MINISTRY OF TRANSPORT
THE SOCIALIST REPUBLIC OF VIETNAM

PREPARATORY SURVEY REPORT
ON
THE PROJECT
FOR
RECONSTRUCTION OF BRIDGES IN THE CENTRAL DISTRICT (PHASE 2)
IN
THE SOCIALIST REPUBLIC OF VIETNAM

MARCH 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Oriental Consultants Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of the Socialist Republic of Vietnam, and conducted field investigations. As a result of further studies in Japan, 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.

Finally, 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 survey team.

March, 2012

Kiyofumi Konishi
Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

SUMMARY

(1) Outline of Vietnam's bridge management

The Government of the Socialist Republic of Vietnam (GOV) is one of the countries which suffered the most serious damages from natural disasters among Asian countries which are hit by natural disasters frequently. Especially, in the Central region of Vietnam, heavy rains occur frequently due to the combined effects of tropical cyclone and seasonal wind, and the influence of mountains on the national border between Vietnam and Laos. In addition, the downstream areas are suffering from flooding damages from rapid swollen water because distance between coastal area and inland area, are short and rain flows quickly in rivers. Also, in the middle- and upstream areas with steed terrain, landslide of sand and stone, flash flooding and other natural disasters occur. Under these circumstances, traffic flows throughout the year can not be secured when flooding occurs around bridges and a stable access to social services can not be maintained to the inhabitants. Also, Vietnam has various modes of transport, including road, rail, waterway, and air, with road transport accounting for approximately 37% and 81% of freight and passenger traffic, respectively. Total road network length is approximately 251,787km and road density is 0.88km/m^2, which is relatively higher than that of neighboring countries.

On the other hand, although bridge investment has focused since 1975 on the rehabilitation of bridges damaged in the war, the GOV has been obliged to replace them with temporary structures due to the lack of a sufficient budget. Those temporary bridges are now suffering from insufficient capacity and cannot handle heavy vehicles, and shall be closed during flooding due to insufficient clearance. This situation has been hampering rural development in Vietnam.

In the intended central region, also, most of temporary bridges have been unimproved and this has resulted in serious impediments to residential life and economic activity in the agriculture, forestry and fishing industry, and medical services for residents.

Moreover, according to the Provincial Departments of Transport (PDOT), 58 heavily deteriorated bridges, including 16 bridges which are about to collapse, have not been improved at all.

(2) Background, history and outline of the Project

Considering this situation, the GOV settled the "National Strategy for protection against disasters until 2030" and the "National Target Program of measures for climate change". According to them, the GOV stated the construction of strong transport infrastructure against flood as one of the disaster measures in the Central region. Also, in the 9th 5-Year National Development Plan, covering the 2011 to 2016 period, further development of infrastructures including improvement of transport infrastructures is considered as one of the most important objectives in order to achieve sustainable development with high growth. The Ministry of Transport (MOT) aims to improve existing bridges by replacing them with new ones in order to develop the uncompleted road network and to ensure the stable transport of agricultural, forestry and fishery products under the target of improvement

and development of rural road network meeting the national design standard in the "Adjustments to the Transport Development Strategy up to 2020 with a Vision toward 2030" issued in 2009.

The Government of Japan (GOJ), in response to a request from the GOV, has been supporting the rural development of Vietnam by providing projects for the reconstruction of rural bridges via Japan's Grant Aid scheme, including "The Project for Reconstruction of Bridges in the Northern Area (1995-98)" and "The Project for Reconstruction of Bridges in the Mekong Delta (2001-03)".

Subsequent to the above, the GOV requested that the reconstruction of 84 high-priority bridges in the central 18 provinces of the country to be developed through Japan's Grant Aid Scheme. In response to the request, the GOJ then conducted a basic design study (the BD) for *The Project for Reconstruction of Bridges in the Central District in 2001*.

Based on the result of the BD, 45 small to medium span bridges were selected for construction and/or renewal in 18 provinces of the central region of Vietnam under Japan's Grant Aid Scheme to ensure safety and smooth flow of rural road traffic. Among the 45 bridges, 22 bridges were to be newly constructed with the Facility Construction type and 23 bridges were to be improved with the Girder Supply type. Note that the work of 23 bridges was completed in Phase 1 of the Project, and the work of 14 of the 22 bridges was completed in 2006 under Terms 1 and 2 of Phase 2.

As for the remaining 6 bridges (2 bridges were withdrawn in 2003 and in 2009) which are to be taken up in Term 3 of Phase 2, more than 10 years after the BD, 6 years after the preparatory survey No.1 (2006) and 2 years after the preparatory survey No.2 (2010) have passed. Therefore, necessity to review the implementation plan was recognized in order to ensure appropriate implementation of the Project in consideration of not only socio-economic situation in the proposed regions, but also world economic situation such as worldwide price hike of steel and oil.

(3) Outline of result of the Survey and Project Contents

Considering this situation, JICA dispatched a Survey Team to Vietnam from December 18 to December 31, 2011. The Survey Team confirmed the need for changes in Project content through a meeting with the Vietnamese side, and changes in site conditions. Based on the results of site reconnaissance, the Survey Team executed an environmental and social impact assessment and a re-estimates of the Project cost in Japan.

As a result of site reconnaissance and discussion with MOT, it was concluded that only 4 bridges in 3 provinces should be studied because it was confirmed that Da Dung Bridge and Tran Bridge in Binh Thuan Province are under construction using Vietnamese national budget. The Survey confirmed that the remaining 4 bridges should still be implemented via Japan's Grant Aid scheme, because no assistance planned for rehabilitating these bridges by other donors or the GOV was confirmed.

In regard to the design specifications of the proposed bridges including design standard and criteria, utilization of the result of the preparatory survey No.2 without any changes was basically confirmed

because no additional request from the GOV was confirmed and site conditions such as regional planning, traffic demand forecast and development of access roads still remains.

A checklist and monitoring forms for environmental and social consideration were also prepared so as to meet the requirements of JICA Guidelines for Environmental and Social Considerations (2010) and re-cost estimates of the Project cost was prepared reflecting the latest procurement conditions of materials and equipment and others, and inflation and price escalation.

As a result of the foregoing, the final specifications of the proposed improvement plan are listed in the table below as the same result of the preparatory survey 2 (2009).

Bridge Name Location : Province	Bridge Length (Span Arrangement) (m)	Clear Width (m)	Super-structure	Foundation	Live Load Level	Approach Road (m)	
						RB	LB
Tam Ngan Bridge Ninh Thuan Province	71.3(21+27+21)	5.5	PC T-girder	Spread	HL93x65%	23	187
Ea Suop Bridge Dak Lak Province	59.3(18+21+18)	7.0	Ditto	Spread	HL93x80%	125	98
Krong K'mar Bridge Dak Lak Province	71.3(21+27+21)	7.0	Ditto	RC pile	HL93x80%	126	147
Ngoi Ngan Bridge Khanh Hoa Province	49.5(2x24)	7.0	Ditto	RC pile	HL93x65%	95	93

*Note: RB: Right Bank, LB: Left Bank

(4) Implementation Schedule and Project Cost

The total cost of the Project to be borne by the Japanese Government is confidential until the contractor for construction will be verified by the Ministry of Foreign Affairs in Japan. The period of Project implementation is estimated to be about 24 months (including tendering).

Although Project Management Unit 2 (PMU2) is responsible for managing the implementation of the construction of the proposed 4 bridges, the relevant PDOT will be responsible for the operation and maintenance of all bridges after completion. Major maintenance activities are assumed to include:

(1) Routine maintenance of both bridges and approach roads
(2) Periodic overlays for the approach roads approximately every 7 years

Based on observations of actual bridge maintenance, it is expected that these activities will be carried out properly by each PDOT. In addition, it has been judged that the necessary maintenance budget for the proposed bridges can be secured, as the average maintenance cost for a new bridge in a province accounts less than 1.0 percent of the total road maintenance budget.

(5) Evaluation of the Project

The following appropriateness and effectiveness are expected with the implementation of the Project.

(A) Appropriateness

a) Beneficiaries of the Project

The beneficiaries of the Project are expected to consist of people living within the districts where the proposed bridges are located, and it is estimated that this will be 2.99 million people.

b) Emergency of the Project

Vietnam is one of the countries which suffered the most serious damages from natural disasters among Asian countries which are hit by it frequently. Especially, in the Central region of Vietnam, landslide of sand and stone, flash flooding and other natural disasters occur frequently due to meteorological and geographical reasons. Due to these natural disasters, road users are exposed to danger when using bridges and secure traffic flow throughout the year can not be secured. Also, a stable access to social services can not be maintained for the inhabitants. On the other hand, although it has focused since 1975 on the rehabilitation of bridges damaged during the war, it has been obliged to replace them with temporary structures due to the lack of a sufficient budget. Those temporary bridges are now suffering from insufficient capacity and cannot handle heavy vehicles, and shall be closed during flooding due to insufficient clearance. In the proposed central region also, most of temporary bridges have been unimproved.

Serious social loss has been recognized because high ratio of poverty in the proposed regions and foregoing situation result in major obstacles in stable access for regional residents to living and social services. Therefore, in order to reduce poverty and increase population in the region, improvement and development of roads and bridges are announced as the high-priority objectives.

Smooth and safe traffic and stable supply of daily commodity will be ensured by the improvement of bridges, replacing temporary ones with permanent bridges, which will secure and stabilize smooth traffic flow at any time during the year. At the same time, ensuring transportation system during emergency situation such as flooding will lead into sense of ease of residents and contribute to the improvement of livelihood and disparity.

c) Consistency with GOV middle and long term development plan

The GOV settled the “National Strategy for protection against disasters until 2030” and the “National Target Program of measures for climate change”. According to them, the GOV stated the construction of strong transport infrastructure against flood as one of the disaster measures in the Central region. Also, the GOV announced Comprehensive Poverty Reduction and Growth Strategy (CPRGS) in 2002 and expressed to tackle poverty reduction in order to improve the social and economic disparity among regions. Based on the GPRGS, the 9^{th} 5-years National Development Plan (2011 - 2016) was established and in consideration of achievement of sustainable development with high growth, further development of infrastructures including transport infrastructures is considered as one of the most important development objectives in the Plan.

And, MOT aims to improve existing bridges by replacing them with new ones in order to develop the uncompleted road network and to ensure the stable transport of agricultural, forestry and fishery products under the target of improvement and development of rural road network meeting the national design standard in the "Adjustments to the Transport Development Strategy up to 2020 with a Vision toward 2030" issued in 2009.

The Project's aim is to realize strong traffic infrastructures against floods, to improve the rural road network resolving traffic bottle-neck, to contribute to the improvement of living and economic activity for regional residents by ensuring stable access of agricultural, forestry and fishery productions to market, to stimulate regional economy and to reduce poverty. Therefore, implementation of the Project is consistent with the objectives of the GOV's national development plan.

d) Consistency with GOJ ODA policy

Revised country assistance policy in Vietnam by GOJ (2009) expresses the strengthening of assistance for 4 important categories including living and social development and disparity improvement in the northern mountainous area, the central mountainous area, and the Mekong Delta area defined as important areas. The Project will contribute to the development of rural infrastructures in the central region including mountainous area and improve the living and social standard, and reduce disparity. Therefore, the project has adequate consistency with GOJ's ODA policy.

(B) Effectiveness

a) Quantitative effectiveness

The following quantitative effectiveness is expected with the implementation of the Project;

Indicator	Base-line (Year 2011)	Target (Year 2016)
Reduction of closed traffic days by flood, etc.	0 to 20 days (depend on bridges)	0 day
Improvement of bridge capacity	Tam Ngan Br. & Ngoi Ngan Br.: Motorbike only	Up to 13 tons
	Ea Suop Br. & Krong K'mar Br.: Up to 18 tons	Up to 18 tons
Widening of the bridges	Tam Ngan Br.: 1.4 m	5.5 m
	Krong K'mar Br.: 4.4 m	7.0 m
	Ea Suop Br.: 4.4 m	7.0 m
	Ngoi Ngan Br.: 3.5 m	7.0 m
Reduction of bridge maintenance cost	VND 35.4 to 360 million / bridge (depend on bridges)	VND 10 million / bridge

b) Qualitative effectiveness

The following qualitative effectiveness is expected with the implementation of the Project;

- Livelihood of the intended regional residents will be improved with the construction of all-weather bridge against flood, etc.
- Improvement by permanent bridge with higher capacity and without speed reduction will contribute to the acceleration of regional economic and poverty reduction,
- Road width for two way traffic will result in time saving and reduction of traffic accident,
- Concrete permanent bridge is expected to save maintenance cost and lead into effective utilization of the budget.
- Utilization of existing Bailey bridge to another location will result in the improvement of accessibility of the location.

In consideration of the foregoing studies and surveys, it was confirmed that the Project has highly appropriateness and effectiveness. However inappropriate affection of the improvement of regional road network at some locations has been recognized because more than 10 years has passed after the BD was carried out in 2001. Therefore, an early implementation of the Project is desired.

Note that the validity of the Project was re-confirmed by this Survey in the same way as the previous studies and surveys from the viewpoint of contributing to the effectiveness of the regional road network, economic development, and the improvement of the standard of living of potential beneficiaries.

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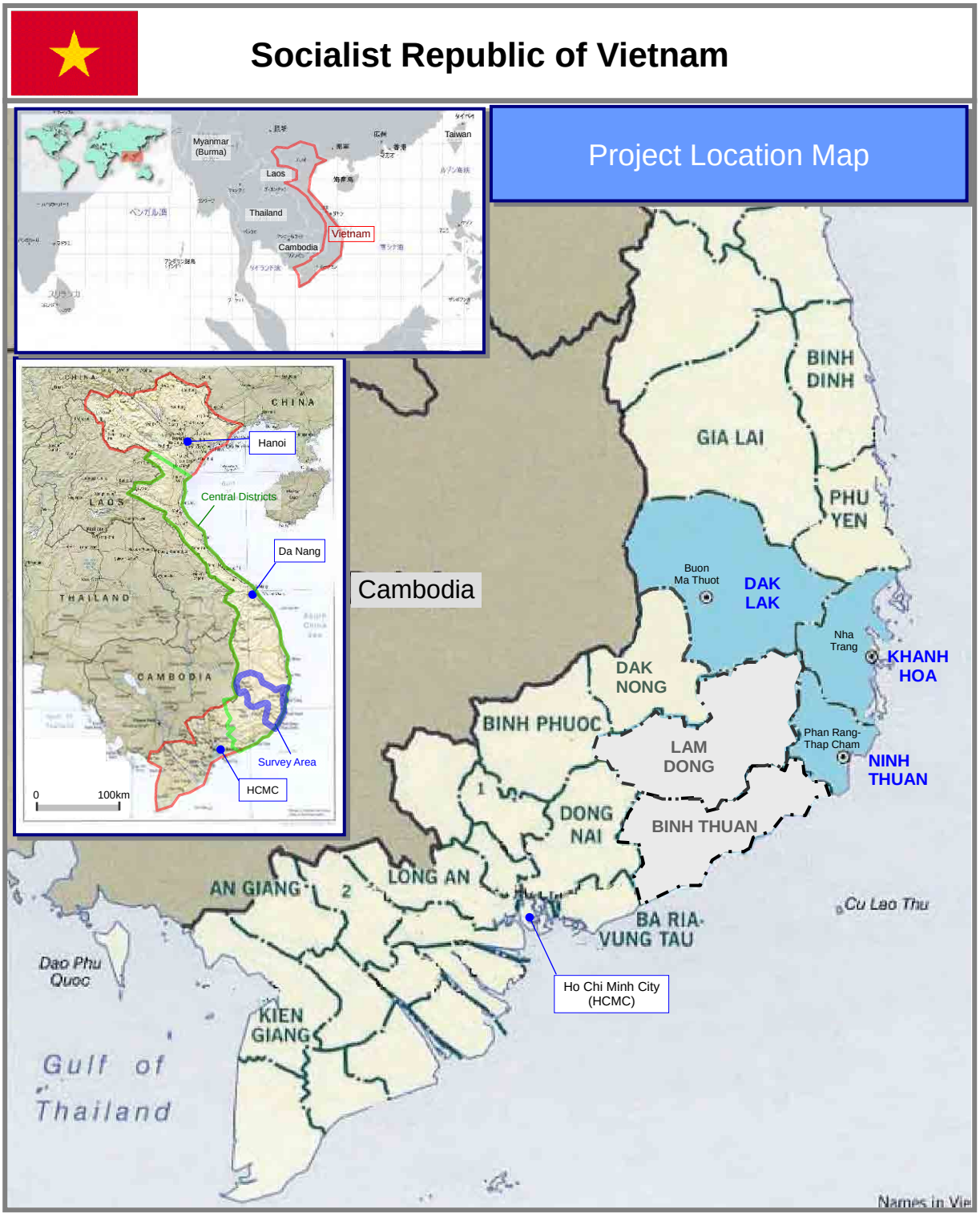

LOCATION MAP OF SURVEYED BRIDGES & PHOTOS

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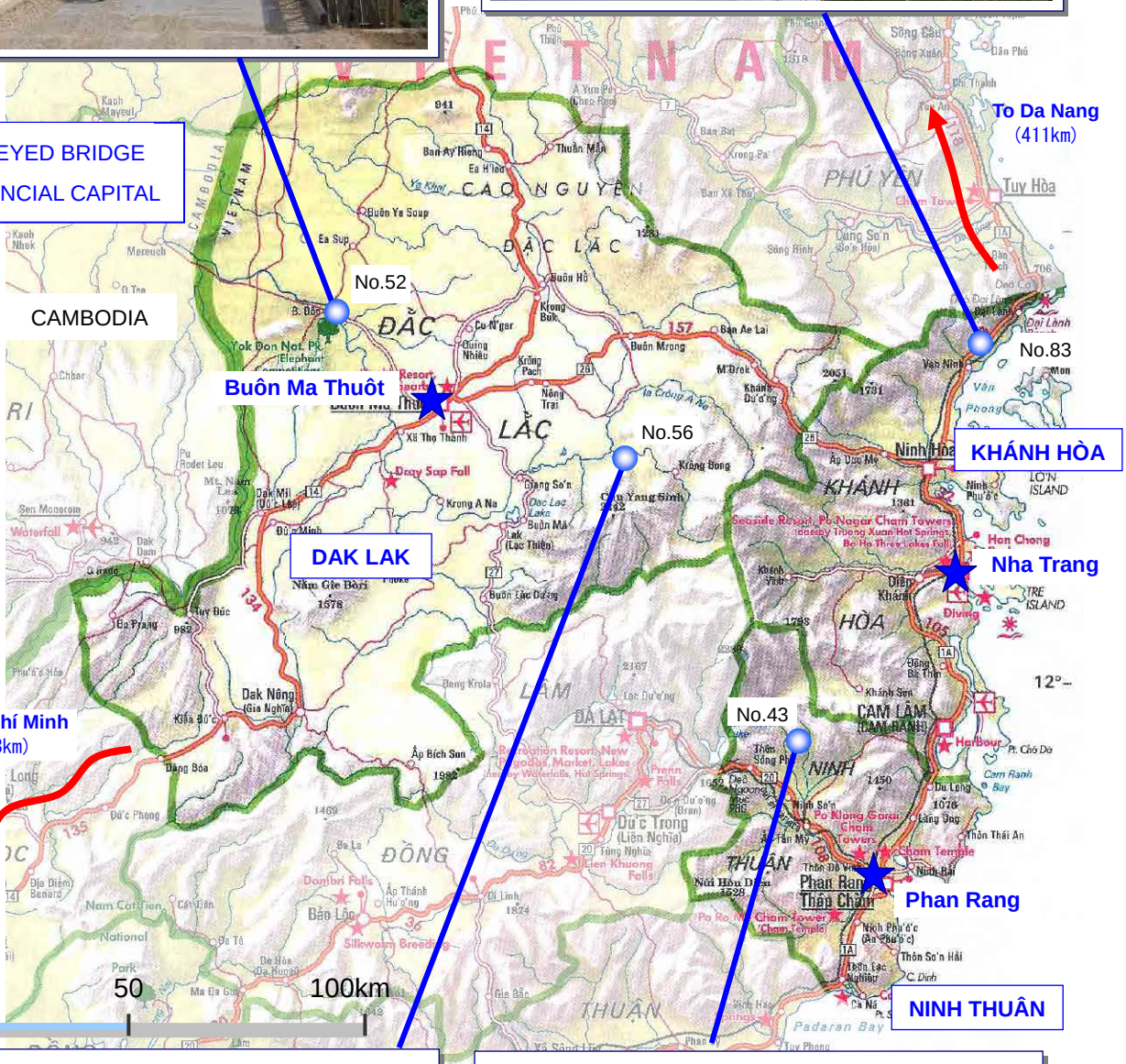
LEGEND

- SURVEYED BRIDGE
- PROVINCIAL CAPITAL



No.56 KRONG K'MAR BRIDGE

No.43 TAM NGAN BRIDGE

Perspectives (Krong K’mar Bridge)

List of Figures and Tables

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Abbreviations

AASHTO	American Association of Stage Highway and Transportation Officials
ADB	Asian Development Bank
BD	Basic Design Study
CAS	Country Assistant Strategy
CPC	Commune People's Committee
CPRGS	Comprehensive Poverty Reduction and Growth Strategy
CSP	Country Strategy and Program
DBST	Double Bituminous Surface Treatment
DD	Detailed Design
DFID	Department of International Development
DMS	Detailed Measurement Survey
DONRE	Department of Natural Resources and Environment
DPC	District People's Committee
DRVN	Directorate for Roads of Vietnam
EIA	Environmental Impact Assessment
EMP	Environmental Management Program
E/N	Exchange of Notes
EPC	Environmental Protection Commitment
FFC	Fatherland Fighting Committee
FS	Feasibility Study
G/A	Grant Agreement
GDP	Gross Domestic Product
HWL	High Water Level
IOL	Inventory of Loss
LEP	Law on Environmental Protection
LWL	Low Water Level
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
MDAP	Minorities Development Action Plan
MOT	Ministry of Transport
MONRE	Ministry of Natural Resources and Environment
MP	Master Plan
NPESD	National Plan for Environment and Sustainable Development
PBD	Plastic Board Drain
PC	Pre-stressed Concrete
PCU	Passenger Car Unit
PID	Project Implementation Division
PDOT	Provincial Department of Transport

PMU	Project Management Unit
PPC	Provincial People's Committee
ROW	Right of Way
RP	Resettlement Program
RRMU	Regional Road Maintenance Unit
SEA	Strategic Environmental Assessment
SES	Social Economic Survey
TOR	Terms of Reference
UNDP	United Nations Development Programme
VEPA	Vietnam Environment Protection Agency
WB	World Bank
WTO	World Trade Organization

CHAPTER 1

BACKGROUND OF THE PROJECT

Chapter 1 Background of the Project

1.1 Project Background

The Government of the Socialist Republic of Vietnam (hereinafter referred to as “GOV”) is one of the countries which suffered the most serious damages from natural disasters among the Asian countries which are hit by natural disasters frequently. Especially, in the Central region of Vietnam, heavy rains occur frequently due to the combined effects of tropical cyclone and seasonal wind, and the influence of mountains on the national border between Vietnam and Laos. In addition, the downstream areas are suffering from flooding damages from rapid swollen water because distance between coastal area and inland area are short, and rains flow quickly in rivers. Also, in the middle- and upstream areas with steed terrain, landslide of sand and stone, flash flooding and other natural disasters occur. Under these circumstances, traffic flow throughout the year can not be secured when flooding occurs around bridges and a stable access to social services can not be maintained to the inhabitants. On the other hand, since 1975, the GOV has been rehabilitating rural bridges that were mainly damaged by the war, with temporary bridges sometimes being used due to the lack of a sufficient budget. The temporary bridges, however, are not design to handle heavy vehicles and their lack of clearance sometimes results in the bridges being closed during the rainy season. Consequently, this situation has been hampering rural development in Vietnam.

Given the above, the Government of Japan (hereinafter referred to as “GOJ”) has been providing Grant Aid to support the improvement of those temporary bridges via the projects listed below:

- “The Project for Reconstruction of Bridges in the Northern Area (1995-98)”: Consists of 8 material procurement type bridges (steel girders supplied) and 21 facility construction type bridges.
- “The Project for Reconstruction of Bridges in the Mekong Delta Area (2001-03)”: Consists of 17 material procurement type bridges and 20 facility construction type bridges.

Followed by those two projects, in March 2001, the GOV made a request to the GOJ for Grant Aid for “the Project for Reconstruction of Bridges in the Central District (hereafter referred to as “Project”)”. The GOJ then entrusted the Japan International Cooperation Agency (hereafter referred to as “JICA”) to execute a study to examine the viability of the Project. Note that JICA is the official agency for implementing the Japanese Government’s technical assistance and expediting the proper execution of Japan's Grant Aid.

In response to the above, JICA decided to conduct a basic design study (hereafter referred to as “BD”) and dispatched a study team to Vietnam from August 2001. The study team eventually selected 45 bridges and steel girders for 23 bridges (steel girder procurement type) were supplied in Phase 1. 14 of the 22 facility construction type bridges were completed in 2006 under Term 1 and 2 of Phase 2.

As for the remaining 7 bridges (1 bridge was withdrawn in 2003) which are to be taken up in Term 3 of Phase 2, JICA conducted an Implementation Review Study in 2006 (hereafter referred to as "IR Study"), 4 years after the BD was pursued in 2001, but the IR Study was suspended. JICA then decided to carry out the Preparatory Survey (hereafter referred to as "Last Survey") in 2009. The Last Survey, however, was suspended again.

Then, JICA has decided to resume the Preparatory Survey this time for the remaining 6 bridges (1 bridge was withdrawn in 2009) in 4 provinces.

1.2 Environmental and Social Consideration

1.2.1 Environmental Impact Assessment

1.2.1.1 Outline on Environmental Social Impacts Affected by the Project Component

As the traffic volume at the vicinity of the proposed bridges has been increasing and the improvement of the connecting roads has been progressing, the importance of these bridges is becoming higher in comparison to the Last Survey and survey period. As no improvement plan for these bridges by the Vietnamese side as well as other donors has been confirmed, and in correspondence to local development plan for each province and increase of traffic volume, as well as improvement of the connecting roads to these bridges, the development of bridges to secure traffic with safety and smooth condition has been planned based on the request of the Vietnamese side. The main environmental and social impacts affected by the project component are land acquisition in relation to bridge construction and improvement of approach roads, resettlement due to land acquisition and compensation issues, livelihood recovery, preservation of community convenience and socio-economic activities.

Impacts to natural environment such as ecology, fauna and flora at river crossing points, geology and soil, water system and impacts on pollution such as air pollution, noise and vibration and water pollution are the main objective issues in order to preserve the existing environmental components.

Regarding land acquisition, resettlement, replacement and compensation of personal assets such as houses and public facilities, stakeholder meetings and compensation agreement on lost assets etc. have been made between 2005 and 2007 and compensation cost have almost all been disbursed by each Provincial Department of Transport (hereinafter referred as to "PDOT") of each province. Some stakeholders who have not yet accepted the compensation will have to as soon as the project implementation schedule will be finalized.

Temporary impacts to water system (such as water turbidity) and temporary soil erosion may be expected, but they will be limited. As for positive components to enhancement side, direct and indirect positive impacts will be considered as shown in "3-4 Project Evaluation". Economic effects and livelihood improvement along the roads including the proposed bridges will be enhanced.

1.2.1.2 Comparison with Alternatives (Include Zero Option）

(1) Tam Ngan Bridge, Ninh Thuan Province

Zero option: The existing bridge is a suspension structure used for pedestrian, but motorbikes can also pass on the bridge. The narrow deck of the bridge is made of wooden plates and it is difficult for 2 persons to walk side by side. Dangerous situation can occur due to pedestrian-induced lateral vibration. The bridge is used for local peoples of approximately 60 households allocated at both side of the Da Ninh River. The approach road to the bridge from the existing road is narrow. Vehicles (except motorbikes) can't go through the bridge. It is inconvenient for local peoples to commute between both bank areas. It creates significant restrictions on the social economic activities and on the traffic flow.

The existing bridge will be replaced by a new one with 2 lanes and the access road connecting the bridge to the existing road and the local traffic serviceability will be improved. As a result, flexibility and safety in socio-economic and livelihood conditions for the local area will be enhanced and improved. The impact on the natural environment of the new bridge construction will be negligible. The public consultation on the bridge construction project conducted by PDOT in 2006, shows that 11 stakeholder were concerned by the land acquisition and the resettlement. 7 householders have agreed on compensation to the land acquisition and the resettlement in the written document. The agreed compensation amounts were paid in 2007. The remaining stakeholders will accept the agreement and be paid their compensation amounts soon after the implementation schedule of the bridge construction will be made. The resettlements of the houses were solved for their relocation within their homestead area.

(2) Ea Suop Bridge, Dak Lak Province

Zero option: The existing bridge is a bailey bridge and this temporary bridge has been used for a long time. The deck of the bridge has been deteriorated, damaged and partially broken, so that vehicles have to drive slowly and it has become inappropriate for two-way traffic on the bridge. When a vehicle is passing on the bridge, vehicles from the opposite side have to wait at the other end of the bridge. Noise and vibration generated by vehicle passing on the bridge are significant. It also brings unsafe condition to pedestrians when they pass on the bridge. Pavement of the existing approach road to the bridge is deteriorated with uneven surface and much dusty condition. It has created not only substantial restriction to the development of socio-economic activities and transportation but also daily transport problems between both river bank sides.

The existing bridge will be replaced by a new one with 2 lanes and the access road connecting the bridge to the existing road and the local traffic serviceability will be improved. As a result, flexibility and safety in socio-economic and livelihood conditions for the local area will be enhanced and improved. The impact on the natural environment of the new bridge

construction will be negligible. PDOT conducted the public consultations for the bridge construction project in 2006. The numbers of stakeholder concerned by the land acquisition and the resettlement were 12 householders. All of the householders agreed and signed the agreement document, and all the compensation amount have been paid to each householder in 2007. A part of hut and temporary shop of 2 householders are affected, but the compensation amounts for them had been paid. Therefore, removal of the existing fences and the temporary hut will be made soon when the project construction will begin. The stakeholders have been satisfied for the compensation according to the interview survey made by the survey team in 2011, and they are looking forward to the benefits of the traffic convenience between both river banks with the new bridge construction.

(3) Krong K'mar Bridge, Dak Lak Province

Zero option: The existing bridge is a temporary structure classified as bailey bridge. The deck of the bridge has been deteriorated, damaged and partially broken, so that vehicles have to drive slowly and it has become inappropriate for two-way traffic on the bridge. When a vehicle is passing on the bridge, vehicles from the opposite side have to wait at the other end of the bridge. Noise and vibration generated by vehicle passing on the bridge are significant. It also brings unsafe condition to pedestrians when they pass on the bridge. Pavement of the existing approach road to the bridge is deteriorated with uneven surface and much dusty condition. It has created not only substantial restriction to the development of socio-economic activities and transportation but also daily transport problems between both river bank sides.

The existing bridge will be replaced by a new one with 2 lanes, and the access road connecting the bridge to the existing road and the local traffic serviceability will be improved. As a result, flexibility and safety in socio-economic and livelihood conditions for the local area will be enhanced and improved. The impact on the natural environment of the new bridge construction will be negligible. The soft ground areas are located at both crossing points. Consideration on soft ground treatment for embanked section will be made with mitigation measures such as plastic board drain method. PDOT conducted the public consultations for the bridge construction project in 2006. 13 stakeholders were concerned by the land acquisition and the resettlement. All of them agreed and signed the agreement document, and the compensation amounts have been paid to each stakeholder in 2007. The stakeholders have been satisfied with the compensation. Moreover, they have high expectations for the new bridge because dust generated on the existing approach road, deterioration of bridge deck and noise and vibration arising by vehicle passing on the existing bridge will be improved.

(4) Ngoi Ngan Bridge, Khanh Hoa Province

Zero option: The existing bridge is a wooden deck structure used for pedestrian, but motorbikes can also pass on the bridge. It is possible for 2 persons to walk side by side, but dangerous situation can occur due to pedestrian-induced lateral vibration. The bridge is mainly

used by local peoples who live or work along Provincial Road No.651C. The existing approach roads are paved with 3.0 to 3.5m in width, although the bridges near the proposed bridge have been already upgraded with 6 m and sidewalks on both sides in width. Therefore, the proposed bridge becomes a bottleneck on this route so that road users (excluding pedestrians and riders on motorbike) have to make a long distance detour. There are inconvenient for local peoples to commute between both bank areas. It creates significant restrictions on the social economic activities and on the traffic flow.

The existing bridge will be replaced by a new one with 2 lanes, and the access road connecting the bridge to the existing road and the local traffic serviceability will be improved. As a result, flexibility and safety in socio-economic and livelihood conditions for the local area will be enhanced and improved. The impact on the natural environment of the new bridge construction will be negligible. PDOT conducted the public consultations for the bridge construction project in 2005. 19 stakeholders were concerned by the land acquisition and the resettlement, and all of them agreed and signed the agreement document. All the compensation amounts have been paid to each stakeholder in 2006. The stakeholders have been satisfied with the compensation because an educational assistance subsidy for children and other livelihood recovery has been given to a householder. They also have high expectation for the new bridge construction because the bottleneck will be solved.

1.2.1.3 Scoping

Based on the site survey result, scoping matrix (Road and bridge) on the environmental impact survey has been made as shown in Table 1.2.1.

1.2.1.4 TOR for Environmental Social Consideration Study

The project had almost finalized compensation and assistance in relation to land acquisition and resettlement in 2007. Prior to the start of the construction, environmental management plan (EMP) and environmental monitoring plan shall be prepared. The project implementation body will request to the contractor to submit EMP and monitoring plan.

(1) Preparation of environmental management plan (EMP) and carry out the EMP

Environmental management items are soil erosion, air pollution, water pollution, waste, noise and vibration, and accidents which prevent or minimize the pollution and impacts during the construction. Environmental management will be conducted in accordance with the mitigation measures described in the environmental management plan (EMP).

(2) Preparation of environmental monitoring plan and carry out the plan

Environmental monitoring items are soil erosion, air pollution, water pollution, waste, noise and vibration, and accidents which prevent or minimize the pollution and impacts during the construction. Environmental monitoring will be conducted in accordance with the mitigation measures described in the environmental monitoring plan.

Table 1.2.1 Environmental Impact Scoping Matrix (Road and Bridge)

Name of Cooperation Project																	
				Planning Phase		Construction Phase							Operation Phase				
	No.	Likely Impacts	Overall Rating	Land acquisition	Change of Land use plan, Control of various activities by regulations for the construction	Reclamation of Wetland, etc.	Deforestation	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of Construction Equipment and Vehicles	Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities	Traffic Restriction in construction area	Increase of Through Traffic	Appearance/ Occupancy of Roads and related building structures	Increasing influx of settlers			
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of SocialEnvironment.	1	Involuntary Resettlement															
	2	Local economy such as employment and livelihood, etc.															
	3	Land use and utilization of local resources															
	4	Social institutions such as social infrastructure and local decision-making institutions															
	5	Existing social infrastructures and services															
	6	The poor, indigenous and ethnic people															
	7	Misdistribution of benefit and damage															
	8	Cultural heritage															
	9	Local conflict of interests															
	10	Water Usage or Water Rights and Rights of Common															
	11	Sanitation															
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS															
Natural Environment	13	Topography and Geographical features															
	14	Soil Erosion	B							B							
	15	Groundwater															
	16	Hydrological Situation															
	17	Coastal Zone															
	18	Flora, Fauna and Biodiversity															
	19	Meteorology															
	20	Landscape															
	21	Global Warming															
Pollution	22	Air Pollution	B						B	B							
	23	Water Pollution	B					B									
	24	Soil Contamination															
	25	Waste	B							B							
	26	Noise and Vibration	B						B	B							
	27	Ground Subsidence															
	28	Offensive Odor															
	29	Bottom sediment															
	30	Accidents	B						B								

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.) No Mark: No impact is expected.

Reference: Japan International Cooperation Agency "III Roads Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.

1.2.1.5 Results of Environmental Social Consideration Study (Predictive Results included)

According to the MOT policy, EIA won't be conducted for the project by the Vietnamese side when

the bridges will be constructed with the Japan's Grant Aid. Therefore, EIA report has not been prepared by the Vietnamese side. For the above reason, EIA report has not been approved by the Vietnamese side. However, the resettlement and land acquisition procedures for the proposed bridge sites have been mostly carried out and successfully achieved.

1.2.1.6 Environmental Impact Assessment

Since environmental impacts are quite limited as the scale of bridge reconstruction are small, the concerned stakeholders agreed and received compensation for resettlement and land acquisition during the 2005 to 2007 period after the stakeholder meetings and its agreement. The remaining stakeholders will accept the agreement and will receive their compensation amounts soon after the implementation schedule of the bridge construction will be made.

According to the Decision 29/2011/ND-CP regarding the environmental protection, the Directorate for Roads in Vietnam (hereinafter referred as to "DRVN") has to make an agreement with the related District People's Committees (hereinafter referred as to "DPC"). Project Management Unit No.2 (hereinafter referred as to "PMU2") was assigned to make an agreement with each DPC on environmental protection issues for this bridge project in accordance with JICA environmental checklist and monitoring form.

1.2.1.7 Mitigation Measures and Cost for Conducting the Mitigation Measures

Items for mitigation measures applied are soil erosion, air pollution, water pollution, waste, noise and vibration, and accidents which prevent or minimize the pollution and impacts during the construction. All of the costs for mitigation measures are included within the project cost.

1.2.1.8 Environmental Management Plan and Monitoring Plan (Implementation Organization, Method, Cost and etc.)

The contractor will implement the environmental management plan (EMP) based on items shown prior in the plan as mentioned in "1.2.1.4 TOR for Environmental Social Consideration Study". The project implementation body will periodically conduct the monitoring as per the described items in the EMP and supervise the works of the mitigation measures presented in the EMP. The costs for the monitoring are included in the supervision amount for the construction.

1.2.2 Land Acquisition and Resettlement

1.2.2.1 Necessity of Land Acquisition and Resettlement (Alternative Consideration)

The necessity of land acquisition and resettlement for the project had been studied during the 2005 to 2007 period. A series of meetings with stakeholders were held during that period and the route alignment with the least negative impacts had been agreed, and most of the land acquisition and resettlement had been compensated.

1.2.2.2 Stakeholder Meeting

Stakeholder meetings on the land acquisition and resettlement for the project sites of the proposed bridges had been carried out during the 2005 to 2007 period. Regarding compensation of the land acquisition and resettlement, the compensation amounts had mostly been agreed and already disbursed. The detail on these items is referred in the follows.

(1) Tam Ngan Bridge, Ninh Thuan Province

PDOT conducted the public consultations on the bridge construction project in 2006, and 11 household were concerned by the land acquisition and resettlement. 7 households agreed on the compensation for the land acquisition and resettlement and signed on the agreement document. They accepted the compensation amounts, and were paid in 2007. The remaining householders will accept the agreement and will be paid the compensation amounts soon after the implementation schedule of the bridge construction will be made. On the other hand, the resettlements of the houses were solved for their relocation within their homestead area. Among 3 organizations which required land acquisition, 2 organizations including the electric power supply company have agreed and received compensation. The remaining organization is a church, and vacant backyard of church is partially affected. An agreement will be made soon after the implementation schedule of the bridge construction will be fixed.

Based on the interview survey from the affected peoples, they have been satisfied on compensation for the land acquisition and resettlement issues. Also, they are looking forward for the new bridge construction and the traffic convenience between the both river sides for a long time. The inhabited K'ho minority group has been receiving assistance in the construction of a low cost house with block mortar structure by the governmental policy, in particular, for a poor class.

(2) Ea Suop Bridge, Dak Lak Province

PDOT conducted the public consultations on the bridge construction project in 2006, 12 stakehold were concerned by the land acquisition and resettlement. All the householders agreed and signed the agreement document for the land acquisition and resettlement, and all of the compensation amounts have been paid to the stakeholders in 2007. A part of hut and temporary shop of 2 householders are affected, but the compensation amounts for them had been paid. Therefore, removal of the existing fences and the temporary hut will be made soon after the start of the project construction.

The stakeholders have been satisfied with the compensation according to the interview survey by the survey team in 2011, and they are looking forward to the traffic convenience between both river sides with the new bridge construction. They also have high expectation for the new bridge because dust generating on the existing approach road, deterioration of bridge deck and noise and vibration arising by vehicle passing on the existing bridge will be improved.

(3) Krong K'mar Bridge, Dak Lak Province

PDOT conducted the public consultations on the bridge construction project in 2006, 13 stakeholders in relation to the land acquisition and resettlement. All the householders agreed and signed the agreement document for the land acquisition and resettlement, and all of the compensation amounts have been paid to the stakeholders in 2007. The resettlement of 3 householders among them had been required and had been finished.

The stakeholders have been satisfied for the compensation according to the interview survey made by the survey team, and they are looking forward to the traffic convenience between both river sides with the new bridge construction. They also have high expectation for the new bridge because dust generating on the existing approach road, deterioration of bridge deck and noise and vibration arising by vehicle passing on the existing bridge will be improved.

(4) Ngoi Ngan Bridge, Khanh Hoa Province

PDOT conducted the public consultations on the bridge construction project in 2005, 19 stakeholder were concerned by the land acquisition and resettlement. The resettled households are 2 families among all of the stakeholders. All the stakeholders agreed and signed the agreement document for the land acquisition and resettlement, and all of the compensation amounts have been paid to the stakeholders in 2006. The resettlement of one householder among them had been required and had been finished. For the other householder, a temporary house had been partially affected. However, as relocation within their homestead is possible, their resettlement will be carried out when the project will start construction. Also, their garden fence and temporary hut will be removed.

The stakeholders have been satisfied for the compensation according to the interview survey made by the survey team, and they are looking forward to the traffic convenience between both river sides with the new bridge construction. They also have high expectation for the new bridge because the traffic ban for vehicle excluding motorbikes will be lifted and traffic convenience will be increased between both river sides after the construction of the new bridge. Also, dust generating on the existing approach road, deterioration of the wooden bridge deck and noise and vibration arising by vehicle passing on the existing bridge will be improved. Moreover, the new bridge will be constructed apart from the residential area, and noise and vibration level will be less than the existing wooden bridge. Therefore, there is no objection excluding dust on existing road. Beside the compensation for the land acquisition and resettlement, an educational assistance subsidy for children as one of livelihood recovery measures has been given to a householder.

1.2.2.3 Monitoring System and Monitoring Form conducted by the Project Implementation Body

As for the monitoring system by the project implementation body, District DONRE supervises the

monitoring activities conducted by PDOT in corporate with the same provincial DONRE. The draft monitoring form to be applied for the project is shown in Appendix 6.1.

1.2.3 Others

Relevant information and data are attached in appendix.

1.2.3.1 Draft Monitoring Form

Draft monitoring form for this project is attached in Appendix 6.1.

1.2.3.2 Environmental Checklist

Appendix 6.2 shows the environmental checklist for this bridge project.

1.2.3.3 Others

Relevant information and data regarding environment are attached in Appendix 6.5.

CHAPTER 2

CONTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2.1 Basic Concept of the Project

2.1.1 Overall Goal and Objectives

The Government of the Socialist Republic of Vietnam (GOV) settled the “National Strategy for protection against disasters until 2030” and the “National Target Program of measures for climate change”. According to them, the GOV stated the construction of strong transport infrastructure against flooding as one of the disaster measures in the Central region. On the other hand, in the ninth 5-Year National Development Plan, covering the 2011 to 2015 period, the GOV evaluates further development of infrastructures including transport sector is the most important objectives in order to achieve sustainable development with a high growth. Also, The Ministry of Transport (MOT) aims to improve existing bridges and built new construction in order to develop the uncompleted road network and to ensure the stable transport of agricultural, forestry and fishery products under the target of improvement and development of rural road network meeting the national design standard in the “Adjustments to the Transport Development Strategy up to 2020 with a Vision toward 2030” approved by the Prime Minister on March 2009. This project is an integral part of the realization of a strong traffic infrastructures against flooding, and of the improvement of rural road network in accordance with the aims of the MOT.

Based on the above policies and objectives involved, the GOV has identified the reconstruction of high-priority bridges in the central area of the country to be developed through Japan’s Grant Aid Scheme. Accordingly, the Project defines its overall goal as “improving the standard of living of rural inhabitants in the central area and narrowing the disparity in poverty levels between urban and rural areas”, with the Project purpose being the “reconstruction of all-weather bridges that will continuously provide safe and smooth passage and secure an evacuation route in a disaster such as flooding for road traffic throughout a year”.

2.1.2 Proposed Bridges

In order to achieve the objectives of the Project, the narrow existing temporary bridges in the central part of Vietnam, with are frequently subjected to closures due to incidences of numerous flooding, will be replaced with permanent bridges of more than 5.5m wide, higher live loads and passable even with the past flood levels. Similarly, the Project will be implemented through Japan’s Grant Aid Scheme with a Japanese national as the prime contractor.

This Preparatory Survey (hereafter referred to as “Survey”) has executed a review of the Preparatory Survey in 2009 (the Last Survey) and reflect the results of the site survey for the proposed bridges together with re-estimating Project cost. The condition of the existing bridges and the results of the Last Survey are shown in Table 2.1.1.

Table 2.1.1 Condition of Existing Bridges & Last Survey Results

Bridge Name	Province	Existing Condition		Last Survey Results	
		Br. L (Span)	Width	Br. L (Span)	Width
Da Dung Bridge	Binh Thuan	73.0 (13+3x20)	4.4	92.3 (3x30)	9.0
Tran Bridge	Binh Thuan	21.0 (12+9)	3.4	65.3 (3x21)	5.5
Tam Ngan Bridge	Ninh Thuan	60.0 (60.0)	1.4	71.3 (21+27+21)	5.5
Ea Suop Bridge	Dak Lak	46.0 (3x15.3)	4.4	59.3 (18+21+18)	7.0
Krong K'mar Bridge	Dak Lak	66.0 (3x22))	4.4	71.3 (21+27+21)	7.0
Ngoi Ngan Bridge	Khanh Hoa	47.0 (8x6.0)	3.5	49.5 (2x24)	7.0

2.2 Basic Design of the Japanese Assistance

2.2.1 Design Policy

(1) Basic Concept

The basic concept, which is based on site investigation results, as well as discussions with the GOV, is as follows:

- Among the 6 bridges shown in Table 2.1.1, it is confirmed that for 2 bridges, the Da Dung Bridge and the Trang Bridge located in Binh Thuan Province, new bridges are currently been constructed and financed by the budget of Binh Thuan Province. After discussions with the MOT, these 2 bridges were withdrawn from the Project. Therefore, the scope of the Project becomes 4 bridges in 3 provinces.

- These 4 bridges were confirmed as part of the implementation program of Japan's Grant Aid Scheme, because their importance has increased due to the improvement in access roads and because there is no improvement plan for the proposed bridges by other donors or the GOV.

- As the results of the site survey, there are no large changes compared with the Last Survey. Therefore, the results of the Last Survey will be used for the Survey. On the other hand, the request for revisions from the Vietnamese Side of the Last Survey results will be included in the Survey if those are confirmed as appropriate from technical viewpoint considerations and the Japan's Grant Aid Scheme viewpoint.

(2) Natural Condition Policy

The central area of Vietnam often experiences damage from flooding due to heavy rainfall. Accordingly, appropriate bridge length and clearance should be set to secure sufficient capacity of water discharges during flood occurrence.

The design high water level (HWL) was established based on interviews with inhabitants living in nearby areas due to the absence of records about the level of water discharge during flood occurrence. The maximum HWL was also estimated based on previous rainfall data to

confirm the results of the interviews. Relative thereto, the Survey confirmed that no severe flooding after completion of the BD in 2002 and for this reason, the design HWL in the BD will be adopted for the detailed design.

As protection against scouring during flood occurrence, embankment slopes and adjacent abutments will be provided with riprap or gabion. Piers that are located in areas of swift current will also be provided with boulders or gabion mattress. Protection work however will not be provided in areas of shallow bedrock in accordance with geotechnical survey result.

The Survey area is mainly covered with metamorphic rock, igneous rock, or sedimentary rock, with the lower plain near the sea being covered with alluvial sedimentary rock. The bearing strata at the proposed bridge sites are located 3-22m deep near abutments, and 0-17m deep around piers, consisting of gravel or the rock layers just mentioned. Note basically that a spread foundation is applied at places where there is a shallow bearing stratum and a pile foundation at places where there is a deep bearing stratum.

Countermeasures against soft ground will be planned for the high embankment adjacent to the abutment at Krong K'mar Bridge, as the embankment will cause either consolidation settlement or sliding failure of the existing ground.

As for earthquakes, as no severe earthquake has been recorded in the southern area of the Indochina Peninsula, only minimum effects will be considered in the design of the bridge structures.

(3) Social Policy

Based on the ROW which was prepared in 2006 on the basis of the results in the IR Study, most of the related stakeholders had agreed and received compensation for the resettlement and land acquisition. The remaining stakeholders are going to make agreement and remove or relocate before the implementation of the bridge construction. Since GOV had many experiences of implementation for other reconstruction projects in rural area and well understood the importance of the land acquisition and resettlement, they will complete the remaining land acquisition and resettlement on time. However, it is necessary to monitor their activities.

On the other hand, the survey areas have been developing, and the site investigations of the Survey found that there are some changes which did not exist in the Last Survey such as new connecting roads, new houses along the existing approach road and new connecting road and etc. surrounding the proposed bridges because 6 and 2 years have already past from the IR Study and the Last Survey, respectively. Therefore, to enhance the convenience and compensate the existing functions for the affected inhabitants, new access roads to connect with new approach roads of bridges should be provided with embankment because the elevation of new approach road rises by an increase in bridge elevation. Furthermore, drainage

facilities should be provided along new approach roads at the toes of embankment slopes in order to catch water from the roads.

(4) Construction Policy in Vietnam

It is necessary for Project implementation to obtain approval from the GOV, but since this has already been achieved in the BD stage, it is no longer required. New design standards and specifications were applied for the detailed design of the Survey.

The capacity of local contractors has improved regarding bridge construction due to their experience with donor-funded projects or projects funded by the GOV. As a result, it has been determined that they are capable of constructing small- to medium-sized bridges with little problem. However, the survey team of the Last Survey visited bridges which were constructed in Phase 1 and found that there was still a problem with quality control, such as the smoothness of the bridge's road surface and the linkage of mortal paste on girders when slab concrete is placed. Accordingly, Japanese engineers dispatched on site for this Project will train the engineers of the local sub-contractor in quality control throughout the construction.

Construction equipment and materials for the Project should be procured from the domestic market as much as possible. Careful attention should be given to the use of oil products and reinforcement materials, which have experienced drastic price hikes in recent years, as this will have a significant impact on Project cost.

(5) Local Contractor Policy

The Japanese contractor who has worked in Terms 1 and 2 of the Phase 2 had actively utilized local contractors, and this practice should continue in Term 3. The Japanese contractor is expected to transfer skills and knowledge in construction site quality control and safety management.

(6) Operation & Maintenance Policy

Project Management Unit No.2 (PMU2) under the Directorate for Roads of Vietnam (DRVN) will be the implementing agency of the Project for the tendering and construction stages. After the completion of construction, the facilities will be turn over to the relevant Provincial Department of Transport (PDOT) for operation and maintenance.

The basic procedure for road and bridge maintenance by PDOTs consists of periodic inspection of relevant roads and bridges, providing annual maintenance plans based on the inspection results, and submitting a maintenance budget plan to the provincial government. After funds are allocated, the PDOTs will contract the works to specialized semi-public firms for maintenance works. Information collected shows that there are about one or two semi-public road maintenance companies in each province.

The Team has deemed the PDOTs capable of maintaining the system of roads and structures

for the proposed bridges, given that the maintenance system at the provincial level has been standardized with support from foreign donors and that maintenance work itself does not required a high level of skill. However, it is necessary for the Japanese side to monitor the performance of the maintenance activities of the PDOTs and to institute the importance of maintenance works considering that the GOV has been struggling for many years for the needs of proper road and bridge maintenance.

(7) Facility Grade Setting Policy

The Project will involve the construction of 4 bridges and its approach roads with the needed associated facilities.

Although the grade of these facilities will basically be the same as those determined in the IR Study and the Last Survey shown hereunder, other requests from the GOV through the Last Survey and the Survey will be incorporated into the Project scope if the request is determined to be appropriate from both a technical and Japan Grant Aid Scheme viewpoint.

- Design Standard: Vietnamese Design Standards and Specifications
- Live Load: HL93x65% (equivalent to H-13) or HL93x80% (equivalent to H-18)
- Bridge Clearance Width: 5.5m or 7.0m
- Road Class: Class IV or V

(8) Construction Methodology & Scheduling Policy

A review will be undertaken of both the bridge erection method and construction yard in the IR Study. The former will be examined on the basis of experience in Terms 1 and 2 of the Project. As for the latter item, all bridges can be utilized as planned in the IR Study, and it has been confirmed with the Vietnamese side that land acquisition has almost completed without hindrance.

Careful attention will be given to the natural conditions, work items and movement of equipment on site for the preparation of an appropriate construction schedule. Firstly, the duration of the rainy season and rainfall intensity should be considered, because the rainy season in the Project area, which is mountainous, is slightly different from that of the costal area. Although the rainy season in both areas continues from May to November, the rain in the mountain side of the Project area is heavier. Secondly, some items of work for the substructure, embankment and soft ground treatment can only be undertaken during the dry season. Finally, the efficient movement of equipment and machineries from site to site for girder fabrication and erection works should be carefully considered, as the Project bridges are located over a wide area and the amount of equipment procured has a significant impact on Project cost.

2.2.2 Basic Plan

2.2.2.1 Request to Change in Grade of Proposed Bridges

Several requests to change the grade of the proposed bridges were made from the GOV through MOT, PMU2, and the PDOTs of Ninh Thuan, Dak Lak and Khanh Hoa, based on the result of the joint site investigations of the Last Survey and the Survey. The major modifications requested are summarized as follows:

[The Last Survey]

- Widening of width for 2 bridges (Tam Ngan Bridge and Ngoi Ngan Bridge)
- Application of higher live load for all bridges

[The Survey]

- Application of higher live load for 3 bridges (Tam Ngan Bridge, Ea Suop Bridge and Krong K'mar Bridge)

It was agreed to cancel the requests in the Survey after discussions with the Vietnamese side as shown in Appendix 5.2: Technical Memorandum in the Preparatory Survey 2011.

Therefore, the followings are described for the proposed 4 bridges based on the results of the Last Survey regarding to the requests in the Last Survey.

2.2.2.2 Response to Request for Widening of Proposed Bridges

(1) Background of Bridge Widening Request

The background of the request for bridge widening for 2 of the 4 bridges is described as follows:

1) Tam Ngan Bridge (Ninh Thuan Province)

Ninh Thuan Province requested the widening of the bridge width to 7.0m from 5.5m which was set in the IR Study. The reasons therefore are:

- This bridge will connect with Lam Son – Phuoc Hoa route which has been upgrading to Class III so far.

2) Ngoi Ngan Bridge (Khanh Hoa Province)

Khanh Hoa Province requested the widening of the bridge width to 7.0m from 5.5m which was set in the IR Study. The reasons therefore are:

- This bridge is located along the Class III Nguyen Hue route (Provincial Road No.651C) used as transportation of passengers for Van Thang-Van Khanh-Van Phuoc communes connecting to Van Ninh District administration center and Van Phong Gulf economic zone. There is a development plan for Van Phong economic zone with 2020 as the target

year in support to Khanh Hoa province economic development.

- Nguyen Hue route is under upgrading. Some section (centre of Van Ninh District) has already been upgraded with 12.0m width. And its upgrading budget has already been secured at 150,635 million VND for 2006-2010 and 2010-2015 respectively.
- The bridge is already dilapidated and in danger of collapse. Motor vehicles are not allowed to use the bridge but motorbikes, bicycles and pedestrians are still using the bridge.

(2) Concept of Bridge Width of 5.5m in BD Stage

Bridge width of 5.5m for both provincial and district roads has been adopted in past bridge reconstruction projects (e.g., the Project for Reconstruction of Bridges in both Northern districts and Mekong Delta Area of Vietnam). In a few cases, a width of 7.0 m was adopted for bridges in town centers. The original bridge width of 5.5m consists of a one-lane carriageway of 3.5 m plus a 1.0 m shoulder on both side of the bridge for bicycles or pedestrians allowing the slow passage of a sedan along a heavy truck stopping at the bridge.

(3) Criteria to Determine Widening of Bridge Width

Table 2.2.1 shows the criteria to determine the necessity for widening of bridge width from 5.5m, which was adopted in the IR Study.

Table 2.2.1 Criteria to Determine the Necessity for Widening of Bridge Width

Criteria	Contents
① Existing Traffic Volume	300 PCU is the threshold for 2-lane operation according to the Vietnamese Standard
② Access Road Class & Existing Condition	- Provincial or District road? - How wide are other bridges for the same road? - Is there any plan (including budget) for upgrading the road?
③ Bridge Location	- Are many users using the bridge because it is located in the vicinity of populated areas such as a district centers?
④ With or Without Request to Widen from the Vietnamese side.	- Is there a request to widen the bridge from the Central Government through the Last Survey?

(4) Discussion & Conclusions

Table 2.2.2 shows the evaluation results for bridges based on the criteria in Table 2.2.1.

Tam Ngan Bridge (Ninh Thuan Province)

The new bridge will be constructed with 5.5m width (same as in the IR Study) from the following reasons:

- There is no upgrading plan on existing road.

- Lam Son-Phuoc Hoa Route which is under construction can be connected to NH27 in only 3.7 km upstream side. Therefore, there is not enough ground to construct in 2 lane road.

Ea Suop Bridge (Dak Lak Province)

The new bridge will be constructed with 7.0 m width (same as in the IR Study) for the following reasons:

- Traffic volume justifies 2-lane operation.
- The bridge is located on Provincial Road No.1 (PR1) and has an important role in the road network of the province. Access roads to the bridge had already been paved with 6m width.

Krong K'mar Bridge (Dak Lak Province)

The new bridge will be constructed with 7.0m width (same as in the IR Study) for the following reasons:

- Traffic volume justifies 2-lane operation.
- The bridge is located on Provincial Road No.12 (PR12) and has an important role in the road network of the province. Access roads to the bridge had already been paved with 6.0 m width on the right bank side and 10 m width on the left bank side.

Ngoi Ngan Bridge (Khanh Hoa Province)

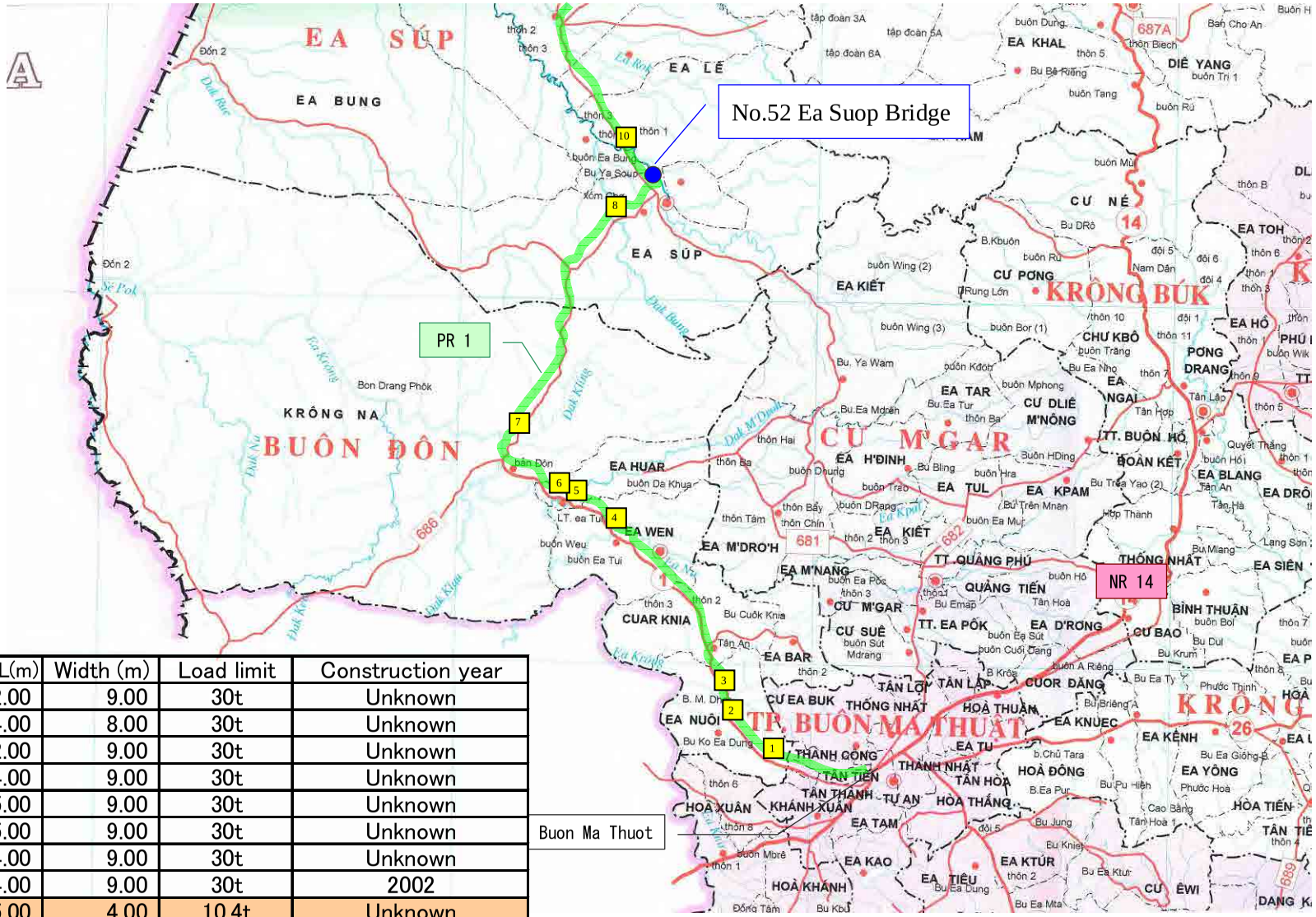
The new bridge will be constructed of 7.0m width based on the following reasons:

- The bridge is located on Provincial Road No.651C (PR651C; Nguyen Hue route).
- PR651C is under upgrading. Some sections (from the centre of Van Ninh District) have already been upgraded to 12.0 m width. Funding has already been secured at 150,635 million VND for 2006-2010 and 2010-2015, respectively.
- A large number of bicycles and motorbikes are using the bridge because it is only way to transport passengers from Van Thang-Van Khanh-Van Phuoc communes to Van Ninh District administration center and Van Phong Gulf economic zone.
- The other two bridges on the same route have already been constructed with 6.0m plus walkway on both sides (see Figure 2.2.1 (3)).

Table 2.2.2 Evaluation Results of Bridge Widening

Bridge Name (Bridge Length) Province	Road Name	① Traffic Volume ＞300 PCU[1]		② Existing Road Conditions/ Road Class		③ Bridge Location (Near populated area?)		Bridge Width			
								Implementation Review Study (2006)	④ Width Request (by PDOT)		Evaluation in the Last Survey
Tan Ngan Bri. (65.3m) Ninh Thuan Pro.	District Road	600＞ 300PCU	○	• This road will connect with Lam Son – Phuoc Hoa route which has been upgraded to Class III road • This is the access road leading to the ethnic minority village on the left side bank • **Access road connecting to NH27 on the right bank side is 3m width. No plan for upgrading**	×	15km from district center of Tan Son	×	**5.5m**	**8.0m**	○	**5.5m**
Ea Suop Bri. (59.3m) Dak Lak Pro.	Provincial Road No.1	1287＞ 300PCU	○	• **Road and other bridges on the same route were constructed with 7.0m width or more**	○	Outer edge of district center of Ea Sup	○	**7.0m**	**7.0m**	○	**7.0m**
Krong K'mar Bri. (71.3m) Dak Lak Pro.	Provincial Road No.12	2033＞ 300PCU	○	• **A 6m wide road was constructed** • **5 out of 8 bridges on the same route were constructed with 7m width after 2000**	○	Outer edge of district center Krong K'mar	○	**7.0m**	**7.0m**	○	**7.0m**
Ngoi Ngan Bri. (49.55m) Khanh Hoa Pro.	Provincial Road No.651C Nguyen Hue Route	1227＞ 300PCU	○	• **This road was upgraded to Class III in 2001** • **This road was designated in the 2020 Van Phong Industrial Zone provincial master plan** • **Although the width of the existing road is 3-3.5m, upgrading budget has already been secured at 150,635 milli. VND for 2006-2010 and 2010-2015 respectively. Moreover, some section (centre of Van Ninh District) has already been upgraded to 12.0m width** • **2 bridges on the same road were constructed with more than 6m plus walkways on both sides after 2000.**	○	10km from district center of van Ninh Van Phong Industrial Zone	○	**5.5m**	**9.0m (1+3.5+3.5+1)**	○	**7.0m**

[1] Passenger Car Unit (PCU) value for a bus, truck and motorbike is 3.0, 2.0 and 0.3, respectively, and is calculated based on the passenger car serving as the base mode with a PCU value equivalent to one.



Bridges on PR1

Br.No	Bridge L(m)	Width (m)	Load limit	Construction year
1	12.00	9.00	30t	Unknown
2	24.00	8.00	30t	Unknown
3	12.00	9.00	30t	Unknown
4	24.00	9.00	30t	Unknown
5	15.00	9.00	30t	Unknown
6	15.00	9.00	30t	Unknown
7	24.00	9.00	30t	Unknown
8	24.00	9.00	30t	2002
9	45.00	4.00	10.4t	Unknown
10	12.00	8.00	30t	Unknown

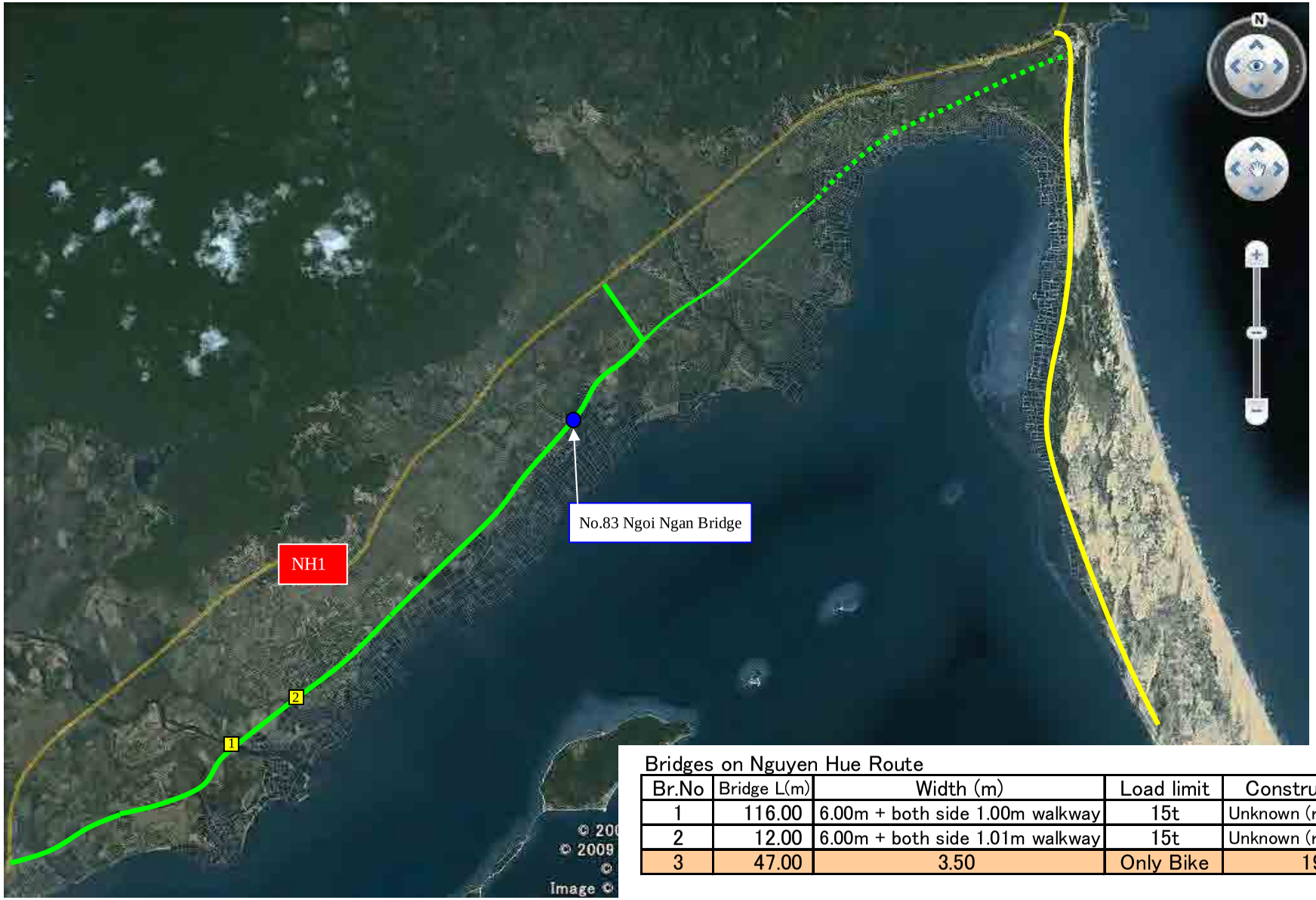
Figure 2.2.1 (1) Existing Conditions of Other Bridges

Bridges on PR12

Br.No	Bridge L(m)	Width (m)	Load limit	Construction year
1	15+5x2	7.00	30t	2001
2	15+5x2	7.00	30t	2000
3	15+5x2	7.00	30t	2000
4	22x3	4.00	13t	1990
5	22.00	7.50	30t	2009
6	13.00	4.00	20t?	1992
7	12.00	4.00	20t?	1984
8	95.00	7.50	30t	2009
9	12.00	4.00	20t?	1993

Figure 2.2.1 (2) Existing Conditions of Other Bridges

Khnah Hoa Province **Ngoi Ngan Bridge**



Bridges on Nguyen Hue Route

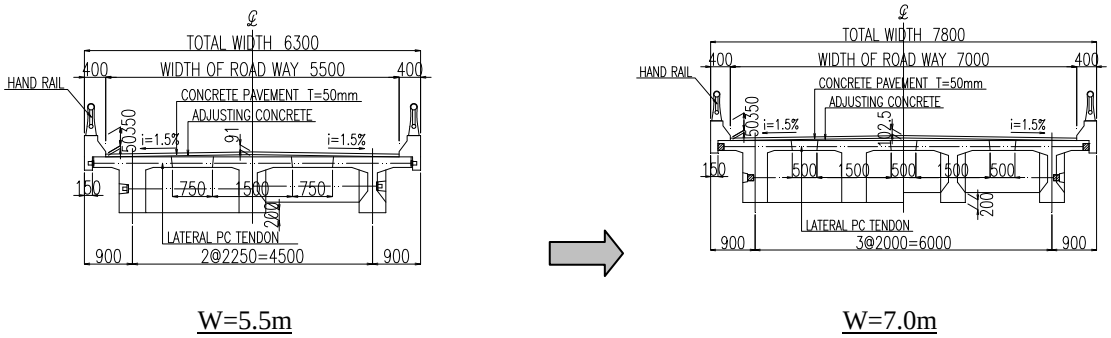
Br.No	Bridge L(m)	Width (m)	Load limit	Construction year
1	116.00	6.00m + both side 1.00m walkway	15t	Unknown (relatively new)
2	12.00	6.00m + both side 1.01m walkway	15t	Unknown (relatively new)
3	47.00	3.50	Only Bike	1960s

Figure 2.2.1 (3) Existing Conditions of Other Bridges

(5) Widening of Bridge Width

The application for bridge widening is conceived as follows:

- 7.0m width : 6.0m (carriageway 3.0m x 2 lanes) + 0.5m shoulder (considering pedestrian refuge space) on both sides (see Figure 2.2.2).



W=5.5m W=7.0m

Figure 2.2.2 Widening of Bridge (Ngoi Ngan Bridge)

2.2.2.3 Response to Request for Higher Live Load for Bridge Design

(1) Background of Request

All provinces requested for a meeting with the survey team in the Last Survey for the application of higher live loads (HL93 equivalent to H-30) for the bridges than the present H-13 or H-18 live load that was set for the IR Study. The major reasons for the request are as follows:

1) Tam Ngan Bridge (Ninh Thuan Province)

Ninh Thuan Province requested the application of HL93 load for the bridge design based on the following reasons:

- This bridge will connect with Lam Son – Phuoc Hoa route which has been upgraded to Class III. Therefore, the new bridge must be designed based on Class III (HL93) standard.

2) Ea Suop Bridge (Dak Lak Province)

Dak Lak Province requested the application of HL93 load for the bridge design based on the following reasons:

- Although the Road Class is classified as Class IV, other bridges along PR1 were constructed with load limit of 30 tons.
- This bridge is located at the outer edge of the district center of Ea Suop with heavy vehicle traffic transporting farm products and timbers.

- Current traffic operating regulations do not allow vehicles of more than 18 tons to pass over the bridge. Accordingly, such vehicles must cross the river near the bridge at low water level.

3) Krong K'mar Bridge (Dak Lak Province)

Dak Lak Province requested the application of HL93 load for the bridge design based on the following reasons:

- Although the Road is Class IV, 8 of 15 bridges along PR12 were constructed with more than load limit of 15 tons, and other bridges were constructed with load limit of 30 tons.
- This bridge is located at the outer edge of the district center of Krong K'mar with heavy vehicle traffic transporting farm products, timbers and construction materials.
- Current traffic operating regulations do not allow vehicles the passage of more than 5 tons over the bridge. Accordingly, such vehicles must cross river near the bridge at low water level.

4) Ngoi Ngan Bridge (Khanh Hoa Province)

Khanh Hoa Province requested the application of HL93 load for the bridge design based on the following reasons:

- This bridge is located along the Nguyen Hue route (Class III), as the only means of transporting passengers from Van Thang-Van Khanh-Van Phuoc communes to Van Ninh District administration center and Van Phong Gulf economic zone.
- Nguyen Hue route is under upgrading. Budget has already been allocated at 150,635 million VND for 2006-2010 and 2010-2015 respectively.
- The existing bridge is extremely dilapidated and is in state of collapse. Passage is limited to motorbikes, bicycles and pedestrians.

(2) Reasons for Using H-13 Live Load for Bridge Design in BD

Background of the Application of Design Live Load (H-13) at the time of the BD

The Vietnamese Bridge Design Code TCN018-79, Ministry of Transport and Communication No2057 QD/Kt14 1979, specifies 5 classes of live load for bridge design (as shown in Table 2.2.3 hereunder).

Table 2.2.3 Live Load for BD (2001)

Live Load Class	Capacity
H-8	10.4 ton vehicle in the center and an 8 ton vehicle at the front and back
H-10	13 ton vehicles can continuously pass
H-13	16.9 ton vehicle in the center and a 13 ton vehicle at the front and back
H-18	30 ton vehicle in the center and a 16.9 ton vehicle at the front and back
H-30	30 ton vehicles can continuously pass

The H-13 live load was generally applied to bridges for provincial and district roads in 2001.

Design Live Load to be Applied

The bridge design standard in Vietnam was revised in 2005 based on AASHTO, that specifies the application of HL93 live load to Class III or higher roads, and 50% or 65% of HL93 live load is also applicable to Class IV or lower roads. However, as shown in Table 2.2.4, 80% of HL93 live load was applied to Class III bridges for the Improvement of Rural Bridges Project in Northern Mountainous Provinces carried out by the same Japans Grant Aid scheme in 2007. This is made for the purpose of using appropriate live load for bridge design under Japan's Grant Aid assistance by subdividing the live load of bridges to more than class III for the new design standard. The proposed live load in Table 2.2.4 (HL93x80%) was confirmed by the Vietnamese side and recorded in the Minutes of Discussions in the Last Survey (see Appendix 4.1).

Table 2.2.4 Proposed Design Live Loads

Current Spec. 22-TCN-273-01						Current Spec. 22-TCN-272-05	Previous Spec.
Road Category		Daily Traffic Volume(PCU)	Design Speed (km/hr)			Live Road	
			Plains Area	Hills Area	Mountains Area		
	Expressway	>25,000	120-100	100-80	80-60	HL93 x 100%	H-30
Rural Trunk Road	Class I	15,000-25,000	110-100	90-80	70-60		
	Class II	6,000-15,000	100-80	80-60	60-40		
	Class III	1,000-6,000	80-60	60-40	50-30	**HL93 x 80%** *Agreement under Project for Improvement of Rural Bridges in Northern Mountainous Provincesin 2007	H-18
	Class IV	200-1,000	60-40	40-30	30-20	**HL93 x 65%**	H-13
		<200 , 1-lane					
Village Road	category A (**Previous Spec. 22TCN-210-92)**						

Under the arrangement, live load HL93x65% is equivalent to H-13 in previous Vietnamese design standard, with load limit of 16.9 tons.

Live load HL93x80% is equivalent to H-18 in previous Vietnamese design standard, with load limit of 30.0 tons.

Live load HL93 is equivalent to H-30 in previous Vietnamese design standard, with load limit of 30.0 tons.

(3) Criteria to Determine Higher Bridge Live Load

The preliminary study for the application of the higher level of live load found that only one vehicle with 30 ton total weight can pass a bridge with H-13 live load at one time. Accordingly, there was an option for the application of new traffic operation that would allow

the passage of one vehicle only if its total weight is more than 16 tons instead of adopting the higher level of live load. However, it is difficult to strictly control the operation without an on-site operator, and the widening of the width of bridge may enable the passage of two heavy vehicles simultaneously along the bridge, despite restriction signs posted before the bridge. Consequently, it was determined that this scheme will not virtually work.

The following criteria were conceived for the application of higher level of live load for the bridges.

Table 2.2.5 Criteria to Determine Higher Live Load

	Items to be Checked	Contents
National Policy & Current Situation	① Policy on Live Load Levels for Provincial Road Bridges	What is the policy of the MOT 2010 Transport Master Plan on live load levels for bridge improvement?
	② Live Load Levels Applied by Other Donors for Bridge Projects	What type of live load is applied in current ADB road improvement projects in the central area and JBIC bridge reconstruction projects?
Provincial Policy & Current Situation	③ Policies & Plans for Applying Design Specifications for Bridges on same route of a proposed Bridge	What does the provincial Transport Master Plan mention about the design standards and specifications for bridges to be improved?
	④ Design Specifications for Other Bridges on the Same Route of a Proposed Bridge	Existing conditions of other bridges on the same route.
	⑤ No. of Trucks more than 16 Tons using Proposed Bridge	Whether or not the present traffic volume of trucks requires an increase in the live load level?
Adequacy as a Japan's Grand Aid Scheme	⑥ Consistency with Previous Terms 1 and 2 Bridges	Whether or not the consistency with Term 1 & 2 bridges already completed is possible?
	⑦ Increase in Initial Construction Cost to Improve Live Load Level	What is initial cost increase after the upgrading of live load level?

(4) Discussion & Conclusions

Except for Tam Ngan Bridge, there was an increasing trend in traffic volume including heavy vehicles and upgrading of the surrounding roads was seen.

Numerous bridges on several sites were constructed with 30 tons load limit which most likely could become traffic bottleneck in the near future if the bridge designs do not take into account the local development and the road improvement condition.

The conclusions for the development for each bridge are described below. The results of the analysis for each item are summarized in Tables 2.2.6 (1)-(4).

Tam Ngan Bridge（Ninh Thuan Province）

The new bridge will be constructed with live load of HL93x65% (same as the IR Study) for the following reasons:

- There is no upgrading plan for existing road.
- Lam Son-Phuoc Hoa Route which is under construction can be connected to NH27 3.7km upstream. Therefore, there is no sufficient ground to upgrade the load limit.

Ea Suop Bridge (Dak Lak Province)

The new bridge will be constructed with live load of HL93x80% (same as the IR Study) for the following reasons:

- The other bridges along the same route were constructed with 30 tons load limit as shown in Figure 2.2.1 (1).
- There is much traffic of heavy vehicles (75 vpd in 2009).
- The bridge is located at the outer edge of the district center of Ea Sup.

Krong K'mar Bridge (Dak Lak Province)

The new bridge will be constructed with live load of HL93x80% for the following reasons:

- The other bridges constructed after 2000 on the same route have 30 tons load limit as shown in Figure 2.2.1 (2).
- Passage of heavy vehicles (146 vpd in 2009) over the existing bridge is not possible and must cross river near the bridge at low water level.
- The bridge is located at the outer edge of the district center of Krong K'mar.

Ngoi Ngan Bridge (Khanh Hoa Province)

The new bridge will be constructed with live load of HL93x65% (same as the IR Study) for the following reason:

- Nguyen Hue route is under upgrading. Some section (centre of Van Ninh District) was already upgraded. Budget at 150,635 million VND was already allocated for 2006-2010 and 2010-2015 respectively. However 2 bridges constructed after 2000 on the same route are limited to 15 tons load as shown in Figure 2.2.1 (3) and heavy vehicles can use NH1 route running parallel with Nguyen Hue route.

(5) Effect of Higher Level of Live Load

The application of higher level live load (HL93x80%) for a bridge will result to a larger girder depth, and the span-girder depth ratio will change from 1/20 to 1/18 in order to secure sufficient girder stiffness for increased vehicle loading. However, it is possible to minimize the impact on construction cost.

Table 2.2.6 (1) Evaluation Result on Application of Higher Level of Live Load

Tam Ngan Bridge Ninh Thuan Province District Road (Class IV)

	Items to be checked	Plan, Spec. or Others	Contents	Evaluation
National Policy & Current Condition	1. National policy	1) Transportation Development Plan (by MOT) 2) Road Development Plan (by MOT) 3) Previous Spec. (Design Specification of Bridges and Culvert No2057 QD/Kt14-97) 4) Current Spec. (Specification of Bridge Design 22TCN-272-05)	• No information about live load. • No information about live load. • H-30 is for Class III or more (national road and provincial main road), H-18 is for Class IV and H-13 is for Class V or less. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	―
	2. Other Donor projects	1) Transportation Improvement Sector Project (ADB fund) 2) Highway and bridge Rehabilitation Project (JBIC fund)	• H-30 to be adopted regardless of road Class. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	Upgrading of live load is not desirable
Provincial Policy & Current Condition	3. Provincial Policy	1) PDOT's Request	• Although this road will connect to Lam Son –Phouc Hoa Route to NH27, there is no upgrading plan.	No justified reasons for upgrading of live load
	4. Condition of Other Bridges on the Same Route	-	• There is no other bridge on the same route.	No justified reasons for upgrading of live load
	5. Traffic Volume in 2009 (truck)	-	• Existing bridge is only for pedestrian, bicycle and motorbike.	―
Adequacy of Japan's Grant Aid Scheme	6. Consistency with Terms1 & 2 Bridges	-	• Difficult to justify because there is no upgrading plan of road.	No justified reasons for upgrading of live load
	7. Construction Cost	-	• Approximately 10% increase in construction cost	―
Conclusion	**Application of Live Load HL93x65% (equivalent to H-13)**			

Table 2.2.6 (2) Evaluation Result on Application of Higher Level of Live Load

Ea Suop Bridge Dak Lak Province Provincial Road No.1 (Class IV)

	Items to be checked	Plan, Spec. or Others	Contents	Evaluation
National Policy & Current Condition	1. National policy	1) Transportation Development Plan (by MOT) 2) Road Development Plan (by MOT) 3) Previous Spec. (Design Specification of Bridges and Culvert No2057 QD/Kt14-97) 4) Current Spec. (Specification of Bridge Design 22TCN-272-05)	• No information about live load. • No information about live load. • H-30 is for Class III or more (national road and provincial main road), H-18 is for Class IV and H-13 is for Class V or less. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	―
	2. Other Donor projects	1) Transportation Improvement Sector Project (ADB fund) 2) Highway and bridge Rehabilitation Project (JBIC fund)	• H-30 to be adopted regardless of road Class. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	Upgrading of live load is desirable
Provincial Policy & Current Condition	3. Provincial Policy	1) PDOT's Request	• Based on the Road Master Plan for Dak Lak Province, H-18 or more should be applied to Provincial roads.	Upgrading of live load is desirable (Same as the IR Study)
	4. Condition of Other Bridges on the Same Route	-	• All other bridges on the same route were already improved with load limit of 30 tons	Upgrading of live load is desirable (Same as the IR Study)
	5. Traffic Volume in 2009 (truck)	-	• Heavy vehicles: 75vpd • Average daily traffic: 1754vpd (1287PCU/day)	Upgrading of live load is desirable (Same as the IR Study)
Adequacy of Japan's Grant Aid Scheme	6. Consistency with Terms1 & 2 Bridges	-	• There is no difference with the IR Study so upgrading of live load is justifiable.	Upgrading of live load is desirable (Same as the IR Study)
	7. Construction Cost	-	• No increase cost	―
Conclusion	**Application of Live Load HL93x80% (equivalent to H-18)**			

Table 2.2.6 (3) Evaluation Result on Application of Higher Level of Live Load

Krong K'mar Bridge Dak Lak Province Provincial Road No.12 (Class IV)

	Items to be checked	Plan, Spec. or Others	Contents	Evaluation
National Policy & Current Condition	1. National policy	1) Transportation Development Plan (by MOT) 2) Road Development Plan (by MOT) 3) Previous Spec. (Design Specification of Bridges and Culvert No2057 QD/Kt14-97) 4) Current Spec. (Specification of Bridge Design 22TCN-272-05)	• No information about live load. • No information about live load. • H-30 is for Class III or more (national road and provincial main road), H-18 is for Class IV and H-13 is for Class V or less. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	—
	2. Other Donor projects	1) Transportation Improvement Sector Project (ADB fund) 2) Highway and bridge Rehabilitation Project (JBIC fund)	• H-30 to be adopted regardless of road Class. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	Upgrading of live load is desirable
Provincial Policy & Current Condition	3. Provincial Policy	1) PDOT's Request	• Based on the Road Master Plan for Dak Lak Province, H-18 or more should be applied to Provincial road.	Upgrading of live load is desirable
	4. Condition of Other Bridges on the Same Route	-	• 8 bridges on the same route were already constructed with H-15 or more live load, and 5 bridges were improved based on H-30 standard (load limit 30 ton) after 2000.	Upgrading of live load is desirable
	5. Traffic Volume in 2009 (truck)	-	• Heavy vehicles: 134vpd • Average daily traffic: 3921vpd (2033PCU/day)	Upgrading of live load is desirable
Adequacy of Japan's Grant Aid Scheme	6. Consistency with Terms1 & 2 Bridges	-	• Some bridges on the same route were improved with load limit of 30 tons so that upgrading of live load is justifiable.	Upgrading of live load is desirable
	7. Construction Cost	-	• Approximately 10% increase in construction cost	—
Conclusion	**Application of Live Load HL93x80% (equivalent to H-18)**			

Table 2.2.6 (4) Evaluation Result on Application of Higher Level of Live Load

Ngoi Ngan Bridge Khanh Hoa Province Provincial Road No.651C: Nguyen Hue Route (Class III)

	Items to be checked	Plan, Spec. or Others	Contents	Evaluation
National Policy & Current Condition	1. National policy	1) Transportation Development Plan (by MOT) 2) Road Development Plan (by MOT) 3) Previous Spec. (Design Specification of Bridges and Culvert No2057 QD/Kt14-97) 4) Current Spec. (Specification of Bridge Design 22TCN-272-05)	• No information about live load. • No information about live load. • H-30 is for Class III or more (national road and provincial main road), H-18 is for Class IV and H-13 is for Class V or less. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	—
	2. Other Donor projects	1) Transportation Improvement Sector Project (ADB fund) 2) Highway and bridge Rehabilitation Project (JBIC fund)	• H-30 to be adopted regardless of road Class. • HL93 is for Class III or more, and 65% or 50% of HL93 is for Class IV or less.	Upgrading of live load is desirable
Provincial Policy & Current Condition	3. Provincial Policy	1) PDOT's Request	• Road improvement budget at 150,635 million VND has already been for 2006-2010 and 2010-2015 respectively.	Upgrading of live load is desirable
	4. Condition of Other Bridges. On the Same Route	-	• 2 bridges constructed after 2000 on the same route are limited to 15 tons load. Heavy vehicles can use NH1 which runs parallel with Nguyen Hue route.	No justifications to upgrade live load
	5. Traffic Volume (truck)	-	• Passage of vehicles are prohibited because of the existing bridge is dilapidated.	—
Adequacy of Japan Grant Aid Scheme	6. Consistency with Terms1 & 2 Bridges	-	• Difficult to justify due to the load limitations of other bridges on the same route.	No justifications to upgrade live load
	7. Construction Cost	-	• Approximately 10% increase in construction cost	—
Conclusion	**Application of Live Load HL93x65% (equivalent to H-13)**			

2.2.2.4 Response to Other Requests

(1) Considerations of Other Requests for Approach Roads & Ancillary Facilities

Requests regarding approach roads and ancillary facilities for bridges from the GOV in the Last Survey and the Survey are summarized in Tables 2.2.7 and 2.2.8, respectively. Since all the requests are concerned with mitigating measures for the affected inhabitants and efficiency of the Project implementation, these are incorporated into the detailed design as had been considered in the IR Study.

Table 2.2.7 Evaluation of Other Requests for Approach Roads & Ancillary Facilities in the Last Survey

Request	Judgment	Reason
1. Tam Ngan Bridge - Securing function of small canal crossing new approach road on right bank.	○	- New approach road construction will require a change in structure of the canal, with the replacement cost to be borne by the Japanese side. - Existing open canal to be replaced by a pipe culvert and its cost is minimal.
2. Krong K'mar Bridge - Installing a drainage facility along the approach road on the right bank	○	- The existing drainage system will malfunction due to the change in the location of the new approach road. Installation of new drainage system can be made at the upstream side of the new approach road (approximately 100m). - The additional cost will have little effect on the overall construction cost.
3. Ngoi Ngan Bridge - Installation of drainage along the upstream side of the new approach road.	○	- An increase in the elevation of the new approach road will result in discharging drain water towards houses along the road, and a drainage system approximately 80m in length is needed to mitigate this condition. - Additional cost will have a minimum effect on the overall construction cost.

Table 2.2.8 Evaluation of Other Requests for Approach Roads & Ancillary Facilities in the Survey

Request	Judgment	Reason
4.1 Ea Suop Bridge - Keeping the existing bridge after the new bridge construction.	X	- No change from the Last Survey. - It obstructs the smooth river flow and affects new bridge because the existing bridge is close to new one. - The width of new bridge is 7.0 m in correspond with the GOV requests. - Maintenance costs will increase and weigh heavily on the provincial budget.
4.2 Ea Suop Bridge - Providing the access road on both banks.	○	- 2 new connecting roads were constructed due to area development. New access roads to connect with new approach roads of bridge will provide on both bank sides the recovery of the existing functions because the elevation of new approach road rises by increase in bridge elevation.
5.1 Krong K'mar Bridge - Keeping the existing bridge after the new bridge construction.	X	- No change from the Last Survey. - It obstructs the smooth river flow and affects the new bridge because the existing bridge is close to the new one. - The width of new bridge is 7.0 m in correspond with the GOV requests. - Maintenance costs will increase and weigh heavily on the provincial budget.

Request	Judgment	Reason
5.2 Krong K'mar Bridge - Securing function of small bridge crossing new approach road on left bank.	○	- New approach road construction will require a change in structure of the canal, with the replacement cost to be borne by the Japanese side. - Existing open canal to be replaced by a 3-cell pipe culvert and its cost is minimal.
5.3 Krong K'mar Bridge - Improvement the pavement and alignment on left bank.	○	- Pavement with 30 in length on left bank is deteriorated and damaged. Therefore, the section will be repaved. - Also, the section is next to the sharp curve. Therefore, the alignment will be improved together with pavement works.
5.4 Krong K'mar Bridge - Providing the access road on right bank.	○	- New connecting road was constructed due to area development. New access road to connect with new approach road of bridge will provide on the right bank side for the recovery of the existing functions because the elevation of new approach road rises by increase in bridge elevation.
6.1 Ngoi Ngan Bridge - Securing function of small canal crossing new approach road on left bank.	○	- New approach road construction will require a change in structure of the canal, with the replacement cost to be borne by the Japanese side. - Existing open canal to be replaced by a pipe culvert and its cost is minimal.

2.2.2.5 Basic Bridge Planning Concepts

(1) River Condition

1) Design High Water Level

It was confirmed in the Survey that there has been no higher flooding water levels since the BD was completed. Accordingly, there is no difference in the design high water level for each of the proposed bridges. Max HWL, Ordinary HWL, and LWL were established on the basis of interview results undertaken during the BD site survey stage. The Max HWL was adopted as the design high water level as shown in Table 2.2.9. Note that the appropriateness of these design water levels were reviewed and checked based on rainfall data in the vicinity of the bridge site.

Table 2.2.9 Field Survey Water Levels and Design High Water Level

Br. No.	Bridge Name	Water Level			Remarks (Max. Year)
		Max HWL (Design HWL)	Ord. HWL	Ord. LWL	
43	Tam Ngan Bridge	127.70	127.10	125.00	(2000)
52	Ea Suop Bridge	20.00	18.80	10.40	(1983)
56	Krong K'mar Bridge	12.00	10.10	5.30	(1989)
83	Ngoi Ngan Bridge	9.80	8.80	7.90	(2000)

2) Freeboard under Girders

Freeboard under girders shall be set based on whether there is debris observed under bridges.

Table 2.2.10 Freeboard under Girders

Conditions	Freeboard
Navigation clearance not required	In flat terrain without debris: H=0.5m In the mountainous terrain with debris: H=1.0m

(2) Superstructure Type

There is no change in the superstructure type selected in the IR Study because the IR Study result is deemed appropriate. The IR Study chose a post-tensioned PC T-girder for a 20-30m span with total bridge length ranging from 30m to 100m for the proposed bridges, taking into consideration the economic aspects as well as previous experience in Vietnam. The typical PC bridge cross-section and side view are as shown in Figure 2.2.3.

In the Last Survey, the design conditions of some of the bridges were modified to suit actual field conditions as follows:

- Krong K'mar Bridge

  Provision of deeper Girder depth enhances girder stiffness considering the increase in live load.

- Ngoi Ngan Bridge

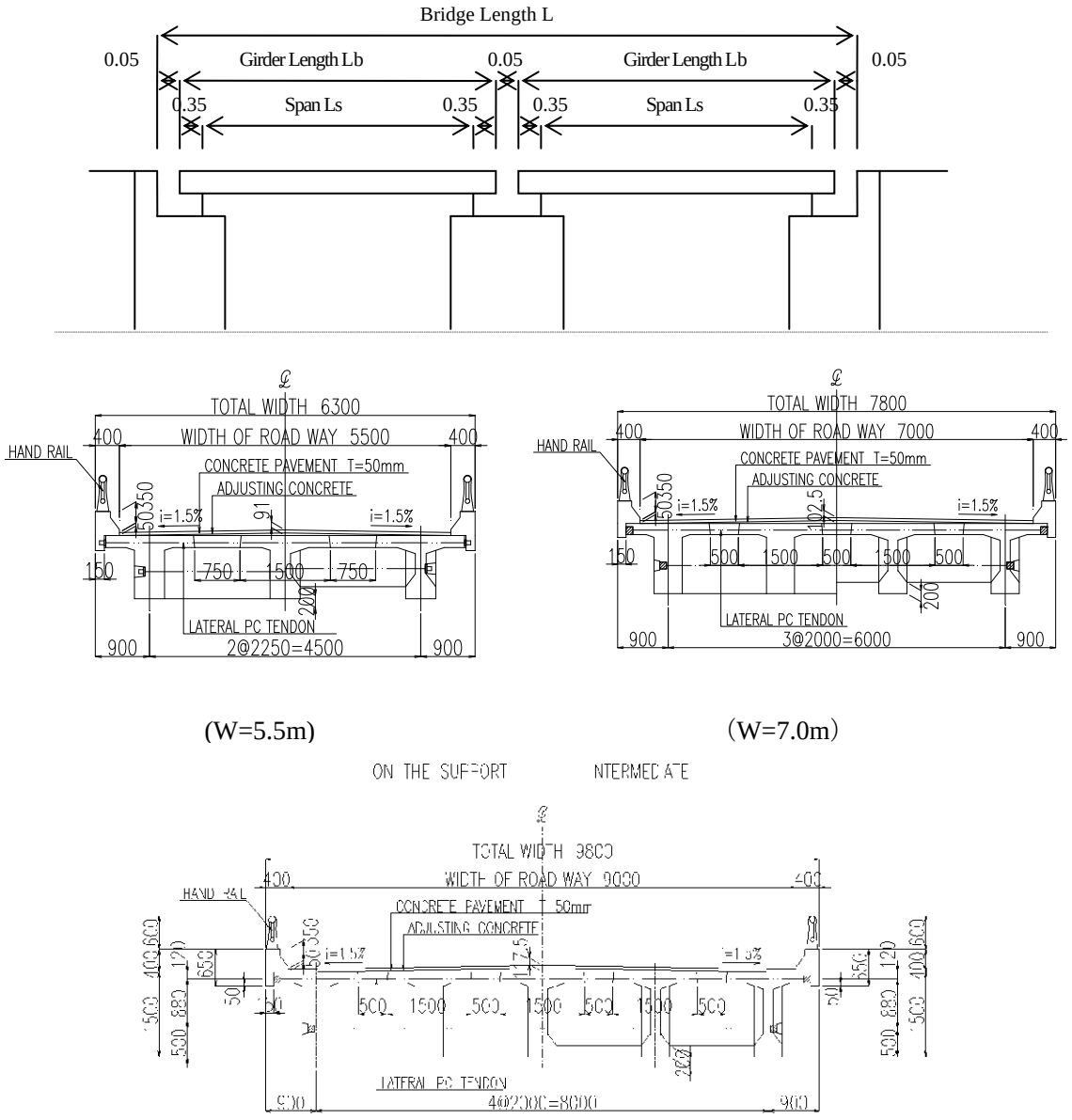
  Only the bridge width was increased. The girder depth was not changed although the number of girders was increased from 3 to 4.

(3) Substructure & Foundation

There is no change in the type of substructure and foundation selected in the IR Study because the result of the IR Study is deemed appropriate. The type of substructure and foundation selected are as shown in Table 2.2.11.

Table 2.2.11 Substructure & Foundation Type

Substructure/ Foundation	Type	Reason for Selection
Abutment	Reversed T	Commonly applied for abutments for economic reasons.
Pier	Wall	Presents fewer obstacles to river flow to avert souring.
	Pile-bent	Used for economic reasons when the flow velocity is slow and there is little possibility of scouring.
Foundation	Spread Foundation	Adopted when a reliable bearing layer is present at a shallow depth.
	Pile Foundation	RC 400 mm square pile adopted for economic and transportability reasons. It is difficult to drive piles to a great depth with the presence of medium layer containing boulders and stones. In such cases, steel pipe piles of 600 mm in diameter will be used for depths greater than 24m.



(W=5.5m) (W=7.0m)

(W=9.0m)

Width (m)	Span (m)	Girder Length Lb (m)	Girder Height (m)		Girder Type
			H-13	HL93x80%	
5.5	21	21.700	1.05	1.20	T-Girder
	27	27.700	1.35	-	
7.0	18	18.700	0.90	1.00	
	21	21.700	1.05	1.15	
	24	24.700	1.25	1.25	
	27	27.700	1.35	1.40	
9.0	30	30.700	1.40	1.50	

Figure 2.2.3 Typical PC Girder for Proposed Bridges

The maximum driving length of an RC square pile is 24m (12m x 2), because of the presence of stones and boulders unlike the Mekong Delta. Driving of low strength concrete piles would be difficult. For Terms 1 and 2 of the Project, pile-caps were constructed above LWL considering constructability when water depth is relatively high even in the dry season. This time pile-cap will be built under the riverbeds for the proposed bridges because of the low LWL and also to protect them from scouring.

(4) Approach Roads & Soft Ground Treatment

The carriageway width of the approach road will be 5.5 m for Tam Ngan Bridge, 6.0 m for Ea Suop Bridge, and Krong K'mar Bridge and Ngoi Ngan Bridge. The length, vertical gradient and horizontal alignment of the approach roads are planned based on the topography and existing land use conditions at each of the bridge site. A 1.5 m shoulder will be provided at both sides of the carriageway. The side slopes were determined based on the embankment height as shown in Figure 2.2.4

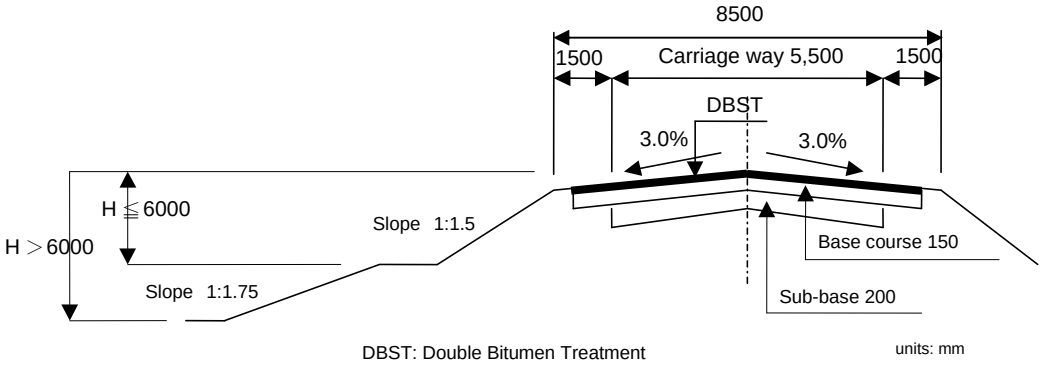


Figure 2.2.4 Typical Road Cross Section

The soft ground treatment will be executed at Krong K'mar Bridge, as the necessity of strengthening the existing ground to support the high embankment was confirmed. Although there are various methods to treat soft ground, the Plastic Board Drain (PBD) method has been deemed appropriate for this site from previous experience in Terms 1 and 2 of the Project as well as for economic reasons. Table 2.2.12 shows the comparison of the various methods for soft ground treatment of the BD.

(5) Revetment & Riverbed Protection

1) Revetment

The abutments of the proposed bridges were set back from the river waterline. However, in rainy season, certain scouring and erosion is anticipated to occur around bridges and approach embankments due to high water velocity. To protect the embankments around abutments, stone masonry will be adopted up to the design HWL and up to 10m from abutments along approach roads. The typical cross-section is illustrated in Figure 2.2.5. On riverbanks, mattress gabion will be placed for the protection, because of its flexibility, durability and economy.

Table 2.2.12 Selection of Soft Ground Treatment Method

	Method			
	Sand Drain	**Plastic Board Drain**	**Sand Compaction**	**Pre-cast pile**
Diameter （mm）	400	65	700	400×400
Increase in strength of sub-soil(kg/c m^2)	C = 0.3 ⇒ 1.0	C = 0.3 ⇒ 0.5	C = 0.3 ⇒ 3.0	—
Characteristics	Most popular	Construction speed high	Effective for sand layer	Piles to support embankment load
Depth for practical application	30m	15m	35m	30m
Minimum interval	1.2m	0.9m	1.2m	1.0m
Construction speed	300m/day	2,500m/day	150m/day	120m/day
Ratio of cost	1.0	0.2	2.4	11.0
Others	Many satisfactory results	Many satisfactory results in Vietnam	-	-

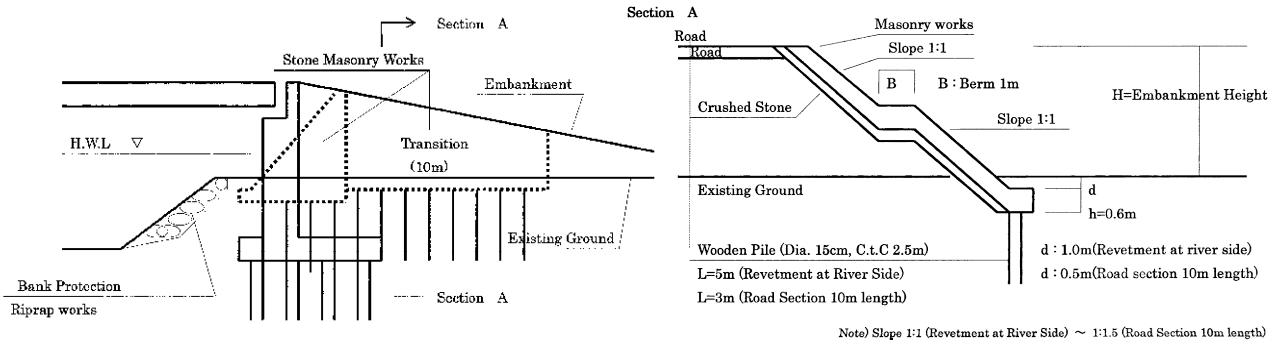


Figure 2.2.5 Slope Protection Works

2) Pier Foundation Protection

When scouring is anticipated around a pier provided with a pile foundation, the structure should be protected with stone or mattress gabion. The area indicated in Figure 2.2.6 depends on the assumed scouring depth. However, if the footing is placed on bedrock, protection work will not be needed above the footing.

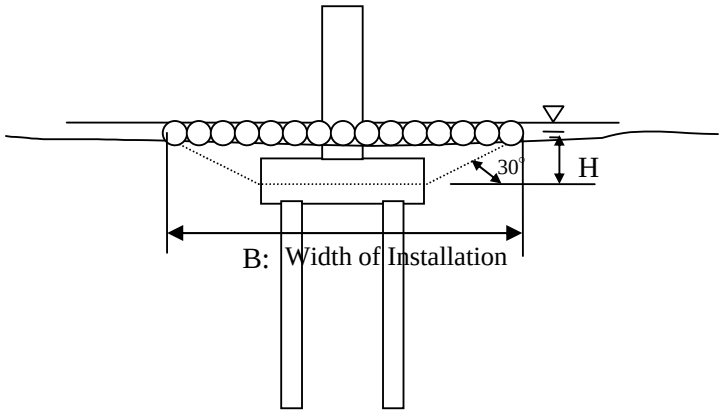


Figure 2.2.6 Pier Footing Protection

2.2.2.6 Design Criteria for Bridges & Approach Roads

(1) Design Standards

The following Vietnamese Design Standards were basically adopted for the Project.

- HIGHWAY SPECIFICATIONS FOR DESIGN, TCVN4054-05, 22TCN-273-01
- SPECIFICATION FOR BRIDGE DESIGN, 22TCN-272-05

In addition to the standards listed above, Japanese and AASHTO standards were also applied as needed.

(2) Design Methodology

Structural members were mainly designed by the allowable stress method.

(3) Road Class & Design Speed

Based on the Vietnamese Standard (i.e. TCVN 4054-05), highways are classified into 7 categories depending on the level of importance and traffic volume. Generally, provincial roads are classified as Road Class III or IV, and district and commune roads are classified as Road Class IV or V.

Table 2.2.13 Road Class & Design Speed

Design categories	Expressway	I	II	III	IV	V	VI	
Design speed (Km/h)	120 120	120 120	100 100	80 60	60 40	40 30	30 20	Flat Mountain
Function	National Highway (NH)			NH &PR	PR & DT	DT & Commune road		
Design traffic volume (PCU/day)	>25000	>15000	>6000	>3000	>500	>200	<200	

(4) Road & Bridge Cross Sections

The widths of the proposed bridges were determined to be flexible considering the site conditions (as described in Section 2.2.2.2). The carriageway width for the approach roads should be same as the bridge as shown in Figure 2.2.7.

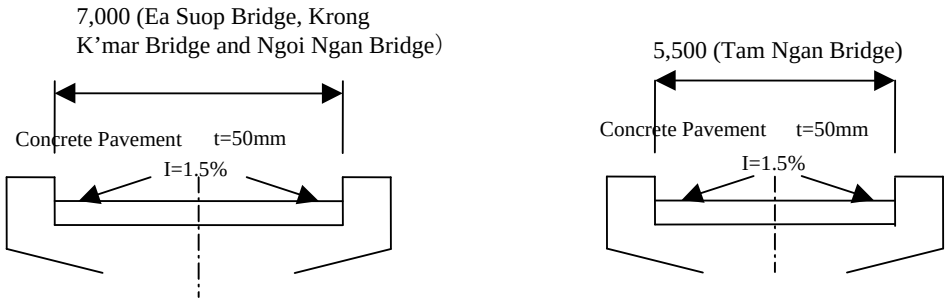


Figure 2.2.7 Typical Cross Sections for Bridges

Note that a bridge width of 5.5m is capable of having a truck and sedan pass each other on a bridge.

(5) Design Loads

1) Live Load

Based on the analysis as described in Section 2.2.2.3, the live loads shown in Table 2.2.14 are to be adopted for the proposed bridges.

Table 2.2.14 Live Loads for Proposed Bridges

Type of Live Load	Bridge Name
HL93x65% (equivalent to H-13)	Tam Ngan Bridge and Ngoi Ngan Bridge
HL93x80% (equivalent to H-18)	Ea Suop Bridge and Krong K'mar Bridge

2) Seismic Horizontal Force

The same concept will be adopted as in the IR Study for seismic horizontal force to be applied for the detailed design. Based on AASHTO and Vietnamese Standard, the horizontal seismic coefficient at 0.05 will be adopted for the proposed bridges.

Table 2.2.15 Seismic Coefficient for Bridge Design

Seismic Coefficient Indicator (SI)	Provincial Name	Design Seismic Coefficient
SI≦7	Other provinces	0.05
SI>7	Thanh Hoa & Ha Tinh Province	0.16

3) Other Loads

The following loads were considered as required:

- Dead load
- Impact load
- Wind load
- Influence of creep for concrete
- Influence of dry shrinkage for concrete
- Earth pressure
- Static pressure of water
- Water pressure during flood
- Buoyancy
- Settlement

(6) Material Strength

Unit weights and strength of materials are shown in Tables 2.2.16 through 2.2.18.

1) Unit weights for materials

Table 2.2.16 Unit Weights of Materials

Designation	Self-weight kN/m^3	Designation	Self-weight kN/m^3
Steel	78.5	Cement, Mortar	21.5
Concrete reinforced	25.0	Asphalt concrete	23.0
Pre-stressed concrete	25.0	Concrete pavement	23.5
Non-reinforced concrete	23.5	Timber	8.0

2) Strength of Materials

In principle, the compressive strength of concrete and reinforcement were considered based on the Vietnam Bridge Standard.

Table 2.2.17 Strength of Concrete

Designation	Strength (N/mm^2)
PC Girder (post tension)	35
Slab	30
Abutment & Pier	21
Concrete Pile	30

Table 2.2.18 Strength of Steel

Designation	Yield Strength (N/mm^2)
Round Bar (A-I)	σ py = 190
Deformed Bar (A-II)	σ py = 240
Deformed (A-III)	σ py = 300

(7) Geometric Standards

The road geometric standards set out in the Vietnam Standard TCVN 4054-05 were basically used for this Project. However, flexibility was decided considering consistency with the alignment of the approach road and the local situation. The major items of the standard are shown in Table 2.2.19.

In addition, the maximum longitudinal grade to be adopted is 6%, taking into consideration the presence of numerous bicycle users.

Table 2.2.19 Road Geometric Design Standard

Item	Unit	Design Standard			
Design Speed	**Km/hr**	**80**	**60**	**40**	**30**
Horizontal alignment					
Minimum curve radius	m	250	125	60	30
Vertical alignment					
Maximum gradient	%	5	6	8	10
Minimum radius of crest	m	4000	2500	700	400
Minimum radius of sag	m	2000	1000	450	250
Minimum vertical curve length	m	70	50	35	25
Cross section					
Cross fall	%	2	2	2	2
Maximum super-elevation	%	8	7	6	6

Tan Ngan Bridge（Ninh Thuan Province）

Since the road is a mountainous road with narrow width, and an intersection is located at the right end of the bridge, a 40km/h design speed was applied.

Ea Suop Bridge (Dak Lak Province)

Since the bridge is located in a mountainous area at the outer edge of the district center of Ea Sup, the design speed should be reduced for safety reasons. In addition, it is necessary to keep small horizontal curve (R=50) to connect the exscinding road. Therefore, a 30km/h design speed was applied.

Krong K'mar Bridge (Dak Lak Province)

Since the bridge is located in a mountainous area at the outer edge of the district center of Krong K'mar, the design speed should be limited for safety purposes. Therefore, a 40km/h design speed was applied.

Ngoi Ngan Bridge (Khanh Hoa Province)

Since the bridge is located in an economic zone near the city area and school zone, the design speed should be limited for safety reasons. In addition, it is necessary to keep small horizontal curve to connect the exscinding road, and the improvement section of the approach roads will also be very long at vertical minimum radius at design speed of 80km/h or 60km/h. Therefore, a 40km/h design speed was applied.

Embankment height and slope shall be in compliance with the applicable requirements of Vietnamese Standard TCVN4054-05.

Table 2.2.20 Embankment Height & Slope

Type of Soil	Slope (H < 6m)	Slope (6m < H < 12m)
Sand and Silt or Clay	1:1.5	1:1.75

2.2.2.7 Summary of Bridge Design

The design results of the proposed 4 bridges are summarized in Table 2.2.21.

2.2.3 General Drawings for Proposed Bridges

A general view of the 4 proposed bridges are attached with each bridge provided with two drawings (one for the overall site including the approach roads and the other one for the bridge structure).

Table 2.2.21 Summary of Bridge Design Results

Bridge Name (Province Name)		**Tam Ngan Bridge** (Ninh Thuan Province)	**Ea Suop Bridge** (Dak Lak Province)	**Krong K'mar Bridge** (Dak Lak Province)	**Ngoi Ngan Bridge** (Khanh Hoa Province)
1. Photo		 Existing : Width 1.4m, Only for pedestrians and motorbikes : Presumed Scouring Depth	 Existing : Width 4.4m, Load limit 18.0t	 Existing : Width 4.4m, Load limit 18.0t	 Existing : Width 3.5m, Only for pedestrians and motorbikes
2. Feature		This bridge will connect with Lam Son - Phuoc Hoa route which has been upgrading. The permanent access for ethnic minorities living on the right bank side	This bridge is located at the outer edge of the district centre of Ea Sup. The other bridges along the same route were constructed with 30 tons load limit. Heavy vehicles must cross the riverbed near the bridge at low water level.	This bridge is located at the outer edge of the district centre of Krong K'mar. The new bridges along the same route were constructed with 30 tons load limit. Heavy vehicles must cross the riverbed near the bridge at low water level.	This bridge is located along Nguyen Hue route within Van Phong Gulf economic zone. This route is under upgrading. Other bridges on the same route have already been constructed with width of 6.0m + walkway and 15 tons load limit.
3.Bridge Location		No Change (About 80m upstream of existing)	No Change (15m downstream of existing)	No Change (11m upstream of existing)	No Change (5m downstream of existing)
4.Bridge Type		No Change (PC-T Girder, Spread Footing)	No Change (PC-T Girder, Spread Footing)	No Change (PC-T Girder, RC Piles)	No Change (PC-T Girder, RC Piles)
5. Bridge Length		No Change: 71.3m(21+27+21)	No Change: 59.3m(18+21+18)	No Change: 71.3m(21+27+21)	No Change: 49.55m(24+24)
6.Bridge Width	IR Study Design	5.5m	7.0m	7.0m	5.5m
	Request from PDOT	8.0m	7.0m	7.0m	9.0m
	Application	No Change (5.5m) There is no upgrading plan on existing road.	No Change (7.0m) Consideration of traffic volume and consistency with other bridges on the same route.	No Change (7.0m) Consideration of traffic volume and consistency with new bridges on the same route.	**7.0m** Consideration of provincial road upgrading plan and consistency with other bridges on the same route.
7.Live Load	IR Study Design	65%HL93 (equivalent to H13)	80%HL93 (equivalent to H18)	65%HL93 (equivalent to H13)	65%HL93 (equivalent to H13)
	Request from PDOT	HL93 (equivalent to H30)	HL93 (equivalent to H30)	HL93 (equivalent to H30)	HL93 (equivalent to H30)
	Application	No Change 65%HL93 (equivalent to H13) There is no upgrading plan on existing road.	No Change 80%HL93 (equivalent to H18) Consideration of traffic volume and consistency with other bridges on the same route.	**80%HL93** (equivalent to H18) Consideration of traffic volume and consistency with new bridges on the same route.	No Change 65%HL93 (equivalent to H13) Consideration of consistency with other bridges on the same route.
8.Approach Road Length		No Change (see General Drawings)			
9.Rivetment & River Protection		No Change (see General Drawings)			
10. Road Drainage		No Change (see General Drawings)			
11.Soft Ground Treatment		No Change (Soft ground treatment will be executed at Krong K'mar Bridge)			

Note) : Changed item from the IR Study Design

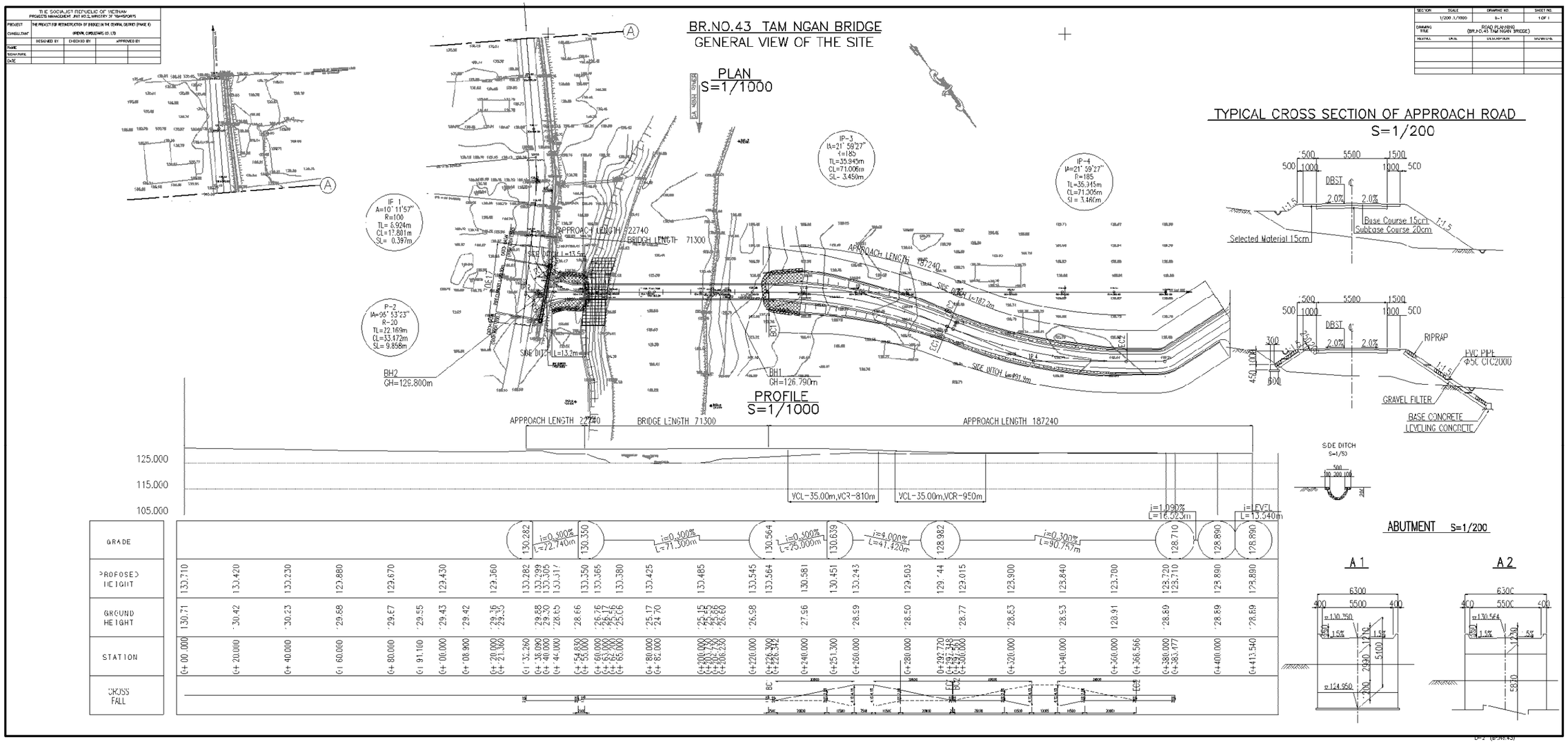


Figure 2.2.8 Tam Ngan Bridge (General View throughout Site)

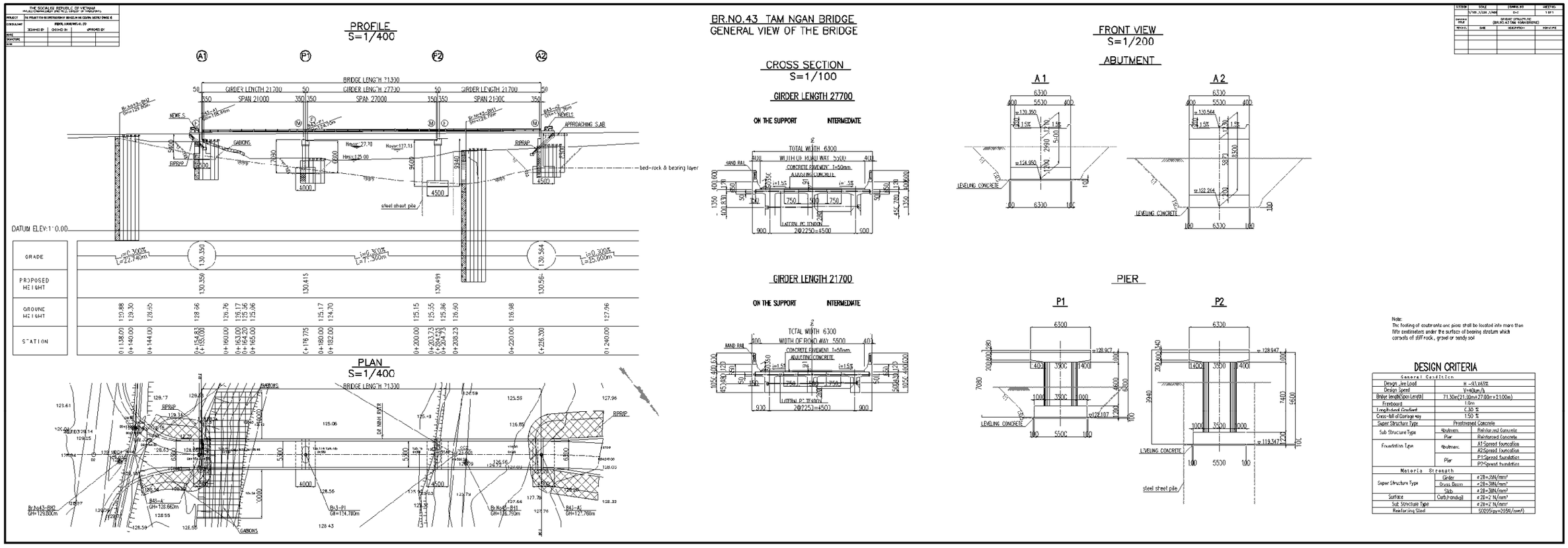


Figure 2.2.9 Tam Ngan Bridge (General View for Structure)

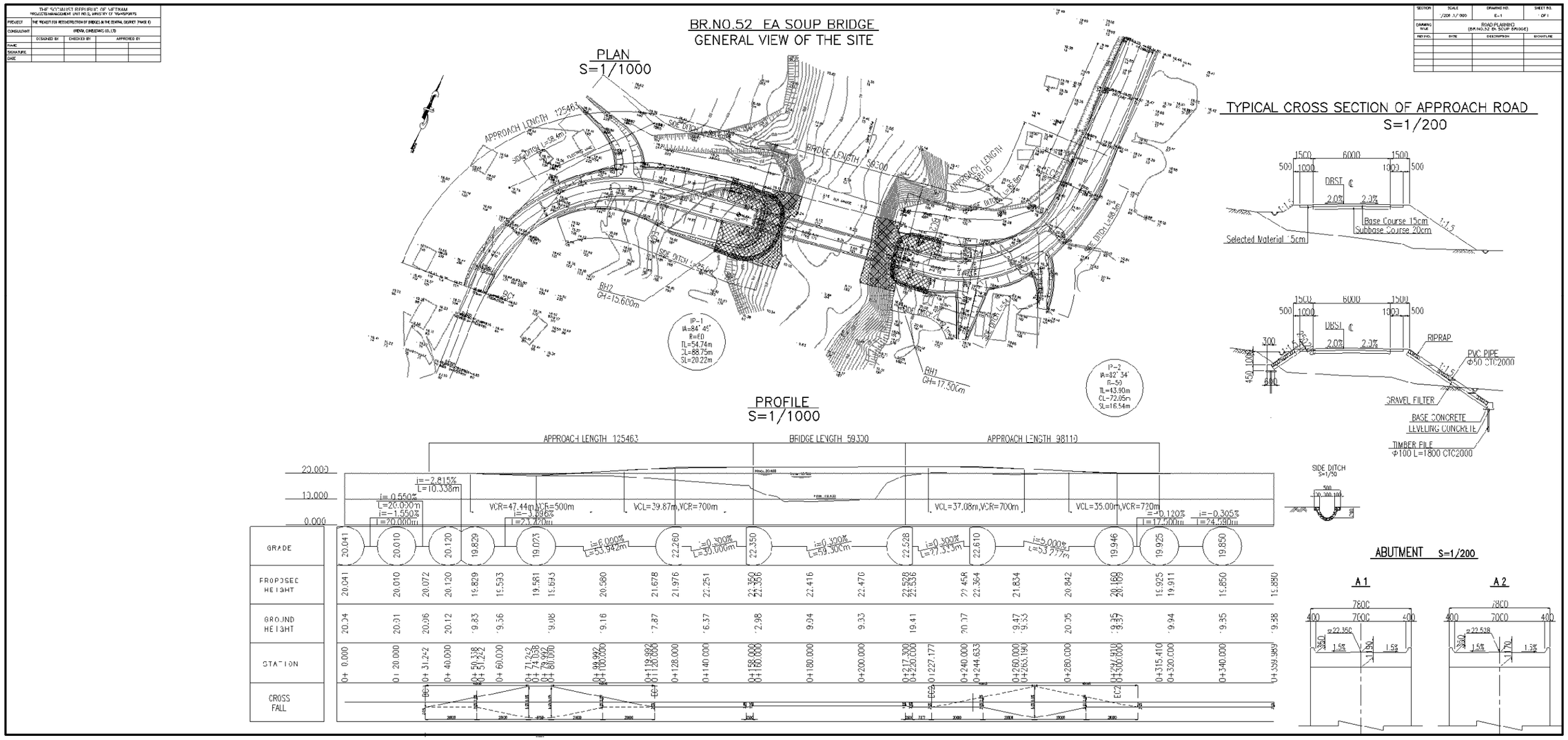


Figure 2.2.10 Ea Suop Bridge (General View throughout Site)

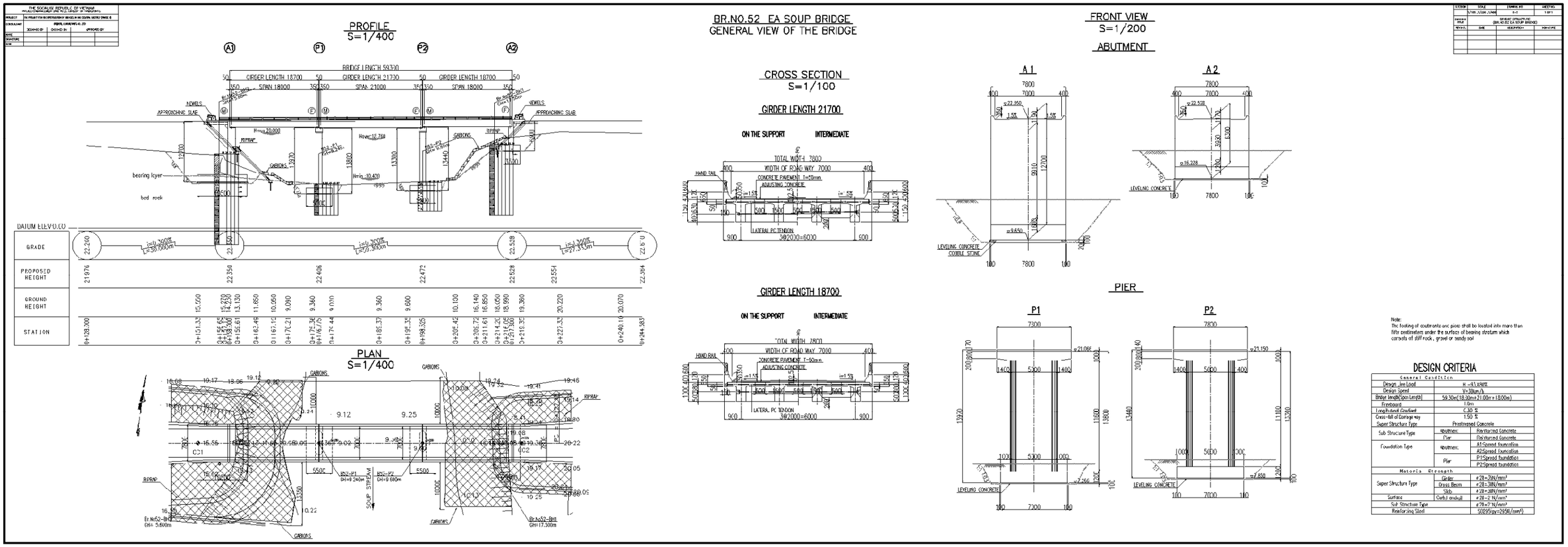


Figure 2.2.11 Ea Suop Bridge (General View for Structure)

THE SOCIALIST REPUBLIC OF VIETNAM
PROJECTS MANAGEMENT UNIT NO.2, MINISTRY OF TRANSPORTS

PROJECT	THE PROJECT FOR RECONSTRUCTION OF BRIDGES IN THE CENTRAL DISTRICTS (PHASE II)		
CONSULTANT	OVERSEAS CONSULTANTS CO., LTD		
	DESIGNED BY	CHECKED BY	APPROVED BY
NAME			
SIGNATURE			
DATE			

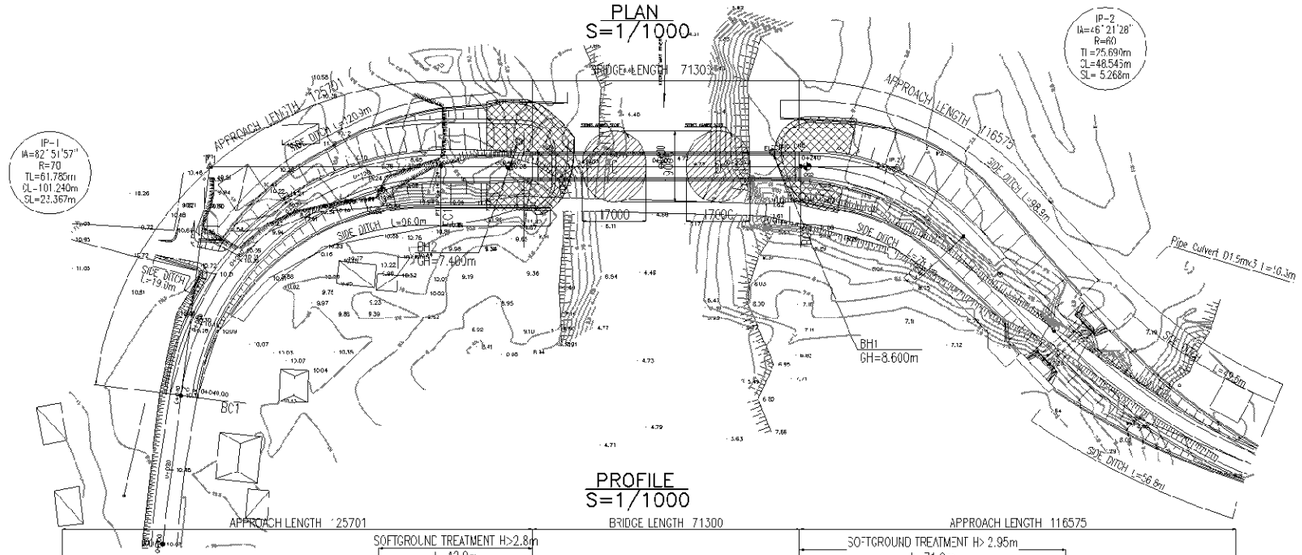
SCALE	DRAWING NO.	SHEET NO.
1/200 1/1000	F-1	1 OF 1

DRAWING TITLE: ROAD PLAN MAP (BR.NO.56 «KRONG K'MAR BRIDGE)

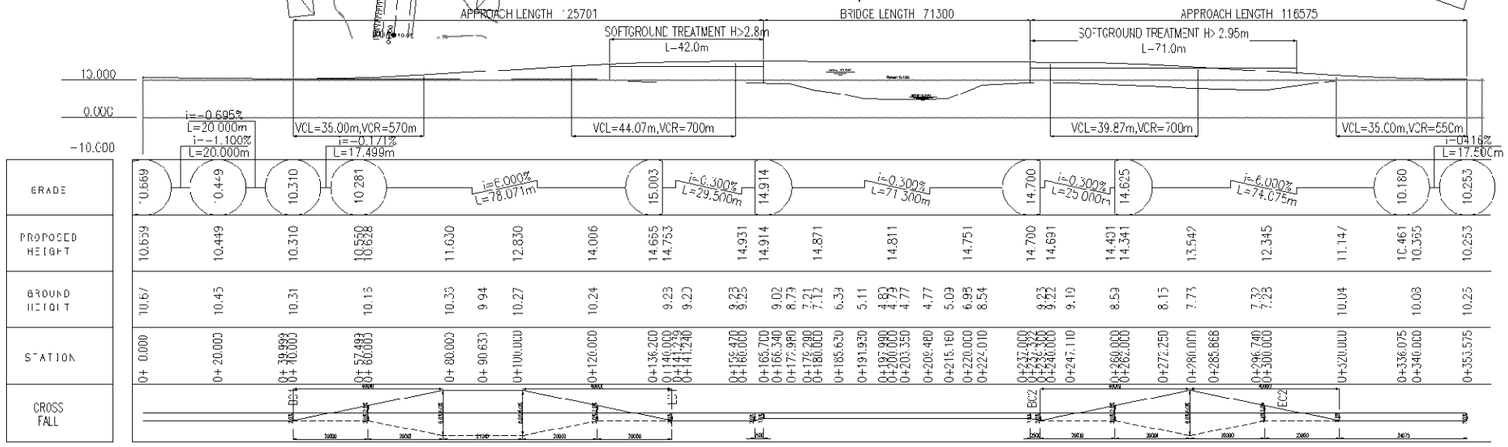
REVISED	DATE	DESCRIPTION	SIGNATURE

BR.NO.56 KRONG K'MAR BRIDGE
GENERAL VIEW OF THE SITE

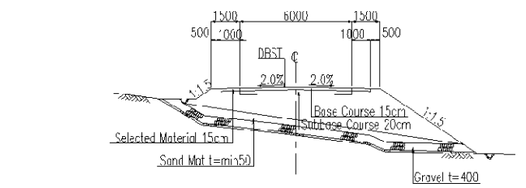
PLAN
S=1/1000

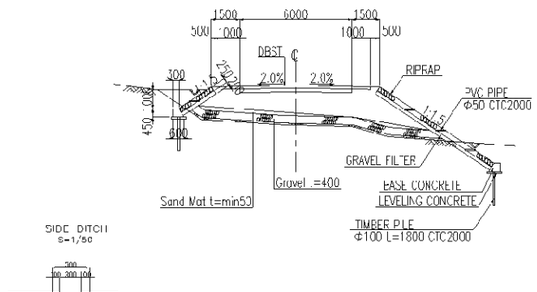


PROFILE
S=1/1000



TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200





SIDE DITCH1
S=1/50

ABUTMENT S=1/200

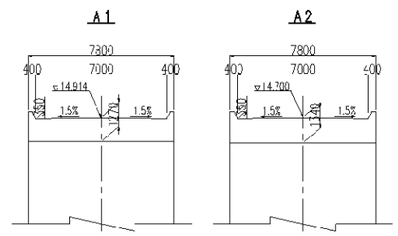


Figure 2.2.12 Krong K'mar Bridge (General View throughout Site)

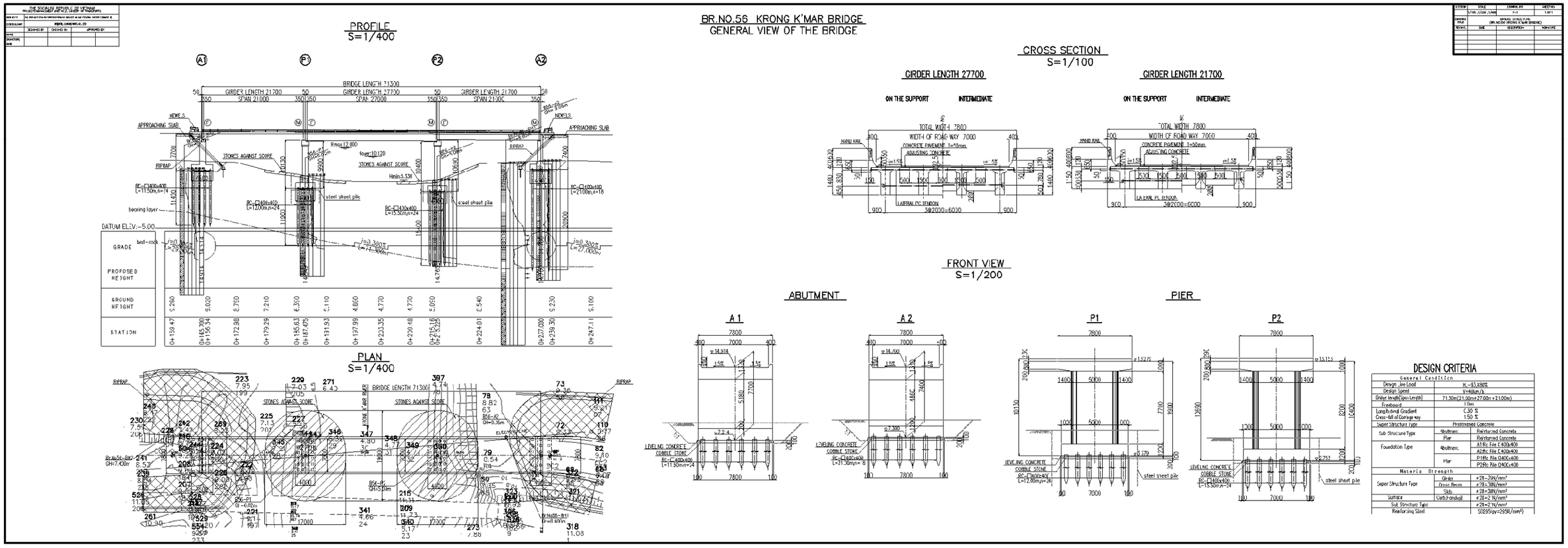


Figure 2.2.13 Krong K'mar Bridge (General View for Structure)

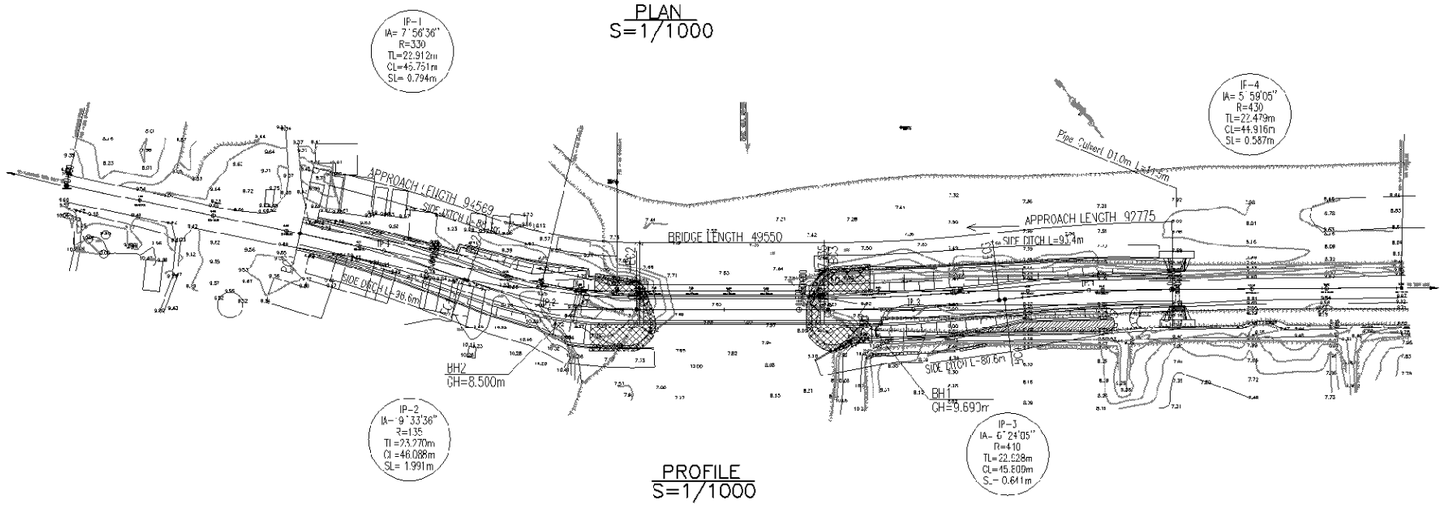
THE SOCIALIST REPUBLIC OF VIETNAM
PROJECTS MANAGEMENT UNIT NO.2, MINISTRY OF TRANSPORTS

PROJECT	THE PROJECT FOR RECONSTRUCTION OF BRIDGES IN THE CENTRAL DISTRICT (PHASE I)		
CONSULTANT	(NIPPON, CONSULTANT CO., LTD)		
	DESIGNED BY	CHECKED BY	APPROVED BY
NAME			
SIGNATURE			
DATE			

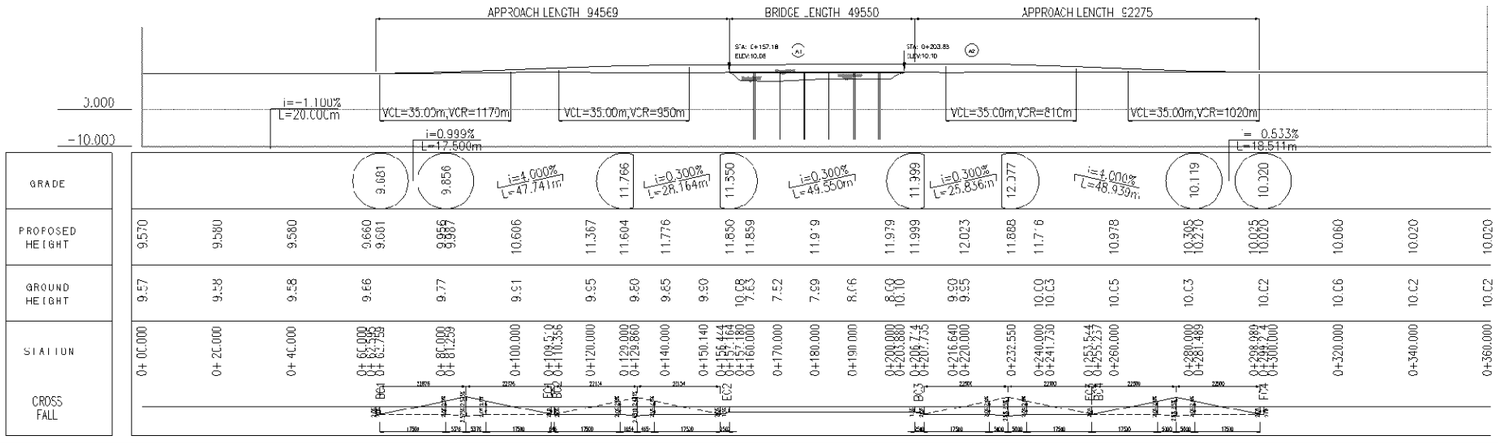
SCALE	1/200 1/1000	DRAWING NO.	G-1
		SHEET NO.	1 OF 1
DRAWING TITLE	ROAD PLANNING (BR.NO.83 NGOI NGAN BRIDGE)		
REVISION	DATE	DESCRIPTION	SIGNATURE

BR.NO.83 NGOI NGAN BRIDGE
GENERAL VIEW OF THE SITE

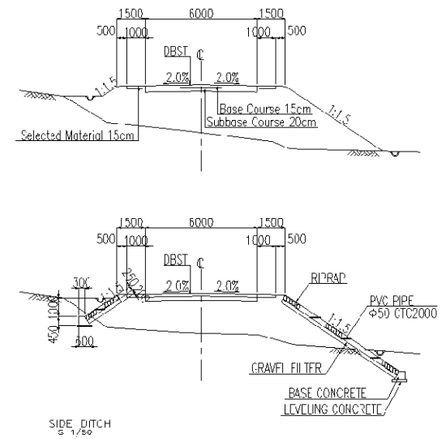
PLAN
S=1/1000



PROFILE
S=1/1000



TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200



ABUTMENT S=1/200

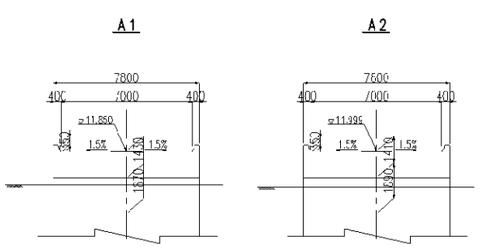


Figure 2.2.14 Ngoi Ngan Bridge (General View throughout Site)

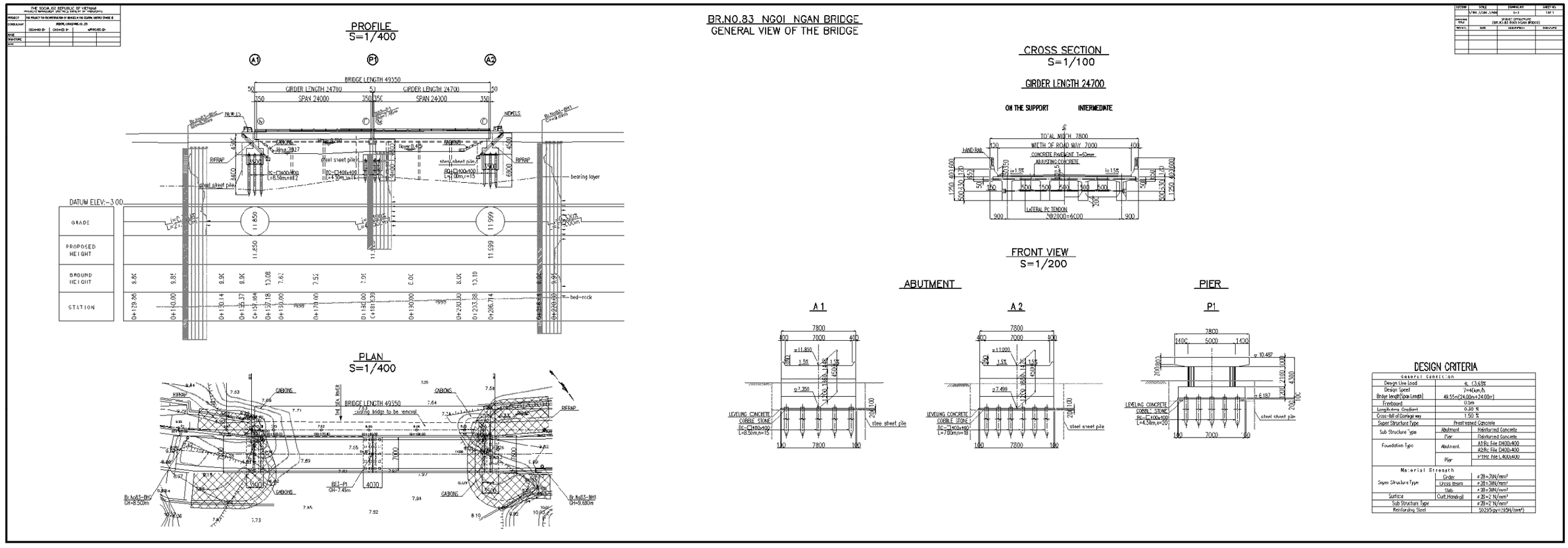


Figure 2.2.15 Ngoi Ngan Bridge (General View for Structure)

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

(1) Basic Concept

The Project will involve the construction of 4 bridges located in 3 different provinces in the central region of Vietnam. Construction will pursued through bidding of Japanese contractors under Japan's Grant Aid Scheme. Based on this premise, the basic concept for the implementation of the Project is described as follows:

- PMU2 will be the implementing an agency for the Project from the tendering stage up to the construction completion stage. However, operation and maintenance of the facilities will be turned over to relevant PDOTs. Accordingly, close communication between PMU2 and the PDOTs will be required for Project implementation.
- The construction plan should be set taking into consideration of the difference in the characteristics of the rainy season between the mountainous and coastal areas, including the duration, rainfall volume and intensity.
- One site office will be established for each group. In order to manage all site offices, a Central Office will be set up in Nha Tran City of Khanh Hoa Province. A liaison office will also be established in Hanoi to ensure close communication with PMU2's headquarters.
- The number of Japanese engineers for construction management will be minimized considering the abundant experience of Term 1 and 2 of the Project. However, Japanese engineers will be deployed to occupy key positions to ensure smooth implementation, quality of works, and safety during construction. These positions will include the Project Manager, Office Manager in charge of administration, and site manager for the each site office. In addition, a bridge expert to supervise PC tensioning and girder erection will be temporary deployed from Japan. Also, Japanese mechanical and electrical engineer will be temporary designated to the Central Office for the management of equipment and machineries to avert possible adverse impact on construction schedule.
- The PC post-tensioned girders will be fabricated in the construction yard for the construction of the superstructure of the proposed bridges.
- In order to reduce construction costs, the efficient use of construction equipment and coupled with the possible reuse of temporary construction materials such as scaffoldings should be made to the extent practicable for the construction of all the bridges. Furthermore, locally available construction materials and equipments should be used to the greatest extent possible, provided that the quality and quantity are in compliance with specification requirements.
- In cases where an existing bridge is located near a new bridge and its removal is indispensable for the new bridge construction, the construction of diversion roads,

temporary bridges, and the removal of the existing bridge will be included in the tasks of the Japanese side in order to realize a smooth Project implementation.

(2) Review of Construction Plan

The construction method for both the substructure and foundation, including the excavation method, was reviewed based on the existing site conditions and the results are summarized in Tables 2.2.22 and 2.2.23 hereunder. The erection method based on the existing conditions for each site was also reviewed for possible improvement.

Table 2.2.22 Construction Method for Foundation Work

Bridge Name	Sub-structure	Foun-dation	Construction Method		Reason for Change
			Implementation Review Study in 2006	Preparatory Survey (This Survey)	
Tam Ngan Bridge	A1	ditto	Open excavation	Same as the left	
	P1	ditto	Dike surrounding	Same as the left	
	P2	ditto	Sheet pile cofferdam	Same as the left	
	A2	ditto	Open excavation	Same as the left	
Ea Suop Bridge	A1	ditto	Open excavation	Same as the left	
	P1	ditto	Dike surrounding	Same as the left	
	P2	ditto	Dike surrounding	Same as the left	
	A2	ditto	Open excavation	Same as the left	
Krong K'mar Bridge	A1	RC Pile	Open excavation	Same as the left	
	P1	ditto	Sheet pile cofferdam	Same as the left	
	P2	ditto	Sheet pile cofferdam	Same as the left	
	A2	ditto	Open excavation	Same as the left	
Ngoi Ngan Bridge	A1	ditto	Sheet pile cofferdam	Same as the left	
	P1	ditto	Sheet pile cofferdam	Same as the left	
	A2	ditto	Sheet pile cofferdam	Same as the left	

Table 2.2.23 Review of Erection Method

Bridge Name	Super-structure	Span(m)	Erection Method		Reason for Change
			Implementation Review Study in 2006	Preparatory Survey (This Survey)	
Tam Ngan Bridge	PC-T girder	21+27+21	Erection girder	Same as the left	
Ea Suop Bridge	PC-T girder	18+21+18	Erection girder	Same as the left	
Krong K'mar Bridge	PC-T girder	21+27+21	Erection girder	Same as the left	
Ngoi Ngan Bridge	PC-T girder	24+24	Erection by using temporary bridge	Same as the left	

2.2.4.2 Implementation Conditions

The Project comprises mainly of bridgework, approach roadwork and other necessary works. All sub-work items, including PC girders, RC substructures with spread footing or RC piles, and DBST

for road surfacing, have been carried out before in Vietnam and there is no work item that requires high technical or supervisory skills. Accordingly, quality, safety and environmental considerations during the construction will be the areas of major concern.

- It is important for the contractor to establish a well-organized management system to cope with the construction schedule, quality requirements, equipment, materials and labor in order to smoothly complete all of the bridges, which are widely dispersed, within the planned period of time. Careful supervision and close communication with PMU2 and the Consultant is also vital.
- Any river work during the rainy season will be carefully executed because of the possible occurrence of flush flood.
- Erection work shall be carefully undertaken to avoid the risk of accidents. This will also involve of laborers as preventive measure against possible occurrence of mishap.
- Taking essential safety measure is vital for the protection of local residents, which includes the proper handling of wastewater and dust generated by the construction work.

2.2.4.3 Scope of Works

The Project to be implemented under the Japan's Grant Aid Scheme will involve certain types of work sharing by both the Japanese and Vietnamese Governments as shown in Table 2.2.24 hereunder.

Table 2.2.24 Joint Tasks for the Japanese and Vietnamese Sides

Responsibilities of the Japanese Side	Responsibilities of the Vietnamese Side
- Construction of bridges, approach roads, revetment and protection works, and other necessary facilities. - Removal of existing bridges and construction of temporary detour bridges in the case of existing bridges being on the same alignment - Construction and removal of temporary roads and bridges needed for the construction works - Procurement of materials, equipment and labor required for the construction work - Supervision of the construction works - Consultancy services required for the implementation of the Project	- Land acquisition for the construction sites and the procurement of lands for temporary facilities such as PC girder fabrication yards, stockpiling areas for materials and equipment, etc. - Secure the land to access from/to ROW. - Compensation for relocation of houses - Removal or relocation of public utilities, such as electrical facilities, telephone poles, water pipes, etc. - Removal of an existing bridge when the proposed bridge is constructed away from existing bridge (for Tam Ngan, Ea Suop and Krong K'mar Bridge) - Tax exemption of imported materials and equipment brought to Vietnam for the Project. Assistance to facilitate customs clearance and exemption from payment of customs duties - Exemption from payment of customs duties and taxes and other financial requirements relative to the implementation of the Project of Japanese and other third party nationals deployed to Vietnam for the Project.

2.2.4.4 Construction Supervision

(1) Scope of Works for Consultancy Services

As an integral part for the implementation of the Project, the Exchange of Notes (E/N) between the Japanese and the Vietnamese Governments and the Grant Agreement (G/A) between the JICA and the GOV will be signed prior to the commencement of the Project. Following the signing of the E/N and the G/A, the contract for consultancy services between the Consultant, who shall possess a recommendation letter from JICA, and the GOV will be signed and the Consultant shall assist the GOV with the preparation of tender documents and the supervision of construction work. The major scope of works of the consultancy services is described below.

1) Assistance with Preparation of Tender Documents

Based on the Survey output, the tender documents will be prepared and submitted to DRVN for approval. The major components of the work will involve the following:

- Review of drawings
- Review of quantities of facilities to be built and cost estimates
- Review of construction plans
- Preparation of Specifications, Conditions of Contract including Instructions to Bidders, Special Conditions among others the execution of the works

2) Assistance for Bidding

The Consultant will provide PMU2 with assistance for the bidding of the Project. This will involve the following major items of services:

- Preparation of the Notice of Tender
- Preparation of the Pre-qualification evaluation criteria and assistance for the prequalification of contractors
- Assistance to conduct of pre-bid meetings and site visits, as necessary
- Assistance to evaluation of bidders
- Assistance for Contract negotiation

3) Construction Supervision

After obtaining the approval of the contract documents from the GOJ, the Consultant will issue the “Notice to Proceed” to the Contractor and thereafter will start deploying the expatriate staffs for the construction supervision of the Project. During the construction period, the Consultant will oversee the quality and safety of the works, execute the administrative work for payment, and make recommendations on working methods to the Contractor. The Consultant will also be coordinating as necessary with the relevant organizations, including JICA, the Embassy of Japan in Vietnam, and the GOV. The components of major activities of the Consultant are summarized in Table 2.2.25.

Table 2.2.25 Supervision Items during Construction Stage

Supervision Items	Contents
① Approval of construction schedule & drawings	- To inspect and approve the construction schedule and shop drawings submitted by the Contractor. - To check whether submitted documents are in accordance with contract documents drawings and specifications, etc.
② Schedule control	- To receive progress reports from the Contractor and to give instructions to ensure the completion of the Project on schedule.
③ Quality control	- To examine the quality of works and approve construction materials and construction methods by making reference to the contract drawings and specifications.
④ Inspection of completed construction works	- To inspect and give approval for completed works and final quantities for payment by checking as-built drawings.
⑤ Issuing of certification	- To issue the necessary certificates for payment for completion of construction and for the expiry of the warranty period to the Contractor.
⑥ Submission of reports	- To inspect monthly progress reports and as-built drawings and photographs prepared by the Contractor for submittal to the Vietnamese authorities, JICA, etc. - To prepare a final report at the completion of construction works for submission to JICA.

(2) Organization of Consultancy Services

1) Consultant's Organization for Assistance to Tendering Process

Pursuant to Japan's Grant Aid Scheme, the following services will be provided for the tender process:

- Preparation of Draft Contract Documents in accordance with the guidelines of Japan's Grant Aid Scheme.
- Preparation of specifications incorporation the results of the review of the specifications that were adopted for Terms 1 and 2 of the Project.
- Deployment of engineers involved in the BD or a series of the survey for this work.

Experts will be deployed for the preparation of tender documents and for assisting the Client in the bidding process.

Table 2.2.26 Consultant's Organization for Preparation of Bidding Documents & Tender Assistance

Name	Roles
Project Manager	To manage & supervise all activities of the Consultant during the tendering process
Document Specialist & Bridge Engineer	To finalize the tendering documents on the basis of the Survey results and to assist the Client in the bidding process.

2) Consultant's Organization during Construction Supervision

A Resident Engineer with experience with bridge projects and Japan's Grant Aid Scheme will be assigned for the construction supervision of the Project to ensure quality of work. The chief

Consultant will work in Vietnam at the beginning and the ending of the Project to coordinate with relevant organizations.

The Bridge engineers will assist the resident engineer for the construction of (1) the widely dispersed 4 bridges, and (2) the tensioning of PC cables and erection of the girders to ensure quality and safety of works. A soil engineer will also be deployed for short duration to supervise the soft ground treatment work for Krong K'mar Bridge. Table 2.2.27 hereunder shows the tasks of each of the engineers mentioned above.

Table 2.2.27 Consultant's Organization for Construction Supervision

Name	Roles & Activities
Chief Consultant (Project Manger)	- To confirm the beginning and the ending of the Project to coordinate with the relevant organizations, including JICA, the Embassy of Japan, and the Vietnamese Government
Resident Engineer	- To supervise all 4 bridges and carry out daily supervision works jointly with the bridge engineer.
Bridge Engineers	- To supervise the daily works of the Contractor and give instructions as necessary - To supervise the tensioning PC cables and girder erection work.
Geotechnical Engineer	- To supervise the procedures and methods of soft ground treatment

2.2.4.5 Quality Control Plan

The quality control of the work will be carried out based on the Vietnamese standard and Japanese Standard. The summaries of tentative quality control plan for each work item are shown in Table 2.2.28.

Table 2.2.28 Summaries of Tentative Quality Control Plan

Quality Control Item		Test	Schedule
1. Embankment	Material	**Material Test for Embankment and Base** (Specific gravity, Water content, Atterberg limits, Grain-size, Compaction, Dry density, CBR)	Before construction
	Dairy	**Daily Inspection for Embankment and Base** (Compaction density)	After construction for each layer
2. Pavement (DBST)	Material	Asphalt emulsion (Physical tests, Specific gravity)	Before construction
	Dairy	Quantity of spray	At the time of execution for each layer
3. Concrete	Batching Plant	**Capability of Batching Apparatus and Mixing**	Before execution at every month
	Material	**Cement and Water** (Certification) **Fine and Coarse Aggregate** (Specific gravity, Grain-size, Unit weight, Absorption, Durability, Alkali-aggregate reaction)	Before construction At the time of material change
	Trial Test	Mixing Design (Slump, Air content, Temperature, Strength)	Before construction
	Daily	**Fresh Concrete** (Air content, Slump, Temperature)	First 5 vehicles At every 50m3 batch
		Placement (Placement method, Compaction, Joint, Curing method, Laitance removal)	At the time of placement
		Specimen (Compression strength)	One specimen/day at 7 days and 28 days strength

Quality Control Item		Test	Schedule
4. Rebar, Formwork and PC Tendon	Material	Inspection of mill sheet for rebar and PC tendon (tensioning and bending test)	Before construction
	Daily	Inspection of rebar arrangement (Size, Dimension, Arrangement, Lap length, Cover, etc)	Before concrete placement
5. Tensioning of PC Cable	Strength	Compressive strength test for concrete specimen	Before tensioning
	Tensioning Apparatus	Calibration of jack and pump	Before the tensioning At 50 cables interval
	Tensioning Test	Refer to the figure of tensioning control	Before tensioning
	Tensioning	Control for each cable,	At the time of tensioning
6. PC Grout	Mix Proportion	Consistency, Bleeding ratio, Expansion ratio, Strength, etc	Before using
	Dairy	Consistency, Temperature	Once/day for every five batches
		Bleeding ratio, Expansion ratio, Compression strength	Once/day

The tolerances of work items are shown in Table 2.2.29.

Table 2.2.29 Summaries of Tentative Tolerance for Construction Items

Work Item			Tolerance	Remarks
Embankment	Embankment	Formation	0cm or more	20m pitch
		Width	-10cm or more	Ditto
	Base	Formation	-2.5cm or more	Ditto
		Thickness	-5cm or more	Ditto
		Width	-10cm or more	Ditto
Pavement	DBST	Width	-3cm or more	Ditto
		Thickness	-1.5cm or more	Ditto
Foundation	Spread Footing	Elevation of bottom	Lower than planned level	4m mesh
Concrete Structure	Footing	Formation	±5cm	
		Thickness	±75mm or ±3%	
	Pier, Abutment, Retaining wall	Position	±30mm	
		Formation	-30mm~+10mm	
		Top length, Top width	±30mm	
		Dimension of Cross-section	-10mm~+20mm or ±2%	
	Slab	Bridge Length	-25mm~+30mm	
		Width	0~+30mm	
		Formation	-20mm~+20mm	
		Thickness	-10~+20mm	
PC Structure	Girder	Bridge Length	-25mm~+30mm	

2.2.4.6 Procurement Plan

(1) Materials

The procurement plan of the Last Survey was checked and the results are summarized in Table 2.2.30. The concrete batching plant, steel formwork and the temporary houses for the construction bridges under Terms 1 and 2 are no longer usable for Term 3.

Table 2.2.30 Procurement Plan for Materials

Name	Specification	Procurement Source	Remarks
Cement	Portland cement	Vietnam	Available in Vietnam
Admixture		Ditto	Imported but available in Vietnam
Re-bar	Deformed bar	Ditto	Ditto
H-shape steel		Ditto	Ditto
PC strand	12S12.7	Japan	Through HCM port
	Type B, 1S21.8	Third country	Indonesia , Ditto
Anchorage	1T22, 12T13M220	Vietnam	Available in Vietnam
Asphalt emulsion		Ditto	Imported but available in Vietnam
Embankment materials		Ditto	Quarry source from each province
Base course materials	Graded crusher-run	Ditto	Ditto
Sub-base course material/ Coarse aggregate	Crasher-run	Ditto	Ditto
Fine aggregate	Sand	Ditto	Ditto
Quarry stone	25～30cm	Ditto	Ditto
Plywood, Timber		Ditto	Available in Vietnam
Falsework, Scaffolding		Third country	China, Through HCM port
Expansion joint	25mm	Vietnam	Available in Vietnam
Rubber bearing		Ditto	Ditto
Sheet pile	III or IV type	Ditto	Imported but available in Vietnam
Steel cover plate	1*2*0.2m	Ditto	Ditto
Angle	H village, other	Ditto	Ditto
Fuel		Ditto	Available in Vietnam

(2) Construction Machinery & Equipment

The major equipment and machineries used by the Contractor for Terms 1 and 2 of the Project were the property of the local sub-contractor. Accordingly, the cost for depreciation of the equipment and machineries will be calculated, except for the crane. The results of the review are shown in Table 2.2.31.

Table 2.2.31 Procurement Plan for Equipment

Name	Specification	Procurement Source	Remarks
Bulldozer	15t	Vietnam	
Back hoe	0.06m^3, 0.6m^3	Ditto	
Dump truck	10t	Ditto	
Crawler crane	40, 50, 65t	Ditto	
Truck crane	15, 25,45t	Ditto	
Vibrating hammer	46, 60kw	Ditto	
Concrete plant	0.5m^3	Ditto	
Truck mixer	4.5m^3	Ditto	
Concrete pumping vehicle	30m^3/h	Ditto	
Grout mixer, pump	15-30l/min	Ditto	
Tension jack, pump		Ditto	
Erection girder		Japan	
Macadam roller	10-12t	Vietnam	

Name	Specification	Procurement Source	Remarks
Vibration roller	0.8-1.0t	Vietnam	
Motor grader	3.1m	Ditto	
Wheel loader	1.3m^3	Ditto	
Truck	2,3,5,11t	Ditto	
Truck with crane	2.9t	Ditto	
Trailer	20t	Ditto	
Generator	10 , 45, 100, 150kVA	Ditto	

2.2.4.7 Operational Guidance Plan

The operational guidance plan was inapplicable in the Project.

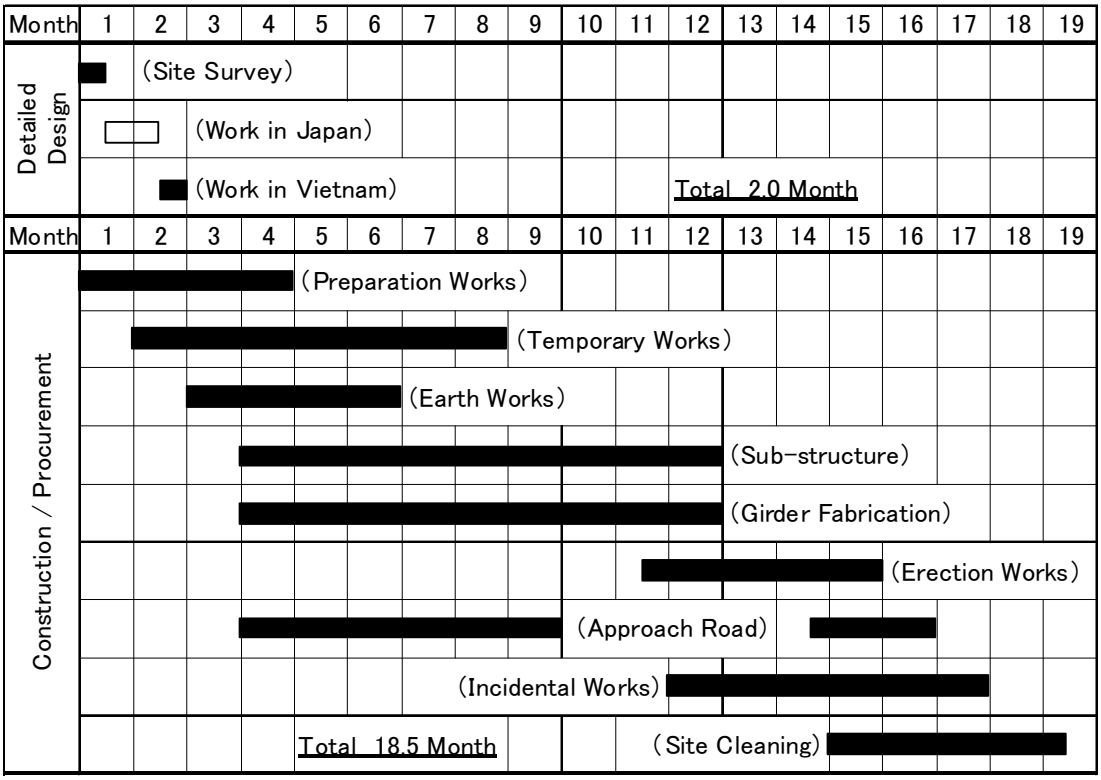
2.2.4.8 Soft Component (Technical Assistance) Plan

The soft component (technical assistance) plan was inapplicable in the Project.

2.2.4.9 Implementation Schedule

Table 2.2.32 shows the tentative project implementation schedule. The preparation of tender documents will be firstly conducted after the Exchange of Notes. Thereafter tendering will be carried out before the commencement of construction works.

Table 2.2.32 Tentative Project Implementation Schedule for Term 3



2.3 Obligations of Recipient Country

The obligations of the recipient country are listed below and were shown in above 2.2.4. Also, the details for each bridge were written in the Technical Memorandum between the Team and the PMU2 which are attached in Appendix 5.

- Land acquisition of construction sites and leasing lands necessary for construction yards (PC girder fabrication, stockpiling of materials, equipment depot, repair shop for equipment, formwork, re-bars arrangement and etc.).
- Provision of right of way for access to bridge construction sites.
- Secure the land to access from / to the construction site.
- Compensation for the relocation of affected houses generated from construction of the Project.
- Removal or relocation of utilities such as electric cables, telephone cables and water pipes.
- Removal of existing bridges when the proposed bridge is built away from the existing one.
- Tax exemptions on materials and equipments imported for the construction of the Project. And, assistance to facilitate customs clearance
- Exemption from customs duties and taxes for Japanese and third party nationals entering Vietnam to work for the Project. Exemption from any other financial requirements relative to the execution of the Project

It has been confirmed with the Vietnamese side that land acquisition and resettlement is almost completed without hindrance including temporary construction yards. However, the land acquisition of 4 householders and 3 organizations including a vacant backyard of church in Tam Ngan Bridge site and resettlement of 1 hut and 1 temporary shop in Ea Suop Bridge site still remain. Also, the relocation of the public utilities such as electric wire and etc. have not been made at the sites of Tam Ngan Bridge, Krong K'mar Bridge and Ngoi Ngan Bridge. These remaining land acquisition, resettlement and relocation activities will be completed before the commencement of construction.

Based on the ROW which was prepared in 2006 on the basis of the results in the IR Study, land acquisition and resettlement are proceeding. PMU2 were requested to examine the ROW carefully again including temporary construction yards, detour roads and other necessary land for construction due to minor changes of bridge width and/or design live load for some bridges reflected after IR Study.

Removal of the existing bridge must be overseen by the Japanese side because it was observed that some existing bridges have not been removed after the completion of the new bridges constructed in Phase 1 of this Project. Since the existence of the old bridge may give a negative effect to the new bridge during flood, the old bridge must be removed after the construction of the new bridge.

2.4 Project Operation Plan

2.4.1 Operation & Maintenance System

Large-scale repair work will not be required for 20 to 30 years after the completion of the bridges, provided that routine inspection and maintenance as shown in Table 2.4.1 are properly executed. Accordingly, it is possible for the PDOTs to carry out the inspection and maintenance work for the proposed bridges based on the current maintenance system of the PDOT.

2.4.2 Inspection & Maintenance Method

(1) Periodic Inspection & Maintenance

Bridge structures, approach roads and revetments around the sub-structures will have to be maintained by PDOTs. Table 2.4.1 shows the recommended intervals for the inspection and maintenance activities of the proposed bridges. Note that it is recommended to execute inspections before and after the rainy season.

Table 2.4.1 Maintenance & Inspection Schedule

	Item	Maintenance & Repair Works	Inspection Interval
Bridge	① Drainage pipe	Clearing of sediment	3 months
	② Expansion joint	Repairing of metal & seal rubber	3 months
	③ Railing	Repairing damage from collisions	3 months
	④ Bearing	Removal of soil deposits	6 months
	⑤ Concrete pavement	Repairing of cracks	6 months
	⑥ Substructure	Removal of debris	6 months
		Inspection of scouring	6 months
Road	① Pavement	Patching, smoothing	3 months
	② Shoulder/slope	Planting turf, reinforcement of soils, repairing riprap	3 months
River bank	① Around abutment	Repairing of riprap/gabion	6 months
	② Riverbank	Repairing of riprap/gabion, planting turf	6 months

It is important to keep records of periodic inspections conducted by PDOTs to assess the conditions of the facilities and to establish a repair schedule. Accordingly, proper inspection procedures including checking methods, intervals and reporting should be established from the outset.

(2) Maintenance of Approach Roads

Although minor maintenance activities will be encountered, patching and leveling should be executed periodically. Overlay should be undertaken approximately at every 7 years taking into consideration the life span of the DBST. For the approach roads to Krong K'mar Bridge, settlement by consolidation might occur because of the high abutments of more than 10m tall, although the approach slab was planned for the backside of these bridges. In the construction stage, close supervision should be made of materials to be pursued in accordance with the

specifications. However, based on the embankment materials used, advice on future maintenance will be given to the Vietnamese side after the construction of the approach roads.

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

(1) Initial Cost Estimation

The total cost of the Project to be borne by the Japanese Government is confidential until the contractor for construction will be verified by the Ministry of Foreign Affairs in Japan as shown in Table 2.5.1.

Table 2.5.1 Approximate Costs to be Borne by Japanese Government

Items			Cost（Million JPY）
Construction Facilities	Bridge	Sub-structure works Super-structure works Revetment works Approach road works Incidental works	Confidential
Detailed Design and Construction Supervision			Confidential

(2) Cost to be borne by Vietnamese Government

As mentioned earlier, land acquisition and resettlement activities were almost completed before December 2011 using their budget of 2,770 million VND. The remaining estimated costs to be borne by the Vietnamese Government are shown in Table 2.5.2. Other costs such as custom duties, internal taxes and etc. shall be borne by the Vietnamese Government in compliance with Japan's Grant Aid system.

Table 2.5.2 Approximate Costs to be Borne by Vietnamese Government

Items	Cost: Million VND (Million JPY)
Land acquisition / Leasing including site clearance	600 (2)
Compensation of resettlement	200 (1)
Removal / relocation of public utilities	200 (1)
Removal of existing bridges	800 (3)
Commissions for banking services	2,000 (8)
Total amount	3,800 (15)

* The above-mentioned costs are estimates subject to review.

(3) Condition of Estimation

i) Time of estimate: February 2012

ii) Exchange rate: 1US$ = JPY79.11 (at the above mentioned time)

1,000 VND = JPY3.81 (at the above mentioned time)

iii) Implementation period: Detailed design and construction period are shown in Table 2.2.31 of Tentative Project Implementation Schedule for Term 3.

iv) Others: Cost estimation to be borne by Japanese Government is complied with the

Japan's Grant Aid system. On the condition that the Project is implemented under the Japan's Grant Aid, the above mentioned exchange rate is to be reviewed by the Japanese Government.

2.5.2 Operation and Maintenance Cost

The estimated cost for the periodic inspection and maintenance to the proposed bridges after construction are shown in the table below.

(1) Periodic Inspection & Maintenance Activities

Periodic inspection and minor repair/ maintenance works will be conducted using the existing maintenance system administrated by PDOTs. The estimated cost for annual inspection and maintenance per bridge is shown in the below;

Personal expenses	:	5.0 million VND	=	5.0 million VND
Materials	:	50% of above	=	2.5 million VND
Equipment including vehicles	:	2.5 million VND	=	2.5 million VND
Total		10.0 million VND（40 Thousand JPY）		

(2) Periodic Maintenance for Pavement

Periodic maintenance, mainly for overlay of DBST for the approach roads, will be entrusted to a local maintenance company to be carried out approximately every 7 years. The estimated cost of the overlay is shown below (Average area of approach roads for 4 bridges);

1,727 m^2 × 1 bridge × 89 Thousand VND	=	153.7 million VND
153.7 million VND / 7 years	=	22.0 million VND
Total		22.0 million VND / bridge (80 Thousand JYP)

(3) Annual Operation & Maintenance Cost

- Dak Lak Province	=	(10 mil. VND + 22 mil. VND) × 2 bridges	=	64 mil. VND / year
- Other 2 provinces	=	10 mil. VND + 22 mil. VND	=	32 mil. VND / year

The annual operation and maintenance cost in Dak Lak Province and the other 2 provinces are estimated at 64 million and 32 million VND, respectively. Also, this cost accounts for less than 1 % of the maintenance budget of each province at maximum, and can be easily covered by the maintenance budget of each province.

CHAPTER 3

PROJECT EVALUATION

Chapter 3 Project Evaluation

3.1 Preconditions

As described in “2.3 Obligations of Recipient Country” and “Table 2.2.23 Joint Tasks for the Japanese and Vietnamese Sides” in this report, predictions for implementation of the Project are as follows.

- To secure the remaining lands of construction sites including temporary construction yards.
- To secure the budget for compensation of the above land acquisition and resettlement works and to pay it.
- To conduct an environmental monitoring based on the draft monitoring form attached in Appendix 6.1.
- To educate inhabits and road users about the traffic safety for securing the traffic safety during the construction due to the proximity between the construction sites and the existing bridges.
- Tax exemptions on materials and equipments imported for the construction of the Project. And, assistance to facilitate customs clearance
- Exemption from customs duties and taxes for Japanese and third party nationals entering Vietnam to work for the Project. Exemption from any other financial requirements relative to the execution of the Project

3.2 Necessity Inputs by the Recipient Country

Items which should be conducted by the Vietnamese Government to continue or show the effects of the Project are as follows.

- To secure the budget which is described in “2.5.1 (2) Cost to be borne by Vietnamese Government” in this report for smooth implementation of the Project, prior to the construction.
- To remove the existing bridges among the above especially from the viewpoint of keeping the soundness of new bridges and preventing scoring by flood.
- To conduct the inspection and maintenance as described in “2.4.2 Inspection & Maintenance Method” and to secure the necessary budget and personnel for keeping the functions of the constructed bridges by the Project.

3.3 Important Assumptions

Important assumptions to continue or show the effects of the Project are as follows.

- To guide properly the detour roads and strengthen the enforcement for overloaded vehicles because new bridges still have limitation of loading although they are permanent bridges.

- To strengthen traffic safety by preventing vehicles collision to the bridges because approach roads sometimes include curve sections and a number of accidents have been reported throughout the country.

3.4 Project Evaluation

3.4.1 Relevance

(1) Beneficiaries of the Project

The beneficiaries of the Project are expected to consist of people living within the districts where the proposed bridges are located, and it is estimated that this will be 2.99 million people.

Table 3.4.1 Beneficiaries

Bridge Name	Tam Ngan Br.	Ea Suop Br.	Krong K'mar Br.	Ngoi Ngan Br.	Total
Area	Ninh Son District	Dak Lak Province		Khanh Hoa Province	-
Beneficiaries	7.0 mil. persons	175.4 mil. persons		116.8 mil. Persons	299.2 mil. persons

(2) Emergency of the Project

Vietnam is one of the countries which suffered the most serious damages from natural disasters among Asian countries which are hit by it frequently. Especially, in the Central region of Vietnam, landslide of sand and stone, flash flooding and other natural disaters occur frequently due to meteorological and geographical reasons. Due to these natural disasters, road users are exposed to danger when using bridges and traffic flow throughout the year can not be secured. Also, a stable access to social services can not be maintained to the inhabitants. On the other hand, although it has focused since 1975 on the rehabilitation of bridges damaged during the war, the GOV has been obliged to replace them with temporary structures due to the lack of a sufficient budget. Those temporary bridges are now suffering from insufficient capacity and cannot handle heavy vehicles, and shall be closed during flooding due to insufficient clearance. In the proposed central region also, most of temporary bridges have been unimproved.

Serious social loss has been recognized because high ratio of poverty in the proposed regions and the foregoing situation result in major obstacles in stable access for regional residents to living and social services. Therefore, in order to reduce poverty and keep up with the increasing population in the region, improvement and development of roads and bridge are announced as the high-priority objectives.

Smooth and safe traffic and stable supply of daily commodity will be ensured by replacing existing bridges with permanent bridges with stable traffic flow through a whole year against flooding. At the same time, to ensure transportation system during emergency such as flooding will lead into sense of ease of residents and contribute to improvement of livelihood and

disparity.

(3) Consistency with GOV middle and long term development plan

The GOV settled the "National Strategy for protection against disasters until 2030" and the "National Target Program of measures for climate change". According to them, the GOV stated the construction of strong transport infrastructure against flooding as one of the disaster measures in the Central region. Also, the GOV announced Comprehensive Poverty Reduction and Growth Strategy (CPRGS) in 2002 and expressed to tackle the poverty reduction in order to improve the social and economic disparity among regions. Based on the GPRGS, the 9th 5-years National Development Plan (2011 – 2016) was established and in consideration of achieving sustainable development with high growth, further development of infrastructures including transport infrastructures is considered as one of the most important development objectives in the Plan.

MOT aims to improve existing bridges by replacing them with new ones in order to develop the uncompleted road network and to ensure the stable transport of agricultural, forestry and fishery products under the target of improvement and development of rural road network meeting the national design standard in the "Adjustments to the Transport Development Strategy up to 2020 with a Vision toward 2030" issued in 2009.

The Project's aim is to realize strong traffic infrastructures against floods, to improve the rural road network resolving traffic bottle-neck, to contribute to the improvement of living and economic activity for regional residents by ensuring stable access of agricultural, forestry and fishery productions to market, to stimulate regional economy and to reduce poverty. Therefore, implementation of the Project is consistent with the objectives of the GOV's national development plan.

(4) Consistency with GOJ ODA policy

In 2009, the GOJ revised the country assistance policy in Vietnam to express the strengthening of assistance to 4 important categories. Regarding the development of arterial road network in interurban area for transport sector, the Project will promote the following subject. In order to strengthen its international competitiveness and to enhance its economic growth, it is necessary to assist the country when considering and selecting the proper priority between arterial roads, railway, port and airport. Concerning development and disparity improvement for living and social services, rural infrastructures will be supported especially in the northern mountainous area, the central mountainous area, and the Mekong Delta area which are defined as important areas.

The Project is to contribute to the development of rural infrastructures in the central region including mountainous area, to the improvement of living and social standard, and to reduce disparity. Therefore, the project has adequate consistency with GOJ's ODA policy.

3.4.2 Effectiveness

(1) Quantitative effectiveness

The following quantitative effectiveness is expected with the implementation of the Project;

Indicator	Base-line (year 2011)	Target (year 2016)
Reduction of closed traffic days by flood and etc.	0 to 20 days (depend on bridges)	0 day
Improvement of bridge capacity	Tam Ngan Br. & Ngoi Ngan Br.: Motorbike only	Up to 13 tons
	Ea Suop Br. & Krong K'mar Br.: Up to 18 tons	Up to 18 tons
Widening of the bridges	Tam Ngan Br.: 1.4 m	5.5 m
	Krong K'mar Br.: 4.4 m	7.0 m
	Ea Suop Br.: 4.4 m	7.0 m
	Ngoi Ngan Br.: 3.5 m	7.0 m
Reduction of bridge maintenance cost	VND 35.4 to 360 million / bridge (depend on bridges)	VND 10 million / bridge

(2) Qualitative effectiveness

The following qualitative effectiveness is expected with the implementation of the Project;

1) Improvement of Livelihood of the inhabitants

With the construction of all-weather bridges against flooding and etc, the accessibility of beneficiaries will be improved and the access to living and social services such as market, administrative office, hospital, school and etc will be easier. Moreover, inhabitants will feel safe due to a stable provision of materials for livelihood.

2) Enhancement of Regional Economic Activities and Poverty Reduction

The construction of permanent bridges with higher capacity and without speed reduction, will increase the transport capacity and secure time scheduled will enhance the regional economic activities. Moreover, it is expected to reduce poverty and upgrade living standard. The following table shows the expected improvement of driving speed and increase of traffic volume for each bridge.

Indicator	Base-line (year 2011)				Target (year 2016)			
	Tam Ngan Br.	Ea Suop Br.	Krong K'mar Br.	Ngoi Ngan Br.	Tam Ngan Br.	Ea Suop Br.	Krong K'mar Br.	Ngoi Ngan Br.
Speed (Limited/Design)	5km/h	5km/h	5km/h	5km/h	40km/h	30km/h	40km/h	40km/h
Traffic Volume (PUC)	432	2,867	2,896	1,421	870	4,087	4,127	2,651

3) Time Saving and Reduction of Traffic Accident

The increase of the bridge width will enable vehicles to pass each other, eliminating waiting times at bridge approaches and saving time. In addition, this widening will further secure

safety and smooth traffic and contribute to the reduction of traffic accidents.

4) Saving Maintenance Cost and Effective Utilization of Budget

As permanent bridges will be constructed with concrete, the maintenance costs will be reduced. Moreover, the limited budget is expected to be utilized effectively for other bridges when the saving maintenance costs will be allocated to them.

5) Improvement of Accessibility at another Location by Utilization of Existing Bailey Bridges

Many crossing points have no crossing structure in the central area, which prevents access to markets and social services for rural villages. On the other hand, the existing Bailey bridges at Ea Suop and Krong K'mar bridge sites will be removed after completion of the new bridges. Therefore, the accessibility to living and social services at the above areas without crossing structure will be improved by diversion and utilization of the removal Bailey bridges.

Based on the above mention, it was verified that the Project has highly appropriateness and effectiveness.