JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

No. 1

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

THE REPUBLIC OF THE PHILIPPINES

THE PROJECT FOR CONSTRUCTING BRIDGES ALONG RURAL ROADS (PHASE Ⅳ) IN THE REPUBLIC OF THE PHILIPPINES

BASIC DESIGN STUDY REPORT

NOVEMBER 1992

KATAHIRA & ENGINEERS INTERNATIONAL

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

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P R E F A C E

In response to a request from 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 IV) in the Republic of the Philippines and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Dr. Michio Okahara, Chief, Foundation Engineering Division, Structure and Bridge Department, Public Works Research Institute, Ministry of Construction and constituted by members of Katahira & Engineers International, from June 24 to August 3, 1992.

The team held discussions with the officials concerned of the Government of Philippines, and conducted afield study at the study area. After the team returned to Japan, further studies were made. Then, a mission headed by Mr. Hajime Ohiro, Deputy Manager, First Engineering Division, Engineering Department, Honshu-Shikoku Bridge Authority, was sent to the Philippines in order to discuss a draft report and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I with to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the teams.

November 1992

Kensuke Yanagiya
President
Japan International
Cooperation Agency

November 1992

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Constructing Bridges Along Rural Roads (Phase IV) in the Republic of the Philippines.

This study has been made by Katahira & Engineers International, based on a contract with JICA, from March 26, 1992 to November 10, 1992. Throughout the study, we have taken into full consideration of the present situation in the Republic of the Philippines, and have planned the most appropriate project in the scheme of a Japan's grant aid.

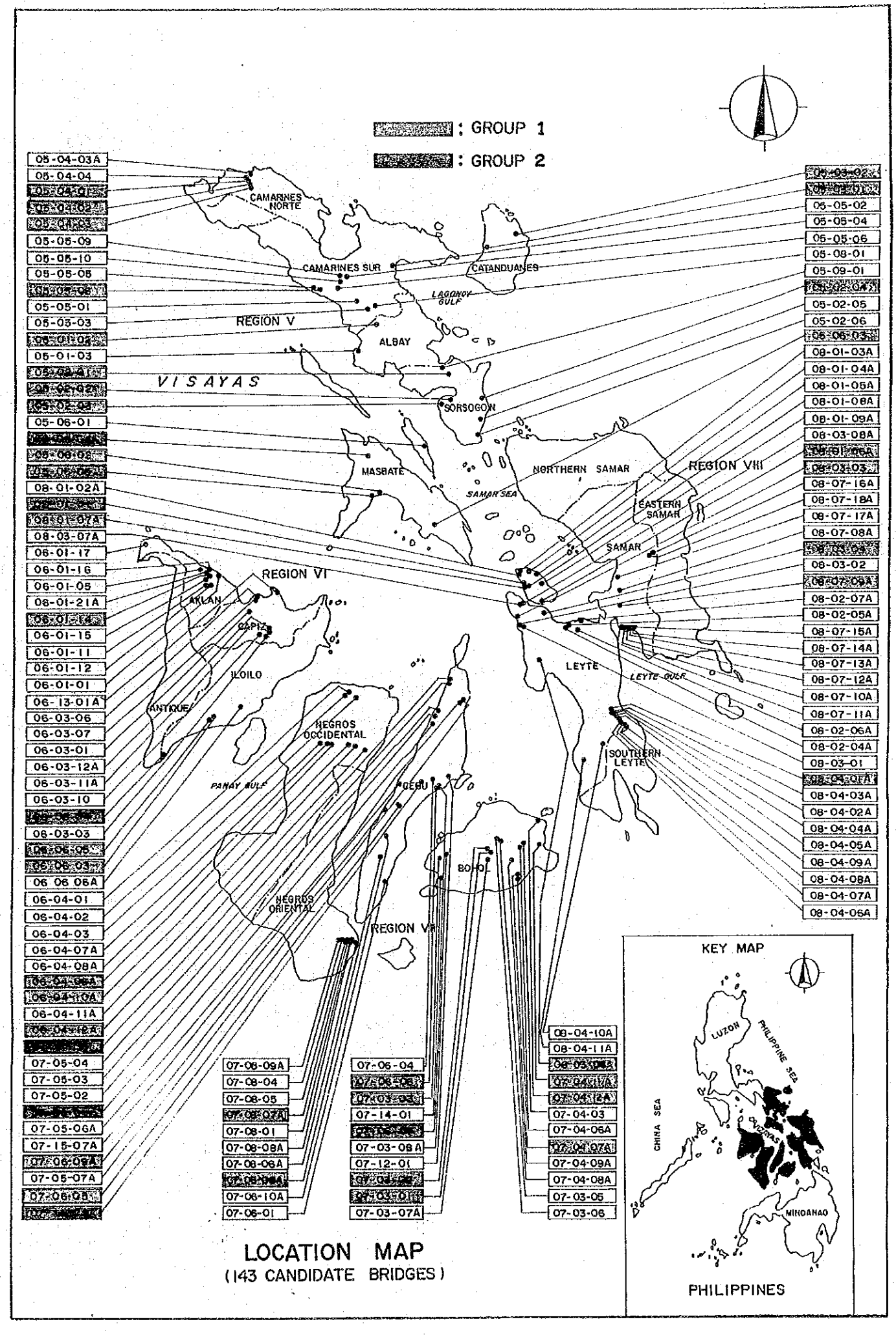
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs and the Ministry of Construction. We also wish to express our deep gratitude to the officials concerned of the Department of Public Works and Highways, JICA office in the Philippines, Embassy of Japan in the Philippines, for their close cooperation and assistance during our study.

At last, we hope that this report will be effectively used for the promotion of the project.

Very truly yours,

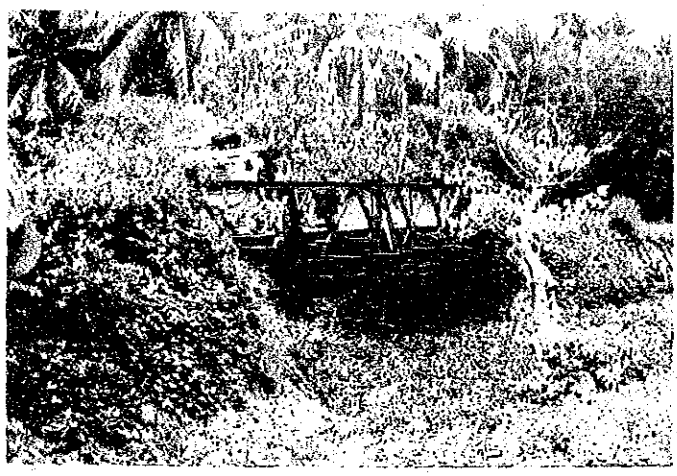
M. Miura

Project Manager, Minoru Miura
The Project for Constructing
Bridges Along Rural Roads
(Phase IV) in the Republic
of the Philippines
Katahira & Engineers International



LOCATION MAP
(143 CANDIDATE BRIDGES)

GROUP 1 BRIDGES



No. 1 Bridge No. ;05.01.02
Bridge Name ;San Vicente Bridge

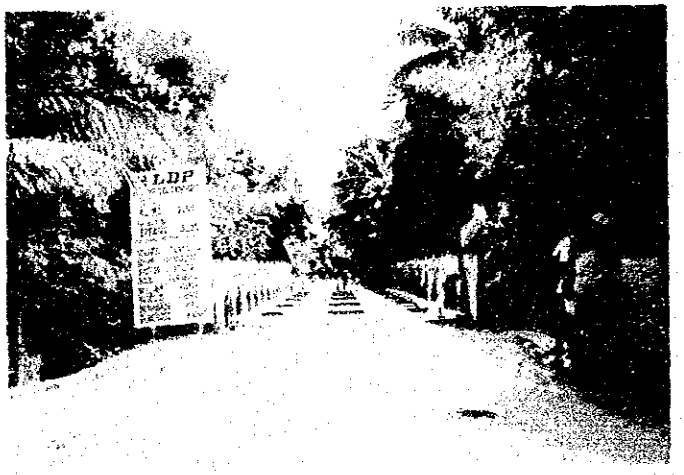
LOCATION ;Km.483+050.00
Libon-Bacolod-San Vicente
-Burabod-Buga Road
Albay (Provincial Road)

Type;Bailey Bridge

No. 2 Bridge No. ;05.02.01
Bridge Name ;San Rafael Bridge

LOCATION ;Km.556+886.00
San Rafael-Monte-Carmelo
-Libton-Miluya-Amomontiog
-Oras-B.Sirang Castilla,
Sorsogon (Barangay Road)

Type;Spillway

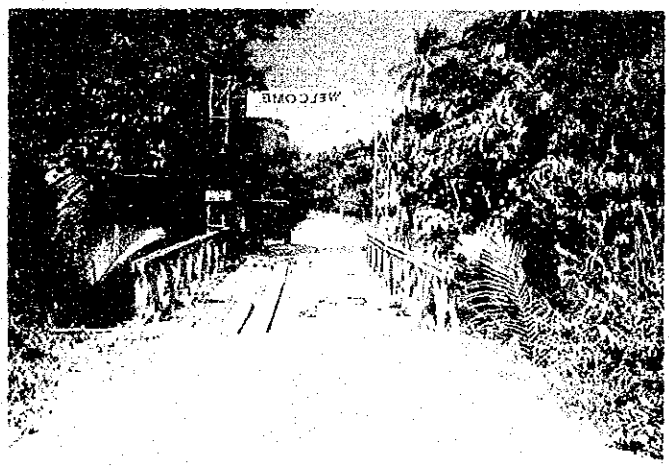


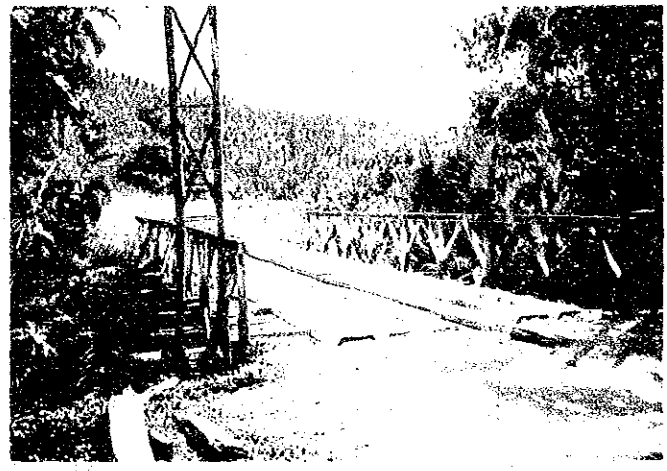
No. 3 Bridge No. ;05.02.02
Bridge Name ;Beriran Bridge

LOCATION ;Km.608+897.00
Juban-Beriran-Caruhayon
Road Juban,
Sorsogon (Barangay Road)

Type;Bailey Bridge

GROUP 1 BRIDGES

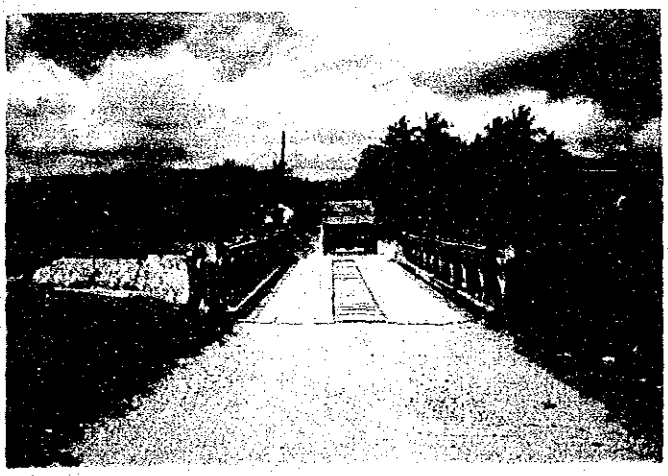


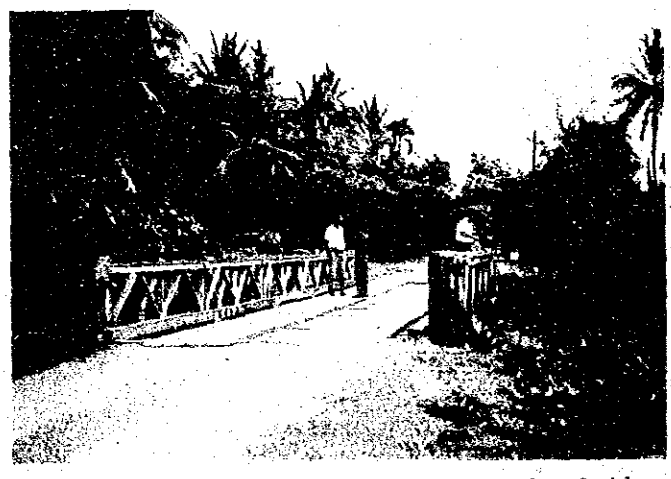


No.4 Bridge No. ;05.02.03
Bridge Name ;Bacalon Bridge

LOCATION ;Km.623+620.00
Juban-Magallanes Road
Magallanes,
Sorsogon (National Road)

Type;Bailey Bridge

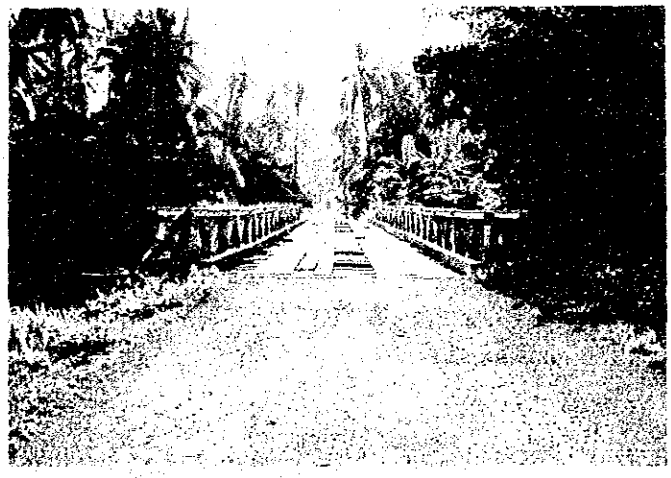




No.5 Bridge No. ;05.03.02
Bridge Name ;Kampawikan Bridge

LOCATION ;Km. 56+649.00
Jct.Panganiban-Sabloyon
Road,Panganiban
Catanduanes(National Road)

Type;Bailey Bridge



No.6 Bridge No. ;05.04.01
Bridge Name ;Mataque Bridge

LOCATION ;Km.325+601.00
Bagong Silang-Capalonga
Camarines Norte
(National Road)

Type;Bailey Bridge

GROUP 1 BRIDGES

No. 7 Bridge No. ;05.04.02
Bridge Name ;Calimoog Bridge

LOCATION ;Km.318+036.50
Bagong Silang-Capalonga
Road,Capalonga
Camarines Norte
(National Road)

Type;Bailey Bridge

No. 8 Bridge No. ;05.04.03
Bridge Name ;Pinaglapaan Bridge

LOCATION ;Km.315+349.30
Bagong Silang-Capalonga
Road,Capalonga
Camarines Norte
(National Road)

Type;Timber Bridge

No. 9 Bridge No. ;05.05.08
Bridge Name ;Odicon Bridge

LOCATION ;Km. 2+100.00
From Pasacao-Odicon
Tagbag Road,Pasacao,
Camarines Sur
(Barangay Road)

Type;Bailey Bridge

GROUP 1 BRIDGES

No. 10 Bridge No. ;05.06.02
Bridge Name ;Manolib Bridge

LOCATION ;Km. 26+946.50
From Masbate Port
Masbate-Aroroy Road,Masbate
(National Road)

Type;Spillway

No. 11 Bridge No. ;05.06.03
Bridge Name ;Baldosa Bridge

LOCATION ;Km. 51+860.00
From Masbate Port
Buenavista-Cawayan Road
Cawayan,Masbate
(National Road)

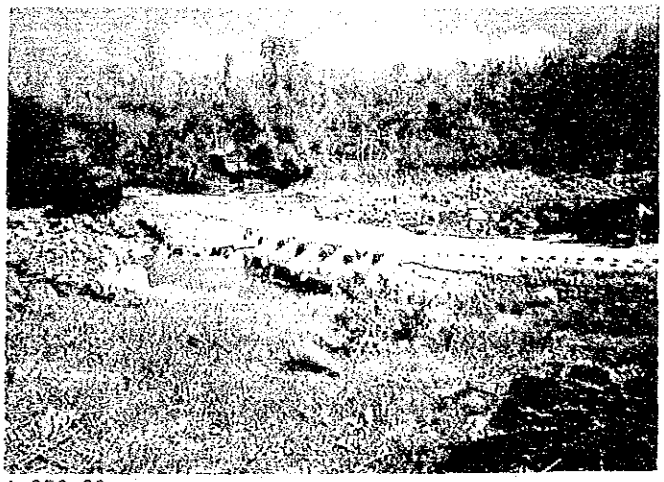
Type;Spillway

No. 12 Bridge No. ;06.01.14
Bridge Name ;Calangcang Bridge

LOCATION ;Km.189+881.63
Calangcang-Carugdog Road,
Makato,Aklan
(Provincial Road)

Type;Barrel RCP

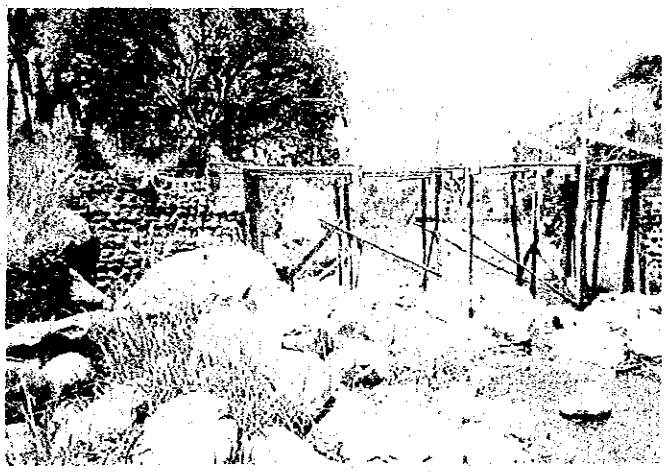
GROUP 1 BRIDGES



No. 13 Bridge No. ;06.04.09A
Bridge Name ;Tayum-an Bridge

LOCATION ;Km. 24+850.00
Bacolod-Murcia-D.S Benedicto
-San Carlos
Bdry.,Negros Occidental
(National Road)

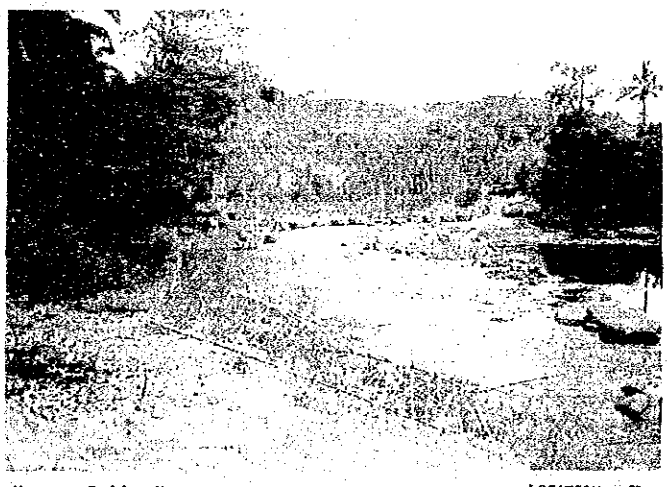
Type;Spillway

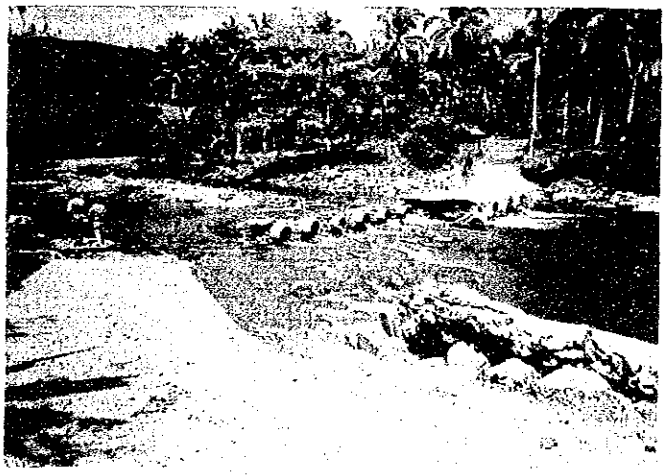


No. 14 Bridge No. ;06.04.10A
Bridge Name ;Pandanon Bridge

LOCATION ;Km. 35+500.00
Bacolod-Murcia-D.S Benedicto
-San Carlos
Bdry.,Negros Occidental
(National Road)

Type;Bailey Bridge



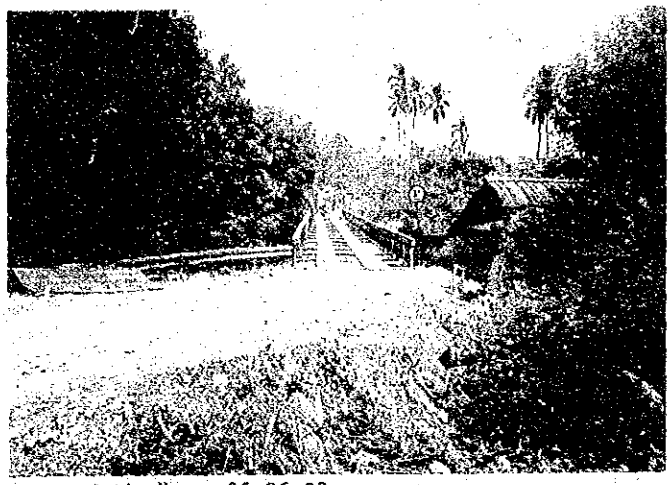


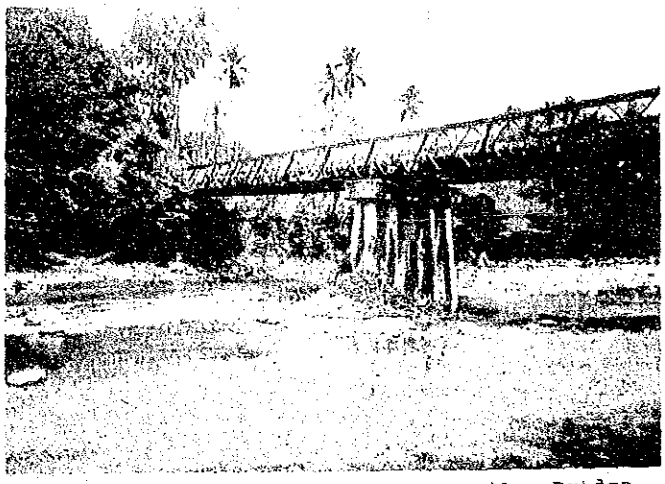
No. 15 Bridge No. ;06.04.12A
Bridge Name ;Bago Bridge

LOCATION ;Km. 68+100.00
Bacolod-Murcia-D.S Benedicto
-San Carlos Bdry.
Negros Occidental
(National Road)

Type;Spillway

GROUP 1 BRIDGES





No. 16 Bridge No. ;06.06.03
Bridge Name ;Seguidan Bridge

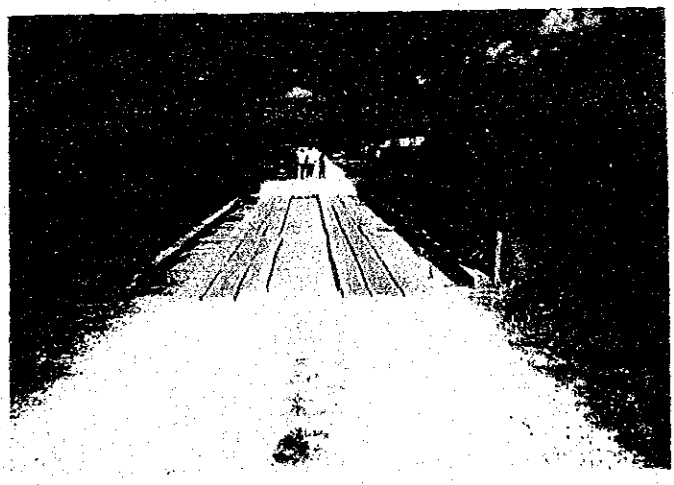
LOCATION ;Km. 57+100.00
Guimbal-Igbaras-Tubungan
Road Tubungan Iloilo
(National Road)

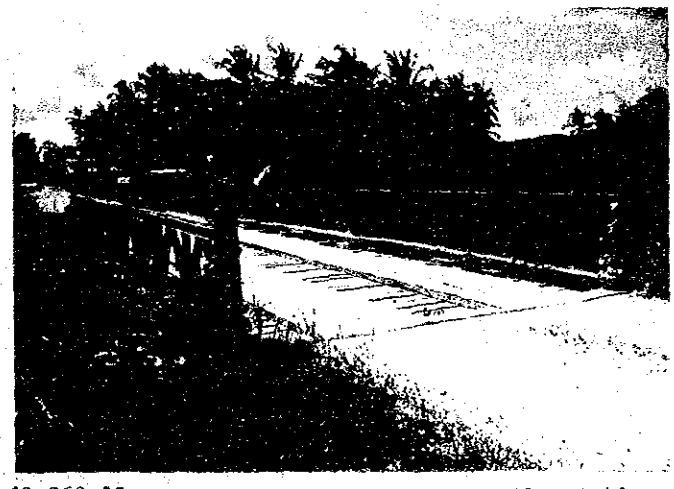
Type;Bailey Bridge

No. 17 Bridge No. ;06.06.05
Bridge Name ;Alameda Bridge

LOCATION ;Km. 47+300.00
Guimbal-Igbaras Road
Igbaras Iloilo
(National Road)

Type;Timber Bridge



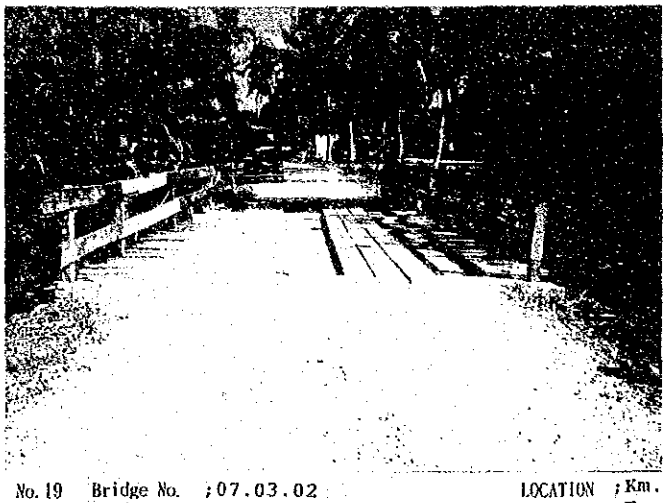


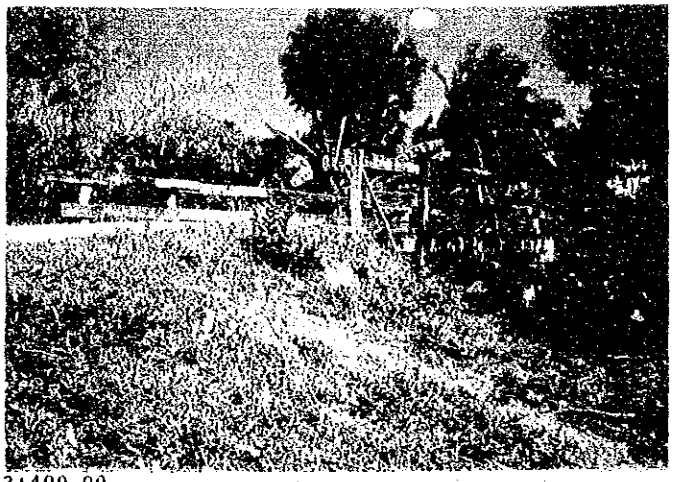
No. 18 Bridge No. ;07.03.01
Bridge Name ;Tohogon Bridge

LOCATION ;Km. 62+260.00
From port of Tagbilaran City
Carmen-Bacani Road,
Bohol I
(National Road)

Type;Bailey Bridge

GROUP 1 BRIDGES

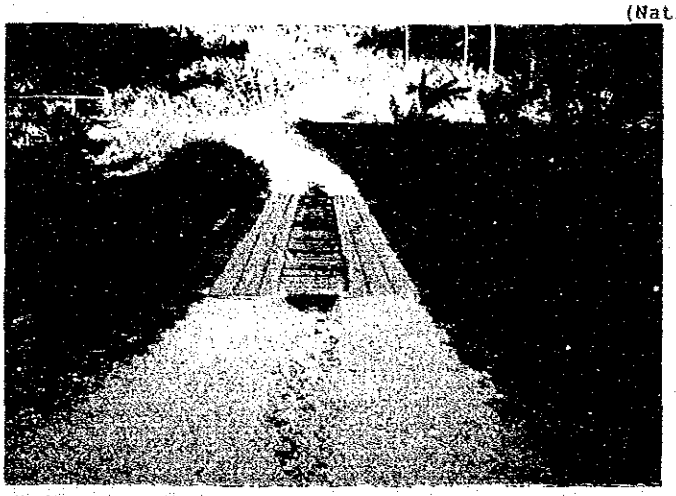


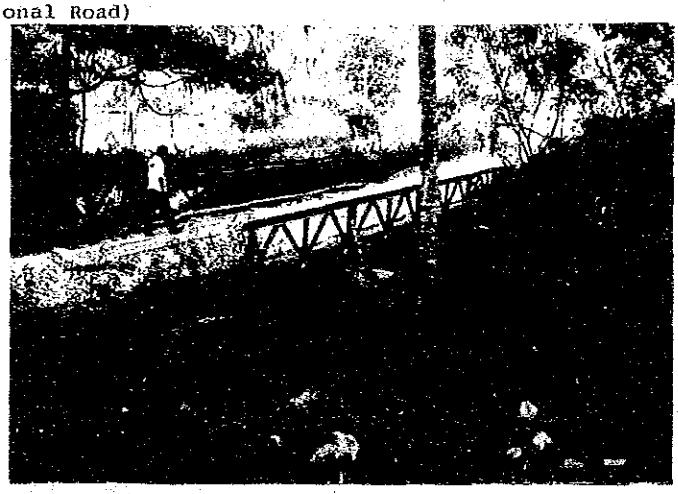


No. 19 Bridge No. ;07.03.02
Bridge Name ;Caneway Bridge

LOCATION ;Km. 63+400.00
From port of Tagbilaran City
Carmen-Bacani Road,
Bohol I
(National Road)

Type;Timber Bridge

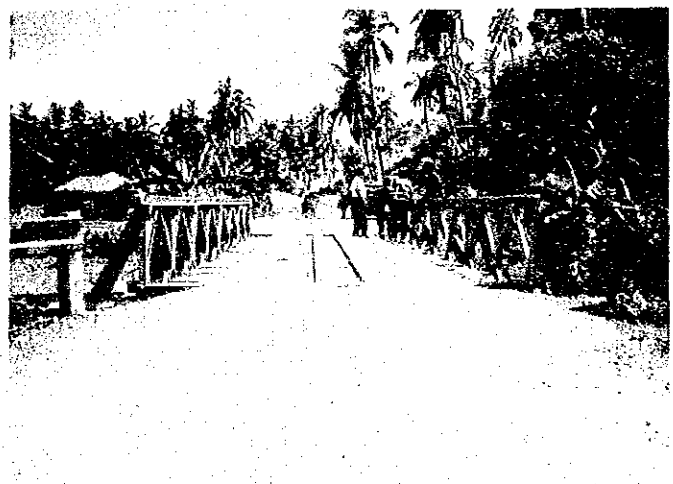


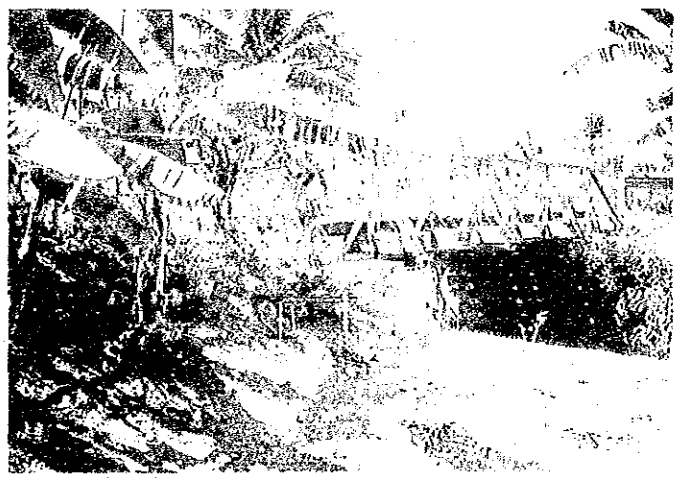


No. 20 Bridge No. ;07.03.03
Bridge Name ;Cantaongon Bridge

LOCATION ;Km. 27+590.00
From port of Tagbilaran City
Catagbacan-Antequera
Road,Antequera Bohol I
(National Road)

Type;Bailey Bridge



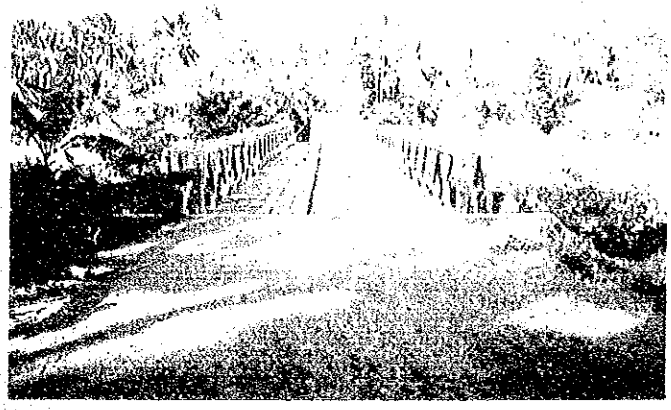


No. 21 Bridge No. ;07.04.07A
Bridge Name ;Canjulao Bridge

LOCATION ;Km. 63+410.00
Jagna-Sierra Bullones Road
Bohol I (National Road)

Type;Bailey Bridge

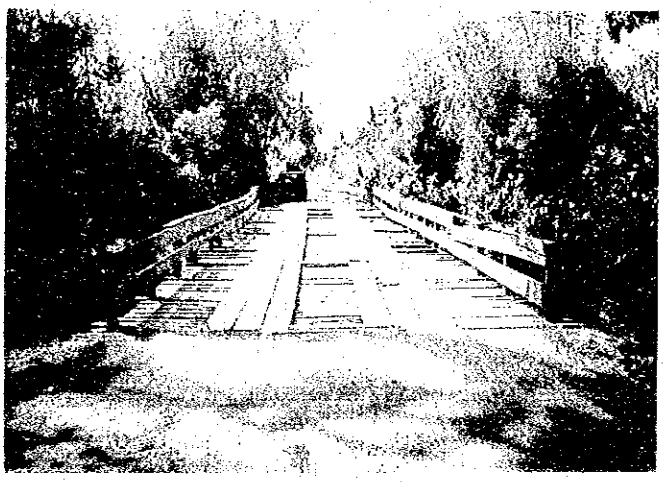
GROUP 1 BRIDGES

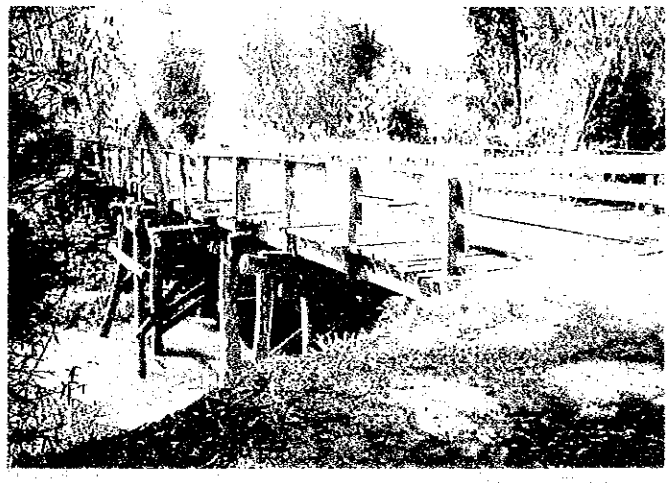


No. 22 Bridge No. ;07.04.11A
Bridge Name ;Carood Bridge

LOCATION ;Km. 98+238.00
Candijay-Mabini Road
Candijay,Bohol II
(Provincial Road)

Type;Bailey Bridge

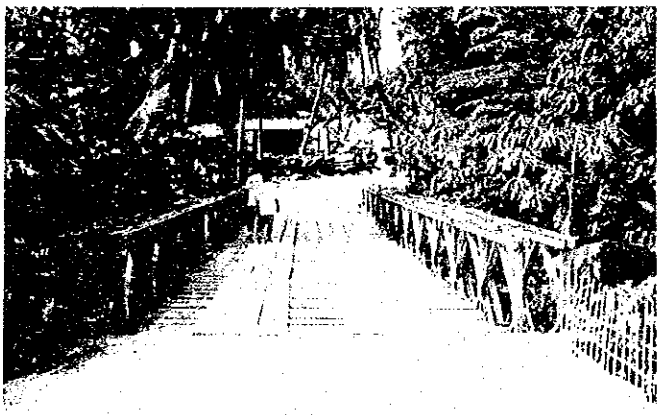




No. 23 Bridge No. ;07.04.12A
Bridge Name ;Tipolo Bridge

LOCATION ;Km.132+326.00
Ubay-Tapal Wharf Road
Ubay,Bohol II
(Provincial Road)

Type;Timber Bridge

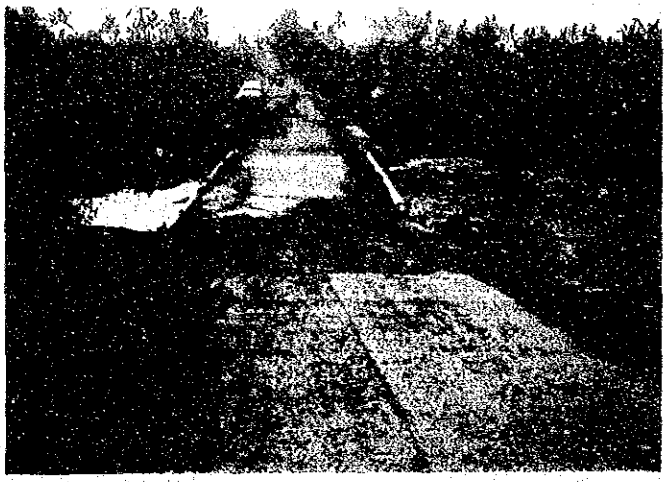


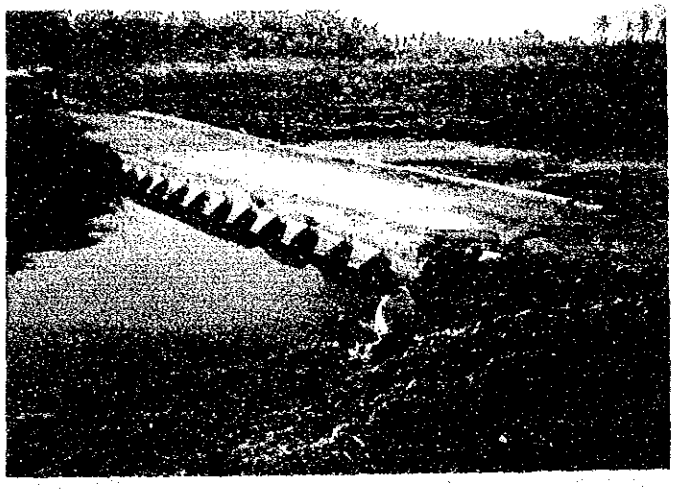
No. 24 Bridge No. ;07.06.05
Bridge Name ;Mantalongon Bridge

LOCATION ;Km. 50+800.00
Barili-Aloguinsan
Road Barili,Cebu II
(National Road)

Type;Bailey Bridge

GROUP 1 BRIDGES





No. 25 Bridge No. ;07.06.06
Bridge Name ;Dumlog-Biasong Bridge

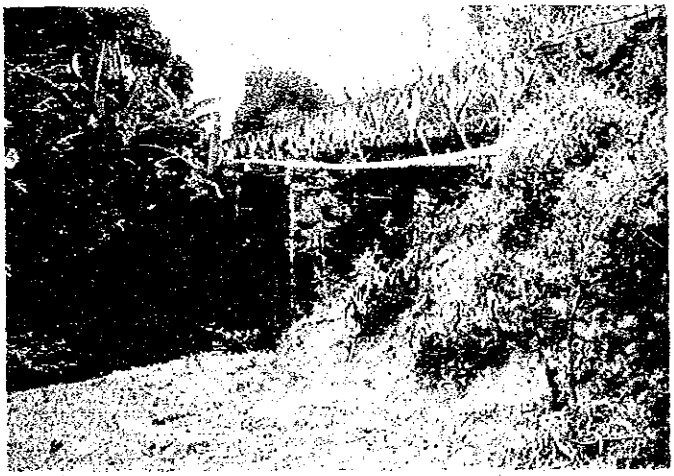
LOCATION ;Km. 12+059.00
Tabunok-Talisay Road
Talisay, Cebu II
(Provincial Road)

Type;Spillway

No. 26 Bridge No. ;07.06.08A
Bridge Name ;Mag-Ambac Bridge

LOCATION ;Km. 95+600.00
Jct.Barili-Aloguinsan
Road, Mantalongon,
Dalaguete Cebu II
(National Road)

Type;Bailey Bridge

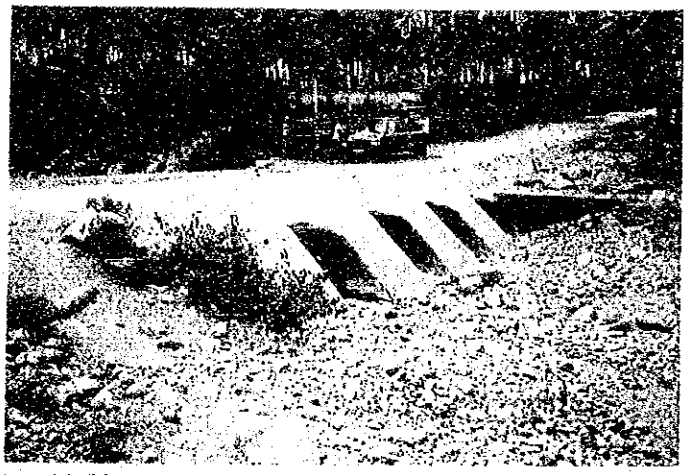


No. 27 Bridge No. ;07.06.09A
Bridge Name ;Ylaya Bridge

LOCATION ;Km. 63+000.00
Barili-Mantayupan
Road, Barili Cebu II
(National Road)

Type;Bailey Bridge

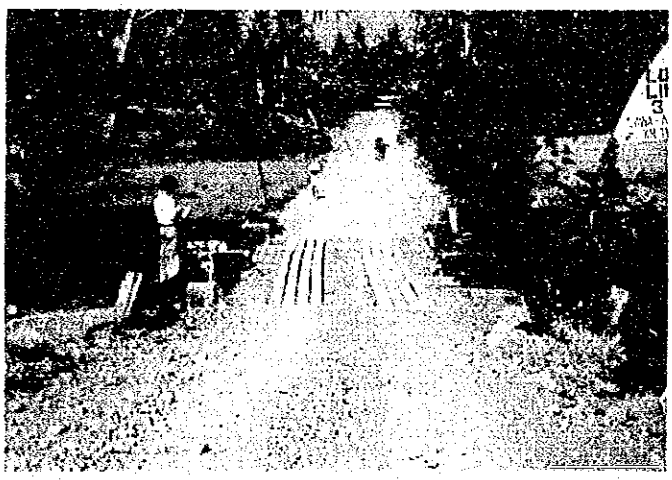
GROUP 1 BRIDGES

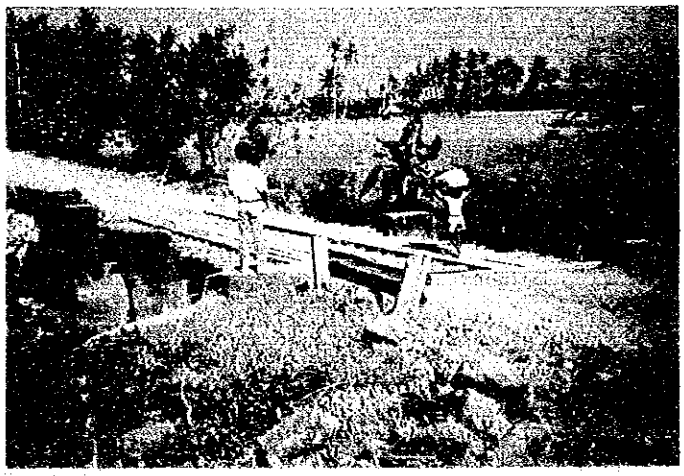


No. 28 Bridge No. ;07.08.07A
Bridge Name ;City Pound Bridge

LOCATION ;Km. 6+246.00
Balugo-Vicinal Road
Dumaguete City
(Barangay Road)

Type;Spillway

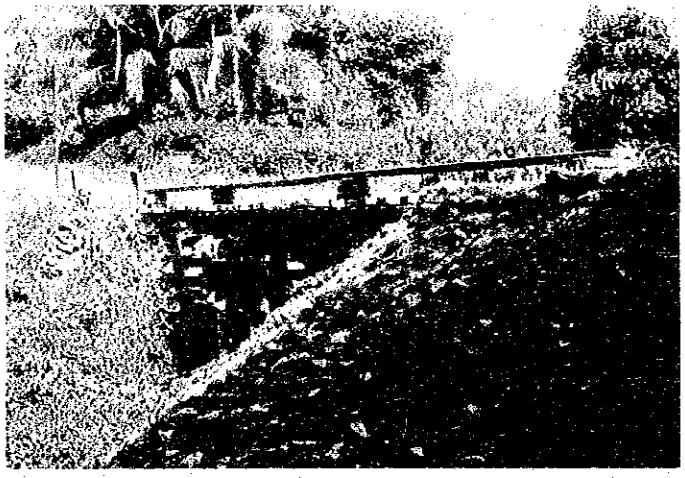




No. 29 Bridge No. ;08.01.06A
Bridge Name ;Lawa-an Bridge

LOCATION ;Km.1110+620.00
Cabucgayan-Biliran
Biliran Sub-Province
(National Road)

Type;Timber Bridge



No. 30 Bridge No. ;08.01.07A
Bridge Name ;Dispo Bridge

LOCATION ;Km.1026+270.00
Naval-Caibiran-Cross
Country Road
Biliran Sub-Province
(National Road)

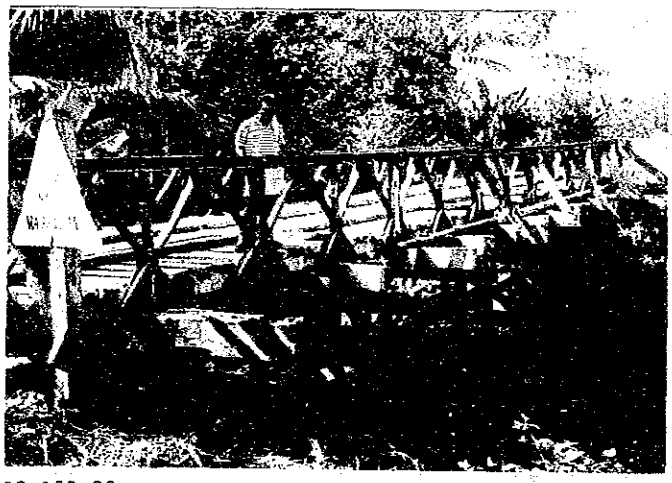
Type;Timber Bridge

GROUP 1 BRIDGES

No. 31 Bridge No. ;08.03.03
Bridge Name ;Basud Bridge

LOCATION ;Km.1022+900.00
San Isidro-Tabango
-Villaba Road
Leyte Ⅲ (National Road)

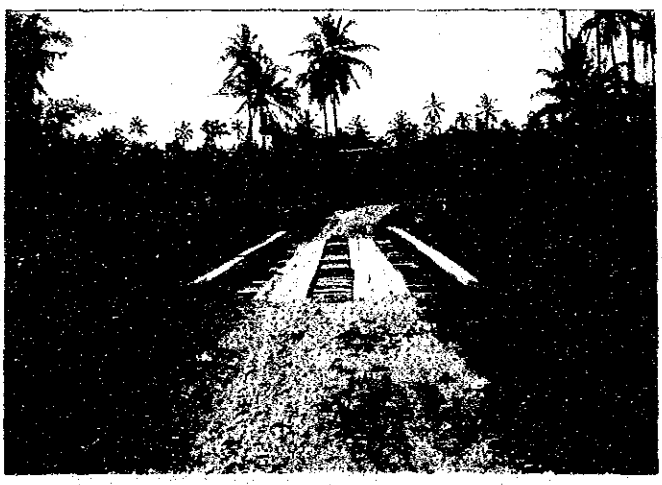
Type;Timber Bridge

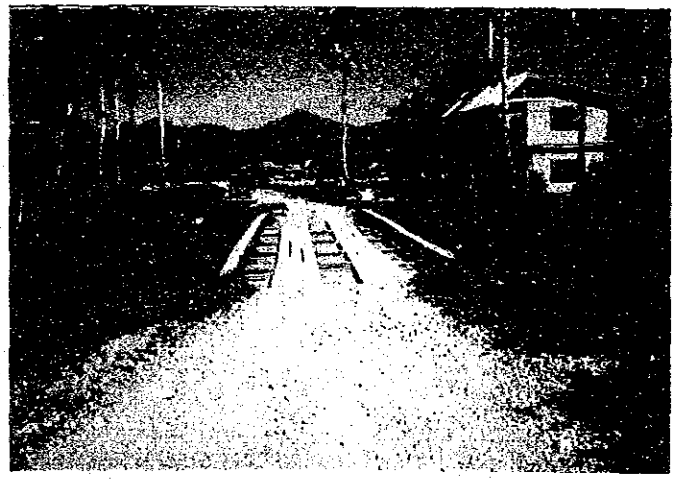


No. 32 Bridge No. ;08.03.06A
Bridge Name ;Matag-ob Bridge

LOCATION ;Km.1003+100.00
Libangao-Matag-ob
-Palompon Road
Leyte Ⅱ
(National Road)

Type;Bailey Bridge





No. 33 Bridge No. ;08.04.01A
Bridge Name ;Matagnao Bridge

LOCATION ;Km. 75+102.00
Abuyog-Silago Road
Leyte Ⅲ (Provincial Road)

Type;Timber Bridge

No. 34 Bridge No. ;08.07.09A
Bridge Name ;Bangon Bridge

LOCATION ;Km.895+176.00
Dolongan-Basey Road
Samar
(National Road)

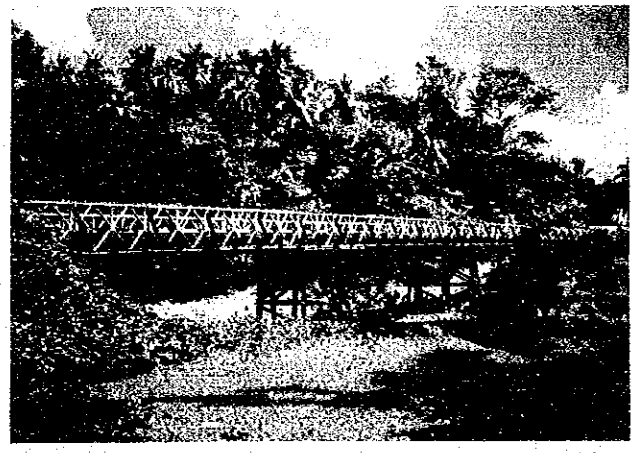
Type;Timber Bridge

GROUP 2 BRIDGES

No.1 Bridge No. ;05.02.04
Bridge Name;Banquerohan Bridge

LOCATION ;Km.607+023.60
Gubat-Barcelona-Bulusan
Road Barcelona Sorsogon

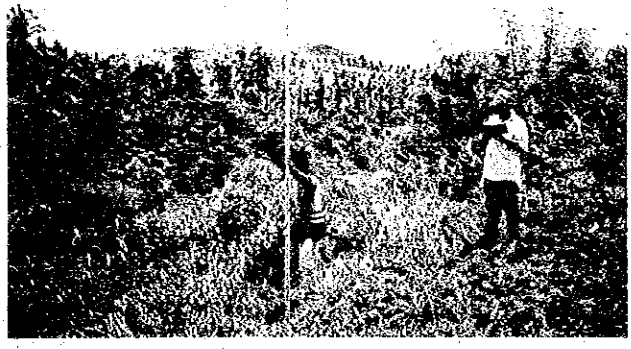
Type;
Rainforced concrete bridge



No.2 Bridge No. ;05.03.01
Bridge Name ;Hitoma Bridge

LOCATION ;Km.151+600.00
Virac-San Andres
-Caramoran
Pandan Road,
Catanduanes

Type;Bailey Bridge



No.3 Bridge No. ;05.06.04
Bridge Name;Lanang Bridge

LOCATION ;Km. 56+129.33
From Masbate Port,
Masbate-Aroroy Road
Masbate

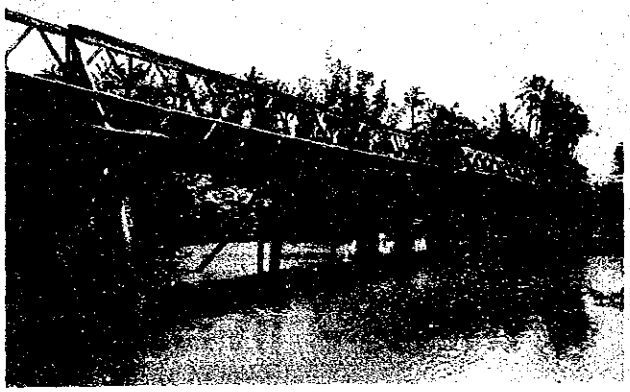
Type;Spillway

GROUP 2 BRIDGES

No.4 Bridge No. ;05.06.05
Bridge Name;Potot Bridge

LOCATION ;Km. 37+739.78
From Masbate Port
Masbate-Balud Road,
Masbate

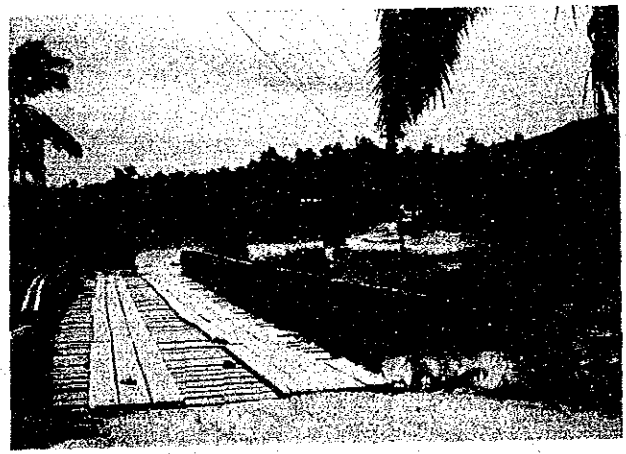
Type;Bailey Bridge



No.5 Bridge No. ;06.06.04
Bridge Name ;Lawigan Bridge

LOCATION ;Km. 70+900.00
Tiolas-Sinogbuhan
Road,San Joaquin,Iloilo

Type;Bailey Bridge

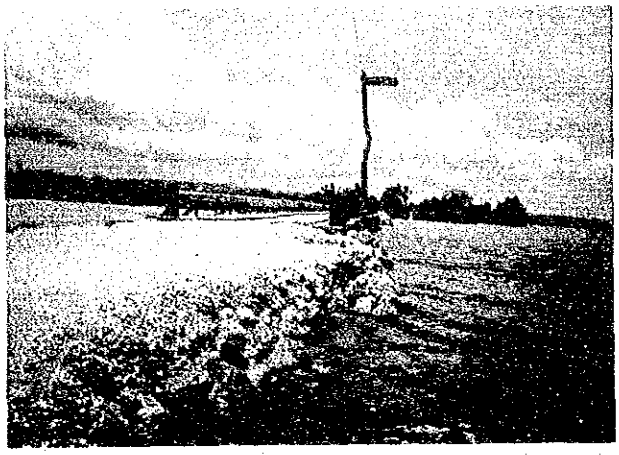


No.6 Bridge No. ;07.05.01
Bridge Name ;Apalan Bridge

LOCATION ;Km. 97+803.00
Toledo-Tabuelan Road
Cebu I

Type;Bailey Bridge

GROUP 2 BRIDGES



No. 7 Bridge No. ;07.05.05
Bridge Name ;Tambongon Bridge

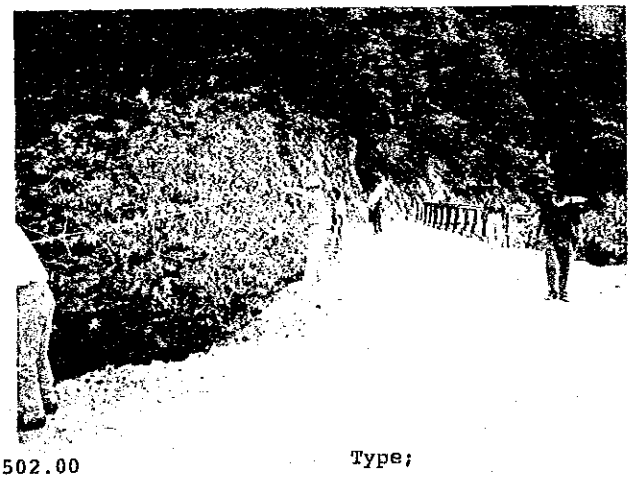
LOCATION ;Km.131+248.00
Antonio de pio
Highway,Cebu I

Type;Timber Bridge

No. 8 Bridge No. ;07.06.07
Bridge Name ;Mojon Bridge

LOCATION ;Km. 0+200.00
From Tabunok
Tabunok-Talisay
Road,Cebu II

Type;Spillway

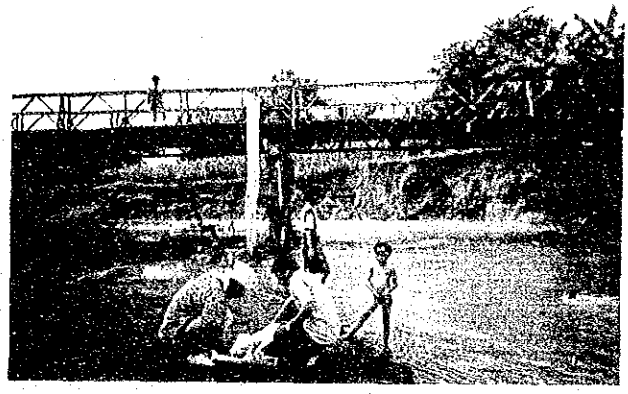


No. 9 Bridge No. ;07.15.06A
Bridge Name ;Alimango Bridge

LOCATION ;Km. 28+502.00
Cebu-Toledo Wharf
Road,Cantabaco,
Toledo City

Type;
Rainforced concrete Arch Bridge

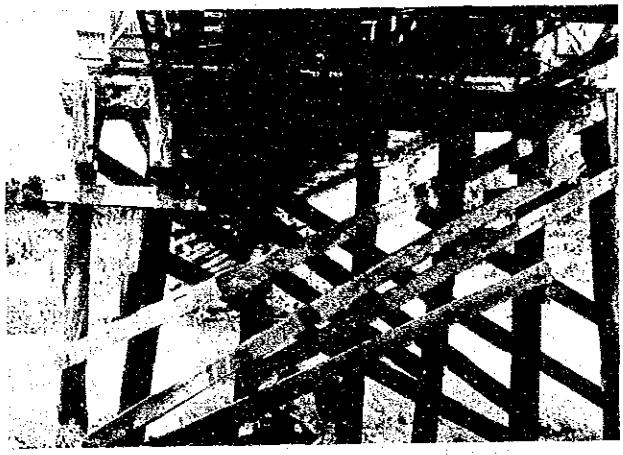
GROUP 2 BRIDGES

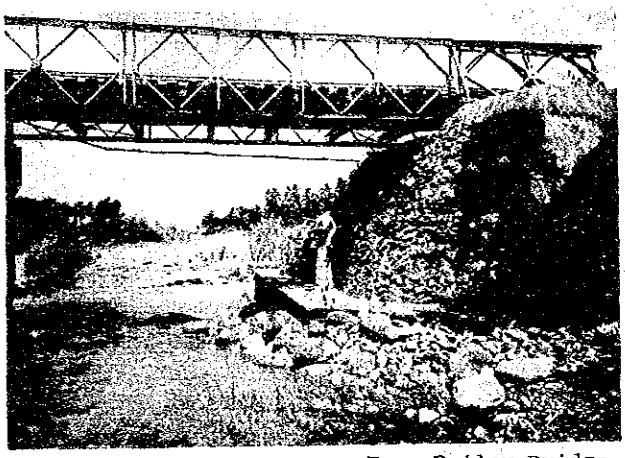


No.10 Bridge No. ;08.01.01
Bridge Name ;Anas Bridge

LOCATION ;Km.102+820.00
From Poat of Ormoc
CVity to Naval-Almeria
and Circumferential
Road,Biliran Sub-Province

Type;Bailey Bridge





No.11 Bridge No. ;08.03.04
Bridge Name ;Elizabeth Bridge

LOCATION ;Km.984+820.00
Lemon-Sambolawan
-Calubian Road
Leyte II

Type;Bailey Bridge

SUMMARY

The Republic of the Philippines (hereinafter referred to the Philippines) has a total population of approximately 60 million in 1990 and 300,000 square kilometers of its land areas. The main principal economic activities in the Philippines are agriculture, forestries and fisheries, and followed by manufacture industry. On the other hand, there is a 160,000 km road network which takes significant roles for promoting socio-economic activities by transporting the passengers and freight, so that the road sector has a share of 77% of the total freight transport.

However, there are many old, dilapidated or temporary bridges in rural areas of the country, which are too weak to carry vehicles for transporting materials and equipment for development. In some areas also, there are no bridges or spillways so that traffic are often closed during rainy season. These missing or weak bridges disturb the smooth traffic flow on the existing roads and result in restraining the development of rural areas.

In this context, the Government of the Philippines has drawn up the road development plan to emphasize the improvement of rural roads, in which particular attention to the replacement of temporary or weak bridges with permanent structures has been paid, as one of important columns of the Medium-Term Philippine Development Plan 1987-1992.

Accordingly, the Projects for Constructing Bridges along Rural Roads (Phase I) and (Phase II) were executed under Japan's Grant Aid program in response to a request of the Government of the Philippines. The contents of both projects were as follows:

Phase I : - supplying steel materials of 24 bridges under Japan's Grant Aid program
- constructing 24 bridges undertaken by the Philippines

Phase II : - supplying steel materials and construction of 10 bridges under Japan's Grant Aid program

These 34 bridges were completely constructed by 1989 and have been utilized.

Based on the results of the said Phase I and Phase II projects, the Government of the Philippines formulated "FIVE YEAR COMPREHENSIVE BRIDGE RECONSTRUCTION PROGRAM ALONG SECONDARY ROADS" in 1989, and requested the assistance of Japan's Grant Aid for constructing bridges along rural roads (Phase III).

The Government of Japan accepted this request as the Project for Constructing Bridges along Rural Roads (Phase III) under Japan's Grant Aid program and Japan International Cooperation Agency (hereinafter referred to JICA) carried out the Basic Design Study on November 1989. Based on this study taking engineering evaluation of proposed 57 bridges in Region III, IV-A, IV-B and one part of Region I, the Group-1 project for supplying steel materials of 27 bridges has been implemented, and the Group-2 project for constructing 10 bridges also has been done. Both projects will be completed by February 1993.

Following to the Phase III, the Government of the Philippines planned to construct 143 bridges in the Regions V, VI, VII and VIII as the second program of the above "FIVE YEAR COMPREHENSIVE BRIDGE RECONSTRUCTION PROGRAM ALONG SECONDARY ROADS" in order to promote the improvement of rural roads, and requested to the Government of Japan for assistance of Phase IV project.

In response to this request, the Government of Japan decided to conduct the Basic Design Study (Phase IV) and JICA sent to the Philippines the Study Team from March 29, 1992 to May 2, 1992 and from June 24, 1992 to Aug. 3, 1992.

The Study Team carried out the field survey which consists of clarifying the background of the project and importance of transport sector in the relevant regions, and the appropriateness as Japan's Grant Aid. The Study Team also collected the necessary data and carried out the topographical survey and geological survey.

As a result, 34 bridges were selected as Group-1 and 11 bridges were set as Group-2. JICA prepared the draft final report of the Basic Design Study based on the results of the field surveys and the analysis, and dispatched the Explanation Team for explaining and discussing the report from September 27 to October 3, 1992.

The main features of Group-1 and -2 are as follows:

	Group-1 Bridge	Group-2 Bridge
Total No. of Bridge	34	11
Total Length of Bridge (m)	1,115	843
Length of Span (m)	15,17,18,21,22,23,24	20,25,27,32,35
Number of Span	.One span - 14 Br. .Two spans - 14 Br. .Three spans - 4 Br. .Four spans - 2 Br. 62 spans 34 Br.	.One span - 1 Br. .Two spans - 1 Br. .Three spans - 8 Br. .Five spans - 1 Br. 32 spans 11 Br.
Width of Bridge (m)	.Total Width 8.32 .Roadway 3.35 m x 2 Lanes .Sidewalk 0.42 m x 2 Lanes	
Type of Superstructure	.H-Beam Composite Girder - 34 Br.	.H-Beam composite Girder - 3 Br. .Built-up Steel Girder - 5 Br. .PC Girder - 3 Br.
Type of Substructure	Abutments: T-Type Abutments (Spread or Pile) Piers: Column-Type Piers (Spread or Pile)	
Cofferdam	Earth Cofferdams	Island Steel Sheet Pile Forepoling
Approach road (m)	Roadways 3.35 m x 2 Lanes Shoulders 1.0 x 2 Lanes Portland Cement Concrete Pavement	
River Bank Protection	Grouted Riprap	Grouted Riprap Gravity Type

Note: Group-1 bridges will be constructed by the Philippines while all steel materials of their superstructures will be supplied by Japan under Japan's Grant Aid program.

The time period required for the detail design and procurement of steel material for Group-1 bridge are estimated to be 5.5 months and 7 months, respectively.

Also the time period for the detail design and construction of Group-2 bridge are required to be 6 months and 12 months, respectively.

The executing agency of the Government of the Philippines for the project is Department of Public Works and Highways.

The project aims at contribution of the activation of regional socio-economics including improvement of the living standard and income by distributing safe and reliable traffic facilities in the relevant regions reconstruction of the old and dilapidated bridges.

About 53,800 square kilometers being 18% of the total land area and 5.36 million peoples will receive socio-economic benefits through the project.

The well improvement in the field of engineering and project management of the DPWH also has been welcomed through implementation of Phase I, II and III Projects.

Hence, it is concluded that this project will be very significant for Japan's Grant Aid.

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PART II (Group-2 Bridge)

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

In response to the request of the Government of the Philippines, the Government of Japan decided to conduct the Basic Design Study on the Project for Constructing Bridges along Rural Roads (Phase IV) (hereinafter referred to as the Phase IV Study) and Japan International Cooperation Agency (hereinafter referred to as JICA) dispatched the Basic Design Study Teams to the Philippines for the field investigations from 29th March to 2nd May 1992 (hereinafter referred to as the 1st Site Study) and from 24th June to 3rd August 1992 (hereinafter referred to as the 2nd Site Study which was headed by Dr. Michio OKAHARA, Chief of Foundation Engineering Division, Structure and Bridge Department, Public Works Research Institute, Ministry of Construction).

Based on the study results through the analysis of the collected data and the field reconnaissance, the 1st Site Study team selected the 43 bridges (32 bridges for Group-1 and 11 bridges for Group-2)[1)] appropriate to Japan's Grant Aid among the 143 bridges requested by the Philippines, taking into consideration the urgency of bridge replacement, the population of the influenced areas, the access conditions between the project sites and main cities, and the socio-economic impact. The results of the 1st Site Study were reported in Interim Report.

The 2nd Site Study team explained and discussed on the contents of Interim Report with the representatives of the Philippines. During discussions, 2 bridges were requested additionally to the Group-1. The Minutes of Discussions were signed and exchanged on July 1, 1992. For 11 bridges of Group-2, the joint site investigations, topographic surveys and geotechnic/hydrographic surveys in the relevant areas were carried out by the 2nd Site Study team.

Note 1) Group-1 bridges are defined as that the Government of the Philippines can construct with the steel materials supplied by the Government of Japan, while Group-2 bridges are those that the design and construction is carried out by the Government of Japan.

Data and informations collected in the field were further analyzed in Japan. As result of the analysis, Basic Design Study Report has been prepared.

The member list of the 1st and 2nd Site Study teams, their itineraries, list of persons met and Minutes of Discussions are filed in Appendices of this Report.