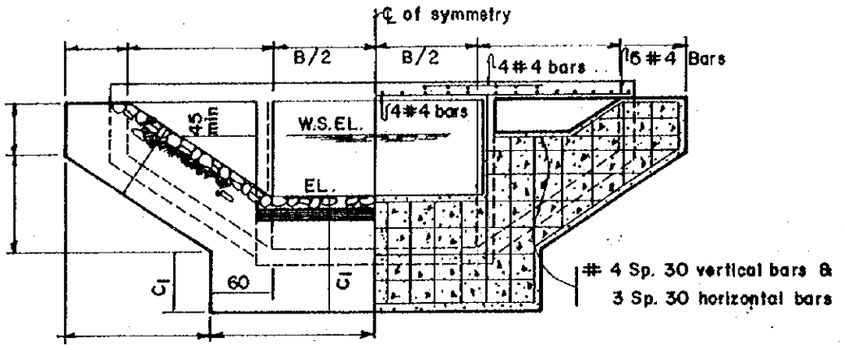
JAPAN INTERNATIONAL COOPERATION AGENCY



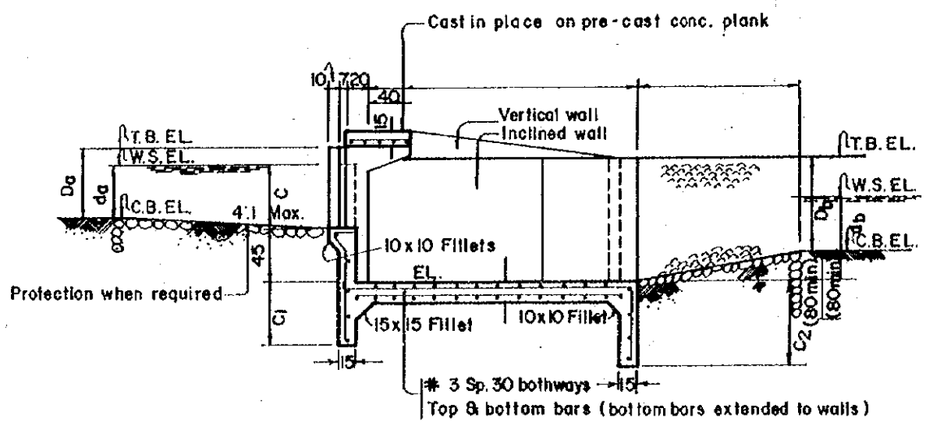
PLAN



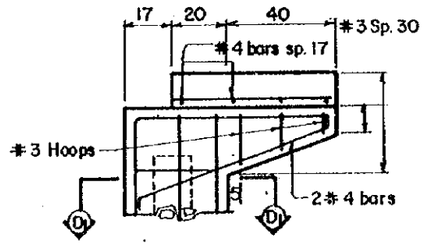
SECTION "C-C"



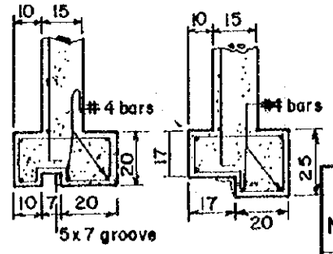
SECTION "B-B"



LONGITUDINAL SECTION "A-A"



SECTION "D-D"



(FOR STOP LOGS) (FOR STEEL GATES)

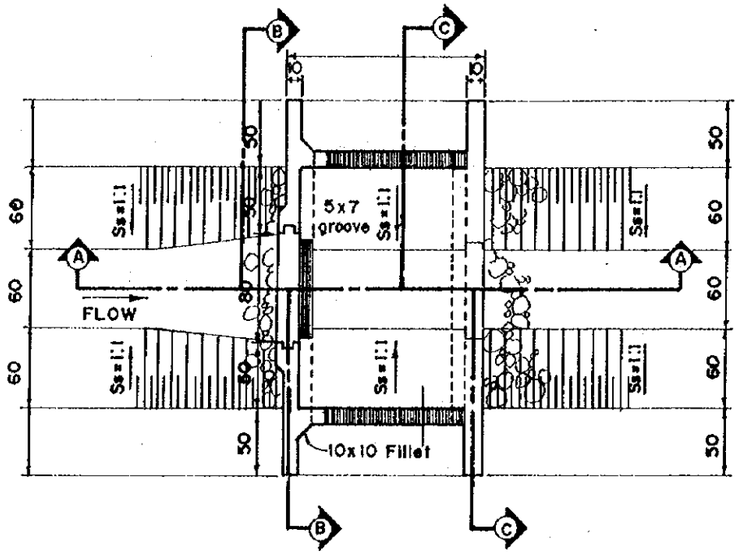
SECTION "D1-D1"

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

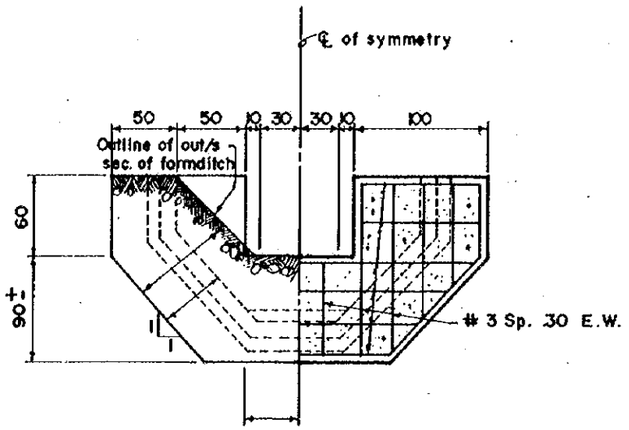
B I A D P
TYPICAL CHECK AND VERTICAL DROP

DRAWING NO. WPIS-IC-016

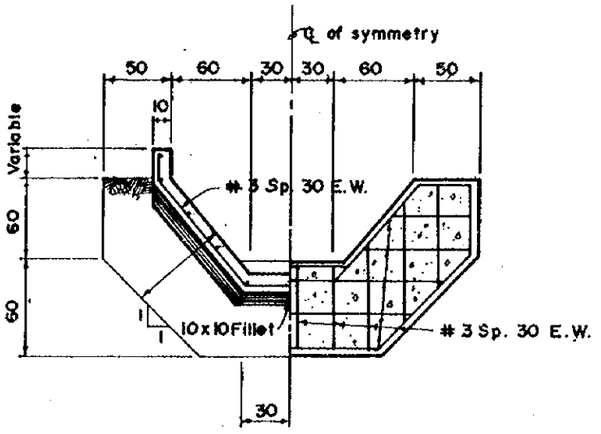
JAPAN INTERNATIONAL COOPERATION AGENCY



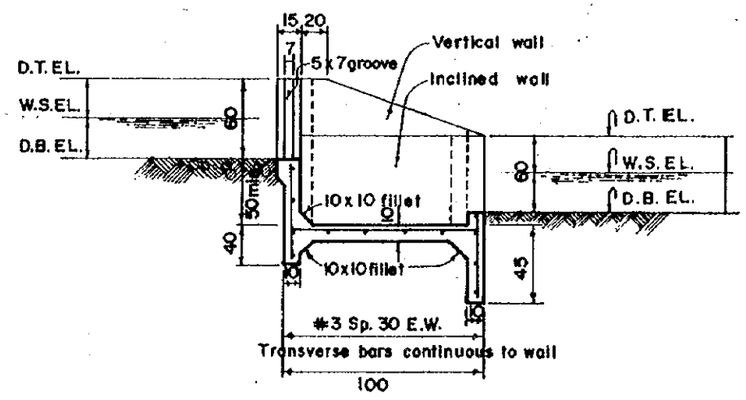
PLAN



SECTION " B-B "

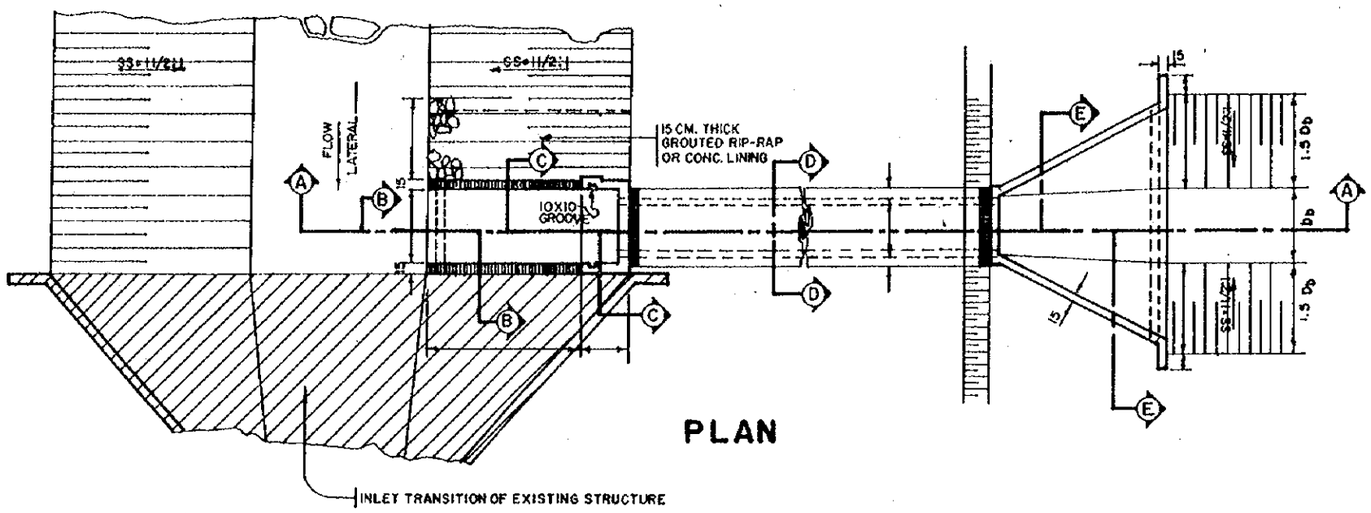


SECTION "C-C"

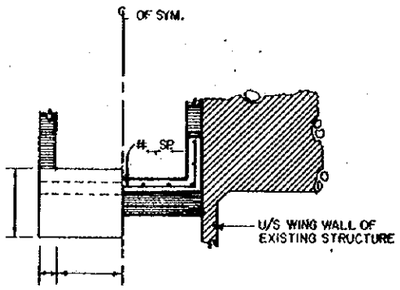


SECTION "A-A"

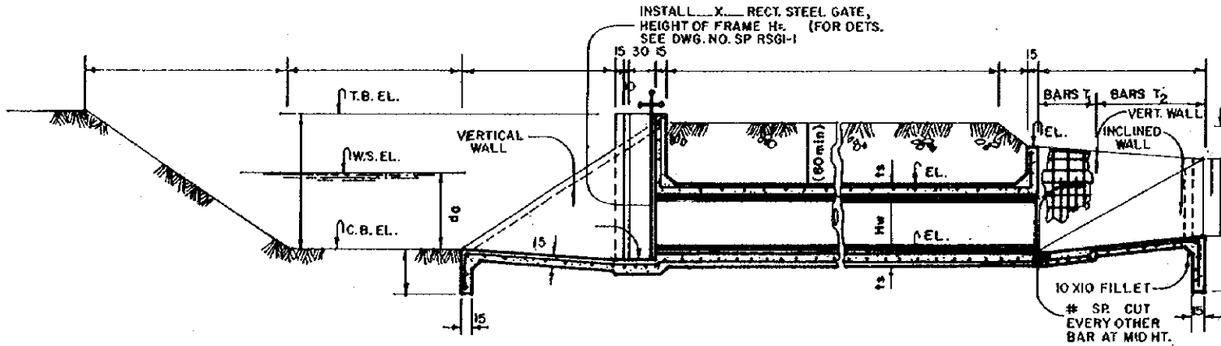
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL SUB-LATERAL DROP	
DRAWING NO.	WPIS-IC-017
JAPAN INTERNATIONAL COOPERATION AGENCY	



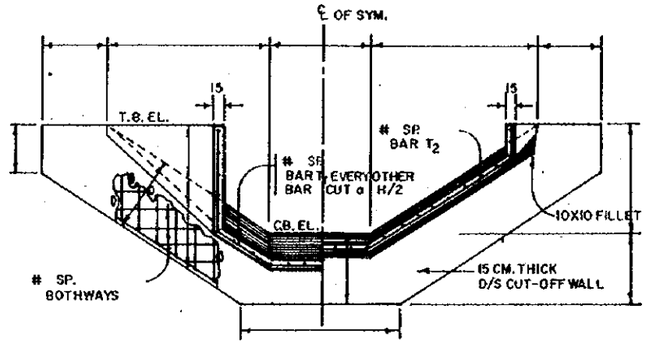
PLAN



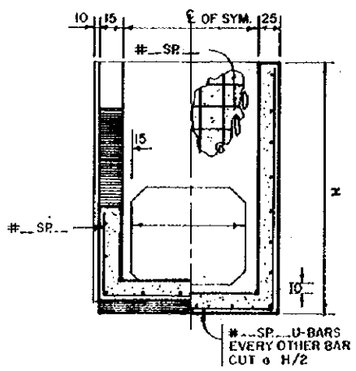
SECTION "B-B"



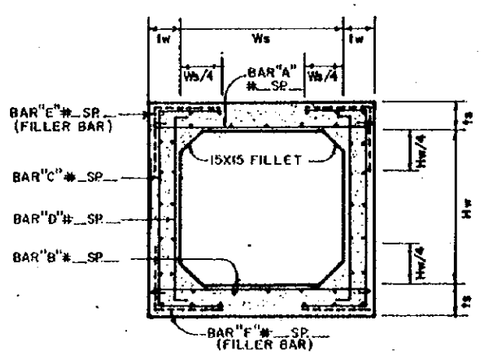
SECTION "A-A"



SECTION "D-D"



SECTION "C-C"



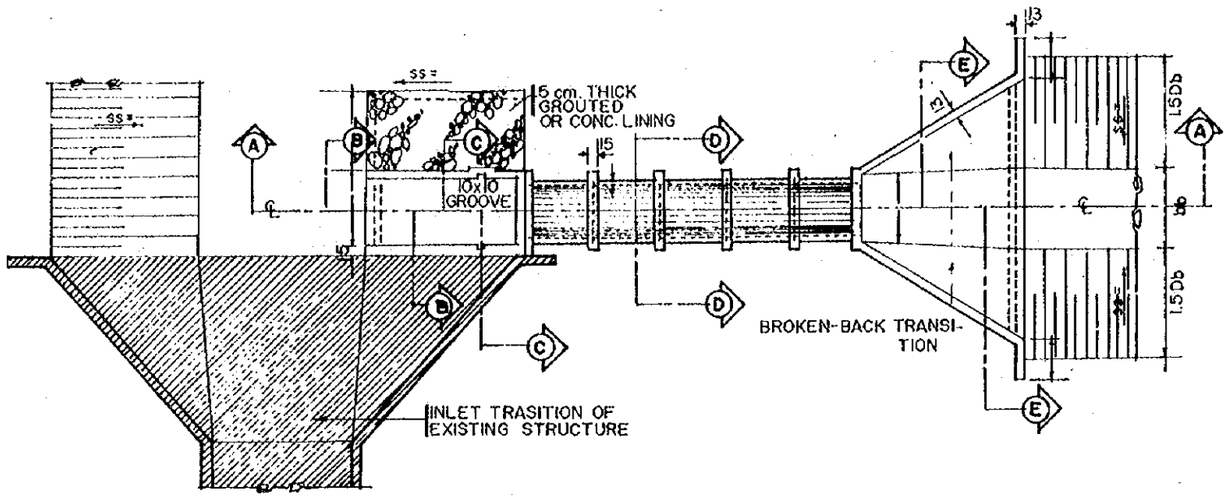
SECTION "D-D"

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

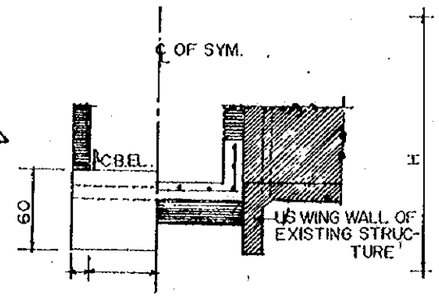
B I A D P
TYPICAL HEADGATE WITH BOX CULVERT

DRAWING NO.	WPIS-IC-018

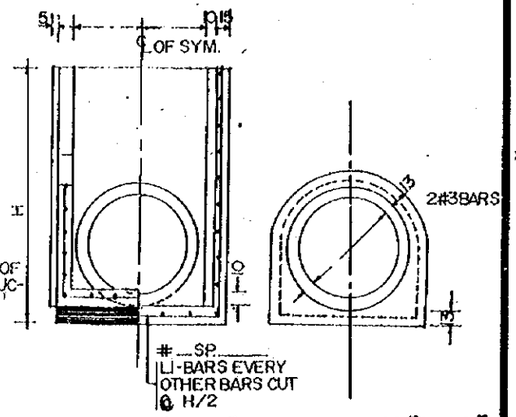
JAPAN INTERNATIONAL COOPERATION AGENCY



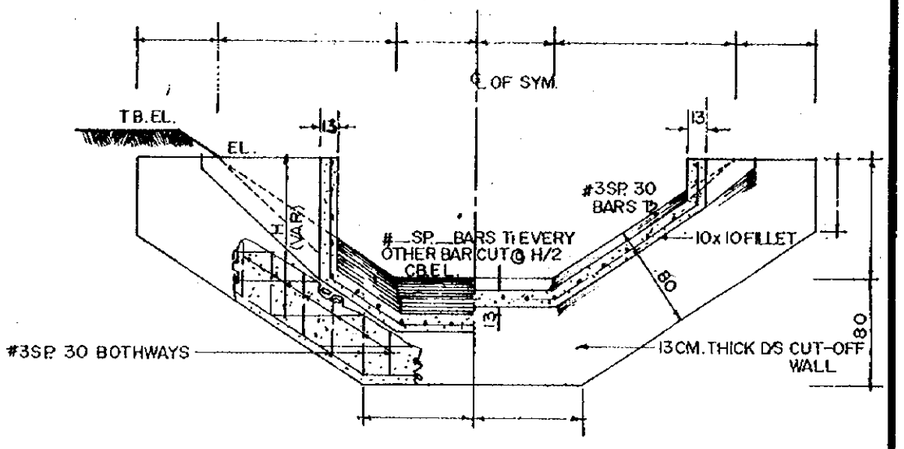
PLAN



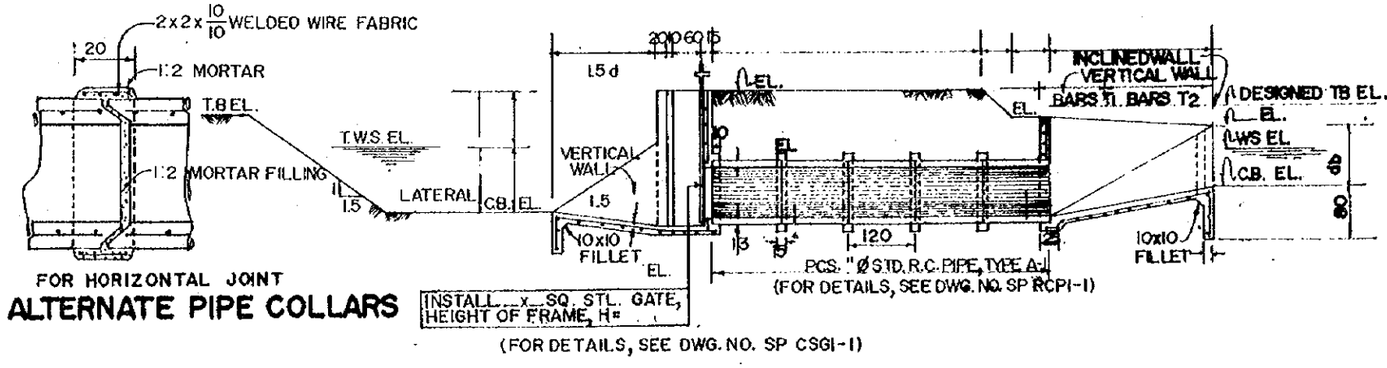
SECTION "B-B"



SECTION "C-C" SECTION "D-D"



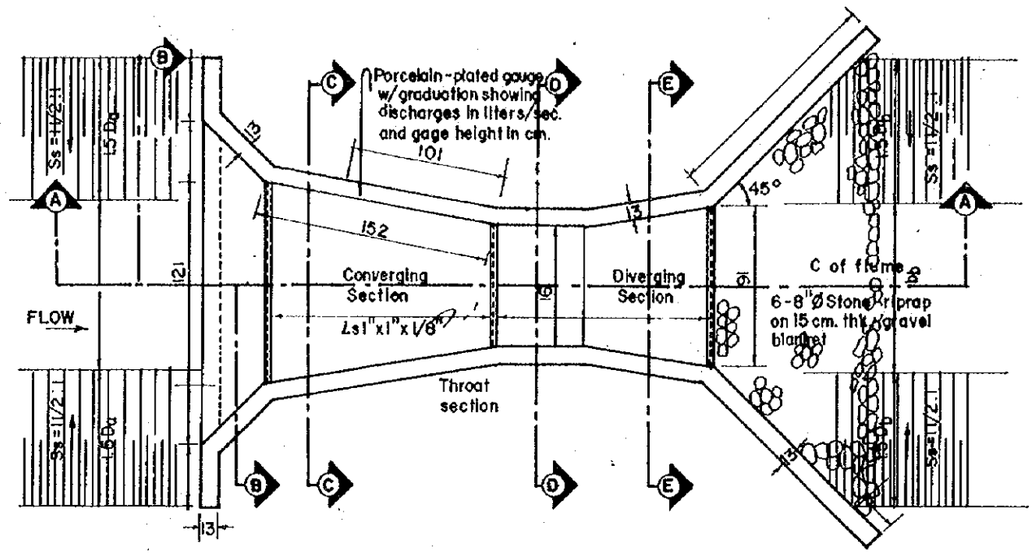
SECTION "E - E"



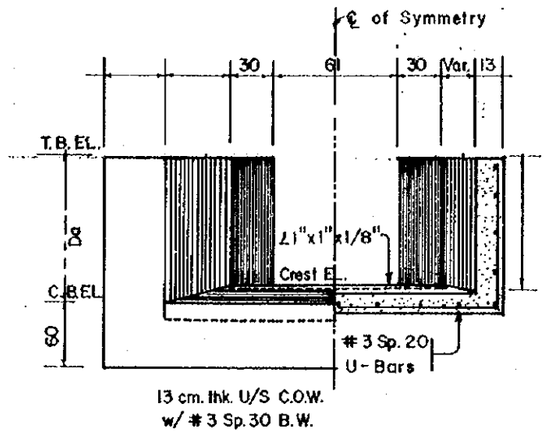
FOR HORIZONTAL JOINT
ALTERNATE PIPE COLLARS

SECTION "A - A"

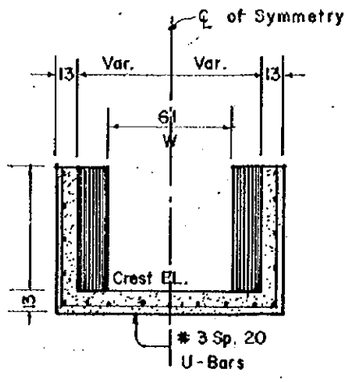
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL HEADGATE WITH PIPE CULVERT	
DRAWING NO.	WPIS - IC - 019
JAPAN INTERNATIONAL COOPERATION AGENCY	



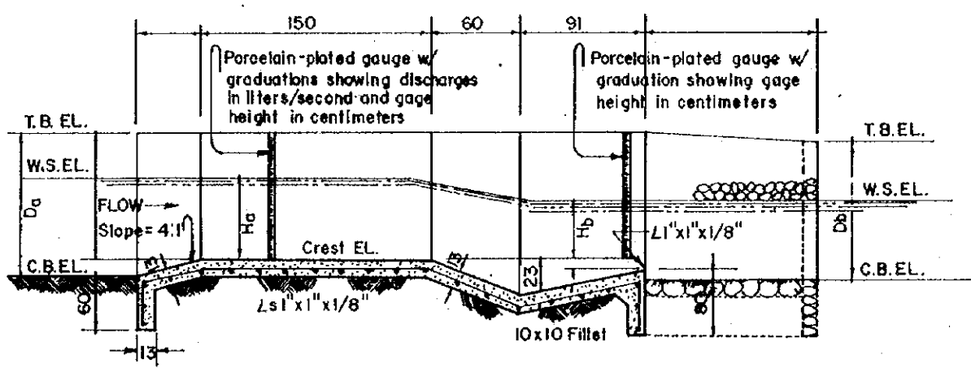
PLAN



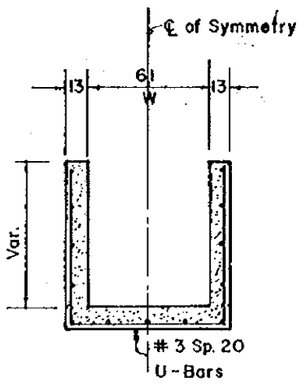
SECTION "B-B"



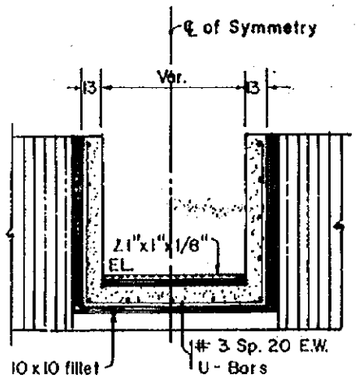
SECTION "C-C"



LONGITUDINAL SECTION "A-A"

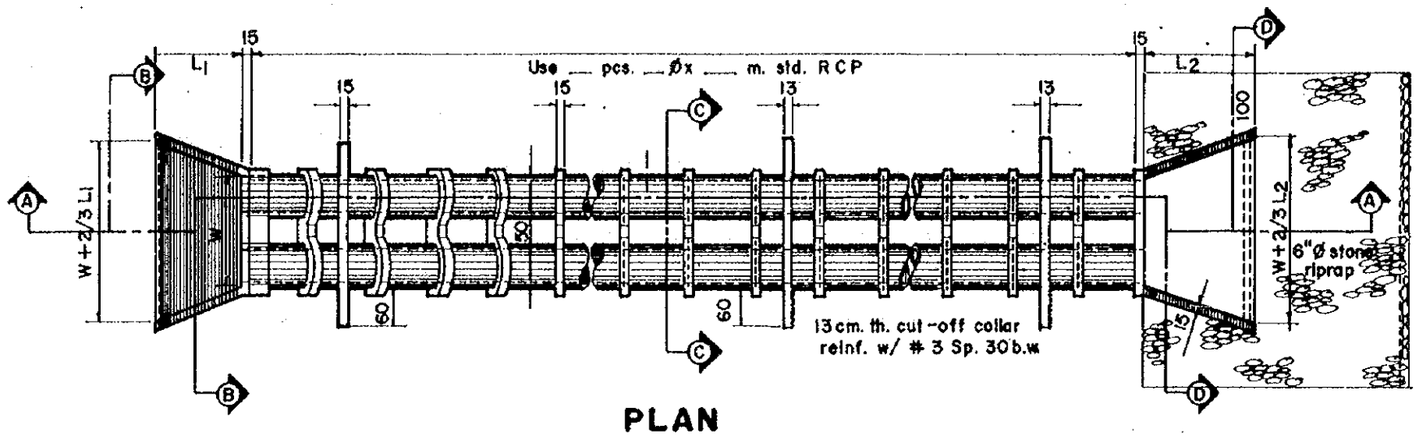


SECTION "D-D"

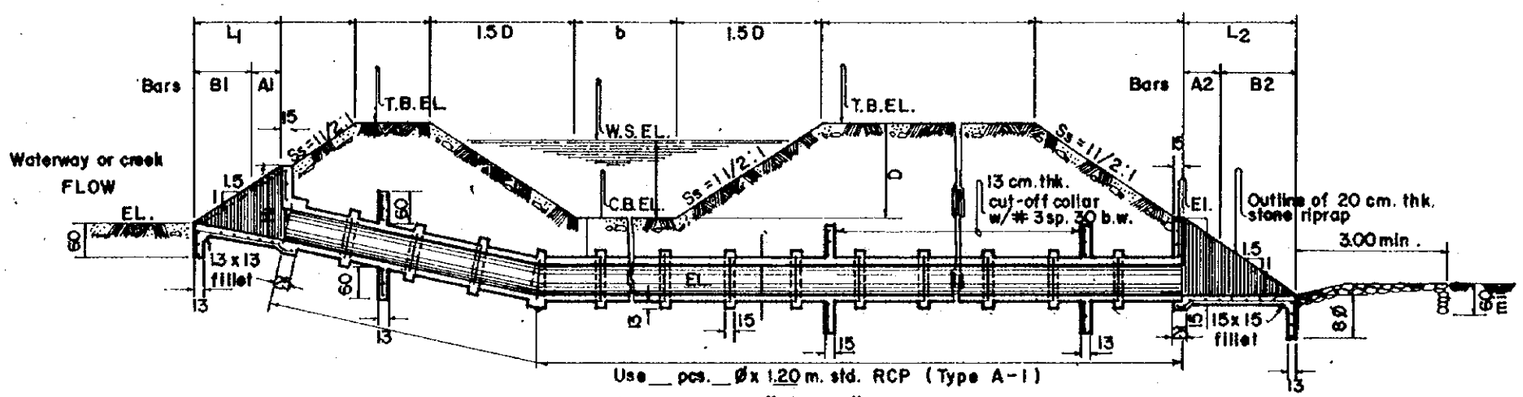


SECTION "E - E"

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL PARSHALL FLUME	
DRAWING NO.	WPIS-IC-020
JAPAN INTERNATIONAL COOPERATION AGENCY	



PLAN



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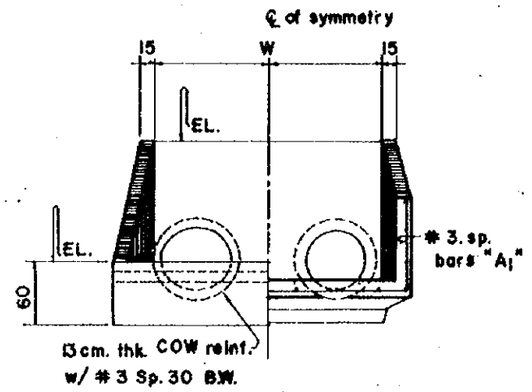
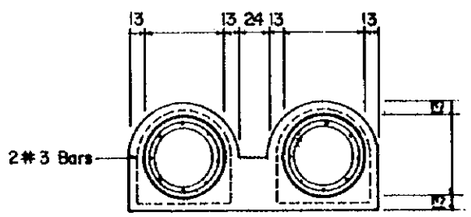
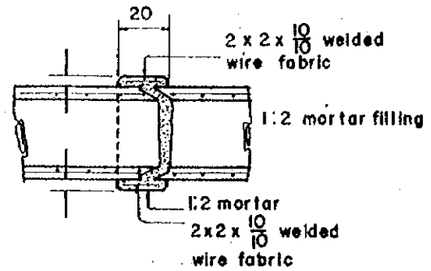


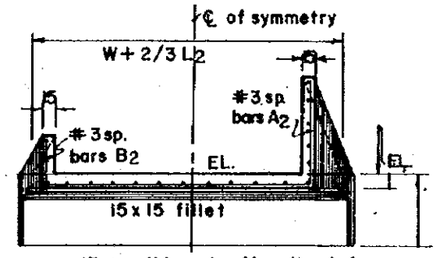
SECTION "B-B"



SECTION "C-C"



ALTERNATE PIPE COLLAR



SECTION "D-D"

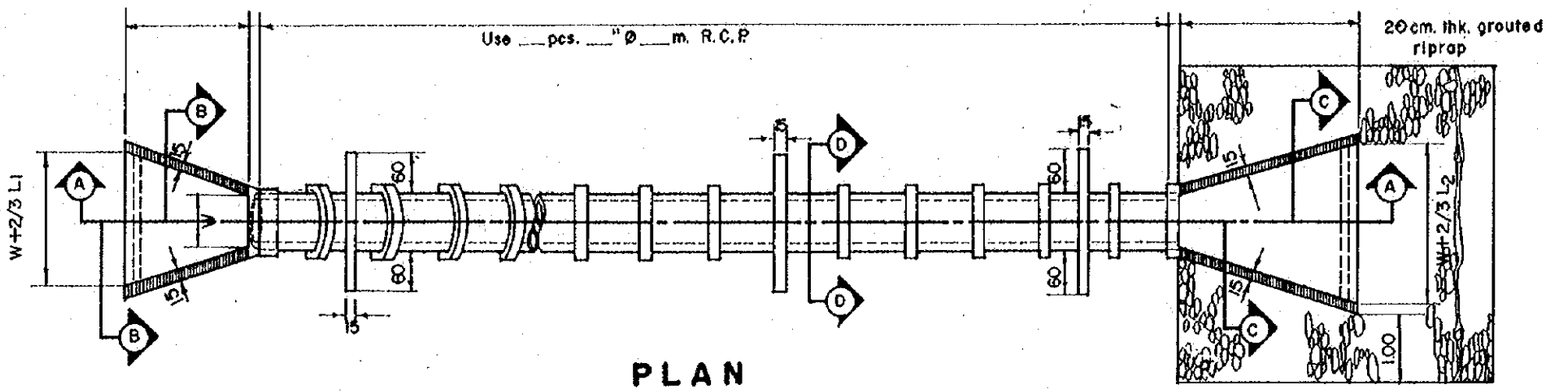
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

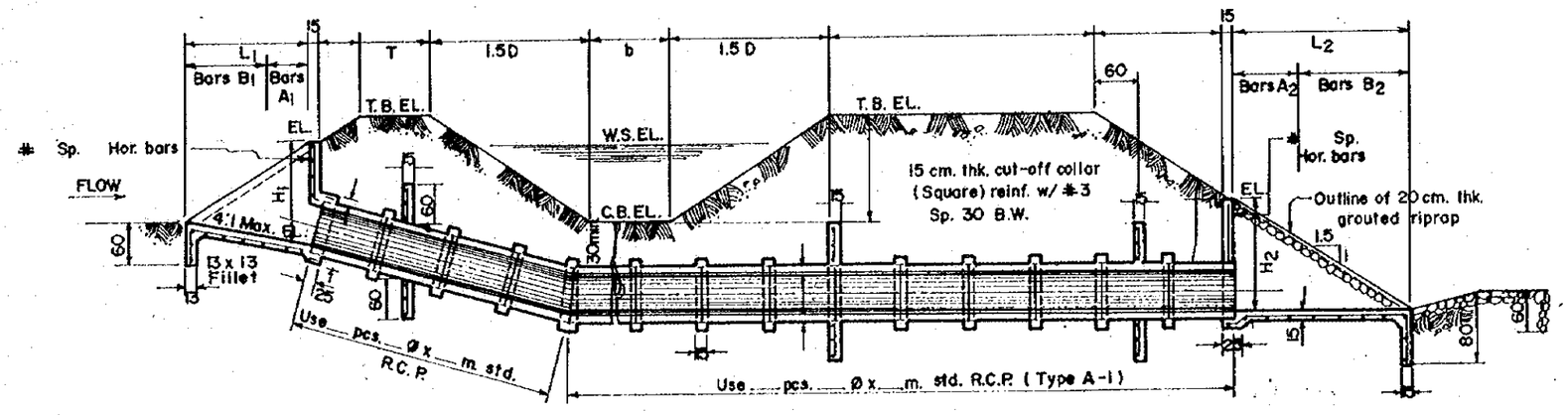
TYPICAL DRAINAGE CULVERT (DOUBLE ROW)

DRAWING NO.	WPIS-IC-021

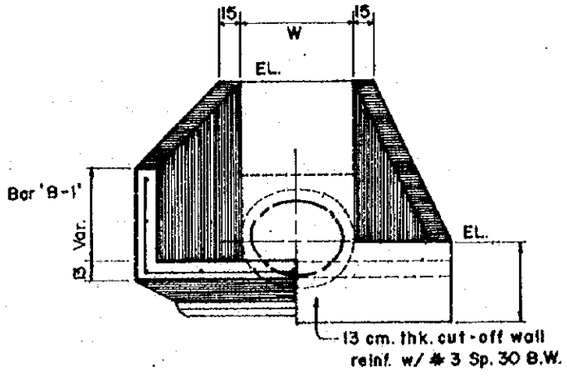
JAPAN INTERNATIONAL COOPERATION AGENCY



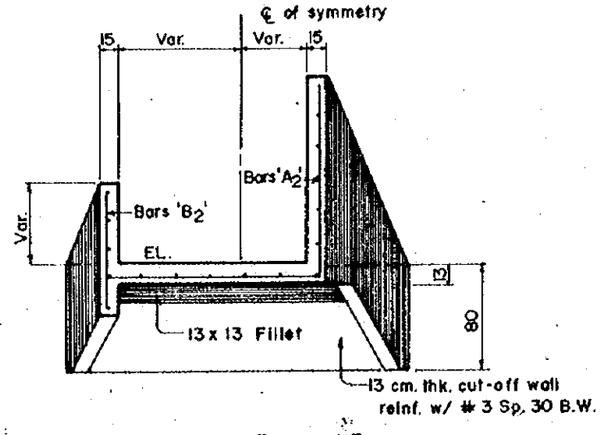
PLAN



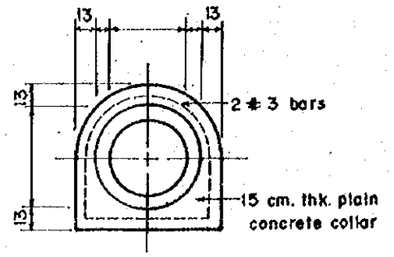
SECTION "A-A"



SECTION "B-B"



SECTION "C-C"



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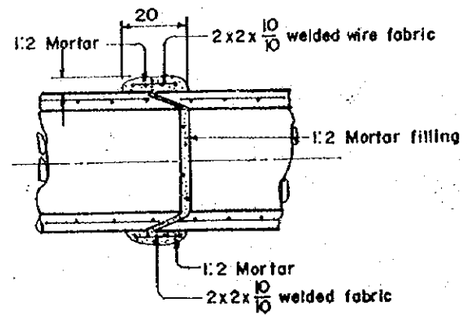


ALTERNATE PIPE COLLAR

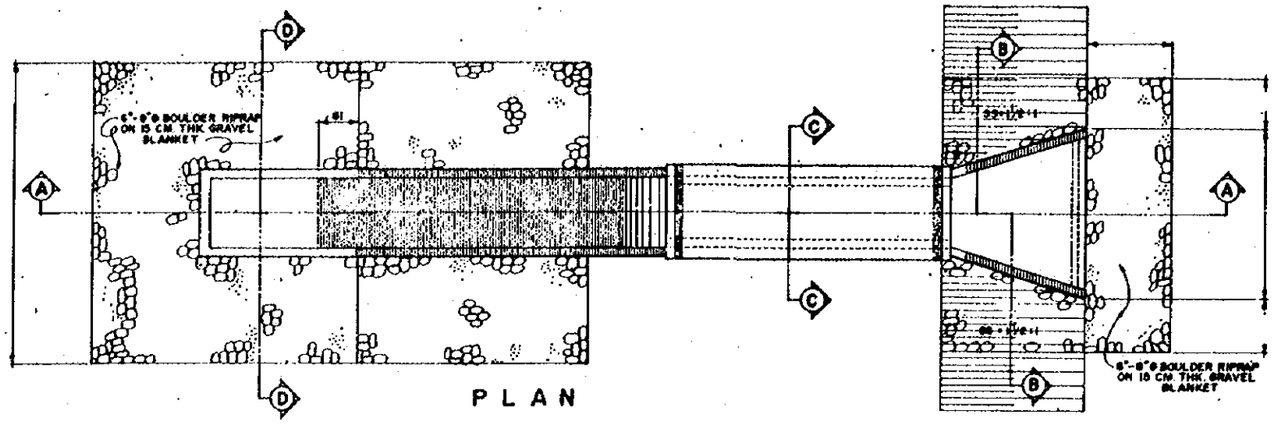
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

S I A D P

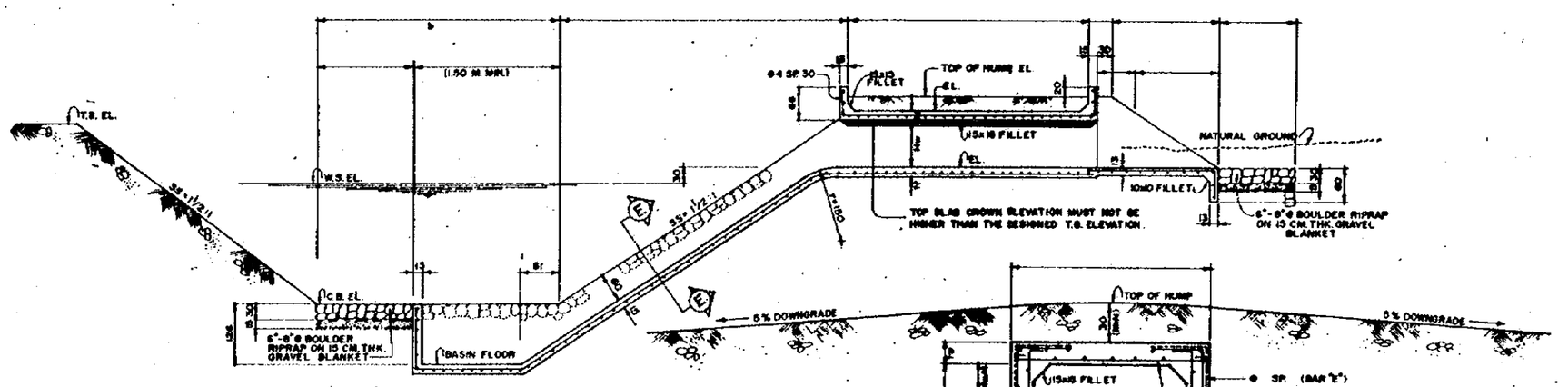
TYPICAL DRAINAGE CULVERT (SINGLE ROW)

DRAWING NO.	WPIS-IC-022

JAPAN INTERNATIONAL COOPERATION AGENCY

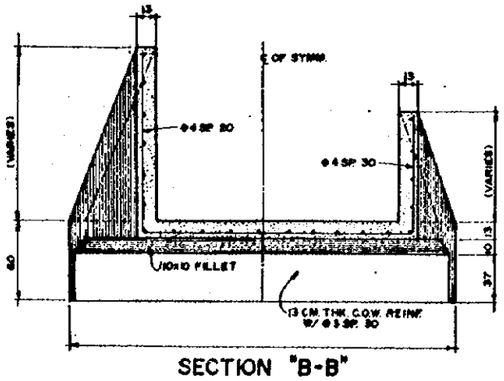


PLAN

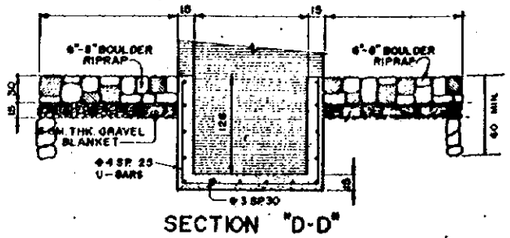


SECTION "A-A"

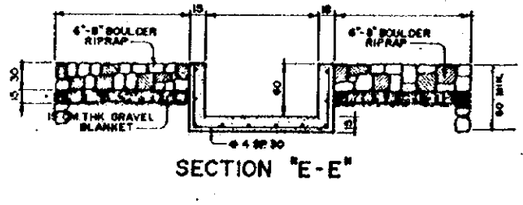
SECTION "C-C"



SECTION "B-B"



SECTION "D-D"



SECTION "E-E"

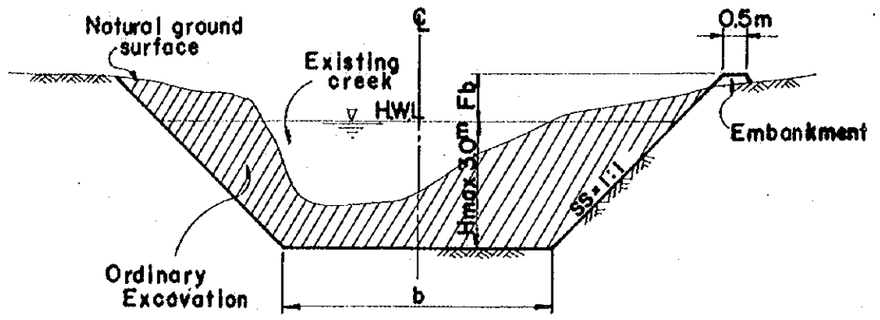
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

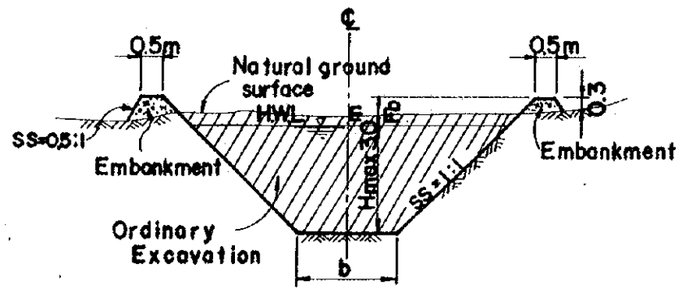
TYPICAL DRAIN INLET

DRAWING NO.	WPIS-IC-023

JAPAN INTERNATIONAL COOPERATION AGENCY

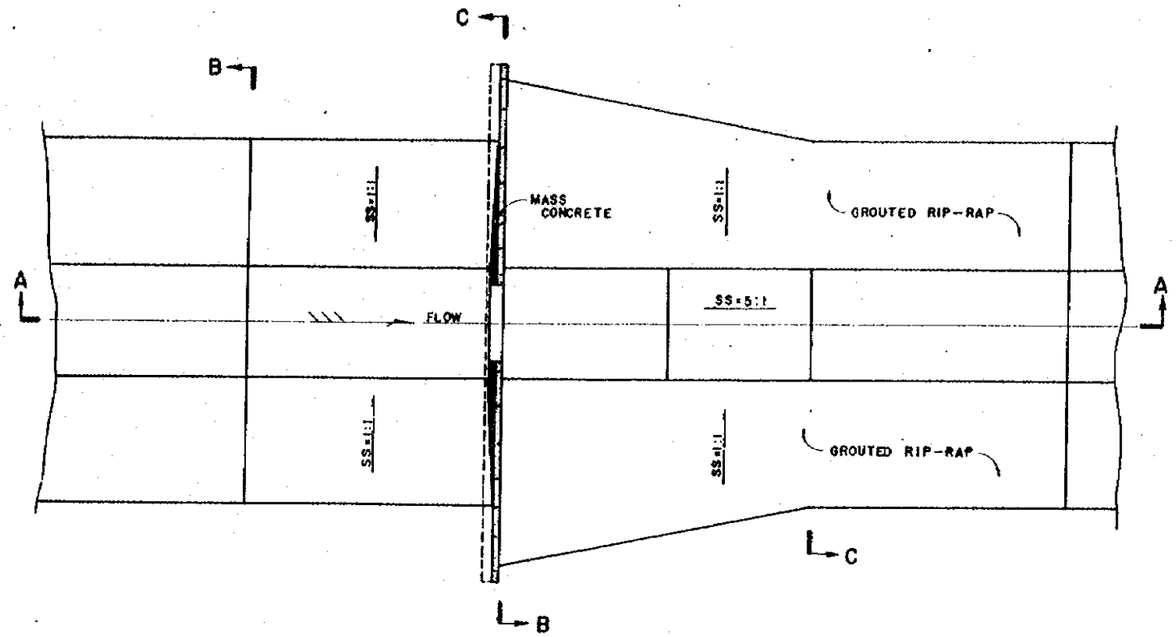


TYPICAL SECTION OF IMPROVEMENT CANALS

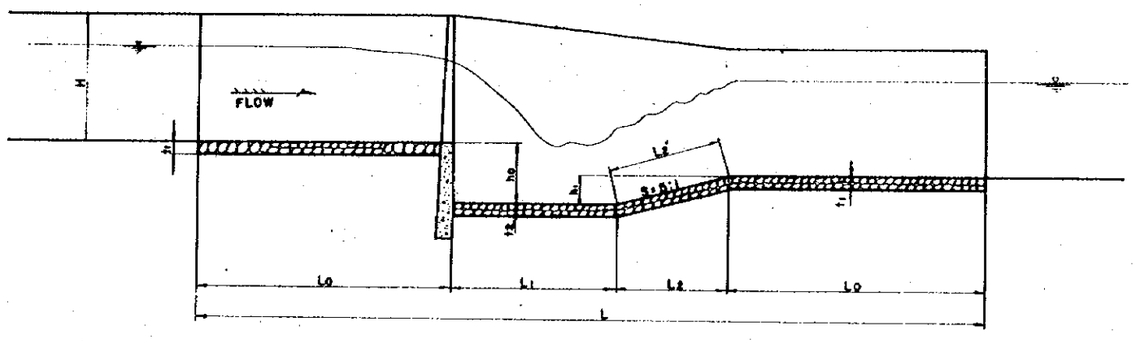


TYPICAL SECTION OF NEWLY CONSTRUCTED CANALS

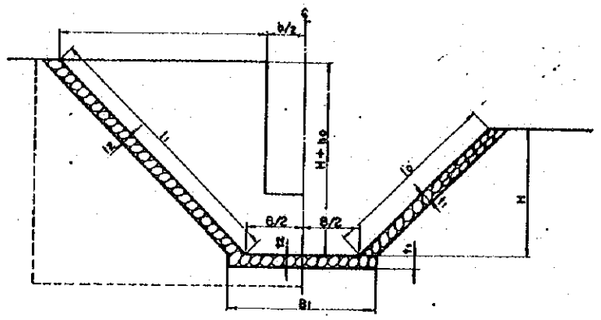
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL DRAINAGE CANAL SECTION	
DRAWING NO.	WPIS - DC - 024
JAPAN INTERNATIONAL COOPERATION AGENCY	



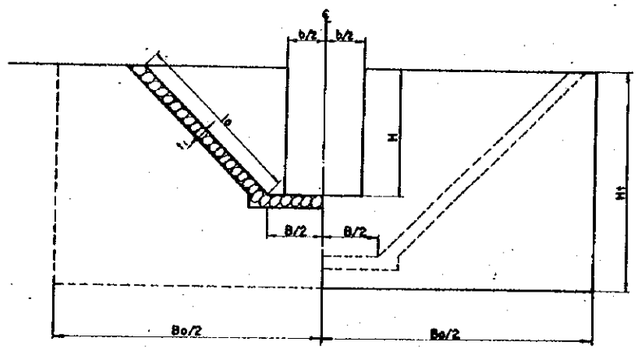
PLAN



SECTION "A-A"



SECTION "B-B"



SECTION "C-C"

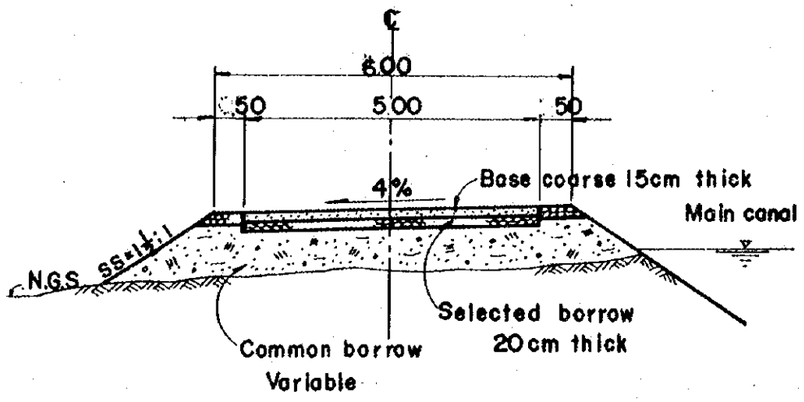
DIMENSION

(UNIT m)

TYPE	H	Lo	L1	L2	L	H	ho	h1	t1	t2	B	b	lo	H1	Bo	l1	B1	t3	t4	L'2		
I	3.0	8.0	5.2	4.5	25.7	4.0	1.9	0.9	0.4	0.4	3.5	2.4	4.0	7.3	16.3	5.9	4.63	0.15	0.6	4.69		
II	1.3	3.6	3.5	3.0	10.1	1.7	1.6	0.6	0.3	0.3	1.1	1.0	1.7	4.6	8.7	3.3	1.95	0.15	0.5	3.06		
III	0.9	2.8	2.9	2.5	8.2	1.2	1.5	0.5	0.3	0.3	0.9	0.7	1.2	4.0	7.3	2.7	1.55	0.15	0.4	2.55		

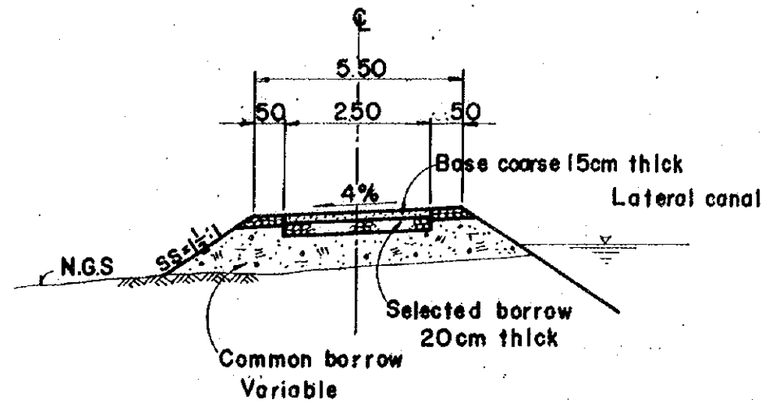
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL DRAINAGE DROP	
DRAWING NO.	WPIS-DC-025
JAPAN INTERNATIONAL COOPERATION AGENCY	

TYPE A

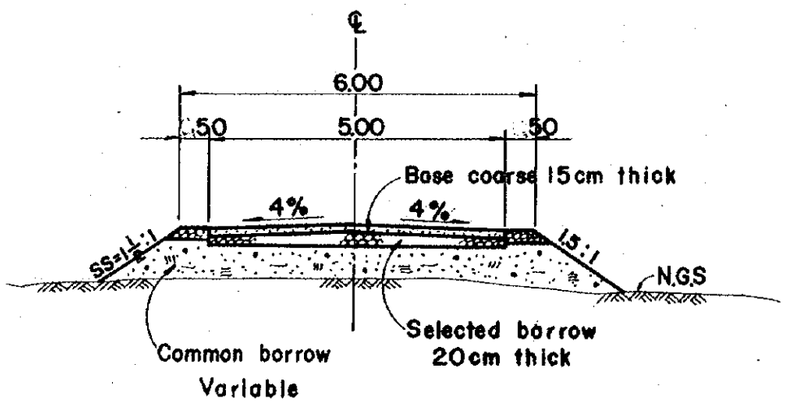


SERVICE ROAD ALONG MAIN CANALS

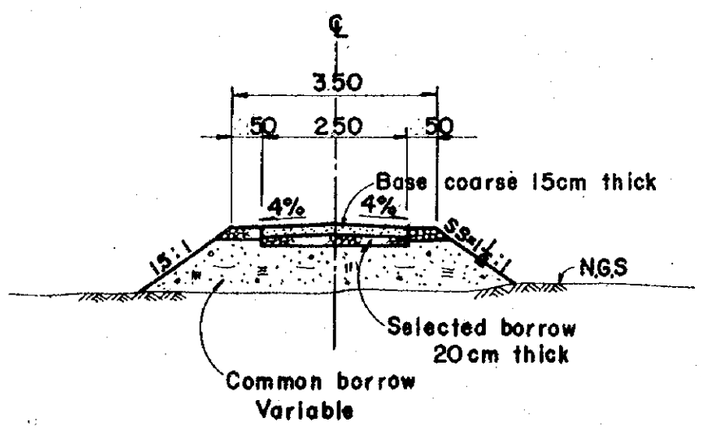
TYPE B



SERVICE ROAD ALONG LATERAL CANALS



ACCESS ROAD
IMPROVEMENT OF PROVINCIAL ROAD OR TRANK ROAD



ACCESS ROAD
IMPROVEMENT OF BARRIO ROAD OR NEW CONSTRUCTION OF CONNECTING ROAD

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

TYPICAL ROAD SECTION

DRAWING NO.	WPIS-RW-026

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

LAY-OUT OF ONFARM FACILITY B(1)

DRAWING NO.	WPIS-OF-027

JAPAN INTERNATIONAL COOPERATION AGENCY

SCALE 0 100 200 300M

N

LOC 28

MAIN CANAL

LAT B

1-1 1-2 1-3 1-4 1-5

2-1 2-2 2-3 2-4

3-1 3-2 3-3 3-4 3-5

LEGEND

- Present paddy field
- Coconuts or Banana field
- Land slope more than 10% or highland area
- Houses
- Main farm ditch
- Supplementary farm ditch
- Farm drain
- Main or Lat, irrigation canal
- Farm road
- Main or Lat, drainage canal
- Turn-out
- Division box or check

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P
LAY-OUT OF ONFARM FACILITY B(2)

DRAWING NO.	WPIS-OF-028

JAPAN INTERNATIONAL COOPERATION AGENCY

N

LOC 28

LAT 'B'

RIVER

WAHIG

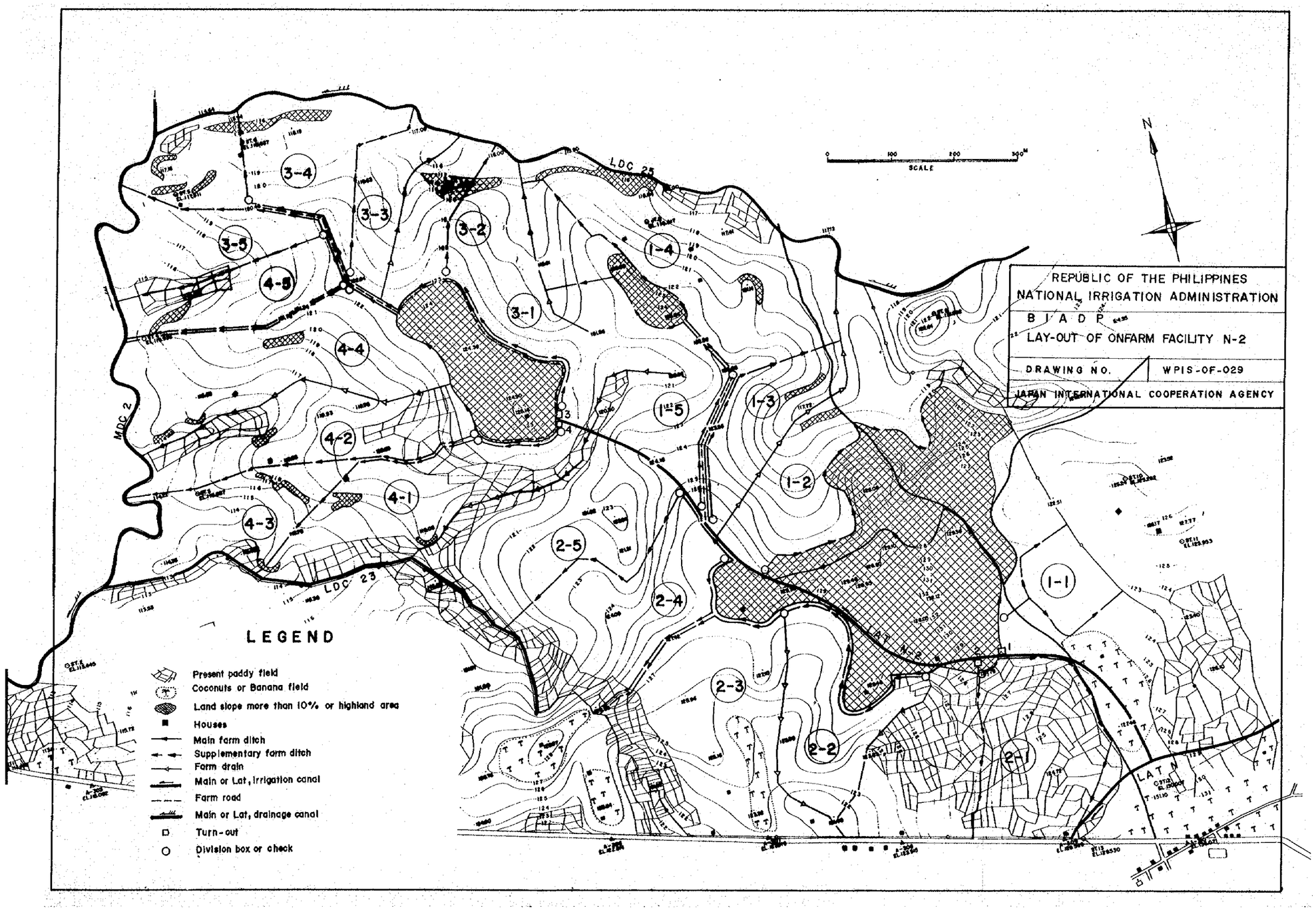
LDC 29-1

4-5 4-4 4-3 4-2 4-1 5-2 5-3 5-1 3-5

SCALE 0 100 200 300 M

LEGEND

- Present paddy field
- Coconuts or Banana field
- Land slope more than 10% or highland area
- Houses
- Main farm ditch
- Supplementary farm ditch
- Farm drain
- Main or Lat, Irrigation canal
- Farm road
- Main or Lat, drainage canal
- Turn-out
- Division box or check

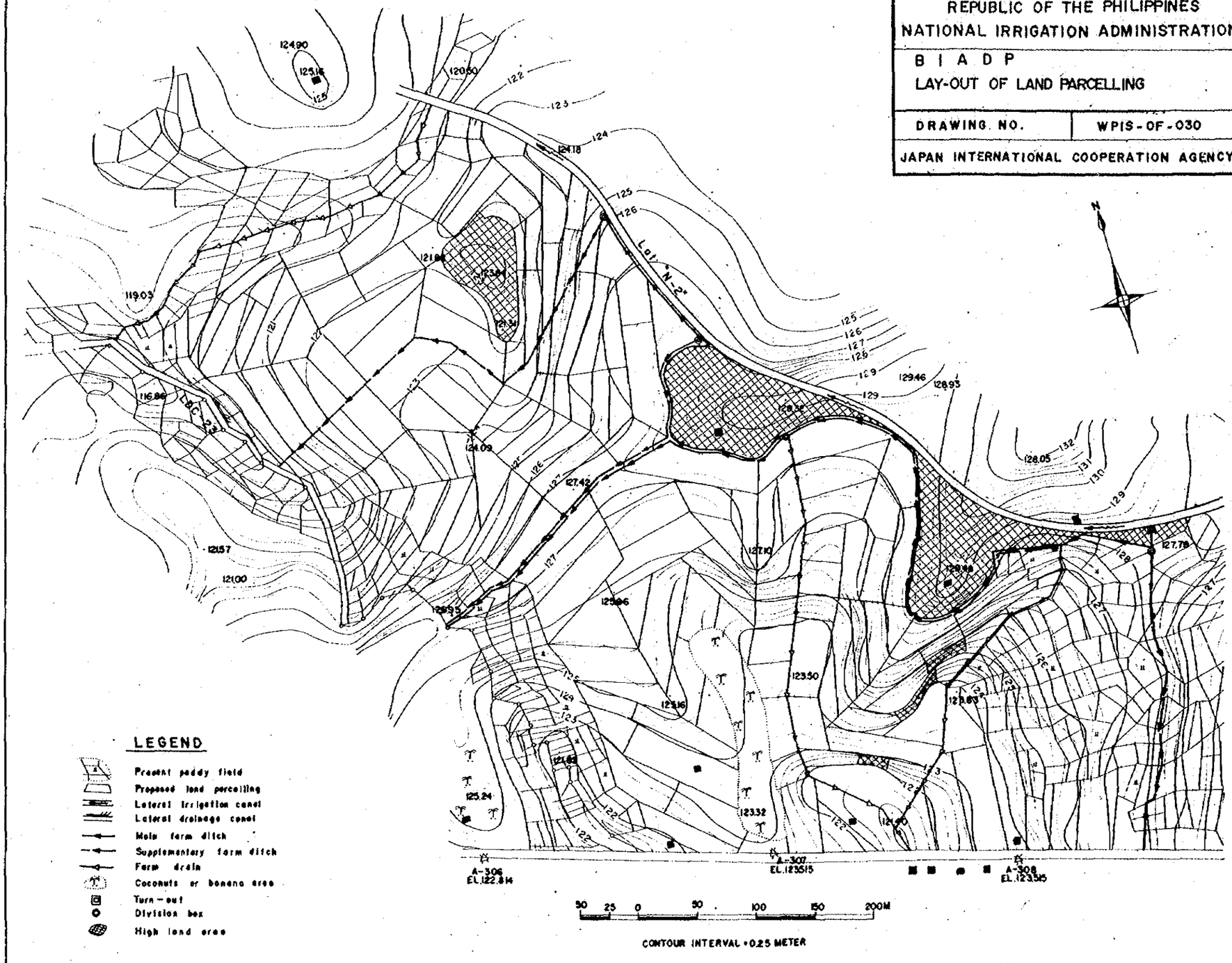

SCALE
0 100 200 300M
N
LDC 25
LDC 23
MDC 2
3-4
3-3
3-2
3-1
3-5
4-5
4-4
4-2
4-1
4-3
1-4
1-5
1-3
1-2
1-1
2-5
2-4
2-3
2-2
2-1
LEGEND
Present paddy field
Coconuts or Banana field
Land slope more than 10% or highland area
Houses
Main farm ditch
Supplementary farm ditch
Farm drain
Main or Lat, irrigation canal
Farm road
Main or Lat, drainage canal
Turn-out
Division box or check
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
B I A D P
LAY-OUT OF ONFARM FACILITY N-2
DRAWING NO. WPIS-OF-029
JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P
LAY-OUT OF LAND PARCELLING

DRAWING NO.	WPIS-OF-030

JAPAN INTERNATIONAL COOPERATION AGENCY

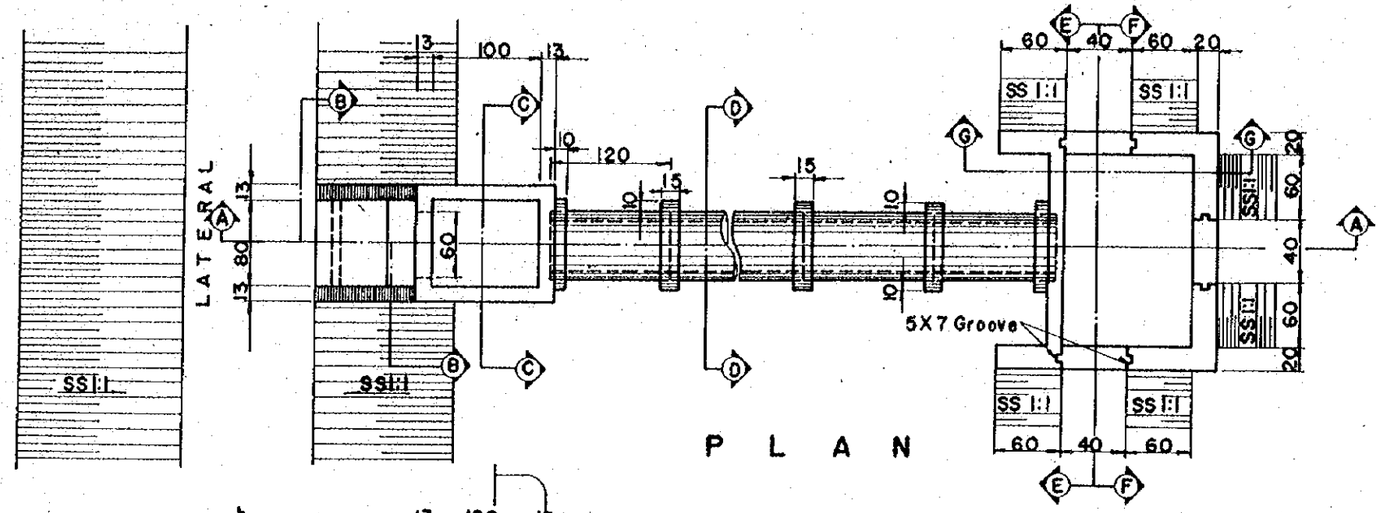


LEGEND

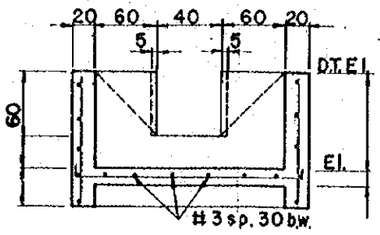
- Present paddy field
- Proposed land parcelling
- Lateral irrigation canal
- Lateral drainage canal
- Main farm ditch
- Supplementary farm ditch
- Farm drain
- Coconuts or banana area
- Turn-out
- Division box
- High land area

50 25 0 50 100 150 200M

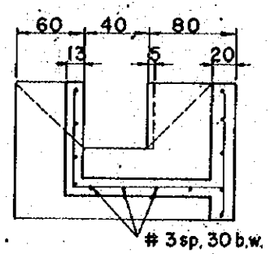
CONTOUR INTERVAL =0.25 METER



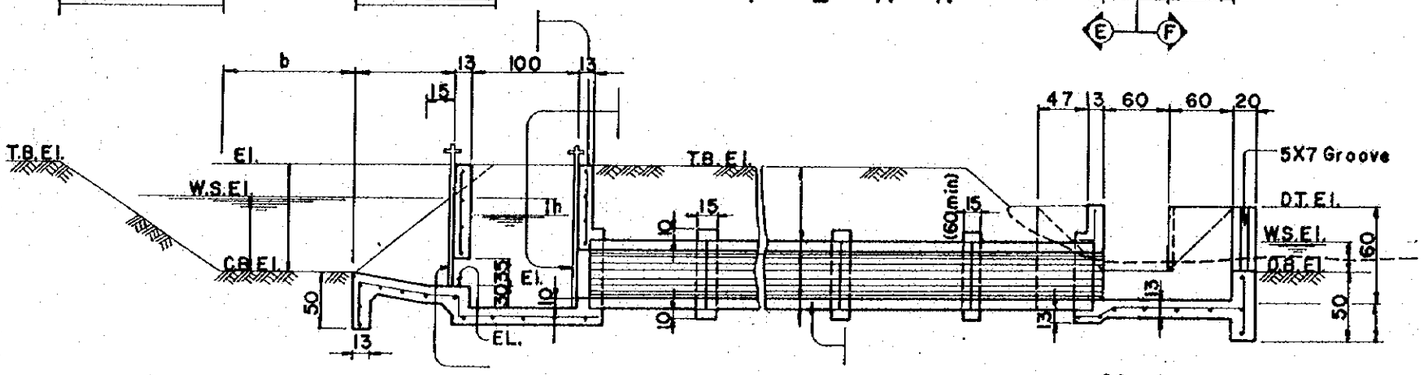
PLAN



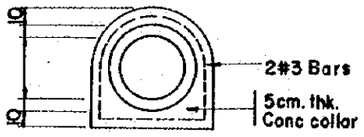
SECTION "F-F"



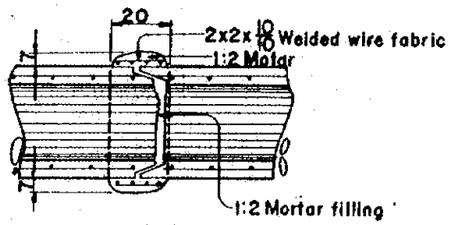
SECTION "G-G"



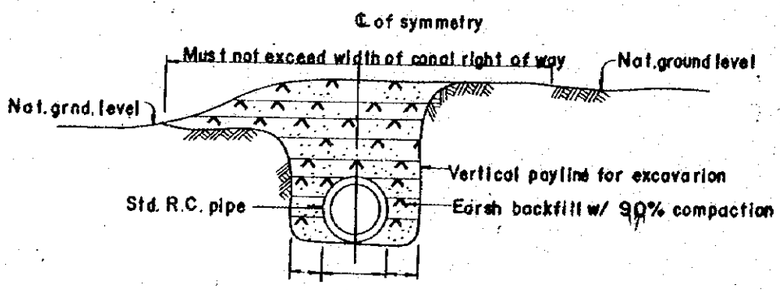
SECTION "A-A"



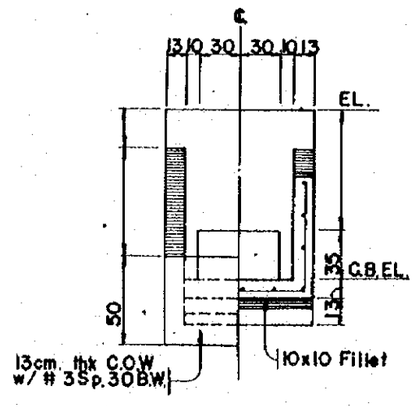
SECTION "D-D"



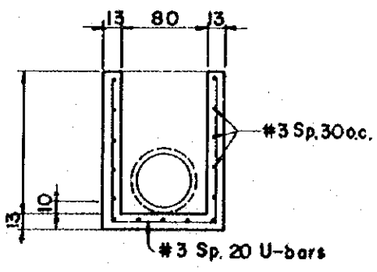
ALTERNATE PIPE COLLAR JOINT



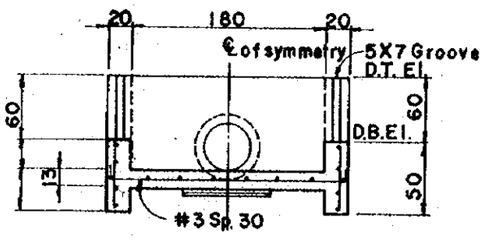
TYPICAL SECTION FOR LAYING
PRECAST R C PIPE



SECTION "B-B"



SECTION "C-C"



SECTION "E-E"

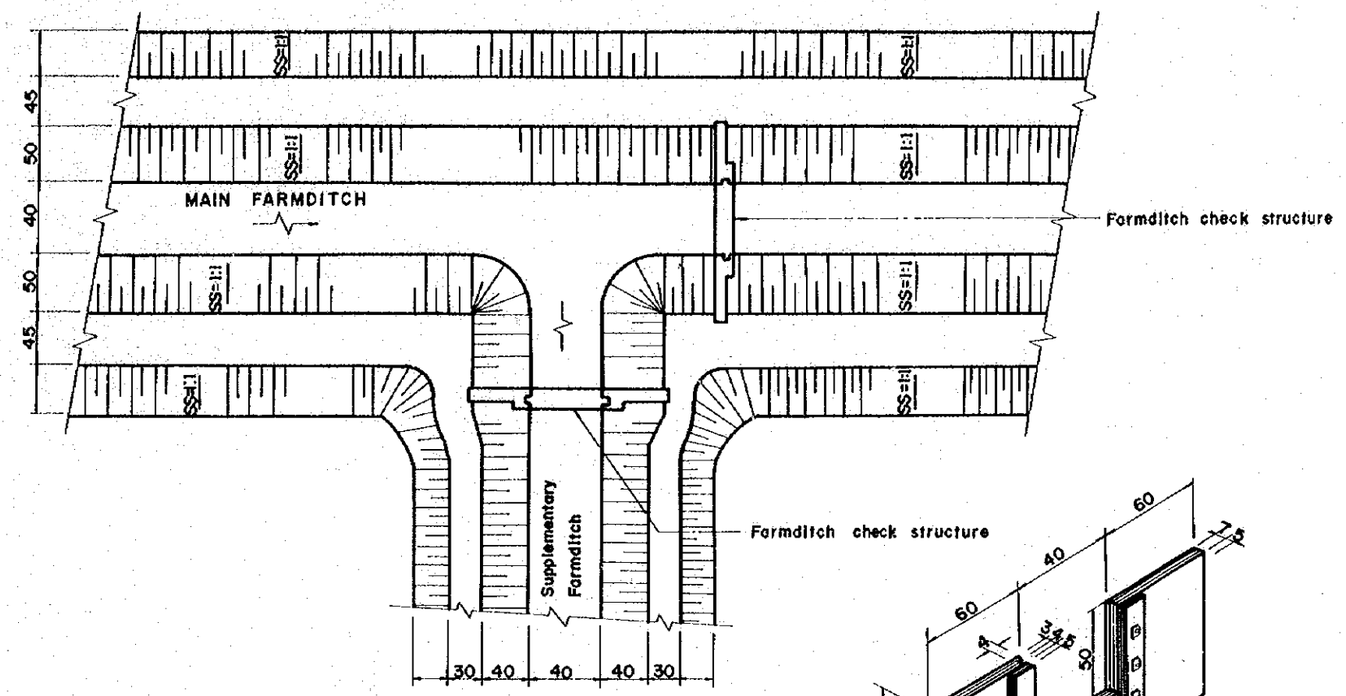
REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

B I A D P

TYPICAL TURN-OUT

DRAWING NO.	WPIS - OF - 031

JAPAN INTERNATIONAL COOPERATION AGENCY

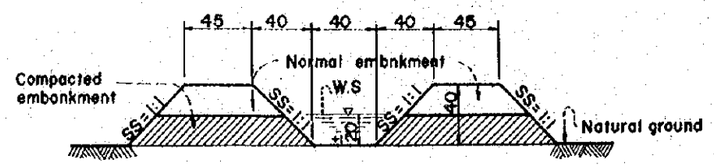


SCHEMATIC PLAN
FOR DIVISION BOX

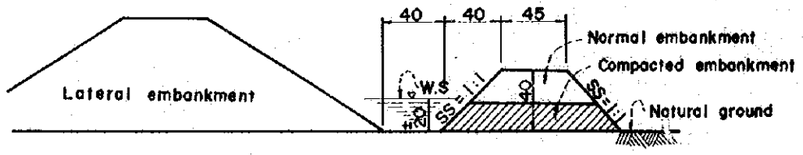
ISOMETRIC VIEW
FARMDITCH CHECK STRUCTURE

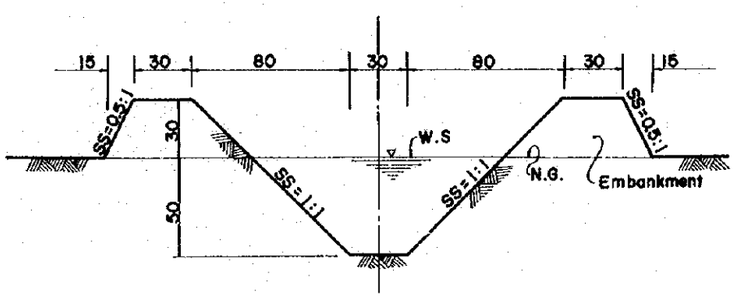
TYPICAL FARMDITCH

CASE I (When farmditch is not adjacent to lateral or canal)

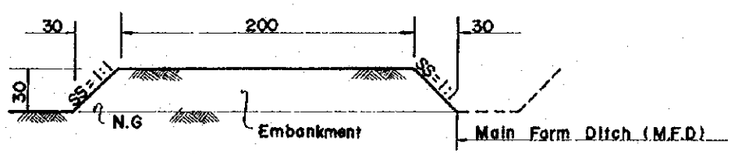


CASE II (When farmditch is adjacent to lateral or canal)



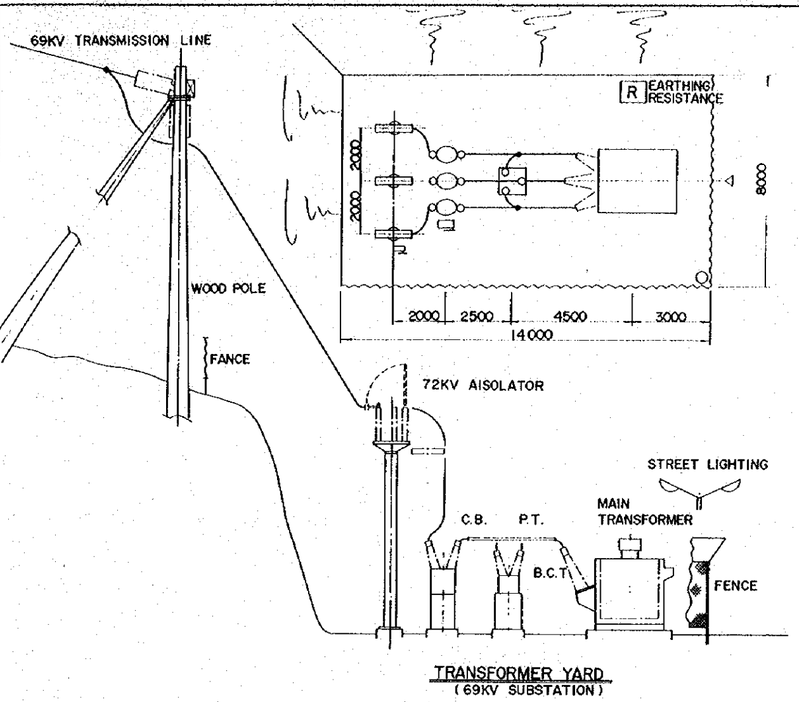


FARM DRAIN

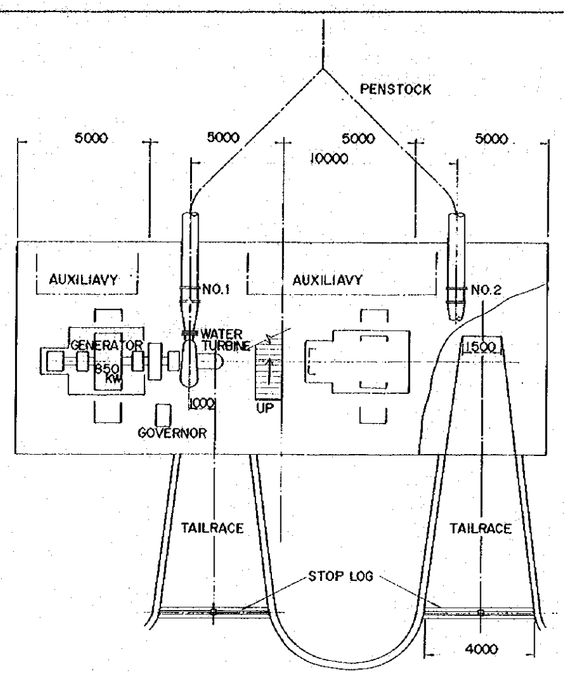


FARM ROAD
Along M.F.D If need

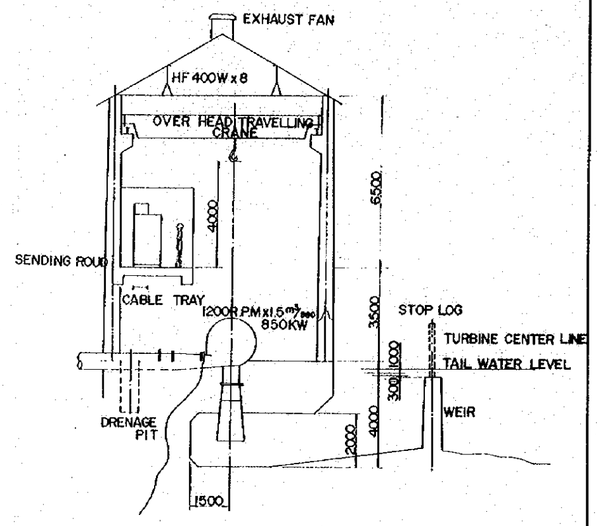
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
B I A D P TYPICAL FARMDITCH SECTION AND DIVISION BOX	
DRAWING NO.	WPIS-OF-032
JAPAN INTERNATIONAL COOPERATION AGENCY	



TRANSFORMER YARD
(69KV SUBSTATION)



B I F L

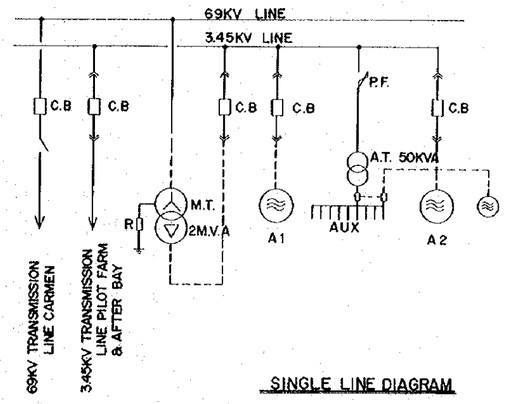


A 1 : ALTERNATOR NO. 1
3.45KV 60HZ
850KW (1062.5KVA)
1200R.P.M

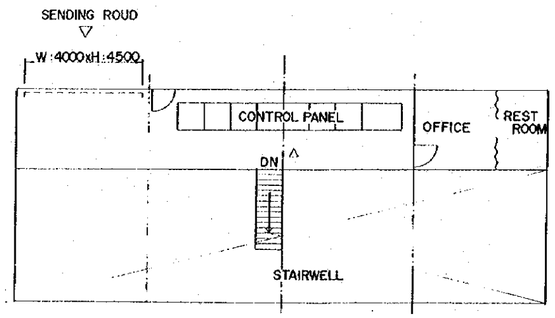
A 2 : SAME AS NO. 1

MT : MAIN TRANSFORMER
69/3.45KV 2MVA
NUTRAL RESISTOR

AT : AUX. TRANSFORMER
345KV/416, 240V
50KVA



SINGLE LINE DIAGRAM



I F L

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NATIONAL IRRIGATION ADMINISTRATION

B I A D P
GENERAL PLAN OF HYDRO POWER PLANT

DRAWING NO.	WPIS - OF - 033

JAPAN INTERNATIONAL COOPERATION AGENCY