5.8 Design of River Protection

5.8.1 Required Area of Water Opening

The discussion on required water opening to run-off flood discharge is presented in Section 5.2.2.

5.8.2 Type of River Bank Protection

As planned for the Phase I Bridges, river bank protection at the front of abutments is constructed when the velocity of water is over 3 m per second or when erosion and scouring are anticipated.

Considering the availability of local materials, grouted riprap protection is adopted for the Project. Since grouted riprap as a structure is not expected to prevent soil embankments from failure, it must be placed at a slope equal to or flatter than the natural angle of repose of the supporting soil. In design, the slope of 1.5:1 is proposed.

Grouted riprap foundations must be extended to bedrock or below the scour depth anticipated. Figure 5.8-1 shows a typical cross section of grouted riprap.

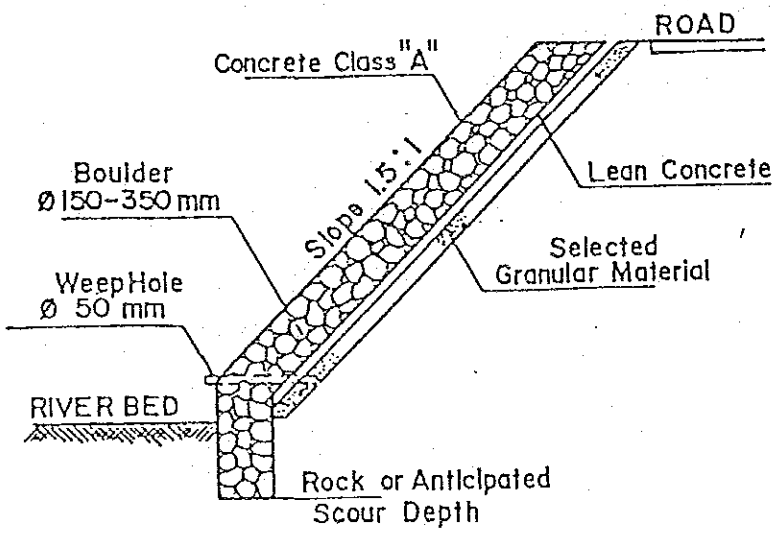


FIGURE 5.8-1 RIVER BANK PROTECTION

5.9 Implementation Plan

5.9.1 Transportation of Steel Materials

Steel materials supplied by Japan's Grant Aid will be shipped by sea from Japan to ports of entry in the Philippines, and then delivered to bridge construction sites by land. The transportation routes and existing conditions of the roads are presented in Table 5.9-1.

As described in the Minutes of Discussions, the Philippine Government will keep the access roads including bridges therein to the following bridge sites passable for the transport of materials and equipment.

04.04b Lumang Bayane Bridge:
Temporary Construction of 2 spill-ways.

04.05b Olangoan I Bridge :
Reinforce 7 dilapidated bridges

05.03 Narangasan I Bridge:
Reinforce 3 dilapidated bridges

07.01 Banban Bridge :
Reinforce 3 dilapidated bridges

07.02 Campacas Bridge :
Improve road from Dalaguete to site including reinforcing 1 dilapidated bridge

08.04 Talisayan Bridge :
Reinforce 2 dilapidated bridges

10.01 Hayangabon I Bridge :
Reinforce 11 timber bridges

Several measures to reinforce these dilapidated bridges can be proposed, and the following measures are presented as examples. Figures 5.9-1 and 5.9-2

illustrate measures to reinforce Bailey and timber bridges, respectively.

TABLE 5.9-1 THE ROUTES OF TRANSPORTATION AND THE ROAD CONDITION

Bridge No.	Bridge Name	Ports of landing	Land Route	Existing Condition land route
04.01a	Binambang	Manila	.Manila->site .108km from Manila	.Paved .Good
04.03a	Leviste II	Manila	.Manila->site .93km from Manila	.Paved .Good
04.04b	Lumang Bayan	Manila-> Matabang	.Matabang->site .5km from Matabang	.Un-paved, little bad .2 spillways
04.05b	Olangoan	Manila-> Anilawan	.Anilawan->site .13km from Anilawan	.Un-paved, little bad .7 dilapidated bridges
05.03	Narangasan I	Manila-> Masbate	.Masbate->site .31km from Masbate	.Un-paved, very bad .2 dilapidated bridges
06.03	Iyang	Cebu-> Iloilo	.Iloilo->site .110km from Iloilo	.Paved .Good
07.01	Banban	Cebu	.Cebu->toledo->site .54km + 7km = 61km	.54km paved, 7km un-paved .3 dilapidated bridges
07.02	Campacas	Cebu	.Cebu->Dalaguete->site .85km + 13km = 69km	.13km very bad .Need improvement
08.04	Talisayan	Cebu-> Tacloban	.Tacloban->MacArther ->site .59km + 10km = 69km	.59km paved, 10km un-pave .2 bridges need rein- forcement
10.01	Hayangabon I	Cebu-> Surigao	.Surigao->Bacnao->site .35km + 40km = 75km	.35km paved, 40km un-pave .11 bridges need rein- forcement

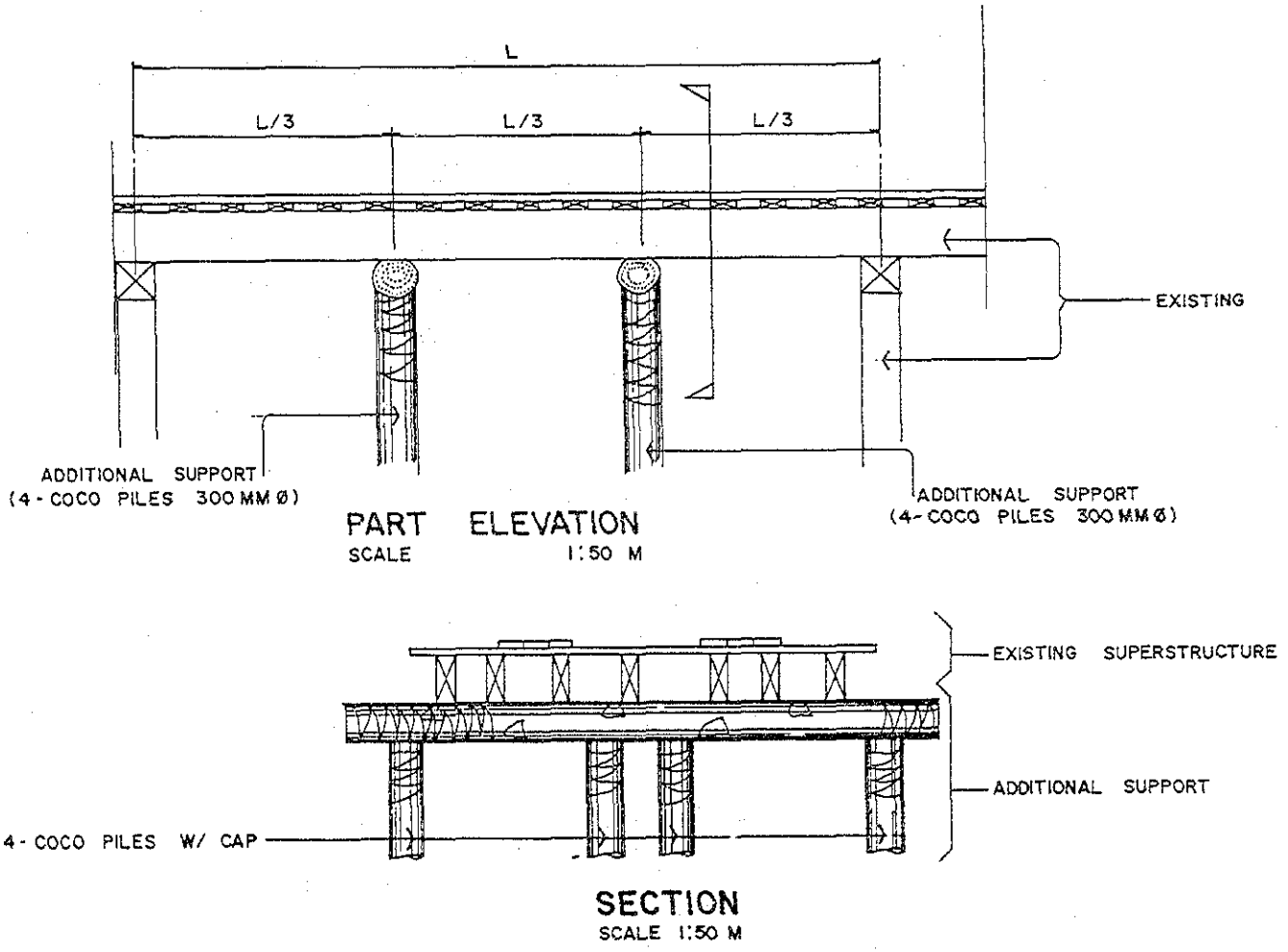
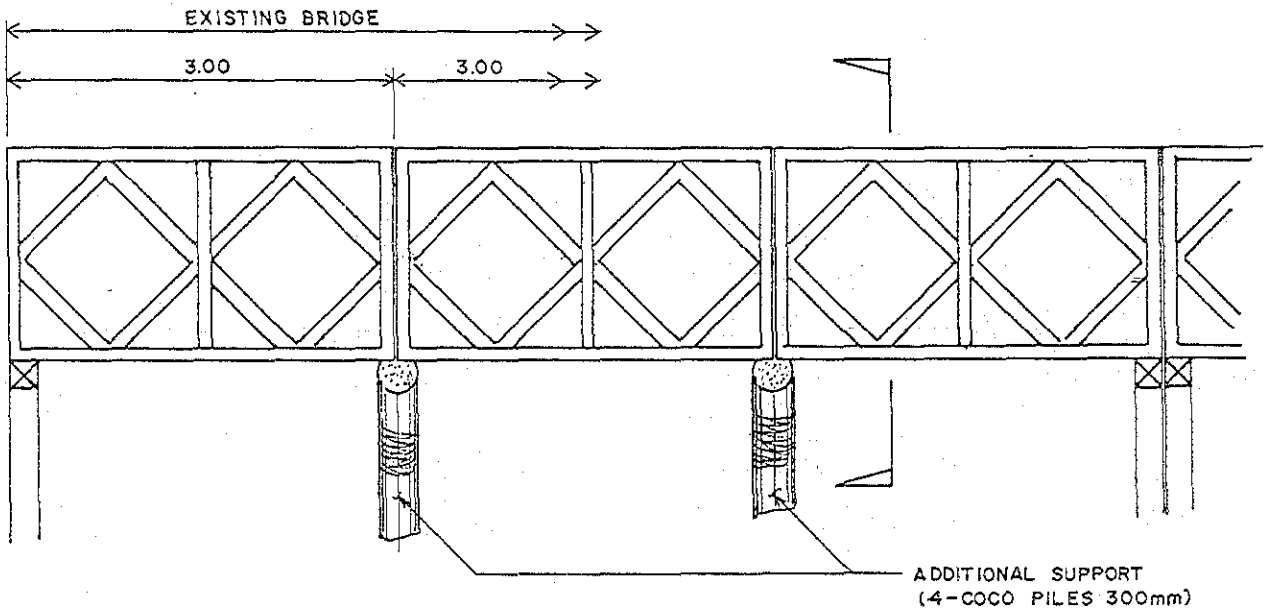


FIGURE 5.9-1 SUPPORT FOR WEAK BAILEY BRIDGE



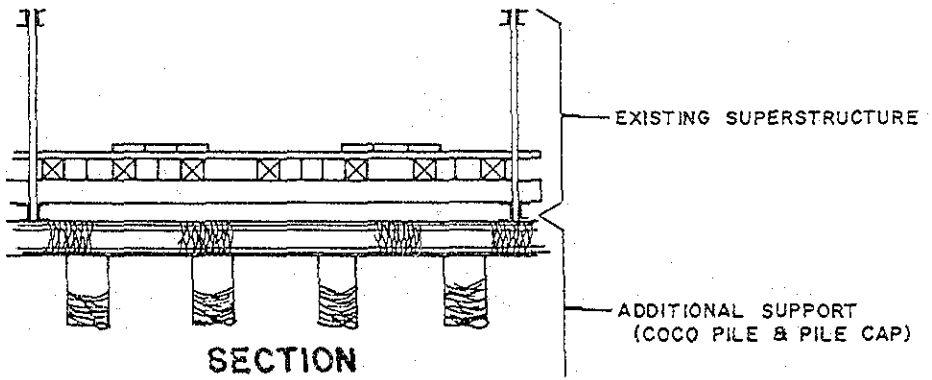


FIGURE 5.9-2 SUPPORT FOR WEAK TIMBER BRIDGE

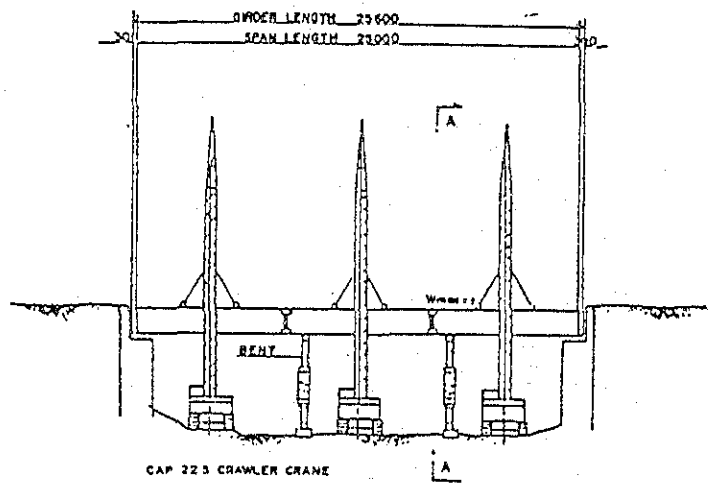
5.9.2 Erection of Steel Girders

The methods which can be adopted to erect the steel girders include the direct erection method which uses a crawler crane from the river bed or from approach roads and the towing-cable erection method. Given the magnitude of construction and other conditions, the direct erection method from the river bed using a crawler crane was adopted in this Study. The scheme of the method is illustrated in Figure 5.9-3.

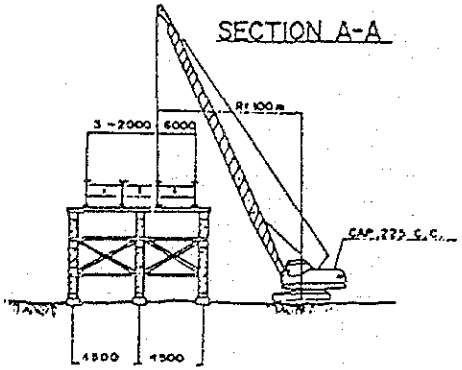
Since the crawler crane needs to enter the river, an approach road leading the crawler crane to the river was planned to be constructed with a temporary embankment. The height of the embankment should be one meter higher than the ordinary level of water considering flooding in the rainy season. However, for the Campacas Bridge, a temporary platform was planned to be constructed for the erection since the river is narrow, and the water flow would be obstructed if a temporary embankment is to be constructed.

With this method, bents are required to hold steel girders while erecting. Coconut trees which are available will be used instead of steel bents. Since it is difficult to build saddles on the river beds during the rainy season, it is planned to drive coconut tree piles into the river beds during the dry season, and the piles can serve as erection girders even during the rainy season.

ELEVATION s=1:200



SECTION A-A



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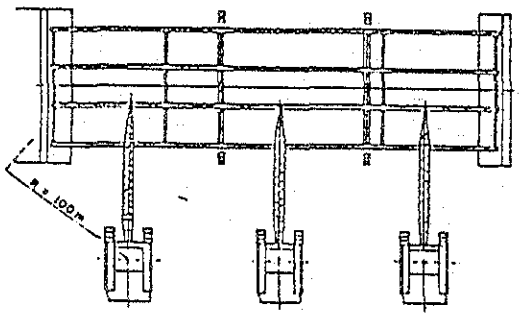


MAIN MACHINE / TOOL

1	CRAWLER CRANE 22.5T	1
2	BENT	2
3	STEEL BLOCK	some
4	TORQUE WRENCH	1
5	WIRE ROPE 16 ϕ	1

FIGURE 5.9-3 GIRDER ERECTION METHOD

5.9.3 Construction of Cofferdams

Construction of substructures are planned to be implemented in the dry season because this means not only reducing construction cost but also guaranteeing the safety and quality of construction. However, where the ordinary water level is high during high tide, temporary cofferdams will be required during construction of substructures.

The fill type is basically employed for cofferdams; however, sheet piles are employed where the ordinary water level is relatively high or the river is wide.

The bridges whose substructures require cofferdams in the construction are listed below:

Filled Cofferdams :

04.01a	Binambang Bridge	(1 pier)
04.04b	Lumang Bayan Bridge	(2 piers)
04.05b	Olangoan Bridge	(2 abutments)
07.01	Banban Bridge	(2 abutments)
10.01	Hayangabon I Bridge	(1 piers)

Sheet Pile Cofferdams:

05.03	Narangasan Bridge	(1 pier)
06.03	Iyang Bridge	(1 pier)
08.04	Talisayan Bridge	(3 piers)

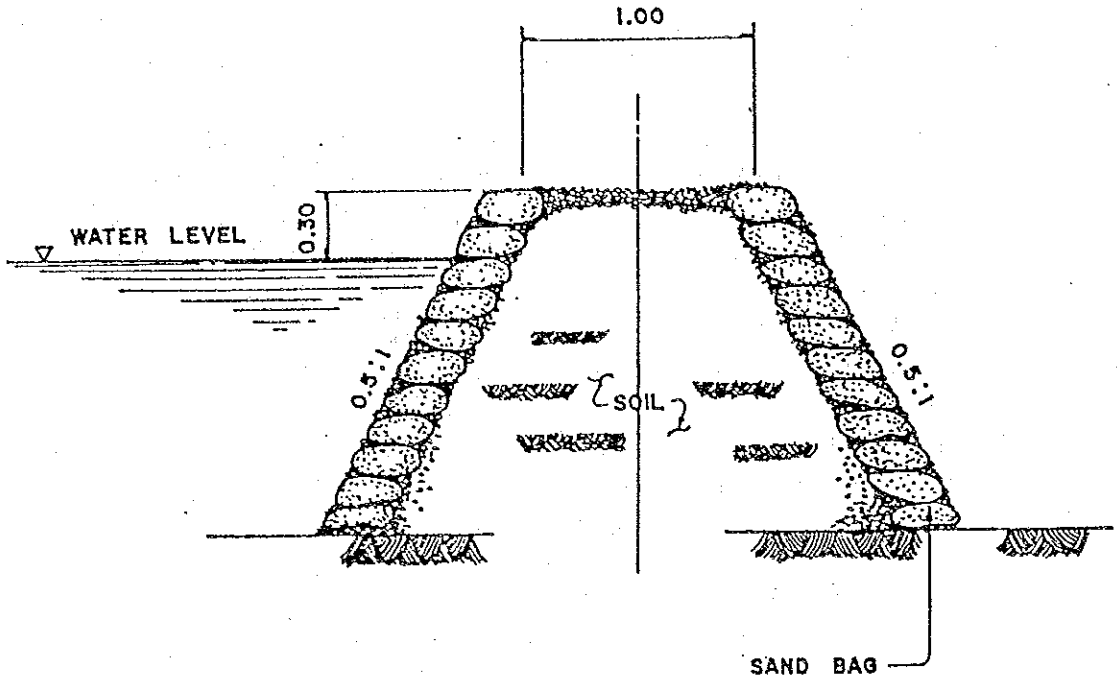


FIGURE 5.9-4 FILLED COFFERDAM

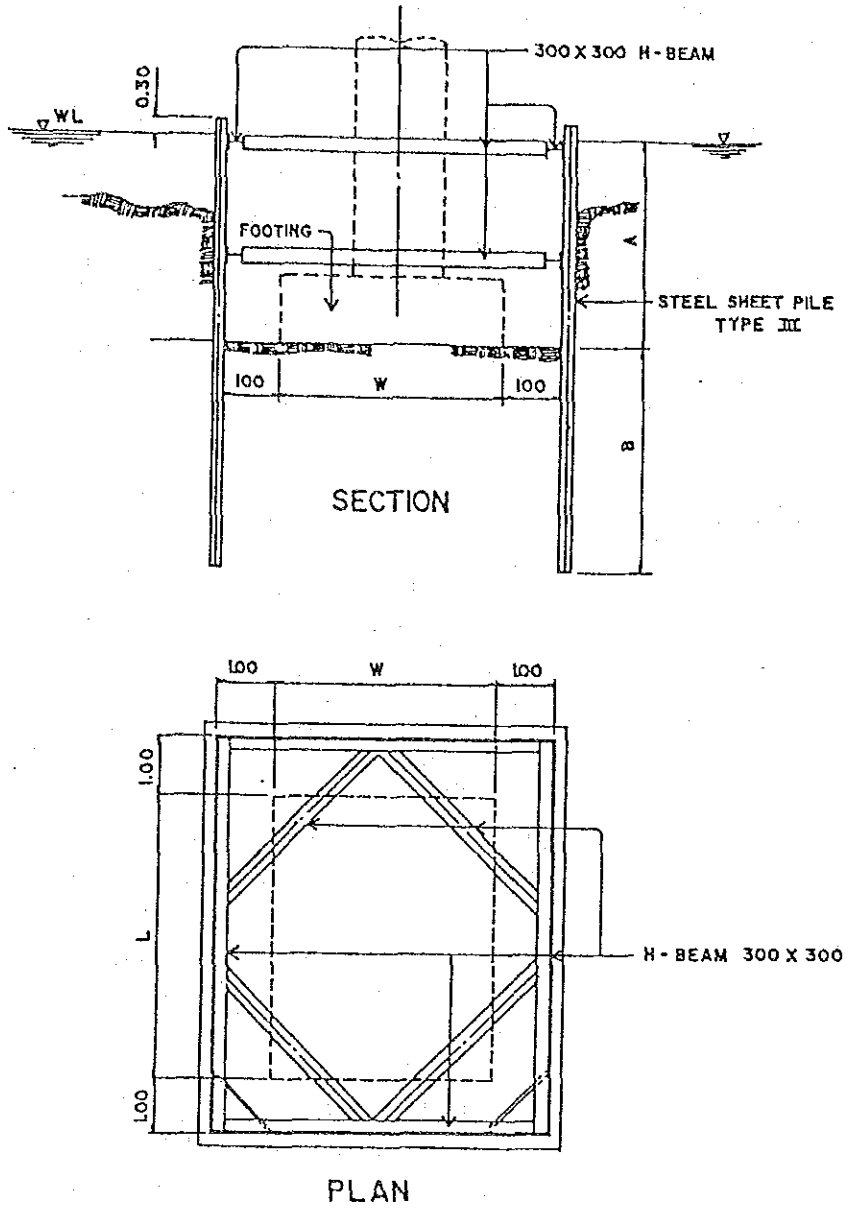


FIGURE 5.9-5 SHEET PILE COFFERDAM

5.9.4 Detour Roads

Detour roads are planned to provide for traffic during construction. The serviceability of the detour roads need to be at the present level to maintain the functions of the roads.

Table 5.9-2 shows the existing conditions of the bridges and their detour roads. According to the Table, the detour roads can be categorized as follows:

1) Existing bridges/spillways to be utilized

04.01a Binambang Bridge
04.04b Lumang Bayan Bridge
04.05b Olangoan Bridge

2) Ford crossing (no bridge exists)

04.3a Leviste II Bridge
08.04 Talisayan Bridge

3) Detour road exists

07.02 Campacas Bridge

4) Temporary bridges to be constructed

05.03	Narangasan I Bridge	(utilize members of existing bridge)
06.03	Iyang Bridge	(wooden bridge)
07.01	Banban Bridge	(")
10.01	Hayangabon I Bridge	(")

Temporary bridges utilizing members of existing bridges and the wooden temporary bridges are illustrated in Figures 5.9-6 and 5.9-7, respectively.

TABLE 5.9-2 DETOUR AND EXISTING CONDITIONS

Bridge No.	Bridge Name	Existing Condition	Detour
04.01a	Binambang	Spillway	Existing spillway can be used
04.03a	Leviste II	Washed-out	Ford-crossing
04.04b	Lumang Bayan	Fair bailey bridge	Use existing bridge
04.05b	Olangoan	Fair bailey bridge	Use existing bridge
05.03	Marangasan I	Fair bailey bridge	Temporary road, using existing bridge members, at upstream side
06.03	Iyang	Dilapidated timber bridge	Temporary road with wooden stage downstream side
07.01	Banban	Dilapidated timber bridge	Temporary road with wooden stage, upstream side
08.04	Talisayan	No existing bridge	Ford-crossing
10.01	Hayangabon I	Dilapidated timber bridge	Temporary road with wooden stage, downstream side

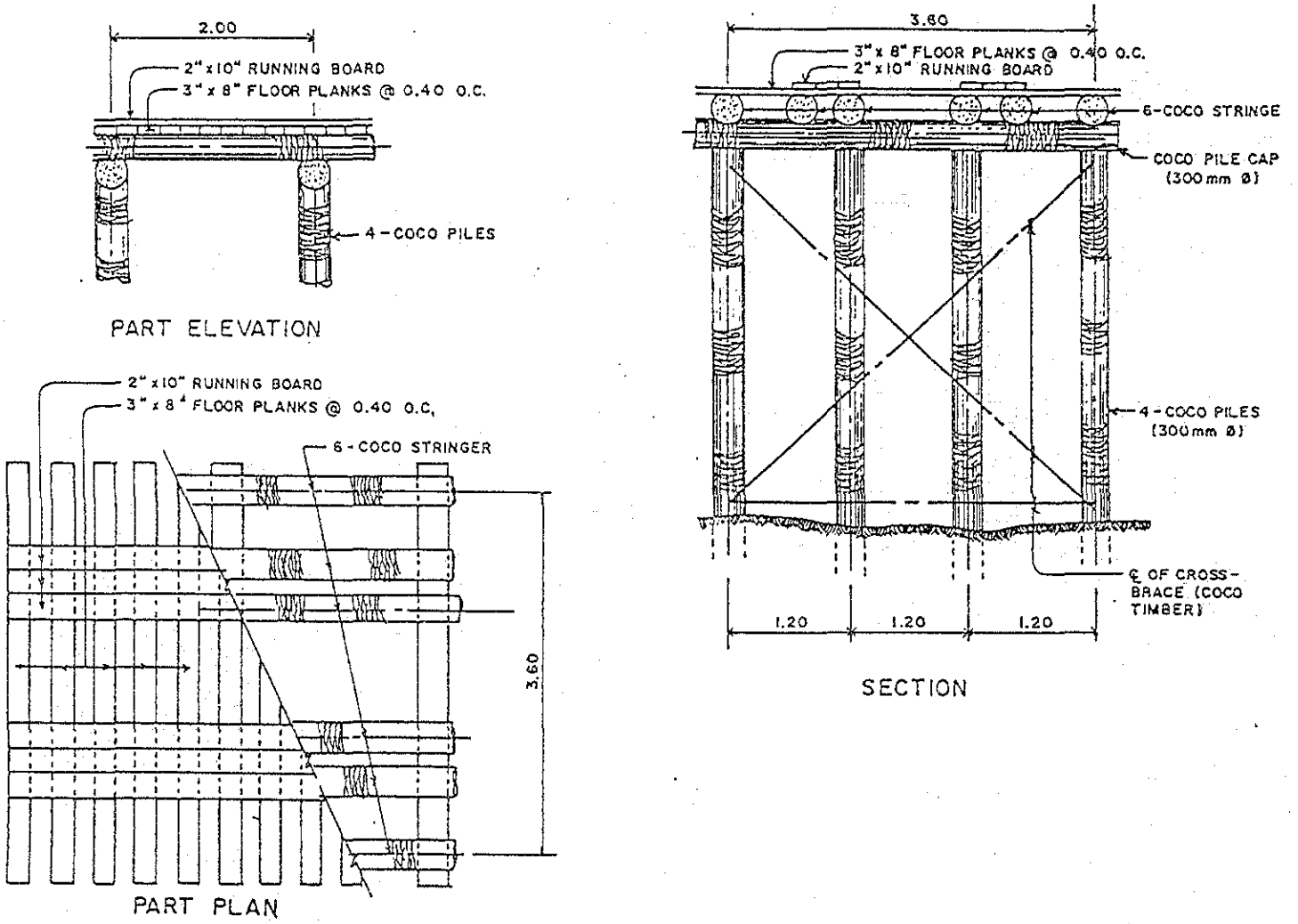


FIGURE 5.9-6 TEMPORARY BAILEY DETOUR BRIDGE

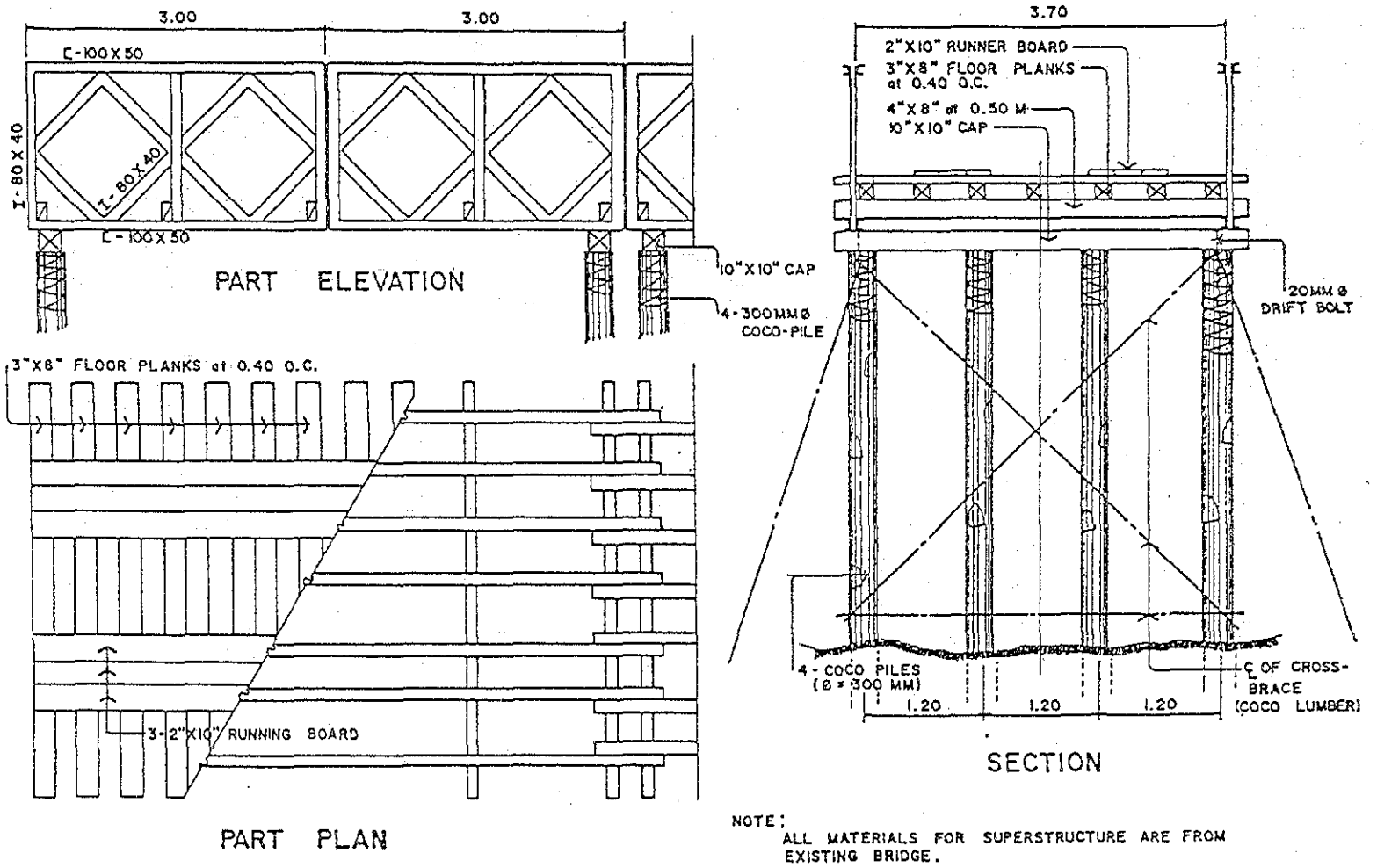


FIGURE 5.9-7 TEMPORARY TIMBER DETOUR BRIDGE

5.9.5 Demolition of Existing Bridges

Existing bridges will be demolished as necessary either before construction is undertaken, by the Japanese side, or after completion of construction, by the Philippine side, as follows:

1) By Japanese side

05.03 Narangasan I Bridge
06.03 Iyang Bridge
07.01 Banban Bridge
07.02 Campacas Bridge
10.01 Hayangabon I Bridge

2) By Philippine side

04.01a Binambang Bridge
04.04b Lumang Bayan Bridge
04.05b Olangoan Bridge

3) No existing bridge

04.03a Leviste II Bridge
08.04 Talisayan Bridge

CHAPTER 6

IMPLEMENTING ARRANGEMENT

CHAPTER 6

IMPLEMENTING ARRANGEMENT

6.1 Executing Agency and Organization

The Department of Public works and Highways (DPWH) is the executing agency for both the Project for Constructing Bridges along Rural Roads Phase I and Phase II.

The DPWH is headed by the Secretary who is assisted by five (5) Undersecretaries and six (6) Assistant Secretaries. In the Department, there are six (6) Service Offices - Planning, Controllership and Financial Management, Administrative and Manpower Development, Legal, Monitoring and Information, and Internal Audit; and five (5) Bureaus - Design, Construction, Maintenance, Equipment, and Research and Standards. Refer to Figure 6.1-1: Organization of the DPWH.

The five (5) Bureaus have the following major functions:

- Bureau of Design ..... undertakes project development, engineering surveys and designs of infrastructure facilities.
- Bureau of Construction . provides technical services for the construction, rehabilitation, betterment and improvement of infrastructure facilities.
- Bureau of Maintenance .. provides technical services and supervision on the maintenance and repair of roads and bridges and other associated structures.
- Bureau of Equipment .... manages all Government construction and maintenance of equipment, including procurement and dispersement to the regions.

. Bureau of Research and Standards ....
provides research and technical services on quality control and on the management of materials, plants and ancillary facilities for the production and processing of construction and maintenance materials.

At the regional level where the infrastructure projects are implemented, the DPWH has 14 Regional Offices each headed by a Regional Director. In addition, there are 92 District Offices and 59 City Engineering Offices, Regional Equipment Centers and Workshops. The latter are under the supervision of the Regional Director concerned. These offices serve as the implementing arms of the DPWH. The locations of regional offices are shown in Table 6.1-1. The organization of the DPWH and of a regional office are shown in Figures 6.1-1 and 6.1-2, respectively.

Figure 6.1-1 ORGANIZATION CHART

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

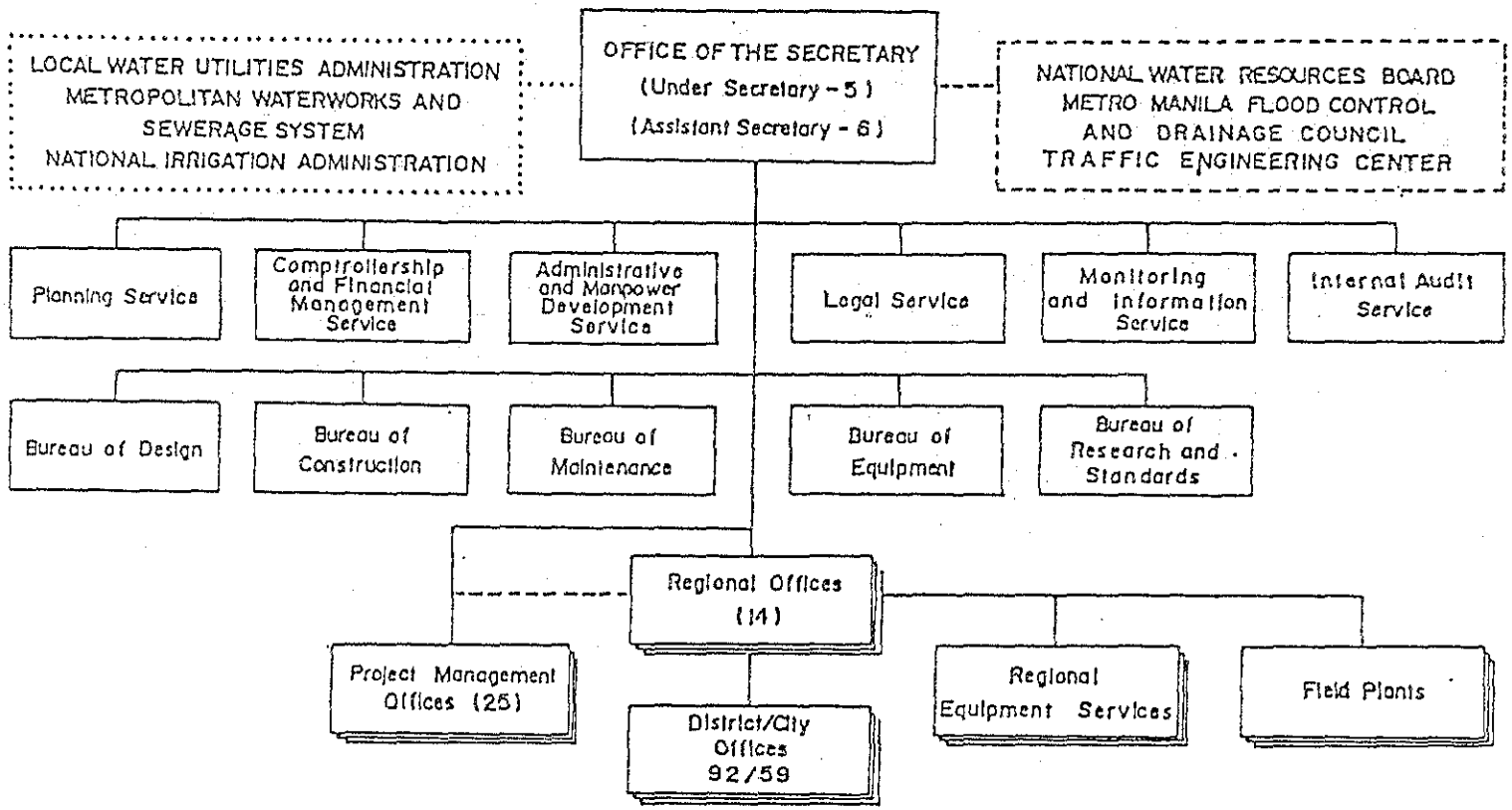
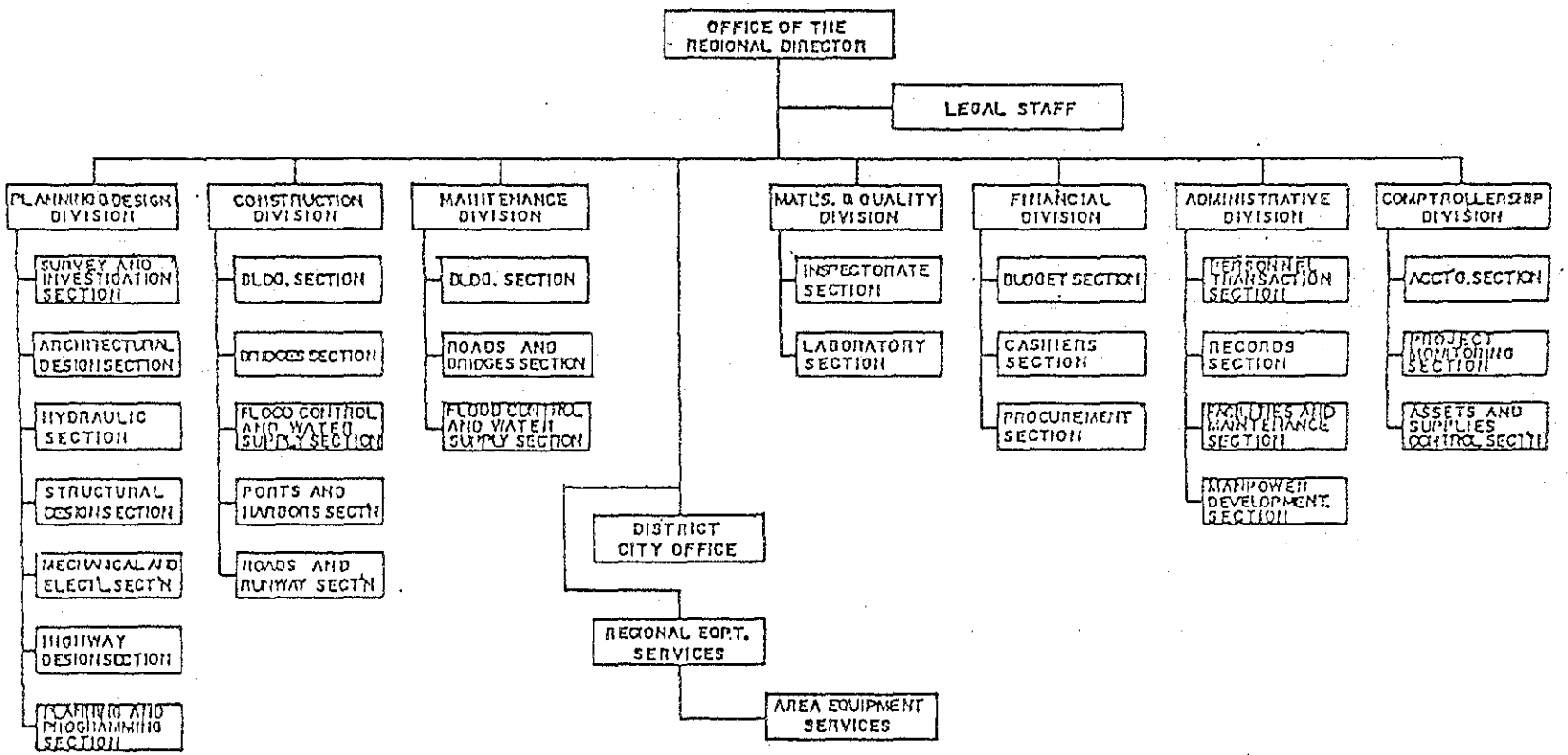


Table 6.1-1 Location of Regional Offices

	Region	Location
1	Region Ⅰ	San Fernando, LA UNION
2	Region Ⅱ	Tuguegarao, CAGAYAN
3	Region Ⅲ	San Fernando, PAMPANGA
4	Region Ⅳ-A	Quezon City, METRO MANILA
5	Region Ⅳ-B	Quezon City, METRO MANILA
6	Region Ⅴ	Legaspi City, ALBAY
7	Region Ⅵ	
8	Region Ⅵ	Cebu City, CEBU
9	Region Ⅶ	Palo, LEYTE
10	Region Ⅸ	Zamboanga City, ZAMBOANGA DEL SUR
11	Region Ⅹ	Cagayan de Oro City, MISAMIS ORIENTAL
12	Region ⅩⅠ	Davao City, DAVAO
13	Region ⅩⅡ	Cotabato City, MAGUINDANAO
14	NCR	2nd Street, Port Area, Manila

Figure 6.1-2 ORGANIZATIONAL CHART
OFFICE OF THE REGIONAL DIRECTOR



6.2 Undertaking of Both Governments

There are a total of ten (10) bridges with a total length of 517.0 m or an average length of 51.7 m per bridge and a total of nineteen (19) spans in the Phase II Bridges. Undertaking of both governments as shown in The Minutes of Discussions for the Project, dated April 7, 1988. The Project covers the following items:

6.2.1 Scope of Grant Aid by the Government of Japan

The scope of Grant Aid by the Government of Japan for the Phase II Bridges covers construction of bridges, access roads and related structures including supply of steel materials. The major construction works are as follows:

(1) Major Construction Works

1) Construction of Superstructures

- Supply, delivery and erection of steel materials, construction of concrete slabs and handrails

2) Construction of Substructures

- Construction of abutments and piers (including piles)
- Temporary works (sheet pile cofferdams)

3) Construction of Approach Roads
(Scope is limited to connecting new bridge to existing road with smooth alignment.)

- Earth works and construction of pavement structures
- Installation of drainage facilities
- Supply, delivery and installation of steel railings

4) Construction of River Bank Protection
(Scope is limited to abutments.)

The quantity of the major construction works for the Phase II Bridges is shown in Table 6.2-1.

TABLE 6.2-1 SUMMARY OF QUANTITIES FOR PHASE II BRIDGES

Bridge No.	Bridge Name	Superstructore		Substructure					Approach Road (road length)		River Bank Protection (protection area)	
		Steel Weight	Concrete Deck Slab (Area)	Abutment (height)		Pier (height)	RC Pile □ 400× 400 (length x number)	Sheet Pile Type Ⅲ (weight)				
				A1	A2				A1	A2	A1	A2
04.01a	Binambang	Built-up Beam 35+35=70m 113.5	594.1 ㎡	H= 7.0m	H= 7.0m	H= 7.0m	A1 = 9.0×16=144.0 A2 = 9.0×16=144.0	—	120	121	286	286
04.03a	Leviste Ⅱ	H-Beam 24m 36.0	203.5	H= 6.0	H= 6.0	—	A1 =11.0×14=154.0 A2 =11.0×14=154.0	—	120	120	204	206
04.04b	Lumang Bayan	Built-up Beam 35+35+35=105m 170.2	890.9	H= 5.5	H= 5.5	H= 7.5 H= 7.0	A1 = 7.0×10= 70.0 A2 = 8.0×10= 80.0 P1 = 8.0×12= 96.0 P2 = 8.0×12= 96.0	—	160	148	220	220
04.05b	Olangoan I	Built-up Beam 35m 56.8	297.4	H= 5.0	H= 5.0	—	A1 = 7.0×10= 70.0 A2 = 9.0×10= 90.0	—	134	121	135	145
05.03	Narangasan I	H-Beam 24+24=48m 72.0	406.8	H= 5.0	H= 5.0	H= 8.0	A1 =19.0×10=190.0 A2 =16.0×10=160.0 P1 = 6.0× 9= 54.0	455m 27.3	121	121	330	320
06.03	Iyang	H-Beam 23+23=46m 67.9	390.1	H= 4.5	H= 4.5	H= 6.0	A2 = 7.0×12= 84.0	390m 23.4	120	120	210	190
07.01	Banban	H-Beam SKEW 25m 40.0	211.8	H= 3.5	H= 3.5	—	A1 =25.0×10=250.0 A2 =25.0×10=250.0	—	121	120	274	276
07.02	Campacas	H-Beam 24m 36.0	203.5	H= 4.0	H= 4.0	—	A1 =11.0×10=110.0 A2 =11.0×10=110.0	—	121	120	240	250
08.04	Talisayan	H-Beam 24+24+24+24 =96m 144.0	813.3	H= 4.5	H= 5.0	H= 5.0 H= 5.0 H= 5.0	A1 =14.0×10=140.0 A2 =11.0×10=110.0 P1 =12.0×12=144.0 P2 =13.0×12=156.0 P3 =11.0×12=132.0	1260m 75.6	121	121	170	180
10.01	Hayangabon I	H-Beam 22+22=44m 56.3	373.5	H= 4.0	H= 4.0	H= 6.0	—	—	121	121	261	239
Total	10 bridges	Bilt-up Beam 210m 340.5 t H-Beam 307m 452.2 t	4,384.9 ㎡	10 abuts	10 abuts	9 piers	261 piles L= 2,988.0m	2,015 m 126.3 t	1,259 m	1,233 m	2,330㎡	2,310㎡

(2) Major Steel Materials

The major steel materials to be supplied by Japan's Grant Aid is as follows:

1) Steel Materials for Bridge Superstructures

i) H-beam Girders

Span length (m)	No. of spans	Size of H-beam girders	Weight (t)
22	2	900 x 300	2 x 28.16 = 56.3
23	2	912 x 302	2 x 33.94 = 67.9
24	8	912 x 302	8 x 36.00 = 288.0
25	1	900 x 300	1 x 39.96 = 40.0
Total:	13		452.2

ii) Build-up Girders

Span length (m)	No. of spans	Height of Girders	Weight (t)
35.0	6	1.600	6 x 56.75 = 340.5

2) Steel Sheet Piles and Others

Size	Total length (m)	Total Weight (t)
Type-III	2,105	126.3
H-300	400	42.5
Total		168.8

3) Steel Railings for Bridge Approaches

Size	Total Length(m)	Total Weight (t)
Gr-A-4E	16 x 4 x 10 = 640	16.64

6.2.2 Undertaking of the Government of the Philippines

The scope of undertaking of the Government of the Philippines for the Phase II Bridges is as follows:

(1) Scope of Major Undertakings

1) To ensure the exemption of custom duties, internal taxes and other fiscal levies for supply of materials under Japan's Grant Aid.

2) To acquire the right-of-way and to provide necessary land area for the construction works

3) To demolish obstacles including houses within the right-of-way that affect the implementation of the Project.

4) To make passable all roads and bridges leading to the project sites for the transportation of materials and equipment provided under Japan's Grant Aid.

(2) Land Acquisition and Obstacle Demolition

The acquisition of right-of-way, the demolition of obstacles including houses and the temporary provision of necessary land area for construction works are shown in Table 6.2-2.

(3) Maintenance of Bridges and Road for Transportation of Materials

The bridges and roads leading to the project sites for the transportation of materials and equipment that must be made passable are shown in 5.9.1. The major maintenance works are as follows:

. 04.04b Lumang Bayan Bridge:
Temporary construction of 2 spillways

. 04.05b Olangoan I Bridge :
Rehabilitation of 3 dilapidated bridges

. 05.03 Narangasan I Bridge :
Rehabilitation of 7 dilapidated bridges

. 07.01 Banban Bridge :
Rehabilitation of 3 dilapidated bridges

. 07.02 Campacas Bridge :
Rehabilitation of road between Dalaguete and project site including reinforcing of 1 dilapidated bridge.

. 08.04 Talisayan Bridge :
Rehabilitation of 2 dilapidated bridges

. 10.01 Hayangabon Bridge :
Rehabilitation of 11 timber bridges

TABLE 6.2-2 LAND ACQUISITION, HOUSE DEMOLITION AND TEMPORARY LAND FOR CONSTRUCTION WORKS

Bridge No.	Name of Bridge	Land Acquisition R.O.W. (m^2)	House Demolition (units)	Temporary Land for Construction Works (m^2)
04.01a	Binambang	3,625	0	600
04.03b	Leviste II	3,065	0	600
04.04b	Lumang Bayan	2,391	0	600
04.05b	Olangoan	3,465	0	600
05.03	Narangasan I	3,395	0	600
06.03	Iyang	2,280	2 (wooden)	600
07.01	Banban	3,200	0	600
07.02	Campacas	976	1 (Wooden)	600
08.04	Talisayan	3,986	0	600
10.01	Hayangabon I	3,540	10 (wooden) 5 (nippa)	600
	Total	29,923	13 (wooden) 5 (nippa)	6,000

6.3 Implementation Schedule

Several factors to be considered in proposing the implementation schedule are as follows:

- Appraisal and Approval of the Project by the Government of Japan.
- Exchange of Notes
- Detailed Design : from November 1988 to January 1989
- Climate

  Dry Season : from December to May
  Rainy Season : from June to October

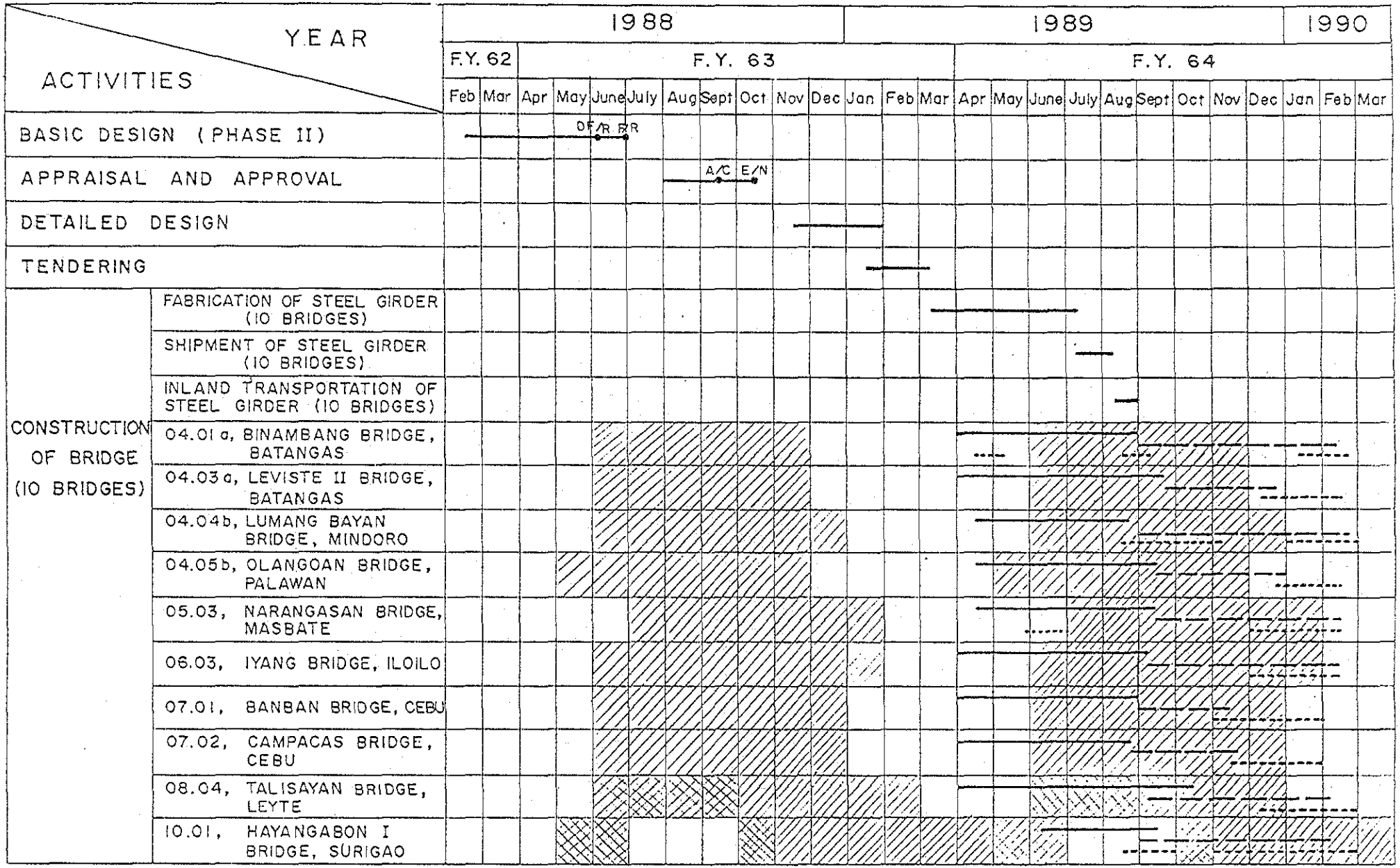
The Exchange of Notes between the Government of Japan and the Government of the Philippines is expected in the middle of October 1988.

The construction schedule, especially for the piers inside rivers, should be executed during the dry season: otherwise, the use of cofferdams may be required: The soil compaction for embankment of approach roads are also recommended to be done during the dry season.

The dry season differs by project sites but is basically from December to May.

With above mentioned conditions, construction is scheduled for twelve (12) months from March 1989 to February 1990. The proposed implementation schedule is shown in Figure 6.3-1.

PROPOSED IMPLEMENTATION SCHEDULE
PHASE II BRIDGES



6.4 Fund Preparation

The fund preparation for the project by the Government of the Philippines is approximately 6.0 million pesos. The public investment program (PIP) of the Philippines includes the budget allocated for the Project including Phase I as shown in Table 6.4-1.

TABLE 6.4-1 BUDGET ALLOCATED FOR THE PROJECT

(unit: million pesos)

	1988	1989	1990	Total
TP	20	20	96	136
P	20	20	96	136
S	0	0	0	0

Note : TP = total pesos
P = peso portion
S = foreign portion

According to the budget plan, the total budget is 136 million pesos. The fund to be prepared for Phase I is 82 million pesos and for Phase II 6.0 million pesos. Though the total budget of 136 million pesos is quite enough to cover the total requirement of 88 million pesos, the budget for the fiscal year of 1989 of 20 million pesos is not sufficient.

The DPWH representatives indicated that the budget for fiscal 1988 was already fixed, but that for 1989 can be adjusted. It is, therefore, recommended that the budget, including Phase I and Phase II for 1989, be amended in accordance with the construction cost estimated through the detailed design.

6.5 Design and Construction Supervision Plan

This Project shall be executed under Grant Aid Program of the Government of Japan, and the Assistant Secretary for Planning is responsible for the execution of the Project under the direction of the DPWH.

Design and construction supervision shall be executed by a Japanese Consultant and construction by a Japanese Contractor. Contracts for consultancy and construction shall be concluded by the DPWH.

The Government of the Philippines has designated the following organizations for the execution of the project under the Assistant Secretary for Planning as follows:

- Bureau of Design : Design and cost estimates
- Bureau of Construction: Specifications and tendering
- Regional Offices : Direction and supervision of construction.
- Bureau of Maintenance : Maintenance

The four (4) executive Bureaus are to have discussions, and contact and make adjustments with the Japanese Consultant in order to complete the Project.

6.6 Maintenance Plan

The Bureau of Maintenance is responsible for the maintenance of national roads and bridges in the Philippines.

There are four (4) categories of maintenance in the DPWH as follows:

- Routine Maintenance: Day-to-day basis throughout the year
- Periodic Maintenance: Recurrent time cycle of more than one year
- Emergency Maintenance: Unprogrammed activities required in the aftermath of slides, floods, etc.
- Special Maintenance: Outside the scope of normal maintenance operations

In the Philippine Highway Maintenance Management System (PHMMS), there are 56 work activities at present, of which eight (8) activities are related to bridge maintenance, as shown in Table 6.6-1.

TABLE 6.6-1 MAINTENANCE ACTIVITIES FOR BRIDGES

Activity No.	Activity
151	Cleaning of Bridges
152	Patching of (PC) Concrete Decks
153	Repair of Concrete Bridges
154	Repair of Steel Bridges
155	Repair of Bailey Bridges
157	Clearing Bridge Waterways
402	Initial Response to Emergencies - Bridges
65X	Bridge Repainting

Since these activity standards are well established, timely application of these maintenance activities are highly recommended.

6.7 Construction Cost

The cost to be borne by the Government of the Philippines is roughly estimated at 6 million pesos, as shown in Table 6.7-1.

TABLE 6.7-1 CONSTRUCTION COST OF THE GOVERNMENT OF THE PHILIPPINES

Item	Quantity	Unit Cost (pesos)	Cost (pesos)
Rehabilitation of Roads Leading to Project Sites	13 km		2,900,000
Rehabilitation of Bridges Leading to Project Sites	29 bridges		330,000
Road Maintenance	663 km	500	330,000
Land Acquisition	29,923 m^2	50	1,500,000
House Demolition	18 houses	50,000	900,000
Necessary Land Rental for Construction Works	6,000 m^2	10	60,000
Total			6,020,000

CHAPTER 7

EVALUATION OF THE PROJECT

CHAPTER 7

EVALUATION OF THE PROJECT

The Project (Phase II) is a continuation of Phase I and it aims to promote active growth of socio-economic development. The Government of the Philippines is eager to complete the Project which can be evaluated as follows.

Traffic interruption due to the failure of old and weak bridges imposes direct and indirect constraints upon people's activities, as well as on the economic and development activities within the influence area of the bridges. This leads to a lack of confidence in road reliability which in turn, discourages, to a certain degree, the private sector's plans to invest in these areas.

The Project, when completed, is envisioned to provide basic transport access in rural areas with rich potential, especially improved transport facilities, which will eliminate severe constraints to increased productivity and social advancement.

The effects of the Project, therefore, should be evaluated not only from their impact on traffic function, but also from the socio-economic point of view.

(1) Direct Effects

The direct effects that will be derive from the Project accrue mainly from direct reductions in traffic costs to road users. This includes vehicle operation, travel time, accidents and discomfort. As for government administrative costs, maintenance and restoration cost savings and salvage value can be expected.

The actual benefits of this Project are as follows:

1) The problem of traffic closure during the rainy season will be solved.

2) Travel time will be shortened.

3) The safe passage of heavy construction equipment, heavy trucks, etc. will be ensured.

4) The function of the rural road network will be improved.

5) Traffic safety will be considerably improved.

(2) Indirect Effects

The various indirect effects of the Project which cannot be quantified are likewise assessed from the point of view of socio-economic impact. These effects are as follows:

1) Contributing to attaining a better life.

2) Activating social activities.

3) Generating greater opportunities for employment.

4) Minimizing disparities between localities.

5) Stabilizing commodity prices.

6) Developing agricultural and industrial productivity.

7) Promoting rich investment from the private sector.

Overall, the Project will serve as an incentive for increased participation by the rural population in economic activities. Further, it will have the impact of bringing people living in isolated and remote areas into the mainstream of the social and economic activities in the country.

CHAPTER 8

CONCLUSION AND RECOMMENDATION

CHAPTER 8

CONCLUSION AND RECOMMENDATION

8.1 Conclusion

The Project (Phase II), a continuation of Phase I Study, aims to improve essential transport facilities in rural areas and secure transportation in areas which are often isolated during the rainy season, by replacing old temporary and dilapidated bridges along rural roads with permanent steel structures.

In January 1987, the Philippine Government proposed the Medium-Term Philippine Development Plan 1987-1992, which aims to increase productivity in rural areas and to alleviate poverty. In the highway sector of the Development Plan, an emphasis is put on improving rural roads connecting farms and markets. In line with this emphasis, replacement of old temporary and dilapidated bridges with permanent steel structures was selected as one of the most important strategies. This Project coincides exactly with the strategy of the Plan. The Project will promote the development of rural areas, increase the employment opportunities, and ultimately contribute to continuous economic development. Therefore, the implementation of this project under Japan's Grant Aid is considered to be quite worthwhile and appropriate.

8.2 Recommendation

Considering the present socio-economic situation of the Philippines, the development of rural areas and the increase of employment opportunities are the most urgent issues. Since this Project contributes greatly to improving this situation, its prompt implementation is required.

To meet this requirement and complete the Project, the appropriate undertakings of the Government of the Philippines are of vital and the following recommendations are given to achieve this goal:

(1) The necessary budget for this Project should be promptly appropriated.

The fund preparation for the Project by the Government of the Philippines is about 6 million pesos. The lack of funds to be readied for Phase I is 42 million pesos. The total of both should be amended in accordance with the construction cost estimated through the detailed design.

(2) A proper organization should be established for implementation of this Project.

This Project will be implemented under the jurisdiction of the Department of Public Works and Highways of the Philippine Government. The Assistant Secretary for Planning service should be responsible for the proper implementation of this Project and for the allocation of the required number and level of engineers and manpower.

(3) Prior to the commencement of the Project, the following items should be implemented:

- Acquisition of right of ways
- Demolition of houses
- Rental of land for construction works
- Maintenance and rehabilitation of all roads and bridges leading to the project sites for the transportation of materials and equipment
- Rehabilitation of dilapidated bridges

APPENDIX I

MISSION FOR BASIC DESIGN STUDY

. MEMBERS AND ITINERARY OF THE BASIC DESIGN STUDY TEAM

. LIST OF PERSONS MET

. MINUTES OF DISCUSSION

1. Member of the Study Team

Leader	:	Mr. Hiro-o Jiin Head of Research Division, Planning and Development Department. Honshuu-Shikoku Bridge Authority
Project Coordinator	:	Mr. Juro Chikaraishi Second Basic Design Study Division, Grant Aid Planning and Survey Department, Japan International Cooperation Agency
Bridge Construction Planning	:	Mr. Tsuneo Bekki Katahira & Engineers Inc.
Bridge Designing	:	Mr. Nobuyuki Uchida Katahira & Engineers Inc.
Implementation Planning and Topographic Survey	:	Mr. Minoru Miura Katahira & Engineers Inc.
Geotechnical Survey	:	Mr. Ken Kusano Katahira & Engineers, Inc.

2. Itinerary

No.	Date		Study Team	Geological Survey	Topographic Survey
1	15th, Feb. 1988	Mon	. Bekki, Miura and Kusano Arrived in Manila . Meeting at Embassy of Japan, JICA		
2	16th, " "	Tue	. Meeting with DPWH . Explanation of Inception Report . Discussion of Progress of Bridge Design for Phase I		
3	17th, " "	Wed	. Discussion among Study Team		
4	18th, " "	Thu	. Miura and Kusano Arrived in Batangas for Site Survey Bridge No. 04.01a 04.03a. . Discussion with District Engineer Office . Collection/Review of Data . Instruction and Supervision of Geological Survey Bridge No. 04.01a . Instruction and Supervision of Topographic Survey Bridge No. 04.03a	Commencement of Survey Bridge No. 04.01a	Commencement of Survey Bridge No. 04.03a
5	19th, " "	Fri	. Miura and Kusano Site Survey Bridge No. 04.01a, 04.03a returned to Manila		
6	20th, " "	Sat	. Collection/Review of Data		
7	21st, " "	Sun	. Collection/Review of Data		

No.	Date		Study Team	Geological Survey	Topographic Survey
8	22nd, Feb. 1988	Mon	. Miura arrived in Batangas, Confirmation of Conclusion of Topographic Survey Bridge No. 04.03a . Returned to Manila		Conclusion of Survey Bridge No. 04.03a
9	23rd, " "	Tue	. Kusano arrived in Batangas, Confirmation of Conclusion of Geological Survey Bridge No. 04.01a	Conclusion of Survey Bridge No. 04.01a	
10	24th, " "	Wed	. Bekki returned to Japan . Miura arrived in Batangas, Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 04.03a, 04.01a . Returned to Manila	Conclusion of Survey Bridge No. 04.03a	Conclusion of Survey Bridge No. 04.01a
11	25th, " "	Thu	. Data Analysis . Analysis of Geological Survey Results . Check of Results of Topographic Survey		
12	26th, " "	Fri	. Miura and Kusano arrived in Masubate, Site Survey Bridge No. 05.03 . Discussion with District Engineer Office and Collection/Review of Data		
13	27th, " "	Sat	. Miura and Kusano Site Survey Bridge No. 05.03 . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 05.03 Returned to Manila	Commencement of Survey Bridge No. 05.03	Commencement of Survey Bridge No. 05.03
14	28th, " "	Sun	. Review of Implementation Planning . Collection/Review of Data		

No.	Date		Study Team	Geological Survey	Topographic Survey
15	29th, Feb. 1988	Mon	. Review of Implementation Planning . Collection/Review of Data		
16	1st, Mar. "	Tue	. Miura and Kusano arrived in Batangas . Confirmation of Conclusion of Geological Survey Bridge No. 04.03a and Topographic Survey Bridge No. 04.01a . Returned to Manila	Conclusion of survey Bridge No. 04.03a	Conclusion of survey Bridge No. 04.01a
17	2nd, " "	Wed	. Miura arrived in Masbate . Confirmation of Conclusion of Topographic Survey Bridge No. 05.03 . Returned to Manila		Conclusion of Survey Bridge No. 05.03
18	3rd, " "	Thu	. Kusano arrived in Masbate . Confirmation of Conclusion of Geological Survey Bridge No. 05.03 . Returned to Manila	Conclusion of Survey Bridge No. 05.03	
19	4th, " "	Fri	. Miura and Kusano arrived in Mindro . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 04.04b . Returned to Manila	Commencement of Survey Bridge No. 04.04b	Commencement of Survey Bridge No. 04.04b
20	5th, " "	Sat	. Analysis of Results of Geological Survey . Check of Results of Topographic Survey		
21	6th, " "	Sun	. Miura and Kusano arrived in Leyte . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 08.04 . Returned to Manila	Commencement of Survey Bridge No. 08.04	Commencement of Survey Bridge No. 08.04

No.	Date		Study Team	Geological Survey	Topographic Survey
22	7th, Mar. 1988	Mon	. Review of Implementation Planning . Analysis of Results of Geological Survey . Check of Results of Topographic Survey		
23	8th, " "	Tue	. Review of Implementation Planning . Analysis of Results of Geological Survey . Check of Results of Topographic Survey		
24	9th, " "	Wed	. Miura and Kusano arrived in Mindoro, Site Survey Bridge No. 04.04b . Discussion with District Engineer Office . Collection/Review of Data . Confirmation of Conclusion of Geological Survey and Topographic Survey of Bridge No. 04.04b	Conclusion of Survey Bridge No. 04.04b	Conclusion of Survey Bridge No. 04.04b
25	10th, " "	Thu	. Miura and Kusano, Site Survey Bridge No. 04.04b . Returned to Manila		
26	11th, " "	Fri	. Miura and Kusano arrived in Leyte, Site Survey Bridge No. 08.04. . Discussion with Regional Office and first District Engineer Office . Collection/Review of Data . Confirmation of Conclusion of Geological Survey and Topographic Survey Bridge No. 08.04	Conclusion of Survey Bridge No. 08.04	Conclusion of Survey Bridge No. 08.04
27	12th, " "	Sat	. Uchida arrived in Manila . Discussion among Study Team		

No.	Date		Study Team	Geological Survey	Topographic Survey
28	13th, Mar. 1988	Sun	. Analysis of Results of Geological Survey . Check of Results of Topographic Survey		
29	14th, " 1988	Mon	. Miura and Uchida reported to JICA about progress of Study		
30	15th, " "	Tue	. Miura and Kusano arrived in Sebu, Site Survey Bridge No. 70.01, 07.02 . Discussion with Regional Office and Second District Engineer Office . Collection/Review of Data . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 07.01 . Returned to Manila	Commencement of Survey Bridge No. 07.01	Commencement of Survey Bridge No. 07.01
31	16th, " "	Wed	. Basic planning of Bridge . Review of Bridge Approach . Review of Implementation Planning . Estimate of Construction Cost		
32	17th, " "	Thu	. Basic Planning of Bridge . Review of Bridge Approach . Review of Implementation Planning . Estimate of Construction Cost		
33	18th, " "	Fri	. Basic Planning of Bridge . Review of Bridge Approach . Review of Implementation Planning . Estimate of Construction Cost		

No.	Date		Study Team	Geological Survey	Topographic Survey
34	19th, Mar. 1988	Sat	. Miura and Kusano arrived in Sebu . Confirmation of Cconclusion of Geological Survey and Topographic Survey Bridge No. 07.01 . Instruction and Supervision of Geographic Survey and Topographic Survey Bridge No. 07.02 . Returned to Manila	Conclusion of Survey Bridge 07.01 Commencement of Survey Bridge No. 07.02	Conclusion of Survey Bridge 07.01 Commencement of Survey Bridge No. 07.02
35	20th, " "	Sun	. Miura and Kusano arrived in Surigao, Site Survey Bridge No. 10.01 . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 10.01 . Discussion with First City Engineer Office . Collection/Review of Data	Commencement of Survey Bridge No. 10.01	Commencement of Survey Bridge No. 10.01
36	21st, " "	Mon	. Miura and Kusano, Site Survey Bridge No. 10.01 . Returned to Manila		
37	22nd, " "	Tue	. Miura and Kusano arrived in Iloilo, Site Survey, Bridge No. 06.03 . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 06.03 . Discussion with City Engineer Office and Second City Engineer Office . Collection/Review of Data . Returned to Manila	Commencement of Survey Bridge No. 06.03	Commencement of Survey Bridge No. 06.03

No.	Date		Study Team	Geological Survey	Topographic Survey
38	23rd, Mar. 1988	Wed	. Miura and Kusano arrived in Palawan . Discussion with Puerto Princesa City Engineer Office . Instruction and Supervision of Geological Survey and Topographic Survey Bridge No. 04.05b . Returned to Manila	Commencement of Survey Bridge No. 04.05b	Commencement of Survey Bridge No. 04.05b
39	24th, " "	Thu	. Miura and Kusano arrived in Sebu . Confirmation of Conclusion of Geological Survey and Topographic Survey Bridge No. 07.02 . Returned to Manila	Conclusion of Survey Bridge No. 07.02	Conclusion of Survey Bridge No. 07.02
40	25th, " "	Fri	. Miura and Kusano arrived in Surigao . Confirmation of Conclusion of Geological Survey and Topographic Survey Bridge No. 10.01 . Returned to Manila	Conclusion of Survey Bridge No. 10.01	Conclusion of Survey Bridge No. 10.01
41	26th, " "	Sat	. Miura and Kusano arrived in Palawan, Site Survey Bridge No. 04.05b . Discussion with Puerto Princesa City Engineer Office . Confirmation of Conclusion of Geological Sur- and Topographic Survey Bridge No. 04.05b . Returned to Manila	Conclusion of Survey Bridge No. 04.05b	Conclusion of Survey Bridge No. 04.05b
42	27th, " "	Sun	. Miura and Kusano arrived in Iloilo . Discussion with Regional Office . Collection/Review of Data . Returned to Manila	Conclusion of Survey Bridge No. 06.03	Conclusion of Survey Bridge No. 06.03

No.	Date		Study Team	Geological Survey	Topographic Survey
43	28th, Mar. 1988	Mon	. Analysis of Results of Geological Survey . Check of Results of Topographic Survey . Basic Planning of Bridge . Review of Bridge Approach . Review of Implementation Planning		
44	29th, " "	Tue	. Messrs. Jin and Chikaraishi arrived in Manila . Meeting at Embassy of Japan, JICA		
45	30th, " "	Wed	. Meeting with DPWH . Explanation and Discussion of Phase II Bridges . Mr. Jin, Mr. Chikaraishi , Miura, and Uchida arrived in Palanlan		
46	31st, " "	Thu	. Mr. Jin, Mr. Chikaraishi Miura and Uchida, Site Survey Bridge No. 04.05b . Explanation and Discussion with Puerto Princesa City Engineer Office . Returned to Manila		
47	1st, Apr. "	Fri	. Discussion among Study Team		
48	2nd, " "	Sat	. Mr. Jin, Mr. Chikaraishi and Miura arrived in Sebu . Discussion with Regional Office		

No.	Date		Study Team	Geological Survey	Topographic Survey
49	3rd, Apr. 1988	Sun	. Mr. Nakamura arrived in Sebu . Mr. Jin, Mr. Chikaraishi Mr. Nakamura and Miura Site Survey, Bridge No. 07.01, 07.02		
50	4th, " "	Mon	. Mr. Jin, Mr. Chikaraishi Mr. Nakamura and Miura Site Survey for Phase I Bridges, Bridge No. 07.03, 07.04, 07.05 . Returned to Manila . Bekki arrived in Manila . Meeting at JICA		
51	5th, " "	Tue	. Explanation and Discussion on Phase II Bridge with DPWH . Discussion among Study		
52	6th, " "	Wed	. Discussion about Draft of Minutes		
53	7th, " "	Thu	. Minutes signed.		
54	8th, " "	Fri	. Meeting at Embassy of Japan, JICA		
55	9th, " "	Sat	. Preparation for Returning to Japan		
56	10th, " "	Sun	. Returned to Japan		

3. List of Persons Met

Persons whom the Study Team met are as follows :

Name and Organization	Title
Embassy of Japan in Philippines	
Mr. Koji Kaminaga	First Secretary
JICA Office in Philippines	
Mr. Moriya Miyamoto	Resident Representative
Mr. Katuhiko Ohshima	Deputy Resident Representative
Mr. Katuhiko Ozawa	Assistant Resident Representative
DPWH	
Mr. Toshiyuki Nakamura	JICA Expert (Highway, Traffic)
DPWH	
Mr. Teodoro Gener	Undersecretary
Mr. Romulo del Rosario	Undersecretary
Mr. Teodoro T. Encarnacion	Undersecretary
Mr. Gregorio Alvarer	Undersecretary
Mr. Manual M. Bonoan	Asst. Secretary for Planning
Mr. Edmundo Mir	Director, Bureau of Construction
Mr. Francisco N. Pascual	Director, Bureau of Design
Ms. Linda M. Templo	Chief Civil Engineer DPD, Planning Service
Mr. Geronimo S. Alonzo	Chief Civil Engineer PMO-Feasibility Study
Mr. Crispin B. Banaag, Jr.	Chief Economist, DPD, Planning Service
Mr. Paciano D. Tubal	Supvg. Civil Engineer Bureau of Construction
Mr. Carlos V. Rodriguez	Chief Civil Engineer Bureau of Design
Mr. Mariano Flores	Senior Civil Engineer of BOD
Mr. Rico Bulan	Senior Civil Engineer of BOD
Mr. Mauro Baccay	Senior Civil Engineer of BOD
Mr. Exequiel Rana	Senior Civil Engineer of PS

DPWH

Mindro, District Engineer Office

Mr. Alberto Mercader	District Engineer
Mr. Mendoza	Assistant District Engineer

DPWH

Puerto, Princesa (Palawan), City Engineer Office

Mr. Maximo G. Tabang	City Engineer
Mr. Danilo Alagao	Supvg. C. E. I.

DPWH

Masbate, District Engineer Office

Mr. Paquito F. Mahinay	Assistant District Engineer
Mr. Solomon J. Riveral	Legal officer
Mr. Villahermosa	Construction Engineer

DPWH

Iloilo, Regional Office

Mr. Mario Talatala	Regional Director
Mr. Bert Casteneda	Assistant Regional Director
Mr. Rutino Osunero	Chief Civil Engineer
Mr. Villanueva	Planning Engineer
Mr. Saldevia	Regional Structural & Bridge Engineer

Iloilo, City Engineer Office

Mr. Jose Varela	District Engineer

Iloilo (Sara), Second District Engineer Office

Mr. Solomon Hufanda	District Construction Engineer

DPWH

Sebu, Regional Office

Mr. Meichor D. Canete	Regional Director
Mr. Simplicio Verdon	Chief, Planning & Design Division
Mr. Gloria Dindin	Supvg. C. E. II

DPWH

Sebu, Second District Engineer Office

Mr. Ernesto G. Roldan	District Engineer
Mr. Wilfredo Ordesta	Assistant District Engineer
Ms. Estela Rosario	Supvg. C. E. II

DPWH

Leyte (Tacloban), Regional Office

Mr. Alfredo P. Torres	Regional Director
Mr. Abelardo Morge	Division Chief

Leyte, First District Engineer Office

Mr. George R. Boco	Chief Civil Engineer
Mr. Valentino Adolfo	Planning Engineer
Mr. Arnaldo Bonifacio	Senior Chief Engineer

DPWH

Surigao, First City Engineer Office

Mr. Romeo	District Engineer
Mr. Songkit	District Engineer
Mr. Ernesto Geotina	Assistant District Engineer
Mr. Lecino Digao	Chief Engineer of the Maintenance Section
Mr. Elsie Tejada	Chief Engineer Quality Control & Materials Section
Mr. Maximo Cuarto	Chief of the Planning Section
Mr. Rome Abao	Chief of the Construction Section

MINUTES OF DISCUSSIONS
OF
THE BASIC DESIGN STUDY ON THE PROJECT FOR CONSTRUCTING BRIDGES ALONG RURAL ROADS (PHASE II)
IN
THE REPUBLIC OF THE PHILIPPINES

In response to the request by the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the project for constructing bridges along rural roads (Phase II) (hereinafter referred to as the "Project"). The Japan International Cooperation Agency (JICA) sent the Basic Design Study Team headed by Mr. Hiro-o Jin, Head of Research Division, Planning and Development Department, Honshu-Shikoku Bridge Authority, from March 29 to April 10, 1988.

The Team held a series of discussions and exchanged views on the Project with the authorities concerned of the Government of the Philippines.

As a result of the study and discussions, both parties mutually agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined toward the realization of the Project.

Manila April 7, 1988

神 弘夫

HIRO-O JIN
Leader,
Basic Design Study Team
JICA

Teodoro T. Encarnacion

TEODORO T. ENCARNACION
Undersecretary
Department of Public Works
and Highways

ATTACHMENT

1. The Objective of the Project

The objective of the Project is to construct bridges along rural roads as listed in Annex 1.

2. Responsible and Coordinating Agency for the Project

Department of Public Works and Highways (DPWH)

3. Project Sites

The Project sites of the bridges are as shown in the map of Annex 2.

4. The Team will convey to the Government of Japan the desire of the Government of the Philippines for the early and successful implementation of the Project and provide necessary materials and services under Japan's Grant Aid Program.

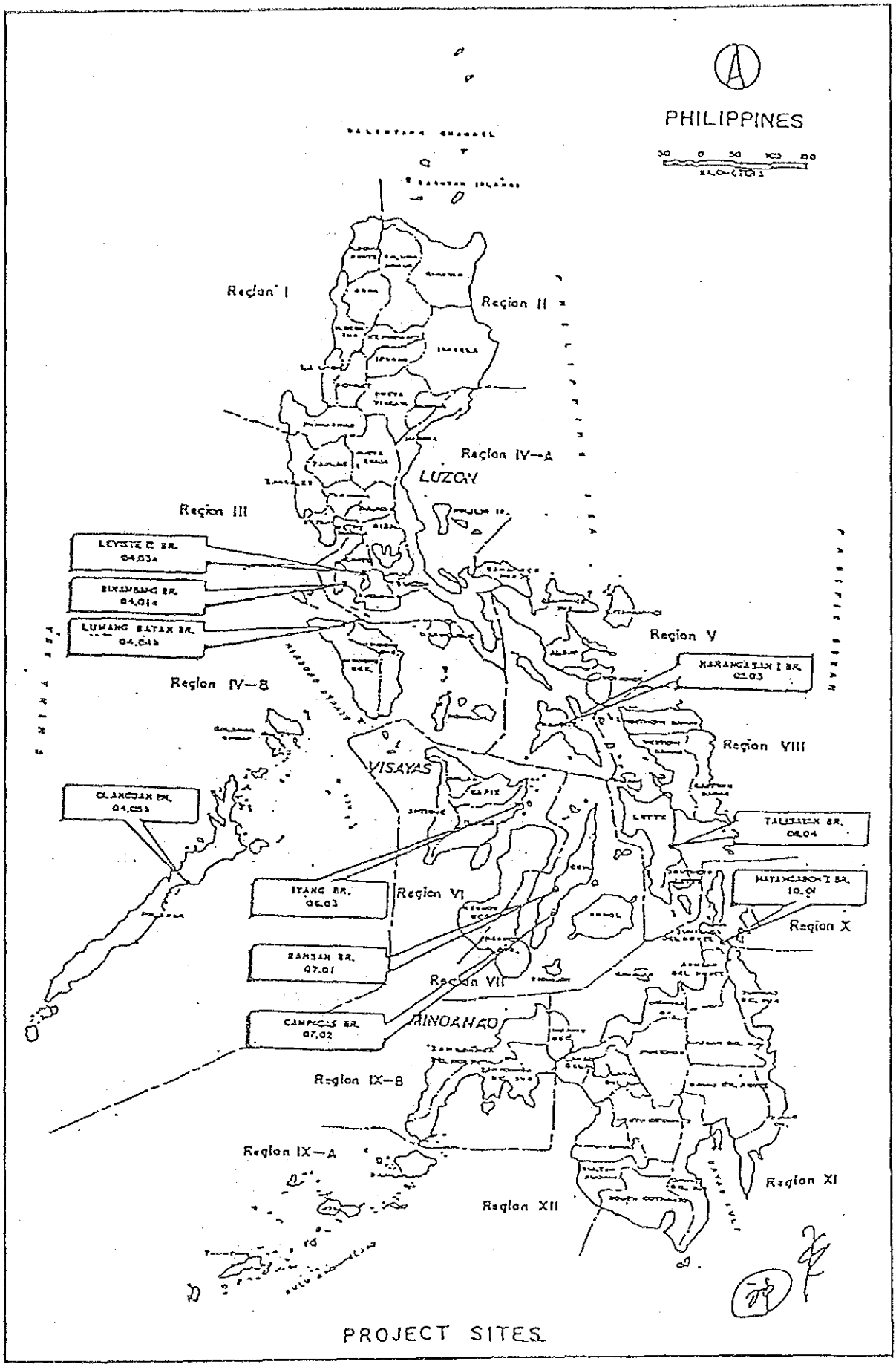
5. The Philippines side has understood the system of Japanese Grant Aid and the necessity of engaging Japanese consulting firm and contractor for the implementation of the Project.

6. The Government of the Philippines will undertake to provide the necessary measures as listed in Annex 3 on condition that a Grant Aid by the Government of Japan is extended to the Project.

7. The Government of the Philippines will undertake to provide the necessary budget and personnel for the proper and effective maintenance of facility provided under the Grant Aid.

LIST OF BRIDGES FOR PHASE II

Bridges No.	Name of Bridges	Location
04.01a	Binambang Bridge	Km 107 + 540 Balayan-Balibago Calatagan Road Balayan, Batangas
04.03a	Leviste II Bridge	Km 92 + 430 Talisay-Laurel-Agoncillo Road Laurel, Batangas
04.04b	Lumang Bayan Bridge	Km 34+ 954 Mamburao-North Puerto Galera Road Orelan, Abra de Ilog, Mindoro Occidental
04.05b	Olangoan I Bridge	Km 74 + 524 Puerto Princesa North Road Concepcion, Puerto Princesa City, Palawan
05.03	Narangasan I Bridge	Km 31 + 145 JCI Tawad-Balud Road, Milagros, Masbate
06.03	Iyang Bridge	Km 109 + 962 Concepcion-San Dionisio National Road Concepcion
07.01	Banban Bridge	Km 61 + 100 Toledo-Pinamungaban National Road, Cebu
07.02	Campacas Bridge	Km 97 + 600 Dalaguete-Mantalongon Road Dalaguete, Cebu
08.04	Talisayan River Crossing Bridge	Km 66 + 400 La Paz-Javier-Bito Road Talisayan-Javier Leyte
10.01	Hayangabon I	Km 1202 + 586 Surigao-Davao Coastal Road Hayangabon, Claver, Surigao del Norte


PHILIPPINES
Region I
Region II
Region IV—A
LUZON
Region III
Region V
Region IV—B
Region VIII
VISAYAS
Region VI
Region X
Region VII
MINDANAO
Region IX—B
Region IX—A
Region XI
Region XII
PROJECT SITES

UNDERTAKINGS BY THE GOVERNMENT OF THE PHILIPPINES

1. To provide necessary data and information for basic design study and for implementation of the Project.

2. To ensure the exemption of custom duties, internal tax and other fiscal levies and prompt unloading and customs clearance at the port of entry in the Philippines of the materials and equipment provided under Japan's Grant Aid.

3. To exempt Japanese national engaged in the Project from customs duties, internal tax, other fiscal levies and other administrative requirements which may be imposed in the Philippines with respect to the supply of materials and services under verified contracts.

4. To accord Japanese nationals whose services may be required in connection with the supply of the materials and the services under verified contracts such facilities as may be necessary for their entry into the Philippines and stay therein for the execution of the Project.

5. To acquire the right of way and to provide necessary land area for the construction works.

6. To demolish obstacles including houses within the right of way that affects the implementation of the Project.

7. To make passable all roads and bridges leading to the project sites for the transportation of materials and equipment provided under Japan's Grant Aid.

APPENDIX 2

MISSION FOR EXPLANATION OF DRAFT FINAL REPORT

. ORGANIZATION AND ITINERARY OF THE STUDY TEAM

. LIST OF PERSON, MET

. MINUTES OF DISCUSSIONS

Member of the Study Team

Team Leader	:	Mr. Juro Chikaraishi Second Basic Design Study Division, Grant Aid Planning and Survey Department, Japan International Cooperation Agency
Bridge Construction Planning	:	Mr. Tsuneo Bekki Katahira & Engineers Inc.
Implementation Planning and Topographic Survey	:	Mr. Minoru Miura Katahira & Engineers Inc.
Geotechnical Survey	:	Mr. Ken Kusano Katahira & Engineers, Inc.

ITINERARY

Date	Activity
15th June, Wed 1988	. Arrived at Manila . Meeting at JICA and Enbassy of Japan
16th June, Thu	. Meeting with DPWH . Explanation on Draft Final Report
17th June, Fri	. Discussion on Draft final Report . Discussion on Undertakings of R.P.
18th June, Sat	. Discussion on Implementation Schedule . Discussion on Draft Minutes of Discussions
19th June, Sun	. discussion among Study Team . Finalizationof Minutes of Discussions
20th June, Mon	. Signing of Minutes of Discussion . Report to JICA and Embassy of Japan
21th June, Tues	. Left from Manila

List of Persons Met

Persons whom the Study Team met are as follows :

Name and Organization	Title
Embassy of Japan in Philippines	
Mr. Koji Kaminaga	First Secretary
JICA Office in Philippines	
Mr. Moriya Miyamoto	Resident Representative
Mr. Katuhiko Ohshima	Deputy Resident Representative
Mr. Katuhiko Ozawa	Assistant Resident Representative
DPWH	
Mr. Toshiyuki Nakamura	JICA Expert (Highway, Traffic)
DPWH	
Mr. Romulo del Rosario	Undersecretary
Mr. Manual M. Bonoan	Asst. Secretary for Planning
Mr. Edmundo Mir	Director, Bureau of Construction
Mr. Francisco N. Pascual	Director, Bureau of Design
Ms. Linda M. Templo	Chief Civil Engineer DPD, Planning Service
Mr. Geronimo S. Alonzo	Chief Civil Engineer PMO-Feasibility Study
Mr. Crispin B. Banaag, Jr.	Chief Economist, DPD, Planning Service
Mr. Paciano D. Tubal	Supvg. Civil Engineer Bureau of Construction
Mr. Carlos V. Rodriguez	Chief Civil Engineer Bureau of Design

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT FOR CONSTRUCTING BRIDGES ALONG RURAL ROADS (PHASE II)
IN
THE REPUBLIC OF THE PHILIPPINES

In response to the request by the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the project for constructing bridges along rural roads (Phase II) (hereinafter referred to as the "Project"). The Japan International Cooperation Agency (JICA) sent the Basic Design Study Team headed by Mr. Hiro-o Jin, Head of Research Division, Planning and Development Department, Honshu-Shikoku Bridge Authority, from March 29 to April 10, 1988.

As a result of the study, JICA prepared a Draft Final Report and dispatched a team headed by Mr. Juro Chikaraishi, Second Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, to explain and discuss it with the relevant officials of the Government of the Republic of the Philippines from 15th to 21st June 1988.

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

Manila, June 20, 1988

JURO CHIKARAISHI
Leader of the Draft Final Team
Japan International Cooperation Agency (JICA)

MANUEL M. BONOAN
Asst.Secretary for Planning
Department of Public Works and Highways (DPWH)

ATTACHMENT

1. The Philippine side has in principle agreed to the basic design proposed in the Draft Final Report.

2. The Philippine side has understood Japan's grant aid system and reconfirmed the necessary measures to be taken by the Philippine Government as agreed on the Minutes of Discussions of the Basic Design Study dated 7th April 1988.

3. The Philippine side has confirmed that the necessary budget and personnel will be appropriated for the proper and effective maintenance of facility provided under the Grant Aid.

4. The Final Report (15 copies in English) will be submitted to the Philippines side within August 1988.

APPENDIX 3

DATA OF PROPOSED BRIDGES

TABLE 1 (1/2) LIST OF CANDIDATE BRIDGES FOR PHASE II

Bridge No.	Name of Bridge	L o c a t i o n
02.01	Sta. Cruz	km. 640 + 747 Dugo-San Vicente Road Sta. Ana, Cagayan
02.02	Dumadata	km. 339 + 770 Cordon-Diffun-Maddela-Aurora Road, Mangandingay Cabarroguis Quirino
02.05	Diduyon	km. 374 + 060 Cordon-Diffun-Maddela-Aurora Road, Maddela, Quirino
04.01a	Binambang	km. 107 + 540 Balayan-Balibago-Calatagan Road, Caloocan, Balayan, Batangas
04.03a	Leviste II	km. 92 + 430 Talisay-Laurel-Agoncillo Road, Laurel, Batangas
04.04b	Lumang Bayan	km. 34 + 954 Mamburao-North Puerto Galera Road, orelan, Abra de Ilog Mindoro Occidental
04.05b	Olangoan	km. 74 + 524 Puerto Princesa North Road Concepcion, Puerto Princesa City, Palawan
04.06b	Bongabon	km. 122 + 720 Calapan South-Bulalacao-San Jose Road, Bongabon Oriental Mindoro
05.03	Narangasan I	km. 31 + 145 Jct. Tawad-Balud Road Milagros, Masbate
06.03	Iyang	km. 109 + 962 Concepcion-San Dionisio National Road, Concepcion Iloilo
07.01	Banban	km. 61 + 100 Pinamungahan-Aloguinsan -Mantalongon Road. Pinamungahan, Cebu
07.02	Campacas	km. 97 + 600 Dalaguete-Mantalongon Road Dalaguete, Cebu

TABLE 1 (2/2) LIST OF CANDIDATE BRIDGES FOR PHASE II

Bridge No.	Name of Bridge	L o c a t i o n
08.03	Habay	km. 1075 + 448 Liloan-San Francisco Road Habay, San Francisco S. Leyte
08.04	Talisayan	km. 66 + 800 La Paz-Javier-Bito Road Talisayan, Javier, Leyte
09.05	Patunan	km. 375 + 090 Dipolog-Sindangan Road Manukan, Zamboanga del Norte
10.01	Hayangabon I	km. 1202 + 586 Surigao-Davao Coastal Road Hayangabon, Claver Surigao del Norte
11.04	Manay	km. 1643 + 783 Davao Orientl -Surigao del Sur National Road Manay, Davao Oriental
12.01	Pikinit	km. 136 + 936 Dobleston-Tukuran Road Caromatan, Lanao del Norte
12.02	Durugao	km. 216 + 498 Awang-Upi-Lebak Road Durugao, South Upi, Maguindanao
12.04	Dangolaan	km. 133 + 983 Dobleston-Tukuran Road Caromatan, Lanao del Norte
12.05	Sapakan	km. 211 + 530 Dulawan-Marbel Road Sapakan, Maguindanao

TABLE 2 (1/3) PHASING OF PROPOSED BRIDGES

NO.	BRIDGE NO.	NAME OF BRIDGE	TRAFFIC VOLUME (ADT)	EXISTING BRIDGE			PROPOSED BRIDGE		DESIGN AND CONSTRUCTION REQUIREMENTS	PHASING
				LENGTH (m)	LENGTH AND CONDITION	LOAD LIMIT (TONS)	LENGTH (m)	TYPE		
1	02.01	Sta. Cruz Bridge Cagayan	281	90.00	Timber . Dilapidated timber trestle	-	3 @ 30=90 m	. Continuous steel girder . Pile foundation	. Topographic and geological surveys are required. . Study on flood control is necessary. . Use of cofferdam for deep water (h=3.5 m) is required. . Long span bridge is advisable because of deep water	2
2	02.02	Dumadata Br. Quirino	261	30.00	Bailey . Dilapidated timber trestle	5	17+17=34 m	. H-beam girder . Pile foundation	. Topographic and geological survey are required. . Use of cofferdam for deep water (h=2.0m) is required.	2
3	02.05	Diduyon Quirino	261	30.00	Timber (Washed-Out)	—	—	—	. Study of flood area and control is required. . Bridge length should be studied	2
4	04.01a	Binambang Bridge Batangas	-	00.00	Spillway . Over-flow meter	5	3 @ 25=75m	. H-Beam Girder . Spread Footing	. Flood water level shall be studied . Topographic and geological survey is required. . Alignment of road shall be studied in order to avoid demolision of existing houses.	2
5	04.03a	Leviste II Br Batangas	520	40.00	Timber (Washed-out)	-	20+20+20+20 +20 = 80 m	. H-Beam girder . Spread foundation	. Maximum high flood water level shall be reviewed	2
6	04.04b	Lumang Bayan Br. Mindoro Occ.	200	60.00	Bailey . Fair Steel . Dilapidated timber trestle	5	3@30 = 30 m	. Continuous steel girder . Pile foundation	. Study on flood area and elevation is required	2
7	04.05b	Olangoan Br. Palawan	-	36.00	Bailey . Fair Steel . Timber Trestle	5	20+20 = 40 m	. H-Beam Girder . Pile foundation	. Geological survey is required . Use of cofferdam for water is required	2

TABLE 2 (2/3) PHASING OF PROPOSED BRIDGES

NO.	BRIDGE NO.	NAME OF BRIDGE	TRAFFIC VOLUME (ADT)	EXISTING BRIDGE			PROPOSED BRIDGE		DESIGN AND CONSTRUCTION REQUIREMENTS	PHASING
				LENGTH (m)	LENGTH AND CONDITION	LOAD LIMIT (TON/S)	LENGTH (m)	TYPE		
8	04.06b	Bongabon Br. Oriental Mindoro	153	351.00	Bailey . Fair Steel . Permanent sub-structure	8	. Depend on existing span length	. Depend on existing pier	. Stability of existing substructure shall be checked	2
9	05.03	Narangasan I Bridge Masbate	-	45.00	. Bailey . Dilapi-dated timber trestle	1	2 @ 35=70 m	. Conti-nuous steel girder . Pile foun-dation	. Bridge length shall be examined considering river bank	2
10	06.03	Iyang Br. Iloilo	526	25.00	Timber . Dilapi-dated	3.5	28 m	. Steel plate girder . Pile foun-dation	. Geological survey is required because of swampy and soft ground condition . Use of cofferdam for deep water (h=2.0m) is required	2
11	07.01	Banban Br. Cebu	97	25.30	Timber . Dilapi-dated	5	30 m	. Steel plate girder . Pile foun-dation	. Geological survey is required . Study of flood area is required	2
12	07.02	Campacas Bridge Cebu	34	20.83	Bailey . Fair Steel . Dilapi-dated trestle timber	5	24 m	. H-beam girder . Pile foun-dation	. Geological survey is required . Maximum high flood water level shall be reviewed	2
13	08.03	Habay Br. S. Leyte	-	61.45	Bailey . Good . Timber trestle	7	22+22+22=66m	. H-beam girder . Pile foun-dation	. Geological survey is required . Study of flood area is required	2
14	08.04	Talisayan River Crossing Leyte	-	51.40	River Crossing . No exis-ting bridge	-	27+27 = 54 m	. H-beam girder . Pile foun-dation	. Topographic and geological surveys are required . Study flood area and control is required	2

TABLE 2 (3/3) PHASING OF PROPOSED BRIDGES

NO.	BRIDGE NO.	NAME OF BRIDGE	TRAFFIC VOLUME (ADT)	EXISTING BRIDGE			PROPOSED BRIDGE		DESIGN AND CONSTRUCTION REQUIREMENTS	PHASING
				LENGTH (m)	LENGTH AND CONDITION	LOAD LIMIT (TONS)	LENGTH (m)	TYPE		
15	09.05	Patunan Br. Zamboanga del Norte	667	25.00	Bailey . Fair steel . Permanent pier . timber trestle	7	25 m	. H-beam girder	. Stability of existing permanent substructures shall be examined and incorporated in design	2
16	10.01	Hayangabon I Bridge Surigao del Norte	55	40.00	Timber . Dilapidated condition	5	21+21 = 42 m	. H-beam girder . Pile foundation	. Geological survey is required . Use of cofferdam for deep water is required	2
17	11.04	Manay Bridge Davao Oriental	450	42.67	Bailey . Fair Steel . Permanent sub-structure	5	. Demand on existing span length	. Depend on existing pier condition	. Stability of permanent substructure shall be checked	2
18	12.01	Pikinit Br. Lanao del Norte	76	20.00	Bailey	3	21 m	. H-beam girder . Pile foundation	. Maximum high water level shall be checked	2
19	12.02	Durugao Br. Maguindanao	-	40.00	Bailey . Fair steel . Permanent sub-structure	5	. Depend on existing span length	. Depend on existing pier condition	. Stability of permanent substructure shall be checked	2
20	12.04	Dangolaan Bridge Lanao del Norte	76	25.00	Timber	3	24 m	. H-beam girder . Pile foundation	. Direction of river stream was changed . Study of flood is required	2
21	12.05	Sapakan Br. Maguindanao	686	100.00	Bailey . Fair steel . Permanent sub-structure	10	. Depend on existing span length	. Depend on existing pier	. Stability of existing permanent substructure shall be checked.	2

APPENDIX 4

HYDROGRAPHIC ANALYSIS

OF BRIDGE OPENINGS

1. Open Channel Hydraulics

The hydraulic design component of this Study is concerned with the determination of the different flood levels that might occur in a channel due to a given flood and of the minimum waterway opening under a structure. The different flood levels were determined by the rating curve computation which is based on Manning's Formula (in metric units):

$$q = \frac{1}{n} AR^{2/3} \cdot S^{1/2}$$

where:

q = discharge, m /S

n = Manning's roughness coefficient

A = cross-sectional area, m^2

R = hydraulic radius
(equals $\frac{\text{cross sectional area}}{\text{wetted perimeter}}$)

S = hydraulic gradient

The value of the coefficient, n, was estimated based on information. Assuming uniform to nearly uniform flow, the value of the hydraulic gradient, S, can be considered equal to the average slope of the stream.

For each site, three channel cross sections were considered: upstream section, bridge point section and downstream section. The selection of the upstream and downstream sections depended on their representativeness to the channel reach under study. Using the energy equation and the results of the rating curve computation, the water depth at the bridge point was obtained. The computation is contained in a computer program named BAK RAT.

The results of the hydraulic computation are given in Table 1, while the supporting computer print-outs are reported separately.

From Table 1, it can be observed that the computed maximum flood level, MFL (computed), and the maximum flood level obtained by field interview, MFL (interview), are not too different, except for the Olangoan I Bridge.

In some cases, MFL (computed) is less than MFL (interview). This seeming disparity can be explained by the fact that MFL (interview) varies greatly and may be unreliable because it depends on the integrity (and reliability) of the interviewee(s) and on the accurate establishment of the datum point where flood measurements are taken. Moreover, the frequency of storms causing the MFL (interview) more often is unknown and very rare (or the worst that ever occurred and thus recorded in the memory of local residents) occurring more than fifty years in the past. On the other hand, MFL (computed) is the product of hydrological and hydraulic analyses based on the physiographic characteristics of the basin and local rainfall conditions. Clearly, these latter results have a certain level of accuracy and reliability within the specified frequency of design.

Given MFL and doing the necessary trimmings of the riverbanks to accommodate the available superstructure, the minimum bridge openings were established. This opening then became the basis of the length and number of bridge spans.

It may be stated that, in bridge design, a freeboard of 1.0 m between MFL and the bottom of the girder is always maintained for drift-free streamflows, while a 1.5 m freeboard is maintained for rivers prone to drifting.

2. Hydrological Data

Table 2 shows the difference in elevation of water level between data furnished by DPWH (permanent bench marks) and in elevation temporarily established based on temporary bench marks by the Study Team.

TABLE 1 RESULTS OF HYDROLOGICAL INVESTIGATION

Bridge No.	Name of Bridge	DA (km^2)	Q(design) (m/s)	V(av) (m/s)	MFL (computed) (m)	MFL (interview) (m)
04.01a	Binambang	91.38	441.70	4.73(ovf)	13.73	15.01
04.03a	Leviste II	3.50	107.97	2.01	17.10	18.00
04.04b	Lumang Bayan	149.02	580.00	2.15	20.91	231.45
04.05b	Olangoan	222.70	815.00	4.47	18.64	17.45
05.03	Narangasan I	36.75	468.50	3.02	57.65	59.00
06.03	Iyang	7.15	162.51	4.17	18.93	19.33
07.01	Banban	60.02	228.73	6.55	20.80	21.12
07.02	Campacas	28.64	272.00	4.61	393.05	393.01
08.04	Talisayan	33.37	279.00	4.02	297.90	298.24
10.01	hayangabon I	10.43	523.23	5.67	19.47	19.50

Note:

DA = drainage area
Q (design) = design discharge
V (av) = average velocity under the bridge
MFL (computed) = maximum flood level (50-year frequency) as computed
MFL (interview) = maximum flood level on field interview

TABLE 2 HYDROLOGICAL DATA

	Bridge No.	Name of Bridge	Location of Bridge	HWL/MFL (m) DPWH(1)	HWL/MFL (m) Study Team(2)	LWL/OWL (m) DPWH(1)	LWL/OWL (m) Study Team(2)	High Tide(m)	Difference in Height Temporary Bench Marks (Study Team)
1	04.01a	Binambang	km 107 + 540 Balayan-Balibago-Calatagan Road Calaocan-Balayan, Batangas	44.900	15.010	41.400	10.610	None	(-) 29.890
2	04.03a	Leviste II	km 92 + 430 Talisay-Laurel-Agoncillo Road Laurel Batangas	16.860	18.000	13.400	15.100	None	(+) 1.140
3	04.04b	Lumang Bayan	km 34 + 954 Maburgo-North Puerto Galiera Road Ovelan, Abra de Ilog, Occ Mindoro	21.170	21.470	17.020	17.430	None	(+) 0.300
4	04.05b	Olangoan	km 74 + 524 Puerto Princesa North Road Concepcion Puerto Princesa City, Palawan	--	17.450	16.900	15.660	16.90	(-) 1.240
5	05.03	Narangasan I	km 31 + 145 Jct. Tawad Balud Road Milagros, Masbate	18.310	59.000	14.020	54.840	56.56	(+) 40.690
6	06.03	Iyang	km 109 + 962 Concepcion-San Dionisio National Road Concepcion Iloilo	1.720	19.330	1.088	18.110	19.33	(+) 17.630
7	07.01	Banban	km 61 + 100 Toledo-Pinamungahan National Road, Cebu	4.100	21.116	1.520	18.970	20.47	(+) 17.016
8	07.02	Campacas	km 97 + 600 Dalaguete-Montalongan Road Dalaguete, Cebu	400.780	393.010	397.80	388.240	None	(-) 7.770
9	08.04	Talisayan	km 66 + 800 La Paz-Javier-Bito Road Talisayan, Javier, Leyte	9.560	298.240	6.92	296.940	None	(+) 288.680
10	10.01	Hayangabon I	km 1202 + 586 Surigan-Davao Coastal Road Hayangabon, Claver, Surigao del Norte	18.400	19.500	17.320	16.790	17.73	(+) 1.100

Note : 1) Data furnished by DPWH

2) Elevation temporarily established by Study Team based on temporary bench marks

MFL = maximum flood level
OWL = ordinary water level
HWL = high water level
LWL = low water level

APPENDIX 5

TOPOGRAPHIC SURVEY

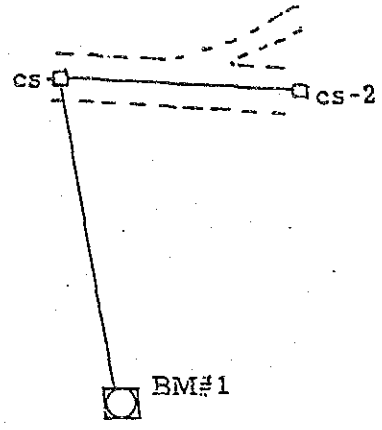
TABLE 1 SURVEY QUANTITY LIST

Bridge No.	Name of Bridge	Location	Centerline Survey (m)	Profile Survey (m)	Cross-Section, Survey, Along Road (Section)	Cross-Section, Survey, Along River (Section)	Monumling (Point)	Topographic Map (Sheet)
04.01a	BINAMBANG	Km. 107 + 540 Balayan, Batangas	522.75	522.75	26	10	4	1
04.03a	LEVISTE II	Km. 92 + 430 Laurel, Batangas	412.30	412.30	23	5	4	1
04.04b	LUMANG BAYAN	Km. 34 + 954 Mindoro Occidental	564.03	564.03	30	16	4	1
04.05b	OLANGOAN	Km. 74 + 524 Puerto Princesa City, Palawan	305.91	305.91	18	10	3	1
05.03	NARANGASAN 1	Km. 31 + 145 Milagros, Masbate	300.00	300.00	26	10	4	1
06.03	IYANG	Km. 109 + 962 Concepcion-San Dionisio National Road Concepcion	380.00	380.00	23	10	4	1
07.01	BANBAN	Km. 61 + 100 Cebu	340.00	340.00	16	13	3	1
07.02	CAMPACAS	Km. 97 + 600 Dalaguete, Cebu	280.00	280.00	15	10	4	1
08.04	TALISAYAN	Km. 66 + 400 Talisayan-Javier Leyte	380.00	380.00	20	6	4	1
10.01	HAYANGABON I	Km. 1202 + 586 Hayangabon, Claver, Surigao del Norte	349.75	349.75	18	6	3	1
	TOTAL		3,834.74	3,834.74	215	104	37	10

TABLE 2-(1/10) DESCRIPTION OF BM-POINT

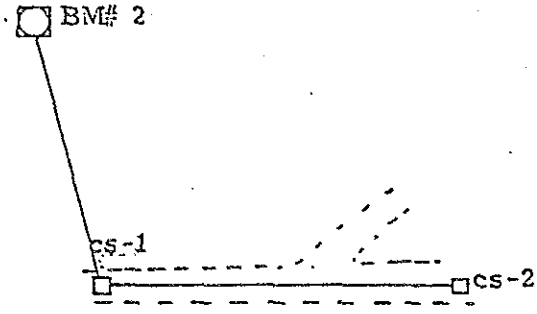
04.01a BINAMBANG BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 1, 1988
ELEVATION	20.000



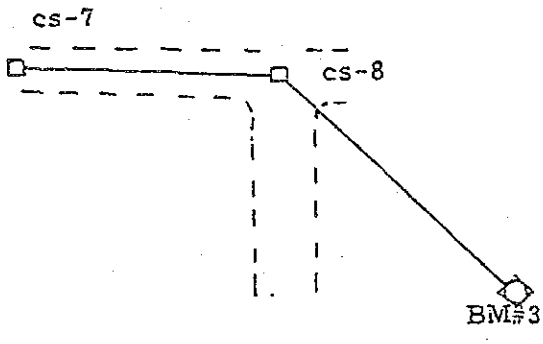
BM#1=20x20x60 cm concrete monument, with ϕ 8mm×60cm steel bar on the center, 16.75m, to the right of Sta. 106+525.25

BM. NO.	2
DATE ESTABLISHED	Mar. 1, 1988
ELEVATION	19.890



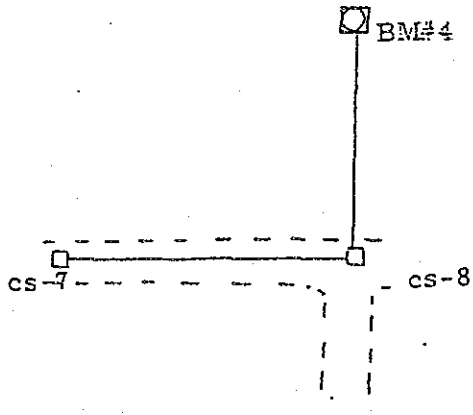
BM#2= 20x20x60 cm concrete monument with ϕ 8mm×60cm steel bar on the center, 57.10m to the left of Sta. 106+522.75m.

BM. NO.	3
DATE ESTABLISHED	Mar. 1, 1988
ELEVATION	19.118



BM#3= 20x20x60 cm concrete mo monument, w/ ϕ 8mm×60cm steel bar on the center, 74.75m to the right of Sta. 107+098.35m

BM. NO.	4
DATE ESTABLISHED	Mar. 1, 1988
ELEVATION	13.190

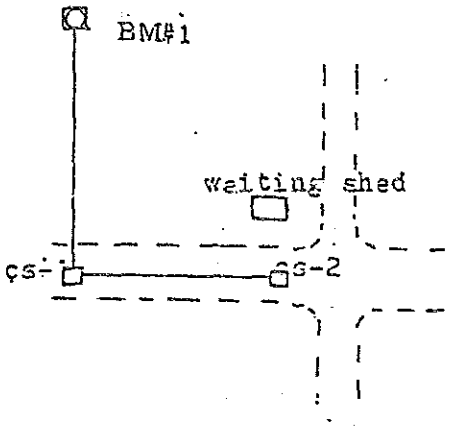


BM#=20x20x60 cm concrete monument with ϕ 8mm×60cm steel bar on the center, 24m, to the right of Sta. 107+048.35m

TABLE 2-(2/10) DESCRIPTION OF BM-POINT

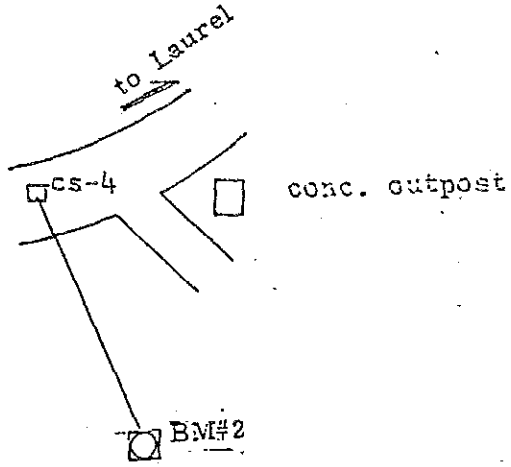
04.03a LEVISTE II BRIDGE

BM. NO.	1
DATE ESTABLISHED	Feb. 22, 1988
ELEVATION	19.443



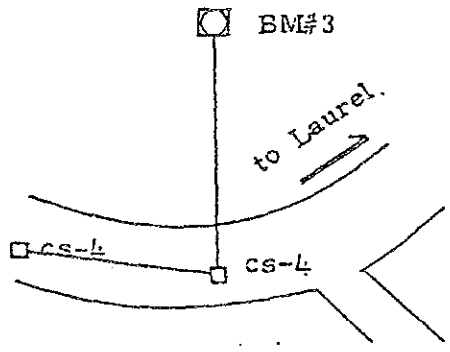
BM#1=20x20x60cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 22.49 m to the right of Sta. 92+227.10

BM. NO.	2
DATE ESTABLISHED	Feb. 22, 1988
ELEVATION	21.303



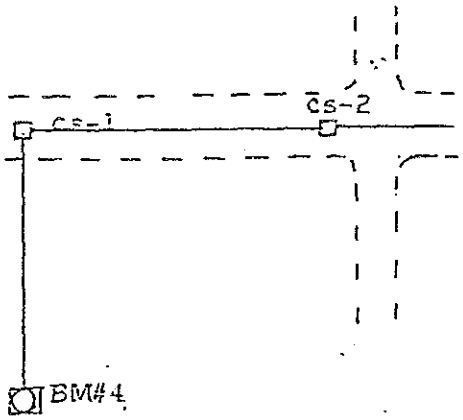
BM#2=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 15.20 m to the left of Sta. 92+639.40

BM. NO.	3
DATE ESTABLISHED	Feb. 22, 1988
ELEVATION	21.918



BM#3=20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 17.82 m to the right of Sta. 92+639.40

BM. NO.	4
DATE ESTABLISHED	Feb. 22, 1988
ELEVATION	23.413

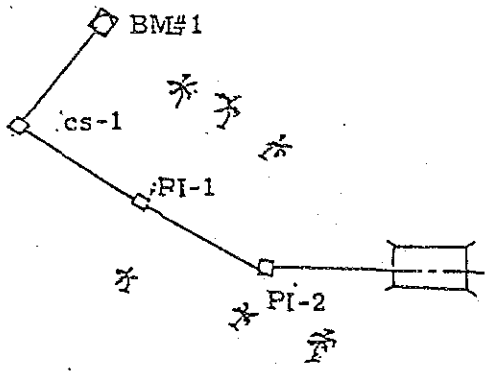


BM#4=20x20x60 cm concrete monument with ϕ 8mm×60cm steel bar on the center, 24m to the right of Sta. 92+227.10

TABLE 2-(3/10) DESCRIPTION OF BM-POINT

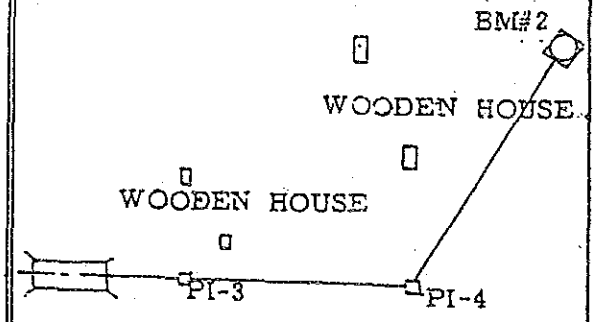
04.04b LUMANG BAYAN BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 9, 1988
ELEVATION	20.000



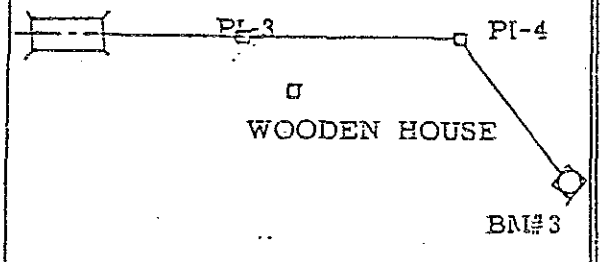
BM#1= 20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 22.15 m to the left of Sta. 35+073.60m

BM. NO.	2
DATE ESTABLISHED	Mar. 9, 1988
ELEVATION	19.902



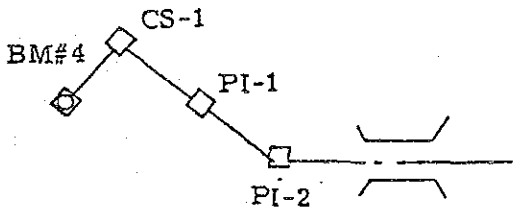
BM#2= 20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 55.15 to the right of Sta. 35+624.03m

BM. NO.	3
DATE ESTABLISHED	Mar. 9, 1988
ELEVATION	20.712



BM#3= 20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 40.15 m, to the right of Sta. 35+624.03

BM. NO.	4
DATE ESTABLISHED	Mar. 9, 1988
ELEVATION	19.764

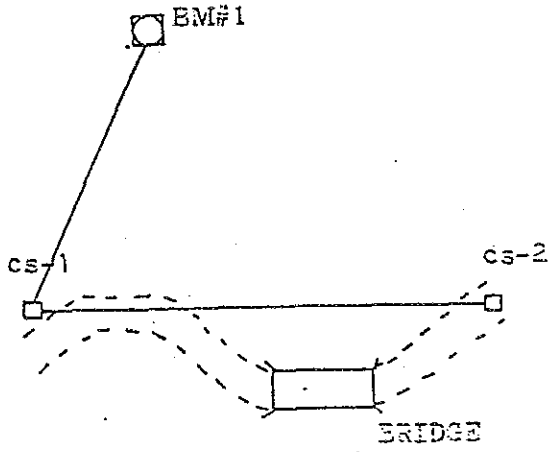


BM#4= 20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 21.90m to right of Sta. 35+073.60

TABLE 2-(4/10) DESCRIPTION OF BM-POINT

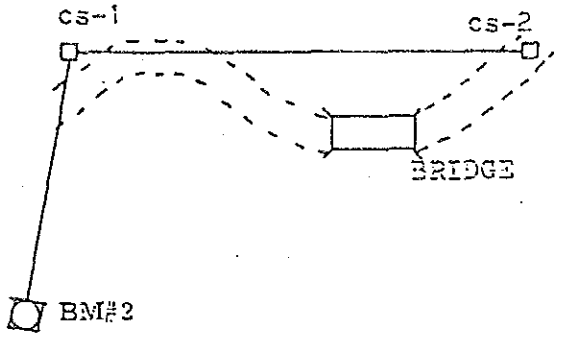
04.05b OLANGOAN BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 26, 1988
ELEVATION	20.000



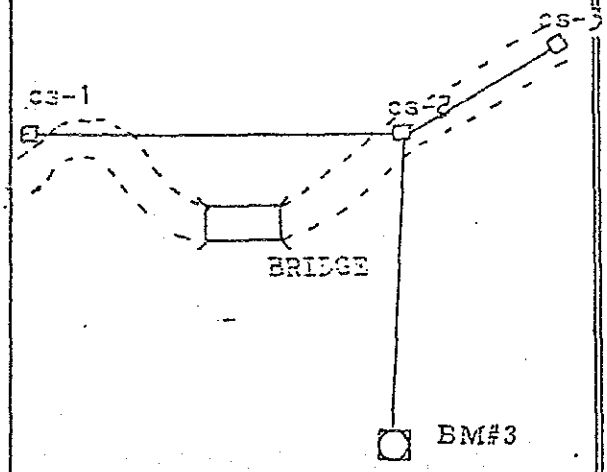
BM#1= 20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 43.91 m, to the left of Sta. 74+376.59

BM. NO.	2
DATE ESTABLISHED	Mar. 26, 1988
ELEVATION	17.767



BM#2= 20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 45.40 m to the left of Sta. 74+395.50

BM. NO.	3
DATE ESTABLISHED	Mar. 26, 1988
ELEVATION	16.964



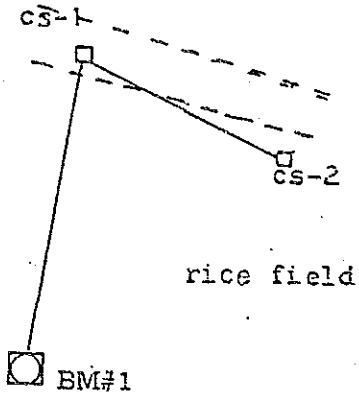
BM#3= 20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 34.90 m. to the right of Sta. 74+595.90

BM. NO.	
DATE ESTABLISHED	
ELEVATION	

TABLE 2-(5/10) DESCRIPTION OF BM-POINT

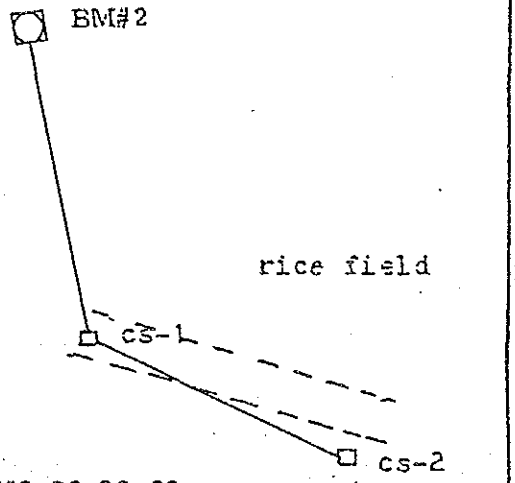
05.03 NARANGASAN BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 2, 1988
ELEVATION	60.000



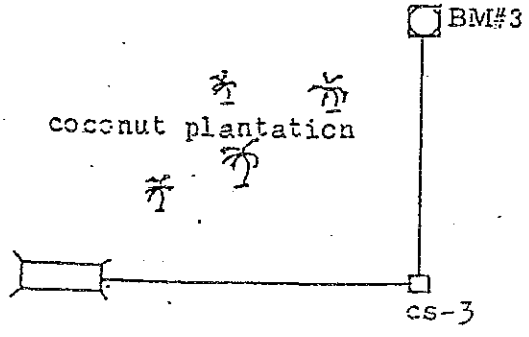
BM#1=20x20x60 cm concrete monument with ϕ 8mm×60cm on the center of steel bar, 35.85m to the left of Sta. 30+898.47

BM. NO.	2
DATE ESTABLISHED	Mar. 2, 1988
ELEVATION	58.925



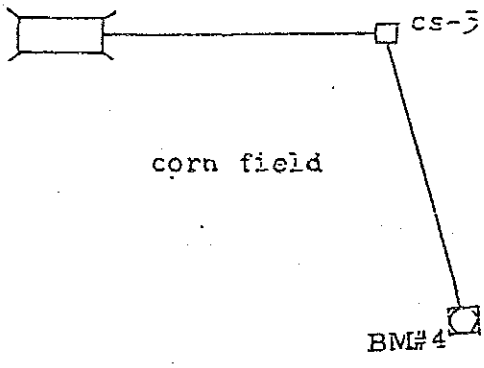
BM#2=20x20x60 cm concrete monument with ϕ 8mm×60cm on the center of steel bar, 44.88 m, to the right of Sta. 30+898.47

BM. NO.	3
DATE ESTABLISHED	Mar. 2, 1988
ELEVATION	57.820



BM#3=20x20x60cm concrete monument with ϕ 8mm×60cm on the center of steel bar, 49.50 m, to the right of Sta. 31+339.01m

BM. NO.	4
DATE ESTABLISHED	Mar. 2, 1988
ELEVATION	57.500

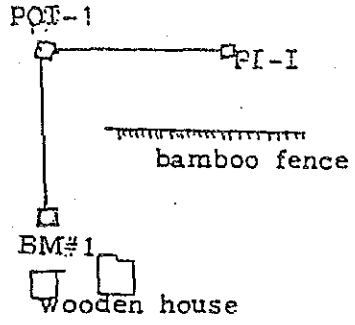


BM#4=20x20x60 cm concrete monument with ϕ 8mm×60cm on the center of steel bar, 36.90 m, to the left of Sta. 31+339.01m

TABLE 2-(6/10) DESCRIPTION OF BM-POINT

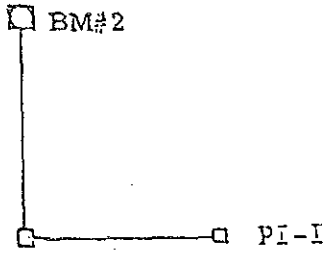
06.03 IYANG BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 27, 1988
ELEVATION	20.000



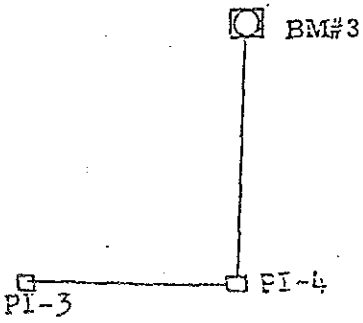
BM#1=20x20x60 cm concrete monument with ϕ 8mm×60cm, steel bar on the center, 5.50 m to the left of Sta. 109+800 m.

BM. NO.	2
DATE ESTABLISHED	Mar. 27, 1988
ELEVATION	19.754



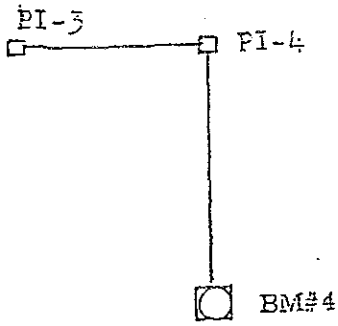
BM#2=20x20x60 cm concrete monument with ϕ 8mm×60cm steel bar on the center, 9.00 m to the left of Sta. 109+800m.

BM. NO.	3
DATE ESTABLISHED	Mar. 27, 1988
ELEVATION	19.433



BM#3=20x20x60 cm concrete monument ϕ 8mm×60cm, steel bar on the center, 3m to the left of Sta. 110+180 m.

BM. NO.	4
DATE ESTABLISHED	Mar. 27, 1988
ELEVATION	19.553

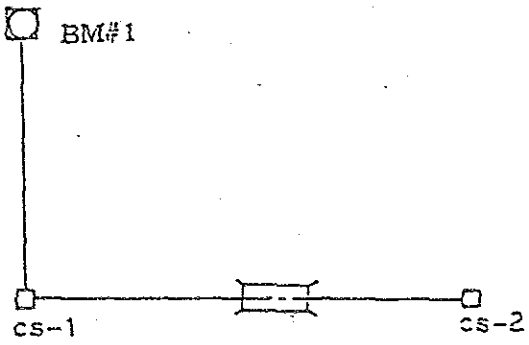


BM#4=20x20x60cm concrete monument with ϕ 8mm×60cm steel bar on the center, 9m to the right of Sta. 110+180.

TABLE 2-(7/10) DESCRIPTION OF BM-POINT

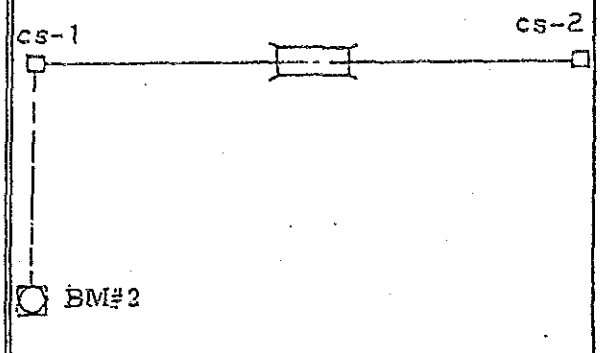
07.01 BANBAN BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 19, 1988
ELEVATION	20.000



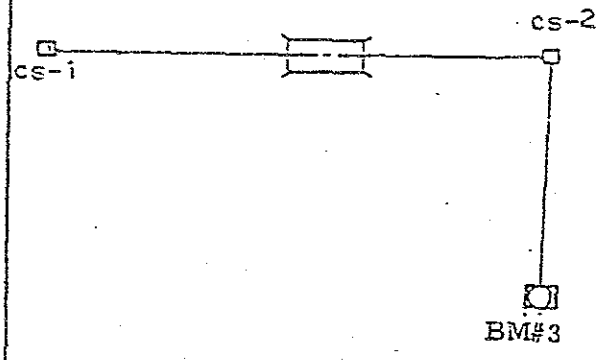
BM#1=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 40.31 m to the right of Sta. 60+980

BM. NO.	2
DATE ESTABLISHED	Mar. 19, 1988
ELEVATION	17.767



BM#2=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 40.50 m to the left of Sta. 60+991

BM. NO.	2
DATE ESTABLISHED	Mar. 19, 1988
ELEVATION	16.964



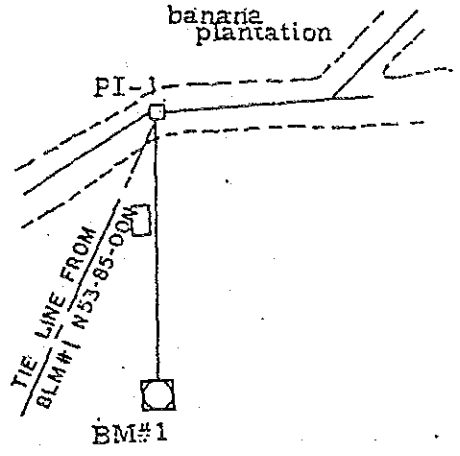
BM#3=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 33.5 m of Sta. 61+320.00m

BM. NO.	
DATE ESTABLISHED	
ELEVATION	

TABLE 2-(8/10) DESCRIPTION OF BM-POINT

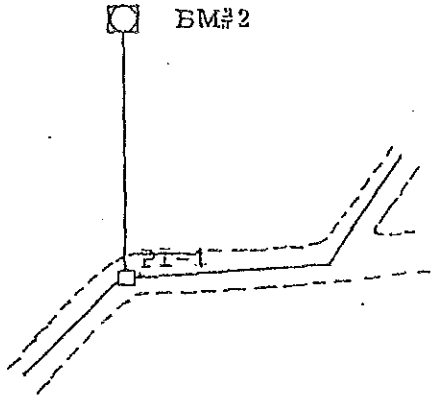
07.02 CAMPACAS BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 24, 1988
ELEVATION	400.00



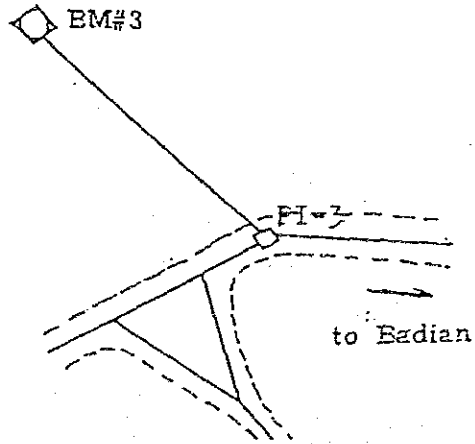
BM#1=20x20x60 cm concrete monument w/ ϕ 8mm×60cm on the center of steel bar, 9.00 m to the right of Sta. of CS-1

BM. NO.	2
DATE ESTABLISHED	Mar. 24, 1988
ELEVATION	400.928



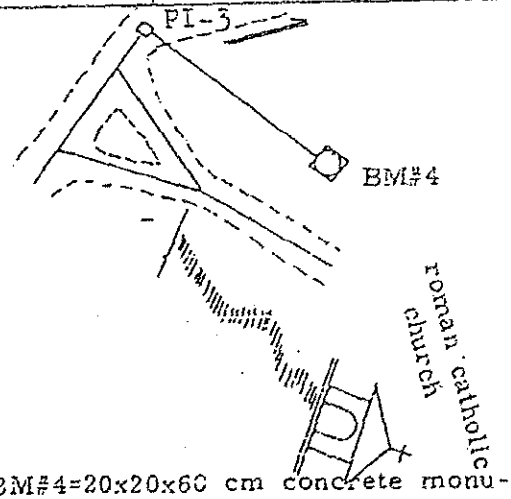
BM#2=20x20x60 cm concrete monument w/ ϕ 8mm×60cm on the center of steel bar, 3.00 m to the left of control Sta. 1

BM. NO.	3
DATE ESTABLISHED	Mar. 24, 1988
ELEVATION	393.362



BM#3=20x20x60 cm concrete monument, w/ ϕ 8mm×60cm on the center of steel bar 10.00 m to the left of CS-3

BM. NO.	4
DATE ESTABLISHED	Mar. 24, 1988
ELEVATION	396.860

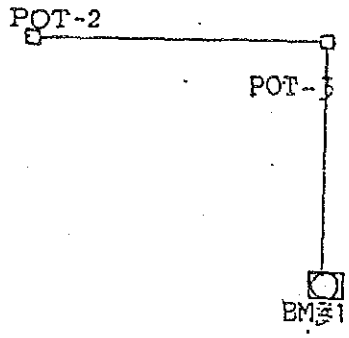


BM#4=20x20x60 cm concrete monument w/ ϕ 8mm×60cm , on the center of steel bar, 9.50 m, to the right of CS-3.

TABLE 2-(9/10) DESCRIPTION OF BM-POINT

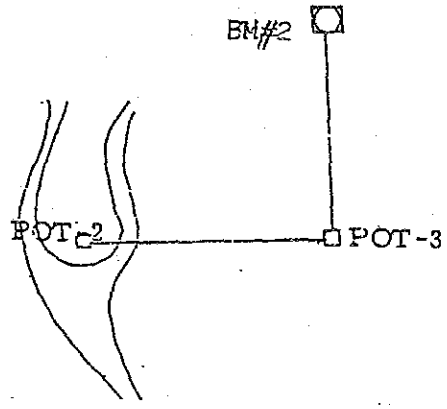
08.04 TALISAYAN BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 11, 1988
ELEVATION	300.000



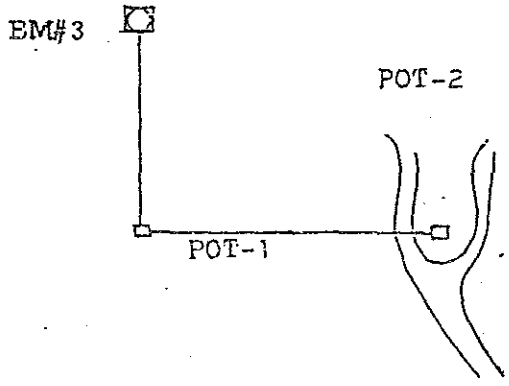
BM#1=20x20x60 cm concrete monument, w/ ϕ 8mm×60cm steel bar on the center, 30m to the right of control Sta. 1

BM. NO.	2
DATE ESTABLISHED	Mar. 11, 1988
ELEVATION	299.310



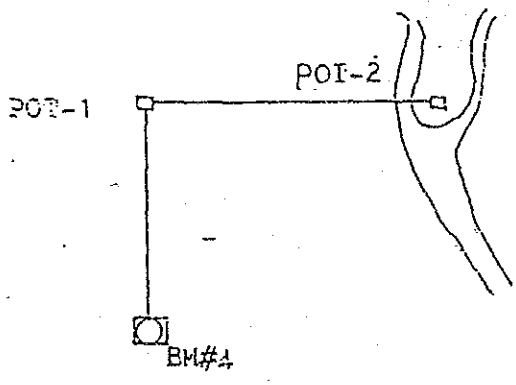
BM#2=20x20x60 cm concrete monument w/ ϕ 8mm×60cm on the center of steel bar, 3.50 m to the left of control Sta. 3

BM. NO.	3
DATE ESTABLISHED	Mar. 11, 1988
ELEVATION	299.660



BM#3=20x20x60 cm concrete monument w/ ϕ 8mm×60cm on the center of steel bar, 30.00 m to the left of control Sta. 1

BM. NO.	4
DATE ESTABLISHED	Mar. 11, 1988
ELEVATION	298.962

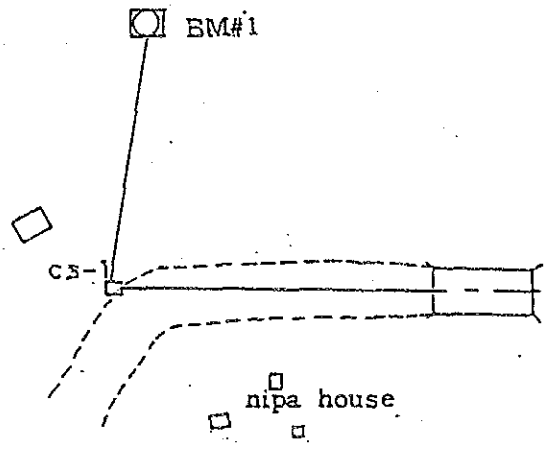


BM#4=20x20x60 cm concrete monument with ϕ 8mm×60cm on the center of steel bar, 30.00m to the right of control Sta. Sta. 1

TABLE 2-(10/10) DESCRIPTION OF BM-POINT

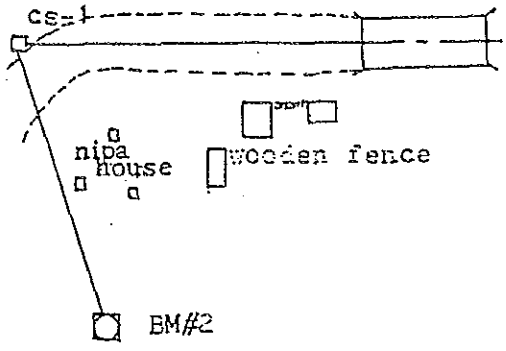
10.01 HAYANGABON I BRIDGE

BM. NO.	1
DATE ESTABLISHED	Mar. 25, 1988
ELEVATION	20.000



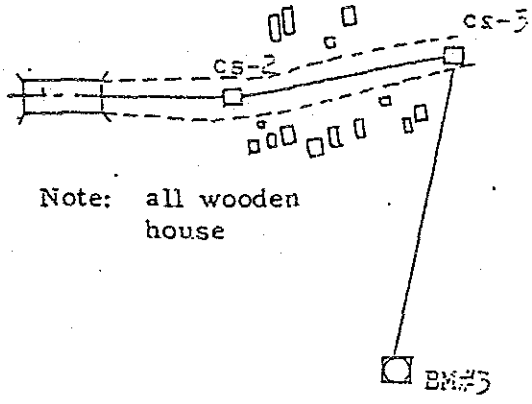
BM#1=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 21 m to the right of Sta. 1202+485.5 m

BM. NO.	2
DATE ESTABLISHED	Mar. 25, 1988
ELEVATION	18.566



BM#2=20x20x60 cm concrete monument w/ ϕ 8mm×60cm steel bar on the center, 15 m to the right of Sta. 1202+484 m.

BM. NO.	3
DATE ESTABLISHED	Mar. 25, 1988
ELEVATION	19.369



Note: all wooden house

BM#3=20x20x60 cm concrete monument with ϕ 8mm×60cm steel bar on the center, 32.5im to the right of Sta. 1202+782.m.

BM. NO.	
DATE ESTABLISHED	
ELEVATION	

APPENDIX 6

GEOTECHNICAL SURVEY

TABLE 1 QUANTITY LIST OF GEOLOGICAL SURVEY

Bridge No.	Name of Bridge	Location	Boring No.	Boring Depth (m)	Soil Common	Soil Hard	SPT	Undisturbed Sampling	Laboratory Test Unit Weight	Laboratory Test NMC	LL	PL	HA	QU	Remarks
04.01a	BINAMBANG	Km. 100 + 759.50 Batangas Province	1	15.0	10.0	5.0	10	0	0	10					
			2	15.0	8.0	7.0	9	0	0	6					
			3	15.0	9.0	6.0	12	0	0	8					
			4	15.0	8.0	7.0	12	0	0	9					
04.03a	LEVISTE II	Km. 92 + 425.62 Batangas Province	1	18.0	12.5	5.5	14	0	0	14					
			2	16.0	11.0	5.0	14	0	0	12					
			3	16.0	11.0	5.0	14	0	0	14					
			4	15.0	10.0	5.0	15	0	0	16					
04.04b	LUMANG BAYAN	Km. 34 + 954 Mindoro Occidental	1	15.0	7.0	8.00	13	0	0	10					
			2	15.0	8.0	7.00	12	0	0	9					
			3	15.0	8.0	7.0	11	0	0	8					
			4	15.0	8.0	7.0	12	0	0	10					
04.05b	OLANGOAN	Km. 74 + 524 Palawan Province	1	15.0	9.0	6.0	13	0	0	11					
			2	15.0	4.0	11.0	3	0	0	3					
			3	15.0	8.0	7.0	10	0	0	9					
05.03	NARANGASAN I	Km. 31 + 145 Masbate	1	22.0	17.0	5.0	19	0	0	19					
			2	15.0	5.0	10.0	9	0	0	9					
			3	18.2	13.0	5.2	15	0	0	15					
06.03	IYANG	Km. 109 + 962 Iloilo Bridge	1	15.1	6.0	9.1	13	0	0	13					
			2	15.1	4.0	11.1	11	0	0	11					
07.01	BANBAN	Km. 62 + 140 Cebu Province	1	30.0	25.0	5.0	20	3	3	20					
			2	30.0	25.0	5.0	20	3	3	20	13	13	13	6	
07.02	CAMPACAS	Km. 97 + 589.48 Cebu Province	1	16.0	11.0	5.0	15	0	0	15					
			2	16.0	11.0	5.0	15	0	0	15					
08.04	TALISAYAN	Km. 0 + 150 Leyte Province	1	16.8	10.0	6.8	13	0	0	9					
			2	19.0	14.0	5.0	16	0	0	14					
			3	18.0	12.0	6.0	15	0	0	12					
10.01	MAYANGABON I	Km. 1202 + 586 Surigao del Norte Province	1	15.0	6.0	9.0	5	0	0	3					
			2	15.0	9.0	6.0	6	0	0	0					
			3	15.0	8.0	7.0	6	0	0	2					
	TOTAL		30	506.2	307.5	198.7	372	6	6	325	13	13	13	6	

Bridge No. 04.01a Name of Bridge BINAMBANG

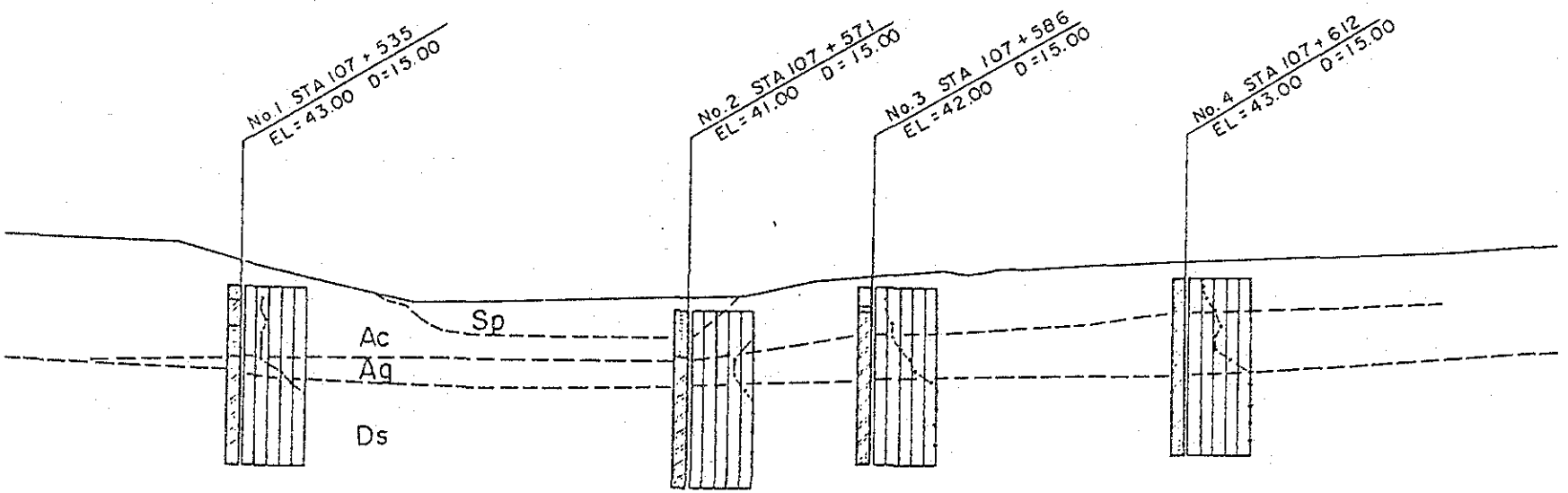


FIGURE 1 (1/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 04-01n Name of Bridge BINAMBANG

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test MC(%)	Thick-ness(m)	N-Value	Soil Test MC(%)	Thick-ness(m)	N-Value	Soil Test MC(%)	Thick-ness (m)	N-Value	Soil Test MC(%)
Sp	Spillways	Rock blocks (tuff)	only Bh-2														
	Basement	Breccia	0-3.0m	3.0m	N>50	-	-	-	3.0	N>50	50	-	-	-	-	-	-
		(unnatural)															
Ac	Present river-deposits	clayey sand (fine sand)	0	2.5	10		10	26					10	26		10	40
		sandy clay				6.5			-	-	-	6.5			2.5		
		alternation	6.5	6.5	19		12	41					10	47		13	42
		(alluvial fan)															
Ag	Flood plain-deposits	clayey sand with gravel	2.5	2.5	30		30	41					33	28	4.5	20	29
						2.5			3.0	35	28	1.5					
		(alluvial fan)	9.0	3.0	48		39	46					48	29		24	44
Ds	Terrace-deposits	stiff sand gravel	6.0	6.0	50 0	6.0	N > 50	46	6.0	N > 50	-	7.0	N > 50		8.0	N > 50	22
		(dilivium deposits)	15.0	9.0													23
Total						15	12	10	15	9	6	15	12	8	15	12	9

Bridge No. 04.03a Name of Bridge LEVISTE II

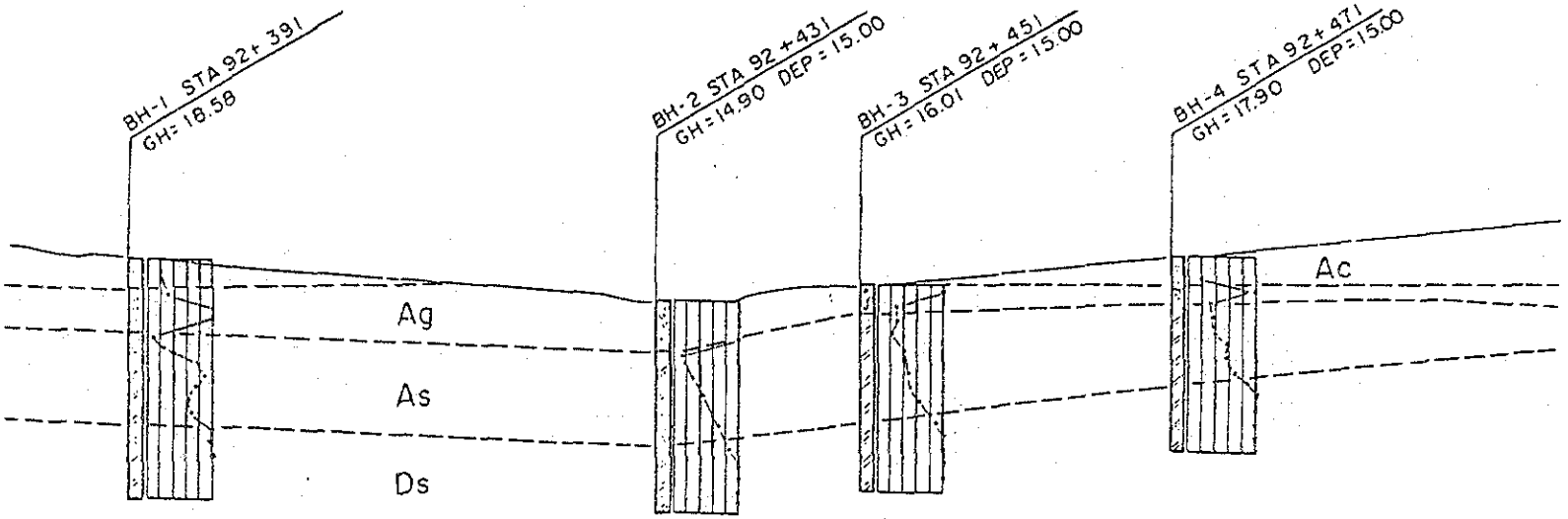


FIGURE 1 (2/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 04-03a Name of Bridge LEVISTE II

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness(m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)
Ag	River deposits	Boulder (Andesite or Basalt)	0	2.0	Boulder zone N≥50	sand clay 2.0	10	25	Gravel boulder		33				Silty sand		
		Gravel			sand zone	sand with boulder	17		3.5	N>50		1.5	N>50	29	2.0	11	39
		Sand, sandy clay	3.5	3.5	N=17	2.0	56	44			36				sandy Silt (boulder)	N>50	43
As	Flood Plain Deposits	Gravel sand (silty sand)	1.5	3.0	5		55	40	3.5	10	24		14	12		14	35
		clay included				3.0						5.5			5.0		
		Boulder and gravel	80	8.5	28 (Ave. 15)		12	44		17	34		26	26		28	29
Ds	Diluvium deposits	Sand	7	7	30		37	36		30	22		30	18		32	35
		included gravel				11.0			9.0			9.0			7.0		
			15	7.5	N>50		N>50	40		N>50	35		70	20		N>50	45
Total						18.0	14	14	16.0	14	14	16.0	14	14	15.0	15	15

Bridge No. 04.04b Name of Bridge LUMANG BAYAN

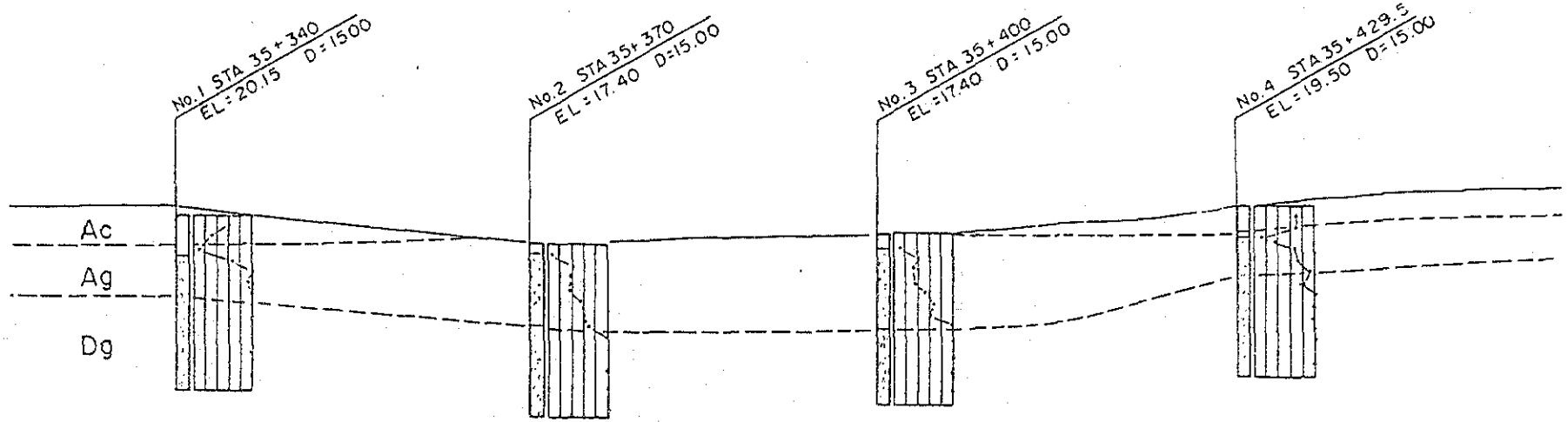


FIGURE 1 (3/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 04.04b . Name of Bridge LUMANG BAYAN

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)
Ac	Flood plain deposits	silt, sand (fine)	0	7	5		5	8		5	9		6	9		6	16
		gravel (10 less andesite limestone schist				7			7			8			6		
Ag		(Alluvium	8	8	31		36	27		31	13		31	10		36	29
Dg	Flood deposits	gravel boulder cobble is limestone	7	7	50/16	8	46	7	8	50	8	7	50/16	9	9	42	11
										50/12							
		(Diluvium)	15	8			N > 50	11			13					50/5	15
Total						15	13	10	15	12	9	15	11	9	15	12	10

Bridge No. 04.05b Name of Bridge OLANGOAN

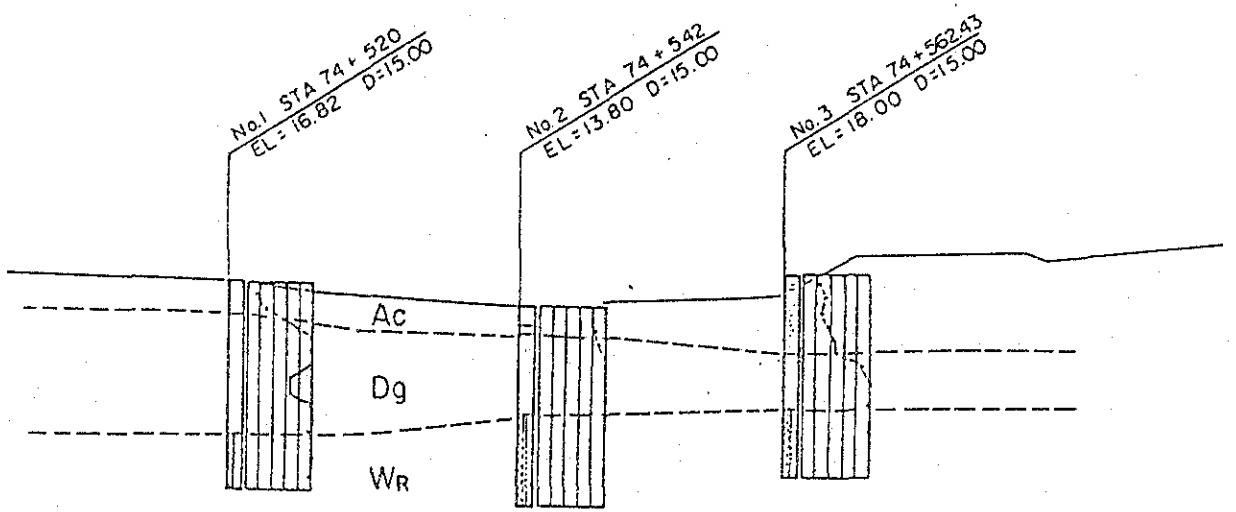


FIGURE 1 (4/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 04-05b Name of Bridge OLANGOAN

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test (%)	Thick-ness (m)	N-Value	Soil Test (%)	Thick-ness (m)	N-Value	Soil Test (%)	Thick-ness (m)	N-Value	Soil Test (%)
Ac	silt clay	silt and clay	0.0	2.0	13	2.0 clay	8	12	0-2 clay 0-1.5 Br. clay 1.5-2 clay	41	3	0	13	12			
		with gravel	6.0	6.0	23		16	14		N > 50	11	6.0	23	21			
Dg	sand	sand gravel	6.0	4.0	45	9.9	N > 50	10	4.0	N > 50	-	6.0	45	19			
	gravel		11.5	8.9	N > 50			15	8.0			10.0	N > 50	20			
WR	weathered rock	boring core rocks fragment breccia rich	8.0	3.1	N > 50	3.1	N > 50	-	8.0	N > 50	-	10.0 15.0	N > 50	-			
		breccia is (weathered rocks)	15.0	7.0													
Total						16	13	11	15	3	3	15	10	9			

Bridge No. 05.03 Name of Bridge NARANGASAN

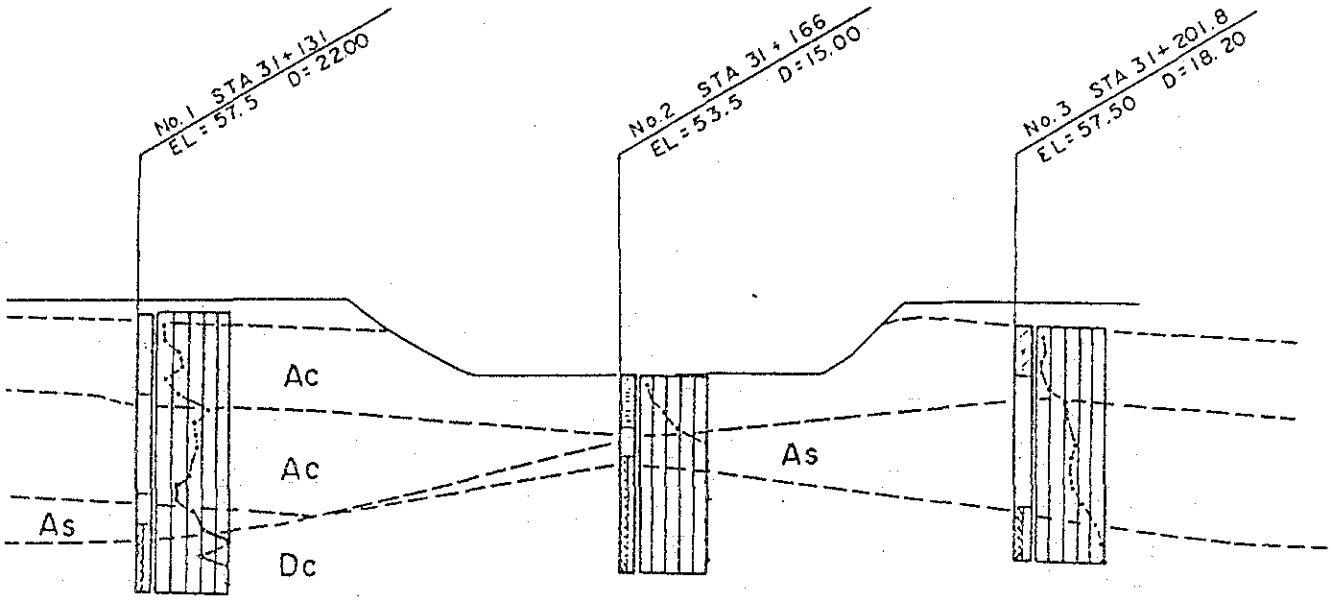


FIGURE 1 (5/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 05.03 Name of Bridge NARANGASAN

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)
Ac	Flood plain deposits	clay silt fine sand	0 5.5	4.5 5.5	3 12	5	4 13	33 46	4.5	5 18	26 33	5.5	3 8	20 25			
As	Flood plain deposits	clay silt fine sand	4.5 16	1.5 11.0	16 43	11	16 34	20 38	1.5	28	25 28	8.5	22 34	46			
Dc	Diluvium deposits	weakly cemented mudstone diluvium	6 20	4.0 8.0	N > 50	6	N > 50	22 38	—	N > 50	—	4.0	43 60	1			
Total						30	10	10	15.0	9	9	10.2	15	15			

Bridge No. 06.03 Name of Bridge IYANG

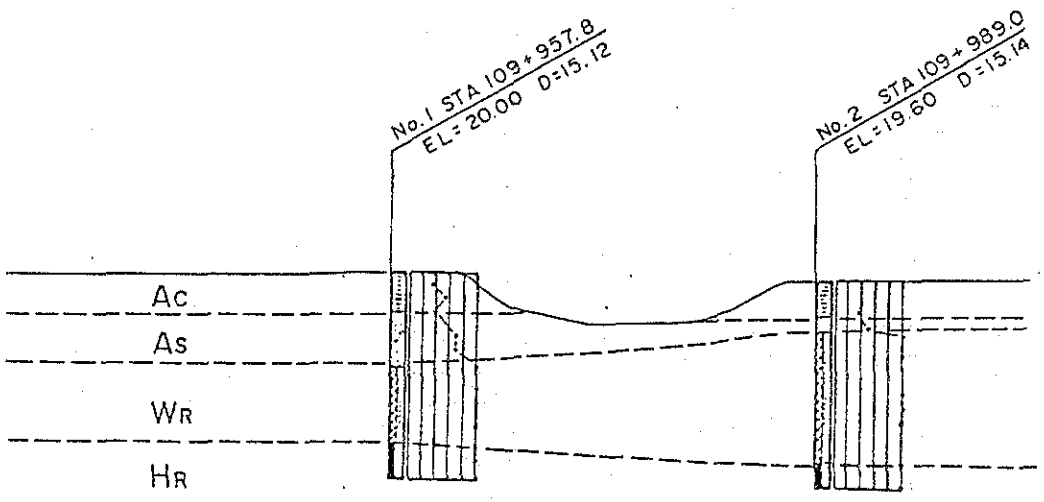


FIGURE 1 (6/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 08-03 Name of Bridge IYANG

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)
Ac	cohesive soil	gravel mixed clay (alluvium deposits)	0	4.0	17	5.0	18	10	4.0	17	18						
			5.0	5.0	22		27	19		22	26						
As		(alluvium deposits) silty sand															
WR	soft rock	weathered (tuffcius shale)	4.0	3.0	N 50	8.0	37	19	9.50	N 50	28						
		tertiary, pliocene	8.5	6.5			N 50	28			34						
BR	bed rock	bed rocks	8.0	1.5			Impos-sible	30		Impos-sible	-						
		weakly weathered (tuffcius shale)			N 50	2.1			1.6								
		tertiary, pliocene	15.0	2.0				32									
Total						15.1	13	13	15.1	11	11						

Bridge No. 07.01 Name of Bridge BANBAN

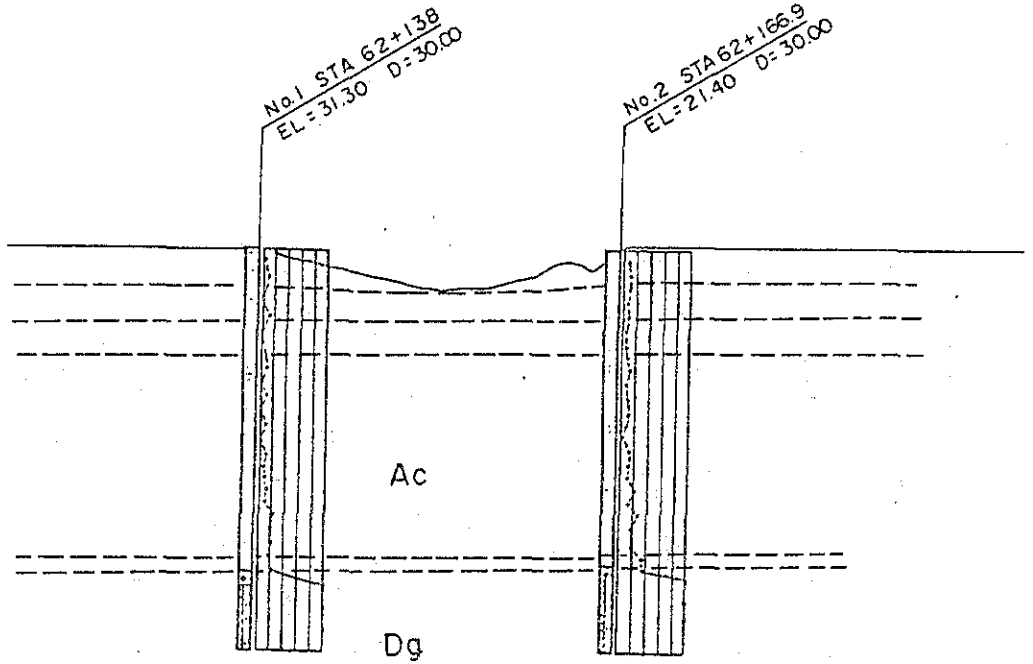


FIGURE 1 (7/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 07.01 Name of Bridge BANBAN

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness(m)	N-Value	Soil Test WC(%)	Thick-ness(m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)
Ac	Clay	clay organic sandy clay lagoon deposits	 24.00	24.00	1/45-10 (1-8)	24.0	1/45 10	40 130	24	2 10	40 120						
Dc	Sand gravel	breccia, limestone boulder clay and sand	24.00 30.00	6.0	N > 50	- 6.00	N > 50	-	6.00	-	-						
Total						30	20	20	30	20	20						

Bridge No. 07.02 Name of Bridge. CAMPACAS

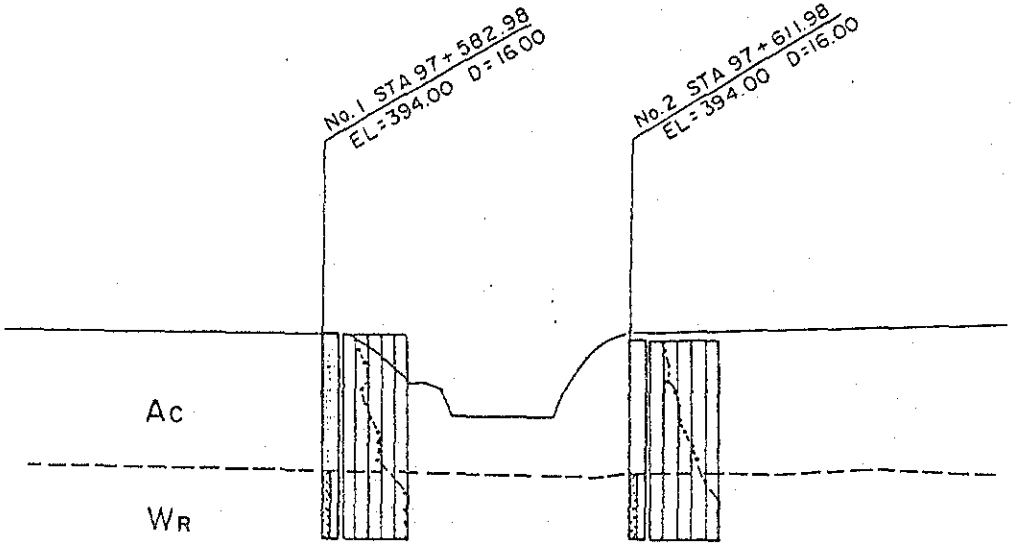


FIGURE 1 (8/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 07-02 Name of Bridge CAMPACAS

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness	N-Value	Thick-ness(m)	N-Value	Soil Test %C(%)	Thick-ness(m	N-Value	Soil Test %C(%)	Thick-ness(m	N-Value	Soil Test %C(%)	Thick-ness(m)	N-Value	Soil Test %C(%)
AC	clay	clay	0.0	8.0	11	8.0	12	24	10.0	11	23						
		silt			8.0												
		Include poor gravel (terrace deposits)	10.0	10.0	38		29	38		38	50						
WR	soft rock	weathered rock	8.0	5.0	39	7.0	39	15	5.0	N > 50	25						
		tertiary (Pliocene) weathered sand stone mudstone	15.0	7.0	N > 50		N > 50		38		37						
			15.0	7.0													
Total						16.0	15	9	16.0	15	15						

Bridge No. 08.04 Name of Bridge TALISAYAN

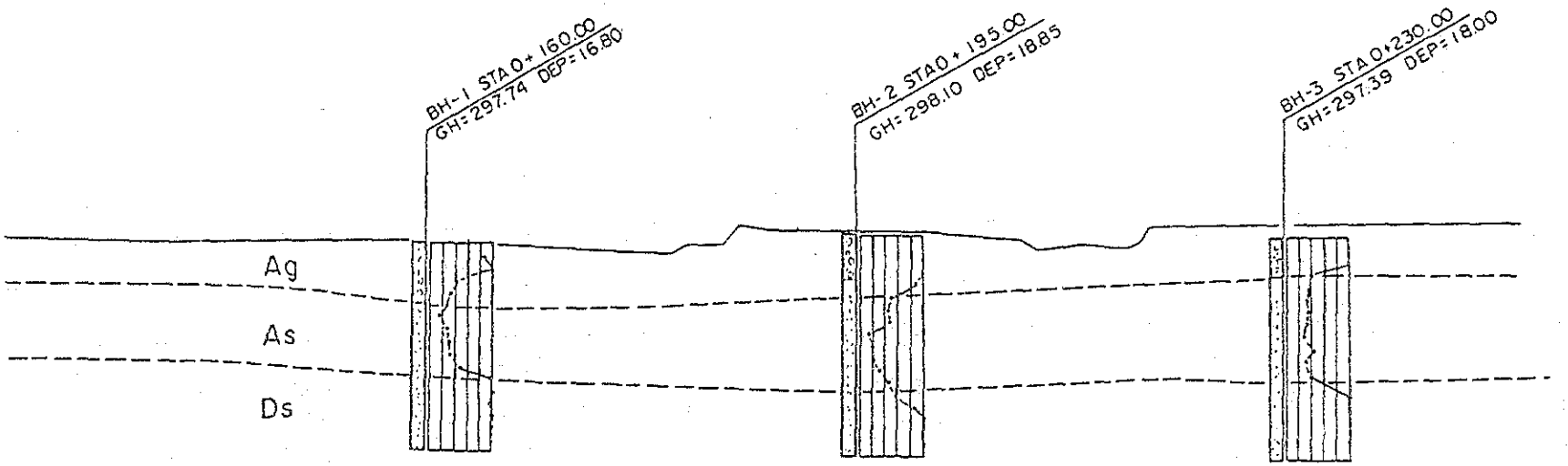


FIGURE 1 (9/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 08-04 Name of Bridge TALISAYAN

General View						Result of Boring: Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)	Thick-ness (m)	N-Value	Soil Test WC(%)
Ag	Flood plain deposits	gravel	0	4	4		7	12		45	8		8	8			
		boulder-gravel							4.0	N > 50		5.0	N > 50				
		sand-fine -course (Alluvium gravel)	5.0	5	5	5.0	22 (45-50)	20			10						
As	Flood plain deposits	fine sand (silty sand) and find gravel (gravel is andesite)	4.0	5	7		7	24		7	16		13	10			
									7.0			9.0					
			11.0	9.0	25	5.0	25	20		15	30		18	31			
Os	Delivium deposits	silty, sand and gravel breccia is wethered granite-porphyry	11.0	4	25	8.8	25			22	11		35				
					N > 50			-	7.8			4.0		-			
			18.0	8			N > 50			N > 50	27		N > 50				
Total						18.8	13	9	19.0	16	16	18.0	15	12			

Bridge No. 10.01 Name of Bridge HAYANGABON I

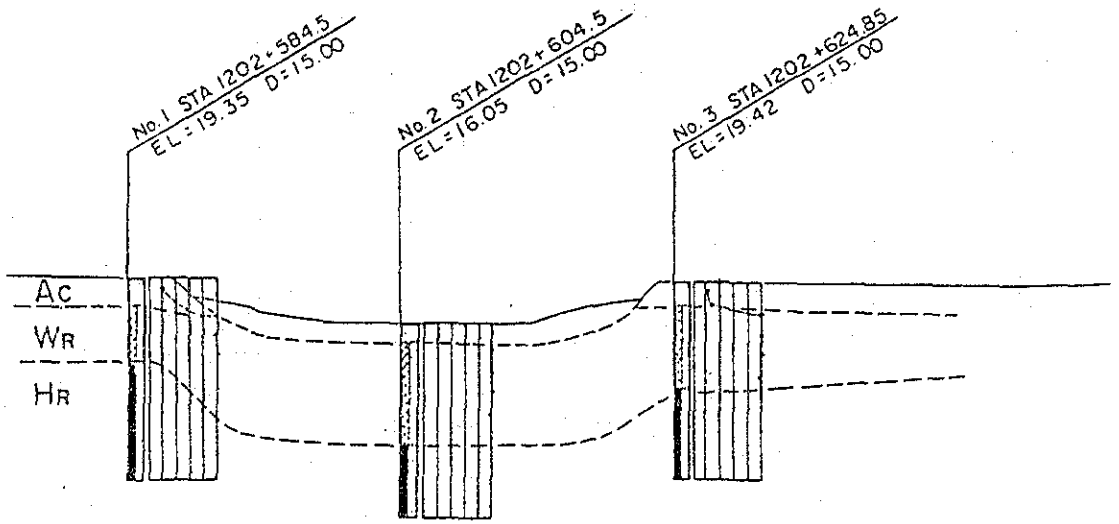


FIGURE 1 (10/10) COLUMNAR SECTION BORING LOG AND GEOLOGY

Bridge No. 10-01 Name of Bridge HAYANGABON I

General View						Result of Boring											
						Boring No. 1			Boring No. 2			Boring No. 3			Boring No. 4		
Symbol	Name of Soil (rock) Layer	Constituted Materials (Layer	Layer Depth (m)	Thick-ness (m)	N-Value	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)	Thick-ness (m)	N-Value	Soil Test NMC(%)
AC	sandy clay	sandy clay	0	1.3	10	2.0	10	41	1.3	N > 50	-	2.3	12	32			
				2.3				44									
		(Alluvium deposits)	2.3		24 (N > 50)		24							34			
WR	soft rocks	weathered bed rocks	1.3	6.0	0	4.0	N > 50	-	7.7	N > 50	-	4.7	N > 50	-			
		(diabase)	8.0	8.0	N > 50												
HR	bed rock	bed rocks	6.0	5.0													
		(diabase)	15	0.0	Impossible	0.0	-	-	0.0	N > 50	-	0.0	-	-			
Total						15	5	3	15	6	0	15	0	2			

APPENDIX 7

ANALYSIS ON SOFT GROUND

1. Calculation of Settlement

1.1 Geology Condition

Results of boring survey, soft soil layer of lagoon is deposited in thickness in Banban Bridge. Refer to Table 1.

TABLE 1 LIST OF GEOLOGY

Geology	Depth (m)	N-Value	Consistency		Natural Water Content (%)	Unconfined Compression Strength (kg/m2)	Remarks
			LL	PL			
Clay with Sand	0-2.5	2-3	88	25	9-51	---	Including plenty sand
Organic Clay	2.5-5.5	1-2	62-65	25-31	100-120	0.1061	Decayed vegetation is not homogeneous.
Clay with Sand	5.5-8.0	1-2	69	30	66-80	0.0989	Mixed sand is not regular.
Clay with Sand	8.0-9.0	2-5	80	44	50-60	---	Including small gravel
Clay	9.0-13.0	2-5	75-83	33-45	50-60	0.1268 0.1197	Homogeneous clay
Clay with Sand	13.0-14.0	2-4	81	39	49-59	---	Including sand in some parts of layer
Organic Clay	14.0-15.5	3-5	80	42	80-100	0.1038	Mixed decayed vegetation is not regular.
Clay	15.5-16.5	5-6	83	39	40-50	0.1287	Homogeneous clay
- do -	16.5-20.0	5-6	83-85	31-39	45-70	---	- do -
- do -	20.0-24.0	6-11	-	-	50-60	---	- do -
Sand and Gravel	24.0-30.0	N>50	-	-	-	---	Including block of coral rock

Note; LL = Liquid limit
PL = Plastic limit

As above, Natural Water Content exceeds Liquid limit. Clay with sand layer at the depth of 5.50 m-8.0 m and clay layer at the depth of 14.0 m-15.5 m tend to be liquid layer.

1.2 Scope for Calculation of Settlement

Scope for calculation of settlement shall be compared Maximum Consolidation pressure PC and Increased load by embankment P_c and shall be determined in case of Pc> P. Refer to Figure 1.

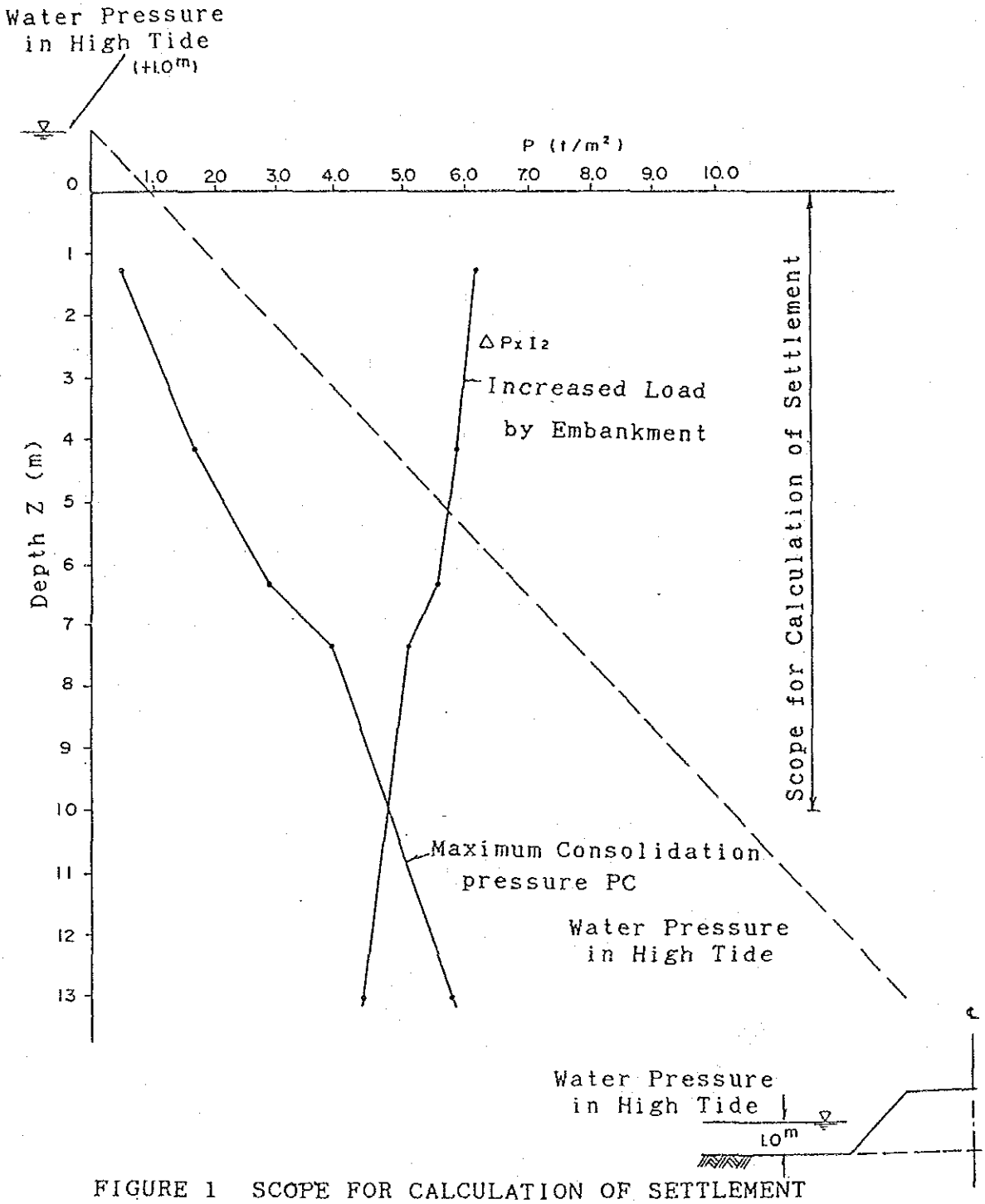


FIGURE 1 SCOPE FOR CALCULATION OF SETTLEMENT

1.3 Calculation of Amount of Settlement

(1) Calculation of Amount of Settlement for Proposed Embankment

Refer to Figure 2 and Table 2.

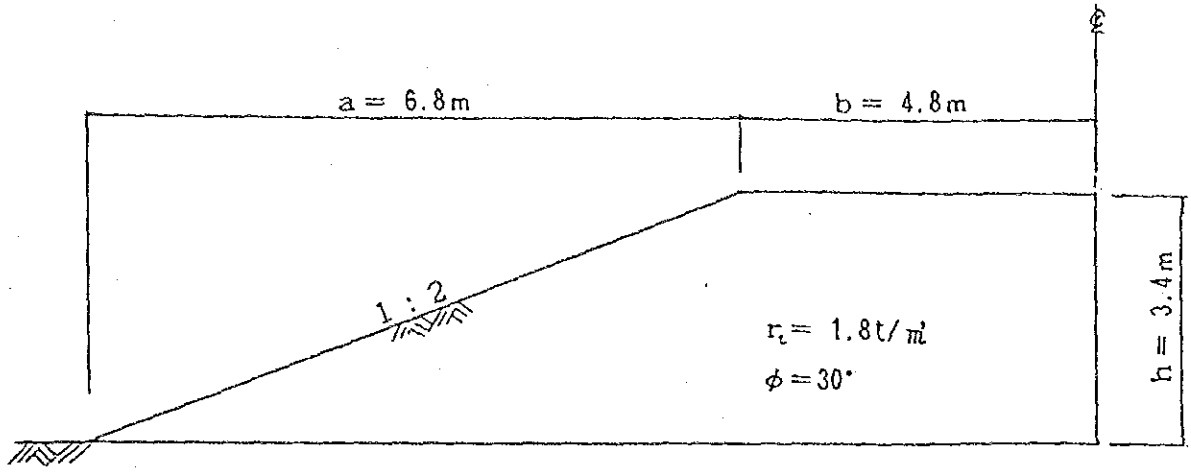


FIGURE 2 PROPOSED EMBANKMENT

TABLE 2 CALCULATION OF AMOUNT OF SETTLEMENT FOR PROPOSED EMBANKMENT

Soil Layer	Depth D (m)	Thickness of Soil Layer H (m)	Central Point Z (m)	Coefficient of Influence a/z	b/z	I'z	IZ(2I'z)	Pc	ΔP (qIz)	Calculation of Settlement eo	Po+ΔP	e1	$H\frac{e0-e1}{1+e0}$(cm)	e-logp
1	1.30	1.30	0.65	10.46	7.38	0.499	0.998	0.52	6.11	1.33	6.63	1.22	6.1	
2	4.20	2.90	2.75	2.47	1.75	0.485	0.970	1.62	5.94	2.89	7.56	2.65	17.9	
3	6.40	2.20	5.30	1.28	0.91	0.450	0.900	2.86	5.51	1.77	8.37	1.65	9.5	
4	7.40	1.00	6.90	0.98	0.69	0.420	0.843	3.82	5.14	1.27	8.96	1.20	3.1	
5	11.80	4.40	9.60	0.79	0.56	0.360	0.720	5.14	4.41	1.69	9.55	1.62	11.4	
Total													45.0	

(2) Calculation of Amount of Settlement for Existing Embankment

Refer to Figure 3 and Table 3.

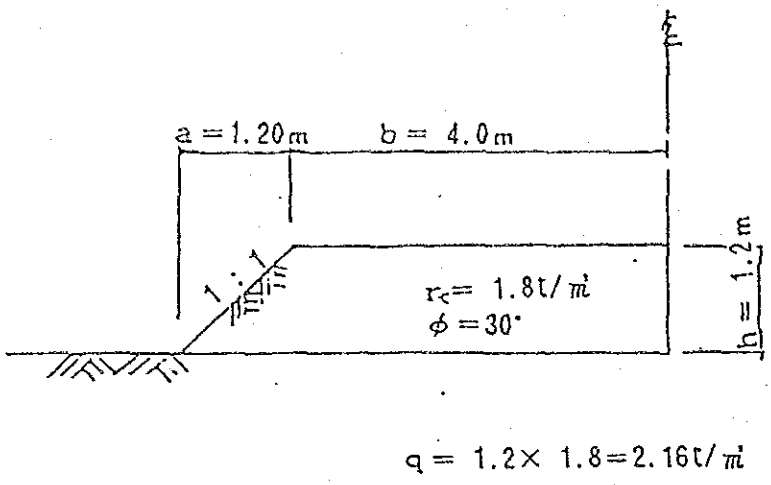


FIGURE 3 EXISTING EMBANKMENT

TABLE 3 CALCULATION OF AMOUNT OF SETTLEMENT FOR EXISTING EMBANKMENT

Soil Layer	Depth D (m)	Thickness of Soil Layer H (m)	Central Point Z(m)	Coefficient of Influence a/z	b/z	l'z	Iz(2I'z)	Po	ΔP (qIz)	Void Ratio eo	Po+ΔP	el	$H\frac{e0-el}{1+e0}$ (cm)	e-logP
1	1.30	1.30	0.65	1.85	6.15	0.499	0.998	0.52	2.16	1.33	2.68	1.28	2.8	A
2	4.20	2.90	2.75	0.44	1.45	0.470	0.940	1.62	2.11	2.89	3.73	2.72	12.7	D
3	6.40	2.20	5.30	0.23	0.75	0.380	0.760	2.86	1.64	1.77	4.50	1.72	3.9	B
4	7.40	1.00	6.90	0.17	0.58	0.330	0.660	3.82	1.43	1.27	5.25	1.25	0.9	A
5	11.8	4.40	9.60	0.12	0.39	0.250	0.500	5.14	1.08	1.69	6.22	1.68	1.6	B
Total													21.9	

Amount of Settlement by Proposed Embankment
Refer to Figure 4.

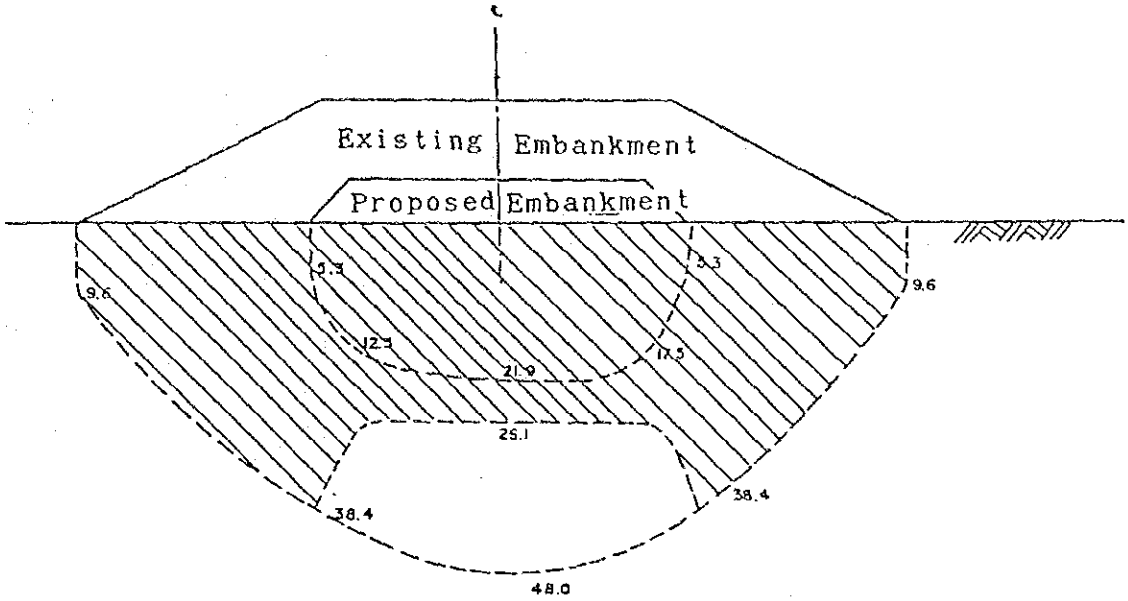


FIGURE 4 AMOUNT OF SETTLEMENT BY PROPOSED EMBANKIMENT

1.4 Calculation of Time of Consolidation

Layer of ①, ③, ④ and ⑥ are mixed with plenty sand, therefore, time of consolidation shall be calculated as drained layer. Refer to Table 4, Table 5 and Figure 5 Time of Settlement Curve.

TABLE 4 COEFFICIENT OF CONSOLIDATION Cv

Layer	Thickness of Layer H (cm)	ΔP	$\frac{1}{2}\Delta P$	Po	$P+\frac{1}{2}\Delta P$	Cv (cm^2/S)	Adopted Curve of Cv
①	130	6.11	3.06	0.52	3.58	6.0×10^{3}	A
②	290	5.94	2.97	1.62	4.59	4.0×10^{-3}	D
③	220	5.51	2.76	2.86	5.62	6.7×10^{-3}	B
④	100	5.14	2.57	3.82	6.39	5.5×10^{-3}	A
⑤	440	4.41	2.21	5.14	7.35	6.0×10^{-3}	B

TABLE 5 CALCULATION OF CONSOLIDATION

U%	10	20	30	40	50	60	70	80	90	95	100	Thickness of Layer H(cm)	Cr $Cm/aday$	$(\frac{H}{2})^2 / CV$
T	0.008	0.031	0.071	0.126	0.196	0.287	0.403	0.567	0.848	1.13		--	--	--
①	0.06	0.25	0.58	1.02	1.59	2.33	3.28	4.62	6.91	9.2		130	518.4	8.15
②	0.48	1.88	4.32	7.29	11.92	17.4	24.5	34.5	51.6	68.7		290	345.6	60.8
③	0.16	0.65	1.4	2.6	4.09	5.9	8.4	11.8	17.7	23.6		220	578.9	20.9
④	0.04	0.16	0.37	0.67	1.04	1.52	2.13	3.0	4.5	5.9		100	475.2	5.3
⑤	0.7	2.89	6.63	11.78	18.31	26.80	37.64	52.96	79.2	103.5		440	518.4	93.4

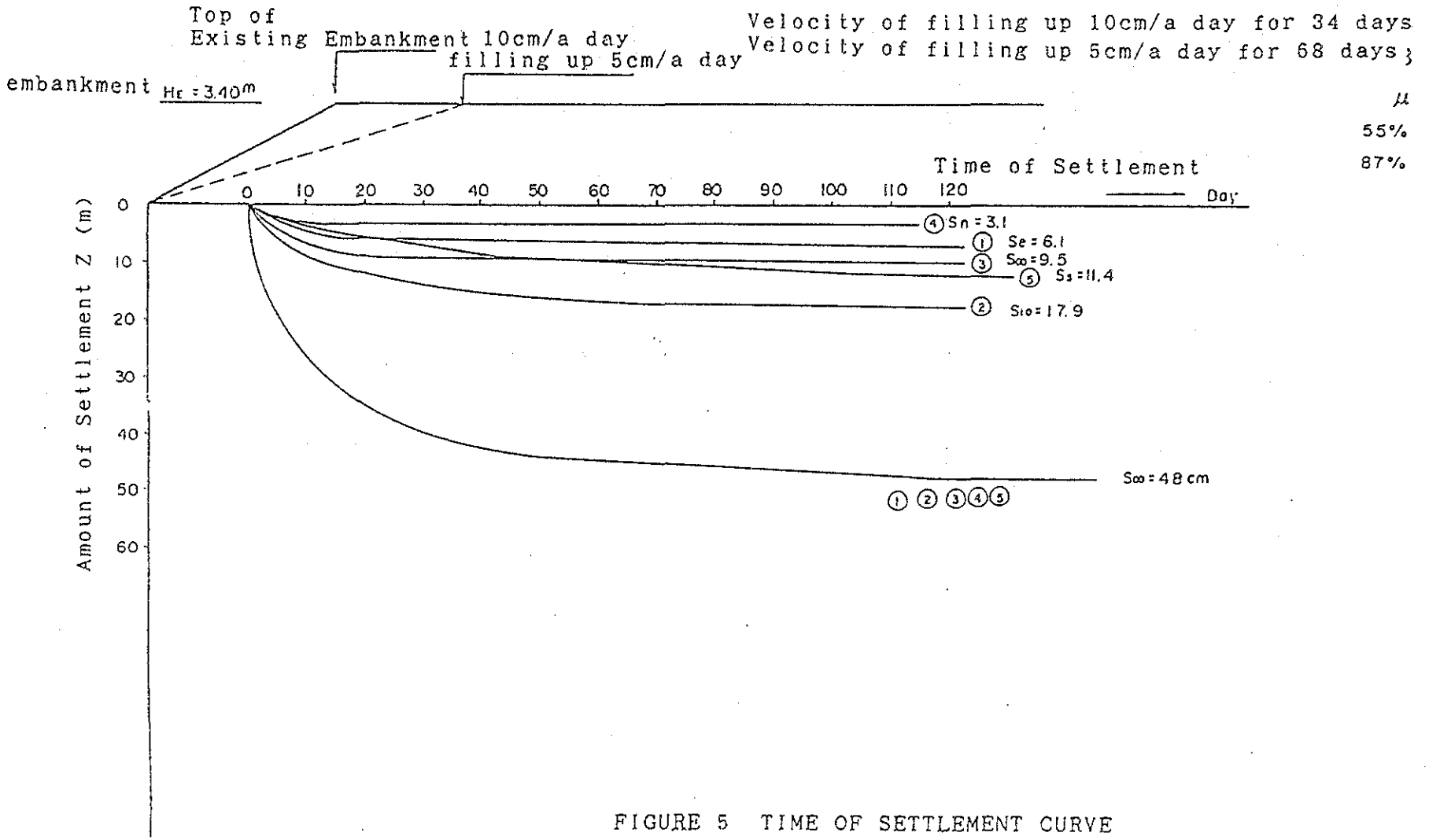


FIGURE 5 TIME OF SETTLEMENT CURVE

2. Calculation for Stability of Slope

2.1 Results of Calculation for Stability (Proposed embankment except abutment)

Objective of safety factor Fs is required more than 1.00, Fs $\geq$ 1.00. Power of Resistance, PR = Fs:MD-MR.
Refer to Table 6.

TABLE 6 POWER OF RESISTANCE

Depth of Slip Surface (m)	MD	MR	Fs	PR
1.3	45.11	37.02	0.821	8.09
4.2	202.86	210.74	1.039	0
6.4	389.27	389.94	1.001	0
7.4	545.33	538.03	0.987	7.3

Note ; MD : Moment of driving
MR : Moment of resistance
PR : Power of resistance

An average slip surface is at an angle of 60^{o} at driven wooden pile. Therefore maximum Shearing Strength is shown as follows. Refer to Figure 6.

$$Smax = PR \cos \theta = 8.1 \times 0.5 = 4.05 \text{ t/m}$$

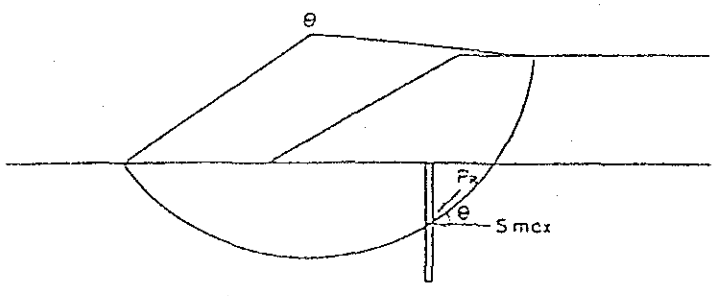


FIGURE 6 SLIP SURFACE

Shearing Strength of Wooden pile τ_s is 4 kg/cm^2 (allowable stress of a short period. If diameter of wooden pile is 20 cm, allowable stress of a short period shall be adopted for a wooden pile.

$$\tau_s \cdot Ap = 14 \times 3.14 \times 10^2 = 4.396 \text{ kg (per a wooden pile)}$$

Safety factor FS≧1.00, therefore

$$\frac{\tau_s \cdot AP}{Smax} = \frac{4.396}{4.05} = 1.00$$

Therefore, a wooden pile shall be required for per 1 m at embankment.

2.2 Results of Calculation for Stability (Abutment)

Results of calculation for Stability and Power of Resistance at abutment are shown in Figure 7 and Table 7.

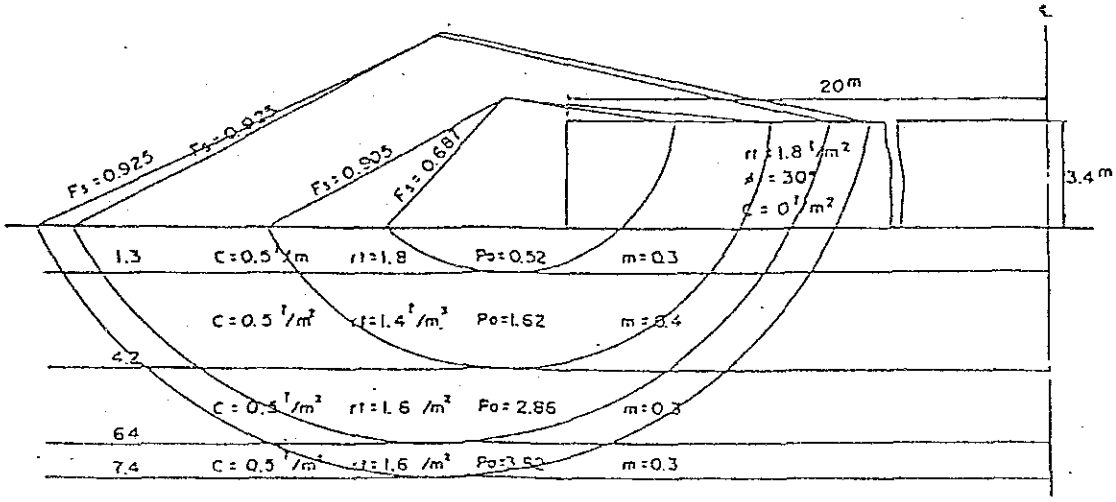


FIGURE 7 RESULTS OF CALCULATION FOR STABILITY (ABUTMENT)

TABLE 7 POWER OF RESISTANCE

Depth of Slip Surface D (m)	MD	MR	Fs	PR
1.3	54.58	37.48	0.687	17.1
4.2	174.38	157.89	0.905	16.5
6.4	362.02	335.02	0.925	27.0
7.4	440.97	407.98	0.925	32.9

Note ; MD : Moment of driving
MR : Moments of resistance
PR : Power of resistance

If Objective of Safety factor should be required more than 1.00, $Fs \geq 1.0$. Power of Resistance is shown as above. Slip surface is at an angle of 60° at a driven wooden pile. Therefore Maximum sheering Strength is shown as follows.

$$Smax = PR \cos\theta = 32.9 \times 0.5 = 16.5 \ t/m^2$$

If sheering strength of a wooden pile τs is 14 kg/cm^2 (a short period), formula is expressed as follows.

$$\tau s \cdot AP = 14 \times 3.14 \times 10^2 = 4.396 \ kg$$ (per a wooden pile, Diameter of a wooden pile is 20 cm)

$$\tau s \cdot AP/Smax = 6.5/4.4 = 3.7 \ piles/m$$

Therefore 4 wooden piles shall be required for per 1 m at abutment. Results of Calculation for stability, method of pile net should be adopted between 7.0 m - 8.0 m from abutment. Refer to Figure 8 as follows.

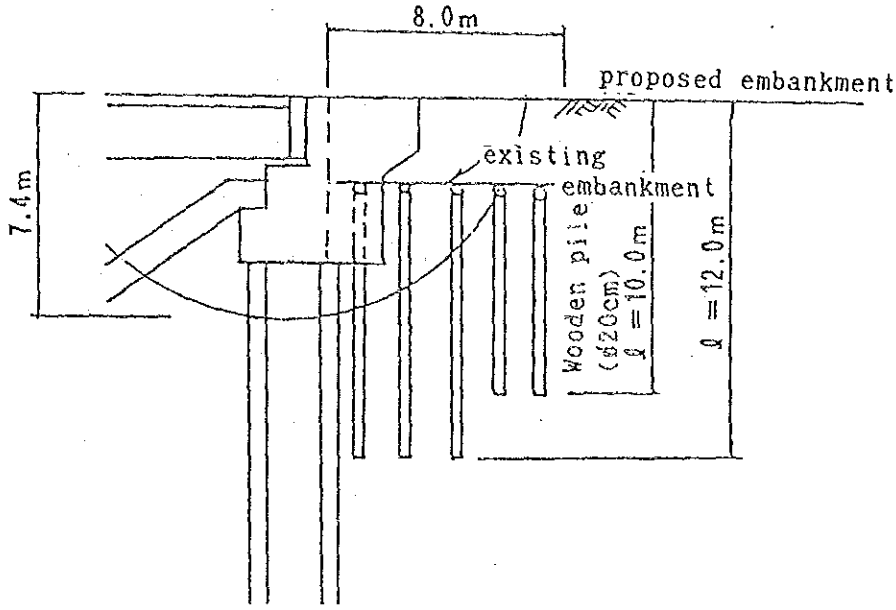


FIGURE 8 METHOD OF PILE NET

The strength of net of bamboo is assumed that C is 1t per m^2 and Safety factor, Fs is more than 1.00. Therefore embankment can be stabilized.

3. Measure of Settlement of Embankment

(1) Settlement of Embankment

. Concrete pavement is planned at bridge approach and embankment should be required the end of Settlement for Constirubion of pavement structure.

. As results of review, if we subtract amount of settlement of existing embankment from amount of settlement of proposed embankment, non-uniform settlement will be arisen 26.1 cm at center of embankment and will be arisen 38.0 cm at shoulder of embankment.

(2) Stability of Embankment

. To use sand for materials of embankment, proposed embankment is not stabilized ($\phi=30^{o}$, $C=0t/m^2$, $rt=1.8t/m^2$). Objective of Safety factor FS is required more than 1.00, $F_S \geq 1.00$ (Velocity of filling up 5cm/a day, top of embankment is U=80%)

(3) Measure of Settlement of Embankment

. Settlement and stability of embankment should be reviewed and measure should be required to reduce differential settlement and increase Safety factor. Therefore, Method of Pile net is the most suitable for measure and net of bamboo and coconut tree are used as a net and a wooden pile.

(4) Review of Method of Pile Net

Strength of a net of bamboo and a wooden frame should not be considered for review in this case. the shearing strength of a net of bamboo is estimated $1t/m^2$ ($Rn=1t/m^2$) and Safety factor is more than 1.00 ($Fs \geq 1.00$).

. Bearing Capacity and required the wooden pile
Length of a wooden pile is 12.0m (The depth of slip surface is 7.4cm and should be penetrated 1/3 of length of a pile.)

Diameter of a wooden pile is ø20.0cm.

Point bearing capacity of a wooden pile is expressed as follows.

$$qa1 = 5qu \times Ap = 5 \times 1.0 \times 0.1^2 \times 3.14$$
$$= 0.157 \text{ t/a pile}$$

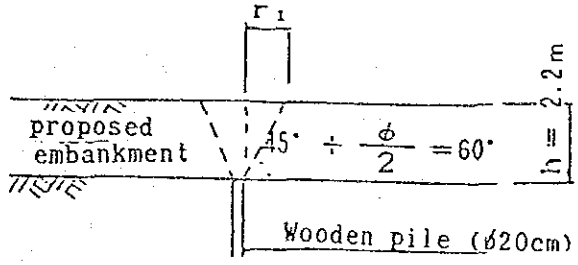
Skin friction is expressed as follows

$$qa2 = \frac{qu}{2} \times \text{ø}c \times Lc = 0.5 \times 2 \times 3.14 \times 0.1 \times 12$$
$$= 3.768 \text{ t/a pile}$$

$$qa1 + qa2 = 3.925 \text{ t/a pile}$$

Load of embankment, $P = 2.2m \times 1.8 = 3.96 t/m^2$ (except existing embankment) and P approximates q (p=q) which is required a wooden pile per $1m^2$.

The shared area of a wooden pile for load of embankment is calculated as follows. Refer to Figure 9.



$$\text{Tan}60^0 = \frac{2.2}{r1}$$

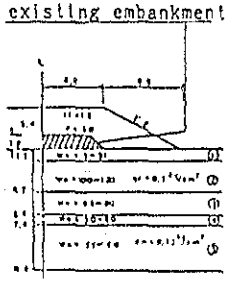
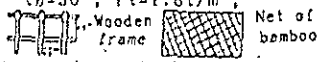
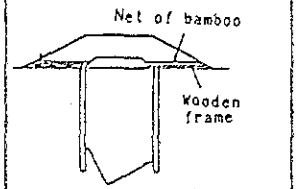
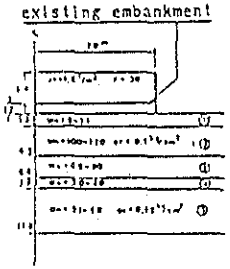
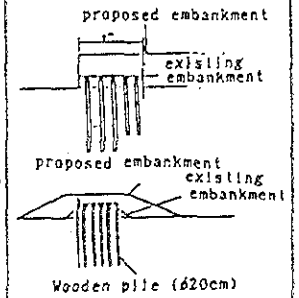
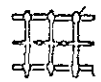
$$r1 = 1.27m$$

$$A = (\frac{1}{2} + 0.1)^2 \times 3.14$$
$$= 1.696m^2$$

FIGURE 9 THE SHRED AREA OF A WOODEN PILE

The shear area of a wooden pile, A_1 is $1.696m^2$. If a driven pipe is at a square corner of an tnterval of 1.5m, the share area is expressed as follows. $A_1/A_2 = 1.696m^2/2.25m^2 = 0.75$ and Settlement of embankment can be reduced 75 percent by the wooden piles. Table 8 shows list of results for measure of Settlement.

TABLE 8 LIST OF RESULTS FOR MEASURE OF SETTLEMENT

Classification	Cross Section for Calculation	Calculation of Settlement Depth Z (m)	Settlement amount (cm)	Calculation of Stability Depth Z (m)	Fs	Measure of Settlement	Figure
Embankment (except abutment)	existing embankment 	1 1.3 2 4.2 3 6.4 4 7.4 5 11.8 Existing embankment 1 1.3 2 4.2 3 6.4 4 7.4 5 11.8 Proposed embankment	6.1 17.9 9.5 3.1 11.4 Total 48.0 2.8 12.7 3.9 0.9 1.6 Total 21.9 26.1	1 1.3 2 4.2 3 6.4 4 7.4	0.821 1.039 1.001 0.987	. Settlement of embankment If we subtract amount of settlement of existing embankment from amount of settlement of proposed embankment, differential settlement will be arisen 26.1cm at center of embankment and will be arisen 38.0cm at shoulder. . Stability of embankment If Slope of embankment is 1:2, safety factor is less than 1.00 and is not stabilized. (ϕ=30°, rt=1.8t/m³, c=1.0t/m²)  Method of pile net should be adopted at shoulder of embankment for differential settlement. The wooden pile (coconut tree) and the net of bamboo is used.	
Embankment (abutment)	existing embankment 			1 1.3 2 4.2 3 6.4 4 7.4	0.687 0.905 0.925 0.925	. Settlement of embankment Results of calculation for stability, embankment at abutment is not stabilized. Method of pile net should be adopted. . Stability of embankment Method of pile net should be adopted for differential settlement of shoulder of embankment (ϕ=30°, rt=1.8t/m³, C=1.0t/m²) . Measure of Settlement of embankment Method of pile net should be adopted at shoulder of embankment for differential settlement. The wooden pile (coconut tree) and the net of bamboo is used.	
Remarks		Measure of settlement should not be required that the height of embankment is lower than 1.5m. (The height of existing embankment is 1.5m and is stabilized.				. Measure of settlement should be required that the height of embankment is higher than 1.5m.	

Note; Fs = Safety factor

APPENDIX 8

COUNTRY DATA

I. Land and Population

(1) Land

The Philippines consists of 7,100 islands that were formed by repeated orogenic movements and volcanic activities. The islands are divided into the three (3) main groups of Luzon, Visayas and Mindanao. Luzon is the largest island and is located furthest north. Visayas, composed of Samar, Leyte and other islands, is situated between the other two, and Midanao, the second largest island, is located furthest south.

The area of the major islands is as follows:

Island	Area (km^2)
Luzon	104,687
Mindanao	94,630
Samar	13,079
Negros	12,704
Palawan	11,784
Others	43,541
Total	280,415

(2) Climate

The Philippines is located in the tropics. The climate in the Philippines is due to its geographical location and the different winds system that prevails over the locality. The condition of the climate has been described in term of the characteristics of the distribution of rainfall received in a locality during the different month of the year. There are four climate types in the Philippines.

Over 50% of the rainfall is associated with tropical cyclones. The frequency of tropical cyclones in the Philippine Area of Responsibility (PAR) has an average of 20 times a year, while the frequency

crossing in the Philippines has an average of 8.8 times a year.

The average annual rainfall in the Philippines is 2416.3 mm. The largest average annual rainfall are 4316 mm and 4360 mm at Borongan in Samar and Hinatuan in Surigao del Sur, respectively, both of which face the Pacific Ocean and belong to the 2nd type of climate. The highest daily rainfall was 979.4 mm recorded in Baguio City on October 17, 1967. In Samar and Leyte islands, the highest daily rainfall in 387.9 mm was recorded in Catbalogan City, whereas in Mindanao Island, 564.7 mm in Surigao City. Figure 1 shows type of Climate and Distribution of Rainfall.

(3) Population

The National Capital Region, an integrated community composed of 4 cities and 13 municipalities, holds a population density of 9,317.4 persons per each square kilometer, as compared to 160.3 for the whole country. Its population has being growing at a much higher rate.

Table 1 shows comparative figures of the population, and density of each region.

II. Economy

(1) National Economy

The decade of the 1970's witnessed substantial growth in the Philippines economy. Real Gross National product (GNP) increased at an average yearly rate of 6.2 percent from 1972 to 1980. However, the early 1980's was a period of relatively slower growth in the Philippine economy as an effect of the worldwide economic recession precipitated by the oil crisis.

This moreover, continued to pose difficulties for the Philippine economy until the early part of 1983. As a result of this tight financial situation, the

maturities of Philippine borrowings became shorter while interest rates became higher. The declining pace of the economy continued until it reached the lowest fall in GNP in 1984 which gave a negative growth of 5.3%. The negative growth of 2.5% in 1985 showed a gradual recovery of the economy, which was actually the start of the Philippine economic recovery, from a negative growth to a positive growth of 1.2% in 1986 to a rapid growth until the early part of 1987 which was estimated at 5.4%.

The relatively higher growth the country is currently experiencing is expected to continue as the necessary structural reforms within the economy are currently being instituted under the new leadership.

(2) Regional Economy

A review of past regional economic performance reveals that different regions of the country showed wide variations in growth and development as exhibited in Table 2. Overall, more than half of the country's domestic output was contributed by only 3 regions: Metro Manila (NCR), Southern Tagalog (R-III) and Western Visayas (R-VI). The depressed regions are Regions II, VIII, IX and XII.

Poverty has been identified as a critical problem in all of the country's regions. Despite various government assistance and programs directed toward low-income groups, the situation has worsened in recent years.

Larger number of poor families and higher poverty incidences have been observed in both developed and poorer regions, pointing to the uneven distribution of incomes within the regions.

As shown in Table 3 regional poverty incidence in 1985 ranged from 44.1 percent in the National Capital Region to a high 73.2 percent in Region V. Nine of the country's thirteen regions had poverty incidences higher than the national average. The Visayas area, covering three regions, had a generally higher

proportion of poor families in the Philippines. Poverty in the rural sector is more severe than in the urban areas. Rural poverty incidence were highest of Regions V, VI, VII and VIII, with more than 70 percent of families falling below the poverty line.

In urban areas, the proportion of poor families was highest in Eastern (R-VIII) and Western (R-VII) Visayas and Northern Midanao (R-IX).

(3) Industrial Structure

By industrial sector, the service sector consistently dominated the country's economy throughout the years from 1970 to 1985, contributing 38% to 42% to the national economy. Industry was next with contributions from 30% to 37%. Agriculture had the least contribution, ranging from 25% to 29% during the same period.

The economy of the country is basically agricultural and its total land area is predominantly rural. The total arable land of the Philippines is 1,333,258 hectares. In 1986, total agricultural crop production of the country reached to 28.5 million metric tons planted to 12.2 million hectors and valued at 77.9 million. Of total production about 80% was contributed by food crops made up of palay, corn and fruits, and only 20% by commercial crops with coconuts and sugarcane as the leading commercial crops.

The largest crop producing region of the country is Region XI (Southern Midanao) contributing about 18 percent of the country's total crop production. The next largest crop producing region are Central Mindanao (R-XII) and Western Visayas (R-VI) contributing 12 percent, respectively.

These different regions of the country consists of different soil types suitable to different types of crops, thus different regions each advantages to different types of crops. The major producers of palay are Regions X, XI and XII, all in Mindanao while the major producers of coconuts are Southern Tagalog

(R-IV) and Southern Mindanao (R-XI). Sugarcane is predominantly grown in Western Visayas (R-VI) while abaca is the major crop of Bicol Region (R-V).

Table 4 shows crop production and the value of production by region. Characteristic of the Philippines Economy, Functional Classification of National Government Expenditure (1987-1992) and Existing Road Length are shown in the Table 5, 6 and 7.

III. National Development Plan

The Medium-Term Philippine Development Plan from 1987 to 1992 was formulated to guide development efforts in both the public and private sector as follows:

The plan address the fundamental problems of the people persistence of poverty and income inequality, high unemployment and underemployement, and urban/rural and regional disparities. These have been brought about by continued structural inefficiencies in the economy. Moreover, the external debt crisis experienced in 1983 has set back whatever gains had been attained in the past.

The Philippines experienced the worst economic and financial crisis in its postwar history starting in late 1983. The roots of these problems can be traced to structural weaknesses in the foundation of the economy, errors in economic management, and abuse of power by the previous regime.

Philippines development efforts in 1987-92 shall be principally directed towards the following goals: (a) alleviation of poverty, (b) generation of more productive employment, (c) promotion of equity and social justice, and (d) the attainment of sustainable economic growth.

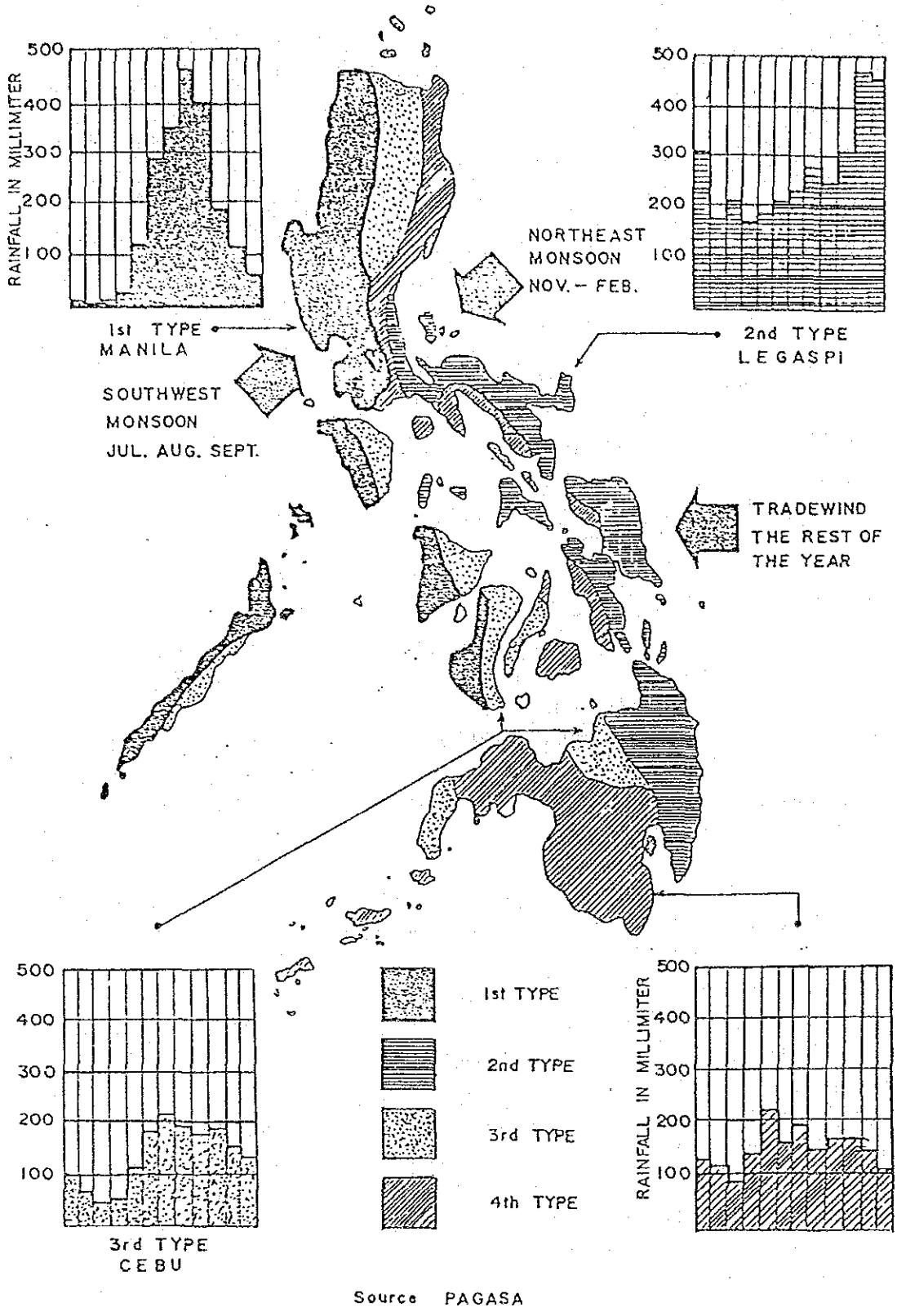


FIGURE 1 TYPE OF CLIMATE AND DISTRIBUTION OF RAINFALL

TABLE 1 POPULATION DENSITY BY REGION AND RANK
1980, 1975, 1970

	Land Area (Sq. Km.)	1980			1975			1970		
		Population (In Thousand)	Density	Rank	Population (In Thousand)	Density	Rank	Population (In Thousand)	Density	Rank
Philippines	300000	48099	160.3		42071	140.2		36685	122.3	
National Capital Region	636	5926	9317.4	1	4971	7814.5	1	3967	6236.9	1
Region III-Central Luzon	18230.8	4803	263.4	2	4210	230.9	2	3616	198.3	3
Region VII-Central Visayas	14951.4	3787	253.3	3	3387	226.6	3	3033	202.8	2
Region VI-Western Visayas	20223.1	4526	223.8	4	4146	205.0	4	3618	178.9	4
Region V-Bicol	17632.5	3477	197.2	5	3194	181.1	5	2967	168.3	5
Region I-Ilocos	21560.4	3541	164.2	6	3269	151.6	6	2991	138.7	6
Region IX-Western Mindanao	18685.1	2529	135.3	7	2048	109.6	9	1869	100.0	8
Region VIII-Eastern Visayas	21431.7	2800	130.6	8	2600	121.3	7	2381	111.1	7
Region IV-Southern Tagalog	46924.2	6119	130.4	9	5214	111.1	8	4456	95.0	9
Region XI-Southern Mindanao	31692.8	3347	105.6	10	2715	85.6	11	2201	69.4	11
Region XII-Central Mindanao	23293.2	2271	97.5	11	2070	88.9	10	1942	83.3	10
Region X-Northern Mindanao	28327.7	2759	97.4	12	2314	81.7	12	1953	68.9	12
Region II-Cagayan Valley	36403.0	2216	60.9	13	1933	53.1	13	1692	46.5	13

TABLE 2 GROSS DOMESTIC PRODUCT AND GROWTH RATE BY REGION: 1971 TO 1985
(AT CONSTANT 1972 PRICES)

	Region/Year	GRDP in Million Pesos				Growth Rate		
		1971	1975	1980	1985	1971-1975	1975-1980	1980-1985
	Philippines	53528	67455	92706	90469	6.0	6.6	9.5
	N C R	16182	20976	29959	27026	6.7	7.4	8.0
I.	Ilocos Region	2691	3144	3319	3859	4.0	1.1	3.1
II.	Cagayan Valley	1421	1809	2437	2472	6.2	6.1	0.3
III.	Central Luzon	4664	5556	7500	7996	4.5	6.2	1.3
IV.	Southern Tagalog	6434	9617	12935	12905	0.6	6.1	-0.05
V.	Bicol Region	2032	2554	3277	3069	5.9	5.1	8.7
VI.	Western Visayas	5988	5837	7331	7241	9.4	4.7	9.8
VII.	Central Visayas	3137	4754	6794	6332	1.0	7.4	8.6
VIII.	Eastern Visayas	1766	2094	2272	2205	4.4	1.6	9.4
IX.	Western Mindanao	1589	1834	3248	3235	3.6	2.1	9.9
X.	Northern Mindanao	2304	2731	4267	4349	4.3	9.3	0.4
XI.	Southern Mindanao	3552	4587	6292	6157	6.6	6.5	9.6
XII.	Central Mindanao	1768	1962	3079	3623	2.6	9.4	3.3

TABLE 3 REGIONAL POVERTY INDICATORS: 1985

Region	Total			Urban			Rural		
	Total Poverty Threshold (In ₱)	Magnitude of Poverty (000 Families)**	Incidence of Poverty (In %) ***	Total Poverty Threshold (In ₱)*	Magnitude of Poverty (000 Families)**	Incidence of Poverty (In %)***	Total Poverty Threshold (In ₱)*	Magnitude of Poverty (000 Families)**	Incidence of Poverty (In %) ***
Philippines	2,382	5,676.6	59.3	3,021	1,875.9	52.1	2,066	3,800.7	63.7
N C R	3,282	550.5	44.1	3,282	550.5	44.1			
Outs, NCR	2,285	5,126.1	61.6	2,912	1,325.4	56.3	2,066	3,800.7	63.7
I	2,374	364.9	52.3	3,093	89.7	56.2	2,139	275.2	51.1
II	2,194	246.3	54.6	2,897	31.3	48.6	2,092	215.0	55.6
III	2,550	420.0	44.4	3,153	178.5	45.2	2,104	241.5	43.8
IV	2,471	712.2	55.9	3,048	241.7	50.6	2,174	470.5	59.1
V	2,148	464.0	73.2	2,625	81.2	62.3	2,047	382.7	76.0
VI	2,449	632.4	73.1	3,069	154.1	65.0	2,249	478.3	76.2
VII	1,982	530.6	68.8	2,426	142.7	58.9	1,819	387.9	73.4
VIII	2,016	385.4	70.4	2,733	81.9	70.1	1,822	303.5	70.5
IX	2,118	316.5	65.3	2,650	47.2	61.6	2,025	269.3	66.0
X	2,262	355.4	66.2	2,952	91.7	65.7	2,022	263.7	66.3
XI	2,388	426.0	61.7	2,998	143.1	59.6	2,079	282.9	62.8
XII	2,233	272.4	65.2	2,624	42.2	56.8	2,161	230.2	67.0

* The monthly income required to satisfy 100 percent of nutritional requirements and other needs of a family of 6.
** The total number of families below the poverty line or threshold in 1985.
*** Out of the total number of families, the proportion of families that fall below the povertyline in 1985.

SOURCE: Inter-agency Working Group on Poverty Determination - NEDA, FNRI, NCSO.

TABLE 4 (1) CROP PRODUCTION BY REGION, 1986
(IN METRIC TONS)

	Ilocos	Cagayan Valley	Central Luzon	Southern Tagalog	Bicol	Western Visayas	Central Visayas	Eastern Visayas	Western Mindanao
All Crops	1,713,726	1,760,242	2,001,026	2,753,156	1,741,385	3,038,775	1,157,011	1,594,719	1,511,664
Food Crops	1,582,284	1,710,079	1,789,876	1,824,165	1,485,439	1,769,198	815,986	1,266,609	1,122,542
Palay (Rough Rice)	871,740	1,172,110	1,525,355	985,765	683,090	1,121,920	148,180	469,440	353,370
Corn (Shelled)	64,530	374,835	8,370	242,305	133,975	43,740	243,645	273,020	216,700
Fruit and nuts except Citrus	265,868	73,754	101,881	330,135	118,420	430,622	137,106	254,842	191,755
Others	241,280	67,985	121,495	262,570	83,810	392,469	119,110	247,207	185,546
Commercial Crops	131,442	50,163	211,150	928,991	255,946	1,269,577	341,025	328,110	389,122
Coconut (Products)	84,961	23,393	10,913	624,397	212,533	116,617	133,123	245,035	295,673
Sugarcane	7,576	16,615	197,127	303,218	13,536	1,149,153	205,072	61,519	8
Abaca	-	-	-	594	29,860	1,185	930	21,462	9,098
Tobacco	35,855	10,122	3,105	695	13	412	583	39	65
Coffee	1,846	4,969	230	32,971	1,215	4,793	1,445	390	17,261
Cacao	114	60	11	133	113	186	2,174	99	306
Peanut	11,117	17,394	1,954	3,051	1,118	979	19,119	844	1,661
Rootcrops	85,378	22,590	38,364	95,247	466,930	82,291	242,079	285,208	301,211
Vegetables	147,067	9,433	35,130	54,954	17,484	25,658	10,482	5,184	3,074
Others	102,446	100,790	79,251	310,751	50,347	57,425	23,089	10,702	142,968

TABLE 4(2) CROP PRODUCTION BY REGION, 1986
(IN METRIC TONS)

Crops	Northern Mindanao	Southern Mindanao	Central Mindanao	Philippines
All Crops	2,673,185	5,040,157	3,544,782	28,529,828
Food Crops	2,351,905	3,995,652	3,207,726	22,921,461
Palay (Rough Rice)	342,095	653,195	770,720	9,096,980
Corn (Shelled)	252,850	1,203,315	900,735	3,922,020
Fruits and Nuts Except Citrus	1,469,021	1,927,076	729,846	6,030,326
Others	550,159	1,320,388	725,915	4,286,367
Commercial Crops	321,280	1,044,505	337,056	5,608,367
Coconut Product	177,555	983,362	254,827	3,162,389
Sugarcane	122,711	34,690	24,091	2,135,316
Abaca	5,474	9,653	4,409	82,665
Tobacco	652	56	4,405	56,002
Coffee	40,457	26,058	4,880	136,515
Cacao	846	3,070	246	6,235
Peanut	563	809	2,163	43,907
Rootcrops	184,054	101,547	763,577	2,668,476
Vegetables	20,603	18,845	9,246	357,060
Others	49,017	50,927	288,812	729,768

TABLE 5 CHARACTARISTIC OF THE PHILIPPINES ECONOMY

	1970	1975	1980	1982	1983	1984	1985
Population (thousands)	36,850	42,070	48,320	50,740	51,960	53,170	54,380
GNP (billion pesos)	42	114	265	335	379	539	607
GDP (billion pesos)	143	195	265	279	282	268	257
GNP Growth rate (%)					1.1	-6.8	-3.8
GNP Per Capital (Pesos)		375		769	635	660	
Consumer Price Increase Rate (%)		-		10.2	10.0	50.4	23.1
Exchange Rate on US$ (Pesos)	59,044	72,479	75,114	85,400	111,127	166,987	186,073
External Accounts (US$ mil.)							
Current Account	-48	-923	-1,917	-3,212	-2,751	-1,268	8
Trade Account	-26	-1,196	-1,939	-2,646	-2,485	-679	-482
Exports	1,064	2,263	5,788	5,021	5,005	5,391	4,629
Imports	1,090	3,459	7,727	7,667	7,490	6,070	-5,111
Invisible trade Account	-141	-46	-412	-1,040	-738	-975	111
Capital Account	271	1,094	2,684	2,846	-394	750	301
Total External Account	75	-11	891	-730	-3,501	-403	952
Gold, Foreign Currency Reserves	251	1,359	3,140	1,711	864	890	1,116
Commercial Banking (mil.Rupiah)							
Total Asset	12	47	123	164	201	224	206
Deposit liabilities	7	15	45	66	76	88	100
Public Finance (mil.Pesos)							
Revenues	4,849	16,838	34,373	37,993	45,606	56,851	68,961
Expenditures	4,790	18,198	37,758	52,407	53,074	66,689	80,102
Accounts	59	-1,360	-3,385	-14,414	-7,468	-9,828	-11,141
External Debt(US$mil.)	1,562	2,043	17,390	24,166	23,871	24,381	26,700
External Debt/GNP(%)	22.1	12.9	49.4	61.5	69.9	75.8	83.7
Debt Service (US$mil.)	258	404	1,576	2,930	2,659	2,802	2,774
Debt Service/Exports(%)		12.7	19.7	36.6	32.7	35.0	35.0

Source: IMF, International Monetary Statistics yearbook, 1986
Philippines Central Bank Data

TABLE 6 FUNCTIONAL CLASSIFICATION OF NATIONAL GOVERNMENT EXPENDITURES, 1987-1992
(Percentage Distribution)

	Actual Annual average 1976-85	Estimate 1986	Projections 1987	1988	1989	1990	1991	1992	Annual Average 1987-92
Economic Services	33.0	17.3	19.9	21.6	23.9	26.3	28.4	30.3	25.1
Agriculture	7.3	3.2	3.8	5.7	6.5	7.4	8.2	9.1	6.8
Industry, trade and tourism	3.1	0.7	1.4	1.9	2.4	2.8	3.0	3.3	2.5
Utilities and infrastructure	23.5	13.4	14.6	14.0	15.0	16.1	17.2	17.9	15.8
Social Services	20.2	18.3	21.5	24.5	28.4	31.4	35.7	39.2	30.1
Education	12.3	10.2	11.5	13.2	14.1	14.9	17.1	18.7	15.0
Health	3.9	3.0	3.4	4.2	5.9	6.6	8.2	9.6	6.3
Social security and welfare	2.1	4.7	6.2	6.2	6.2	6.3	6.4	6.4	6.2
Housing and community development	1.9	0.4	0.4	0.9	2.2	3.6	4.0	4.5	2.7
Defense	14.0	6.9	7.3	7.4	8.0	8.4	8.5	8.9	8.1
General Public Services	20.0	10.0	11.3	15.7	14.7	13.7	12.3	9.6	12.9
Debt Service Fund and Net Lending[a]	11.9	47.5	40.0	30.8	25.0	20.2	15.1	12.0	23.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

a. For 1987 onwards, this item includes a portion of the external liabilities of government financial institutions to be assumed by the national government. Excludes debt service on liabilities of the Philippine Nuclear Power Plant.

Sources of Basic Data: MBM and NEDA.

TABLE 7 (1) EXISTING ROAD LENGTH, 1985 (km)

	National					City			
	Concrete	Asphalt	Gravel	Earth	Total	Concrete	Asphalt	Gravel	Total
Philippines	6132.90	5714.75	13601.18	810.29	26259.12	637.44	2016.48	1166.85	3820.77
N C R	440.47	421.64	14.04	-	876.15	281.87	832.78	159.09	1273.74
I	447.90	943.16	904.49	98.19	2393.74	8.25	183.42	118.05	309.72
II	607.02	107.95	1530.31	61.95	2307.23	-	-	-	-
III	810.59	501.19	378.08	-	1689.86	56.52	115.83	40.95	213.30
IV-A	507.04	973.72	854.66	16.30	10351.72	37.28	120.17	47.26	204.71
IV-B	23.47	265.89	1343.49	73.10	1705.95	0.64	7.46	54.91	63.01
V	624.42	401.32	961.39	47.45	2034.58	20.34	81.14	125.77	227.25
VI	314.73	590.39	1637.44	52.80	2595.36	79.80	163.05	51.31	294.16
VII	159.48	648.51	859.77	9.40	1677.16	32.43	236.68	24.10	293.21
VIII	664.81	58.84	1161.16	100.30	1985.11	39.09	2.81	20.02	61.92
IX	50.99	338.17	651.03	-	1040.19	8.22	76.89	36.31	121.42
X	639.07	311.62	1251.06	5.70	2207.45	36.10	71.20	98.91	206.21
XI	458.22	123.64	1234.97	142.95	1959.78	15.10	92.45	319.06	426.61
XII	384.69	28.72	819.31	202.14	1434.86	21.71	32.61	71.11	125.43

TABLE 7(2) EXISTING ROAD LENGTH, 1985 (km)

Region	Municipal					Provincial				
	Concrete	Asphalt	Gravel	Earth	Total	Concrete	Asphalt	Gravel	Earth	Total
Philippines	11706.25	1579.03	6318.79	3220.75	12990.63	711.57	2739.52	19443.45	5524.74	28419.28
N C R	351.18	162.02	29.36	11.78	554.34	-	-	-	-	-
I	40.44	286.70	667.64	409.74	1404.52	48.84	483.32	1678.66	659.69	2870.51
II	21.09	56.45	827.99	236.41	1141.94	8.44	159.04	1416.70	388.23	1972.41
III	202.22	213.60	465.88	155.21	1082.09	302.75	360.87	1534.95	185.66	2384.23
IV-A	279.98	217.12	252.22	114.97	885.65	132.36	498.75	954.66	308.24	1894.01
IV-B	50.03	22.16	342.84	103.87	472.55	11.47	50.30	1667.75	351.90	2081.42
V	107.07	192.40	360.93	121.16	799.68	35.02	318.15	1089.53	361.05	1803.75
VI	197.95	87.52	345.14	59.01	695.28	61.92	94.29	1966.89	106.20	2229.30
VII	97.56	137.24	445.53	228.19	930.47	13.69	169.93	1906.53	266.51	2356.66
VIII	246.93	18.12	305.44	137.95	717.13	65.39	327.39	865.55	185.12	1443.45
IX	3.31	25.58	518.10	253.71	800.80	1.68	184.36	1563.86	278.35	2028.25
X	38.25	91.72	556.34	523.88	1221.26	14.09	87.97	1907.97	663.34	2673.37
XI	39.57	33.56	753.77	429.50	1283.37	10.74	4.50	2018.59	783.61	2817.44
XII	30.58	34.84	447.61	435.37	951.50	5.17	0.67	876.83	986.85	1869.52

TABLE 7 (3) EXISTING ROAD LENGTH, 1985 (km)

Region	Barangay					Total				
	Concrete	Asphalt	Gravel	Earth	Total	Concrete	Asphalt	Gravel	Earth	Total
Philippines	-	-	90213.83	-	90213.83	9188.15	12049.78	130749.11	9721.59	161708.63
N C R	-	-	234.71	-	234.71	1073.52	1416.43	437.20	11.78	2938.93
I	-	-	11011.23	-	11011.23	545.44	1896.59	14380.08	1167.62	17989.73
II	-	-	7745.80	-	7745.80	636.55	323.44	11520.80	686.59	13167.38
III	-	-	7943.06	-	7943.06	1372.08	1191.48	10362.91	386.05	13312.52
IV-A	-	-	5428.89	-	5428.89	956.66	1809.76	7537.69	460.87	10764.98
IV-B	-	-	3782.27	-	3728.27	85.61	345.82	7191.26	532.56	8155.25
V	-	-	4012.86	-	4012.86	786.85	993.01	6550.47	547.78	8878.11
VI	-	-	7486.82	-	7486.82	654.41	935.25	11487.60	223.67	13300.93
VII	-	-	5854.05	-	5854.05	303.66	1192.36	9089.97	526.04	11112.03
VIII	-	-	5113.86	-	5113.86	1016.22	407.12	7466.02	432.05	9321.44
IX	-	-	5210.93	-	5210.93	64.20	625.00	7980.22	532.16	9201.58
X	-	-	9675.19	-	9675.19	727.60	562.51	13489.47	1204.00	15983.58
XI	-	-	9306.09	-	9306.09	523.72	254.15	13631.48	1382.98	15792.33
XII	-	-	7408.08	-	7408.08	442.14	96.84	9623.94	1627.46	11790.38