



JAPAN INTERNATIONAL
COOPERATION AGENCY



Republic of the Philippines
DEPARTMENT OF
PUBLIC WORKS AND HIGHWAYS

THE STUDY
ON
THE IMPROVEMENT OF EXISTING BRIDGES
ALONG PASIG RIVER AND MARIKINA RIVER
IN
THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT
EXECUTIVE SUMMARY

JULY 2004



KATAHIRA & ENGINEERS INTERNATIONAL



CTI ENGINEERING INTERNATIONAL CO. LTD.

PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct the Study on the Improvement of Existing Bridges along Pasig River and Marikina River in the Republic of the Philippines and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team headed by Mr. Tsuneo Bekki of Katahira & Engineers International, consisting of Katahira & Engineers International and CTI Engineering International Co. LTD., to the Republic of the Philippines, five times between October 2002 and June 2004.

The team held discussions with the officials concerned in the Government of the Republic of the Philippines, and conducted field surveys on eighteen bridges (seventeen bridges : existing bridges, one bridge : a new bridge) . Upon returning to Japan, the team prepared this report.

I hope that this report will contribute to the improvement of the bridges in the Republic of the Philippines and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials of the Government and those concerned in the Republic of the Philippines for the close cooperation they extended to the study.

July 2004

Kazuhisa Matsuoka

Vice President

Japan International Cooperation Agency

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency
Tokyo, Japan

July 2004

Dear Mr. Matsuoka,

Letter of Transmittal

We are pleased to submit to you the report of “The Study on the Improvement of Existing Bridges along Pasig River and Marikina River in the Republic of the Philippines”. The report includes the advises and suggestions of the authorities concerned of the Government of Japan and your agency as well as the comments made by the Department of Public Works and Highways and other authorities concerned in the Republic of the Philippines.

The report studies and analyses the condition of seriously and heavily damaged and deteriorated existing seventeen (17) bridges along Pasig River and Marikina River and presents the improvement works of these bridges. The report also studies the construction of new bridge in line with improvement of traffic function of Ayala Bridge. Moreover, this report proposes the urgent improvement works of seven (7) bridges (existing six (6) bridges and new construction of one (1) bridge) to be implemented in the period 2004 – 2010. The Study concludes that these projects are technically, economically, financially and environmentally viable and will contribute the socio-economic development in Metro Manila. In view of the urgency of improving bridges in Metro Manila, we recommend the Government of the Philippines to implement the projects with top priority.

We wish to take this opportunity to express our sincere gratitude to your agency, the Ministry of Foreign Affairs and the Ministry of Land, Infrastructure and Transport. We also wish to express our deep gratitude to the Governmental Agencies concerned in the Republic of the Philippines for the close cooperation and assistance extended to us during the Study. We hope this report will contribute to the development of Metro Manila.

Very truly yours,

Mr. Tsuneo BEKKI
Team Leader
of the Study on the Improvement of Existing Bridges
along Pasig River and Marikina River
in the Republic of the Philippines

SUMMARY

OBJECTIVES OF THE PROJECT

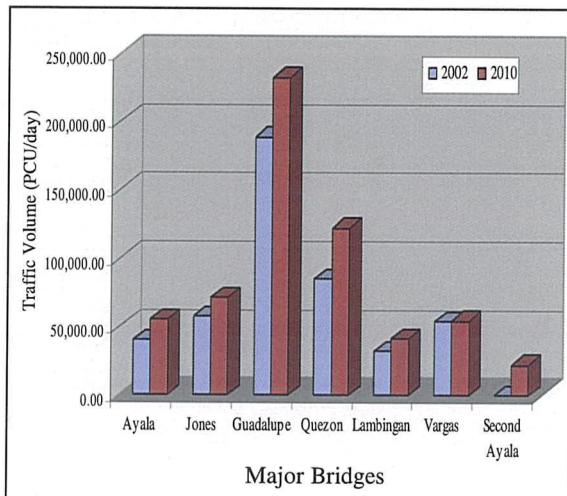
- To improve the condition of seriously and heavily deteriorated bridges by effective and economic measures,
- To improve the traffic function of bridges having insufficient traffic capacities, and
- To improve bridge navigation clearance to prevent vessel collisions.

STUDY BRIDGES

	No. of Bridges	No. of Bridge Structures
Pasig River	12 + 1	14 + 1
Marikina River	5	6
Total	18	21

Note: + 1; Second Ayala Bridge

TRAFFIC VOLUME



MAJOR DAMAGES AND CAUSES

- Heavily corroded floor system and steel members due to water leakage.
- Ruptured steel girder and sway bracing due to vessel collision.
- Major cracks on gerber hinge portions due to unbalanced length of overhang girder and insufficient reinforcement.
- Flexure cracks of girder on pier due to insufficient prestress forces and improper span proportion.
- Excessive deflection of PC girders due to improper span proportion and construction quality.

PROPOSED IMPROVEMENT WORKS

- Replacement of heavily corroded floor system and steel members.
- Installation of additional girders for structural function of existing exterior girders
- Rehabilitation of gerber hinge parts by installation of PS slanted cables.
- Additional external tendons on PC girders to counter excessive deflection and flexural cracks of girder on pier.

PROJECT COST

ITEMS	Unit: In Million Pesos		
	Package I	Package II	Package III
Detailed Design	50.10	9.90	38.90
ROW Acquisition	63.00	-	190.00
Construction Cost	1,255.90	198.10	647.62
Const. Supervision	96.40	15.90	64.80
Sub-total	1,465.40	223.90	941.32
GRAND TOTAL	2,630.62		

Proposed Improvement Works and Evaluation

Bridge Name	Major Damages	Major Improvement Works	Environmental Impact	EIRR (%)
Ayala Bridge	<ul style="list-style-type: none"> • Heavily corroded floor system. • Ruptured stringers and section loss of lower chords. 	<ul style="list-style-type: none"> • Replacement of lower chord and floor system. • Strengthening of abutment and pier. 	5 houses 4 Families	34.3
Jones Bridge	<ul style="list-style-type: none"> • Ruptured and deformed exterior girders. 	<ul style="list-style-type: none"> • Replacement of ruptured sway bracing. • Installation of additional girder. 	None	24.0
Guadalupe Bridge	<ul style="list-style-type: none"> • Cracks at gerber hinge portion of girder. 	<ul style="list-style-type: none"> • Rehabilitation of gerber hinge portion with slanted P/S cables. • Installation of transverse P/S cables at diaphragm. 	18 Informal Settlers	41.8
Quezon Bridge	<ul style="list-style-type: none"> • Heavily corroded joint connections of floor system. • Poor treatment of expansion joint. 	<ul style="list-style-type: none"> • Replacement of gusset plates. • Replacement of heavily corroded joint connections, longitudinal tie beam and vertical members. 	59 Informal Settlers	34.3
Lambingan Bridge	<ul style="list-style-type: none"> • Cracks at gerber hinge portion and on pier. • Insufficient uplift devices. 	<ul style="list-style-type: none"> • Installation of CFRP (vertically at web near hinge and longitudinally at top of girder over pier support). • Additional concrete block doweled to abutment. 	18 Informal Settlers	22.5
Vargas Bridge	<ul style="list-style-type: none"> • Cracks at gerber hinge parts and on pier and large vertical deformation. 	<ul style="list-style-type: none"> • Installation of CFRP at top of girder and horizontally at gerber hinge. • Installation of external cables along girder. 	35 Informal Settlers	24.1
Second Ayala Bridge	<ul style="list-style-type: none"> • New construction 	<ul style="list-style-type: none"> • 3-Span PC Box Girder Type 	10 Houses 3 Families 57 Informal Settlers	22.3

IMPLEMENTATION PLAN

Seven (7) bridges selected for F/S (First Phase) under short term.

Package 1: Very Urgent (2004~ 2007)

Ayala Bridge, Jones Bridge,
Guadalupe Bridge

Package 2: Urgent (2005~ 2007)

Quezon Bridge, Lambingan Bridge,
Vargas Bridge

Package 3: Traffic Capacity Improvement
(2007~ 2010)

Second Ayala Bridge

ECONOMIC EVALUATION

Economic indications of benefit cost analysis yielded more than 20% EIRR on all selected bridges with the exception of Quezon Bridge with 18.60% EIRR. These economic returns justify the early project implementation.

ENVIRONMENTAL IMPACT ASSESSMENT

- Adverse impacts of the project were assessed as being minimal.
- Overall, the positive impacts were assessed as being high.

PROJECT EVALUATION

The projects were evaluated to be feasible in terms of technical, economic, financial and environmental impact assessment.

CONCLUSION

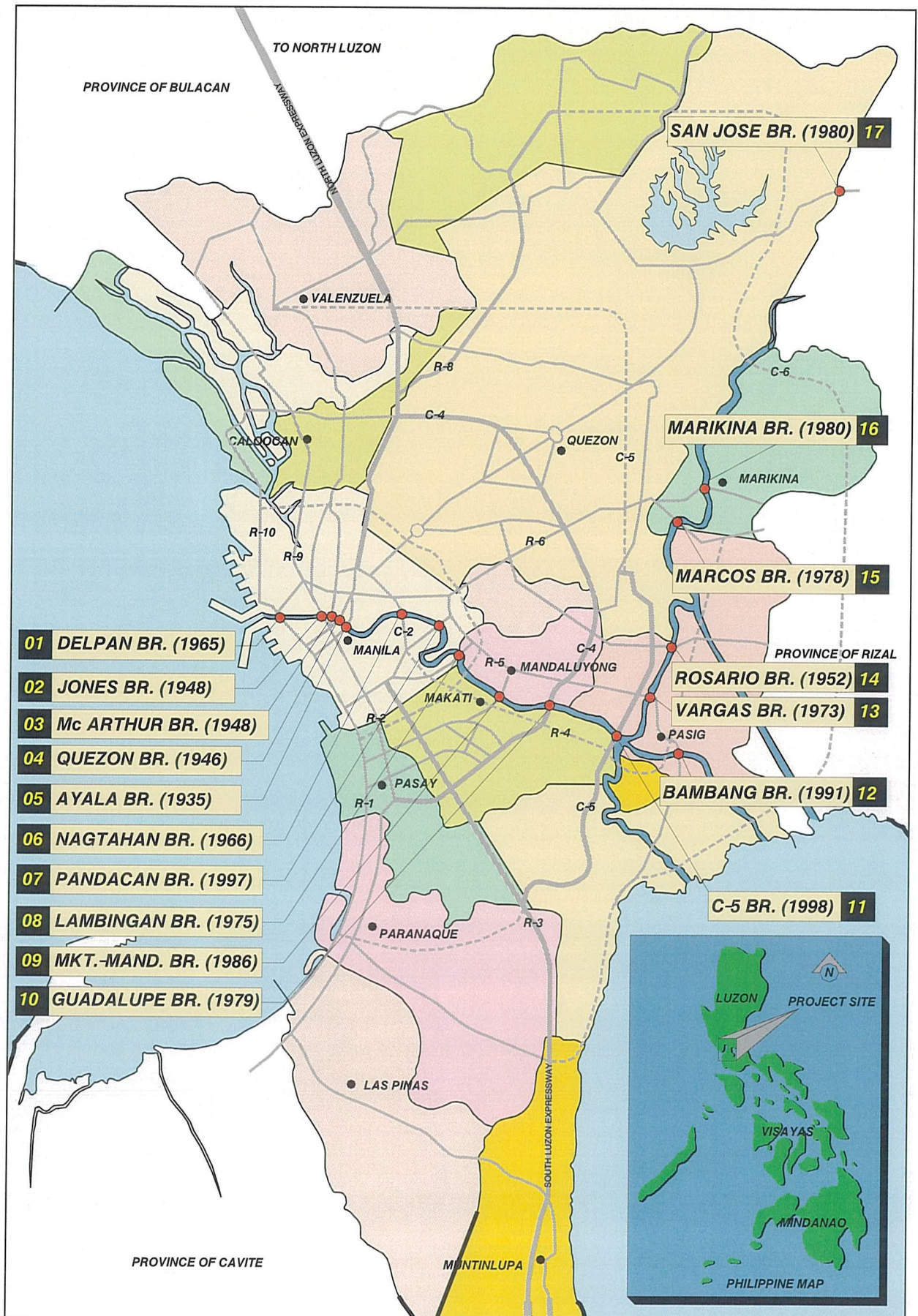
The implementation of proposed improvement measures is justified based on findings of the Study, to cope with existing problems such as heavily deteriorated structures, limited traffic capacity and vessel collisions.

The improvement of existing bridge as life line at transport facilities is expected to promote the socio-economic activities in Metro Manila.

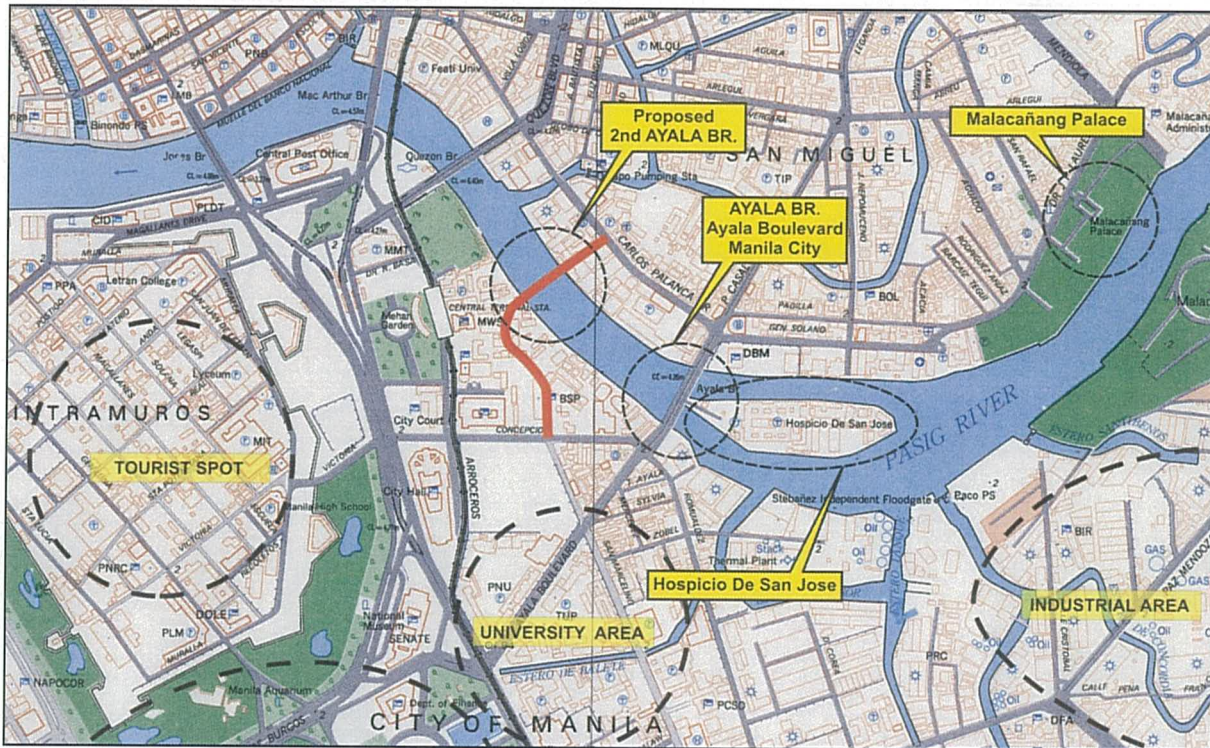
RECOMMENDATION

- Early Implementation
For early realization, the thorough preparation of the following is required;
 - Securing Environmental Compliance Certificate (ECC)
 - R.O.W. Acquisition
 - Preparation of Resettlement Plan for Project-affected People
- Temporary Implementation of Vehicle Load Limit Regulation for the Ayala Bridge for the safety of bridge users.
- Implementation of Second Ayala Bridge at the optimum timing.
- Dissemination of Established Technology as Sustainable Human Capacity Building Program

		Implementation Schedule							Unit: In Million Pesos
		2004	2005	2006	2007	2008	2009	2010	TOTAL
Package 1	Ayala Bridge								1,256.90
	Jones Bridge								185.40
	Guadalupe Bridge								23.10
	Sub-Total	29.70	153.52	705.75	576.40	-	-	-	1,465.40
Package 2	Quezon Bridge								135.20
	Lambingan Bridge								59.20
	Vargas Bridge								29.50
	Sub-Total	-	6.00	46.97	170.93	-	-	-	223.90
Package 3	Second Ayala Bridge								941.32
	Sub-Total	-	-	-	133.90	95.00	356.21	356.21	941.32
Grand Total		29.70	159.52	752.72	881.23	95.00	356.21	356.21	2,630.62



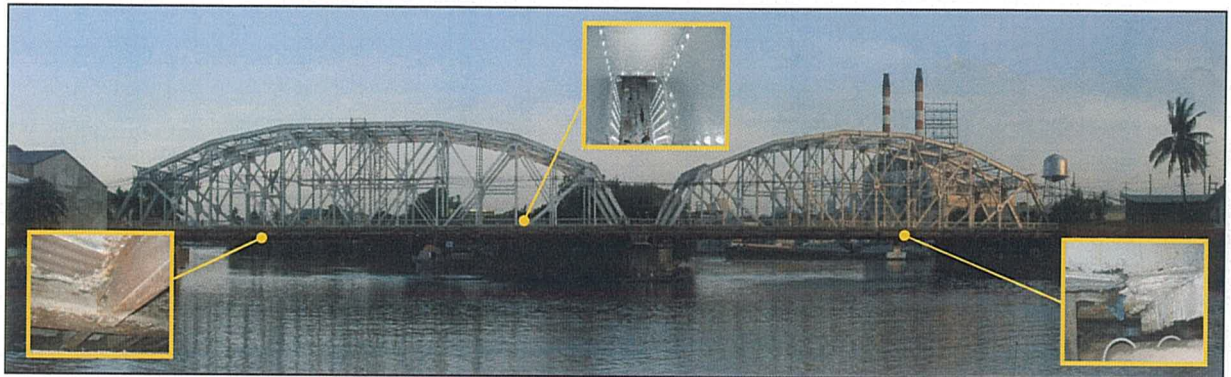
LOCATION MAP OF STUDY BRIDGES



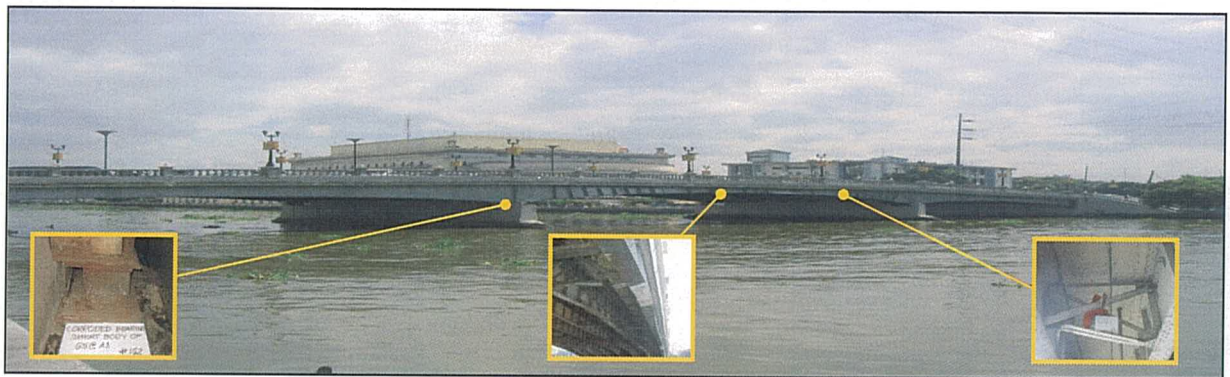
VICINITY OF PROPOSED SECOND AYALA BRIDGE

- 02 – JONES BRIDGE (1948)
- 03 – Mc ARTHUR BRIDGE (1948)
- 04 – QUEZON BRIDGE (1946)
- 05 – AYALA BRIDGE (1935)

PHOTOGRAPHS OF F/S BRIDGES



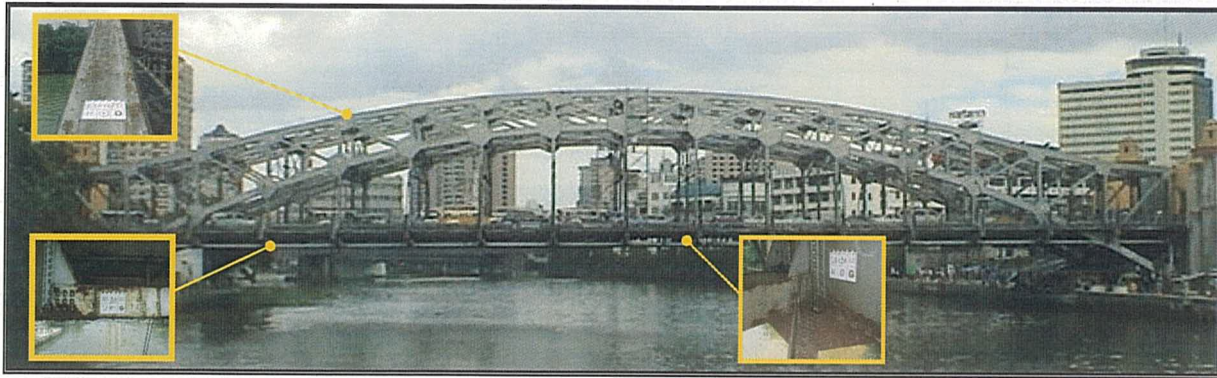
Ayala Bridge



Jones Bridge



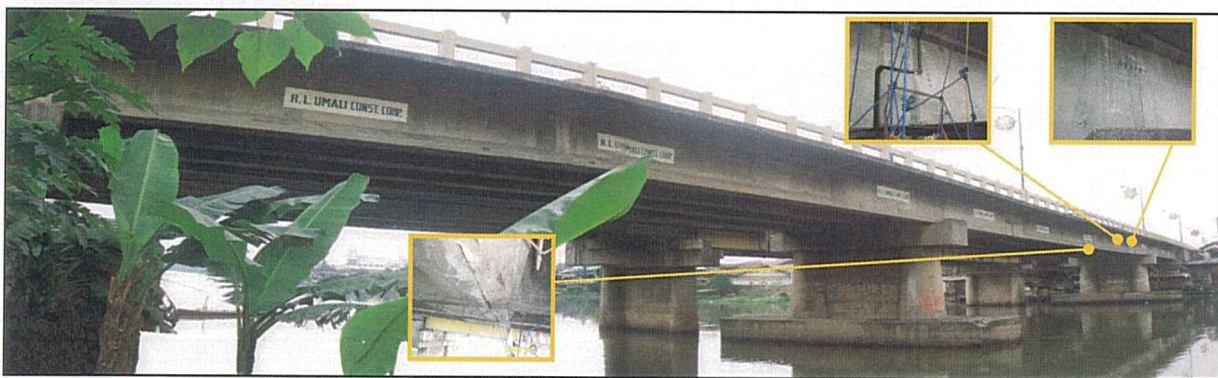
Guadalupe Bridge



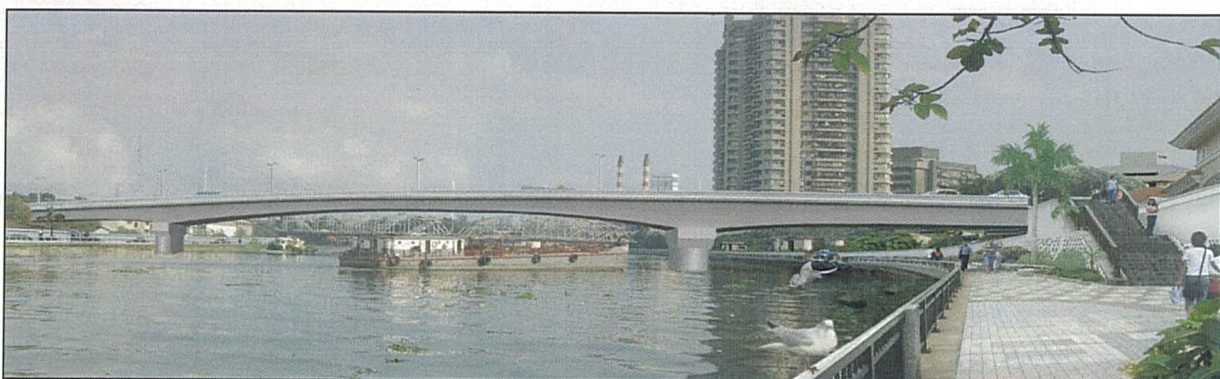
Quezon Bridge



Lambingan Bridge



Vargas Bridge



Proposed Second Ayala Bridge

COLLABORATION WORKS

During the course of the Study, technology transfer was performed as one of the main objectives of the Study through continuous participation of counterpart members of the Philippine Government as well as local consultants in all tasks of the Study.

Counterpart members also facilitated the coordination with officials of other agencies related to the Study.

TECHNOLOGY TRANSFER

SEMINAR ON METHODOLOGY AND OUTPUT OF THE STUDY

Seminars were held to discuss the methodology and outputs of the Study on the beginning and end period of each study stage with participation of higher authorities, members of the Steering Committee, Counterpart Team, JICA Advisory Committee and Study Team.



Seminar

WORKSHOP ON NEW ENGINEERING TOPICS

The workshops were held both in the field and office to introduce the new engineering technology adopted in the study; for field survey, (1) bridge inspection technique, (2) impact vibration test, (3) microtremor measurement test, (4) static load test, (5) echo sounder, etc., and for technical analysis, (1)

structural damage rating, (2) damage diagnosis, (3) analysis of structural soundness based on load-rating analysis, (4) selection of most appropriate bridge improvement measures in consideration of life-cycle cost analysis, etc.

The importance of those field survey and technical analysis methods was fully recognized by attendants, and local consultants could successfully accomplish such works under the guidance of JICA Study Team.



Field Works (Impact Vibration Test)

DISSEMINATION OF ESTABLISHED TECHNOLOGY

The highly engineering technique on assessment of structural soundness of existing bridges, damage diagnosis, load-rating analysis, etc., was established and compiled in the Manual entitled "An Approach to Inspection and Condition Evaluation of Bridges".

The necessity of dissemination of such technology was earnestly acknowledged by officials and private who were planning to conduct similar study as the next step for the purpose.

PARTICIPATION IN JICA TRAINING COURSE

Four (4) members of counterpart participated in JICA Training Course in Japan on Bridge Maintenance and Design Technology from October 2003 to December 2003.

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