MINISTRY OF TRANSPORT
THE SOCIALIST REPUBLIC OF VIETNAM

BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
CONSTRUCTION OF BRIDGES
IN
MEKONG DELTA AREA

DECEMBER 2000

JAPAN INTERNATIONAL COOPERATION AGENCY
PACIFIC CONSULTANTS INTERNATIONAL

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PREFACE

In response to a request from the Government of Socialist Republic of Vietnam, the Government of Japan decided to conduct a basic design study on the Project for Construction of Bridges in Mekong Delta Area and entrusted the study to the Japan International Cooperation Agency (JICA).

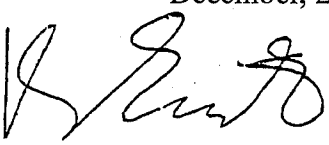
JICA sent to Vietnam a study team from March 26 to April 26 and from June10 to July 22, 2000.

The team held discussions with the officials concerned of the Government of Vietnam, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Vietnam in order to discuss a draft basic design, and as this result, the present report was finalized.

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 wish to express my sincere appreciation to the officials concerned of the Government of the Socialist Republic of Vietnam for their close cooperation extended to the teams.

December, 2000



Kunihiko Saito
President
Japan International Cooperation Agency

December, 2000

Letter of Transmittal

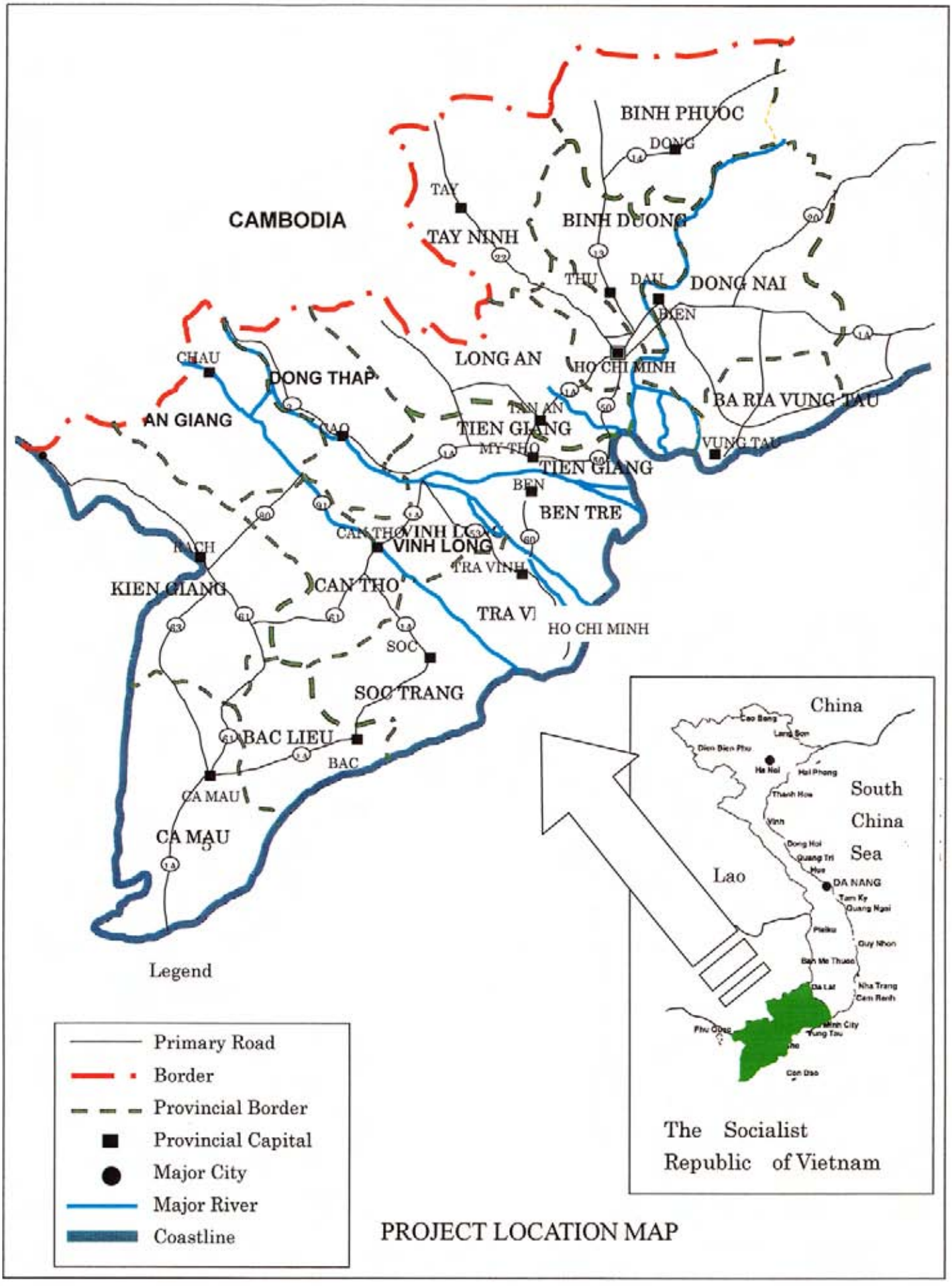
We are pleased to submit to you the basic design study report on the Project for Construction of Bridges in Mekong Delta Area in the Socialist Republic of Vietnam.

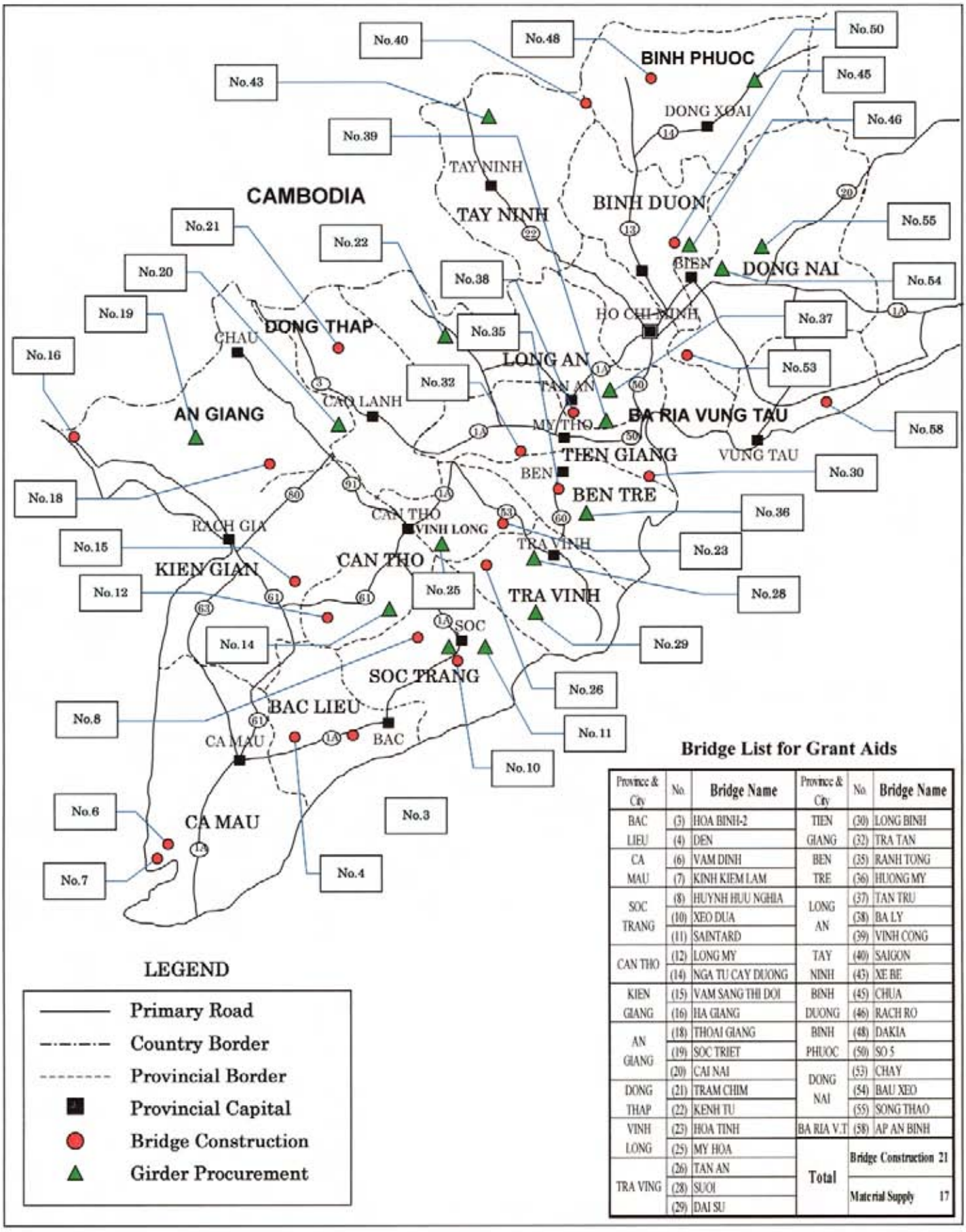
This study was conducted by Pacific Consultants International, under a contract to JICA, during the period from March 17, 2000 to January 15, 2001. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Vietnam and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Hiroyuki Endo
Project manager,
Basic Design Study Team on the Project for Construction of Bridges in Mekong Delta Area in the Socialist Republic of Vietnam
Pacific Consultants International


CAMBODIA
BINH PHUOC
DONG
TAY
TAY NINH
BINH DUONG
THU
DAU
DONG NAI
BIEN
CHAU
DONG THAP
LONG AN
HO CHI MINH
AN GIANG
TAN AN
TIEN GIANG
BA RIA VUNG TAU
MY THO
VUNG TAU
TIEN GIANG
BEN
BEN TRE
VINH LONG
TRA VINH
KIEN GIANG
CAN THO
TRA VI
HO CHI MINH
SOC
SOC TRANG
BAC LIEU
BAC
CA MAU
CA MAU
China
South
China
Sea
Lao
DA NANG
Legend
Primary Road
Border
Provincial Border
Provincial Capital
Major City
Major River
Coastline
The Socialist
Republic of Vietnam
PROJECT LOCATION MAP



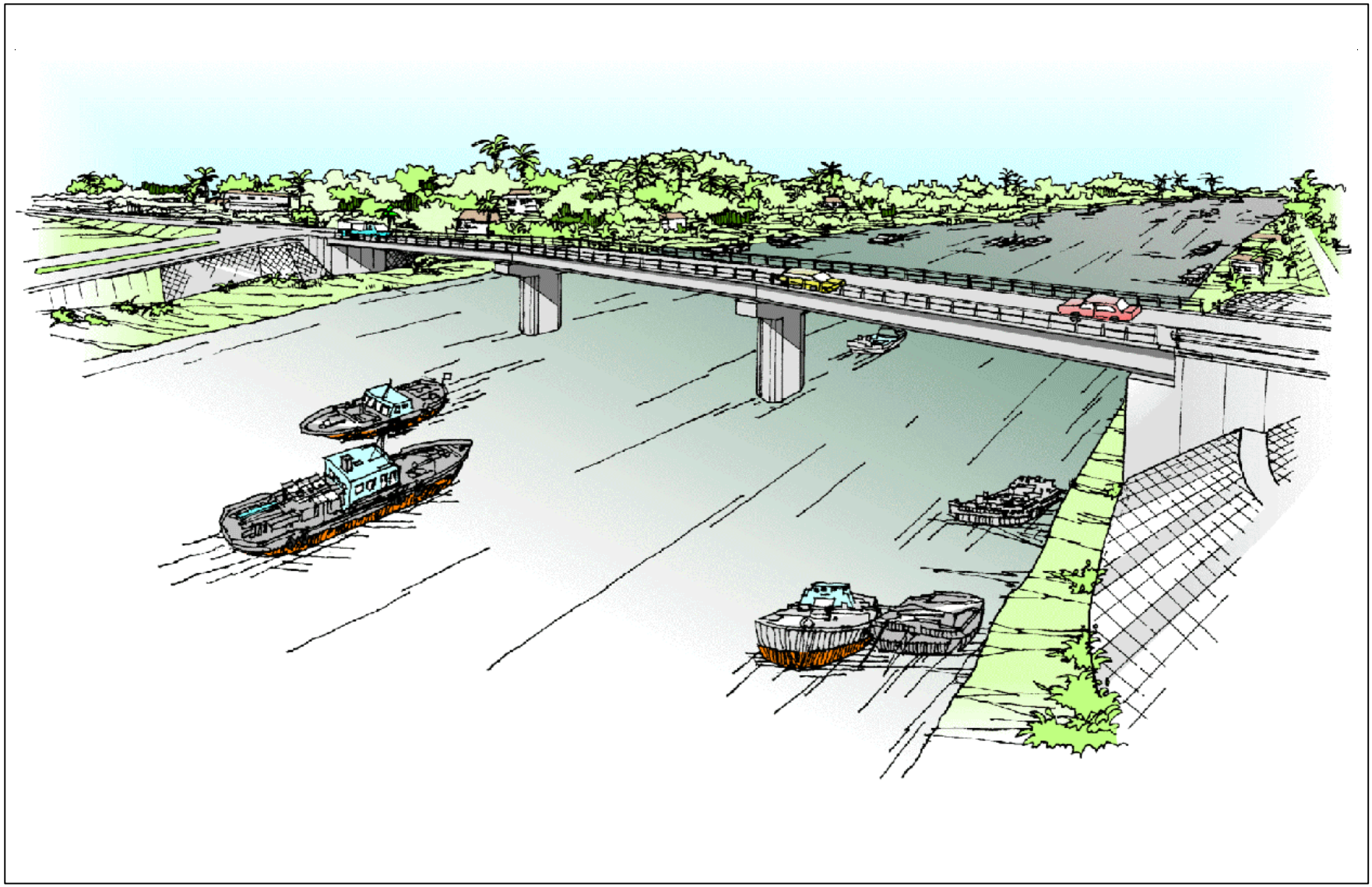
LEGEND

- Primary Road
- Country Border
- Provincial Border
- Provincial Capital
- Bridge Construction
- Girder Procurement

Bridge List for Grant Aids

Province & City	No.	Bridge Name	Province & City	No.	Bridge Name
BAC LIEU	(3)	HOA BINH-2	TIEN GIANG	(30)	LONG BINH
	(4)	DEN		(32)	TRA TAN
CA MAU	(6)	VAM DINH	BEN TRE	(35)	RANH TONG
	(7)	KINH KIEM LAM		(36)	HUONG MY
SOC TRANG	(8)	HUYNH HUU NGHIA	LONG AN	(37)	TAN TRU
	(10)	XEO DUA		(38)	BA LY
	(11)	SAINTARD		(39)	VINH CONG
CAN THO	(12)	LONG MY	TAY NINH	(40)	SAIGON
	(14)	NGA TU CAY DUONG		(43)	XE BE
KIEN GIANG	(15)	VAM SANG THI DOI	BINH DUONG	(45)	CHUA
	(16)	HA GIANG		(46)	RACH RO
AN GIANG	(18)	THOAI GIANG	BINH PHUOC	(48)	DAKIA
	(19)	SOC TRIET		(50)	SO 5
	(20)	CAI NAI	DONG NAI	(53)	CHAY
DONG THAP	(21)	TRAM CHIM		(54)	BAU XEO
	(22)	KENH TU		(55)	SONG THAO
VINH LONG	(23)	HOA TINH	BA RIA V.T	(58)	AP AN BINH
	(25)	MY HOA	Total	Bridge Construction 21	
TRA VING	(26)	TAN AN		Material Supply 17	
	(28)	SUOI			
	(29)	DAI SU			

BRIDGE LOCATION MAP



Perspective

ABBREVIATIONS

Authorities and Agencies

AASHTO	:	American Association of State Highway and Transportation Officials
JICA	:	Japan International Cooperation Agency
MOPI	:	Ministry of Planning & Investment
MOT	:	Ministry of Transport
PMU	:	Project Management Unit
SPC	:	State Planning Committee

Other Abbreviations

A	:	Ampere
A/P	:	Authorization to Pay
Ave.	:	average
B	:	Breadth
Br	:	Bridge
CBR	:	California Bearing Ratio
Cm	:	cent meter
DBST	:	Double Bituminous Surface Treatment
GDP	:	Gross Domestic Product
H	:	Height
HP	:	horsepower
K l	:	kiloliter
KV	:	Kilovolt-ampere
KW	:	kilowatt
Km	:	kilometer
Km/h	:	Kilometer per hour
Km^2 or sq.km	:	Square kilometer
L	:	litter
Lm	:	Linear meter
M, M	:	metro
Max.	:	Maximum
Min.	:	Minimum
Min.	:	minute
No.	:	Numbers

PC	:	Prestressed Concrete
PVC pipe	:	vinyl chloride pipe
RC	:	Reinforced Concrete
Sub-St.	:	substructure
VND	:	Vietnamese Dong
Veh.	:	Vehicles
VpD or VPD	:	Vehicles Per Day
W	:	Width
m^2 SQ.M	:	Square meter
m^3 or cum.	:	cubic metro
mm^2	:	Square Millimeter
t	:	Ton
trn	:	Trillion
t/h	:	Ton per hour
t/m^2	:	Ton per square meter
¥	:	Yen
$	:	Dollar
ϕ	:	Diameter
%	:	Per cent

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Chapter 1 Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

Since 1986, the Government of the Socialist Republic of Vietnam (Vietnam) has been working aggressively under the Doi Moi reform program to develop all sectors of the economy, and to carry out restructuring.

Infrastructure development is an indispensable part of this program, and in particular priority for funding has been given to the transport sector. In part, construction and refurbishment of roads and bridges is required to remedy the heavy damage suffered by the road network during the Vietnam War.

The region targeted by this project is the southern part of Vietnam, including the 12 provinces of the Mekong Delta and the south west, together the Ho Chi Minh City and the 5 provinces to it's north east. The land to the northeast is hilly, whilst the in the lowlands of the delta and southwest with its rivers and canals, the economy has historically centered on farming and fishing.

The Mekong Delta is highly fertile land and produces 60 % of the national rice crop, and in turn accounts for 70 % of the value of the country's exports. The region thus plays a major role in the national economy. Despite this importance however, many of the region's bridges were constructed as temporary structures, and are now subject to loading restrictions and cause obstruction to river flow amongst other problems. Each year's rainy season flood flows result in damage and collapse of structures, cutting transport links. Transport of goods and produce, access to schools, hospitals and markets is prevented. Such cyclic instability is a major cause of the relatively low living standards of the inhabitants.

In response to this situation, the Vietnamese Government in 1997 approached the Japanese Government for assistance with bridge improvement. In 1998 severe flooding destroyed many bridges and roads were cut off. The Provincial Government has built or budgeted for a number of bridges, however this is still inadequate. Further investment is essential if development of the area is to occur.

This project is similar to the project for Reconstruction of Bridges in Northern Vietnam which was carried out successfully from 1995 to 1998. As a result, the Government of Vietnam requested further Grant Aid from the Government of Japan to implement the current project, Construction of Bridges in Mekong Delta Area.

Chapter 2　Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 Objectives of the Project

The aim of the project is to replace inadequate existing bridges, and to construct new bridges in Ho Chi Minh City and the surrounding 17 provinces, thereby contributing to the economic development of the region.

The scale of bridges targeted are medium span structures with total bridge length from 20-100m. The structures considered in the project were those originally identified as priority bridges in the request for grant aid assistance made by the Government of Vietnam.

2.2 Basic Concept of the Project

2.2.1 Request and Alteration

The original request for aid was made by the Government of Vietnam in 1997. An inception report was prepared by the Japanese study team examining the 57 bridges in 16 Provinces and 1 city.

A subsequent revised request was made in 1999, and it is in accordance with this request that this report has been prepared. It investigates 60 bridges in 17 Provinces and 1 City, and covers a similar geographical area to that covered by the Improvement of the Road Network in the Mekong Delta Area program as recently funded by the World Bank. In contrast to this project, it is noted that the World Bank project is concerned only with roads and small-scale bridges less than 6m length.

2.2.2 Selection of Target Bridges

The need for replacement or new construction of each bridge as selected by the Government of Vietnam was confirmed by site surveys. The decision process of whether or not to include bridges in the project was assisted by a scoring system, which prioritized bridges by assessing their present condition, level of usage, and local economic conditions. The selection process was as follows.

STEP 1: Deletion from the project list of bridges already under construction or completed, sites where bridges are not yet required and bridges on roads where funds have already been allocated by the Government.

STEP 2: Bridges meeting the following criteria are omitted.

- Bridge length over 100m
- Poor access roads make access to site a severe problem
- Difficult to transport construction materials to the bridge site (either by road or water)
- Existing bridge is functional, has adequate width, has only minor damage and can continue to be maintained by the Province.

STEP 3: In the original request bridges had been categorized into two groups depending on the preferred construction option as shown below. This categorization was reassessed.

Construction Type Bridges (Group A)

Structures satisfying the following criteria were chosen as most appropriate for immediate construction by Japanese Grant Aid

- Bridge sites on deep alluvial deposits where very soft ground conditions require use of long foundation piles, the installation of which requires special construction equipment.
- Bridge sites in deep valley locations where substructure and superstructure construction are difficult.
- Bridge sites where land acquisition is not a major concern.
- Bridge sites where transport of construction materials to site is not overly difficult.

Steel Girder Supply Type Bridges (Group B)

Sites satisfying the following criteria were judged most suitable for construction by the Vietnamese Government, with assistance by the Japanese Government limited to supply of steel girders, and limited technical assistance.

- Sites with moderate to good ground conditions, where piled foundations or ground treatment are not necessary.
- Bridge sites where conditions are suitable for girder erection.
- Sites not having an environment corrosive to steel girders (i.e. not coastal sites)

STEP 4: A scoring system was used at this stage to prioritize bridges, by judging against three criteria.

① State of Disrepair

Highest weighting (50%) is given to this score which reflects the existing bridge condition. Highest scores are given if no bridge is present or the existing structure is dangerous. Ratings are given accordingly for dilapidated bridges, bridges with low ultimate strength capacity, wooden bridges, simple Bailey bridges without concrete deck slab, and temporary bridges.

② Daily Traffic Volume

Second highest weighting (30%) is given to present traffic volume. This is in order to target bridges with high traffic load so as to maximize social and economic benefit.

③ Local Economy

In order to target improvement of low-income rural areas, weighting of 20% is given to this measure of the local economic conditions.

Table 2.1 Scoring System

	State of Disrepair		Daily Traffic Volume vehicle 1＋motorcycle 0.3＋pedestrian 0.1		Local Economy GDP(US$)／head		
	5	• No bridge • Extremely low ultimate strength • Dangerous condition	5	over 4000	5	under 200	
	4	• Heavily damaged • Low ultimate strength	4	3000-3999	4	200-249	
	3	• Moderate damage • Moderate ultimate strength	3	2000-2999	3	250-349	
	2	• Lightly damaged • Adequate ultimate strength	2	1000-1999	2	350-399	
	1	Good Condition	1	under 999	1	over 400	
Score Weighting	50%		30%		20%		100%

Note: Vietnam average GDP per head is 338US$

This score is converted into a percentage, and then bridges prioritized on a scale of A to E as shown in Table 2-2.

Table 2.2 Overall Rating

Rating			Pass / Fail (for inclusion in project)
A	100-80	Highest priority	Pass
B	60-79	↑	Pass
C	40-59		Pass
D	20-39	↓	Fail (unless deemed essential to network)
E	under 20	Low priority	Fail

From the above result, bridges rated A, B and C were selected for inclusion in the project. However, a number of D rated bridges were also included in the project in the event that they were deemed essential to the overall road network.

STEP 5: The results of the above assessment Steps 1-4 were discussed with the Vietnamese Government. Requests for correction or amendment of the process were discussed and the results finalized.

2.2.3 Step 1 and Step 2 - Bridges Deleted from the Project

According to Steps 1 and 2 of the selection procedure described above, bridges omitted from the project are listed in Table 2-3.

Table 2-3 Bridges deleted from the Project

No.	Province or City	Bridge No.	Bridge Name	Provincial or Village	Existing Bridge		Remarks
					Type	Length (m)	
1	BAC LIEU	(1)	NGAN DUA	Provincial Road	No Bridge.	-	In case of over-pass on the existing, this bridge will be more than 100m
2		(2)	KE	Provincial Road	Timber Bridge.	60	Low traffic volume, small benefit
3	CA MAU	(5)	LUONG THUOC	Provincial Road	Steel Truss.	40	Already under construction
4	SOC TRANG	(9)	BA LUI	Provincial Road	Bailey Bridge	36	Low traffic volume, small benefit
5	CAN THO	(13)	NGA SAU	Provincial Road	RC Girder	-	No access road planned even for the future
6	KIEN GIANG	(17)	No.11	Provincial Road	No Bridge	-	This bridge will be more than 100m
7	VINH LONG	(24)	BA KE	Provincial Road	No Bridge	-	Already under construction
8	TRA VINH	(27)	RACH VON	Provincial Road	RC Girder	-	Canal has been filled in.
9	TIEN GIANG	(31)	XOM SOC	Provincial Road	-	-	Tender for construction already completed
10	BEN TRE	(33)	CAI MON LON	Provincial Road	Steel Truss.	81	Situated on national highway
11		(34)	CAI GA	District Road	Steel Truss.	72	Situated on national highway
16	BINH PHUOC	(49)	DAC NHAU	Provincial Road	Steel Truss.	87	Already tendered for under construction
18	DONG NAI	(52)	AN HOA	Provincial Road	Steel Truss.	36	No access roads for transport
19	BA RIA V.T	(56)	SUOI GIAU	Provincial Road	No Bridge	-	Easy bridge construction in the dry season because of no water
20		(57)	SONG RAY 2	Provincial Road	No Bridge	-	No access roads for transport
21	HCMC	(59)	CONG DDDINH	-	Steel H	60	Existing bridge still functional.
22		(60)	NO.3	-	RC Girder	90	Already constructed

2.2.4 Step 3 - Re-categorization of Bridges

Division into two groups

- □ Group A Construction Type Bridges (100% Japanese Aid)
- □ Group B Steel Girder Supply Type Bridges (material supply only by Japanese Government)

had been made in the original request from the Vietnamese Government. A reassessment of the suitability of each bridge for the construction option was made and the results are shown in Table 2.4.

Four bridges were altered from group A to group B, and 2 bridges from group B to group A.

Table 2.4 Classification of Bridges (Construction Type/ Girder Supply Type)

Province / City	Bridge No.	Original Request			Original Group	Revised Group	Remarks
		Bridge Name	Length (m)	Width (m)	Const. * Supply **	Const. * Supply **	
BAC LIEU	(3)	HOA BINH-2	60	5.5	A	A	
	(4)	DEN	60	5.5	A	A	
CA MAU	(6)	VAM DINH	60	5.5	A	A	
	(7)	KINH KIEM LAM	80	5.5	B	A	Corrosive environment
SOC TRANG	(8)	HUYNH HUU NGHIA	45	5.5	A	A	
	(10)	XEO DUA	30	5.5	A	B	Difficult land acquisition
	(11)	SAINTARD	100	5.5	B	B	
CAN THO	(12)	LONG MY	90	8.0	A	A	
	(14)	NGA TU	45	5.5	B	B	
KIEN GIANG	(15)	VAM SANG THI DOI	75	5.5	A	A	
	(16)	HA GIANG	70	5.5	A	A	
AN GIANG	(18)	THOAI GIANG	90	5.5	A	A	
	(19)	SOC TRIET	50	5.5	A	B	Difficult access
	(20)	CAI NAI	30	5.5	B	B	
DONG THAP	(21)	TRAM CHIM	80	6.5	A	A	
	(22)	KENH TU	70	6.5	B	B	
VINH LONG	(23)	HOA TINH	74	5.5	A	A	
	(25)	MY HOA	84	5.5	B	B	
TRA VINH	(26)	TAN AN	45	6.5	A	A	
	(28)	SUOI	65	5.5	B	B	
	(29)	DAI SU	45	5.5	B	B	
TIEN GIANG	(30)	LONG BINH	38	5.5	B	A	Corrosive environment
	(32)	TRA TAN	75	5.5	A	A	
BEN TRE	(35)	RANH TONG	85	6.5	B	B	
	(36)	HUONG MY	60	6.5	B	B	
LONG AN	(37)	TAN TRU	65	6.5	A	B	Difficult access
	(38)	BA LY	65	5.5	A	A	
	(39)	VINH CONG	40	6.5	B	B	
TAY NINH	(40)	SAIGON	80	6.5	A	A	
	(41)	NINH DIEN	30	5.5	A	B	Difficult access
	(42)	SUOI TRE	36	5.5	B	B	
	(43)	XE BE	30	5.5	B	B	
BINH DUONG	(44)	VUNG GAM	50	5.5	A	A	
	(45)	CHUA	30	5.5	A	A	
	(46)	RACH RO	27	5.5	B	B	
	(47)	RACH GOC	30	5.5	B	B	
BINH PHUOC	(48)	DAKIA	45	6.5	B	B	
	(50)	NO.5	38	6.5	B	B	
	(51)	BOM RIA	22	6.5	B	B	
DONG NAI	(53)	CHAY	50	5.5	A	A	
	(54)	BAU XEO	30	5.5	B	B	
	(55)	SONG THAO	20	5.5	B	B	
BA RIA VUNG TAU	(58)	AP AN BINH	45	5.5	A	A	

2.2.5 Priority Ranking

By using the scoring method shown in Tables 2-1 and 2-2, prioritization was made according to the three criteria.

a) State of disrepair

b) Daily traffic volume (provided by questionnaire survey)

c) Local economic conditions (GDP/per head in the Province)

with results as shown in Table 2-5.

In certain cases, even if a bridge was ranked D according to the above scoring system, it was still included in the project if it was deemed to be essential to the overall road network. This was applicable for the following bridges.

No.	Province	Bridge No.	Bridge Name
1	Tra Vinh	28	Suoi
2	Tra Vinh	29	Dai Su
3	Tra Vinh	43	Xe Be
4	Binh Duong	45	Chua
5	Binh Phuoc	50	No. 5

2.2.6 Final Revision

During discussion with the Vietnamese Government, the request was made to revise two bridges from steel girder supply to construction type.

Ranh Tong Bridge in Ben Tre Province was recategorized for budgetary reasons, and due to the length and difficulty in construction.

Binh Phuoc Bridge in Dakia Province was recategorized due to its deep valley location and difficulty in construction.

After considering the appropriateness of the amendments, the study team agreed with the alterations.

Final agreed construction options are shown in Table 2-5.

Overviews of bridge details are given for the construction type bridges (21 No.) in Table 2-6 and girder supply type bridges (17 No.) in Table 2-7.

Table 2-5 Candidate Bridge Selection Process

Province / City	Bridge No.	Original Request from Vietnam Government				Navigation Clearance (m×m)	STEP 1	STEP 2	STEP 3	Prioritization								Initial Categorization				Final Assessment			
		Bridge Name	Length (m)	Width (m)	Const. Supply ** *		Eliminated	Eliminated	Const. Supply ** *	State of Disrepair	Traffic Volume		Local GDP		Priority Rating		D Rated, but essential to road network	Number of bridges		Bridge Name	Const. Supply ** *	Number of bridges		Bridge Name	Const. Supply ** *
										Rating	Daily Vol.	Rating	GDP/head $	Rating	A*10+B*6+C*4	Ranking		Construction	Supply			Construc-tion	Supply		
BAC LIEU	(1)	NGAN DUA	90	5.5	**	4.5×18.0		✓	-	-	-	-	240	4	-	-		2	-			2	-		
	(2)	KE	70	5.5	*	4.5×18.0		✓	-	-	-	-			-	-									
	(3)	HOA BINH-2	60	5.5	*	5.0×24.0			*	5	3570	4			74	B				HOA BINH-2	*			HOA BINH-2	*
	(4)	DEN	60	5.5	*	2.5×18.0			*	5	2100	3			68	B				DEN	*			DEN	*
CA MAU	(5)	LUONG THUC	60	5.5	*	4.0×21.0	✓		-	-	-	-	295	3	-	-		2	-			2	-		
	(6)	VAM DINH	60	5.5	*	4.5×30.0			*	5	6700	5			80	A				VAM DINH	*			VAM DINH	*
	(7)	KINH KIEM LAM	80	5.5	**	4.0×27.0			*	5	3900	4			74	B				KINH KIEM LAM	*			KINH KIEM LAM	*
SOC TRANG	(8)	HUYNH HUU NGHI	45	5.5	*	2.5×12.0			*	3	5840	5	264	3	72	B		1	2	HUYNH HUU NGHIA	*	1	2	HUYNH HUU NGHIA	*
	(9)	BA LUI	45	5.5	*	2.5×12.0		✓	-	-	-	-			-	-									
	(10)	XEO DUA	30	5.5	*	2.5×12.0			**	3	2470	3			48	C				XEO DUA	**			XEO DUA	**
	(11)	SAINTARD	100	5.5	**	7.0×30.0			**	2	4230	5			50	C				SAINTARD	**			SAINTARD	**
CAN THO	(12)	LONG MY	90	8.0	*	6.0×30.0			*	2	1110	2	317	3	44	C		1	1	LONG MY	*	1	1	LONG MY	*
	(13)	NGA SAU	50	5.5	**	5.0×25.0		✓	-	-	-	-			-	-									
	(14)	NGA TU	45	5.5	**	5.0×25.0			**	5	1110	2			62	B				NGA TU	**			NGA TU	**
KIEN GIANG	(15)	VAM SANG THI DO	75	5.5	*	7.0×30.0			*	5	4200	5	336	3	92	A		2	-	VAM SANG THI DOI	*	2	-	VAM SANG THI DOI	*
	(16)	HA GIANG	70	5.5	*	7.0×30.0			*	5	1240	2			62	B				HA GIANG	*			HA GIANG	*
	(17)	NO.11	55	5.5	**	7.0×30.0		✓	-	-	-	-			-	-									
AN GIANG	(18)	THOAI GIANG	90	5.5	*	7.0×30.0			*	2	2450	3	309	3	50	C		1	2	THOAI GIANG	*	1	2	THOAI GIANG	*
	(19)	SOC TRIET	50	5.5	*	6.0×25.0			**	5	1300	2			62	B				SOC TRIET	**			SOC TRIET	**
	(20)	CAI NAI	30	5.5	**	2.5×10.0			**	5	4140	5			80	A				CAI NAI	**			CAI NAI	**
DONG THAP	(21)	TRAM CHIM	80	6.5	*	3.5×24.0			*	5	1000	2	236	4	78	B		1	1	TRAM CHIM	*	1	1	TRAM CHIM	*
	(22)	KENH TU	70	6.5	**	4.0×24.7			**	5	1000	2			62	B				KENH TU	**			KENH TU	**
VINH LONG	(23)	HOA TINH	74	5.5	*	6.0×24.7			*	5	910	1	278	3	68	B		1	1	HOA TINH	*	1	1	HOA TINH	*
	(24)	BA KE	98	6.5	*	6.0×24.7	✓		-	-	-	-			-	-									
	(25)	MY HOA	84	5.5	**	6.0×18.0			**	5	1550	2			62	B				MY HOA	**			MY HOA	**
TRA VINH	(26)	TAN AN	45	6.5	*	3.0×25.0			*	5	1050	2	270	3	74	B		1	2	TAN AN	*	1	2	TAN AN	*
	(27)	RACH VON	60	5.5	*	2.0×18.0	✓		-	-	-	-			-	-									
	(28)	SUOI	65	5.5	**	3.0×25.0			**	2	1520	2			32	D	○			SUOI	**			SUOI	**
	(29)	DAI SU	45	5.5	**	3.0×25.0			**	2	750	1			26	D	○			DAI SU	**			DAI SU	**
TIEN GIANG	(30)	LONG BINH	38	5.5	**	3.5×10.0			*	4	1390	2	275	3	64	B		2	-	LONG BINH	*	2	-	LONG BINH	*
	(31)	XOM SOC	44	5.5	*	2.5×15.0	✓		-	-	-	-			-	-									
	(32)	TRA TAN	75	5.5	*	4.5×20.0			*	5	1420	2			62	B				TRA TAN	*			TRA TAN	*
BEN TRE	(33)	CAI MON LON	85	6.5	*	5.0×30.0	✓		-	-	-	-	271	3	-	-		-	2			1	1		
	(34)	CAI GA	75	6.5	**	5.0×30.0	✓		-	-	-	-			-	-									
	(35)	RANH TONG	85	6.5	**	3.5×24.0			**	3	1400	2			42	C				RANH TONG	**			RANH TONG	*
	(36)	HUONG MY	60	6.5	**	3.0×24.0			**	2	1650	2			32	D	○			HUONG MY	**			HUONG MY	**
LONG AN	(37)	TAN TRU	65	6.5	*	3.0×24.0			**	4	2100	3	286	3	70	B		1	2	TAN TRU	**	1	2	TAN TRU	**
	(38)	BA LY	65	5.5	*	3.0×24.0			*	4	2150	3			58	C				BA LY	*			BA LY	*
	(39)	VINH CONG	40	6.5	**	3.0×24.0			**	2	1700	2			32	D	○			VINH CONG	**			VINH CONG	**
TAY NINH	(40)	SAIGON	80	6.5	*	3.0×24.0			*	5	1240	2	254	3	74	B		1	1	SAIGON	*	1	1	SAIGON	*
	(41)	NINH DIEN	30	5.5	*	2.5×20.0			**	2	1130	2			32	D									
	(42)	SUOI TRE	36	5.5	**	3.0×24.0			**	2	1370	2			32	D									
	(43)	XE BE	30	5.5	**	3.5×18.0			**	2	1000	2			32	D	○			XE BE	**			XE BE	**
BINH DUONG	(44)	VUNG GAM	50	5.5	*	7.0×56.0			*	2	1500	2	437	1	36	D		1	1			1	1		
	(45)	CHUA	30	5.5	*	7.0×25.0			*	2	1410	2			32	D	○			CHUA	*			CHUA	*
	(46)	RACH RO	27	5.5	**	7.0×37.0			**	5	1385	2			62	B				RACH RO	**			RACH RO	**
	(47)	RACH GOC	30	5.5	**	7.0×25.0			**	2	1555	2			32	D									
BINH PHUOC	(48)	DAKIA	45	6.5	**	Non.			**	5	1240	2	151	5	82	A		-	2	DAKIA	**	1	1	DAKIA	*
	(49)	DAC NHAU	91	6.5	*	Non.	✓		-	-	-	-			-	-									
	(50)	NO.5	38	6.5	**	Non.			**	2	1070	2			32	D	○			NO.5	**			NO.5	**
	(51)	BOM RIA	22	6.5	**	Non.			**	2	1070	2			32	D									
DONG NAI	(52)	AN HOA	50	5.5	*	2.5×50.0		✓	-	-	-	-	389	2	-	-		1	2	CHAY	*	1	2	CHAY	*
	(53)	CHAY	50	5.5	*	2.5×36.0			*	5	1200	2			62	B				BAU XEO	**			BAU XEO	**
	(54)	BAU XEO	30	5.5	**	3.5×20.0			**	5	1500	2			62	B				SONG THAO	**			SONG THAO	**
	(55)	SONG THAO	20	5.5	**	3.5×16.0			**	5	1200	2			62	B									
BA RIA RIA VUNG TAU	(56)	SUOI GIAU	35	5.5	*	Non.		✓	-	-	-	-	1,442	1	-	-		1	-			1	-		
	(57)	SONG RAY 2	50	5.5	*	Non.		✓	-	-	-	-			-	-									
	(58)	AP AN BINH	45	5.5	*	3.5×20.0			*	5	1000	2			62	B				AP AN BINH	*			AP AN BINH	*
HO CHI MING C.	(59)	CONG DINH	60	6.5	*	-		✓	-	-	-	-	902	1	-	-		-	-			-	-		
	(60)	NO.3	90	5.5	**	-	✓		-	-	-	-			-	-									
																		19	**19**			**21**	**17**		

*: 34 bridges

Table 2-6 Construction Type Bridges (21 No.)

No.	Province / City	Bridge No.	Bridge Name	Navigational Clearance (m×m)	Road Classification	Width (m)	Length (m)				Girder Type
							Side Span (m)	Center Span (m)	Side Span (m)	Bridge Length (m)	
1	BAC LIEU	(3)	HOA BINH-2	5.0×24.0	Provincial Road	5.5	18.60	33.00	18.60	70.40	PC
2		(4)	DEN	2.5×18.0	Provincial Road	5.5	12.50	24.54	12.50	49.74	PC
3	CA MAU	(6)	VAM DINH	4.5×30.0	Provincial Road	5.5	18.60	33.00	18.60	70.40	PC
4		(7)	KINH KIEM LAM	4.0×27.0	Provincial Road	5.5	24.54	33.00	24.54	82.28	PC
5	SOC RANG	(8)	HUYNH HUU NGHIA	2.5×12.0	Provincial Road	5.5	12.50	18.60	12.60	43.80	PC
6	CAN THO	(12)	LONG MY	6.0×30.0	Provincial Road	5.5	33.00	33.00	33.00	99.20	PC
7	KIEN GIANG	(15)	VAM SANG THI DOI	5.0×25.0	Provincial Road	5.5	24.54	33.00	24.54	82.28	PC
8		(16)	HA GIANG	7.0×30.0	Provincial Road	5.5	18.60	33.00	18.60	70.40	PC
9	AN GIANG	(18)	THOAI GIANG	7.0×30.0	Provincial Road	5.5	18.60	33.00	18.60	70.40	PC
10	DONG THAP	(21)	TRAM CHIM	4.0×24.0	Provincial Road	5.5	24.54	33.00	24.54	82.28	PC
11	VINH LONG	(23)	HOA TINH	5.0×18.0	District Road	5.5	18.60	33.00	18.60	70.40	PC
12	TRA VINH	(26)	TAN AN	3.0×25.0	Provincial Road	5.5	12.50	33.00	12.50	58.20	PC
13	TIEN GIANG	(30)	LONG BINH	3.0×10.0	Provincial Road	5.5	24.54	12.50	-	37.19	PC
14		(32)	TRA TAN	4.5×20.0	Provincial Road	5.5	12.50	33.00	12.50	58.20	PC
15	BEN TRE	(35)	RANH TONG	3.5×24.0	Provincial Road	5.5	24.54	33.00	24.54	82.28	PC
16	LONG AN	(38)	BA LY	3.0×20.0	Provincial Road	5.5	33.00	24.00	-	57.15	Steel
17	TAY NINH	(40)	SAIGON	3.0×24.0	Provincial Road	5.5	18.60	33.00	18.60	70.40	PC
18	BINH DUONG	(45)	CHUA	N/A	Provincial Road	5.5	-	30.00	-	30.10	Steel
18	BINH PHUOC	(48)	DAKIA	N/A	Provincial Road	5.5	12.50	18.60	12.50	43.80	PC
20	DONG NAI	(53)	CHAY	2.0×18.6	District Road	5.5	12.50	24.54	12.50	49.74	PC
21	BA RIA V.T	(58)	AP AN BINH	3.5×20.0	District Road	5.5	-	33.00	-	33.10	PC

Table 2-7 Steel Girder Supply Type Bridges (17 No.)

No.	Province / City	Bridge No.	Bridge Name	Navigational Clearance (m×m)	Road Classification	Width (m)	Length (m)				Girder Type
							Side Span (m)	Center Span (m)	Side Span (m)	Bridge Length (m)	
1	SOC TRANG	(10)	XEO DUA	2.5×12.0	Provincial Road	5.5	-	30.00	-	30.10	Steel Girder
2		(11)	SAINTARD	7.0×30.0	Provincial Road	5.5	33.00	33.00	33.00	99.20	Steel Girder
3	CAN THO	(14)	NGA TU CAY DUONG	5.0×25.0	Provincial Road	5.5	15.00	30.00	15.00	60.20	Steel Girder
4	AN GIANG	(19)	SOC TRIET	6.0×25.0	Provincial Road	5.5	27.00	30.00	27.00	84.20	Steel Girder
5		(20)	CAI NAI	2.5×10.0	Village Road	4.5	-	33.00	-	33.10	Steel Girder
6	DONG THAP	(22)	KENH TU	3.5×24.0	Provincial Road	5.5	30.00	30.00	30.00	90.20	Steel Girder
7	VINH LONG	(25)	MY HOA	6.0×18.0	Village Road	4.5	30.00	30.00	30.00	90.20	Steel Girder
8	TRA VINH	(28)	SUOI	3.0×25.0	District Road	5.5	21.00	30.00	21.00	72.20	Steel Girder
9		(29)	DAI SU	3.0×25.0	Provincial Road	5.5	10.00	30.00	10.00	50.20	Steel Girder
10	BEN TRE	(36)	HUONG MY	3.0×24.0	Provincial Road	5.5	-	30.00	-	30.10	Steel Girder
11	LONG AN	(37)	TAN TRU	3.0×20.0	District Road	5.5	18.00	27.00	18.00	63.20	Steel Girder
12		(39)	VINH CONG	3.0×20.0	Provincial Road	5.5	-	30.00	-	30.10	Steel Girder
13	TAY NINH	(43)	XE BE	2.5×18.0	Village Road	4.5	-	30.00	-	30.10	Steel Girder
14	BINH DUONG	(46)	RACH RO	N/A	Provincial Road	5.5	-	27.00	-	27.10	Steel Girder
15	BINH PHUOC	(50)	SO 5	N/A	Provincial Road	5.5	10.00	30.00	-	40.15	Steel Girder
16	DONG NAI	(54)	BAU XEO	N/A	Village Road	4.5	-	21.00	-	21.10	Steel Girder
17		(55)	SONG THAO	N/A	Village Road	4.5	-	21.00	-	21.10	Steel Girder

2.2.7 Construction Plan

Planned method of construction for the two groups of bridges are as follows.

1) Construction Type Bridges

Construction of bridges is carried out fully under the Japanese Grant Aid Program. This includes all activities such as design and construction of bridges, approach roads, river bank protection and replacement of the existing bridges. The construction of these bridges will give much benefit to the surrounding communities and these locations were selected since construction conditions are comparatively difficult and accessibility to the sites is fair. The list of candidate bridges is shown in Table 2-8.

2) Steel Girders Supply Type Bridges

In this case, only steel girders are supplied under the Japanese Grant Aid Program. The government of Vietnam is responsible for the design and construction of bridges to utilize the girders supplied, of approach roads and associated structures. In this way capacity building of the domestic contractors can best occur. Technical assistance is also provided by the Japanese Government with the aim of encouraging technology transfer. These are bridges which have already been planned to be constructed by the Ministry of Transport of Vietnam and are comparatively small-scale bridges. The list of candidate bridges is shown in Table 2-9.

Table 2-8 Construction Type Bridges - Basic Design Data

Province	Bridge No	Name of Bridge	Navigation Clearance (m x m)	Road Classification	Design Width (m)	Plan			Superstructure	Foundation	Approach Road (m)	Existing Bridge
						Span (m)	Bridge Length (m)	Bridge Area (m^2)				
BAC LIEU	(3)	HOA BINH-2	5.0 x 24.0	Provincial Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	RC Pile	187.6	No existing bridge
	(4)	DEN	2.5 x 18.0	Provincial Road	5.5	12.5+24.54+12.5	49.74	273.6	PC Girder	RC Pile	152.26	New bridge located at 42 m upper stream of the existing
CA MAU	(6)	VAM DINH	4.5 x 30.0	Provincial Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	Steel Pipe Pile	174.60	No existing bridge
	(7)	KINH KIEM LAM	4.0 x 27.0	Provincial Road	5.5	24.54+33.0+24.54	82.28	452.5	PC Girder	RC Pile	157.72	No existing bridge
SOC TRANG	(8)	HUYNH HUU NGHIA	2.5 x 12.0	Provincial Road	5.5	12.5+18.6+12.6	43.80	240.9	PC Girder	RC Pile	157.2	New bridge located at near down stream of the existing
CAN THO	(12)	LONG MY	6.0 x 30.0	Provincial Road	5.5	33.0+33.0+33.0	99.20	545.6	PC Girder	RC Pile	280.8	Existing bridge demolished/ temporary bridge in place
KIEN GIANG	(15)	VAM SANG THI DOI	5.0 x 25.0	Provincial Road	5.5	24.54+33.0+24.54	82.28	452.5	PC Girder	RC Pile	177.72	No existing bridge
	(16)	HA GIANG	7.0 x 30.0	Provincial Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	RC Pile	259.6	No existing bridge
AN GIANG	(18)	THOAI GIANG	7.0 x 30.0	Provincial Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	RC Pile	229.6	Existing bridge demolished/ temporary bridge in place
DONG THAP	(21)	TRAM CHIM	4.0 x 24.0	Provincial Road	5.5	24.54+33.0+24.54	82.28	452.5	PC G Girder	RC Pile	144.22	No existing bridge
VINH LONG	(23)	HOA TINH	5.0 x 18.0	District Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	Steel Pipe Pile	144.22	New bridge located at near upper stream of the existing
TRA VINH	(26)	TAN AN	3.0 x 25.0	Provincial Road	5.5	12.5+33.0+12.5	58.20	320.1	PC Girder	RC Pile	176.8	Existing bridge demolished/ temporary bridge in place
TIEN GIANG	(30)	LONG BINH	3.0 x 10.0	Provincial Road	5.5	24.54+12.5	37.19	204.5	PC Girder	Steel Pipe Pile	177.81	Existing bridge demolished/ temporary bridge in place
	(32)	TRA TAN	4.5 x 20.0	Provincial Road	5.5	12.5+33.0+12.5	58.20	320.1	PC Girder	RC Pile	217.8	New bridge located at near down stream of the existing
BEN TRE	(35)	RANH TONG	3.5 x 24.0	Provincial Road	5.5	24.54+33.0+24.54	82.28	452.5	PC Girder	RC Pile	157.72	Existing bridge demolished/ temporary bridge in place
LONG AN	(38)	BA LY	3.0 x 20.0	Provincial Road	5.5	33.0+24.0	57.15	314.3	Steel Girder	RC Pile	177.85	Existing bridge demolished/ temporary bridge in place
TAY NINH	(40)	SAIGON	3.0 x 24.0	Provincial Road	5.5	18.6+33.0+18.6	70.40	387.2	PC Girder	RC Pile	179.6	New bridge located at near down stream of the existing
BINHDUONG	(45)	CHUA	None	Provincial Road	5.5	30.0	30.10	165.6	Steel Girder	Spread Foundation	239.9	New bridge located at near down stream of the existing
BINH PHUOC	(48)	DAKIA	None	Provincial Road	5.5	12.5+18.6+12.5	43.80	240.9	PC Girder	Spread Foundation	216.2	Existing bridge demolished/ temporary bridge in place
DONG NAI	(53)	CHAY	2.0 x 18.6	District Road	5.5	12.5+24.54+12.5	49.74	273.6	PC Girder	RC Pile	135.26	Existing bridge demolished/ temporary bridge in place
BA RIA V.T	(58)	AP AN BINH	3.5 x 20.0	District Road	5.5	33.0	33.10	182.1	PC Girder	RC Pile	186.9	New bridge located at 100 m down stream of the existing

Table 2-9 Steel Girder Supply Type Bridges - Basic Design Data

Province	Bridge No.	Name of Bridge	Navigation Clearance (m x m)	Road Classification	Bridge width (m)	Plan (m)			Superstructure	Remarks
						Span (m)	length (m)	Bridge Area (m^2)		
SOC TRANG	(10)	XEO DUA	2.5 x 12.0	Provincial Road	5.5	30.0	30.10	165.6	Steel Girder	
	(11)	SAINTARD	7.0 x 30.0	Provincial Road	5.5	33.0+33.0+33.0	99.20	545.6	Steel Girder	
CAN THO	(14)	NGA TU CAY DUONG	5.0 x 25.0	Provincial Road	5.5	15.0+30.0+15.0	60.20	331.1	Steel Girder + H Beam	
AN GIANG	(19)	SOC TRIET	6.0 x 25.0	Provincial Road	5.5	27.0+30.0+27.0	84.20	463.1	Steel Girder	
	(20)	CAI NAI	2.5 x 10.0	Village Road	4.5	30.0	33.10	149.0	Steel Girder	
DONG THAP	(22)	KENH TU	3.5 x 24.0	Provincial Road	5.5	30.0+30.0+30.0	90.20	496.1	Steel Girder	
VINH LONG	(25)	MY HOA	6.0 x 18.0	Village Road	4.5	30.0+30.0+30.0	90.20	405.9	Steel Girder	
TRA VINH	(28)	SUOI	3.0 x 25.0	District Road	5.5	21.0+30.0+21.0	72.20	397.1	Steel Girder	
	(29)	DAI SU	3.0 x 25.0	Provincial Road	5.5	10.0+30.0+10.0	50.20	276.1	Steel Girder + H Beam	
BEN TRE	(36)	HUONG MY	3.0 x 24.0	Provincial road	5.5	30.0	30.10	165.6	Steel Girder	
LONG AN	(37)	TAN TRU	3.0 x 20.0	District Road	5.5	18.0+27.0+18.0	63.20	347.6	Steel Girder	
	(39)	VINH CONG	3.0 x 20.0	Provincial Road	5.5	30.0	30.10	165.6	Steel Girder	
TAY NINH	(43)	XE BE	2.5 x 18.0	Village Road	4.5	30.0	30.10	135.5	Steel Girder	
BINH DUONG	(46)	RACH RO	None	Provincial Road	5.5	27.0	27.10	149.1	Steel Girder	
BINH PHUOC	(50)	SO 5	None	Provincial Road	5.5	10.0+30.0	40.15	220.8	Steel Girder + H Beam	
DONG NAI	(54)	BAU XEO	None	Village Road	4.5	21.0	21.10	95.0	Steel Girder	
	(55)	SONG THAO	None	Village Road	4.5	21.0	21.10	95.0	Steel Girder	

2.3 Basic Design

2.3.1 Design Concepts

(1) Physical Conditions

Within the project area, the Mekong Delta area in particular is subject to heavy river flows during the monsoon season. Flooding is a major problem, and it is important to provide adequate cross section for river flow at the bridge locations. Slope protection is essential in order to prevent slope erosion by flood flows and by waves caused by passing boats. However, in tidal areas and generally, river velocities are not so high that bed protection in the form of gabions is required.

Also in the Mekong Delta area foundation soil conditions are very poor, with extensive very soft alluvial deposits (SPT blowcounts below 5) generally 15 to 50m deep, occasionally extending to over 50m depth. Under such conditions piled foundations are required. Construction of approach road embankments in these circumstances risks severe differential settlement and slip circle failure. As a result ground improvement is anticipated at around half of the bridge sites.

In the hilly areas in the northeastern provinces, ground conditions and flood flows are not such a major design consideration.

The project area is in a seismically inactive area, and hence the impact of earthquake force on the bridges is minimal.

(2) Social Conditions

The project bridges are to be designed taking account of the following points:

- Land acquisition The alignment of the proposed bridges should be planned so as to facilitate land acquisition and compensation issues regarding houses, farmland and ponds

- Navigation clearance Given the importance of river transport in the region, adequate clearance for river traffic must be provided.

(3) Construction Conditions

Local contractors have had the opportunity to take part in major projects in recent years including Improvement of National Highway No. 1 funded by the Japanese Government and Mytuan Bridge funded by the Australian Government. Their technical capabilities have been improving steadily, however experience of large

plant and new technologies remains limited. In this project foreign engineers will aim to continue the process of technology transfer, and in particular assist with developing programming and quality control skills.

(4) Use of Local Contractors and Materials

Bridge construction in the country is at present carried out by a state-owned construction enterprise acting as part of a Government Agency. This enterprise shall be used since it has experience and a good record on previous projects.

Wherever possible, locally available materials and plant shall be used in the project.

(5) Management Ability of Government Agency

Construction and maintenance of national roads has been implemented by the MOT, and other roads are under the auspices of the Communist Party of each province or county.

A Project Management Unit (PMU) within the Ministry of Transport, PMU - No. 18 will conduct this project with overseas assistance. PMU - No. 18 has previously successfully worked on Japanese-funded projects on National Road No. 1 and National Road N.18, and on the project for Reconstruction of Bridges in the Northern Districts. It has the staff and the technical capability to implement the project.

(6) Grade of Bridge Requirement

The design for bridge construction and steel girder supply type bridges is made on the basis of a bridge length of less than 100 meters in accordance with the project brief. Design grade in terms of traffic volume and other performance targets is to be Vietnamese standard level, even on provincial and village roads. Road categories shall be V and VI, and grades of bridges are designed as follows.

i) Following Vietnam design standards

ii) Using live load H13 in the Vietnam Standard

ii) To a design water level

The water level for the design of girder soffit elevation is determined as follows, taking into consideration whether river transportation exists or not:

- Rivers and canals for navigation managed by the central government

  20-year water level is adopted according to government law and it is

supplemented by an appropriate clearance for navigation to determine soffit elevation.

- Rivers and canals for navigation managed by the provincial governments

  Responsibility for determining design water levels and the clearance for navigation lies with the Provincial Government. However, this study proposes that 2 bridges in Dong Thap province should be designed based on water levels recorded in the 1978 floods and the remaining 26 bridges should be designed based on the criteria of the central government.

- Other rivers and canals

  The design water level is determined based on the flood water level and it is supplemented by an allowance for flood to obtain the design girder soffit elevation. This will be applied to 6 bridges in the hilly provinces of Binh Phuoc, Binh Duong and Dong Nai.

(7) Corrosion Resistant Steel Girder Supply

Corrosion resistant steel is popular for use as a low maintenance material in developed countries whilst consideration of the location and exposure conditions is still required. In this project it was agreed to use corrosion resistant material in certain locations where access is difficult and maintenance would otherwise be an onerous burden. This applied to 6 out of the 17 steel girder supply type structures. The selected bridges are listed in Table 2-10.

Table 2-10 Corrosion Resistant Steel Girder Supply Type Bridges

Province	Bridge Number	Bridge Name
AN GIANG	(19)	SOC TRIET
	(20)	CAI NAI
DONG THAP	(22)	KENH TU
TAY NINH	(43)	XE BE
BINH DUONG	(46)	RACH RO
BINH PHUOC	(50)	SO 5
Total		6

(8) Construction Schedule

In the rainy season from May to November, the average monthly rainfall is as high as 250 mm and the number of days with a rainfall of more than 10 mm is up to 50 days.

The water level of the rivers in the Mekong Delta starts increasing in May and reaches its peak in October. In January, water level returns to average dry season levels. One or two typhoons can be expected in October and November.

Appropriate construction plans for the bridges will be made in consideration of these natural factors. Accordingly substructure construction and approach road soft ground treatment work shall be carried out in the dry season and superstructures constructed in the rainy season.

Since the bridge sites are numerous and geographically dispersed, consideration in planning is given to effective use of available manpower and equipment.

(9) Soft Component

There are 17 bridges on the project that are to be constructed by the Vietnam Government using steel girders supplied by the Japanese Government. Since there is little experience of steel bridge construction in Vietnam, technical assistance will be provided as part of this project. It is hoped in this way to encourage capacity building of the domestic construction industry, and to carry out transfer of technology. A Japanese engineer will be present to assist with construction supervision, and to aid development of construction programming skills.

2.3.2 Basic Design

(1) Design Water Levels

(a) Rivers and canals for navigation

20-year flood water level was calculated by Gumbel's method using the water level data collected at each station. The levels are shown in Table 2-11. The design water level for each planned bridge site was estimated by using the data of the nearest station and by consideration of the geographical location of the station. The bridges and the stations selected, together with water level data are presented in Table 2-12 and design water levels are given in Table 2-13.

(b) Bridges in the Province of Dong Tap

The design water levels for the 2 bridges of Tram Chim (No.21) and Kenh Tu (No.22) were determined on the basis of the flood water level of 1978, as requested by the provincial government. The observation stations whose data were used for the calculation are Tan Chau upstream on the Mekong River and Hung Thanh in the province of Long An. These design water levels are also

shown in Table 2-13.

(c) Saigon bridge in the province of Tai Ninh

A F/S report is available for the Saigon Bridge (No.40) in which the design water level has been decided as 18.84 m (based on a Temporary Bench Mark). To determine this value, the 1988 flood water level, which is regarded as 20-year return period flood level, was taken into consideration. This elevation is equivalent to 24.71m according to the national standard datum (State E.L.).

(d) Others

For the rivers in the hilly provinces, hydrological data to estimate the design water levels was not available. Thus the design water levels are determined based on recorded highest water levels obtained during site survey. The design water levels are shown in Table 2-13.

Table 2-11 20-Year Flood frequency Water Levels

EL..Dataum: State

Name of W.L Station	Province/City	Name of River/Cana	Calculated Water Level 20 Years Return Period (cm)	Remarks
1.Tan Chau	An Giang	Tien	520	
2.Cho Moi	An Giang	Rach Ong Chuong	344	
3.Cao Lanh	Dong Thap	Tien	233	
4.My Thuan	Soc Trang	Tien	173	
5.My Tho	Tien Giang	Tien	174	
6.Cai Lay	Tien Giang	Rach Ba Rai	164	
7.Moc Hoa	Long An	Vam Co Tay	302	
8.Hung Thanh	Dong Thap	Phuoc Xuyen	337	
9.Tra Vinh	Tra Vinh	Co Chien	187	
10.Hoa Binh	Tien Giang	Tien	172	
11.Chau Doc	An Giang	Hau	489	
12.Long Xuyen	An Giang	Hau	273	
13.Can Tho	Can Tho	Hau	184	
14.Dai Ngai	Soc Trang	Hau	189	
15.Tri Ton	An Giang	Xang Tri Ton	365	
16.Tan Hiep	Kien Giang	Kenh Cai San	200	
17.Vi Thanh	Can Tho	K enh Xa No	72	
18.Thu Dau Mot	Binh Duong	Sai Gon	120	
19.Bien Hoa	Dong Nai	Dong Nai	221	
20.Phu An	Ho Chi Minh	Sai Gon	142	
21.Nha Be	Ho Chi Minh	Dong Nai	145	
22.Ben Luc	Long An	Vam Co Dong	135	
23.Phudc Long	Binh Phuoc	Dong Nai	1677	
24.Tri An	Dong Nai	Dong Nai	7716	
25.Dau Tieng	Tay Ninh	Sai Gon	422	
26.Ca Mau	Ca Mau	Ong Doc/Bay Hap	102	
27.Nam Can	Ca Mau	Cua Lon	136	
28.Vung Tau	Ba Ria Vung Tau	East sea	151	
29.Rach Gia	Kien Giang	Thailand Gulf	114	
30.Tan an	Long An	Vam Co Tay	173	
31.Phung Hiep	Soc Trang	Quan La	152	
32. Ganh Hao	Bac Lieu	East sea	211	
33.Song Doc	Ca Mau	Thailand Gulf	N.A	Ref.Average 74
34.Phuoc Long	Bac Lieu	Phung Hiep	60	
35.My Thanh	Soc Trang	Thailand Gulf	N.A	Ref.Average 188

Table 2-12 Related Water Level Stations and Water Levels of 20-year Flood Frequency

Province & City	Type Const: * Supply: **		No.	Bridge Name	Related W.L Stations		Remarks
					Sta.No & W.L	Sta.No & W.L	
BAC LIEU	1	*	(3)	HOA BINH-2	No.32: 211cm & No.35: 188cm	No.34: 60 cm	L(%) = 0.25
	2	*	(4)	DEN	No.26: 102cm	No.34: 60 cm	
CA MAU	3	*	(6)	VAM DINH	No.26: 102cm	No.33: 91cm('99)	
	4	*	(7)	KINH KIEM LAM	No.33: 91cm('99)		
	5	*	(8)	HUYNH HUU NGHIA	No.31: 152cm	No.34: 60 cm	L(%) = 0.19
SOC TRANG	6	**	(10)	XEO DUA	No.31: 152cm	No.34: 60 cm	
	7	**	(11)	SAINTARD	No.14: 189cm		
	8	*	(12)	LONG MY	No.31: 152cm	No.17: 72cm	
CAN THO	9	**	(14)	NGA TU CAY DUONG	No.31: 152cm		
KIEN GIANG	10	*	(15)	VAM SANG THI DOI	No.16: 200cm	No.17: 72cm	
	11	*	(16)	HA GIANG	No.29: 114cm		
AN GIANG	12	*	(18)	THOAI GIANG	No.12: 273cm	No.29: 114cm	
	13	**	(19)	SOC TRIET	No.15: 365cm		
	14	**	(20)	CAI NAI	No.12: 273cm	No.3: 233cm	
DONG THAP	15	*	(21)	TRAM CHIM	Ref.1978 W.L		Request from Prov.
	16	**	(22)	KENH TU	Ref.1978 W.L		Request from Prov.
VINH LONG	17	*	(23)	HOA TINH	No.4: 173cm	No.9: 187cm	
	18	**	(25)	MY HOA	No.13: 184cm		
TRA VINH	19	*	(26)	TAN AN	No.9: 187cm	No.14: 189cm	
	20	**	(28)	SUOI	No.9: 187cm	No.14: 189cm	
	21	**	(29)	DAI SU	No.9: 187cm	No.14: 189cm	
TIEN GIANG	22	*	(30)	LONG BINH	No.10: 172cm		
	23	*	(32)	TRA TAN	No.4: 173cm	No.5: 174cm	
BEN TRE	24	*	(35)	RANH TONG	No.9: 187cm	No.5: 174cm	
	25	**	(36)	HUONG MY	No.9: 187cm		
LONG AN	26	**	(37)	TAN TRU	No.22: 135cm	No.30: 173cm	
	27	*	(38)	BA LY	No.30: 173cm		
	28	**	(39)	VINH CONG	No.30: 173cm		
TAY NINH	29	*	(40)	SAIGON	Ref.to F/s		
	30	**	(43)	XE BE	Historic flood level		hilly area
BINH DUONG	31	*	(45)	CHUA	Historic flood level		hilly area
	32	**	(46)	RACH RO	Historic flood level		hilly area
BINH PHUOC	33	*	(48)	DAKIA	Historic flood level		hilly area
	34	**	(50)	SO 5	Historic flood level		hilly area
DONG NAI	35	*	(53)	CHAY	No.21: 145cm		L(%) = 0.21
	36	**	(54)	BAU XEO	Historic flood level		hilly area
	37	**	(55)	SONG THAO	Historic flood level		hilly area
BA RIA	38	*	(58)	AP AN BINH	No.28: 151cm		L(%) = 0.27

Note:

1). * : Construction and ** : Procurement

Table 2-13 Design Water Levels

Datum of W.L :State

Province & City	Type */**	No.	Bridge Name	Design			Remarks	
				Water Levels (m)	Return Period (Year)	Navigation Clearance (m)	Topo.Condition	Other
BAC LIEU	*	(3)	HOA BINH-2	1.65	20	5.0	Inland Flood Plain	
	*	(4)	DEN	0.81	20	2.5	Coastal Flood Plain	
CA MAU	*	(6)	VAM DINH	0.97	20	4.5	Inland Flood Plain	
	*	(7)	KINH KIEM LAM	0.91	20	4.0	Coastal Flood Plain	
SOC TRANG	*	(8)	HUYNH HUU	1.35	20	2.5	Inland Flood Plain	
	**	(10)	XEO DUA	1.35	20	2.5	Inland Flood Plain	
	**	(11)	SAINTARD	1.89	20	7.0	Inland Flood Plain	
CAN THO	*	(12)	LONG MY	1.12	20	6.0	Inland Flood Plain	
	**	(14)	NGA TU	1.52	20	5.0	Inland Flood Plain	
KIEN GIANG	*	(15)	VAM SANG T.D	1.36	20	7.0	Inland Flood Plain	
	*	(16)	HA GIANG	1.14	20	7.0	Coastal Flood Plain	
AN GIANG	*	(18)	THOAI GIANG	1.94	20	7.0	Inland Flood Plain	
	**	(19)	SOC TRIET	3.65	20	6.0	Inland Flood Plain	
	**	(20)	CAI NAI	2.53	20	2.5	Inland Flood Plain	
DONG THAP	*	(21)	TRAM CHIM	3.50	Based on 1978 Flood	3.5	Inland Flood Plain	Request from prov.
	**	(22)	KENH TU	2.70	Based on 1978 Flood	4.0	Inland Flood Plain	Request from prov.
VINH LONG	*	(23)	HOA TINH	1.87	20	6.0	Inland Flood Plain	
	**	(25)	MY HOA	1.84	20	6.0	Inland Flood Plain	
TRA VINH	*	(26)	TAN AN	1.88	20	3.0	Inland Flood Plain	
	**	(28)	SUOI	1.88	20	3.0	Inland Flood Plain	
	**	(29)	DAI SU	1.88	20	3.0	Inland Flood Plain	
TIEN GIANG	*	(30)	LONG BINH	1.72	20	3.5	Coastal Flood Plain	
	*	(32)	TRA TAN	1.74	20	4.0	Inland Flood Plain	
BEN TRE	*	(35)	RANH TONG	1.87	20	3.5	Inland Flood Plain	
	**	(36)	HUONG MY	1.87	20	3.0	Inland Flood Plain	
LONG AN	**	(37)	TAN TRU	1.54	20	3.0	Inland Flood Plain	
	*	(38)	BA LY	1.73	20	3.0	Inland Flood Plain	
	**	(39)	VINH CONG	1.73	20	3.0	Inland Flood Plain	
TAY NINH	*	(40)	SAIGON	24.71	20	3.0	Hilly Area	Ref.to F/S report
	**	(43)	XE BE	15.80	20	2.5	Hilly Area	
BINH DUONG	*	(45)	CHUA	5.80	50	0.5	Hilly Area	No Navigation
	**	(46)	RACH RO	5.50	50	0.5	Hilly Area	No Navigation
BINH PHUOC	*	(48)	DAKIA	90.70	50	0.5	Hilly Area	No Navigation
	**	(50)	SO 5	253.50	50	0.5	Hilly Area	No Navigation
DONG NAI	*	(53)	CHAY	1.61	20	2.0	Inland Flood Plain	
	**	(54)	BAU XEO	48.30	50	0.5	Hilly Area	No Navigation
	**	(55)	SONG THAO	71.00	50	0.5	Hilly Area	No Navigation
BA RIA	*	(58)	AP AN BINH	1.41	20	3.5	Hilly Area	

1). * : Construction and ** : Procurement

(2) Bridge Design

ii) River Conditions

As discussed earlier in the section on hydrological analysis, bridges and approach roads shall satisfy the following basic criteria.

1) River Cross Section

The required cross-sectional area of flow will be provided at each location of bridge construction. The bridges are designed to restore the natural cross-sectional area of flow which in cases had been reduced by filling at the abutments to allow use of shorter temporary bridges.

2) Design Water Levels

As discussed in the section on design concepts, design water levels are given in Table 2-13.

3) Navigation Clearance

Navigational clearance in terms of width and height is required to allow passage of ships and boats on the rivers and canals. The size of the navigation clearances are shown in Table 2-6, as determined following discussion with the relevant authorities.

4) Freeboard to Girders

Sufficient clearance between flood level and bottom of girder will be provided to avoid damage to the bridge from floodwater and driftwood. Generally, determination of freeboard is made depending on volume and area of flow. However, due to lack of pertinent data, such as flood runoff, flood velocities, etc., freeboard was set at a standard 1.0 m in hilly areas, and 0.5 m in the lowlands. The vertical clearance to roadways shall be set at 4.5m.

Table 2-15 Clearance

Roadway vertical clearance	H=4.5m	
Freeboard to girders (rivers/canals)	Lowland areas	H=0.5m
	Hilly areas	H=1.0m

Table 2-14 Navigational Clearance

Province	Bridge Number	Bridge Name	Road classification	Construction Supply	Navigation (m×m)
BAC LIEU	(3)	HOA BINH-2	Pro.	Construction	5.0×24.0
	(4)	DEN	Pro.	Construction	2.5×18.0
CA MAU	(6)	VAM DINH	Pro. No.6	Construction	4.5×30.0
	(7)	KINH KIEM	Pro. No.6	Construction	4.0×27.0
SOC TRANG	(8)	HUYNH HUU	Pro. No.13	Construction	3.0×12.0
	(10)	XEO DUA	Pro. No.13	Supply	2.5×12.0
	(11)	SAINTARD	Pro. No.6	Supply	7.0×30.0
CANTHO	(12)	LONG MY	Pro. No.931	Construction	6.0×30.0
	(14)	NGA TU	Pro. No.928	Supply	5.0×25.0
KIEN GIANG	(15)	VAM SANG T.D	Pro.	Construction	5.0×25.0
	(16)	HA GIANG	Pro. No.955	Construction	7.0×30.0
AN GIANG	(18)	THOAI GIANG	Pro. No.943	Construction	7.0×30.0
	(19)	SOC TRIET	Pro. No.943	Supply	6.0×25.0
	(20)	CAI NAI	Village	Supply	2.5×10.0
DONG THAP	(21)	TRAM CHIM	Pro. No.843	Construction	4.0×24.0
	(22)	KENH TU	Pro. No.844	Supply	3.5×24.0
VING LONG	(23)	HOA TINH	Dis.	Construction	5.0×18.0
	(25)	MY HOA	Village	Supply	6.0×18.0
TRA VINH	(26)	TAN AN	Pro. No.911	Construction	3.0×25.0
	(28)	SUOI	Dis. No.2	Supply	3.0×25.0
	(29)	DAI SU	Pro. No912	Supply	3.0×25.0
TIEN GIANG	(30)	LONG BINH	Pro. No.877	Construction	3.0×10.0
	(32)	TRA TAN	Pro. No.864	Construction	4.5×20.0
BEN TRE	(35)	RANH TONG	Pro. No.888	Construction	3.5×24.0
	(36)	HUONG MY	Pro. No.888	Supply	3.0×24.0
LONG AN	(37)	TAN TRU	Dis.	Supply	3.0×20.0
	(38)	BA LY	Pro. No.828	Construction	3.0×20.0
	(39)	VINH CONG	Pro. No.827A	Supply	3.0×20.0
TAY NINH	(40)	SAIGON	Pro. No.794	Construction	4.5×24.0
	(43)	XE BE	Village	Supply	2.5×18.0
BING DUONG	(45)	CHUA	Pro. No.746	Construction	N/A
	(46)	RACH RO	Pro. No.746	Supply	N/A
BINH PHUOC	(48)	DAKIA	Pro. No.749	Construction	N/A
	(50)	NO.5	Pro. No.750	Construction	N/A
DONG NAI	(53)	CHAY	Dis. No.19	Construction	2.0×18.6
	(54)	BAU XEO	Village	Supply	N/A
	(55)	SONG THAO	Village	Supply	N/A
VUNG TAU	(58)	AP AN BINH	Dis.	Construction	3.5×20.0

ii) Design Standards

The following Vietnamese design standards were adopted. In addition to the standards listed below, Japanese Standards and AASHTO standards were also used where required.

- Highway Specifications for Design TCVN 4054: 1988 (VIETNAM)
- Design Specification for Bridges and Culverts on the basis of limit states, Ministry of Transport and Communication No. 2057 QD/KT14 1979 (VIETNAM)
- Design Criteria of Highway TCVN 4054-85 (VIETNAM)

iii) Design Methodology

Structural members were designed by the allowable stress method under a design load, and also checked by the limit state method in accordance with the Vietnam Standard.

iv) Relation between Design Traffic Volume and Design Speed

According to Vietnamese Design Standards (i.e. TCVN 4054-85 and 1998), highways are divided into six technical classes depending on the importance of the highway and traffic volume. Table 2-16 shows, for each of these classes, the maximum safe design speed under normal conditions:

Table 2-16 (1) Highway Design Speed and Traffic Volume

Road Grade	I	II	III	IV	V	VI
Average Daily Traffic Volume	>6000	3000 ~ 6000	1000 ~ 3000	300 ~ 1000	50 ~ 300	<50
Design Speed	80-60	80-60	80-60	60-40	40-20	25-15
No. of lanes	6	4	2	2	2 (v=40) 1 (v=20)	1

Table 2-16 (2) Design Speed and Road Width

	Design Speed V (km/hr)				
	20	25	40	60	80
Lane width (m)	3.50	3.50	3.00	3.50	3.50
Shoulder width (m)	2×1.50	2×1.50	2×1.50	2×2.50	2×3.00

Traffic volumes for this project located in the rural area of the Mekong Delta and south east Vietnam are less than 300 vehicles per day, hence road categories V and VI have been selected as appropriate by the JICA Study Team based on the site survey.

In principle the design speed should be 40km/h for Provincial Roads and 25km/h for other District Roads.

v) Road and Bridge Cross Section

In this project all road and bridge categories are categories V and V1. However bridge width is generally determined taking consideration of economy and is narrower than that of the approach road. Hence width of bridges on provincial and district roads is 5.5m, sufficient for two trucks to pass. On village roads it is 4.5m which is determined based on category V specification (design speed 20km/h) adding a margin of 0.5m on both sides.

Cross sections are as shown in Figures 3-1 and 3-2.

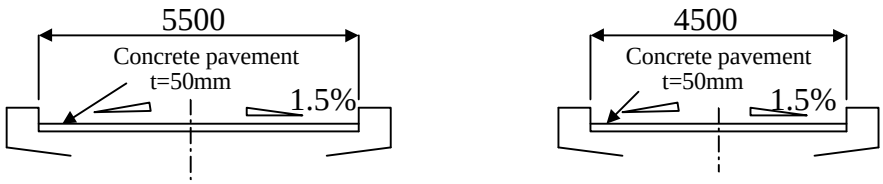


Figure 3-1 Cross Section for Bridges

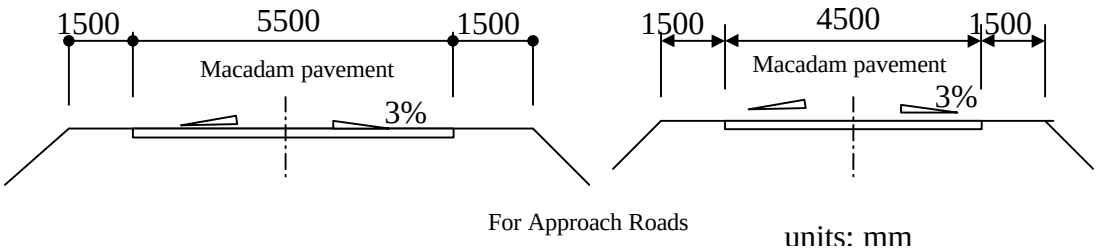


Figure 2-2 Cross Section for Approach Roads

vi) Design Load

① Live Load

Bridge were designed for H13 and X-60 live loadings as described in the Vietnamese Standard.

② Seismic Horizontal Force

In accordance with AASHTO and Vietnam Standard 22TCN-221-95, a horizontal seismic coefficient Kh = 0.05 is adopted.

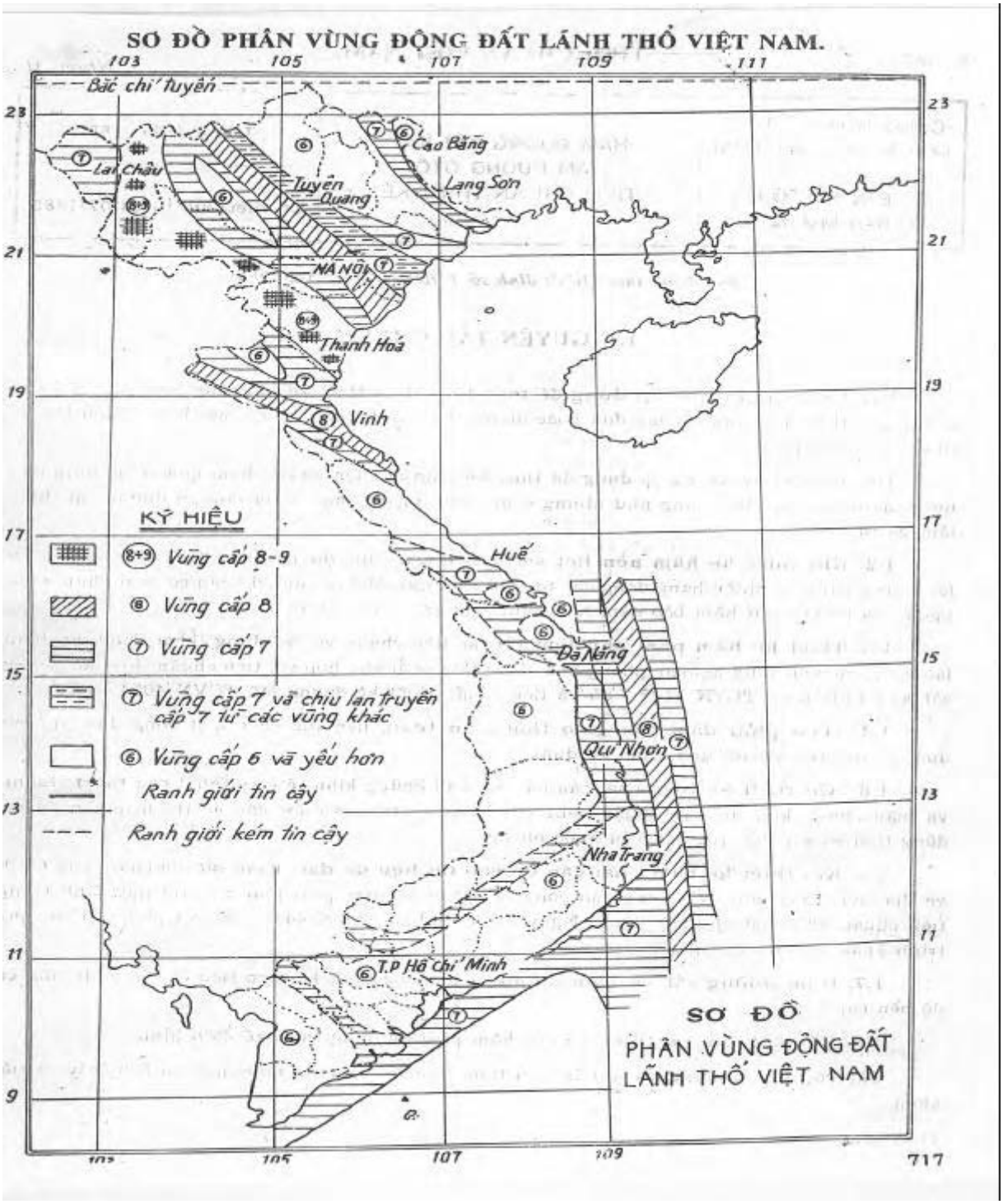


Figure 2-1 Seismic Intensity Map

●：Construction Type Bridge Group

▼：Girder Supply Type Bridge

③ Ship Impact

Regarding design for ship impact, a 30t force at the points of the pier structure was adopted in accordance with Vietnam Bridge Standard No. 2057 QD/KT 14 article 2.27.

④ Other

- Dead Load
- Live Load, including impact load
- Wind Loads
- Influence of creep of concrete
- Influence of dry shrinkage of concrete
- Earth Pressure
- Static pressure of water
- Buoyancy
- Settlement

vii) Design Criteria

① Construction Materials

a) Materials and unit weights

Table 2-17 Unit Weight of Materials

Designation	Self-weight kg/m^3	Designation	Self-weight kg/m^3
Steel	7,850	Cement Mortar	2,150
Reinforced Concrete	2,500	Asphalt Pavement	2,300
Prestressed Concrete	2,500	Concrete Pavement	2,350
No-reinforced Concrete	2,350	Timber	800

b) Strength of materials

In principal, compressive strengths of concrete are specified in Vietnam Bridge Standard No.2057 QD/Kt14 article 5.12, and reinforcing bars in article 5.13.

Table 2-18 Strength of Concrete

Designation	Strength (kg/cm^2)
PC Girder (Pre-tension)	400
PC Girder (Post-tension)	350
Slab	300
Abutment, Pier	200
Concrete Pile	300

Table 2-19 Allowable Stress of Reinforcement Bar

Designation	Yield Strength (kg/cm^2)
Round Bar (A-I)	σ py=1900
Deformed bar (A-II)	σ py=2,400
Deformed bar (A-III)	σ py=3,000

Design tensile strength of prestressing strands are as follow:

Table 2-20 PC Strands

Girder	Designation	Yield Load (Kgf/mm^2)	Ultimate Load (Kgf/mm^2)
Pre-tension	SWPR7A T12.7 mm	160	190
Post-tension	SWPR7B 12T12.4 mm	150	175

Basic strength of steel for plate girders shall be specified below in accordance with Japanese Standard or AASHTO.

Table 2-21 Steel Tensile Strength

Designation	Tensile strength (kgf/mm^2)	Remarks
SS400, SM400	41-52	Normal steel
SM490, SM490Y	50-62	Normal steel
SM520	53-65	Normal steel
SMA400W	41-55	Corrosion resistant steel
SMA490W	50-62	Corrosion resistant steel

② Road Geometric Standards

Road geometric standards as set out in Vietnam Standard TCVN 4054 1998 were used.

Table 2-22 Geometric Design

Item	Unit	Design Standard	
Design Speed	Km/hr	40	25
Horizontal alignment			
Minimum curve of radius	m	60	15
Minimum curve length	m	70	45
Minimum transition curve length	m	35	25
Super elevation runoff		1/100	1/100
Minimum length of sight distance	m	40	20
Vertical alignment			
Maximum gradient	%	8	9
Minimum radius of crest	m	700	200
Minimum radius of sag	m	450	100
Minimum vertical curve length	m	30	25
Cross section			
Cross fall	%	3	3
Maximum super-elevation	%	6	6

vii) Design Criteria

1) Superstructure Type

The bridge types in the project fall into either the construction type bridge or the steel girder supply type bridge category.

a) Construction Type Bridges (21 No.)

In the Mekong Delta area, and around Ho Chi Minh City, the majority of bridge superstructures are of the pretensioned PC girder type.

The type of bridge was determined considering the following issues:

- Use of materials in Vietnam
- Transportation of equipment
- Manpower and technical level for construction
- Economical design
- Construction method/erection machine, etc.
- Maintenance

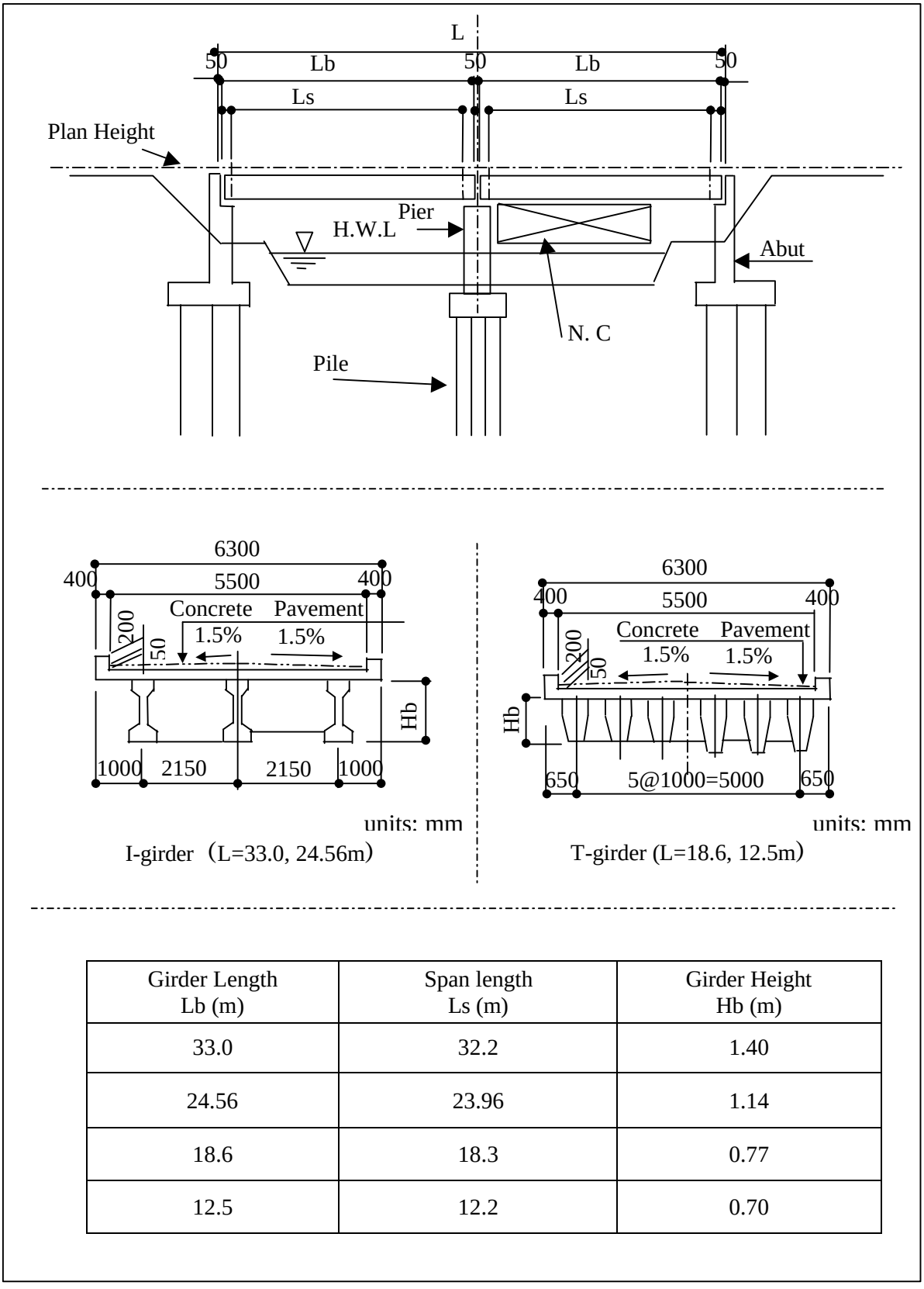
An illustration of the advantages and disadvantages of pre- and post-tensioned concrete beams is shown in Table 2-23.

Table 2-23 Comparison Table

Superstructure	Quality	Girder Depth	Transport	Manufacture Period	Economy
Pretensioned Girder	◎	◎	Δ	◎	◎
Posttensioned Girder	○	○	◎	○	○

Pretensioned girders are difficult to transport due to their length. However in all other respects pretensioned girders are superior to post-tensioned girders. The depth of section of pretensioned girders is lower and allows use of a lower deck level, and hence design of lower approach road embankments is possible.

Standard PC bridge construction is shown in cross section in Figure 2-4



Girder Length Lb (m)	Span length Ls (m)	Girder Height Hb (m)
33.0	32.2	1.40
24.56	23.96	1.14
18.6	18.3	0.77
12.5	12.2	0.70

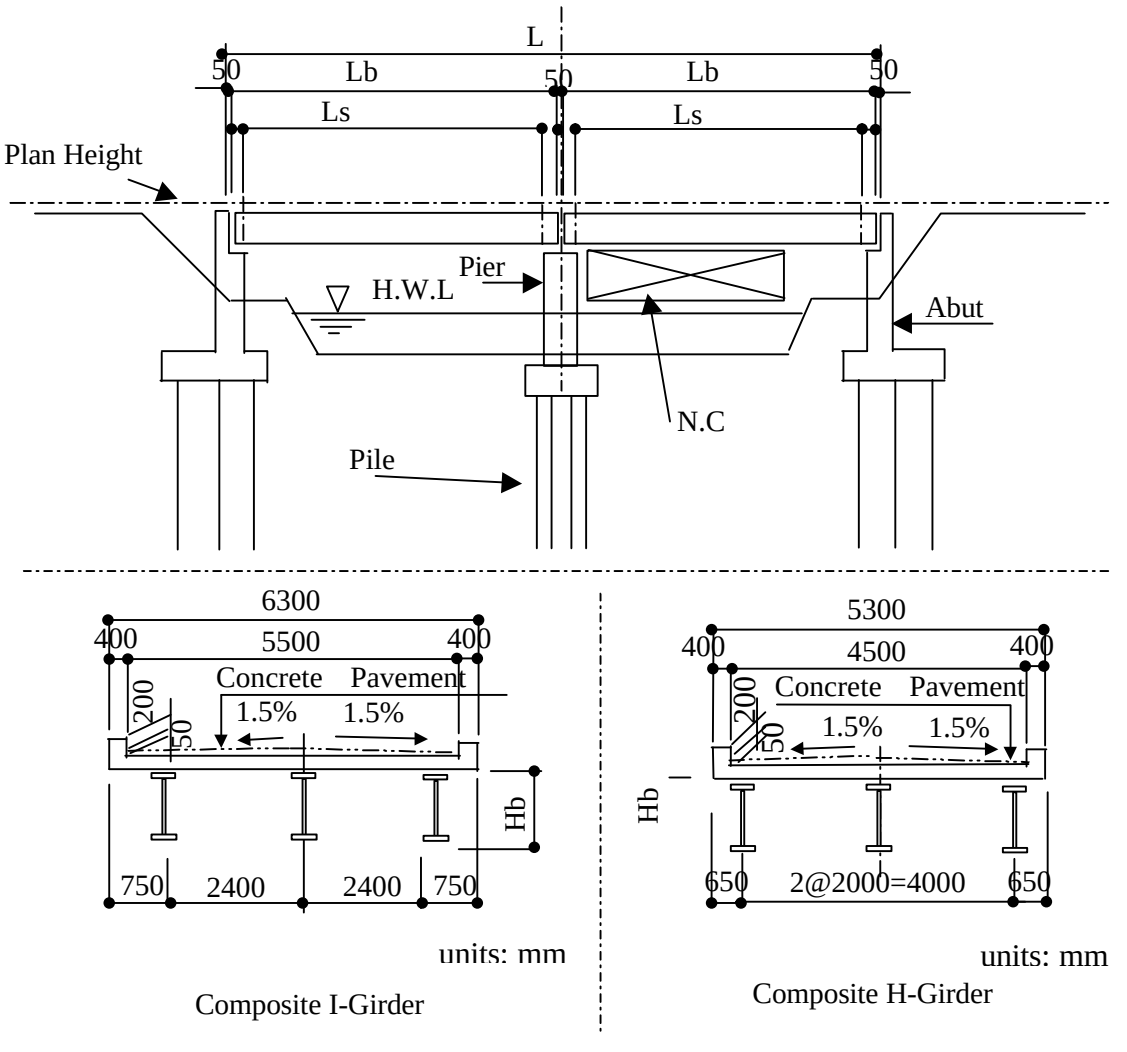
Figure 2-4 Typical PC Girder Bridge

b) Steel Girder Supply Type Bridges (17 No.)

Steel girder will be delivered to the MOT of each province via Saigon Port following procurement overseas. Based on experience gained in the project for Reconstruction of Bridges in Northern Vietnam, the girder types are selected as follows.

Girder Length L< 20m	H-section steel girder
Girder Length L>20m	I-section steel girder

Standard steel girder cross sections are shown in Figure 2-5.



	For road width 5.5m			For road width 4.5m		
	Girder Length Lb (m)	Span Ls (m)	Girder Height Hb (m)	Girder Length Lb (m)	Span Ls (m)	Girder Height Hb (m)
I-Girder	33.0	32.50	1.50	33.0	32.50	1.40
	30.0	29.50	1.40	30.0	29.50	1.30
	27.0	26.50	1.30	27.0	-	-
	21.0	20.50	1.10	21.0	20.50	1.00
H-Girder	18.0	17.50	1.00	18.0	-	-
	15.0	14.50	0.90	15.0	-	-
	10.0	9.50	0.548	10.0	-	-

Figure 2-5 Typical Steel Girder Type Bridge

2) Substructure and Foundation

The types of substructure and foundation selected were as shown in Table 2-24.

Table 2-24 Substructure and Foundation Type

Substructure / Foundation	Type	Reasons for Selection
Abutment	Inverted T	Commonly used in bridge design
Pier	Wall	Less obstruction to river flow Advantageous against scouring
Foundation	Spread footings	Adopted when reliable soil bearing capacity is present
	Driven precast piles	Available in the Mekong Delta region 400mm square section adopted for economy and transportability Maximum pile length 36m (3 x 12m lengths)
	Driven steel piles	Precast driven piles are difficult to drive to great depth. In this case driven steel piles are used. 500mm diameter steel pipe piles are selected.

3) Approach Roads and River Revetment (21 No. Construction Type Bridges)

i) Road Structure Geometric Standards

Geometric design for roads follows Vietnam Standard TCVN 4054: 1998. Details of design geometry are given in Table 2.22

ii) Design Concept

① Road Alignment

Design of the bridge and approach roads shall satisfy national standards with respect to horizontal and vertical alignment. In case of Provincial Roads, a design speed of 40km/h was adopted according to the design standard. Design speed for the country roads is generally 25km/h. When the traffic volume increases following new/replaced bridge construction, it will be modified from 25km/h to 40km/h.

② Land Acquisition

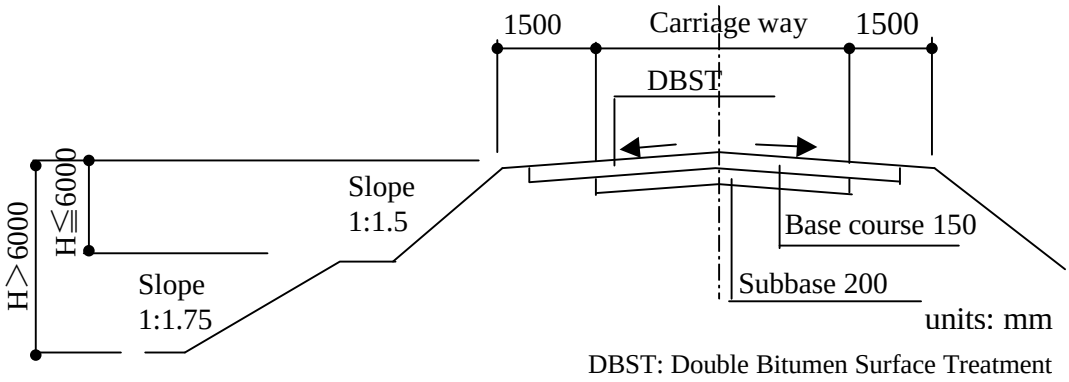
Land acquisition and compensation arising from bridge construction has been minimized. Horizontal alignment was chosen in order to avoid existing houses as far as possible.

iii) Approach Roads and River Revetment

① Approach Roads

The widths of approach roads are of two types, 4.5 m and 5.5 m. The length, vertical gradient and linear alignment of approach roads were planned based on topography and existing land use conditions at each bridge site.

The typical cross section of approach roads with 1.5m shoulder width was planned based on existing road conditions in Vietnam, and side slopes was determined depending on the embankment height, as shown in Figure 2.6.



DBST: Double Bitumen Surface Treatment

Figure 2-6 Typical Road Cross Section

② Revetment and Riverbed Protection

Existing bridge abutments are set back from the water line. However in the flood season, high water velocities and some scour are anticipated around bridges. Also erosion of approach embankments by flood flows and waves from passing boats is a concern. Hence wet masonry is adopted up to the design water level along the approach road up to 10m from the abutment. On the river bank stone fill will be used as protection as a flexible, durable and economic measure. Wooden stakes are driven below the base of the slope protection in the case of soft soil conditions.

The typical cross section is illustrated in Figure 2-7

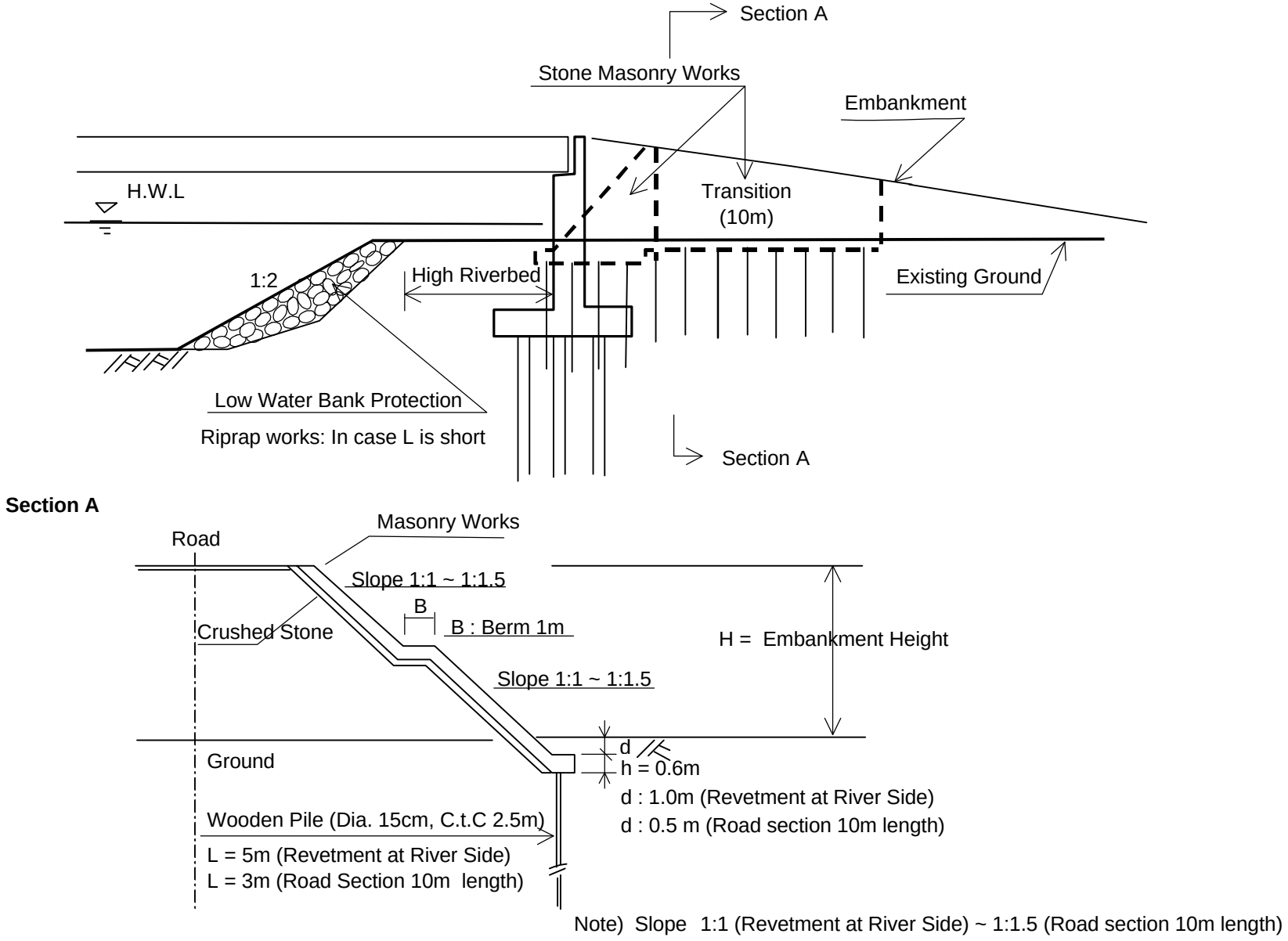


Figure 2-7 Slope Protection Works

③ Soft Ground Treatment

Areas of soft ground (Ac-deposit) are extensively distributed in the Mekong Delta Area extending up to 19~25 meters below ground level. In order to construct high embankments for approach roads to bridges, improvement of the soft ground is required.

The following methods were considered for treatment of soft ground.

i) Sand drain method

ii) Paper drain method

iii) Sand compaction method

iv) Precast RC pile

The advantages of the four methods are illustrated in Table 2-25

Table 2-25 Selection of Soft Ground Treatment Method

Item	Method			
	Sand Drain	Plastic Vertical Drain	Sand Compaction	Pre-Cast RC Pile
Diameter (mm)	400	65	700	400 × 400
Increase in Strength of Sub Soil (kg/cm^2)	C=0.3⇒1.0	C=0.3⇒0.5	C=0.3⇒3.0	-
Characteristic	This method is most popular.	Construction rate is high	Range of application is wide.	No Settlement.
Depth for practical application	30 m	10 m	35 m	30 m
Minimum Spacing	1.2 m	0.9 m	1.2 m	1.0 m
Construction Speed	300 m/day	2,500 m/day	150 m/day	120 m/day
Ratio of Cost	1.0	0.2	2.4	11.0
Other	Many Satisfactory Results	Low depth for practical application		

From the table above, sand drain method shall be applied in this project because of high strength increase, successful experience and in particular low construction cost.

(3) Basic Bridge Design Summary

Results of the basic design stage for the construction type bridges are summarized in Tables 2-26 (1) and 2-26 (2), and for the steel girder supply type bridges in Table 2-27.

Table 2-26 (1/2) Summary of Construction Type Bridges

Bridge No.			(3)	(4)	(6)	(7)	(8)	(12)
Name of Bridge			HOA BINH 2	DEN	VAM DINH	KINH KIEM LAM	HUYNH HUU N.	LONG MY
Condition of Bridge Site			Ferry (boat) Rural communities	Bailey Bridge Rural communities	Ferry (boat) Rural communities	Ferry (boat) Rural communities	Bailey Bridge Rural communities	Bailey Bridge Urban communities
Horizontal Alignment			Straight	Straight	Straight	Straight	Straight	Straight
Vertical Alignment			8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	2.5% ↙ ↘ 2.5%	2.5% ↙ ↘ 2.5%
Bridge Length (m)			70.40	49.74	70.40	82.28	43.80	99.20
Span Length (m)			18.6+33.0+18.6	12.5+24.54+12.5	18.6+33.0+18.6	24.54+33.0+24.54	12.5+18.6+12.5	33.0+33.0+33.0
Clear Width(m)			5.5	5.5	5.5	5.5	5.5	5.5
Type of Structure	Super-Structure		PC Girder	PC Girder	PC Girder	PC Girder	PC Girder	PC Girder
	Sub-Str.	Abutment	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE
		Pier	Wall Type	Wall Type	Wall Type	Wall Type	Wall Type	Wall Type
	Foundation		RC Precast Pile	RC Precast Pile	Steel Pipe Pile	RC Precast Pile	RC Precast Pile	RC Precast Pile
	Abutment Protection		Riprap	Riprap	Riprap	Riprap	Riprap	Riprap
Length of Approach Roads (m)			187.6	152.26	174.60	157.72	157.2	280.8

Bridge No.			(15)	(16)	(18)	(21)	(23)	(26)
Bridge Name			VAM SANG THI DOI	HA GIANG	THOAI GIANG	TRAM CHIM	HOA TINH	TAN AN
Condition of Bridge Site			Ferry(boat) Rural communities	Ferry(boat) Rural communities	Bailey Bridge Rural communities	Ferry(boat) Rural communities	Bailey Bridge **市郊外部**	Bailey Bridge Rural communities
Horizontal Alignment			Straight	Straight	Straight	Straight	Straight	Straight
Vertical Alignment			8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%
Bridge Length (m)			82.28	70.40	70.40	82.28	70.40	58.20
Span Length (m)			24.54+33.0+24.54	18.6+33.0+18.6	18.6+33.0+18.6	24.54+33.0+24.54	18.6+33.0+18.6	12.5+33.0+12.5
Clear Width (m)			5.5	5.5	5.5	5.5	5.5	5.5
Type of Structure	Super-Structure		PC Girder	PC Girder	PC Girder	PC Girder	PC Girder	PC Girder
	Sub-Str.	Abutment	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE
		Pier	Wall Type	Wall Type	Wall Type	Wall Type	Wall Type	Wall Type
	Foundation		RC Precast Pile	RC Precast Pile	RC Precast Pile	RC Precast Pile	Steel Pipe Pile	RC Precast Pile
	Abutment Protection		Riprap	Riprap	Riprap	Riprap	Riprap	Riprap
Length of Approach Roads (m)			177.72	259.6	229.6	144.22	144.22	176.8

Table 2-26 (2/2) Summary of Construction Type Bridges

Bridge No			(30)	(32)	(35)	(38)	(40)	(45)
Name of Bridge			LONG BINH	TRA TAN	RANH TONG	BA LY	SAIGON	CHUA
Condition of Bridge Site			Large Damaged Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities
Horizontal Alignment			Straight	Straight	Straight	Straight	Straight	Straight
Vertical Alignment			8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	5% ↙ ↘ 5%	2% ↘ ↘ 1.6%
Bridge Length (m)			37.19	58.20	82.28	57.15	70.40	30.10
Span Length (m)			24.54+12.5	12.5+33.0+12.5	24.54+33.0+24.54	33.0+24.0	18.6+33.0+18.6	30.0
Clear Width (m)			5.5	5.5	5.5	5.5	5.5	5.5
Type of Structure	Super-Structure		PC Girder	PC Girder	PC Girder	Steel Girder	PC Girder	Steel Girder
	Sub-Str.	Abutment	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE
		Pier	Wall Type	Wall Type	Wall Type	Wall Type	Wall Type	-
	Foundation		Steel Pipe Pile	RC Precast Pile	Steel Pipe Pile	RC Precast Pile	RC Precast Pile	Spread Foundation
	Abutment Protection		Riprap	Riprap	Riprap	Riprap	Riprap	Riprap
Length of Approach Roads (m)			177.81	217.8	157.72	177.85	179.6	239.9

Bridge No.			(48)	(53)	(58)
Name of Bridge			DAKIA	CHAY	AP AN BINH
Condition of Bridge Site			Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities
Horizontal Alignment			Straight	Straight	Straight
Vertical Alignment			↘ 5.81% 4.83% ↗	8% ↙ ↘ 8%	8% ↙ ↘ 8%
Bridge Length (m)			43.80	49.74	33.10
Span Length (m)			12.5+18.6+12.5	12.5+24.54+12.5	33.0
Clear Width (m)			5.5	5.5	5.5
Type of Structure	Super-Structure		PC Girder	PC Girder	PC Girder
	Sub-Str.	Abutment	RC INVERTED T-TYPE	RC INVERTED T-TYPE	RC INVERTED T-TYPE
		Pier	Wall Type	Wall Type	-
	Foundation		Spread Foundation	RC Precast Pile	RC Precast Pile
	Abutment Protection		Riprap	Riprap	Riprap
Length of Approach Roads (m)			216.2	135.26	186.9

Table 2-27 Summary of Steel Girder Supply Type Bridges

Bridge No.	(10)	(11)	(14)	(19)	(20)	(22)
Name of Bridge	XEO DUA	SAINTARD	NGA TU CAY D.	SOC TRIET	CAI NAI	KENH TU
Condition of Bridge Site	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Ferry (boat) Rural communities	Ferry (boat) Rural communities	Ferry (boat) Rural communities	Ferry(boat) Rural communities
Horizontal Alignment	Straight	Straight	Straight	Straight	Straight	Straight
Vertical Alignment	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%
Bridge Length (m)	30.10	99.20	60.20	84.20	33.10	90.20
Span Length (m)	30.0	33.0+33.033.0	15.0+30.0+15.0	27.0+30.0+27.0	33.0	30.0+30.0+30.0
Clear Width (m)	5.5	5.5	5.5	5.5	4.5	5.5
Super-Structure	Steel Girder	Steel Girder	Steel Girder+ H Beam	Steel Girder	Steel Girder	Steel Girder

Bridge No.	(25)	(28)	(29)	(36)	(37)	(39)
Name of Bridge	MY HOA	SUOI	DAI SU	HUONG MY	TAN TRU	VINH CONG
Condition of Bridge Site	Ferry(boat) Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities
Horizontal Alignment	Straight	Straight	Straight	Straight	Straight	Straight
Vertical Alignment	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%	8% ↙ ↘ 8%
Bridge Length (m)	90.20	72.20	50.20	30.10	63.20	30.10
Span Length (m)	30.0+30.0+30.0	21.0+30.0+21.0	10.0+30.0+10.0	30.0	18.0+27.0+18.0	30.0
Clear Width (m)	4.5	5.5	5.5	5.5	5.5	5.5
Super-Structure	Steel Girder	Steel Girder	Steel Girder+ H Beam	Steel Girder	Steel Girder+ H Beam	Steel Girder

Bridge No.	(43)	(46)	(50)	(54)	(55)
Name of Bridge	XE BE	RACH RO	SO 5	BAU XEO	SONG THAO
Condition of Bridge Site	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities	Bailey Bridge Rural communities
Horizontal Alignment	Straight	Straight	Straight	Straight	Straight
Vertical Alignment	8% ↙ ↘ 8%	↘ 0.5%	2% ↙ ↘ 2%	3% ↙ ↘ 3%	3% ↙ ↘ 3%
Bridge Length (m)	30.10	27.10	40.15	21.10	21.10
Span Length (m)	30.0	27.0	10.0+30.0	21.0	21.0
Clear Width (m)	4.5	5.5	5.5	4.5	4.5
Super-Structure	Steel Girder	Steel Girder	Steel Girder+ H Beam	Steel Girder	Steel Girder

Chapter 3 Implementation Plan

CHAPTER 3 IMPLEMENTATION PLAN

3.1 Implementation Plan

3.1.1 Implementation Plan for Construction Type Bridges

(1) Concepts

The project consists of the construction of twenty-one small to medium sized bridges in seventeen different provinces in the Mekong Delta area, the southern part of Vietnam. The implementation concept of the grant aid project is summarized as follows:

- Taking into account construction restrictions and costs, the construction period will include three dry-seasons and the project is determined to be of three fiscal years (twenty-nine months) duration.
- In order to complete the construction of all twenty one bridges, these bridges are divided into six groups, as shown in Table 3-1, and are constructed simultaneously.

Table 3-1 Grouping of Bridges

Group	Central Office	Bridge No.	Group	Central Office	Bridge No.
①	Ca Mau	No.3	⑤	My Tho	No.30
		No.4			No.32
		No.6			No.35
		No.7			No.38
②	Can Tho	No.8	⑥	HCM	No.40
		No.12			No.45
		No.18			No.48
③	Rach Gia	No.15			No.53
		No.16			No.58
④	Vinh Long	No.21			
		No.23			
		No.26			

- There are various small and large rivers, reticulated canals and channels in the Mekong Delta area. These shall be fully used for the transportation of construction materials, equipment and labor.

- Taking advantage of the above-mentioned waterways, erection of girders shall generally be barge-mounted crawler crane.

- In order to minimize the construction costs, construction equipment and temporary construction materials shall be reused for all the bridges. Furthermore, materials and equipment shall be procured from the domestic market, as far as possible, if the quality and quantity is acceptable.

- For PC girders that require high quality control, pretensioned girders manufactured in factories shall be used.

- Within the state-owned enterprise carrying out bridge construction, there are five companies with satisfactory achievements in the construction of medium sized bridges and over. Furthermore, there is at least one construction company in every province engaged in the construction and maintenance of small-scale bridges and roads. This project will make use of these companies wherever possible

- Considering the limited number of local civil engineers with experience in the construction of bridges, engineers in charge at each construction site working under the Japanese engineer, are expected to be brought from a third country.

- Japanese skilled labor shall be dispatched for sand compaction drain works and girder erection, for both PC and steel type bridges, since there is little experience of these kind of works in the southern part of Vietnam.

- Considering the dispersed nature of the project bridges and simultaneous construction of many bridges, the central offices of the contractor and the consultant will be installed in Ho Chi Minh City. Furthermore, the contractor shall install regional offices for each group of bridges in cities with favorable working conditions and communication facilities.

- In cases where existing bridges are being replaced by newly constructed bridges, the work of construction of diversion roads and temporary bridges and removal of existing bridges will also be included in this project.

(2) Implementation Conditions

The main objective of this project is the construction of bridges. Following consideration of construction conditions, maintenance and operation works, and construction costs, PC girders are generally adopted for superstructures, and reinforced concrete pile/steel pipe pile for substructures. In a number of cases steel girder type bridges are also used. These bridge types are common in Vietnam and their construction is not complicated. The important construction points are as follows:

- Since most of the materials and equipment are planned to be procured in Vietnam, it should be done in such a way as to avoid delays on the construction schedule. For this purpose, transportation on waterways should generally be used as access by road to most of the construction sites is not favorable.

- To complete the construction of bridges within the planned construction period, the planning and control by the construction company on construction schedule, quality, equipment and materials, and labors as well as the supervision by the consultant is very important.

- Safety education and safety measures generally practiced in Japan shall be followed on the sites in order to improve standards and to avoid potential disputes that could occur following an accident.

- It is important, throughout the construction period, to take into consideration the safety of the local residents, vehicles and boats as well as passers by.

(3) Scope of Works

For the implementation of the project under the Grant aid of the Japanese government, the share of works to be undertaken by the Japanese and the Vietnamese governments are as described hereafter.

i) The Share to be borne by the Japanese Government

- Construction of bridges, approach road and revetment
- Removal of existing bridges and construction of detour bridges (only for bridges replacing the existing ones)
- Construction and removal of temporary roads and bridges for the construction works
- Installation and removal of camps and construction yards for the construction works
- Procurement of materials, equipment and labor required for the above construction works
- Field management for the above construction works
- The consultancy services required for implementation of the project

ii) The Share to be borne by the Government of Vietnam

- Acquisition of the construction sites and supply of the land necessary to perform the temporary works
- Lease of land for temporary works and construction yards
- Compensation for houses removed in the construction sites
- Removal of existing bridges
- The exemption from tax of the materials and equipment imported for the project, and the expeditious processing of custom procedures
- The exemption from custom fees and taxation for the Japanese and the third party nationals entering Vietnam to work on the project, and exemption from other financial obligations

Refer to appendix 6 for further details of the share to be borne by the Government of Vietnam.

(4) Consultant Supervision

i) Basic Policy of Detailed Design and Consultant Supervision

① Basic Policy of Detailed Design

The basic policy of the detailed design is as follows:

- Field studies during the detailed design period will be conducted to reconfirm the site details, carry out supplementary studies related to the

construction/estimation, and carry out additional survey based upon the basic design. Final discussion shall be held with the government of Vietnam to confirm issues relating to the detailed design.

- After completion of detailed design, a presentation of the design will be made to the Vietnamese authorities, and discussions will be held for agreement.

② Basic Policy of Consultant Supervision

The basic policy of the construction supervision will be as follows:

- Since twenty-one bridges are planned to be constructed or replaced simultaneously, the construction management will be carried out by both Japanese engineers and local engineers.

- The role of construction supervision engineers will be as set out in section 3.1.4.(3). If required staff/backup can be made available from Japan as required.

- As the sand drain method is unfamiliar in the southern parts of the country, with the cooperation of the contractors the Japanese supervisors will train engineers of the government of Vietnam in order to encourage technology transfer.

ii) Consultant Supervision

The supervisors dispatched to the sites will perform the following construction supervision works.

- Approval of the Construction Schedule and Construction Drawings

Supervisors will inspect and approve the construction schedule and shop drawings submitted by the contractor, checking that they conform to the requirements set out in the contract documents, contract drawings, specifications etc.

- Schedule Control

Supervisors will receive progress reports from the contractor, and give instructions as required to ensure completion of the project on schedule.

• Quality Control

Supervisors will examine the quality of, and approve construction materials and construction methods making reference to the contract drawings and specifications.

• Inspection of Completed Construction Works

Supervisors will inspect and approve the completed works and record drawings and approve final quantities for payment.

• Issuing of Certification

Supervisors will issue the necessary certificates for payment to the contractor, for completion of construction and for expiry of the warranty period.

• Submittal of Reports

Supervisors will inspect the monthly reports and record drawings prepared by the contractor and submit them to the Vietnamese authorities, JICA and others. Furthermore, the supervisors will prepare the final report at completion of construction and submit it to JICA.

iii) Consultant Supervision System

Considering the construction contents and time schedule, the number and the duration of employment of Japanese engineers engaged in construction supervision services will be as set out below. In addition, as far as possible local engineers shall be employed, with the aim of economy and for the purpose of technology transfer.

• Overall Supervisor

The overall supervisor will visit bridge sites at start up and completion of each bridge, or as required.

• Resident Bridge Engineer

The resident bridge engineer will be assigned permanently until the completion of the construction and will conduct supervision of construction in general. The engineer will also be present for the warranty inspection held one year after completion of the bridge.

• Substructure Engineer

The substructure engineer will visit sites as required during substructure construction.

• Soils Engineer

The soils engineer will be visit sites as required during soft ground treatment works.

(5) Procurement Plan

i) Materials

① Basic Policy

As a general rule, construction materials that are readily available at local markets in Vietnam shall be procured from local sources. However, special products or those that are cannot be sourced locally in sufficient quantity and quality within the project schedule, will be obtained from Japan or from a third country.

② Present Materials Procurement Conditions

The present procurement conditions of the major construction materials required for this project are as set out below:

a) Cement

Cement manufactured in Vietnam is mostly Portland cement and supply is adequate for domestic demand. The major cement plants in the northern area are namely HOANG THACH (Thanh Hoa province), BIN SON (Hai Phong City) and CHIN PHONG (Hai Phong City), and SAO MAI (Kien Giang province) in the southern area.

b) Aggregates

Sand is collected from Dong Nai River (Dong Nai Province), Saigon River (Tay Ninh Province) Co To mountain (An Giang Province) and Dinh mountain (Ba Ria Vung Tau Province). Due to topographical limitations, river aggregates are not readily usable. As a result, crushed stone manufactured at Da Kai area (Binh Phuoc Province), in the suburbs

of Tan Uyen City (Binh Duong Province), Chau Thoi Mountain (Dong Nai Province), Ba Den Mountain (Tay Ninh Province), Co To mountain (An Giang Province) and Dinh Mountain (Ria Vung Tau Province) are used as aggregates.

In the north eastern provinces embankment materials shall be procured from the mountain quarries, and in the Mekong delta area dredged sand from the Mekong River will be used.

c) Reinforcing Steel Bar

Domestic production of reinforcing steel bar exceeds demand and the product is exported to Cambodia and Laos. The major steel factories are VSC-POSCO (Hai Phong City) and NASTEEL-VINA・VINAUSTEEL (Bac Thai Province) in the northern area and VINAKYOUEI (Ba Ria Vung Tau Province), VIET-THANH・VIKIMCO (HCM City), VICASA (Don Nai Province) and TAY DO STEEL (Can Tho province) in the southern area. The latter four factories are a part of SOUTHERN STEEL CORPORATION group. The steel manufactured here are round steel bars of sizes Φ6, 8 and 10mm and deformed steel bars of sizes D10, 12, 13, 14, 16, 18, 19, 20, 22, 25, 28, 30 and 32 mm, i.e. corresponding to JIS standard bar sizes.

d) PC Strand/Ducts, Steel for Girders and Temporary Works

High tensile strand for PC construction and ducts, manufactured in Japan, India and Korea, are imported via Thailand and Singapore. Steel for girders and temporary works (Steel Pipe Pile, Sheet Pile and H section) is generally imported from China and Korea. However, special steel is imported from Japan.

e) Concrete Products

PC girders, RC piles and RC Pipe culverts are locally available. The factory manufacturing PC girders is Concrete Company No.620 (Binh Duong Province), which belongs to the Cienco-6 Group and is one of the few ISO-9002 registered companies. The products are I shaped girders of 33 m and 24.5 m length, and T shaped girders of 18.6 m and 12.5 m length, with a production capacity of one hundred girders per month.

f) Formwork/Falsework/Scaffolding/Timber for Temporary Works

Materials for formwork/falsework/scaffolding as well as all timber for temporary works can be procured in the local market.

g) Ready Mixed Concrete and Asphalt Hot Mix

Ready mixed concrete can be procured in HCM City. There are also three other plants in the vicinity of the project bridges, about 30 km away from the respective sites. However, considering the road conditions, transportation distance (more than 30 km), and limitations of the factories (number of truck mixers, reliability of target strength), procurement from these plants is not the preferred option.

Similarly, there are asphalt concrete hot mix plants in HCM City. Asphalt hot mix plants in other provinces are all mobile.

h) Miscellaneous

- Bridge Bearings and Expansion Joints

Bridge bearings and expansion joints shall be imported from overseas.

- Water for Mixing of Ready Mixed Concrete

River water is muddy near the bridge locations and mixed with salt-water at coastal areas. Therefore, at sites where water for public use is not available, well installation will be necessary.

③ Procurement Plan of Materials

Considering the above, the procurement plan of major construction materials is shown in Table 3-2.

Table 3-2 Procurement Plan for Major Construction Materials

Name of Material	Specification	Supply Source			Remarks
		Vietnam	Japan	Third Country	
Embankment fill		○			
Upper sub-base material	stabilized material	○			
Lower sub-base material	Crushed stone	○			
Coarse aggregate	Crushed stone	○			
Fine aggregate	Sand	○			
Quarry stone	20～25 cm	○			
Asphalt emulsions		○			Imports
Cement	Portland	○			
Admixtures		○			Imports
Reinforcing steel	Deformed bars	○			
PC wire	12.7 mm		○		
Sheath	φ50 mm		○		
Anchoring	7T13M130		○		
Steel girder			○		
PC girder		○			
RC pile		○			
Steel pipe pile				○	
Bridge Bearing (Rubber)			○		
Bridge Bearing (Metal)			○		
Expansion apparatus	Expansion 25 mm		○		
Traffic sign	Speed, load	○			
Plywood for form		○			
Temporary wooden materials		○			
Falsework				○	
Steel sheet pile	Type IV			○	
Temporary steel girder		○			Effel Type
Steel covering plate	1 x 2 x 0.2 m	○			Imports
H Shaped steel	H-shape pile, others			○	
Fuel		○			Imports
Percentage (%)		70	5	25	

ii) Construction Equipment

① Basic Policy

The procurement policy for construction equipment is similar to that of construction materials. Considering the present conditions mentioned below, standard construction equipment should be procured locally. On the other hand, large-scale or special equipment will be imported from Japan in order to avoid breakdowns or malfunctions that would risk affecting progress of the works.

② Present Construction Equipment Procurement Conditions

Generally, there are no leasing companies supplying construction equipment in Vietnam. However, some large local companies own equipment including that for river works such as is to be used on this project. New heavy equipment from Japan, America and Korea etc. is increasingly available, replacing older plant from the former USSR and China. Small-sized equipment is available in the local markets.

The plant for earthworks and pavement works could be easily procured, since this is owned not only by large corporations but also by smaller companies. Heavy equipment for foundation works and bridge construction is mostly owned by large companies. Therefore, it is important to arrange the construction schedule in such a way that the equipment can be obtained for the project. In particularly, each company/ group must have available two large cranes and three sets of lifting equipment for PC girders.

③ Procurement Plan for Construction Equipment

The procurement plan of major construction equipment is shown in Table3-3. The plan is based on the present procurement conditions mentioned above.

Table3-3 Procurement Plan for Major Construction Equipment

Description	Specification	Supply Source			Remarks
		Vietnam	Japan	Third Country	
Bulldozer	15 ton	○			Earth works
Excavator	0.6 m^3	○			
Diesel clamshell	0.8 m^3	○			
Motor grader	Width 3.8 m	○			Earth works and road works
Tandem roller	12 ton	○			
Tire roller	8-20 ton	○			
Asphalt finisher	2,000 lr	○			
Dump truck	8 ton	○			
Sprinkler	5 ton	○			
Portable concrete mixer	350 lr	○			Concrete works
Concrete bucket	0.5m^3	○			
Water pump	8", 4"	○	○		Dewatering works
Pile driving machine	30 m		○		Renovation works of poor subsoil
Air compressor	11 m^3		○		
Wheel loader	1.2 m^3			○	Small scaled carrying works
Girder hoisting apparatus	1 set	○			erection works
Truck crane	25 ton	○			
Crawler crane	40 ton	○			
Crawler crane	120 ton		○		Temporary works
Barge	400 ton	○			erection works
Tug boat	300 HP	○			
Vibro hammer	60 kw		○		Temporary works
Diesel hammer	4.5 ton	○			Foundation pile works
Generator	200 kw		○		For vibro hammer
Generator	25 kw	○			Erection works
Percentage (%)		65	30	5	

iii) Transport Plan of Materials and Construction Equipment

① The Routes and Period of Transportation for Procurement from Vietnam

Materials such as embankment fill, sand and crushed stone shall be procured locally. Other construction equipment and materials shall be carried to and from construction sites by either the suppliers in Ho Chi Minh City or through Saigon Port.

The transportation routes for materials and equipment to and from Ho Chi Minh to each construction site are as shown in Table 3-4. Generally, waterways in the Mekong Delta area and land transportation in the mountainous areas are the main means of transportation.

② The Routes and Period of Transportation for Procurement from Japan

The routes and period of transportation for materials and equipment procured from Japan is assumed as follows:

Packing and Loading	Factory ～ Sea Port	0.25
Shipping	Japanese Sea Port ～ Ho Chi Minh Sea Port	0.50
Custom Clearance	Ho Chi Minh Sea Port	0.25
Land Transportation	Ho Chi Minh Sea Port ～ construction sites	0.20
		1.20 months

Table 3-4 Bridge Construction - Construction Materials (incl. PC Beam) & Equipment Transportation (1/2)

Province	Br. No.	Bridge Name	Transport. Method	PC	H.G	L.G	Cross River/ Canal Road at Bridge Site	Connected River/ Canal Connected Road	Distance from HCM (km)	Remarks
Bac Lieu	3	Hoa Binh-2	Waterway	○	○	○	Bac Lieu - Ca Mau Canal	Bac Lieu Co Co River	300	
			Road	×	○	○	Provincial Road	National Highway No.1	290	
	4	Den	Waterway	○	○	○	Canh Den Canal	Cho Hoi Canal	290	
			Road	×	×	×	Provincial Road	National Highway No.1		Bad condition
Ca Mau	6	Van Dinh	Waterway	○	○	○	Vam Dinh Canal	Bac Lieu - Ca Mau Canal	400	
			Road	×	×	○	Provincial Road No.6	National Highway No.1	390	
	7	Kinh Kiem Lam	Waterway	○	○	○	Kinh Kiem Lam Canal	CIA Doi River	420	
			Road	×	×	×	Provincial Road No.6	National Highway No.1		No Bridge at Van Dinh
Soc Trang	8	Huynh Huu	Waterway	○	○	○	Tan Lap Canal	Quan Lo Phung Heip Canal	220	
			Road	×	×	○	Provincial Road No.13	National Highway No.1	250	4 bridges : Low limited load
Can Tho	12	Long My	Waterway	○	○	○	Cai Lon River	Lon My Canal	230	
			Road	×	○	○	Provincial Road No.931	National Highway No.31	220	
Kien Giang	15	Vam Sang Thi Doi	Waterway	○	○	○	Thot Not Cai Be Canal	Hau Giang River (Bassac)	270	
			Road	×	×	○	Provincial Road	National Highway No.61	270	1 bridge : Low limited load
	16	Ha Giang	Waterway	○	○	○	Rach Dia - Ha Tinh Canal	Rach Soi Hau Giang Canal	350	
			Road	×	○	○	Provincial Road No.955	National Highway No.80	330	
An Giang	18	Thoai Giang	Waterway	○	○	○	Rach Gia - Long Xuyen	Long Xuyen River	250	
			Road	×	×	○	Provincial Road No.943	National Highway No.91	220	1 bridge : Low limited load
Dong Thap	21	Tram Chim	Waterway	○	○	○	Dong Tien Canal	Tien Giang River (Mekong)	230	
			Road	×	×	○	Provincial Road No.843	National Highway No.30	210	1 bridge : Low limited load
Vinh Long	23	Hoa Tinh	Waterway	○	○	○	Ho Tinh River	Bao Ke Canal	140	
			Road	×	○	○	District Road	National Highway No.53	150	
Tra Vinh	26	Tan An	Waterway	○	○	○	Nha Tho River (Tuoi Tre)	An Truong Canal	150	
			Road	×	○	○	Provincial Road No.911	National Highway No.60	220	
Tien Giang	30	Long Binh	Waterway	○	○	○	Sau Thoan Canal	Tien Giang River (Mekong)	120	
			Road	×	○	○	Provincial Road No.877	Provincial Road No.862	110	
	32	Tra Tan	Waterway	○	○	○	Tra Tan Canal	Tien Giang River (Mekong)	120	
			Road	×	×	○	Provincial Road No.864	Provincial Road No.861	110	2 bridges : Low limited load
Ben Tre	35	Ranh Tong	Waterway	○	○	○	Ong Di River	Ham Luong River(Mekong)	120	
			Road	×	○	○	Provincial Road No.888	National Highway No.60	110	

PC : Pre-stressed Concrete Member, H.G : Heavy Equipment & Materials L.G : Light Equipment & Materials

○ : Recommended × : Not Recommended △ : Reinforcement of bridge with low limited load required

Table 3-4 Bridge Construction - Construction Materials (incl. PC Beam) & Equipment Transportation (2/2)

Province	Br. No.	Bridge Name	Transport. Method	PC	H.G	L.G	Cross River/ Canal Road at Bridge Site	Connected River/ Canal Connected Road	Distance from HCM (km)	Remarks
Long An	38	Ba Ly	Waterway	×	×	×	Ba Ly Canal	Ba Dinh Canal		Small boat (irrigation gate)
			Road	△	△	○	Provincial Road No.828	National Highway No.1	50	3 bridges : Low limited load
Tay Ninh	40	Saigon	Waterway	×	×	×	Saigon River	-		Dam at downstream
			Road	○	○	○	Provincial Road No.794	Provincial Road No.795	160	
Binh Duong	45	Chua	Waterway	×	×	×	Stream	Do Nai River		Small boat for stream
			Road	△	△	○	Provincial Road No.794	National Highway No.1	50	1 bridge: Low limited load
Binh Phuoc	48	Dakia	Waterway	×	×	×	Da kia Stream	Be River		Stream
			Road	○	○	○	Provincial Road No.749	Provincial Road No.741	140	
Dong Nai	53	Chay	Waterway	○	○	○	Ong Keo Canal	Nha Be River	20	
			Road	×	○	○	District Road	Provincial Road No.763	50	
Ba Ria - Vung Tau	58	Ap An Binh	Waterway	×	×	×	An Binh Canal	Sea		Marine transportation
			Road	○	○	○	District Road	Provincial Road No.766	120	

PC : Pre-stressed Concrete Member, H.G : Heavy Equipment & Materials L.G : Light Equipment & Materials

○ : Recommended × : Not Recommended △ : Reinforcement of bridge with low limited load required

Remarks for transportation on waterways:

- The size of barge transporting pre-tensioned girders : 400 ton, width 10m (minimum width 8m)
- One time transportation amount of pre-tensioned girders : 200 ton (10 numbers for 24.5m long girders)
- The size of barge transporting reinforced concrete piles : 300 ton, width 8 ～ 10m
- One time transportation amount of reinforced concrete piles : 200 ton
- Three days is required for transportation from HCM to the farthest province Ca Mau.
- As a 400-ton barge is required for heavy equipment to be used on water, the same barge shall be used for transportation.

(6) Implementation Schedule

The implementation schedule for this project is composed of the detailed design, tender, construction/construction supervision phases as described below. The schedule for implementation is shown in summary in Table 3-5.

i) Detailed Design

The consultant that has signed the design contract with the Vietnamese government shall perform the following detailed designs.

- Detailed design for twenty-one bridges (Field investigation, Plan and design, Drawings, and Calculations)

- Construction cost estimate, tender documents including technical specification

ii) Tender

The consultant for the Vietnamese government shall conduct tenders in Japan for the project. The details are as follows:

- Pre-qualification of contractors

- Evaluation and preparation of Short List of tenderers

- Briefing on the project and question and answer session

- Receipt, opening of tenders, and evaluation of the tenders

- Assessment meeting, award of contract

iii) Construction/Consultant Supervision

After signing the contract, and obtaining the approval of the Japanese government, the works will be commenced. The construction operations will consist of; preparation of the construction site, temporary works, bridge substructure works, bridge superstructure works, approach road works, revetment works, removal works and cleaning and clearing works. Though the construction period for each bridge varies, the total construction period has been assumed to twenty-nine months. The consultant will perform,

throughout the period of construction, the services described in 3.1.4 (Consultant Supervision).

The effect of the rainy season, from May to October, on the construction schedule is limited. However, as far as possible, all other works except the superstructure work shall be carried out during the dry season. This is very important in particular for substructure works in the Mekong Delta area so as to avoid the impact of flood flows on the works.

Table 3-5 Project Implementation Schedule

	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Detailed Design		(Study in Vietnam)																												
			(Study in Japan)																											
					(Meeting with Vietnamese officials)																									
tender						(Work in Japan)	<Total 5 months>																							
Construction	Preparation Works																													
	No.1 Ca Mau Central Office																													
	No.3 Hoa Binh-2 Br.																													
	No.4 Den Br.																													
	No.6 Van Dinh Br.																													
	No.7 Kinh Kiem Lam Br.																													
	No.2 Can Tho Central Office																													
	No.8 Huynh Huu Nghia Br.																													
	No.12 Long My Br.																													
	No.18 Thoai Giang Br.																													
	No.3 Rach Gia Central Office																													
	No.15 Vam sang Thi Doi Br.																													
	No.16 Ha Giang Br.																													
	No.4 Vinh Long Central Office																													
	No.21 Tram Chim Br.																													
	No.23 Hoa Tinh Br.																													
	No.26 Tan An Br.																													
	No.5 My Tho Central Office																													
	No.30 Long Binh Br.																													
	No.32 Tra Tan Br.																													
	No.35 Ranh Tong Br.																													
	No.38 Baly Br.																													
	No.6 Ho Chi Minh Central Office																													
	No.40 Saigon Br.																													
	No.45 Chua Br.																													
	No.48 Dakia Br.																													
	No.53 Chay Br.																													
	No.58 Ap An Binh Br.																									<Total 29 months>				

(7) Responsibilities of the Government of Vietnam

For construction type bridges, it has been agreed that the Government of Vietnam will take responsibility for the following issues.

• Acquisition of the construction sites and supply of the land necessary to perform the temporary works

• Lease of land for temporary works and construction yards

• Compensation for houses removed in the construction sites

• Removal of existing bridges

• The exemption of tax on the materials and equipment imported for the project, and the expeditious processing of custom procedures

• The exemption from custom fees and taxation for the Japanese and the third party nationals entering Vietnam to work on the project, and exemption from other financial obligations

3.1.2 Implementation Plan for Steel Girder Supply Type Bridges

(1) Implementation Concept

This component of the project comprises supply of steel girders under Japanese Grant Aid for bridges that are to be constructed by the Vietnamese Government. This method is to be followed for the construction of 17 bridges in 12 provinces in Southern Vietnam. The implementation concept is as follows:

- Steel girder requirements for each bridge will be determined based on the detailed design conducted by the consultant. In order to reduce maintenance and management costs, corrosion resistant steel shall be used for certain bridges where conditions permit.

- Girders are delivered (loading, ocean transportation, inland transportation and handing over at the warehouse of the Ministry of Transport in each Province)

- The government of Vietnam will take full responsibility and see that the steel girders are used for the construction of the bridges. The consultant that conducted the detailed design will review the design drawings before the commencement of the construction as well as render supervision assistance. This is referred to as the soft component of this project.

(2) Scope of Works

The implementation of this component of the project anticipates division of duties between the governments of Japan and Vietnam as follows.

i) The Share to be borne by the Japanese government

- Supply steel girders for bridge construction

- Supply consists of main girders, cross beam, splice plates (high strength bolts), bridge bearings, expansion joints, gullies, coating material and erection apparatus.

- Transportation of materials to the warehouse of the Ministry of Transport in each province.

- The consultant services necessary for the implementation of the works. (Detailed design, cost estimate and technical assistance during construction)

ii) The Share to be borne by the Government of Vietnam

- Acquisition of construction sites and provision of land necessary for temporary works
- Compensation for houses removed
- Construction and removal of camp yards and construction yards
- Removal and relocation of obstructions
- Removal of existing bridges and construction of detours
- Construction of substructures, approach roads and revetments
- Construction of superstructures using materials supplied by Japan
- Procurement of materials, equipment and labor for above mentioned works
- Field management costs for the above construction works
- Local consultant services necessary for the implementation of the works
- Exemption from tax of materials and equipment imported for the project and the expeditious processing of the custom procedures
- Exemption from custom fees for all Japanese working on the project, and exemption from all other financial obligations

Refer to Appendix 6 for details on the share to be borne by the government of Vietnam.

(3) Consultant Supervision

Responsibilities of the supervising consultant consists of detailed design works and the soft component. The basic concept of detailed design is as described in 3.1.4 (Consultant Supervision) and of the soft component (technical assistance component) is as follows:

- One to two Japanese engineers will be dispatched during the time of review of the design drawings prepared by the government of Vietnam and one engineer during the construction supervision period.

- Output produced by the supervisor will be a training manual for steel girder type bridge construction and a monitoring report on program and quality control.

Execution will start one year after the hand over of materials and equipment, yet within the period of E/N.

(4) Procurement Plan

i) Procurement of Materials

Steel girders and accessories will be procured from Japan for the following reasons.

- Steel plates are as mentioned in 3.1.5 (Procurement Plan) imported from overseas.

- Steel girders adopted by the project including corrosion resistant steel plates on some bridges.

ii) Transportation Route and Period

The transportation period for materials and equipment to be procured from Japan as mentioned in 3.1.5 is about 1.2 months. Road transportation, as shown in Table 3-6, will be adopted for the inland transportation route of materials to the warehouse of the Ministry of Transport in each province.

Table 3-6 Steel Girder Supply - Steel Girder Transportation

Province	Br. No.	Bridge Name	Unloading Place (Pro. MOT Storage)	Transportation Route	Distance from HCM (km)	Remarks
Soc Trang	10	Xeo Dua	Soc Trang	National Highway No.1	230	Ferry : Hau Giang River
	11	Saintard		-		
Can Tho	14	Nga Tu	Can Tho	National Highway No.1	170	Ferry : Hau Giang River
				-		
An Giang	19	Soc Triet	Long Xuyen	National Highway No.91	190	Ferry : Hau Giang River
	20	Cai Nai		National Highway No.1		
Dong Thap	22	Kenh Tu	Cao Lanh	National Highway No.30	170	
				National Highway No.1		
Vinh Long	25	My Hoa	Vinh Long	National Highway No.1	140	
				-		
Tra Vinh	28	Suoi	Tra Vinh	National Highway No.53	200	
	29	Dai Su		National Highway No.1		
Ben Tre	36	Huong My	Ben Tre	National Highway No.60	90	Ferry : Tien Gian River
				Provincial Road No.861		
				National Highway No.1		
Long An	37	Tan Tru	Tan An	National Highway No.1	50	
	39	Vinh Cong		-		
Tay Ninh	43	Xe Be	Tay Ninh	National Highway No.22	100	
				-		
Binh Duong	46	Rach Ro	Thu Dau Mot	National Highway No.13	30	
				-		
Binh Phuoc	50	No.5	Dong Xoai	Provincial Road No.741	100	
				National Highway No.13		
Dong Nai	54	Bau Xeo	Bien Hoa	National Highway No.1	30	
	55	Song Thao		-		

(5) Implementation Schedule

The implementation schedule, as shown in Table 3-7, consists of the following works.

- Detailed design : Superstructure design work of 17 bridges as explained in 3.1.6 (Implementation Schedule)
- Tender : Work similar to that described in 3.1.6
- Supply of girders : Manufacture, transportation and hand over of steel girders
- Soft component : Assistance with supervision of bridge construction

Table 3-7 Project Implementation Schedule (Provision of Metal Girders)

Months		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Detailed Design			(Study in Vietnam)															
					(Study in Japan)													
						(Meeting with Vietnamese officials)												
Tender							(Work in Japan)				<Total 5 months>							
Supply	Manufacture																	
	Marine transportation																	
	Inland Transportation						<Total 5 months>											
	Handover									(12 months + 2 months = 14 months)								
	Soft component																	

(6) Responsibilities of the Government of Vietnam

For steel girder supply type bridges, it has been agreed that the Government of Vietnam will take responsibility for the following issues.

- Acquisition of construction sites and provision of land necessary for temporary works
- Compensation for houses removed
- Construction and removal of camp yards and construction yards
- Removal and relocation of obstructions
- Removal of existing bridges and construction of detours
- Construction of substructures, approach roads and revetments
- Construction of superstructures using materials supplied by Japan
- Procurement of materials, equipment and labor for above mentioned works
- Field management costs for the above construction works
- Consultant services necessary for the implementation of the works

- Exemption from tax of materials and equipment imported for the project and the expeditious processing of the custom procedures
- Exemption from custom fees for all Japanese working on the project, and exemption from all other financial obligations

3.2 Project Cost Estimate

3.2.1 Construction Cost Estimate

(1) Construction of Bridges

The expenditure to be borne by the Vietnamese Government in connection with the implementation of the project is as follows.

① Land Acquisition	: 4,563 Million VND
② Compensation of house moving	: 2,187 Million VND
③ Removal of Obstructions	: 670 Million VND
④ Construction Yards Leasing	: 3,580 Million VND
Total	: 11,000 Million VND

(2) Supply of Steel Girders and Soft Component

The expenditure to be borne by the Vietnamese Government in connection with the implementation of the supply and soft component is as follows.

① Bridge Constructions	: 66,277 Million VND
② Removal of Existing Bridges and Construction of Detours	:
③ Land Acquisition	:
④ Compensation of house moving	: 26,490 Million VND (②～⑦)
⑤ Removal of Obstructions	:
⑥ Construction Yards Leasing	:
⑦ Design and Construction Supervising	:
Total	: 92,767 Million VND

3.2.2 Operation and Maintenance Plan

(1) Operation and Maintenance System

Large-scale repair works will not be necessary until 20 to 30 years after the completion of bridges if the operation and maintenance routine mentioned in 3.3 (2) is followed. Painting of corrosion resistant steel is not required. Therefore, the operation and maintenance after the completion of this project will be carried out following the present system, under the control of the Ministry of Transportation in each province.

(2) Operation and Maintenance Method

1) Periodic Inspection and Maintenance

Though the main objective of this project is the construction of 38 bridges, the approach roads are included in the operation and maintenance objectives. The operation and maintenance is carried out as explained in the Table 3-8.

Table 3-8 Maintenance and Operation Schedule

	Item	Maintenance and Repairing Works	Interval
Bridge	① Drain Pipe	Clearing of sediments	3 months
	② Expansion Joint	Repairing of metal and seal rubber	3 months
	③ Handrail	Repairing damages by traffic accidents	3 months
	④ Bridge Bearings	Removal of earth deposits	6 months
	⑤ Concrete Pavement	Repairing of cracks	6 months
	⑥ Steel Girder	Repairing of corrosion and paint peeling off	1 year
	⑦ Substructure · River Protection	Repairing of scour	1 year
Road	① Road Surface	Patching, smoothing	1 month
	② Shoulder/Slope	Planting (turf), reinforcement of earth, repairing masonry	1 month

It is important to keep records of the results of periodic inspection in the road resisters and to assess the bridge condition in order to establish the repair schedule. Therefore, the periodic inspection procedure must be established from the outset.

2) Maintenance of Asphalt Pavement

Minor maintenance (Patching, Leveling), of the surface of the bridges and approach roads are done, during periodic inspection. Also, considering the life span of asphalt pavement, overlay should be carried out every ten years.

3) Steel Girder Painting

Minor painting maintenance of the steel girders will be carried out during periodic inspections. Also, considering the life span of paints, overall painting should be carried out every ten years.

(3) Operation and Maintenance Cost

1) Periodic Inspection and Maintenance

Periodic inspection, minor repair/maintenance will be executed under the direct management of the Ministry of Transport in each province. The cost for operation and maintenance per year is estimated as shown below:

Personal expenses (engineer, worker):
500 Thousand VND/month × 12 months × (21+17) bridges = 228 Million VND
Miscellaneous materials cost :Lump-sum (labor cost × 150%) = 343 Million VND

Vehicle hire charge:
500Thousand VND/month × 12months × (21+17) bridges = 228 Million VND
Total 799 Million VND (6.1 Million Yen)

2) Maintenance of Asphalt Pavement

The maintenance of asphalt pavement is entrusted to a local construction company and the estimate for a period of ten years is as shown below.

Bridge construction:
1,100m^2/ bridge × 21 bridges × 100 Thousand VND/m^2 = 2,310 Million VND

Steel girder supply:
1,100m^2/ bridge × 17 bridges × 100 Thousand VND/m^2 = 1,870 Million VND
Total 4,180 Million VND (32.2 Million Yen)

3) Steel Girder Painting

The painting of steel girders is entrusted to a local construction company and the estimate for a period of ten years is as shown below.

Bridge construction:
1,600m^2/2 bridges × 180 Thousand VND/m^2 = 288 Million VND

Girder supply:
9,200m^2/17bridges × 180 Thousand VND/m^2 = 1,656 Million VND
Total 1,854 Million VND (14.2 Million Yen)

Chapter 4 Project Evaluation and Recommendation

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4-1 Project Effect

Development of the road network in the Mekong Delta has been hindered by previous dependence on water transport, and a slow move to road transport, and also by the natural barriers presented by the numerous rivers.

Many of the 1960's built rural roads lack maintenance, and in particular development of feeder roads linking these roads to the arterial roads has not been implemented. Bridges on these roads have become unusable, or have restrictions to heavy vehicles. Small ferries at these crossings represent bottlenecks in the transport network.

Agriculture, forestry and fishing are the principle economic activities in the region, representing more than 50% per capita GDP in 13 of the 17 project provinces. Consequently transport infrastructure is of primary importance, and the regular disruption caused by flood flows in the rivers holds back economic development and improvement of living conditions in the Delta Area.

(1) Direct Effects of the Project

1) Construction of 10 new bridges and replacement of 28 damaged bridges will ensure smooth traffic flow on the existing road network. Moreover, the following benefits are expected.

   i) reliable transport of essential commodities
   ii) rapid transport of agricultural products and encouragement of agricultural development
   iii) facilitates access to hospitals and schools
   iv) improves access to markets and living standards of the inhabitants

2) Replacement of 3 wooden bridges that are at present only open to pedestrian and bicycle traffic will address safety concerns.

3) Construction of new bridges at the locations served by small ferries, which suffer interruption during the flood season, will ensure year round mobility.

4) Replacement of 22 bridges currently closed to heavy vehicles will eliminate the cost of detours.

5) Adequate navigation clearance will be provided on the 32 bridges that currently have inadequate freeboard.

6) The soft component of the project, that is for the bridges constructed by the Government of Vietnam, will assist in the improvement of technical standards and construction programming in the country.

(2) Indirect Effect

1) Removal of bottlenecks in the rural road network improves efficiency of the transport network as a whole. The benefits to the industrial and agricultural sectors are not limited to the project area, but also assist in the socio-economic development of the surrounding regions as well.

2) Targeted improvement of socio-economic conditions in the Mekong Delta Area will reduce regional inequality and contribute to balanced nation-wide development.

4-2 Recommendations

This project is recommended for Grant Aid by the Government of Japan since it will contribute to the early completion of the road network, to development of the region, and to the improvement of living conditions of the residents of the Mekong Delta Area.

The capacity of the Government of Vietnam to operate and maintain the project bridges has been assessed and it is concluded that adequate capacity is present. A unit of the Ministry of Transport, Project Management Unit 18, has recently successfully completed construction of a similar project, "Project for the Reconstruction of Bridges in the Northern Districts"

It is emphasized that maintenance must not be neglected following execution of the project, otherwise the benefits of the project will be reduced in the medium and long term. In particular, such maintenance must include assurance of the required cross sectional area below the bridges prior to the flood season, removal of driftwood, inspection for damage to bank protection during the flood season, and immediate repair of even minor damage. At the very least, funds for such inspection and repair must be provided.

Appendices

Appendices

Appendix 1.
Member List of the Survey Team

Appendix 1. Members List of the Survey Team

Name	Assignment	Authority/Firm
Mr. Yoshikazu YAMADA	Team Leader	Third Project Management Division, Grant Aid Management Department,JICA
Mr. Hiroyuki ENDO	Chief Consultant	Pacific Consultants International
Mr. Toshio UENO	Bridge Engineer	Pacific Consultants International
Mr. Jiro KOYAMA	Bridge Engineer	Pacific Consultants International
Mr. Isao MISONO	Engineer for Hydrology	Pacific Consultants International
Mr. Sakae TAKADA	Engineer for Topography/Geology	Pacific Consultants International
Mr. Kazuo MIZUKOSHI	Construction Specialist (Schedule & Quantity)	Pacific Consultants International
Mr. Ryu MIZUKOSHI	Interpreter	Pacific Consultants International

Appendix 2.
Survey Schedule

Appendix 2. Survey Schedule

Schedule of 1st Field Survey

Date		Leader: Mr.Yamada	Chief: Mr. Endo Bridge Eng. Mr. Ueno Interpreter: Mr. Mizukoshi	Bridge Eng.: Mr. Koyama Surveyor : Mr. Misono
March 26	Sun	Narita—Hong Kong—Hanoi		
27	Mon.	Courtesy Call: JICA, Japanese Embassy, MPI		
28	Tue.	Explanation of Inception report to MOT • Questionnaire • Proposed Data		
29	Wed.	Data Collect		Haneda—Kanku—Ho Chi Minh
30	Thurs.	Meeting with MOT Data Collect		Courtesy Call to PMU 18, South office Office Arrange, data Collect
31	Fri.	Site survey (Duc Khe Bridge) Signing on Minutes of Discussion with MOT		Site Survey: Binh Duong, Dong Nai,
April 1	Sat.	Mr. Endo: Data collection	Mr. Ueno and Mr. Mizukoshi Moved to HCMC	Site Survey: Long An, HCMC
2	Sun.	Mr. Endo: Data Collection	Data Collection	
3	Mon.	Courtesy Call EOJ and JICA	Site Survey: Dong Nai	Site Survey: Binh Phuoc
4	Tue.	Mr. Endo move to HCMC	Data Collection	Site Survey: Ba Ria Vung Tau
5	Wed.		Site Survey: Tay Ninh	
6	Thurs.		Internal Meeting	
7	Fri.	Courtesy Call to Mr. Nguyen Ta n Man, Vice minister of MOT		
8	Sat.	Data collect, , Preparation the site survey		
9	Sun.		Site Survey: Dong Thap TraVinh Vinh Long Tien Giang Ben Tre	Site Survey: Bac lieu Ca Mau Soc Trang Can Tho Kien Giang An Giang
10	Mon.			
11	Tue.	Move to		
12	Wed.			
13	Thurs.			
14	Fri.			
15	Sat.		Data Collect	
16	Sun.		Data Collect	
17	Mon.		Data Collect, Visiting CIENCO 6 and 620	
18	Tue.		Meeting with Mr. Nguyen Ta n Man, Vice minister of MOT	
19	Wed.		Data Collect:	
20	Thus.		Data Collect	(Mrs. Misono, Mizukoshi): Dong Thap Sites survey. Tien Giang sites survey.
21	Fri.		Data Collect	
22	Sat.		move to Hanoi	
23	Sun.		Internal meeting	
24	Mon.		Data Collect	
25	Tue.		Courtesy call JICA, EOJ, MOT, MPI	
26	Wed.		Hanoi –Narita	

Schedule of 2nd Field Survey

Date		Mr. Endo	Mr. Ueno	Mr.Koyama	Mr. Takada	Mr. Misono	Mr. Mizukoshi(k)
June 11	Sun.	Arrive at Hanoi					
12	Mon.	Courtesy Call MPI, JICA					
13	Tue.	Explanation of I/R to MOT					
14	Wed.	Preparation of M/D					
15	Thurs.	Internal Meeting					
16	Fri.	Sign of M/D,Ueno and Mizukoshi to Hanoi					
17	Sat.	Mr. Endo and Mr. Koyama to Hanoi			Arrive at HCMC		
18	Sun.	Preparation for study and site survey					
19	Mon.	Meeting with PMU			Meeting with Con.	-Data collection -Data arrangement	-Making Qnnaire -Visiting Company -Being preparation for site survey
20	Tue.	Report to MOT South			Meeting with Con.		
21	Wed.	Internal Meeting and Visit to 620			Meeting with Con.		
22	Thurs.	S/S: Vinh L (one day trip) (23),(25) Binh P (one day trip) (40)(48)					
23	Fri.						
24	Sat.	to Japan	Data arrangement		Meeting with Con.	Preparation for site survey	-Data collection -Other
25	Sun.		S/S: Kien G An G Can T Tra V Don T		Data arrangement		
26	Mon.			S/S: Ba Ria V Long A Tay N Binh P	S/S: Binh D Dong N Ba Ria V Long A Tien G	S/S: Dong N, Baria V Long A, Tien G Dong T	-Data collection
27	Tue.						Site Survey: Tay N Tra Vinh
28	Wed.						
29	Thurs.						
30	Fri.						
July 1	Sat.		D/A	D/A	Data arrangement	-Data arrangement	-Data arrangement
2	Sun.		D/A	D/A	S/S: Ben T Tra V Vinh L Dong T Can T	S/S: Ca M Bac L Soc T Can T Ben T Kien G An G	S/S: Ca M Bac L Soc T
3	Mon.		S/S: Tien G Ben t	S/S: Ca M Bac L Soc T			
4	Tue.						
5	Wed.						
6	Thus.						
7	Fri.		D/A	D/A			-Data collection
8	Sat.		D/A	D/A	Data arrangement		-Data collection
9	Sun.	HCMC	D/A	D/A	D/A	D/A	-Data collection
10	Mon.		D/A	D/A	Dakia	Re-survey Misono office Mr.Tuan survey	-Data collection
11	Tue.		D/A		Meeting TEDI		D/A
12	Wed.	BinhD BariaV			Meeting TEDI		Binh D
13	Thus.				Meeting TEDI	D/A	D/A
14	Fri.		D/A		D/A	D/A	D/A
15	Sat.		D/A	D/A	D/A		D/A
16	Sun.						
17	Mon.						
18	Tue.						
19	Wed.						
20	Thus.	Leave HCMC for Hanoi					
21	Fri.	Report to JICA, EOJ					
22	Sat.	Leave for Japan					

Note:- D/A means data arrangement
-S/S means Site Survey

Appendix 1. Members List of the Survey Team

Name	Assignment	Authority/Firm
Mr. Yoshikazu YAMADA	Team Leader	Third Project Management Division, Grant Aid Management Department,JICA
Mr. Hiroyuki ENDO	Chief Consultant	Pacific Consultants International
Mr. Toshio UENO	Bridge Engineer	Pacific Consultants International
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Mr. Kazuo MIZUKOSHI	Construction Specialist (Schedule & Quantity)	Pacific Consultants International
Mr. Ryu MIZUKOSHI	Interpreter	Pacific Consultants International

Appendix 3.
List of Party Concerned in the Recipient Country

Appendix 3. List of Party Concerned in the Recipient Country

Organization	Persons in Charge	Name
Ministry of Planning and Investment	Deputy General Director of Infrastructure Depattment	Pham Van Ngu
	Expert, MOT	Nguyen Xuan Tien
Ministry of Transport	Vice Minister	Nguyen Tan Man
	General Director of Planning and Investment Department	Tran Doan Tho
Project Management Unit	General Director	Bui Tien Dung
	Chief of Representative, HCMC office	Nnguyen Thach
	Director of Economic & Planning Department	Doan Van Chiem
	Director of Economic & Planning Department	Do Thi Kim Dung
	Expert of Economic & Planning Department	Nguyen Hai Ha
	Assistant of General Director	Le Huu Chien
	Deputy Chief of Representative, HCMC Office	Nguyen Hai Van
Bac Lieu Pro.	Deputy of Urban Management Dep.	Huynh Quac Ca
Ca Mau Pro.	Deputy of Transport-Traffic	Lieu Huy Hoang
Soc Tran Pro.	Director of Transport-Traffic	Ta Hoang Dau
	Deputy of Transport-Traffic	Tran Thanh Nghiep
	Director of Planning Dep.	Trinh Xuan Xe
	Deputy Director of Planning Dep	Nguyen Quoc Tuan
Can Tho Pro.	Deputy of Transport-Traffic	Le Hung Cuong
Kien Giang Pro.	Director of Planning & Investment Dep.	Dao Huy Hiep
An Giang Pro	Director of Transport Dep.	Huynh Thanh Quang
Dong Thap Pro	Deputy of Transport-Traffic	Nguyen Van Cong
	President of traffic project,	Dau Van Que
Vinh Long Pro.	Director of technical and planning	Tran Hoang Lam
	Specialist	Vo Van Quay

Organization	Persons in Charge	Name
Tra Vinh Pro.	Director of Transport	Tran Sam
	President of PMU	Tran Van Chuyen
	Specialist, PMU	Nguyen Buy Khang
Tien Giang Pro.	Director of Transport-Traffic	Le Van Phuoc
	Deputy of Transport-Traffic	Nguyen Van Hung
	Director of Traffic Controle	Le Van Viet
Ben Tre Pro.	Deputy Director, Transport-Traffic	Nguyen Ngoc De
	President of PMU	Ngyen Van Cao
	Director of Forestry Road Network, PMU	Huynh Hoang Oanh
	Deputy Director of Planning & investment	Nguyen Trung Chuong
Long An pro.	Deputy Director, Transport-Traffic	Nguyen Mau Ngo
Tay Ninh Pro.	Deputy Director, Transport-Traffic	Cao Thi Nhan
	Director of Planning-Traffic	Trinh Xuan Ngoc
	Deputy of Director, Planning and Investment, Tan Chau Peoples Commeetee	Nguyen Thanh Son
	Traffic Specialist, Tan Chau Peoples Committee	Diep Thanh Chung
Binh Duong Pro.	Deputy Director, Transport-Traffic	Le Van Vinh
Binh Phuoc Pro.	Director, Transport-Traffic	Nguyen Thanh Van
	Deputy Director, Transport-Traffic	Duong Manh Huynh
Dong Nai Pro.	Deputy Director, Transport-Traffic	Duong Manh Huynh
Ba Ria Vung Tau Pro.	Deputy Director, Transport-Traffic	Huynh Van Chau
	Director of Traffic Managenent	Nguyen Van Chau
Ho Chi Minh City	Director, Transport-Traffic	Nguyen Van Manh
	Deputy of General Director, NHA BE Peoples Committee	Vo Minh Thanh
JICA VIETNAM OFFICE	Chief	Jibiki Takanori
		Hatakeyama Tadasi
		Sugano Yuhiti
JAPANESE EMBASSY	Second Secretary	Miyagawa Kenji
JAPANESE CONSULATE	Second Secretary	Furudate Seiki
	Ms.Yuko Ito	Project Formulation Adviser, JICA

Appendix 4.
Minutes of Discussion

MINUTES OF DISCUSSIONS
ON BASIC DESIGN STUDY
ON THE PROJECT FOR CONSTRUCTION OF
BRIDGES IN MEKONG DELTA AREA
IN THE SOCIALIST REPUBLIC OF VIETNAM
(First Field Survey)

In response to a request from the Government of Socialist Republic of Vietnam (hereinafter referred to as "the Vietnam"), the Government of Japan decided to conduct a Basic Design Study on the Project for Construction of Bridges in Mekong Delta Area (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA dispatched to the Vietnam the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Yoshikazu Yamada, Director, Third Project Management Division, Grant Aid Management Department, JICA, and is scheduled to stay in the country from March 26 to April 26, 2000.

The Team held discussions with officials concerned of the Government of Vietnam and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed with further works and prepare the Interim Report.

Hanoi, March 31, 2000

Yoshikazu Yamada.
Leader,
Basic Design Study Team
JICA

Duong Duc Ung
Director General,
Foreign Economic Relations Department,
Ministry of Planning and Investment

Tran Doan Tho
Director General,
Department of Planning and Investment,
Ministry of Transport

Bui Tien Dung
General Director
PMU 18,
Ministry of Transport

ATTACHMENT

1. Objective

The objective of the Project is to secure a safe and smooth transport at the targeted feeder roads, aiming at improving living standards of rural people, accelerating the rural development by constructing the medium span bridges and providing steel bridges for short span bridges along the feeder roads in east south and west south 17 Provinces (Tay Ninh, Binh Duong, Binh Phuoc, Dong Nai, Ba Ria Vung Tau, Long An, Bac Lieu, Ca Mau, Soc Trang, Can Tho, Kien Giang, An Giang, Dong Thap, Vinh Long, Tra Vinh, Tien Giang, Ben Tre) and 1 city (Ho Chi Minh).

The main components of the Project are (A) construction of bridges and (B) procurement of steel girders in 17 Provinces and 1 city.

2. Project Site

The project sites are located in the Mekong Delta Area where are shown in Annex-1.

3. Responsible and Implementing Agency

The Responsible and Implementing Agency of the Project is Project Management Unit (PMU 18) under the Ministry of Transport.

4. Candidate bridges requested by the Government of Vietnam

After the discussions with the Team, the list of candidate bridges shown in Annex-2 have finally requested by Vietnamese side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

(1) Vietnamese side has understood the Japan's Grant Aid Scheme explained by the Team as described in ANNEX-3.

(2) Vietnamese side will take necessary measures, as described in ANNEX-4 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

(1) The consultants will proceed with further studies in Vietnam until April 26, 2000.

(2) JICA will prepare the interim report in English and dispatch a team to discuss its contents and to study detail at the sites around the middle of June 2000.

(3) JICA will prepare the draft report in English and dispatch a team in order to explain its contents in the beginning of October 2000.

(4) In case that the contents of the report would be accepted in principle by the Government of Vietnam, JICA will complete the final report and send it to the Government of Vietnam by January 2001.

7. Other Relevant Issues

(1) Vietnamese side will submit answers to the questionnaire in which the Team handed to the Vietnamese side by April 25 2000.

(2) Vietnamese side has agreed to provide necessary number of counterpart personnel to the Team during the period of their studies

(3) Vietnamese side shall obtain F/S (Feasibility Study) approval of the Government of Vietnam by end of November 2000 for smooth implementation of the Project.

(4) Vietnamese side promised to exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes including VAT, and other fiscal levies which may be imposed in Vietnam regarding the supply of products and services under the verified contracts.

(5) Vietnamese side shall secure the land for bridges, connecting roads, temporary offices, storage yards, take responsibility for demolition of all obstacles, if necessary, and clear sites before commencement of the construction.

(6) Both sides confirmed concerning about Component (A) as below;

a) Demolition of Existing Bridges

Demolition of Existing Bridges shall be borne by Vietnamese side in case that a new bridge will be constructed at upstream / downstream side of the existing bridge when there are existing bridges at Project sites.

b) Construction of Connecting Roads

Vietnamese side shall make possible all roads and bridges leading to the Project sites before commencement of the construction.

(7) Both sides confirmed concerning about Component (B) as below;

a) Demolition of Existing Bridges

Vietnamese side has understood that demolition of existing bridges shall be borne by Vietnamese side in all cases when there are bridges existing at Project sites.

b) Construction of Connecting Roads

Vietnamese side shall make possible all roads and bridges leading to the Project sites

commencement of the inland transportation of materials.

c) Design Work and Construction Work

Design work of substructures and construction of bridges and connecting roads are the responsibilities of the Government of Vietnam.

d) Construction Period

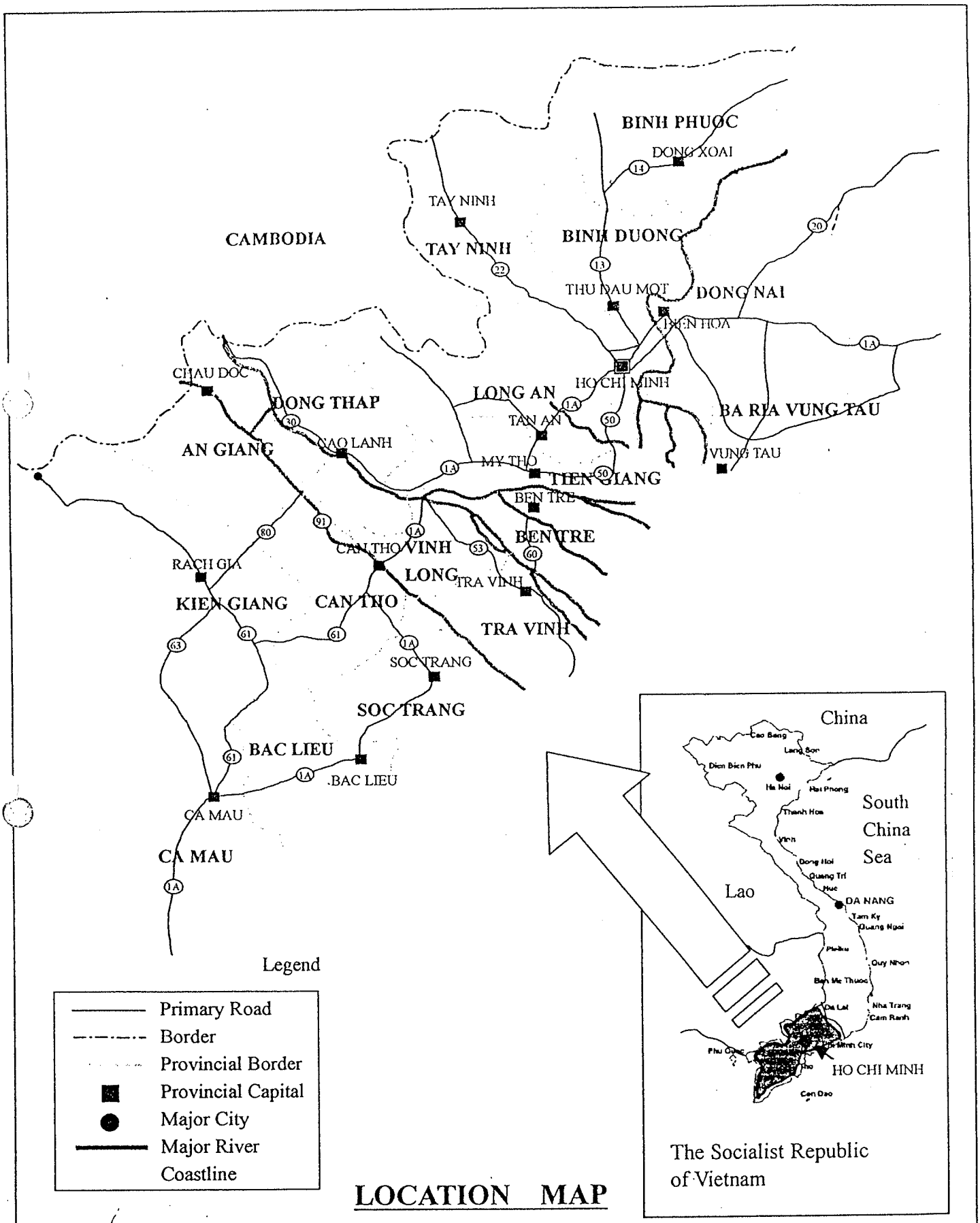
Vietnamese side shall construct all projected steel bridges within the period of two years after delivery of steel materials purchased under the verified contracts.

e) Allocation of Necessary Budget

Vietnamese side shall allocate the necessary budget to meet the cost of design and construction work for projected bridges.

f) Consultant Services for the Construction of Bridges using Steel Girders

Vietnamese side has requested the consultant services. (1) preparation of manuals for steel girder erection, (2) preparation of manuals for designing of substructure and approach road and embankment, (3) guidance and training at sites on steel girder erection, as one of the components of the Grant Aid to secure the smooth implementation works by Vietnamese side.



LOCATION MAP

LIST OF CANDIDATE BRIDGES

Province & City	No.	Bridge Name	Length	Width	Construction: * Procurement:**	Existing Condition
BAC LIEU	(1)	NGAN DUA	90	5.5	**	No bridge, crossing by small boat
	(2)	KE	70	5.5	*	Temporary wooden bridge for passenger
	(3)	HOA BINH-2	60	5.5	*	No bridge, crossing by small boat
	(4)	DEN	60	5.5	*	Temporary wooden bridge for passenger
CA MAU	(5)	LUONG THUC	60	5.5	*	Steel truss bridge with wood slab
	(6)	VAM DINH	60	5.5	*	No bridge, crossing by small boat
	(7)	KINH KIEM LAM	80	5.5	**	No bridge, crossing by small boat
SOC TRANG	(8)	HUYNH HUU NGHIA	45	5.5	*	Steel truss bridge with wood slab
	(9)	BA LUI	45	5.5	*	Steel truss bridge with wood slab
	(10)	XEO DUA	30	5.5	*	Steel truss bridge with wood slab
	(11)	SAINTARD	100	5.5	**	Steel truss bridge with wood slab
CAN THO	(12)	LONG MY	90	8	*	Steel truss bridge with wood slab
	(13)	NGA SAU	50	5.5	**	RC bridge with wood slab
	(14)	NGA TU CAY DUONG	45	5.5	**	No bridge, crossing by small boat
KIEN GIANG	(15)	VAM SANG THI DOI	75	5.5	*	No bridge, crossing by small boat
	(16)	HA GIANG	70	5.5	(*)	No bridge, crossing by small boat
	(17)	SO 11	55	5.5	**	No bridge, crossing by small boat
AN GIANG	(18)	THOAI GIANG	90	5.5	*	Temporary wooden bridge for passenger
	(19)	SOC TRIET	50	5.5	*	No bridge, crossing by small boat
	(20)	CAI NAI	30	5.5	**	Temporary wooden bridge for passenger
DONG THAP	(21)	TRAM CHIM	80	6.5	*	No bridge, crossing by small boat
	(22)	KENH TU	70	6.5	**	No bridge, crossing by small boat
VINH LONG	(23)	HOA TINH	74	5.5	*	Built in 1959, seriously damaged
	(24)	BA KE	98	6.5	*	No bridge, crossing by small boat
	(25)	MY HOA	84	5.5	**	No bridge, crossing by small boat
TRA VINH	(26)	TAN AN	45	6.5	*	Temporary wooden bridge for passenger
	(27)	RACH VON	60	5.5	*	Temporary wooden bridge for passenger
	(28)	SUOI	65	5.5	**	Built in 1975, seriously damaged
	(29)	DAI SU	45	5.5	**	Steel truss bridge with wood slab
TIEN GIANG	(30)	LONG BINH	38	5.5	**	Built in 1975, seriously damaged
	(31)	XOM SOC	44	5.5	*	Built in 1941, seriously damaged
	(32)	TRA TAN	75	5.5	*	Temporary wooden bridge for passenger
BEN TRE	(33)	CAI MON LON	85	6.5	*	Steel truss bridge with wood slab
	(34)	CAI GA	75	6.5	**	Steel truss bridge with wood slab
	(35)	RANH TONG	85	6.5	**	Steel truss bridge with wood slab
	(36)	HUONG MY	60	6.5	**	Steel truss bridge with wood slab
LONG AN	(37)	TAN TRU	65	6.5	*	Steel truss bridge with wood slab
	(38)	BA LY	65	5.5	*	Temporary wooden bridge for passenger
	(39)	VINH CONG	40	6.5	**	Temporary steel bridge with wood slab
TAY NINH	(40)	SAIGON	80	6.5	*	Temporary steel bridge with wood slab
	(41)	NINH DIEN	30	5.5	*	Temporary steel bridge with wood slab
	(42)	SUOI TRE	36	5.5	**	Temporary steel bridge with wood slab
	(43)	XE BE	30	5.5	**	Temporary steel bridge with wood slab
BINH DUONG	(44)	VUNG GAM	50	5.5	*	Steel truss bridge with wood slab
	(45)	CHUA	30	5.5	*	Steel truss bridge with wood slab
	(46)	RACH RO	27	5.5	**	Steel truss bridge with wood slab
	(47)	RACH GOC	30	5.5	**	Steel truss bridge with wood slab
BINH PHUOC	(48)	DAKIA	45	6.5	**	Steel truss bridge with wood slab
	(49)	DAC NHAU	91	6.5	*	Temporary wooden bridge for passenger
	(50)	SO 5	38	6.5	**	Steel truss bridge with wood slab
	(51)	BOM RIA	22	6.5	**	Steel truss bridge with wood slab
DONG NAI	(52)	AN HOA	50	5.5	*	Steel truss bridge with wood slab
	(53)	CHAY	50	5.5	*	Temporary steel bridge with wood slab
	(54)	BAU XEO	30	5.5	**	Temporary steel bridge with wood slab
	(55)	SONG THAO	20	5.5	**	Temporary steel bridge with wood slab
BA RIA VUNG TAU	(56)	SUOI GIAU	35	5.5	*	No bridge, crossing by small boat
	(57)	SONG RAY 2	50	5.5	(*)	No bridge, crossing by small boat
	(58)	AP AN BINH	45	5.5	*	No bridge, crossing by small boat
HO CHI MINH C.	(59)	CONG DINH	60	6.5	*	Temporary steel bridge with wood slab
	(60)	SO 3	90	5.5	**	No bridge, crossing by small boat

*: 34 bridges
**: 26 bridges

Japan's Grant Aid Program

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid is executed by the following procedures.

- Application (request made by a recipient country)
- Study (Preparatory Study / Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- Determination of Implementation (Exchange of Notes between the Governments of Japan and the recipient country)
- Implementation (Implementation of the Project)

(2) Firstly, an application or a request for a Project submitted by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is suitable for Japan's Grant Aid. If the request is deemed appropriate, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the study (Basic Design Study), using a Japanese consulting firm(s). If the background and objective of the requested project are not clear, a Preparatory Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises the project to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results would be then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledges by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Basic Design Study

(1) Contents of the Study

The purpose of the Study (Preparatory Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

(a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation;

(b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view.

(c) to confirm items agreed on by both parties concerning the basic concept of the Project.

(d) to prepare a basic design of the project.

(e) to estimate cost involved in the project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the project. Therefore, the implementation of the project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency .

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid provides a recipient country with non-reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation as such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both

Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

(3) "The period of the Grant Aid" means Japanese single fiscal year in which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding contracts with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed. However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of single fiscal year at most by mutual agreement between the two Governments.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, construction and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Gove: of Japan. The "Verification" is deemed necessary to secure accountability to Japanese t- ayers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to unde measures such as the following:

(a) to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

(b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

(c) to secure buildings prior to the installation work in case the Project is providing equipment,

(d) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

(e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and

services under the Verified Contracts,

(f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9) Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

Major Undertakings to be taken by Each Government

NO	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
5	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country		●
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	● Component (A)	● Component (B)
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
9	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities		●
10	To coordinate and solve any issues related to the Project which may be raised from third parties or inhabitants in the Project area during implementation of the Project		●

MINUTES OF DISCUSSIONS
ON BASIC DESIGN STUDY
ON THE PROJECT FOR CONSTRUCTION OF
BRIDGES IN MEKONG DELTA AREA
IN THE SOCIALIST REPUBLIC OF VIETNAM
(Second Field Survey)

In March 2000, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study (First Field Survey) Team on the Project for Construction of Bridges in Mekong Delta Area (hereinafter referred to as "the Project") to the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared an interim report of the study.

In order to explain and to consult Vietnam on the components of the interim report, JICA sent to Vietnam the Basic Design Study (Second Field Survey) Team (hereinafter referred to as "the Team"), which is headed by Mr. Yoshikazu Yamada, Director, Third Project Management Division, Grant Aid Management Department, JICA, from June 11 to July 22, 2000.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed with further works and prepare the Basic Design Study Report.

Hanoi, June 15, 2000

Yoshikazu Yamada
Leader,
Basic Design Study Team,
JICA

Duong Duc Ung
Director General,
Foreign Economic Relations Department,
Ministry of Planning and Investment

Tran Doan Tho
Director General,
Department of Planning and Investment,
Ministry of Transport

Bui Tien Dung
General Director,
PMU 18,
Ministry of Transport

ATTACHMENT

1. Components of the Interim Report

Vietnamese side agreed and accepted in principle the components of the interim report explained by the Team.

2. Japan's Grant Aid Scheme

The Vietnamese side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Vietnam as explained by the Team and described in ANNEX-3 and ANNEX-4 of the Minutes of Discussions signed by both parties on March 31, 2000.

3. Schedule of the Study

(1) The Team will proceed to further studies in Vietnam until July 22, 2000.

(2) JICA will prepare the draft report and dispatch a mission in order to explain its contents in the beginning of October 2000.

(3) In case that the contents of the draft report is accepted in principle by Vietnamese side, JICA will complete the final report and send it to the Government of Vietnam by January 2001.

4. Other Relevant Issues

(1) Both parties agreed that the bridges shown in ANNEX will be surveyed in detail in this Second field Survey. Based on the further studies by the Team, JICA will assess the appropriateness of their results and will recommend to the Government of Japan for approval.

(2) Both parties agreed the road design in principle as below;

(Provincial and District Road)

Clear Width of Bridge: 5.5m , Live Load : H13

(Commune Road)

Clear Width of Bridge: 4.5m , Live Load : H13

In case both sides agree, provincial road bridges with Clear Width of 7m can be considered.

(3) The Team will consider on use of Weathering Steel in some bridges in order to save cost for maintenance.

(4) The Vietnamese side shall secure the land for bridges, temporary offices and storage yards, and responsibility for demolition of all obstacles, if necessary, and clear sites before commencement of construction.

(5) The Government of Vietnam shall allocate necessary budget to meet the construction cost of bridges and approach roads which is necessary for the construction of bridges of material supply type.

(6) The Vietnamese side shall demolish all existing bridges after construction of the new bridges for material supply type and shall demolish some existing bridges for facility construction type if the route will be shifted from the existing route.

5. F/S for the Project by Vietnam

Feasibility study for the Project by Vietnam based on Vietnamese Law shall be finished by the middle of November 2000.

6. Soft Component for Implementation of Material Supply Type

Both parties recognized the necessity of soft component so as to smooth the project successfully. And the content of the soft component will be discussed between both parties during the second field survey.

ANNEX

Selected Bridge

Province	Bridge No.	Bridge Name	Const.:* Procu.:**	No. of Bridge		
				Const	Procu.	Total
BAC LIEU	(3)	HOA BINH-2	*	2		2
	(4)	DEN	*			
CA MAU	(6)	VAM DINH	*	2		2
	(7)	KINH KIEM LAM	*			
SOC TRANG	(8)	HUYNH HUU NGHIA	*	1	2	3
	(10)	XEO DUA	**			
	(11)	SAINTARD	**			
CAN THO	(12)	LONG MY	*	1	1	2
	(14)	NGA TU	**			
KIEN GIANG	(15)	VAM SANG THI DOI	*	2		2
	(16)	HA GIANG	*			
AN GIANG	(18)	THOAI GIANG	*	1	2	3
	(19)	SOC TRIET	**			
	(20)	CAI NAI	**			
DONG THAP	(21)	TRAM CHIM	*	1	1	2
	(22)	KENH TU	**			
VINH LONG	(23)	HOA TINH	*	1	1	2
	(25)	MY HOA	**			
TRA VINH	(26)	TAN AN	*	1	2	3
	(28)	SUOI	**			
	(29)	DAI SU	**			
TIEN GIANG	(30)	LONG BINH	*	2		2
	(32)	TRA TAN	*			
BEN TRE	(35)	RANH TONG	*	1	1	2
	(36)	HUONG MY	**			
LONG AN	(37)	TAN TRU	**	1	2	3
	(38)	BA LY	*			
	(39)	VINH CONG	**			
TAY NINH	(40)	SAIGON	*	1	1	2
	(43)	XE BE	**			
BINH DUONG	(45)	CHUA	*	1	1	2
	(46)	RACH RO	**			
BINH PHUOC	(48)	DAKIA	*	1	1	2
	(50)	NO.5	**			
DONG NAI	(53)	CHAY	*	1	2	3
	(54)	BAU XEO	**			
	(55)	SONG THAO	**			
BA RIA VUNG TAU	(58)	AP AN BINH	*	1		1
Total				**21**	**17**	**38**

MEMORANDUM OF MEETING

On Basic Design Study

On the Project for Construction of Bridges in Mekong Delta Area

In the Socialist Republic of Vietnam

(Second Field Survey)

The meeting was held between PMU18 and JICA field survey team on 19th July 2000, at the Head Office of PMU18 in Hanoi.

The list of the attendants from both parties is as follows;

PMU18:	Mr. Vu Ngoc Van	Director of Project No. 2 Development Dept.
	Mr. Le Huu Chien	Assistant to General Director
	Mr. Doan Van Chiem	Director of Economic & Planning Dept.
	Ms. Do Thi Kim Dung	Deputy Director of Economic & Planning Dept.
JICA field survey team:		
	Mr. Hiroyuki Endo	Project Manager of Field Survey
	Mr. Toshio Ueno	Bridge Designer
	Mr. Jiro Koyoma	Bridge Designer
	Mr. Ryu Mizukoshi	Interpreter

The materials prepared by JICA field survey team are as follows;

- Bridge Plan Data
- Design Criteria (Draft)
- Content of Soft Component for Implementation of Material Supply Type (Draft)
- Location Map of Ap An Binh Bridge

The main discussions were:

1) JICA field survey team explained the results of the 2nd field survey by using the paper of "Bridge Plan Data".
2) Classification of 2 roads among 38 roads was clarified to village (commune) road from district one.
3) The dimension of navigation clearance at several locations was reduced by the Provincial Department of Transport.
4) JICA field survey team was requested by the provincial people's committee to adopt the live load H30 at 15 bridges and also to increase bridge width from 5.5m to 6m.
5) PMU18 expressed on the clearance that the reduction of dimension of clearance was welcome to reduce the construction cost. However PMU18 advised that as the clearance of bridge No.3 was still under confirmation to the province, JICA field survey team should wait for the answer to commence the basic design.
6) PMU18 requested on the live load that as adoption of H30 would affect the cost very much, H18 would be considered instead of H13, if the total cost would be within budget.
7) PMU18 also asked on the bridge width that 6m width would be considered, if the cost would be within budget.
8) On the soft component PMU18 agreed basically, for it had been discussed in the M/D signed on 16th June 2000.
9) PMU18 promised to review and comment the Design Criteria (draft), and provide the latest Vietnamese design standard.
10) PMU18 requested on the transportation of the material supply that the destination of materials should be at bridge site, because the timing of delivery will be same as the commencement of construction of substructure by local contractor at each bridge site, and the cost of transportation from port to bridge site will be same the cost to the stock yard of province.
11) JICA field survey team promised to convey the subject of live load, bridge width and destination of transportation of materials to JICA Tokyo.
12) JICA field survey team received the official answer on the future plan of extension of Ap An Binh

Bridge form Ba Ria Vung Tau Province.

PMU18 and JICA field survey Team agreed on the content of this memorandum.

Hanoi, July 21, 2000

Hiroyuki ENDO
Project Manager,
2nd Field Survey Team
JICA

Bui Tien Dung
General Director
PMU 18
Ministry of Transport

Bridge Plan Data

Province	Br. No.	Bridge Name	Road Class	Const. Procu.	Length (m)	Width (m)	Clearance (m)		Location of Road Center	Live Load	Clear Width	Remarks
							Planned	Result				
BAC LIEU	(3)	HOA BINH-2	Pro.	C	(38.0)	5.5	5×24		Existing Br. site	Request H30		
	(4)	DEN	Pro.	C	47.0	5.5	2.5×18		42m away from exist	Request H30		
CA MAU	(6)	VAM DINH	Pro. No.6	C	(55.0)	5.5	4.5×30		On original	Request H30		
	(7)	KINH KIEM	Pro. No.6	C	[80.0]	5.5	4×27		On original	Request H30		
SOC TRANG	(8)	HUYNH HUU	Pro. No.13	C	40.0	5.5	2.5×12		7m away from exist	Request H30		
	(10)	XEO DUA	Pro. No.13	P	24.0	5.5	2.5×12		Shift to downstream	Request H30		
	(11)	SAINTARD	Pro. No.6	P	85.0	5.5	7×30		Shift to downstream	Request H30		
CANTHO	(12)	LONG MY	Pro. No.931	C	87.7	5.5	6×30		On riginal			
	(14)	NGA TU	Pro. No.928	P	50.0	5.5	5×25		On original			
KIEN GIANG	(15)	VAM SANG T.D	Pro.	C	80.0	5.5	7×30	5×25	On original			
	(16)	HA GIANG	Pro. No.955	C	65.0	5.5	7×30		On original	Request H30		
AN GIANG	(18)	THOAI GIANG	Pro. No.943	C		5.5	7×30		On original			Hospital
	(19)	SOC TRIET	Pro. No.943	P	53.0	5.5	6×25		3m away from exist			
	(20)	CAI NAI	Village	P	28.6	4.5	2.5×10		On original			
DONG THAP	(21)	TRAM CHIM	Pro. No.843	C	66.0	5.5	4.0×24		On original			
	(22)	KENH TU	Pro. No.844	P	70.0	5.5	3.5×24		On original			
VING LONG	(23)	HOA TINH	Dis.	C	65.7	5.5	6×18	5×18	Shift to downstream			
	(25)	MY HOA	Village	P	70.0	4.5	6×18		On original			
TRA VINH	(26)	TAN AN	Pro. No.911	C	43.4	5.5	3×25		On original			
	(28)	SUOI	Dis. No.2	P	64.1	5.5	3×25		On original			
	(29)	DAI SU	Pro. No912	P	43.5	5.5	3×25		On original			
TIEN GIANG	(30)	LONG BINH	Pro. No.877	C	27.5	5.5	3.5×10	3×10	On original			
	(32)	TRA TAN	Pro. No.864	C	49.9	5.5	4.5×20		Shift to downstream	Request H30	Request W=6m	
BEN TRE	(35)	RANH TONG	Pro. No888	C	85.0	5.5	3.5×24		On original	Request H30	Request W=6m	
	(36)	HUONG MY	Pro. No.888	P	51.0	5.5	3.0×24		On original	Request H30	Request W=6m	
LONG AN	(37)	TAN TRU	Dis.	P	60.0	5.5	3×24	3×20	Shift to downstream			
	(38)	BA LY	Pro. No.828	C	58.5	5.5	3×24	3×20	Shift to downstream			
	(39)	VINH CONG	Pro. No.827A	P	36.0	5.5	3×24	3×20	On original			
TAY NINH	(40)	SAIGON	Pro. No.794	C	71.0	5.5	3×24		Shift to downstream	Request H30	Request W=6m	F/S 7+2×1.0
	(43)	XE BE	Village	P	27.0	4.5	2.5×18		Shift to downstream			
BING DUONG	(45)	CHUA	Pro. No.746	C	27.0	5.5	N/A		Shift to upstream	Request H30	Request W=6m	
	(46)	RACH RO	Pro. No.746	P	24.0	5.5	N/A		Shift to upstream	Request H30	Request W=6m	
BINH PHUOC	(48)	DAKIA	Pro. No.749	C	40.6	5.5	N/A		On original			
	(50)	NO.5	Pro. No.750	P	37.0	5.5	N/A		Shift northward			
DONG NAI	(53)	CHAY	Dis. No.19	C	45.0	5.5	2.0	2×18.6	On original			
	(54)	BAU XEO	Village	P	24.5	4.5	N/A		On original			
	(55)	SONGTHAO	Village	P	15.0	4.5	N/A		On original			
VUNG TAU	(58)	AP AN BINH	Dis.	C	38.0	5.5	3.5×20		Shift to around 50m	Request H30	Request W=6m	

A-4-18

BASIC DESIGN STUDY
ON
THE PROJECT FOR CONSTRUCTION OF BRIDGES
IN
MEKONG DELTA AREA

Design Criteria
(Draft)

July, 2000

Basic Design Criteria on the project for construction of Bridges in Mekong Delta Area

(1) Design Standards

The following Design Standard shall be applied for the Project;

- HIGHWAY-SPECIFICATIONS FOR DESIGN, TCVN 4054:1998 (VIETNAM)
- DESIGN SPECIFICATION FOR BRIDGES AND CULVERTS ON THE BASIS OF LIMIT STATES-MINISTRY OF TRANSPORT AND COMMUNICATION, No.2057 QD/Kt14 (VIETNAM)
- DESIGN CRITERIA OF HIGNWAY, TCVN 4054-85 (VIETNAM)

(2) Design Methodology

Structural members will be designed by the allowable stress method in a design load, and also checked by the limit state method based on Vietnam Standards.

(3) Relation between Design Traffic Volume and Design Speed

According to the Vietnam Design Standards (i.e. TCVN 4054-85 and 1998), highways are divided into six technical classes depending on the importance of highway and traffic volume,. The following table shows, for each of these classes, the maximum speed evaluated for a vehicle running safety in normal conditions.

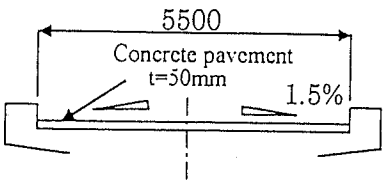
Table 2.1 – Highway Design Speed and Traffic Volume

	I	II	III	IV	V	VI
Average Daily Traffic Volume	>6000	3000~ 6000	1000 ~ 3000	300 ~ 1000	50 ~ 300	<50
Design Speed	80-60	80-60	80-60	60-40	40-20	25-15

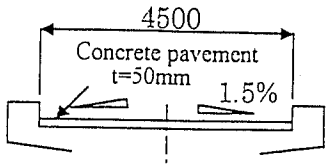
Bridges on the Project are located in the rural area of Mekong Delta and East-South of Vietnam. Road Category have been selected V and VI by JICA Study Team based on the Site Survey.

(4) Design Clear Width of Bridges

The clear width of the bridge and the approach road width are specified as follows based on the traffic volume, the road category and site survey. Furthermore, it has been agreed with MOT on the M/D.

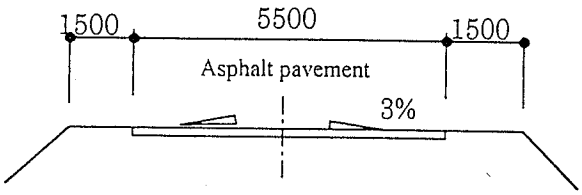


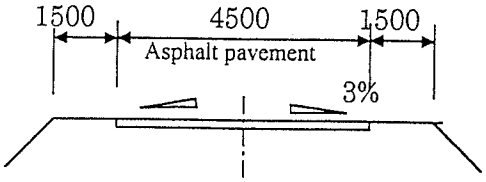
For Provincial and District Road



For Village Road

For Bridge





For Approach Road

(5) Loading

1) Live Load

Bridge shall be designed by H13 and X-60 based on Vietnam Standard.

2) Seismic Horizontal Force

Horizontal seismic coefficient : kh=0.05

3) Others

- Dead Load
- Impact of Live Load
- Wind Loads
- Loads due to Collision of Ships
- Influence of creep on concrete
- Influence of dry shrinkage on concrete
- Earth Pressure
- Static pressure of water
- Floatation or displacement forces

Above mentioned Collision of Ships shall be considered 30t force at the point of the Pier structure in accordance with Vietnam Bridge Standard No.2057 QD/Kt14 article 2.27.

(6) Design Condition

1) Materials and its self-weight for construction

Designation	Self-weight kg/m3	Designation	Self-weight kg/m3
Steel	7,850	Cement, mortar	2,150
Concrete reinforced	2,500	Asphalt Pavement	2,300
Prestressed concrete	2,500	Concrete Pavement	2,350
No-reinforced concrete	2,350	Timber	800

2) Strength of materials

In principal, compressive strength of concrete are specified Vietnam Bridge Standard No.2057 QD/Kt14 article 5.12, and regarding reinforcing bar article 5.13.

Concrete

Designation	Strength (kg/cm2)
PC Girder (Pre-tension)	400
PC Girder (Post-tension)	350
Slab	300
Abutment, Pier	200
Concrete Pile	300
Lean concrete	150

Reinforcing bar

Designation	Yield Strength (kg/cm2)
Round Bar (A- I)	σ py=1900
Deformed bar (A- II)	σ py=2,400
Deformed bar (A-III)	σ py=3,000

Design tensile strength of prestressing stress are as follow.

PC steel

Girder	Designation	Yield Load (Kgf/mm2)	Ultimate Load (Kgf/mm2)
Pre-tension	SWPR7A T12.7mm	160	190
Post-tension	SWPR7B 12T12.4mm	150	175

Basic strength of steel for plate-girder shall be specified below in accordance with Japanese Standard or AASHTO.

Designation	Tensile strength (kgf/mm2)	Remarks
SS400,SM400	41-52	Normal steel
SM490, SM490Y	50-62	Normal steel
SM520	53-65	Normal steel
SMA400W	41-55	Weathering steel
SMA490W	50-62	Weathering steel

3) Road Geometric Standard

Major technical specifications of highway shall be applied below in accordance with Vietnam standard TCVN 4054 1998.

Item	Unit	Design Standard	
Design Speed	Km/hr	40	25
Horizontal alignment			
Minimum curve of radius	m	60	15
Minimum curve length	m	70	45
Minimum transition curve length	m	35	25
Super elevation runoff		1/100	1/100
Minimum length of sight distance	m	40	20
Vertical alignment			
Maximum gradient	%	8	9
Minimum radius of crest	m	700	200
Minimum radius of sag	m	450	100
Minimum vertical curve length	m	30	25
Cross section			
Cross fall	%	3	3
Maximum super-elevation	%	6	6

4) Clearance

Vertical clearances for roads and non-navigational clearances for river are as follows.

Vertical height on road	H=4.5m
Clearance between flood stage and bottom of girder	Flat area : H=0.5m Mountainous area : H=1.0m

5) Proposed Datum of Water Level

Province & City	Type */**	No.	Bridge Name	Design			Remarks	
				Water Levels (m)	Return Period (Year)	Navigation Clearance (m)	Topo.Condition	Other
BAC LIEU	*	(3)	HOA BINH-2	1.65	20	5.0	Inland Flood Plain	
	*	(4)	DEN	0.81	20	2.5	Coastal Flood Plain	
CA MAU	*	(6)	VAM DINH	0.97	20	4.5	Inland Flood Plain	
	*	(7)	KINH KIEM LAM	0.91	20	4.0	Coastal Flood Plain	
SOC TRANG	*	(8)	HUYNH HUU	1.35	20	2.5	Inland Flood Plain	
	**	(10)	XEO DUA	1.35	20	2.5	Inland Flood Plain	
	**	(11)	SAINTARD	1.89	20	7.0	Inland Flood Plain	
CAN THO	*	(12)	LONG MY	1.12	20	6.0	Inland Flood Plain	
	**	(14)	NGA TU	1.52	20	5.0	Inland Flood Plain	
KIEN GIANG	*	(15)	VAM SANG T.D	1.36	20	7.0	Inland Flood Plain	
	*	(16)	HA GIANG	1.14	20	7.0	Coastal Flood Plain	
AN GIANG	*	(18)	THOAI GIANG	1.94	20	7.0	Inland Flood Plain	
	**	(19)	SOC TRIET	3.65	20	6.0	Inland Flood Plain	
	**	(20)	CAI NAI	2.53	20	2.5	Inland Flood Plain	
DONG THAP	*	(21)	TRAM CHIM	3.50	Based on 1978 Flood	3.5	Inland Flood Plain	Request from prov.
	**	(22)	KENH TU	2.70	Based on 1978 Flood	4.0	Inland Flood Plain	Request from prov.
VINH LONG	*	(23)	HOA TINH	1.87	20	6.0	Inland Flood Plain	
	**	(25)	MY HOA	1.84	20	6.0	Inland Flood Plain	
TRA VINH	*	(26)	TAN AN	1.88	20	3.0	Inland Flood Plain	
	**	(28)	SUOI	1.88	20	3.0	Inland Flood Plain	
	**	(29)	DAI SU	1.88	20	3.0	Inland Flood Plain	
TIEN GIANG	*	(30)	LONG BINH	1.72	20	3.5	Coastal Flood Plain	
	*	(32)	TRA TAN	1.74	20	4.0	River Side Flood Plain	
BEN TRE	*	(35)	RANH TONG	1.87	20	3.5	Inland Flood Plain	
	**	(36)	HUONG MY	1.87	20	3.0	Inland Flood Plain	
LONG AN	**	(37)	TAN TRU	1.54	20	3.0	Inland Flood Plain	
	*	(38)	BA LY	1.73	20	3.0	Inland Flood Plain	
	**	(39)	VINH CONG	1.73	20	3.0	Inland Flood Plain	
TAY NINH	*	(40)	SAIGON	18.84	20	3.0	Hilly Area	Ref.to F/S report
	**	(43)	XE BE	*Being examined	**Beeing examined	2.5	Hilly Area	
BINH DUONG	*	(45)	CHUA	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
	**	(46)	RACH RO	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
BINH PHUOC	*	(48)	DAKIA	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
	**	(50)	SO 5	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
DONG NAI	*	(53)	CHAY	1.61	20	2.0	River Side Flood Plain	
	**	(54)	BAU XEO	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
	**	(55)	SONG THAO	*Being examined	**Beeing examined	0.5 (flood)	Hilly Area	No Navigation
BA RIA	*	(58)	AP AN BINH	1.41	20	3.5	Hilly Area	

1). * : Construction and ** : Procurement

2).* Being examined : Design water levels will be determined based on the site survey due to no availability of water level data

3).**Being examined : Occurance frequency will be evaluated based on rainfall data

BASIC DESIGN STUDY
ON
THE PROJECT FOR CONSTRUCTION OF BRIDGES
IN
MEKONG DELTA AREA

Content
of
Soft Component for Implementation of Material Supply Type
(Draft)

July, 2000

KE PG

1. Related Agencies:

Ministry of Transport (MOT),
Project Management Unit 18 under the Ministry of Transport (PMU 18),
Project Management Unit 18 Representative Office in the South (PMU 18 SR)
Provincial Department of Transport (PDOT)
Japan International Cooperation Agency (JICA)

2. Scope of Application

1) Assistance on review of design and supervision of the component, where bridges are constructed by the Vietnamese Government using materials supplied by the Japanese Government, in the Project for Construction of Bridges in Mekong Delta Area on which the Japanese Government extends the Grant Aid to the Ministry of Transport of the Vietnamese Government

2) Period of implementation
   - Within the period described in the Exchange of Note ,and
   - Within one year after hand over of the materials.

3) Number of personnel
   - Engineers for review of the detailed design and construction schedule conducted by local consultants, and
   - One engineer for monitoring the construction

4) Output
   - Manual on erection of girders, and
   - Report on progress control and quality control. (Monthly report)

2. Contents of Implementation

1) Contents of assistance

There may be a delay that affects the progress of the whole Project on the works, for which the Vietnamese side is responsible, and then the soft component shall assist in preparation of construction plans, supervision of the construction and so-

on in order to promote the progress. As bridge sites are scattered over twelve provinces, the soft component shall assist the responsible agencies of the Central government (MOT, PMU 18) in guiding local governments (PDOT) to arrange receiving the bridge materials.

To put it concretely, it shall advise the Vietnamese Government in solving problems to ease a smooth implementation of the Material Supply Component by monitoring the progress control and quality control through supervision by local consultants. Together with the above work, the Japanese Government can understand the situation of the Grant Aid Project from the Monthly Reports submitted to JICA.

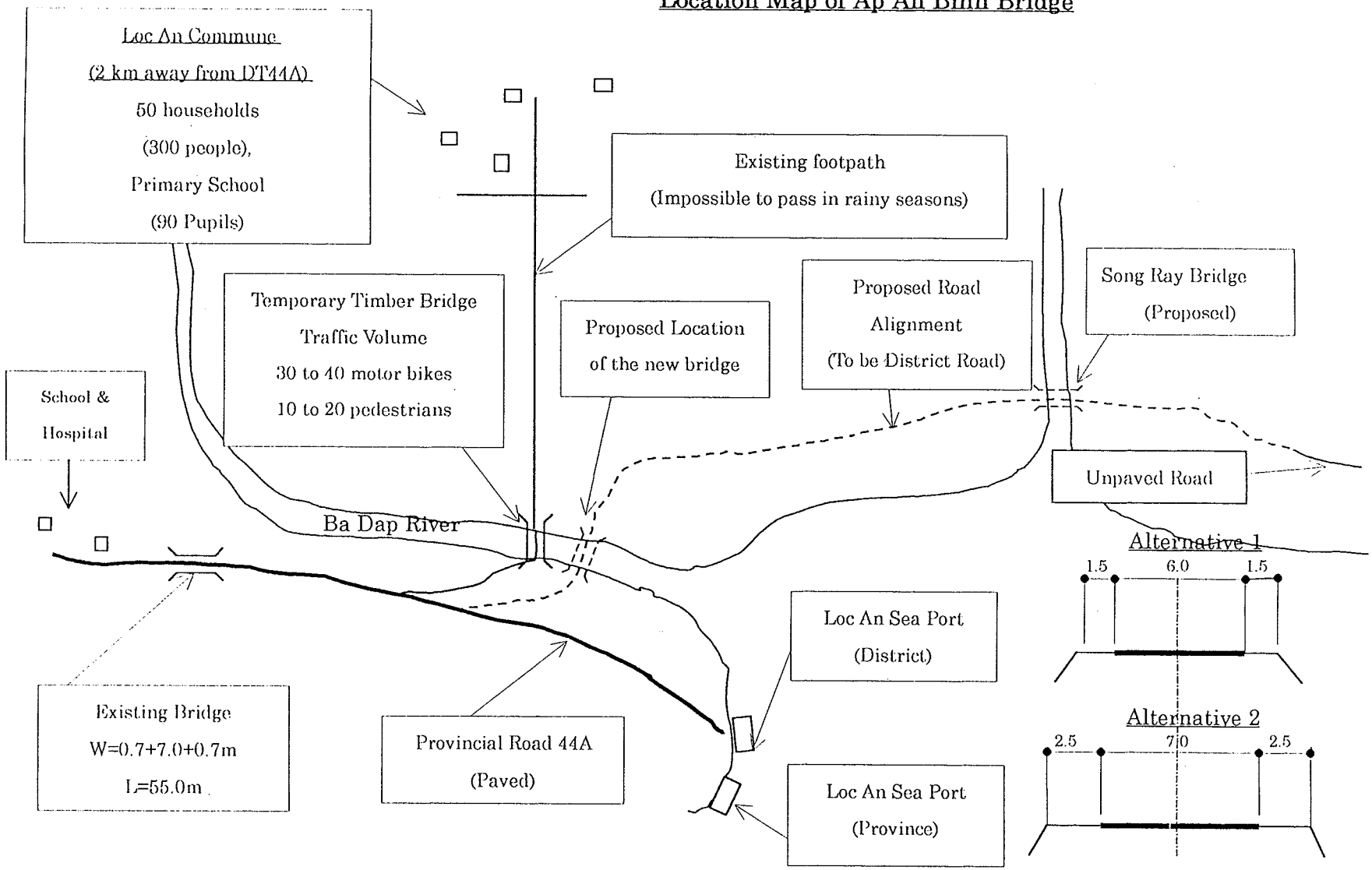
The soft component shall confirm problems occurring during the construction period, and then suggest a timely solution.

In case betterment on implementation of the Material Supply Component is found, it will be proposed to JICA, and also publicity of ODA scheme shall be given timely.

2) Assistance body

Japanese Consultant shall be assigned to the soft component scheme directly.

Location Map of Ap An Binh Bridge



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