

**MINISTRY OF TRANSPORT OF VIETNAM  
THE SOCIALIST REPUBLIC OF VIETNAM**

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT FOR DEVELOPMENT  
OF  
TRAFFIC CONTROL SYSTEM  
FOR EXPRESSWAY IN HANOI  
IN  
VIETNAM**

**March 2012**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ORIENTAL CONSULTANTS CO., LTD.  
METROPOLITAN EXPRESSWAY CO., LTD.**

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## PREFACE

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

The survey team held a series of discussions with the officials concerned of the Government 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 the Country

The Socialist Republic of Vietnam (hereinafter referred to as “Vietnam”) is a socialist country, which is situated in the east side of Indochina, and faces China in the north, Laos in the west, and Cambodia in the southwest. Population is 85.79 million according to census in April, 2009, and an area is 329 thousand sq. km, which is slightly smaller than Japan.

Hanoi metropolitan area, study area for the Project, is located in temperate climate area with a rainy season from April to October. Mean temperature of Hanoi is 16 deg. C. in January and 29 deg. C. in July. Average annual rainfall is 1,704 mm, and exceeds 4,000 mm in some places in the mountain area due to the Annamite Range.

GDP in Vietnam is 101.9 billion dollars in 2010 according to IMF statistics. Its economy was converted to market-oriented economy after Doi Moi in December 1986 as well as Chinese reform and liberalization. In the Communist Party National Meeting in December 1996, industrialization and modernization strategies were adopted which aims to enter the ranks of industrial nations by 2020. Official development assistance and foreign investment are driving the economy of the nation. GDP, which temporarily dropped by the world financial crisis, indicates steady growth such as 8.5 % in 2007, 6.3 % in 2008, 5.3 % in 2009, and 6.8 % in 2010, and inflation rate stays in a high level of 11.8 % in 2010. Affiliation with WTO has been an important target for the government, and it was realized in January 2007.

Major export items are crude oil, garment, and agricultural and fishery products. Especially Vietnam was the second biggest exporting country of rice in the world, but presently export is restricted. Production of cashew nuts and black pepper in Vietnam is the largest and makes up one third of the world production. Other than rice, major exported goods are coffee, tea, rubber, and fishery products. However, proportion of agriculture in GDP has decreased against increase of other industries. Breakdown of GDP is 21.99 %, 39.91 %, and 38.10 % for primary, secondary, and tertiary industry respectively. Crude oil production is the third position in Southeast Asian countries.

The Five-Year Social and Economic Development Plan of Vietnam (2011 – 2015) was approved in the Parliament in November 2011, which has a goal of growth rate 6.5 to 7 % in average of gross domestic product, and intends restructuring of economy through public investment and reformation of state enterprise.

### 2 Background and Outline of the Project

Development of infrastructure including transportation sector is the most important target in the abovementioned Five-Year Social and Economic Development Plan. The development strategy for transport sector established in 2009 with assistance of Japan pointed out importance of development of trunk road network in major cities such as Hanoi, and construction of expressway network is in progress so as to cope with rapidly increasing traffic demand.

At present reporting of incidents depends upon communication from road users. It takes time to grasp exact location and situation of incidents. Traffic regulation can be made only on incident site by dispatched staff, and it also takes time. In order to improve such situation, development of traffic control system is the most pressing issues, which enables early detection of incidents, confirmation of exact situation, quick decision of proper traffic regulation, and prompt indication of traffic regulation sign.

In a part of expressways in Vietnam, ITS (Intelligent Transport System) has been developed. However, number of staff who can operate the system is not sufficient. In addition the system are introduced in several sections of expressways recently completed without compatibility of technical standards. As a result, convenience for users is not sufficient, and investment for the system is not so efficient.

In order to strengthen the operation and management system of ITS for the expressways in Vietnam, JICA has dispatched the Expressway Management Institution Advisor and is implementing the technical cooperation project for operation and management for expressway (The Project for Capacity Enhancement in Road Maintenance). These cooperation aims to resolve the abovementioned issues through establishment of the operation standards and manuals for expressways including traffic control. Furthermore in the above Technical Cooperation Project, field training is planned for traffic control personnel in a suitable section equipped with traffic control system.

This Project aims to procure and install ITS, especially traffic control equipment for the priority sections of the expressways in Hanoi metropolitan area. Consequently it is expected that ITS technology will be widely realized, number of operation staff of ITS will increase, and smooth traffic in the expressways will be realized.

### 3 Results of Preparatory Survey and Outline of the Project

In response to the request from the Government of Vietnam, the Government of Japan made a decision to conduct a preparatory survey for which JICA mobilized a study team to Vietnam from October 30 to November 28, 2011. The team discussed the Project with MOT, VEC, and MoPIC, and confirmed the components of the request, executed site surveys, and studied the needed equipment and the corresponding operation/maintenance procedures. The results of the preparatory survey conducted in Japan are summarized in the Draft Final Report, and a team for the explanation of the Report was sent to Jordan from January 8 to 14, 2012.

Based on the results of the field survey and discussions, the purpose of the Project is to introduce technology of traffic control system (ITS) in the expressways in Hanoi metropolitan area so as to get incident information on the expressways promptly and deliver information to road users without delay so as to minimize influence by road closure and congestion. For that purpose, Japan's Grant Aid will procure traffic control system which consists of roadside equipment, equipment in the control center, and communication system for the Ring Road No. 3 and QL-1 (National Highway No. 1) of the expressways in Hanoi metropolitan area.

Major equipment procured in the Project are summarized in the table below:

Category/System		Major Equipment	Quantity
Roadside Equipment	CCTV Camera	Traffic Monitoring Camera (PTZ Type)	39 nos.
		Event Detection and Vehicle detection camera (Fixed Type)	26 nos.
	Variable Message Sign Board	Variable Message Sign Board (VMS) Mobile Variable Message Signs (Mobile VMS)	6 nos. 2 nos.
Control Center Equipment	Control System	Main Monitor Display	4 nos.
		Liquid Crystal Display (for CCTV monitoring) Monitor Controller, etc.	12 nos. 1 set
	Software	Network Management System, etc.	1 set
Communication System		Media Convertor, etc.	1 set

#### 4 Project Implementation Schedule

The required duration for the implementation of the Project is 2.5 months for detailed design and 15.5 months for tendering and procurement.

#### 5 Project Evaluation

##### (1) Relevance

##### 1) Beneficiaries of the Project

Direct beneficiaries of the Project are the vehicles passing through expressways in the project site (20,000 vehicles per day) and their users. Indirect beneficiaries of the Project are 6.5 million residents in Hanoi City.

##### 2) Objective of the Project

The purpose of the Project is to introduce technology of traffic control system (ITS) in the expressways in Hanoi metropolitan area where traffic congestion and incidents are increasing. Consequently road information on the expressways can be collected promptly and precisely, and proper actions can be taken against the incidents and other events. It will contribute to ensure smooth traffic in the expressways in the area, and will be useful for improvement of life and stabilization of people's livelihood.

##### 3) Compatibility with Medium/Long Term Development Plan of Vietnam

In the Five-year Social and Economic Development Plan of Vietnam (2011 – 2015), further

development of infrastructures including transportation infrastructures is the important issues in order to realize sustainable development under continuous economic growth. Furthermore, in the development strategies for transport sectors for the year 2030, importance of development of trunk road network in major cities such as Hanoi and Ho Chi Minh is indicated.

The Project corresponds to these development plan and strategies, and coincides with the higher plans of the nation.

4) Compatibility with Aid Policies of Japan

Traffic control system procured by the Project is based on the advanced technologies of Japan. It coincides with Japanese economic strategies for Asian countries which utilize excellent technologies and experiences of Japan through assistance for development of infrastructures.

(2) Effectiveness

(A) Quantitative Effect

Table 1 Quantitative Effect

Effect Indicators	Base Line (Year 2011)	Target (Year 2016)
Required Time to provide Traffic Information to Road Users	Approx. 30 to 40 min. (Interval of updating of information in radio broadcasting)	Approx. 5 min.
Required Time to Dispatch Emergency Vehicle after Event Occurred	Approx. 30 min.	Approx. 5 min.

(B) Qualitative Effect

- 1) Accuracy of traffic information will be improved and convenience of road users will be upgraded.
- 2) Response time to traffic incidents will be shortened, and smooth traffic will be recovered in shorter time.
- 3) Road safety will be strengthened by providing meteorological information and incident information.

Consequently it is concluded that implementation of the Project is appropriate, and effectiveness of the Project is expected.

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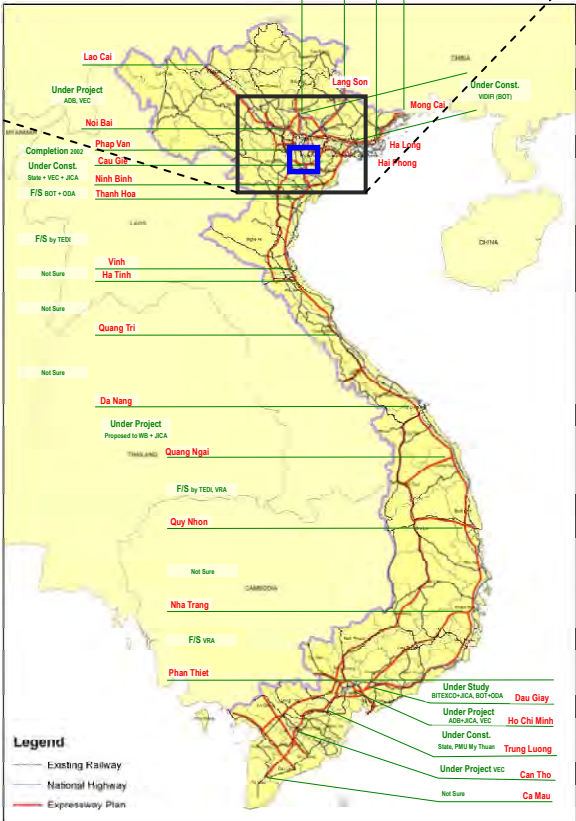
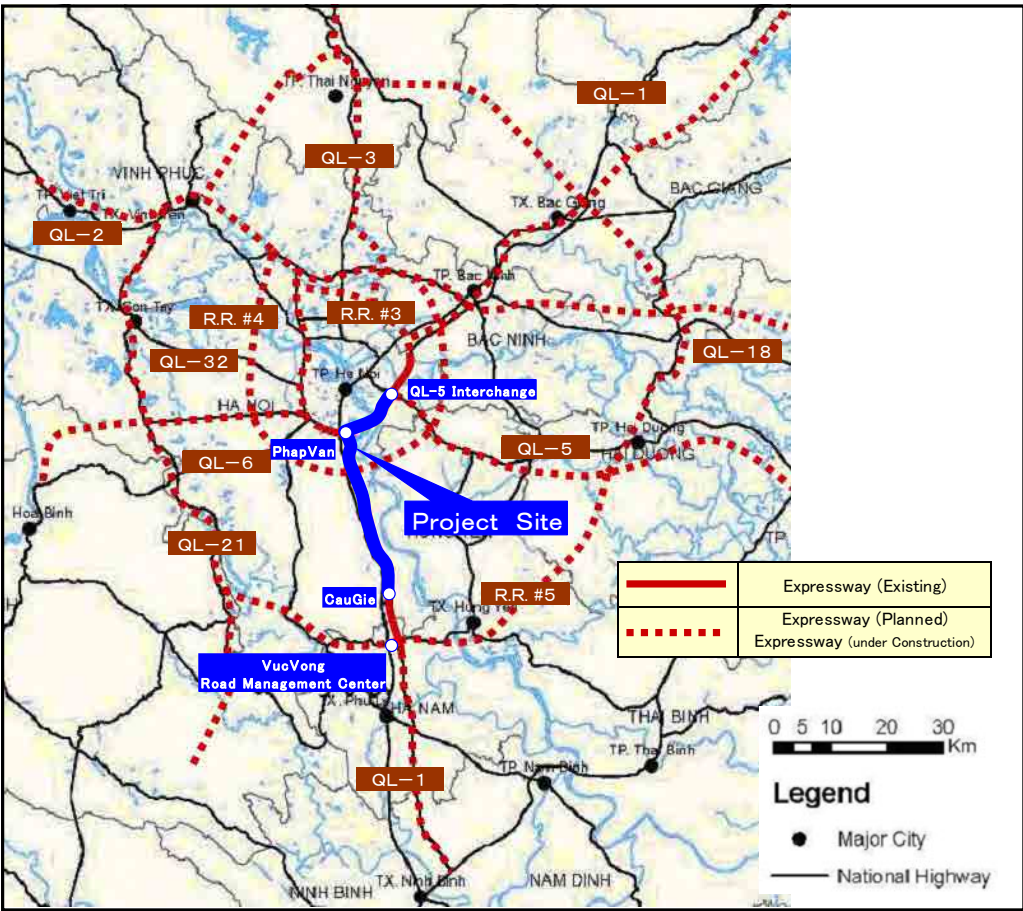
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# LOCATION MAP



Socialist Republic of Viet Nam



PERSPECTIVE / QL-1 Variable Message Sign Board

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## ABBREVIATIONS

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CCTV (camera)	Closed Circuit Television (camera)
CSS	Changeable Speed Limit Sign Board
IC	Interchange
ITS	Intelligent Transport System
JCT	Junction
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
PTZ (camera)	Pan Tilt and Zoom (camera)
VEC	Vietnam Expressway Corporation
VMS	Variable Message Sign Board

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## **CHAPTER 1 BACKGROUND OF THE PROJECT**

# Chapter 1 Background of the Project

## 1-1 Background of the Project

Passenger and cargo traffic has rapidly increased in Vietnam in accordance with recent economic growth especially in the urban area and trunk roads. This trend is expected to continue, and especially increase of private vehicles and heavy trucks may bring frequent occurrence of traffic congestion and incidents, which may hinder smooth traffic and logistic in the country. So as to cope with such increase of traffic demand, construction of expressways and development of Intelligent Transport Systems (ITS) is proceeded with throughout the country.

In order to strengthen the operation and management system and ITS system for the expressways in Vietnam, JICA has dispatched the Expressway Management Institution Advisor and is implementing the technical cooperation project for operation and management for expressway (The Project for Capacity Enhancement in Road Maintenance). These cooperation aims to resolve the abovementioned issues through establishment of the operation standards and manuals for expressways including traffic control. Furthermore in the above Technical Cooperation Project, field training is planned for traffic control personnel in a suitable section equipped with traffic control system.

This Grant Aid Project intends to support traffic control by collecting incident information by monitoring at road side, delivery of traffic information to road users by introduction of ITS especially traffic control system in the priority sections on the expressways in the Hanoi metropolitan area. Consequently ITS technology will be widely familiarized, and training of ITS operating engineers will be expedited, so that smooth traffic in the expressways and more efficient logistic in the region will be ensured together with public security.

## 1-2 Natural Conditions

There are no specific natural conditions to be considered in the project site since all roadside equipment will be installed in the existing right of way.

## 1-3 Environmental and Social Considerations

### 1-3-1 Scoping

The detailed environmental impact assessment (EIA) has not been required for the Project since the components of the project are mainly related to the installation of equipment. However, environmental protection commitment needs in accordance with the Decree 29/2011/ND-CP issued by the Government of Vietnam. In order to suggest the existing

environmental condition to the Vietnamese side, the environmental scoping was conducted at the project site on November 2011 by the JICA Preparatory Survey Team. The result of the scoping is shown in Table 1-3-1.

Table 1-3-1 Summary of Environmental and Social Impacts

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase	Operation Phase	
Pollution	1	Air pollution	D	D	No considerable impact on air condition
	2	Water pollution	D	D	No considerable impact on water quality
	3	Waste	C	D	<b>Construction Phase:</b> Waste caused by construction works will not occur normally. Generation of construction waste may cause by construction works <b>Operation Phase:</b> No considerable generation of waste
	4	Soil pollution	C	D	<b>Construction Phase:</b> Soil pollution caused by construction works will not occur normally. In case of accidental massive leaking of fuel or oil, soil pollution may occur. However, there are no agricultural lands around the project site. <b>Operation Phase:</b> No considerable impact on soil quality
	5	Noise and vibration	C	D	<b>Construction Phase:</b> Noise and vibration level caused by construction works will not occur normally. However, noise caused by construction vehicles and/or construction machineries may occur. <b>Operation Phase:</b> No considerable impact on noise and vibration.
	6	Ground subsidence	D	D	No considerable impact on ground subsidence
	7	Offensive odors	D	D	No considerable generation of offensive odors
	8	Bottom sediment	D	D	No considerable impact on bottom sediment
Natural Environment	9	Protected areas	D	D	No protected area in and around project site
	10	Ecosystem	C	D	<b>Construction Phase:</b> Removal or plant of shrubs in median and grasses of slope may occur on construction work. <b>Operation Phase:</b> No considerable impact on ecosystem, but necessity of recovery of roadside vegetation

	11	Hydrology	C	D	<b>Construction Phase:</b> Impact on ground water of pilling works will not occur normally. <b>Operation Phase:</b> No considerable impact on hydrology
	12	Geographical features	D	D	No considerable impact on geographical features.
Social Environment	13	Resettlement/ Land Acquisition	D	D	No impact on the present land user
	14	Poor people	D	D	No poor people at the project site
	15	Ethnic minorities and indigenous peoples	D	D	No residential area of ethnic minorities or indigenous peoples in and around the project site
	16	Local economies, such as employment, livelihood, etc.	C	C	<b>Construction Phase/Operation Phase:</b> Street vender will normally exist on the road for selling the foods and drinks to the drivers and/or customers.
	17	Land use and utilization of local resources	D	D	No considerable impact on land use and utilization of local resources
	18	Water usage	D	D	No considerable impact on water usage
	19	Existing social infrastructures and services	D	D	No considerable impact on existing social infrastructures and services
	20	Social institutions such as social infrastructure and local decision-making institutions	D	D	No considerable impact on social institutions
	21	Misdistribution of benefits and damages	D	D	No considerable impact on misdistribution of benefits
	22	Local conflicts of interest	D	D	No considerable impact on local conflicts
	23	Cultural heritage	D	D	No consideration impact on cultural heritage
	24	Landscape	D	D	No consideration impact on landscape
	25	Gender	D	D	No considerable impact on gender
	26	Children's rights	D	D	No considerable impact on children's rights
	27	Infectious diseases such as HIV/AIDS	D	D	No considerable impact on HIV/AIDS
	28	Working conditions (including occupational safety)	D	D	No considerable impact on working conditions



	29	Accidents	C	D	<b>Construction Phase:</b> Car accident will not occur normally. However, car accidents may occur because of traffic control during construction work. <b>Operation Phase:</b> No considerable accident on the project site
Other	30	Trans-boundary impacts or climate change	D	D	No trans-boundary impacts such as climate change

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected

### 1-3-2 Environmental Management Plan and Monitoring Plan

Monitoring form (draft) which is important for keeping the existing condition based on the scoping result is shown in Table 1.3.2. These environmental items should be monitored.

Table 1-3-2 MONITORING FORM (Draft)

Environmental Item	Responsible Person and Organization	Item	Location	Method	Frequency	Monitoring Results
Construction phase						
Air quality	- VEC - Construction contractor	Dust Fine particles of concrete	Around construction site	Visual observation and interviews with pedestrians	Visual observation: Daily Interviews: Monthly or as needed	
Noise and vibration	- VEC - Construction contractor	Noise and vibration caused by construction works	Around construction site	Interviews with persons concerned, hospital and pedestrians	Daily or Weekly as needed	
Waste	- VEC - Construction contractor	Disposal methods of construction waste	Construction site and disposal site	Visual observation and meetings with contractor	Visual observation: Daily Meetings: Monthly or as needed	
Plant of shrubs	- VEC - Construction contractor	Removal/or plant of shrubs	Construction site	Visual observation and meetings with contractor	Visual observation: Daily Meetings: Monthly or as needed	
Accidents	- VEC - Construction contractor	Effect of accident prevention measures	Construction site	Visual observation, and interviews with pedestrians and construction workers	Visual observation: Daily Interviews: Monthly or as needed	

Commercial activity on the road	- VEC - Construction contractor - VEC	Status of street vendors	Construction site	Visual observation and interviews with street vendors	Visual observation: Daily Interviews: Monthly or as needed	
Operation phase						
Traffic management	- VEC	Status of vehicular traffic	Around Interchange area	Interviews with road users and record of traffic accidents	2~6 times during the first year after completion	
Commercial activity near junction	- VEC	Status of street vendors	Around Interchange area	Interviews with street vendors	2~6 times during the first year after completion	

## **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 Purpose of the Project

It is one of the important issues for the Government of Vietnam to provide efficient and safe transport service with competitive strength for further promotion of economic growth of the country. Especially in Hanoi metropolitan area where traffic congestion and incidents are increasing, the government sets the goals to ensure smooth traffic in the expressways and efficient commodity flow in the region

In order to achieve the above overall goal, the purpose of the Project is to introduce technology of traffic control system (ITS) in the expressways in Hanoi metropolitan area so as to get incident information on the expressways promptly and deliver information to road users without delay so as to minimize influence by road closure and congestion.

#### 2-1-2 Basic Concept of the Project

The Project aims to procure traffic control system which consists of roadside equipment, equipment in the control center, and communication system for the Ring Road No. 3 and QL-1 (National Highway No. 1) of the expressways in Hanoi metropolitan area.

By this Project, ITS (traffic control system) is developed in some sections of the expressways in Hanoi metropolitan area. As the result, incident information and traffic information of congestion and regulation are quickly delivered to road users.

The requested Japanese assistance of the Project is procurement of roadside equipment such as CCTV camera, equipment and software of traffic control system, and communication system for the road sections mentioned above. Equipment for traffic control center will be installed in the Road Management & Traffic Control Office at Vuc Vong on QL-1.

Concept of the proposed traffic control system is shown in Figure 2-1-1. Table 3-1-1 summarizes the major equipment in the system.

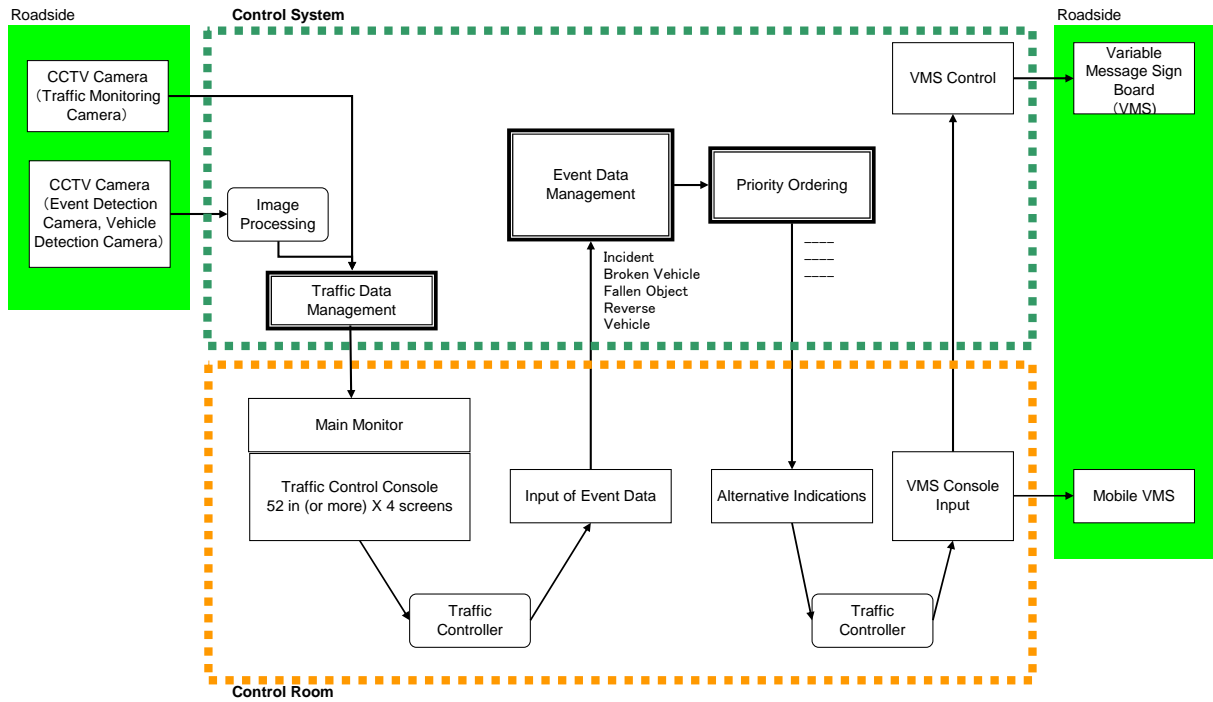


Figure 2-1-1 Concept of Traffic Control System

Table 2-1-1 Major Equipment

Category/System		Major Equipment	Quantity
Roadside Equipment	CCTV Camera	Traffic Monitoring Camera (PTZ Type)	39 nos.
		Event Detection and Vehicle detection camera (Fixed Type)	26 nos.
	Variable Message Sign Board	Variable Message Sign Board (VMS)	6 nos.
		Mobile Variable Message Signs (Mobile VMS)	2 nos.
Control Center Equipment	Control System	Main Monitor Display	4 nos.
		Liquid Crystal Display (for CCTV monitoring) Monitor Controller, etc.	12 nos. 1 set
	Software	Network Management System, etc.	1 set
Communication System		Media Convertor, etc.	1 set

## 2-2 Outline Design of the Japanese Assistance

### 2-2-1 Design Policy

#### 1) Basic Policy

In the design of traffic control system for expressways in Hanoi metropolitan area, it should be noted that breakdown of road function caused by traffic incident and broken-disabled vehicles will affect whole traffic flow on the expressways due to insufficient diversion routes. For the current traffic volume, therefore, it is more important for road management authorities to grasp the situation of the incident without delay, to deliver incident information to users and to recover road function by traffic regulation if required rather than distribution of information on traffic congestion which rarely occurs at present traffic volume.

In order to achieve the above purpose, the Project aims to install the traffic control system to collect incident information and event data through surveillance by roadside equipment and support traffic control service.

#### 2) Design Policy for Natural Environment

The land of Vietnam extends north and south. Natural conditions are vastly differs in the north and the south. The Project site, Hanoi City is located in the subtropical climate. The monthly average highest temperature is 33 degree Celsius in August and the lowest is 14 degree in January. Precipitation concentrates in the rainy season from May to September and little rainfall in winter season. In the Project it is not necessary to consider rainy season into construction schedule planning since no civil works are required.

#### 3) Design Policy for Social and Economic Condition

Traffic demand increases rapidly in Vietnam. Traffic jam on the expressways, which rarely occurs at present, may increase in future. Possibility of expandability of the system should be considered so that the traffic control system may correspond to change of traffic volume and traffic events on the expressways in accordance with change of social and economic conditions.

#### 4) Design Policy for Procurement and Business Environment

Installation of optical fiber cable and installation of CCTV cameras, VMS and other equipment is planned to be executed by local experienced firms. Some specialized works such as installation of software in computer, adjustment and test run of the system, and initial operation training will be made by Japanese engineers of manufacturers. Materials such as grass fiber cable and steel poles will be procured in the local market in Vietnam.

#### 5) Involvement of Local Contractors and Consultants

Contractors for ordinary electrical/mechanical works are available in Vietnam. Their techniques and work force will be fully utilized in the installation works of the Project. In the consulting service, ability of local engineers will be utilized as much as possible.

## 6) Design Policy for Operation and Maintenance

The equipment procured in the Project such as CCTV camera and VMS are presently used in some places in Vietnam. No problems are expected in operation and maintenance for those equipment. As for the control center equipment with software, training is required. Operation and maintenance is not difficult for trained staff, and equipment itself is not a complicated machine.

## 7) Design Policy for Grade of Equipment

Grade of equipment is similar with the standard equipment operated in Japan and other countries in the world. Specification of the equipment is based on the recommendation in the Study for Supporting ITS Standards and Operation Plan. (JICA 2011)

## 8) Design Policy for Procurement Method and Implementation Schedule

### i) Methodology for Procurement

#### a) CCTV Camera (PTZ type and Fixed type)

There are no CCTV camera products produced in Vietnam by local or foreign manufacturers. Products of other countries are available in local markets. In the Project, however, CCTV camera requires interface with other components of the system. It is highly possible to get troubles in the interface between the systems of different manufacturers. Since some information regarding interface is not disclosed to others, troubles may happen when the systems of different manufacturers are incorporated at site.

In order to avoid such troubles, the Supplier should examine the performance between different systems before the equipment is transported from factories to the site. Therefore it is planned that the CCTV cameras are procured in Japan or Vietnam the quality of which can be confirmed by the Supplier

#### b) Variable Message Sign Board (VMS) and Mobile VMS

Several VMS manufactured by the Vietnamese maker are installed on the national highways and toll gates in and around Hanoi City. However those products have no function of LED switching in order to avoid deterioration due to unchanging lighting for long hours, and no experiences to develop a product for the system operated through network.

Therefore VMS and mobile VMS should be products of Japanese manufacturers which conforms to the specification, and which has experiences to be supplied to other countries.

#### c) Display (Size 55 and 20)

Products of Korea and Japan are available in Vietnam, and which are widely used in many countries. In the Project, the Supplier may procure products the quality of which can be confirmed.

d) Data Server, Station, PC, and Peripheral Equipment

These products manufactured in other countries are widely distributed and used by many users in Vietnam, and no problems are expected in quality. These will be procured in the Vietnamese market.

e) Software

Simple software may be developed in some Vietnamese firms. However, traffic event data, which is the main portion of the software for the Project can be developed by Japanese firms. Traffic event data assists selection of the most suitable information to be indicated among several input data, and it is most effective to adopt technologies based on the knowledge and experiences accumulated in the long history of development of ITS in Japan. Other software, which are closely associated with the above software, should be developed by the same manufactures so that the systems may function as one unit.

Therefore the software shall be products of the Japanese experienced manufacturers.

f) Communication System

Necessary products manufactured in other countries such as L2 and L3 switches are available in Vietnam. Those can be used in the Project through examination of reliability and experiences of utilization in the similar works.

ii) Tendering and Period for Procurement

The Project will be tendered in single package to ensure economy in cost, efficiency and competitions among potential tenderers. The procurement schedule will be prepared to ensure that the project will be completed within the duration as called for in the Contract. Special attention will be paid to coordination of the schedule of a series of works such as equipment manufacturing, transportation and installation on site.



## 2-2-2 Basic Plan (Equipment Plan)

### 1) Overall Plan

#### 1-1) Review of Existing Plan for Traffic Control System

The design of the traffic control systems for expressway in northern Viet Nam area has shown below.

Table 2-2-1 Previous Designs of Traffic Control System for Expressway

Study	Organization	Outline of Engineering Design	Term
1. Study for Supporting ITS Standards and Operation Plan Development	JICA	In Vietnam, where expressway construction is underway nationwide, it has become an urgent issue to perform ITS implementation in an integrated way over many different road sections. (1) Definition of "Road Map of ITS" implementation (2) Definition of service levels of expressway operation (3) Proposals on frameworks needed for expressway operation using ITS (4) Selected key policies as premises for structuring ITS (5) Documents of the Draft ITS Standards (6) ITS Pilot Project Plan for integrating expressways	- Jan., 2011
2. QL-1 / PhapVan – CaoBo(Ninh Binh) ITS Design	VEC/CadPro	The facility design which takes for the traffic control system of the about 78km section from PhapVan and CaoBo interchange of the QL-1. In this design, the traffic control office was planned at VucVong Road Management Office.	- Mar., 2011
3. Study for Assistance of ITS Integration Project Implementation over NH No.3 and Na Noi Metropolitan Area	JICA	Design of the development plan which relates to the ITS development in the North Vietnam area. (Special Assistance for Project Implementation)	Aug., 2011 - Mar., 2012

The outline of each design are shown below.

## ① Study for Supporting ITS Standards and Operation Plan Development

### (1) Outline of Study

#### 1. Establishment of Basic Policy of System

Basic policies are as listed below:

- Layout of CCTV cameras: 2km interval on the expressway
- Layout of Vehicle Detectors: one of the following three concepts in accordance with traffic volume; i) Middle point of interchanges, ii) the place where traffic congestion frequently occurs, and iii) 2 km interval
- Integration of control of roadside equipment (Introduction of NVR network video recorder)
- Establishment of transmission method (Combination of SDH and G-Ethernet)

These will be verified through further study.

#### 2. Establishment of ITS Standards

In this Study, following standards were established:

Design standard, Standard of equipment specification, Standards for message and data, and Communication system plan

#### 3. Establishment of ITS Pilot Project

It was confirmed in this Study to carry out “examination of procedures for integration of ITS developed by road sections and unification of ITS development standards” and “Examination of practicality of basic policies of the system selected in the ITS Standard”

### (2) Equipment Plan

Traffic control equipment standardized in this Study are CCTV, Variable message sign boards (VMS), changeable speed limit sign boards, control center equipment, central processing equipment and communication equipment. Specification of these equipment are shown in Table 2-3.

Although mobile VMS was not included in this Study, it will be included in the components of the Grant Aid Project in order to supplement VMS.

② ITS Design for QL-1 Phap Van – Cao Bo (Ninh Binh) by VEC/CadPro

(1) Outline of the Design

This is a design to introduce traffic control system to the section of Phap Van to Cao Bo (78 km) of QL-1 (National highway No. 1, toll expressway) A traffic control room is planned in the road management office at Vuc Vong.

(2) Equipment Plan

Equipment which was standardized in this project are CCTV, variable message signboards, changeable speed limit sign boards, control center equipment, central processing equipment and communication equipment. Major specifications are indicated in Table 2-3. Cost is summarized below including toll rate system. Quantities of major equipment are as follows:

Route monitoring camera: 78, Guiding camera: 7, Vehicle tracking camera: 5 (20 in original plan), Variable message sign board: 2, Changeable speed limit sign boards: 10

Table 2-2-2 Cost for Traffic Control System for Phap Van – Cao Bo

**SUMMARY TABLE**  
PROJECT: CẦU GIÈ – NINH BÌNH EXPRESSWAY (PHASE 1)  
PACKAGE 10.1: MANAGEMENT AND OPERATION SYSTEM FOR EXPRESSWAY

No	ITEM	UNIT	QUANTITY	VALUE		NOTE
				Internal (VND)	Import (USD)	
<b>A</b>	<b>Construction cost</b>			<b>61,469,870,000</b>		
	Optical Cable line			61,469,870,000		
<b>B</b>	<b>Equipments cost</b>			<b>120,646,443,753</b>	<b>7,592,582</b>	
1	Toll system		1	48,098,882,073	4,142,852	
2	Monitor and control system		1	52,437,874,632	1,946,691	
3	Communications system		1	17,109,687,048	1,283,040	
5	Addition monitor traffic system from Km 180 to Km 188+300.		1	3,000,000,000	220,000	TT
<b>C</b>	<b>Consultant cost</b>			<b>23,501,140,000</b>	<b>29,496,133,840</b>	
1	Cost to adjust project			-		
	Survey cost			536,140,000		
	Detail design and working drawing design cost			19,965,000,000		
	Other consultant cost			3,000,000,000		
<b>D</b>	<b>Other cost</b>			<b>19,978,695,710</b>		
1	Import tax (Temporary)			6,757,398,284		5% costs of imported equipment
2	Other cost			13,221,297,426		
	<b>Sum (A+B+C+D)</b>			<b>380,744,115,136</b>		<b>Temporary 1USD=17800VND</b>
<b>E</b>	<b>Contingency cost</b>			<b>36,074,411,514</b>		
	<b>TOTAL</b>			<b>396,818,526,650</b>		

③ Comparison between Existing Studies and Designs

Table 2-3 summarizes comparison of the specifications of equipment in the abovementioned study/design. The last column indicates specifications adopted in the Grant Aid Project. Function and location of each equipment are mentioned in the following section.

Table 2-2-3 Comparison of Specifications of Traffic Control System Equipment

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
<b>CCTV Monitoring</b>				
CCTV Camera	Roadside	<p><u>Function (Purpose):</u> Traffic Monitoring, Event Detection, Vehicle Detection</p> <p><u>Installation Site:</u> Every 2 km (PTZ type) for</p> <ul style="list-style-type: none"> <li>o <b>Traffic Monitoring.</b> Event detection is not intended.</li> </ul> <p>For o <b>Event Detection</b>, Fixed type camera shall be installed at IC/Junction and necessary points on the through lane (with image recognition function)</p> <p>For o <b>Vehicle Detection</b>, fixed type cameras shall be installed at every 500m intervals in congestion-prone sections. (with image recognition function)</p> <p><u>Camera Control:</u> Remote control of PTZ camera shall be made by introduction of Network Video Recorder.</p>	<p><u>Function (Purpose):</u> Traffic Monitoring, Event Detection, Vehicle Detection</p> <p><u>Installation Site-1:</u> o <b>Traffic Monitoring Camera:</b> Every 2 km (PTZ type) on Ring Road No.3 and QL-1. For traffic monitoring of IC's ramp way shall be installed.</p> <p><u>Installation Site-2:</u> o <b>Event Detection Camera:</b> For event detection, Fixed type camera shall be installed at necessary sections on the through lane (with image recognition function)</p> <p><u>Installation Site-3:</u> o <b>Vehicle Detection Camera:</b> For vehicle detection, fixed type cameras shall be installed at merging section of Interchange/Junction expressway (through lane). (with image recognition function)</p> <p><u>Camera Control:</u> Remote control of PTZ camera shall be made by introduction of Network Video Recorder.</p>	<p><u>Function (Purpose):</u> Traffic Monitoring, Event Detection, Vehicle Detection</p> <p><u>Installation Site-1:</u> o <b>Traffic Monitoring Camera:</b> Every 2 km (PTZ type) on Ring Road No.3 and QL-1. For traffic monitoring of IC's ramp way shall be installed.</p> <p><u>Installation Site-2:</u> o <b>Event Detection Camera:</b> For event detection, Fixed type camera shall be installed at necessary sections on the through lane (with image recognition function)</p> <p><u>Installation Site-3:</u> o <b>Vehicle Detection Camera:</b> For vehicle detection, fixed type cameras shall be installed at merging section of Interchange/Junction expressway (through lane). (with image recognition function)</p> <p><u>Camera Control:</u> Remote control of PTZ camera shall be made by introduction of Network Video Recorder.</p>
		<p><u>Function (Purpose):</u> Traffic Monitoring, Condition Monitoring</p> <p><u>Installation Site:</u> o <b>Route Monitoring Camera:</b> Will be installed at every approx. 2 km along the route at the height of 12 m of pole toward two different directions. Fixed angular field of view. 68 cameras will be installed at 34 points through 78 km long route.</p> <p>o <b>Guiding Camera:</b> PTZ camera to monitor whole area of IC. Will be installed at 7 points of Khe Hoi, Van Diem, Dai Xuyen, Vuc Vong, Liem Tuyen, and Cao Bo.</p> <p>o <b>Vehicle Tracking Camera:</b> 2 cameras for each direction will be installed at 5 toll gates (Khe Hoi, Van Diem, Dai Xuyen, Vuc Vong, Liem Tuyen), total 20 nos.</p> <p><u>Others:</u> NVR is used as temporary storage of monitored traffic image</p>		

<b>Function Package</b> (Equipment Components)	<b>Location</b>	<b>ITS Standard for Viet Nam</b> (Draft/Jan., 2011)	<b>Design for the Section between Phap Van, Cau Gie and Ninh Binh</b> (Design by CadPro with Comments by KEC, MOT and VEC)	<b>Design Policy for Grant Aid Project</b>
		<p><u>Operation Hours:</u> Monitoring all day all year</p> <p><u>Image Compression Type:</u> MPEG-4</p> <p><u>Communication Protocol:</u> IP</p>	<p><u>Operation Hours:</u> N.A.</p> <p><u>Image Compression Type:</u> H.264 and MJPEG</p> <p><u>Communication Protocol:</u> IP</p>	<p><u>Operation Hours:</u> Monitoring all day all year</p> <p><u>Image Compression Type:</u> MPEG-4</p> <p><u>Communication Protocol:</u> IP</p>
<b>CCTV Camera Controller</b>	Road Management Office (Vuc Vong)	<p><u>Function:</u> PTZ Control</p> <p><u>Location of Control Function:</u> Regional Main Center and Road Management Office</p> <p><u>Communication Protocol:</u> IP</p> <p><u>Others:</u> On obligations for information disclosure regarding camera control</p>	<p><u>Function:</u> Camera no function PTZ, setup parameter for camera (No5, p95)</p> <p><u>Location of Control Function:</u> Center operation for expressway Cau Gie – Ninh Binh (No5, p94)</p> <p><u>Communication Protocol:</u> IP (No5, p52)</p> <p><i>Comment by KEC:</i> N/A</p>	<p><u>Function:</u> PTZ Control</p> <p><u>Location of Control Function:</u> Expressway management Center (VucVong)</p> <p><u>Communication Protocol:</u> IP</p>
<b>CCTV Monitoring</b> (including screen and console)	Road Management Office (Vuc Vong)	<p><u>Screen Size:</u> 20 inch or more</p> <p><u>Selection of Screen:</u> Specific camera shall be displayed.</p> <p><u>Operation hours:</u> Shall be displayed all day all year</p>	<p><u>Screens size:</u> 21"+joystick+keyboard specialize (No5, p69)</p> <p><u>Selection of Screen:</u> Specific camera shall be displayed. (No5.p69)</p> <p><u>Operation hours:</u> Shall be displayed all day all year (7, 19)</p>	<p><u>Screen Size:</u> 20-21 inch or more</p> <p><u>Selection of Screen:</u> Specific camera shall be displayed.</p> <p><u>Operation hours:</u> Shall be displayed all day all year</p>

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
<b>Vehicle Detection</b>				
Vehicle Detector	Roadside	<p><u>Type:</u> Loop-Coil, Ultra sonic, Image recognition</p> <p><u>Function:</u> Measurement of traffic volume and average vehicle velocity</p> <p><u>Operation:</u> Measurement all day all year</p> <p><u>Others:</u> Regulation on obligations for disclosure of communication interface</p>	<p><u>Type:</u> By CCTV camera</p> <p><u>Function:</u> Processing information from CCTV camera to execute function measurement of traffic volume and average vehicle velocity ( KEC, p84)</p> <p><i>Comment by KEC:</i> With a fix camera, CCTV cannot monitor extreme close-up accident and congestion situation. Recommendation to use Pan-Tilt equipment and zoom lens.( KEC, p85)</p>	<p><u>Type:</u> Image recognition</p> <p><u>Function:</u> Measurement of traffic volume, traffic velocity and type of vehicle</p> <p><u>Operation:</u> Measurement all day all year</p> <p><u>Others:</u> Regulation on obligations for disclosure of communication interface</p>
<b>Traffic Analysis</b>				
Traffic Data Server	Road Management Office (Vuc Vong)	Server including Monitor, Back-up media, Drive, Printer	Structure of traffic data server ( No5, p78)  <i>Comment by KEC:</i> No survey and analysis operating conditions to calculate volume of hard disk and capacity of CPU (KEC, p119)	Server including Monitor, Back-up media, Drive, Printer

<b>Function Package</b> (Equipment Components)	<b>Location</b>	<b>ITS Standard for Viet Nam</b> (Draft/Jan., 2011)	<b>Design for the Section between Phap Van, Cau Gie and Ninh Binh</b> (Design by CadPro with Comments by KEC, MOT and VEC)	<b>Design Policy for Grant Aid Project</b>
<b>Traffic Analysis Processing</b>	Road Management Office (Vuc Vong)	<p><u>Input Data:</u> Traffic data collected by vehicle detector</p> <p><u>Major Functions:</u> Traffic Analysis (Parameter: vehicle type, Time, Lane), Average Velocity Analysis, Ratio of Heavy Vehicle, Congestion Evaluation, Analysis Result Recording</p>	<p><u>Input Data:</u> Images from CCTV cameras</p> <p><u>Major Functions:</u> Included in Image Analysis software Traffic parameter (Number of vehicles, velocity) from images</p>	<p><u>Input Data:</u> Traffic data collected by vehicle detector</p> <p><u>Major Functions:</u> Traffic Analysis (Parameter: vehicle type, Time, Lane), Average Velocity Analysis, Heavy Vehicle ratio, Analysis Result Recording</p>
<b>Event Detection</b>				
<b>Image Recognition Processing</b>	Road Management Office (Vuc Vong)	<p><u>Major Functions:</u> Automatically detecting the occurrence of an incident, broken-down vehicles and left obstacles on the expressway. Recording of detected results</p> <p><u>Communication Protocol:</u> TCP/IP</p>	No function at roadside since all data are processed at centers	<p><u>Major Functions:</u> Automatically detecting the occurrence of an incident, broken-down vehicles and left obstacles on the expressway. Recording of detected results</p> <p><u>Communication Protocol:</u> TCP/IP</p>
<b>Traffic Monitoring</b>				
<b>Traffic Monitoring Management Server</b>	Road Management Office (Vuc Vong)	<p><u>Function:</u> Indicating Traffic Event Data produced by traffic event data server and Information directly provided (CCTV monitoring, Incident occurrence information, Construction work information, Traffic regulation information, Information from persons in charge) on a main monitor display (large screen)</p>	<p><u>Function:</u> Traffic image analysis system, Alarming, and Recording of unusual situations</p>	<p><u>Function:</u> Indicating Traffic Event Data produced by traffic event data server, and Information directly provided (CCTV monitoring and Incident occurrence information) on a main monitor display (large screen)</p>

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
		<p><u>Event Category to be Displayed:</u> Incident (Traffic incident, Broken-down vehicle, left obstacle, reversing vehicle, Vandalism, Natural disaster) Traffic congestion (Traffic jam) Significant weather (Heavy rain, Strong wind, Fog, High temperature) Construction works (Information on works) Traffic regulation (Closure, Entrance closure, Lane closure, Speed restriction, Warning information)</p>	<p><u>Event Category to be Displayed:</u> Incident, Broken-down vehicle, left obstacle, reversing vehicle Traffic regulation Expressway closure, Entrance closure, Lane closure, Speed restriction, Warning information)</p>	
Traffic Monitoring Management Console	Road Management Office (Vuc Vong)	<p><u>Contents Displayed:</u> Controlled area of each main center (600km x 600km) can be displayed, and each IC shall be displayed with 10 cm size.</p> <p><u>Screen Component:</u> A large screen shall be composed of twelve (=3 x 4) 60-inch screens.</p>	<p><u>Contents Displayed:</u> All of information to manager expressway</p> <p><u>Screen component :</u> 24 screens (=3x8) 52-inch (5,91)</p> <p><i>Comment by KEC: (102, KEC)</i></p> <ul style="list-style-type: none"> <li>- Monitor border is too thick (1.78cm). Recommendation: use monitor with border reduced by half</li> <li>- Review function and power of control computer</li> </ul> <p><u>Need to support more display mode:</u> Single screen, 4 screen components, cyclic scene, zoom in, zoom out</p>	<p><u>Screen component :</u> 4 screens (=2x2) 52-55 inch screens.</p>



<b>Function Package</b> (Equipment Components)	<b>Location</b>		<b>ITS Standard for Viet Nam</b> (Draft/Jan., 2011)	<b>Design for the Section between Phap Van, Cau Gie and Ninh Binh</b> (Design by CadPro with Comments by KEC, MOT and VEC)	<b>Design Policy for Grant Aid Project</b>
<b>Traffic Event Data Mangement</b>					
<b>Traffic Event Data Server</b> (Hardware + Software)	Road Management Office (Vuc Vong)	<p><b>Major Functions:</b> Accumulation of traffic event data and preparation of information to be distributed</p> <p><b>Description of Traffic Event Data:</b> Incident, Traffic jam, Significant weather, Construction works, Traffic Regulation Alarm set-up and relevance between events are considered.</p> <p><b>Preparation of information to be distributed:</b> Contents to be displayed in VMS, Prioritization of information reflecting contents and points to be displayed</p>	<p><b>Major Functions:</b> Accumulation of traffic event data and preparation of information to be distributed (5, 72)</p> <p><b>Description of Traffic Event Data:</b> —</p> <p><b>Preparation of information to be distributed:</b> Contents to be displayed in VMS, Prioritization of information reflecting contents and points to be displayed ( No5, p 72)</p>	<p><b>Major Functions:</b> Accumulation of traffic event data and preparation of information to be distributed</p> <p><b>Description of Traffic Event Data:</b>  <ul style="list-style-type: none"> <li>o <b>Incident</b> Traffic incident, Broken-down vehicle, left obstacle, reversing vehicle</li> <li>o <b>Traffic regulation</b> Expressway closure, Entrance closure, Lane closure, Speed restriction, Warning information)</li> </ul> </p> <p><b>Preparation of information to be distributed:</b> Contents to be displayed in VMS, Prioritization of information reflecting contents and points to be displayed</p>	
<b>Traffic Event Data Monitor</b>	Road Management Office (Vuc Vong)	<p><b>Function:</b> Contents shall be displayed on the screen which was processed by the above traffic event data server.</p>	<p><b>Function:</b> Contents shall be displayed on the screen which was processed by the above traffic event data server.</p>	<p><b>Function:</b> Contents shall be displayed on the screen which was processed by the above traffic event data server.</p>	
<b>VMS Display</b>					
<b>Variable Message Sign Board (VMS)</b>	Roadside	<p><b>Function:</b> To distribute road users traffic event information</p>	<p><b>Function:</b> To distribute road users traffic conditions</p>	<p><b>Function:</b> To distribute road users traffic event information</p>	

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
		<p><u>Location to be Installed:</u> Entrance, Junction, and Short of exit (1st step), Additional installation short of toll gate, and Midpoint of ICs (2nd step)</p> <p><u>Contents Displayed:</u> Traffic Event (including contents of traffic regulation), Causative traffic event, Information of Location (Section)</p> <p><u>Number of Letters to be Displayed:</u> 24 letters in 2 or 3 lines</p> <p><u>Function:</u> Indication of speed limit</p> <p><u>Location:</u> Through lane and Midpoint of ICs</p>	<p><u>Location to be Installed:</u> 2 points at Phap Van (Km 187+500) and Cao Bo (Km 258+800)</p> <p><u>Contents Displayed:</u> Location of trouble, Cause of trouble, and Display for guidance</p> <p><u>Number of Letters to be Displayed:</u> [To be confirmed] letters in 3 lines</p> <p><u>Function:</u> Indication of speed limit</p> <p><u>Location:</u> Midpoint of two toll gates</p>	<p><u>Location to be Installed:</u> o Ring Road No.3 Exit lane of each Interchange/Junction o Phap Van – Cau Gie Exit lane of each Interchange/Junction (Tram Thu Phi Toll Barrier)</p> <p><u>Contents Displayed:</u> Traffic Event (including contents of traffic regulation), Causative traffic event, Information of Location (Section)</p> <p><u>Number of Letters to be Displayed:</u> 24 letters in 2 or 3 lines</p> <p><u>Function:</u> Indication of speed limit</p> <p><u>Location:</u> Through lane and Midpoint of ICs in QL1 and Ring Road No.3</p>
Changeable Speed Limit Sign Board (CSS)	Roadside	<p><u>Function:</u> To produce message from data elements of message displayed in VMS and input message in VMS control, and to indicate on roadside VMS through VMS center controller</p> <p>Message can be classified.</p>	<p><u>Function:</u> To produce messages displayed in VMS by the following three methods: 1. Manual input 2. Selection from available messages 3. Re-use messages previously used</p> <p>Message samples are available, but event class is not considered.</p>	<p><u>Function:</u> Regarding information which can be produced in the event data server, to produce message from data elements of message displayed in VMS and input message in VMS control, and to indicate on roadside VMS through VMS center controller (Selection from available messages and Re-use messages previously used)</p> <p>Message can be classified.</p>
VMS Center Controller	Road Management Office (Vuc Vong)	<p><u>Function:</u> To produce message from data elements of message displayed in VMS and input message in VMS control, and to indicate on roadside VMS through VMS center controller</p> <p>Message can be classified.</p>	<p><u>Function:</u> To produce messages displayed in VMS by the following three methods: 1. Manual input 2. Selection from available messages 3. Re-use messages previously used</p> <p>Message samples are available, but event class is not considered.</p>	<p><u>Function:</u> Regarding information which can be produced in the event data server, to produce message from data elements of message displayed in VMS and input message in VMS control, and to indicate on roadside VMS through VMS center controller (Selection from available messages and Re-use messages previously used)</p> <p>Message can be classified.</p>

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
<b>Communication System</b>				
<b>Integration Layer Network</b>	Network	<p>Network among three regional main centers to be established in the whole country and road management offices</p> <p><u>Transmission method:</u> SDH or G-Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p> <p><u>Topology:</u> Ring configuration (To secure redundancy)</p>	<p><i>Design by CadPro:</i> Centre of communication in Vuc Vong and 7others communication stations</p> <p><u>Transmission method:</u> In basic design, use SDH switch and L3 switch. But in the modify design, use only L3 switch.</p> <p><u>Transmission media:</u> Fiber-optic cable (No 8, p11)</p> <p><u>Topology:</u> line configuration ( KEC, p107)</p> <p><i>Comment by CadPro:</i> Recommendation to use SDH switch</p>	<p>Necessary fiber core number is designed considering future requirement when whole Ring Road No.3 and QL-1 in ITS Integration Project is complete.</p> <p><u>Transmission method:</u> SDH or G-Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p> <p><u>Topology:</u> Ring configuration (To secure redundancy)</p>
<b>Layer Network in Road Sections</b>	Network	<p>Network between road management offices and terminal node</p> <p><u>Transmission method:</u> SDH or G-Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>	<p>Aggregation Layer connecting Vuc Vong management office, seven toll gates, and service centers)</p> <p><u>Transmission method:</u> G-Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>	<p>Network between road management offices and terminal node</p> <p><u>Transmission method:</u> SDH or G-Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>

Function Package (Equipment Components)	Location	ITS Standard for Viet Nam (Draft/Jan., 2011)	Design for the Section between Phap Van, Cau Gie and Ninh Binh (Design by CadPro with Comments by KEC, MOT and VEC)	Design Policy for Grant Aid Project
		<p><u>Topology:</u> Ring configuration (To secure redundancy)</p>	<p><u>Topology:</u> Star (Redundancy secured)</p>	<p><u>Topology:</u> Ring configuration (To secure redundancy)</p>
<b>Terminal Network Layer</b>	Network	<p>Network between terminal nodes and each roadside equipment</p> <p><u>Transmission method:</u> Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>	<p>Access Layer (Each roadside equipment are connected by network with eight ring configuration, and connected with aggregation layer.)</p> <p><u>Transmission method:</u> Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>	<p>Network between terminal nodes and each roadside equipment</p> <p><u>Transmission method:</u> Ethernet</p> <p><u>Transmission media:</u> Fiber-optic cable</p>
<b>Command Communication</b>	Road Management Office (Vuc Vong)	<p>For directive communication from regional main centers to road management offices and toll gates (IC)</p> <p>To secure connection without calling loss</p> <p>No connection with PSTN (Public Switched Telephone Networks)</p> <p>Function for receiving confirmation</p>	<p><i>Design by CadPro:</i> Use switchboard IP PABX. Capacity of switchboard in centre Vuc Vong is 48 subscribers. For the others information stations, the capacity is from 16 to 24, capable of expanding to 48 subscribers (No8, p45)</p> <p>Connection with PSTN ( No5, p43)</p>	Cellular phone
<b>Dedicated Telephone</b>	Road Management Office (Vuc Vong)	To be connected with PSTN Internal phone among Regional main center, Road management offices and Toll gate offices	Connected with PSTN IP telephone	Cellular phone

<b>Function Package</b> (Equipment Components)	<b>Location</b>	<b>ITS Standard for Viet Nam</b> (Draft/Jan., 2011)	<b>Design for the Section between Phap Van, Cau Gie and Ninh Binh</b> (Design by CadPro with Comments by KEC, MOT and VEC)	<b>Design Policy for Grant Aid Project</b>
<b>Radio Voice Communication</b>	Road Management Office (Vuc Vong)	Directive communication from road management offices to personnel in the jurisdiction	Voice communication among PV, CG, and NB	Cellular phone
<b>Network management System</b>	Road Management Office (Vuc Vong)	Detection of fault/failure Resource management Performance monitoring Test function  Switching function to redundant equipment : Switching function when automatic switching does not function	Setting management Fault management Performance management Safety management Power source management	Detection of fault/failure Resource management Performance monitoring Test function  Switching function to redundant equipment : Switching function when automatic switching does not function

### ③-1 Roadside System: CCTV Camera

#### (1) Function of Camera

Function of CCTV camera is surveillance of conditions of expressway and traffic events in the all designs.

#### (2) Type and Location of Camera

In the every designs, three types of camera are proposed, but there are slight differences in the terminology, function and location in the among three types of camera as shown in the table below:

Table 2-2-4 ITS Design for QL-1 Phap Van – Cao Bo (Ninh Binh)

Type	Function	Location	Remarks
Traffic Monitoring Camera	To identify the magnitude of incident by rotating and zooming manually, after confirmation of incidents on the expressway by the information of patrol of road management authority and road users	At every 2 kilometer interval to monitor 1 km section of the both directions with rotating and zooming of cameras	The camera is installed on the base with pan, tilt and zoom function (PTZ camera) This cameras are used for monitoring of thru lanes and interchanges.
Event Detection Camera	To confirm whole traffic flow by identification of all events including traffic volume counting and identification of reverse vehicle by image recognition function (center processing)	At interchanges and other points to supplement the above traffic monitoring camera	Fixed type camera. Software for image recognition is installed at center equipment.
Vehicle Detection Camera	Same as the event detection camera	The points where traffic jam frequently occurs on the expressway At certain intervals in the entrances and exits since traffic jam rarely occurs at present.	Fixed type camera. Software for image recognition is installed at center equipment.

Table 2-2-5 Function and Location of CCTV Cameras in ITS Design by VEC/CADPRO

Type	Function	Location	Remarks
Traffic Monitoring Camera	To identify the magnitude of incident, after confirmation of incidents on the expressway by the information of patrol of road management authority and road users	Two cameras are installed at every 2 kilometer interval to monitor both directions. Alternatively poles are constructed and camera installed at 12 m high.	Fixed type camera
Event Detection Camera	To confirm whole traffic flow at interchanges by image recognition function	Installed at interchanges	Digital PTZ camera (To cut a part of picture and record)
Vehicle Detection Camera	To confirm whole traffic flow by traffic volume counting with image recognition function	Installed at toll gates at interchanges	Fixed type camera

Considering these two design policies, CCTV are installed in the Project on the thru lanes (Traffic monitoring camera) and at interchanges where congestion easily occurs (Event Detection camera and Vehicle detection camera) The number of cameras are below the standard of the Study for Assistance of ITS Integration Project Implementation over NH No. 3 and Hanoi Metropolitan Area. Installation of additional equipment is expected.

### ③-2 Roadside System: Variable Message Sign Board (VMS)

#### (1) Function of VMS

Function is to provide traffic event to road users.

(2) Contents of indication of VMS is slightly different between two designs. In the Grant Aid project, contents regarding meteorology are not included since meteorological observation system are not included.

The following table shows definition of the events and indicated items in VMS in the Project.

Table 2-2-6 Indication of VMS based in the Study for Supporting ITS Standards and Operation Plan Development

Traffic Event Category	Traffic Event Class LEVEL	Definition	Suitability for the Project
Incident	Traffic Accident	1 Serious traffic accident with issuing Closure	✓
		2 Traffic accident with issuing lane/speed restriction	✓
		3 Traffic accident without traffic regulation	✓
	Broken-down Vehicle	Vehicle stopping on road due to disorder	✓
	Left Obstacle	Object on road which may prevents vehicle traffic	✓
	Reversing Vehicle	Vehicle running in the reverse direction	✓
	Vandalism	Willful destruction of road facilities or obstruction of vehicles	
	Natural Disaster	Natural disaster which may prevent car passing	✓
Traffic Congestion	Congestion	State where passing cars run very slow on average	
	Crowdedness	State where passing cars run slow on average	
Significant Weather	Heavy Rain	1 Significant heavy rain with issuing Closure	
		2 Heavy rain with issuing lane/speed restriction	
		3 Heavy rain with issue of warning information	
	High Wind	1 Significant high wind with issuing Closure	
		2 High wind with issuing lane/speed restriction	
		3 High wind with issue of warning information	
	Dens Fog	1 Significant dense fog with issuing Closure	
		2 Dense fog with issuing lane/speed restriction	
		3 Dense fog with issue of warning information	
	High Temperature	High temperature or high road surface temperature with issue of warning information	
Construction Work	Construction Work	Improvement/repair of road facilities	✓
Traffic Regulation	Closure	Regulation to ban flow in all lanes of the through traffic	✓
	Lane Closure	Regulation to ban flow of part of lanes of the through traffic	✓
	Entry Closure	Regulation to ban inflow into the through traffic at entry point	
	Speed Limitation	Regulation to restrict the fastest speed of the through traffic	✓(CSS)
	Warning Information	Information to arouse care of the passing drivers	✓



Table 2-2-7 VMS Indication in ITS Design by VEC/CADPRO

Traffic Event Category	Traffic Event Class	Operation	Suitability for the Project
Incident	Traffic Accident	Low Speed Be Careful	✓
	Damage Vehicles		✓
	Natural Disaster (Land Slide)		✓
	Natural Disaster (Flood)		✓
	Natural Disaster (Fire)		✓
Traffic Congestion	Traffic Jam	Escape	
Significant Weather	Heavy Rain	Using right/left Lane	
	Rain	Avoid	
	Strong Wind	Turn on Lights	
	Smog		
Construction Work	Construction Works and Sites		✓
Traffic Regulation	Closing Road		✓

There are no significant difference between two designs, and the latter is included in the former design. In the Project, therefore, indication in VMS should be the former except information on significant weather, traffic congestion and entry closure since meteorological observation equipment are not included, since definition of traffic congestion has not been established, and since equipment are not installed at the entrance of interchange (non-expressway side).

### (3) Location of VMS

In the ITS Standards and Operation Plan Study, VMS will be installed at merging/diverging points, entrance of toll gates, and midpoints of long sections between two interchanges.

In the ITS design of VEC/CADPRO, VMS are installed short of Phap Van toll gate and short of Cao Bo toll gate in the 78 km section between Phap Van and Ninh Binh.

Based on these designs, VMS will be installed in the Project short of exits, which will provide information of road ahead to the drivers so as to ensure safe and smooth traffic.

As for Phap Van to Cau Gie section, VMS is already planned at the toll gate at Tram Thu Phi in the VEC design, and no installation in Grant Aid Project.

### ③-3 Roadside Equipment: Changeable Speed Limit Sign Board (CSS)

This equipment indicates for road users changed speed limit due to incidents and weather conditions.

CSS indicates speed limitation for each lane such as 50, 60, 80, 100 km/hr. In the Project, however, CSS will not be installed in the Project until meteorological observation equipment is introduced.

### ③-4 Roadside Equipment: Mobile Variable Message Sign Board (Mobile VMS)

This equipment supplement the function of VMS. This equipment is not planned in the existing designs.

One equipment mounted on the vehicle is stationed for Ring Road No. 3, and another is for QL-1.

### ③-5 Center System

#### (1) Function of Center

In every design, this function is defined to identify occurrence of incidents on expressways, process data, and provide information to roadside equipment. This function will be applied to the Project.

#### (2) Location of Center

In the ITS Standards and Operation Plan Study, development of Northern Regional Main Center is planned, which is the upper function of the traffic control room in the road management office at Vuc Vong of QL-1 planned in ITS Design of VEC/CADPRO.

A control center for the Project is equivalent with the above road management office. Equipment for the center will be installed in the space which will be provided by VEC in the Vuc Vong road management office.

## 2) Equipment Plan

### 2-1) Scope of the System installed by the Grant Aid Project

Scope of traffic control system in the Project will be planned considering the following points in addition to the compatibility with requests by the recipient country.

- a. Compatibility with upper system in terms of operation and connection
- b. Coordination with the existing survey and designs
- c. Proper scale as a Grant Aid Project

As for a. and b., design policies in the ITS Standards and Operation Plan Study (JICA, Nov. 2011) and ITS Integration Project Assistance Study (JICA, Mar 2012) are to be considered. Design policies of ITS Design for QL-1 (Phap Van – Cao Bo) are to be examined so as to maintain compatibility for operation and connection with the Project.

The system will be built with the systems stipulated in JICA Study considering the system prepared by Vietnamese side so as to ensure compatibility for operation and connection.

As for c., the contents of the Project was decided as described in the following section considering equipment installation schedule and operation of the system.

## 2-2) Recommended System Plan

Based on the above, whole plan of the system introduced by the Grant Aid Project are shown in Figure 2-1 and equipment location plan at each site are shown in Figure 2-2.

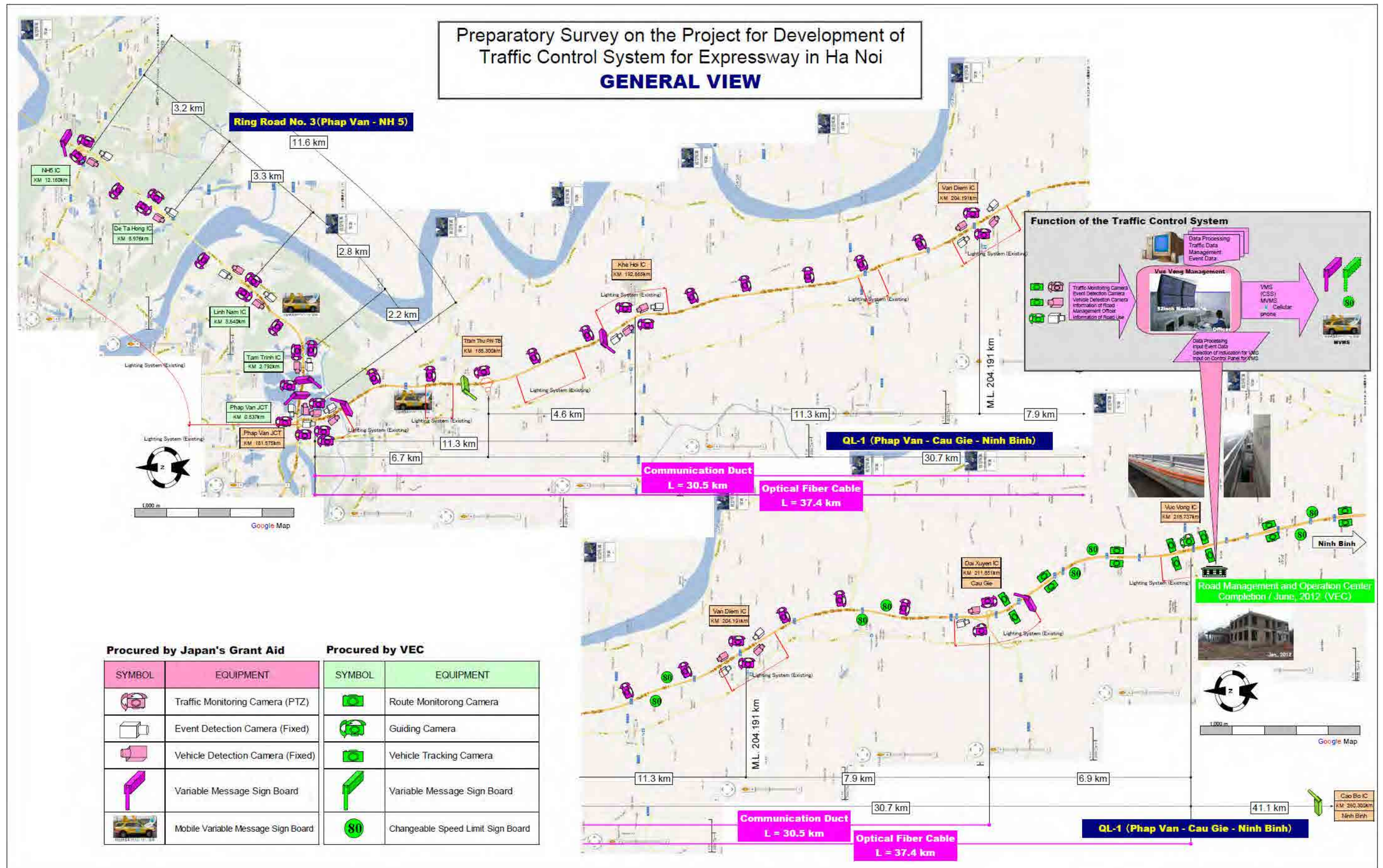


Figure 2-2-1 General View of Installed Equipments



**Proposed Systems**

Equipments/Devices: Procured by Japan's Grant Aid for MOT's Section

Equipments/Devices: Procured by Japan's Grant Aid for VEC's Section

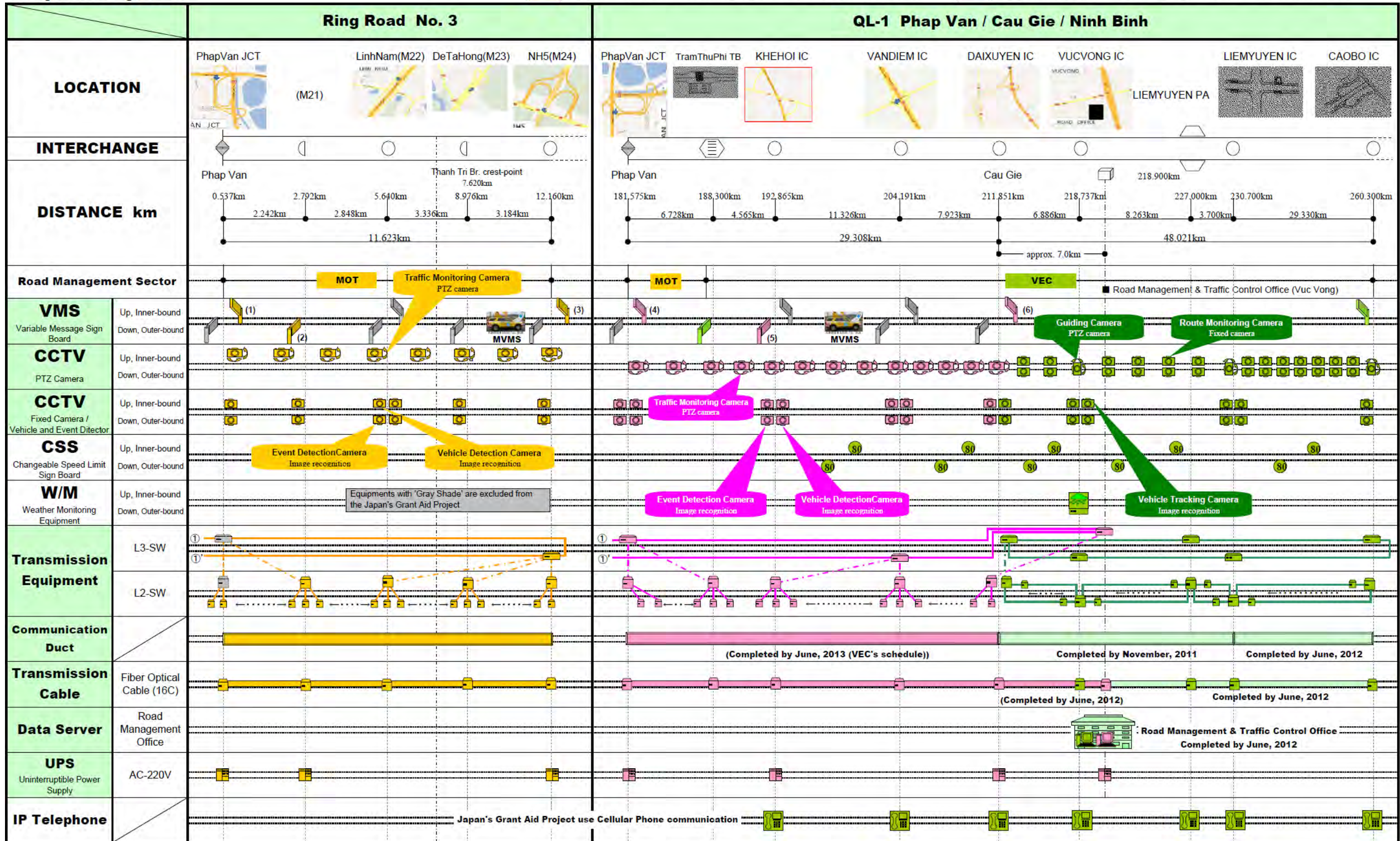


Figure 2-2-2 Diagram of Installed Equipments



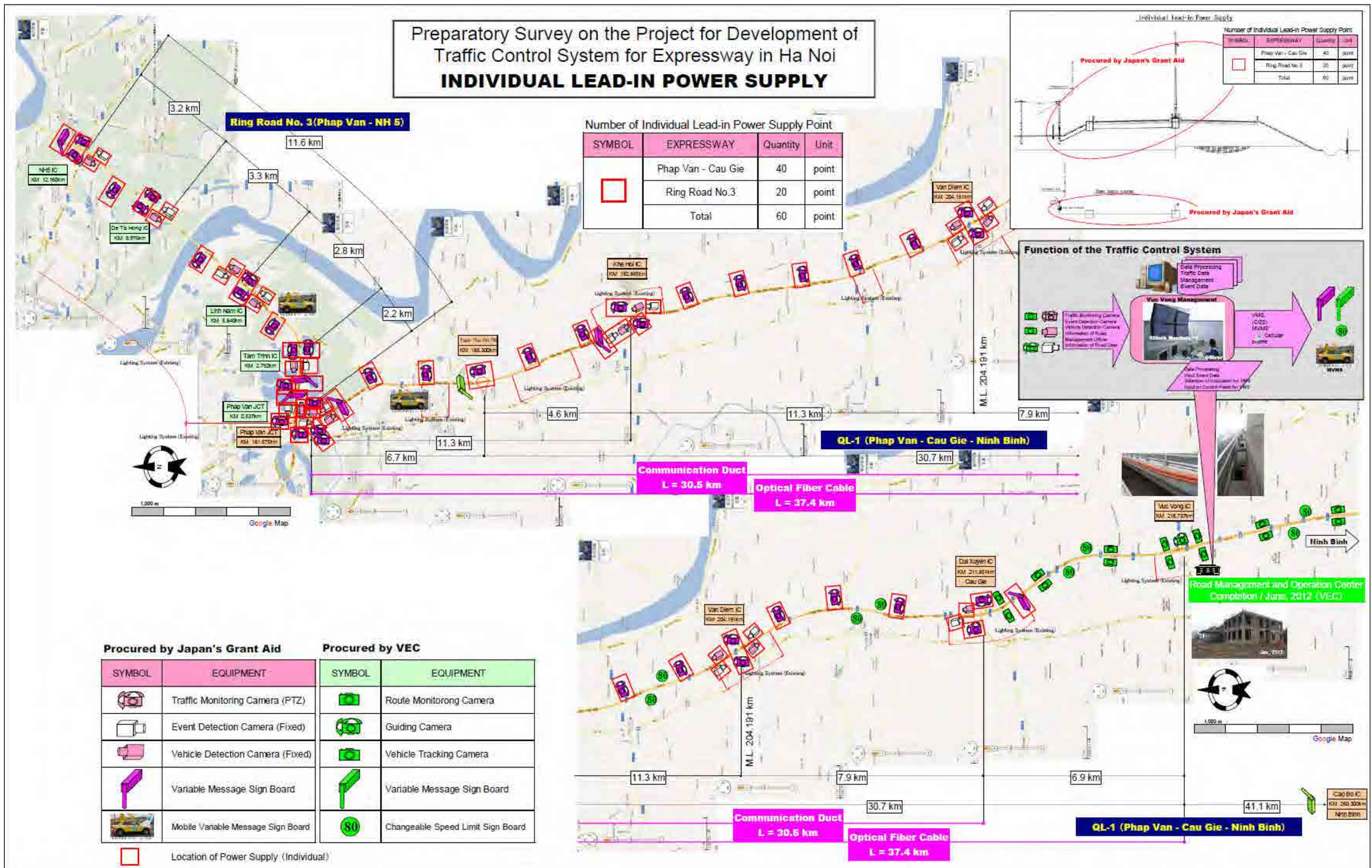


Figure 2-2-3 Individual Lead-in Power Supply

### 2-3) Layout Plan of the System

Layout plans of the equipment at each interchange and junction are as follows:

#### ① QL-1 Phap Van – Cau Gie

##### (1) Phap Van Junction

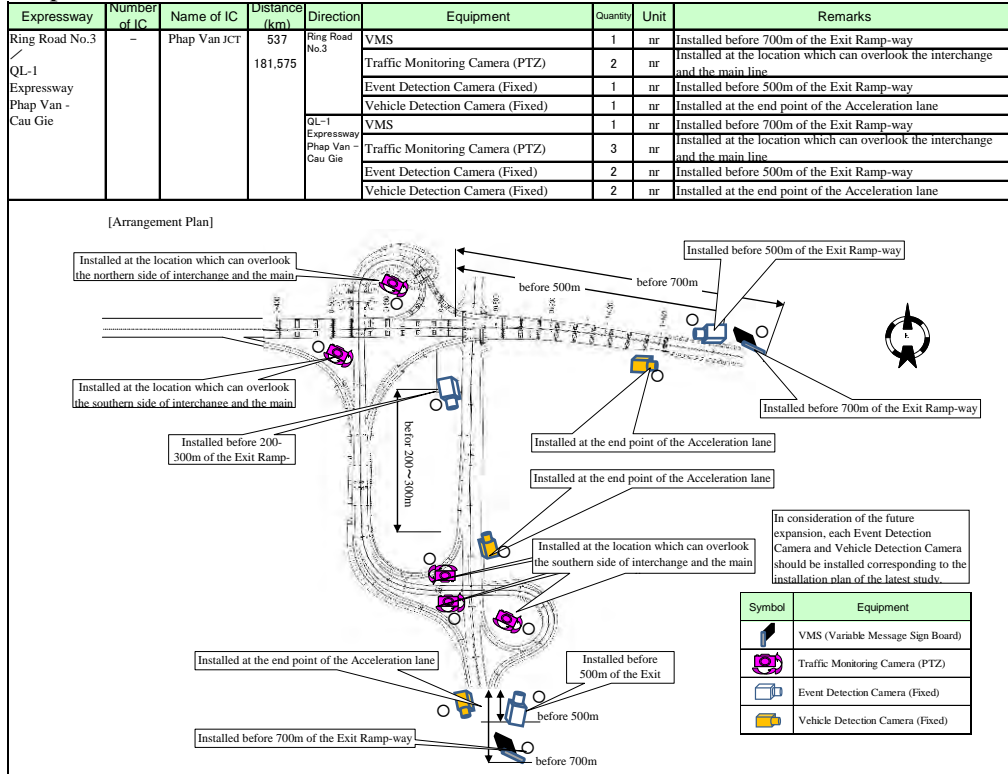


Figure 2-2-4 Equipment Layout Plan at Phap Van Junction

##### (2) Tram Thu Phi Toll Gate

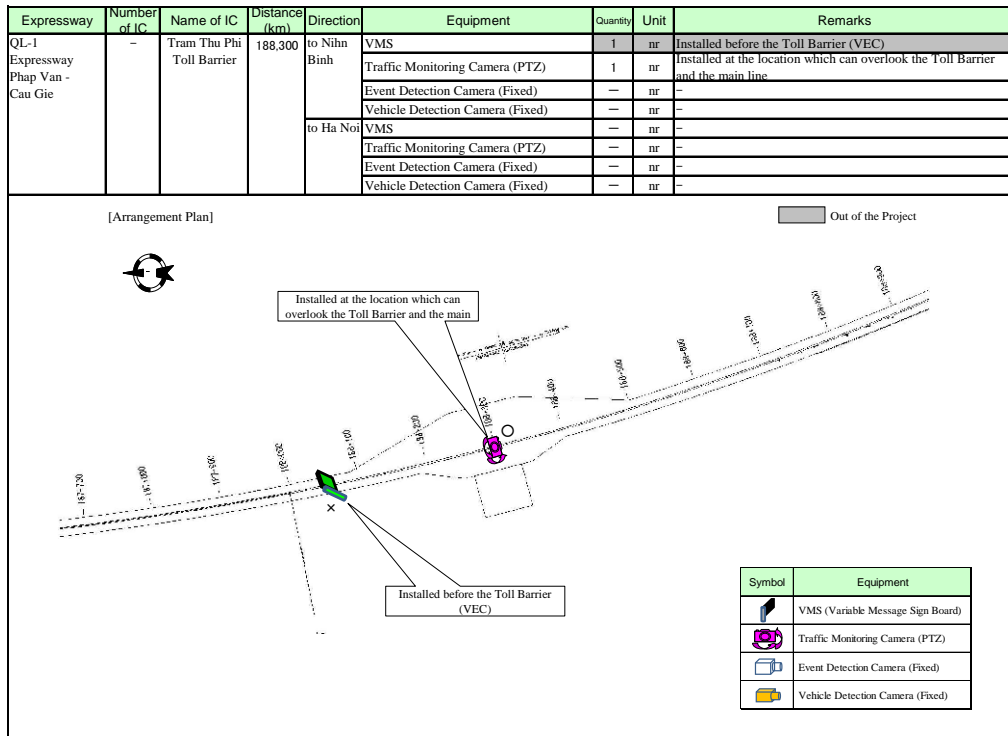


Figure 2-2-5 Equipment Layout Plan at Tram Thu Phi Toll Gate



### (3) Khe Hoi Interchange

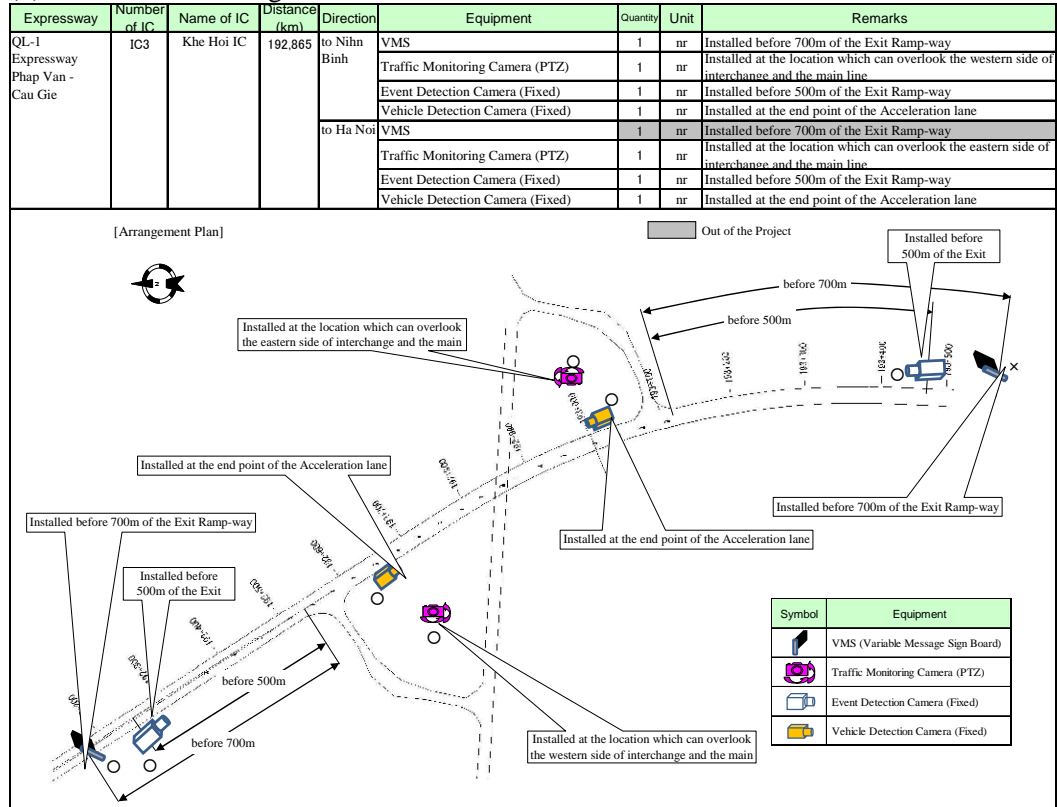


Figure 2-2-6 Equipment Layout Plan at Khe Hoi Interchange

### (4) Van Diem Interchange

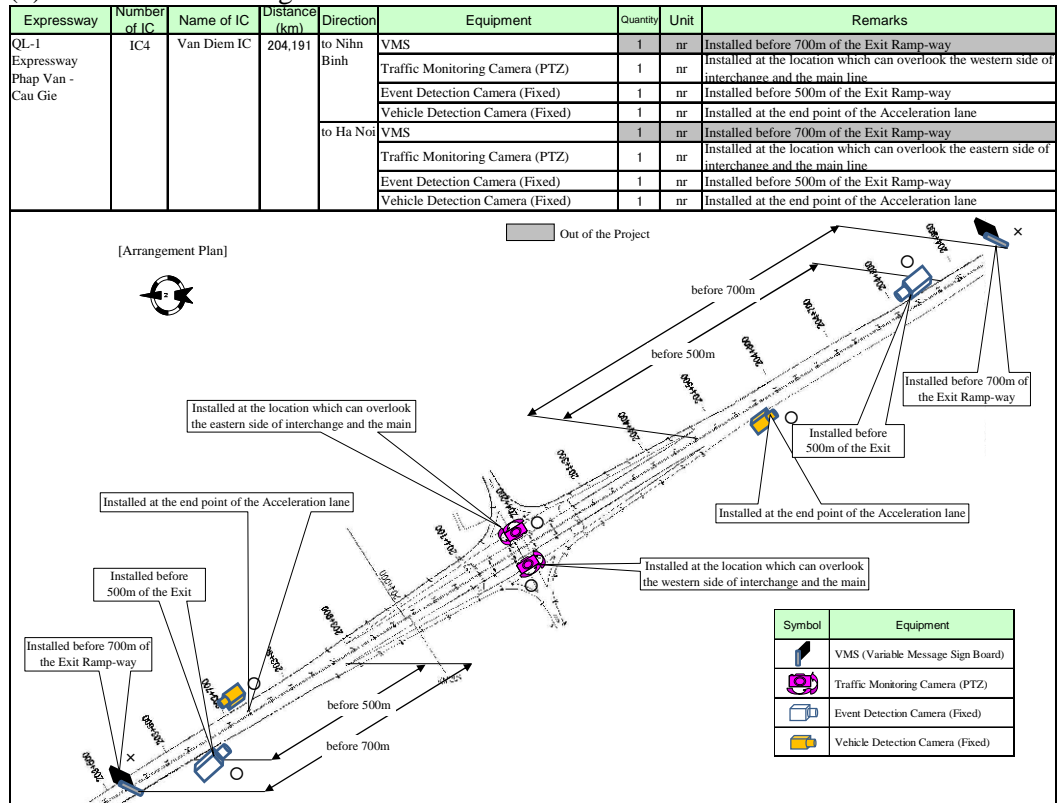


Figure 2-2-7 Equipment Layout Plan at Van Diem Interchange



(5) Dai Xuyen (Cau Gie) Interchang

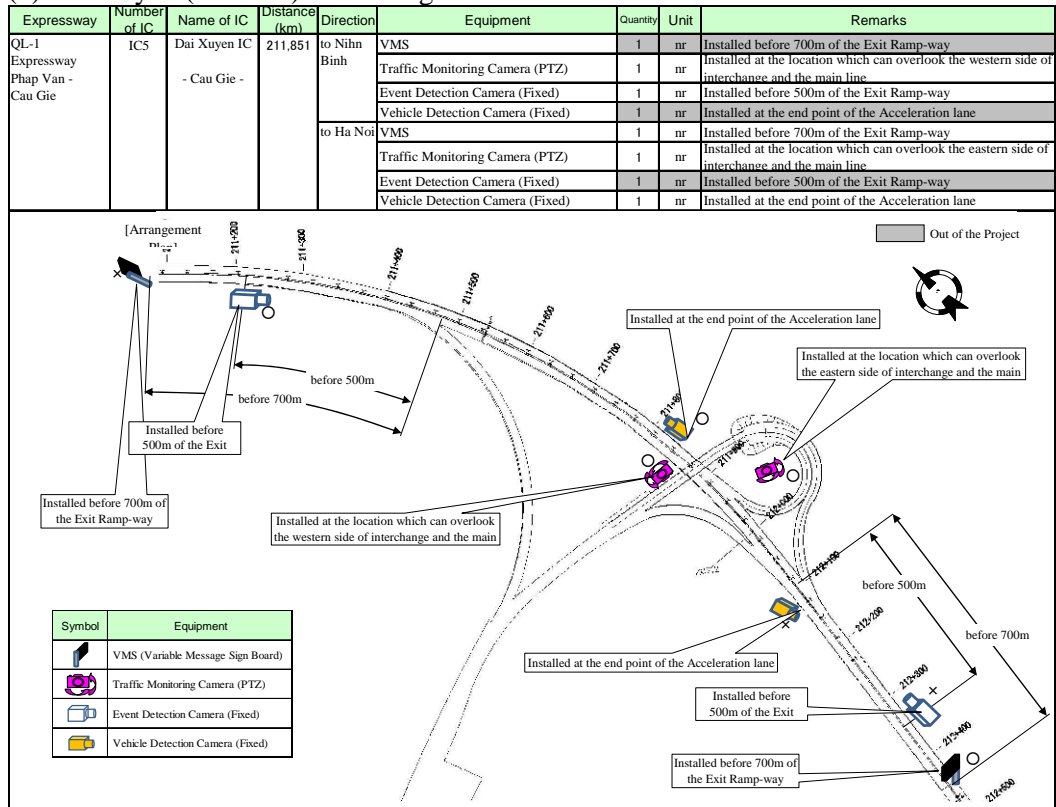


Figure 2-2-8 Equipment Layout Plan at Dai Xuyen (Cau Gie) Interchange

② Ring Road No.3

(1) Phap Van Junction

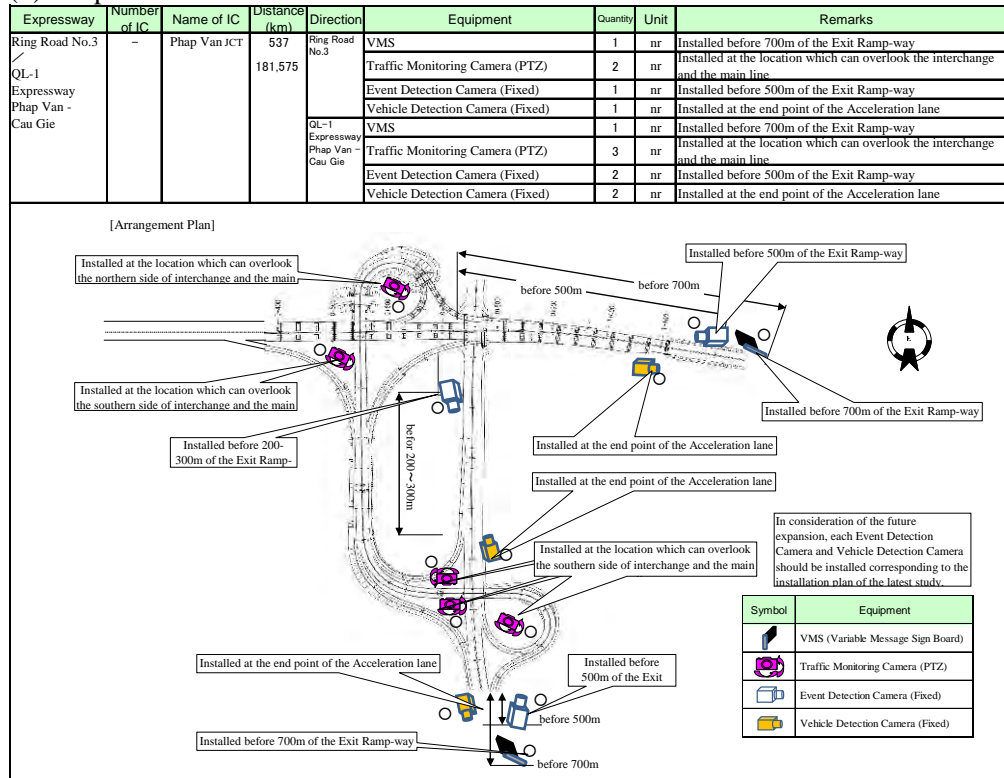


Figure 2-2-9 Equipment Layout Plan at Phap Van Junction

(2) Tam Trinh Interchange (M21)

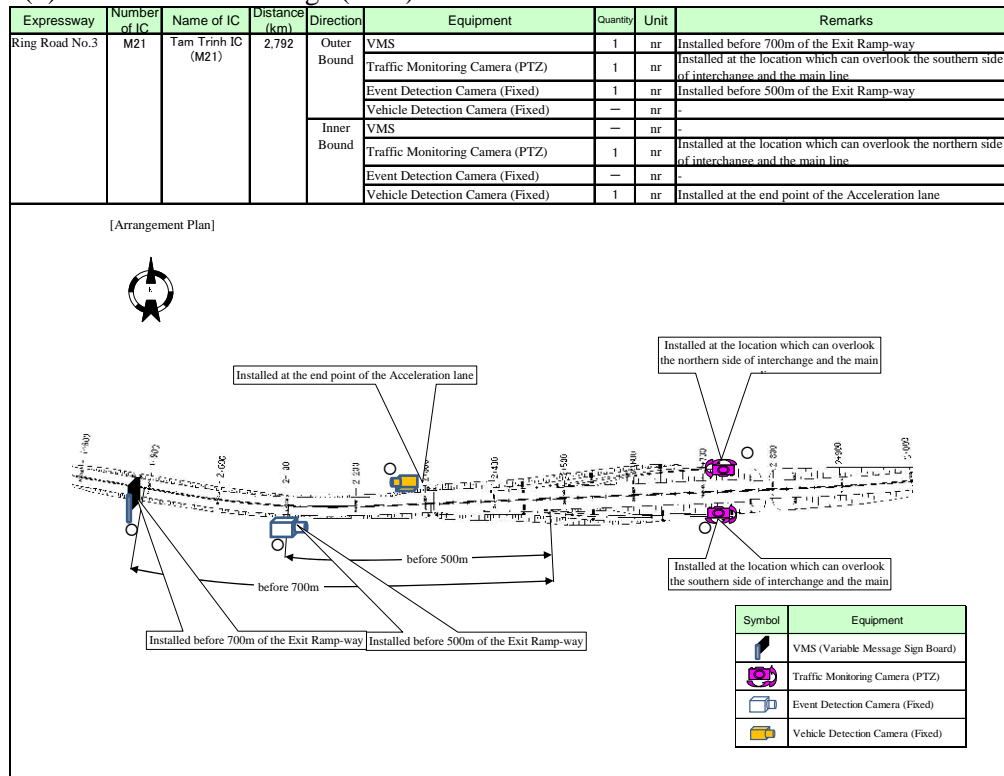


Figure 2-2-10 Equipment Layout Plan at Tam Trinh Interchange (M21)

(3) Linh Nam Interchange (M22)

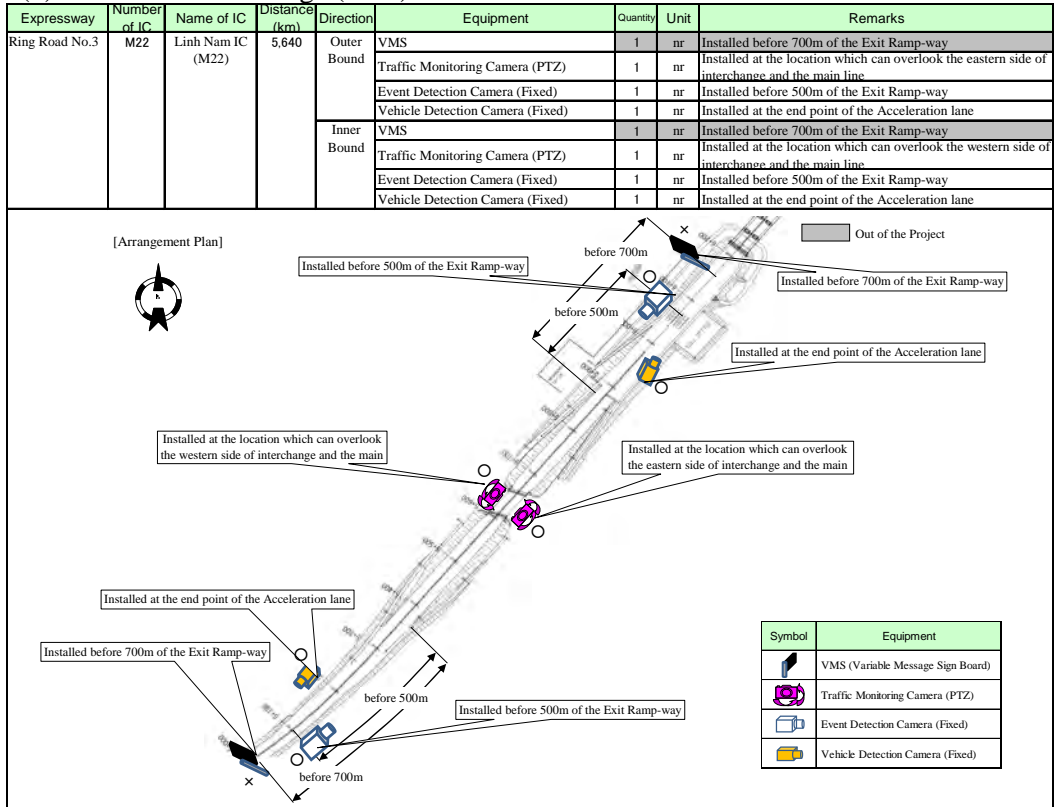


Figure 2-2-11 Equipment Layout Plan at Linh Nam Interchange

(4) De Ta Hong Interchange (M23)

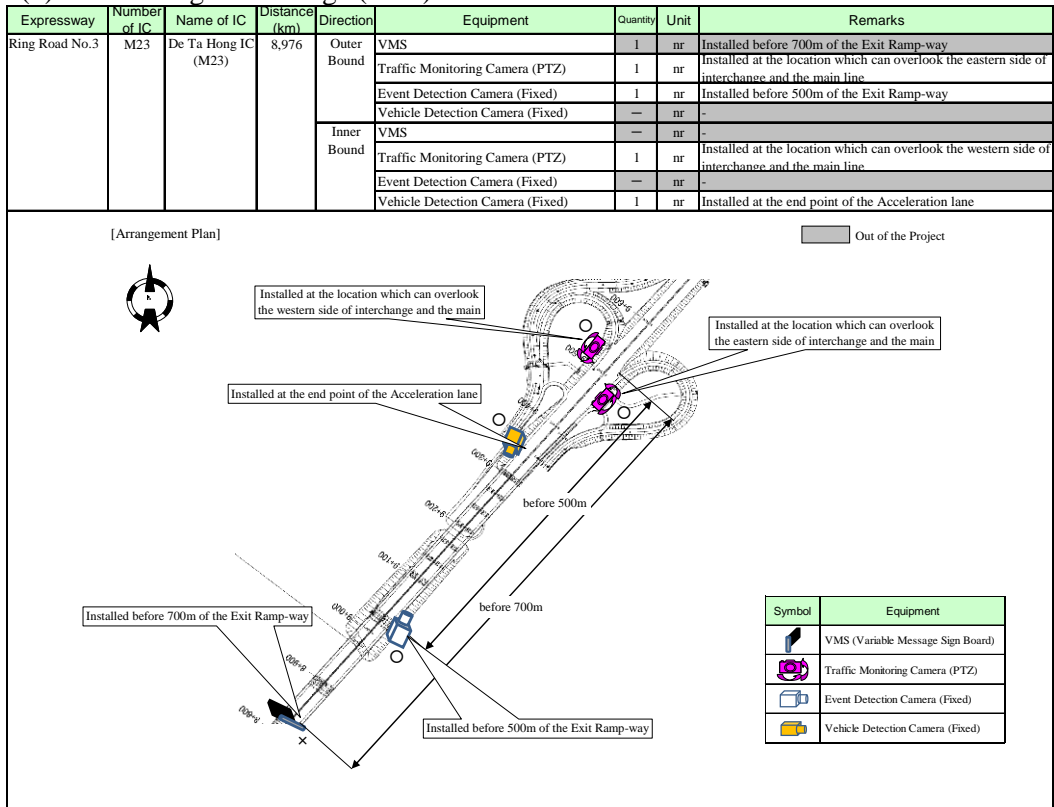


Figure 2-2-12 Equipment Layout Plan at De Ta Hong Interchange (M23)

(5) National Highway No. 5 Interchange (M24)

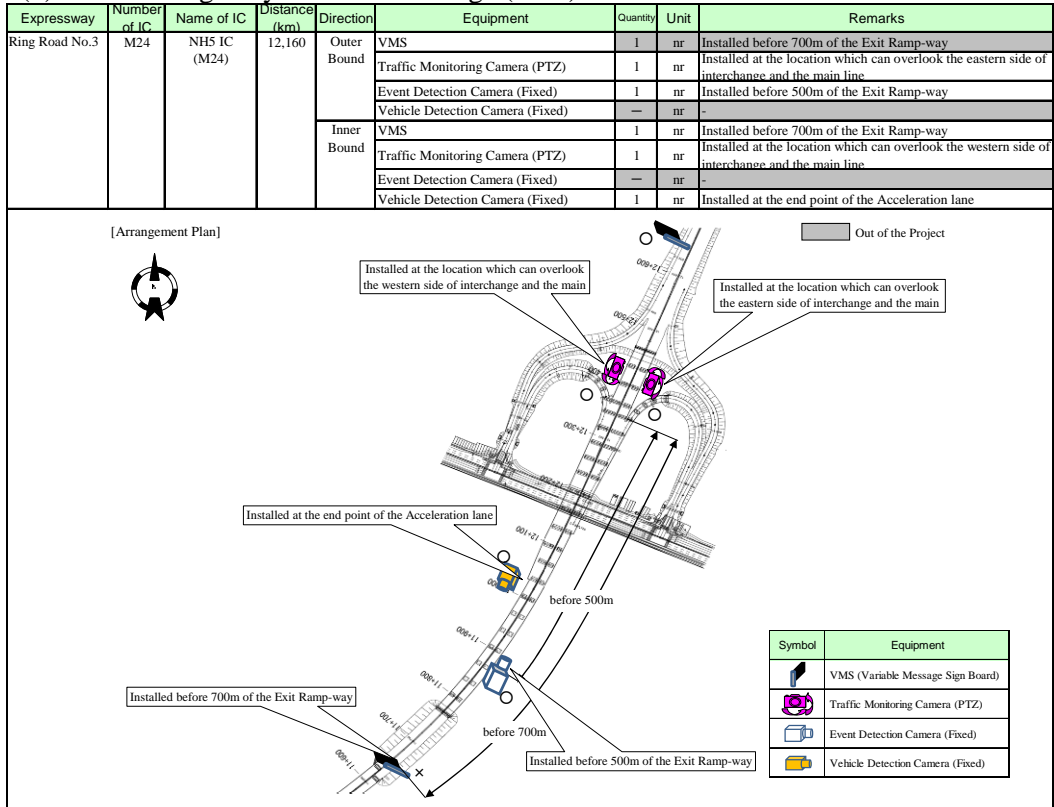


Figure 2-2-13 Equipment Layout Plan at NH-5 Interchange (M24)

2-4) Points of Concern (1)

1. Communication System

The system and equipment mentioned above will be installed on QL-1 (Phap Van – Cau Gie) and Ring Road No. 3. Coordination of the equipment installation schedule and specification of equipment with VEC project (CCTV, VMS and CSS) so that the equipment installed by the Project may fully function soon after completion of the Project. Further coordination will be important.

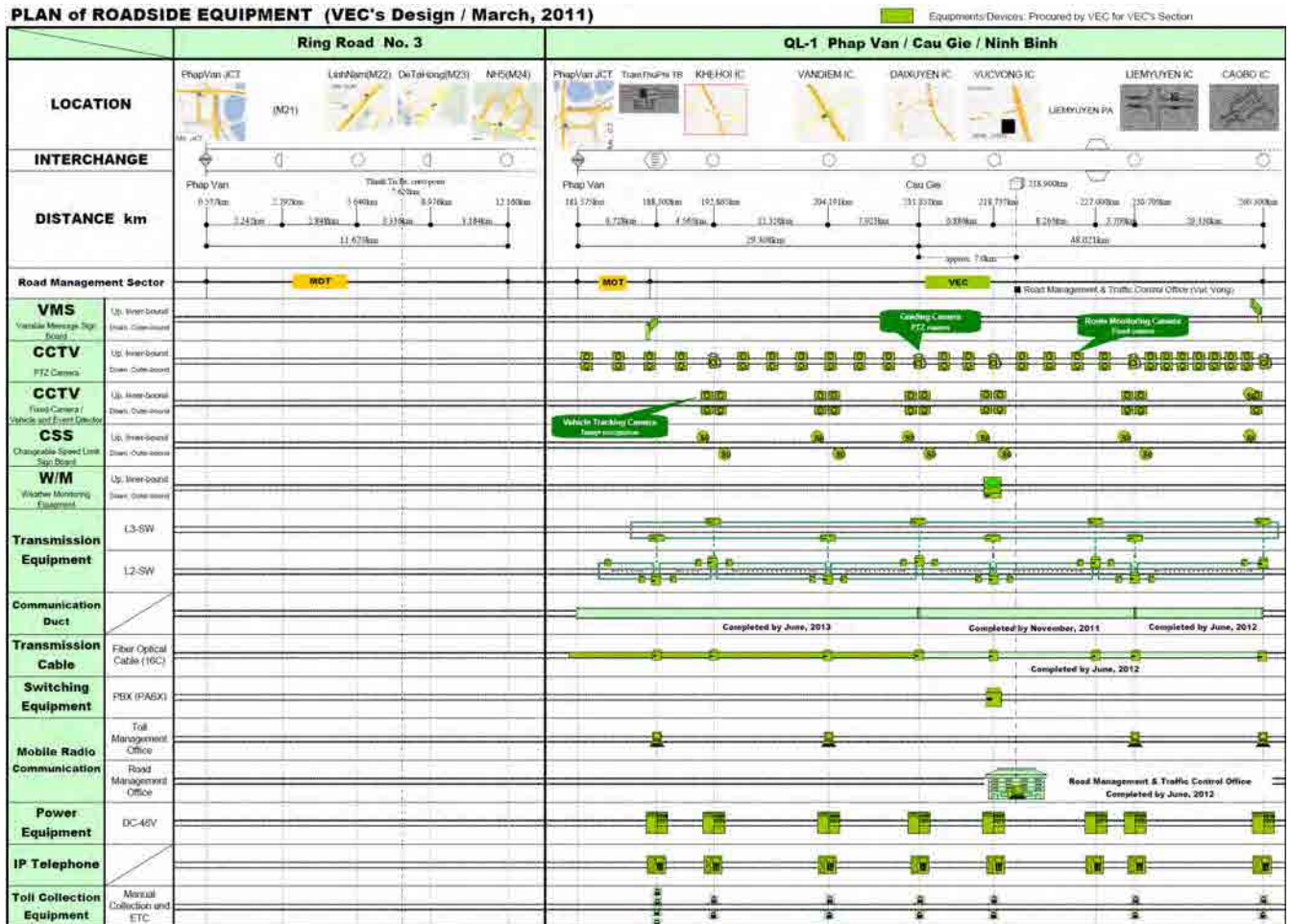


Figure 2-2-14 System Introduction Plan of VEC

2-5) Points of Concern (2)

2. Repairing Project of QL-1

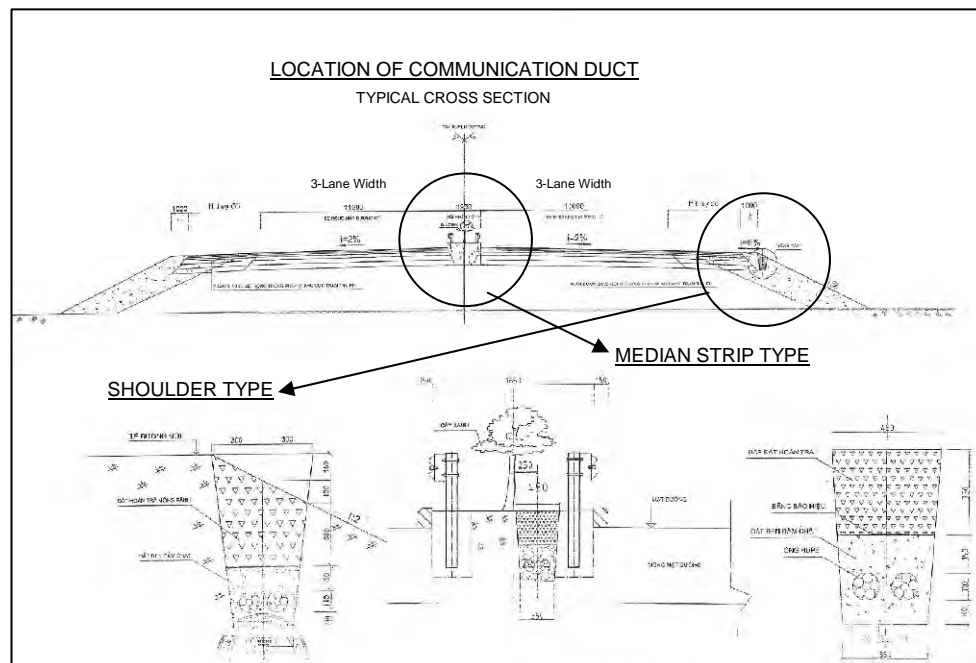
JICA's study "Preparatory survey on PPP project for development of QL-1 (Phap Van – Cau Gie) " is on going now. On the other hand, "Detailed engineering design for traffic control system of QL-1(Phap Van – Nihn Bihn)" is carried out by VEC.

Table 2-2-8 Schedule of repair works for QL-1

Repair Works	Schedule	Remarks
Approval of MOT	Dec., 2011 – Jan., 2012	
QL-1 : Cau Gie – Nihn Bihn	by the end of Mar., 2012	Open (VEC's project)
QL-1: Phap Van – Cau Gie (Phase-1)	by the end of Mar., 2014	Reopen for toll road (four-lane) Surface repairing
QL-1: Phap Van – Cau Gie (Phase-2)	by the end of Mar., 2017	Reopen for toll road (six-lane)

Source : NEXCO Central Ha Noi Office

And our study team received the D/D drawings which were appraised by VEC on 26<sup>th</sup>. March, 2011. The typical cross section is shown below. On the other hand, according to the design of JICA's study, the type of median strip and vertical alignment are changed.



Source: VEC's Detailed Design

Figure 2-2-15 Location of Communication Duct and Cable (Typical Cross Section)

Based on these 2 studies, when the GA's project stage will start (on June, 2012), the numbers of lanes of the QL-1 is four lanes. So the temporary installation of the communication duct and cable will be installed. Therefore, GA's study team expects to be completely installed in a regular location at the "QL-1: Phap Van - Cau Gie (Phase-1)" stage of the PPP project.

### 2-2-3 Outline Design Drawings

The outline design drawings are shown below. And the other drawings show at the back of this report (A-19 – A-28).

D-1 General view of the project location

D-2 Communication system network

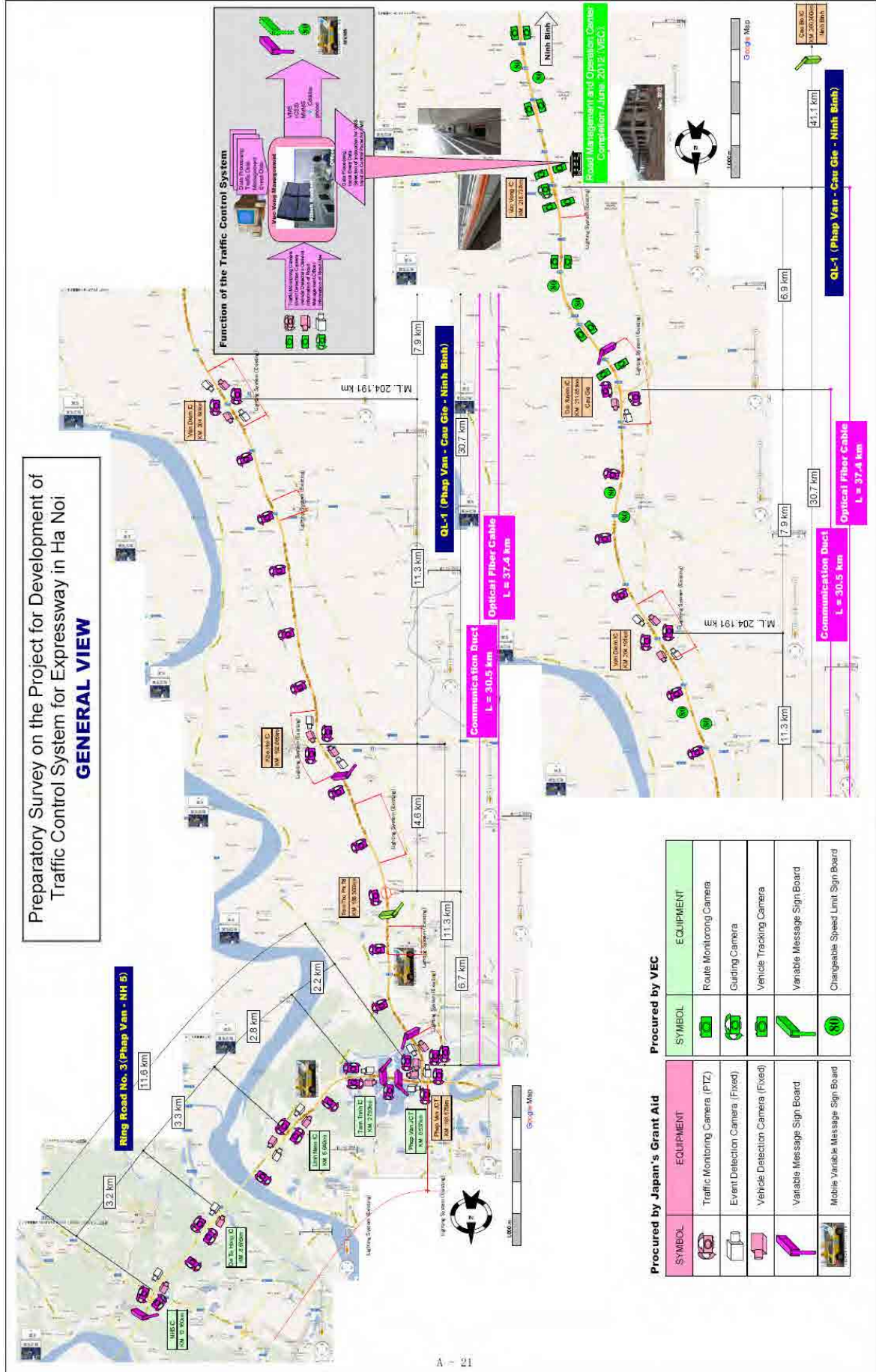
D-3 Power supply diagram (Reference)

D-5 Location of Communication duct

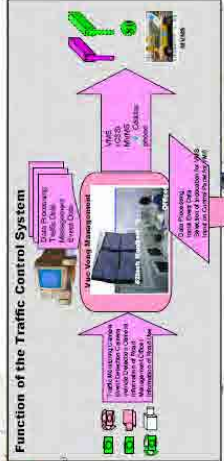
D-13 Monitor Display at the road management office (Reference)



Preparatory Survey on the Project for Development of Traffic Control System for Expressway in Ha Noi  
**GENERAL VIEW**

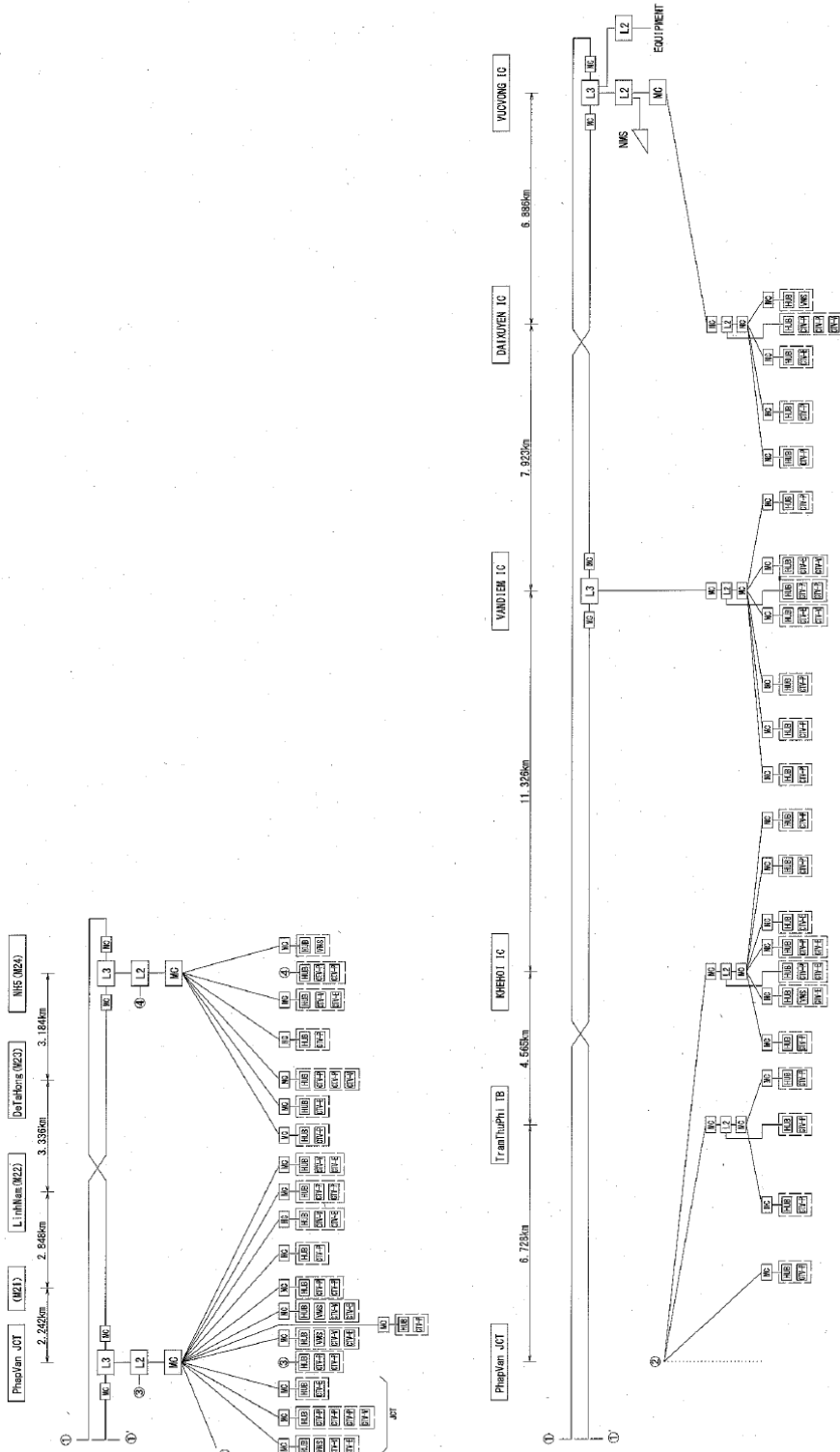


Procured by Japan's Grant Aid		Procured by VEC	
SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT
	Traffic Monitoring Camera (PTZ)		Route Monitoring Camera
	Event Detection Camera (Fixed)		Guiding Camera
	Vehicle Detection Camera (Fixed)		Vehicle Tracking Camera
	Variable Message Sign Board		Variable Message Sign Board
	Mobile Variable Message Sign Board		Changeable Speed Limit Sign Board





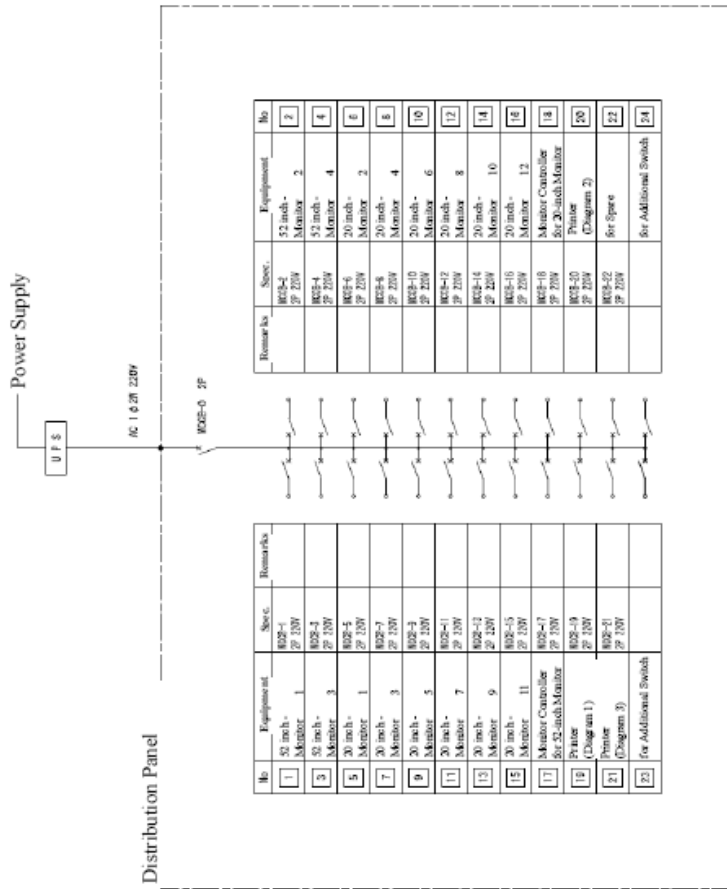
# COMMUNICATION SYSTEM NETWORK



## EQUIPMENT

ABBREVIATION	EQUIPMENT	REMARKS
L3-SW/L3	L3 SWITCH	
L2-SW/L2	L2 SWITCH	
MS	MS-SWITCH	
MC	MEDIA CONVERTER	
MVS	VARIABLE MESSAGE SIGN BOARD	
CTV-P/E/V	CTV	
MMS	NETWORK MONITORING SYSTEM	

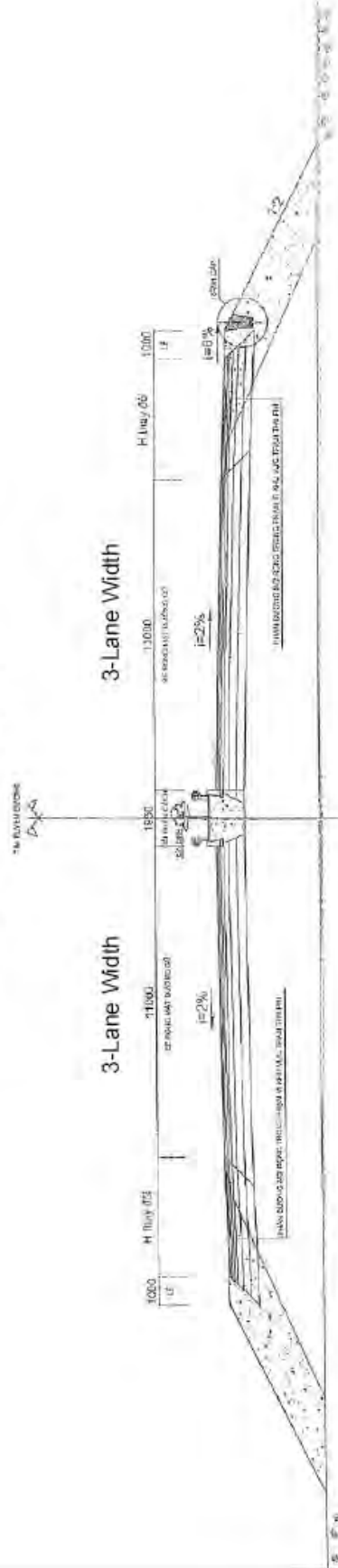
# POWER SUPPLY DIAGRAM



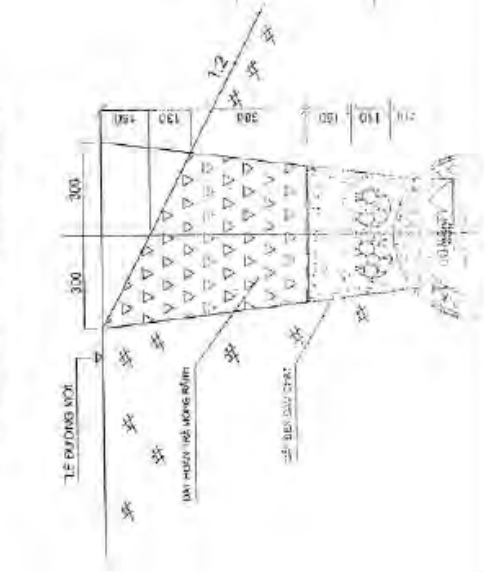
**NOTE:**  
The equipment and their layout shown on this expression are for reference purpose only.

# LOCATION OF COMMUNICATION DUCT

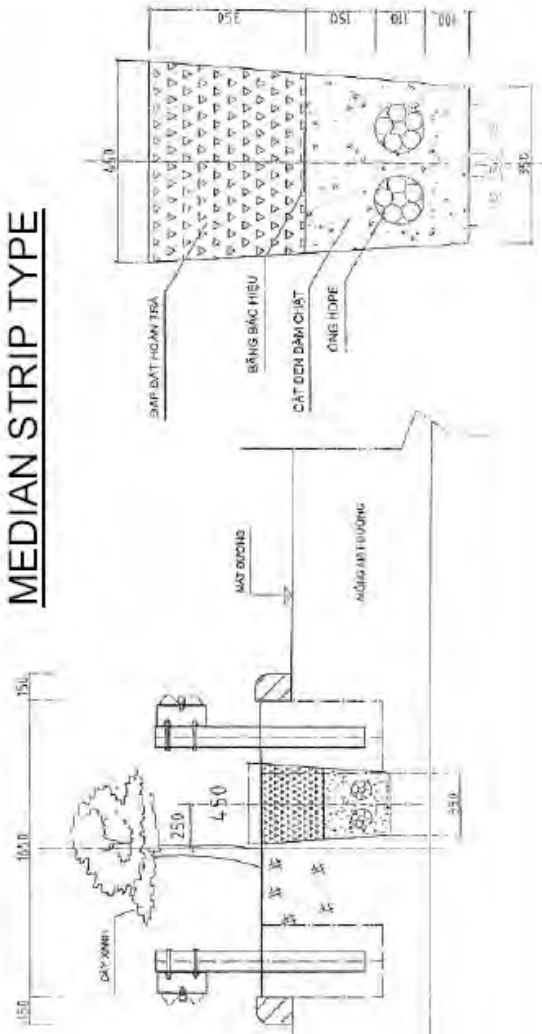
## TYPICAL CROSS SECTION



## SHOULDER TYPE

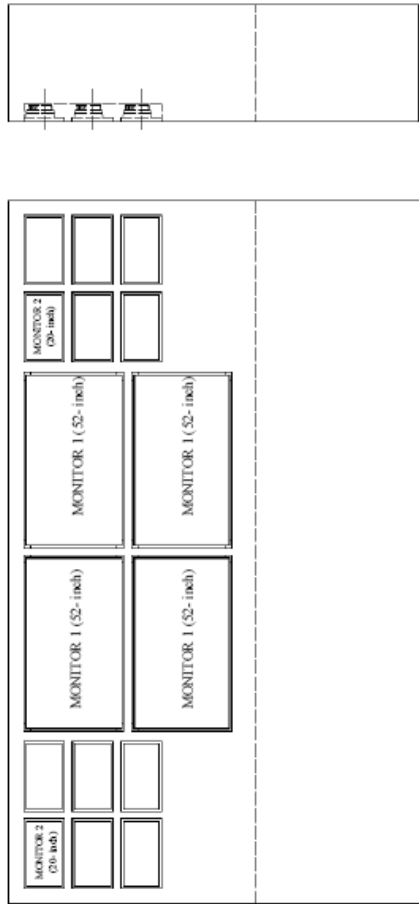


## MEDIAN STRIP TYPE

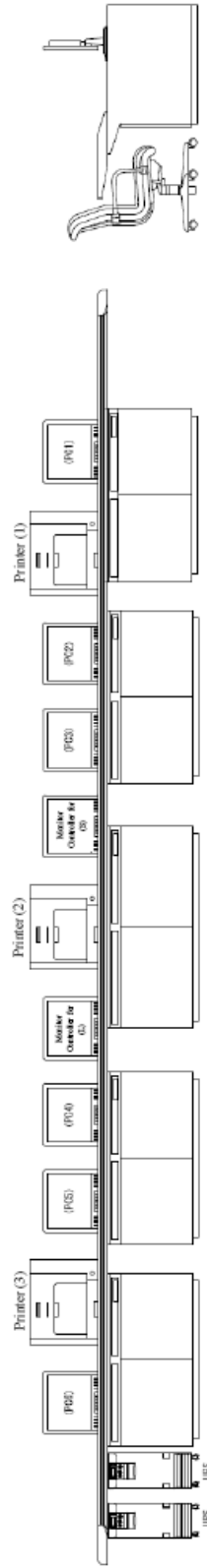


## MONITOR DISPLAY 1(52-inch) and 2(20-inch) (Reference)

MONITOR ARRANGEMENT (Reference)



MONITOR CONTROLLER PANEL ARRANGEMENT (Reference)



**NOTE:**  
The equipment and their layout shown on this expression are for reference purpose only.

## 2-2-4 Implementation Plan

### 2-2-4-1 Implementation Policy

Except control center equipment and VMS, most of the equipment can be procured in Vietnam most of which are the products of the third countries and Japan. Those products should have enough quality with sales records and should have sufficient support system of manufacturers through branch offices and agents.

VMS and control center equipment such as monitor controllers and software should be procured from Japan since the products with specification required in the Project are not available in the products of the third countries.

### 2-2-4-2 Implementation Conditions

The Project will procure the traffic control system which consists of several components. Not only each component conforms with the specification but also the whole system is to be composed so as to function as one system.

### 2-2-4-3 Scope of Works

Works to be borne by the Japanese side include procurement in Japan and Vietnam, packing, marine transportation, inland transportation from the port disembarked to the site, unpacking, installation, adjustment, testing, and initial training for operation.

Works to be borne by the Vietnamese side include tax exemption, customs clearance, banking arrangement, registration of the vehicle with mobile VMS, and supply of electricity and water supply to the construction site.

The table below shows the demarcation of the works for each side.

Table 2-2-9 Demarcation of Works

Works	Japan's Grant Aid	Recipient Side
1. Banking Arrangement (B/A)、Authorization to Pay (A/P)		X
2. Tax exemption and custom clearance		X
3. Expense for staff for supervision and inspection		X
4. Registration of vehicles		X
5. Equipment cost	X	
6. Transportation cost	X	
7. Installation, adjustment, and testing cost	X	
8. Permission of construction works		X
9. Temporary stock yard of materials and equipment		X
10. Fee of electricity, water and telephone		X
11. Initial operation training	X	
12. Coordination with relevant organizations for initial training		X
13. Power Supply for operation of equipment		X

#### 2-2-4-4 Consultants Supervision

The Consultant will perform the services in accordance with the procedures for the Grant Aid Project after conclusion of the agreement for detailed design and procurement supervision with the implementing agency of the recipient country with verification of the Japanese Government of the agreement. The services provided by the Consultant are as mentioned below:

##### 1) Detailed Design

The Consultant will execute detailed design stipulated in the agreement for the services based on this preliminary survey, Exchange of Notes and Grant Agreement. Project cost estimation will be reviewed and tender documents including drawings and technical specification will be prepared.

##### 2) Assistance in Tendering

After coordination with the implementing agency on the tender procedure, following works will be executed on behalf of the implementing agency.

- Tender notice
- Delivery of tender documents
- Tender opening
- Tender evaluation
- Assistance for negotiation and conclusion of the Contract

##### 3) Procurement Supervision

The Consultant will supervise whether the procured equipment conform with the specification and whether equipment is correctly installed. A procurement supervision engineer will stay at site to supervise installation to hand-over. A Equipment engineer will review and approve the shop drawings of equipment.

#### 2-2-4-5 Procurement Plan

Equipment installed in the Project consist of the products procured in Japan and Vietnam. Most of the products procured in Vietnam are manufactured in other countries than Vietnam and Japan. Those products should have enough quality with sales records and should have sufficient support system of manufacturers through branch offices and agents.

Some products such as a vehicle to install a mobile VMS are to be procured from the third countries other than Japan since the products of the recipient country are not available and the products of Japan are expensive due to transportation cost. Official request by the recipient country and prescribed formalities are required in the implementation stage for procurement of the products of the third countries.

### 2-2-4-6 Operational Guidance Plan

Adjustment and test run will be carried out by the engineers of the manufacturer with assistance of local engineers since professional knowledge and techniques are required.

Training by the experts of traffic control will be scheduled in the on-going JICA technical cooperation project.

### 2-2-4-7 Implementation Schedule

Most of the equipment procured by the Project will require installation works. The sites are on the thru lanes, interchanges and junctions of the Ring Road No. 3 and National Highway No. 1. Control center equipment will be installed at the space prepared by VEC in the new road maintenance office at Vuc Vong. Critical path among the all works is installation of grass fiber cable, and progress of that work will be related with installation of other equipment.

Implementation schedule of the Project is as shown in the figure below:

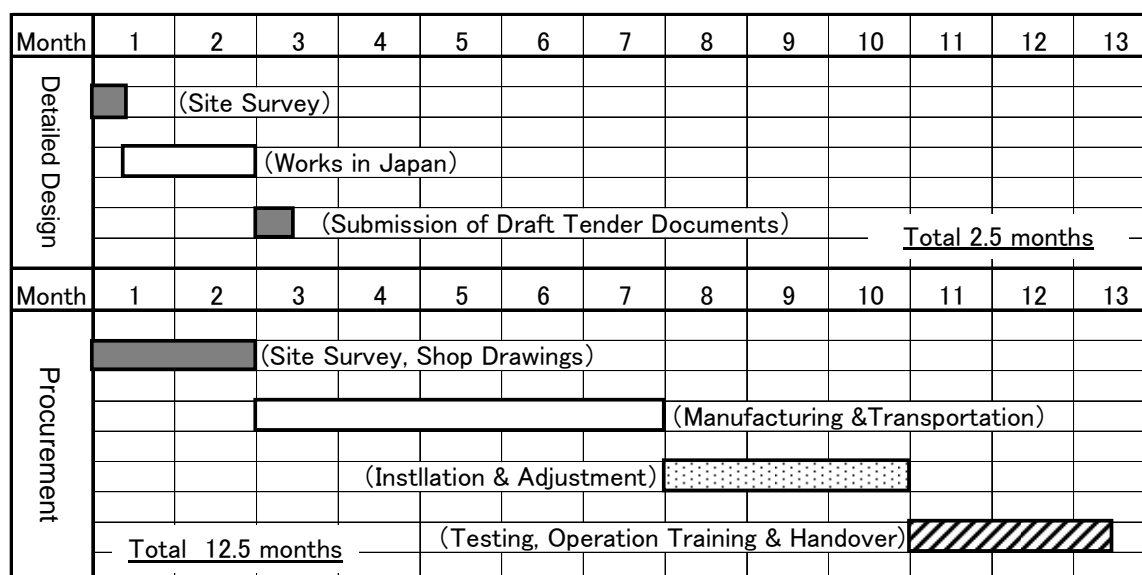


Figure 2-2-16 Project Implementation Schedule

### 2-3 Obligations of Recipient Country

The followings summarize the obligations of the recipient country agreed with the Vietnamese side for implementation of the Grant Aid Project.

➤ Obligations of the recipient country for implementation of Grant Aid Projects

- Undertakings by the Recipient Country

- Unloading and customs clearance of imported products and materials at ports of disembarkation

- To bear custom duties, internal taxes and other fiscal levies
  - To accord Japanese nationals facilities necessary for entry and stay in Vietnam
  - Banking arrangement (B/A)
  - Authorization to Pay (A/P)
  - Proper and effective use of the equipment purchased under the Grant Aid
- Obligations of the recipient country for implementation of the Requested Japanese Assistance
- Acquisition of the necessary site and distribution of electricity to the site
    - Power supply for roadside equipment including installation of distribution boards
    - Preparation of space and power supply for control center equipment in the traffic control center

## 2-4 Project Operation Plan

The equipment procured by the Project will be operated and maintained by VEC. Technical, quality and environmental management department will be a responsible section in VEC, and Vietnam Expressway Operation and Maintenance JSC (VEC O&M), one of the member units of VEC, will be engaged with operation and maintenance of the installed equipment. Current number of staff of the department is 18, and VEC O&M has 73 staffs. Figure 2-16 indicates the organization chart of VEC. MOT is under consideration of new establishment which may consist of VEC, DRVN in MOT, and People's Committee of Hanoi City.

Following works are required to maintain the equipment of traffic control system.

### Inspection

#### Daily Inspection

(Checking of operation, Checking of cable connections, Cleaning, etc.)

#### Periodical Inspection

(Inspection in accordance with manufacturer's requirement)

#### Periodical Replacement of Consumables

(Replacement of batteries, hard disc, lens, etc.)

#### Trouble Shooting



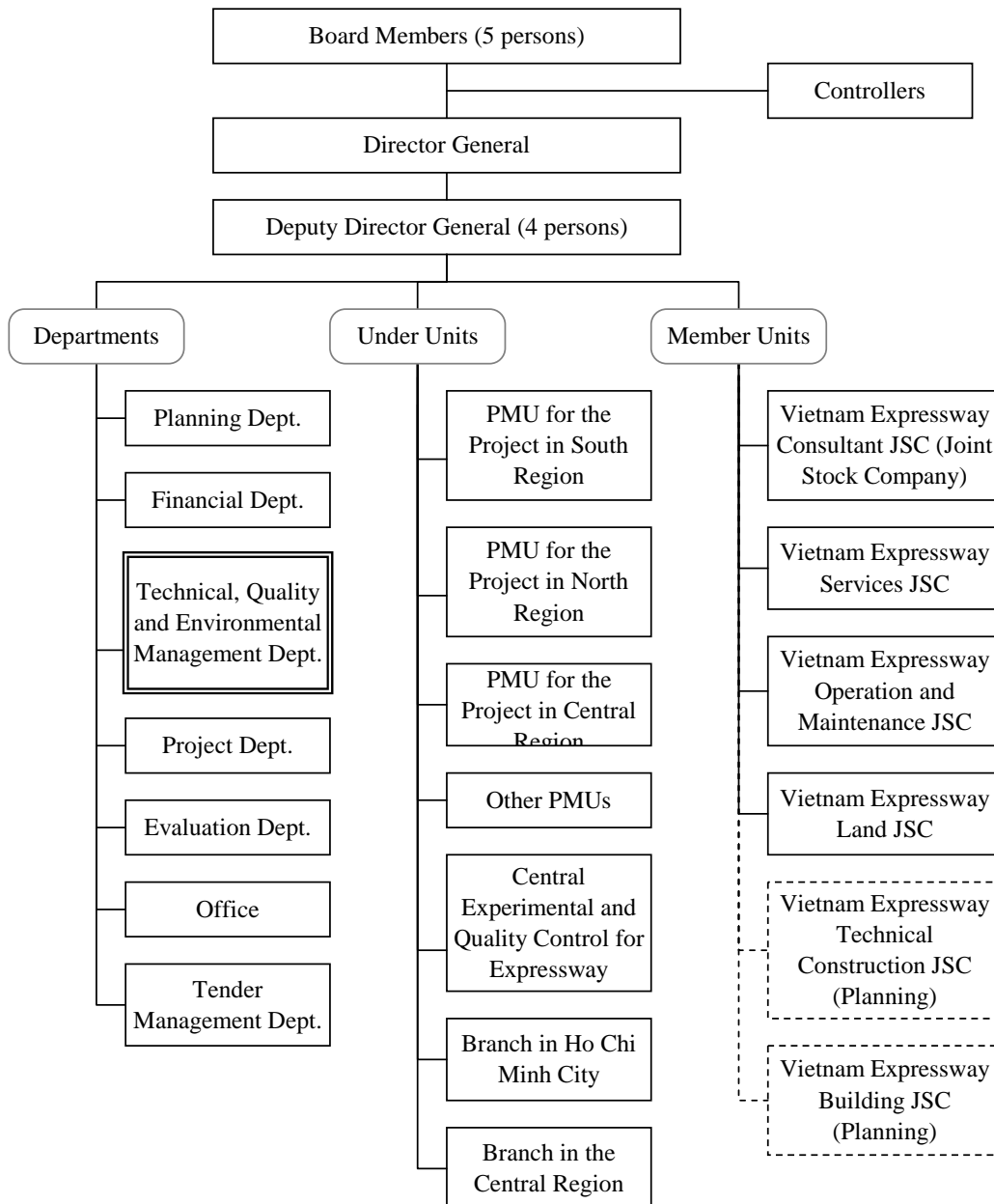


Figure 2-4-1 Organization Chart of VEC

2-5 Project Cost Estimate

2-5-1 Initial Cost Estimation

The tentative cost for the Project was estimated by JICA Preparatory Survey Team. The contents of the Project cost to be borne by Japan are separately shown to the Vietnamese side by the Survey Team. This cost estimate is provisional and will be further examined by the Government of Japan for approval of the Grant.

### 3) Cost to be borne by the Recipient Country

Following cost are to be borne by the Vietnamese side for implementing the obligations by the recipient country/.

Power supply for roadside equipment      VND. 10 billion (Japanese Yen 40 million)  
(Up to distribution boards)

### 4) Bases of the Cost Estimates

(1) Time of estimation:                      November 2011

(2) Foreign exchange rates:                1USD = 79.67 Yen

10,000 Vietnamese Dong = 38.58 Yen

(3) Procurement and Construction period:

Detailed design and equipment procurement period are shown in the Implementation Schedule.

(4) Others:                                      Estimation was carried out in accordance with the regulations and rules of Japanese Grant Aid.

## 2-5-2 Operation and Maintenance Cost

Annual operation and maintenance cost of equipment which is procured by the Project is estimated about Japanese Yen 4 mil (VND 1,000 Mil) which includes the cost required for periodical replacement of parts and repair works for trouble. Breakdown of the cost is as follows:

Daily inspection and periodical inspection: Yen 200 thousand (VND 50 mil)

Periodical replacement of consumables:      Yen 600 thousand (VND 150 mil)

Trouble shooting:                                      Yen 3200 thousand (VND 800 mil)

This amount is equivalent of approximately 0.1 % of annual supply and employee cost, which is considered that operation/maintenance cost of the Project may not significantly affect the finance of VEC.

## **CHAPTER 3 PROJECT EVALUATION**

## Chapter 3 Project Evaluation

### 3-1 Preconditions

Followings are preconditions to be executed by Vietnamese side without delay so that this Grant Aid Project may be implemented.

#### 1) Acquisition of Work Permission

Necessary permissions and procedures for installation works on the Ring Road No. 3 and QL-1 (National Highway No. 1) shall be taken from the relevant departments/sections of MOT and VEC.

#### 2) Tax Exemption

Necessary budget is to be prepared for custom duties, internal taxes and other fiscal levies on the imported products and materials from Japan.

#### 3) Environmental and Social Consideration

Environmental protection commitment is to be prepared which summarizes items to be considered during equipment installation works before Vietnamese's approval of the feasibility study on the Project.

### 3-2 Necessary Inputs by Recipient Country

Following actions should be taken by the Vietnamese side so that the Project effects may be produced and maintained.

#### 1) Traffic Control Staff

Traffic control is to be carried out by sufficient numbers of traffic control staff with required capability educated through trainings

#### 2) Power Supply

Necessary power for equipment installed by the Project on roadside and in the control center is to be supplied.

#### 3) Preparation of Space for Equipment Installation

Necessary space for installation of equipment is to be secured in yhe Vuc Vong traffic control center.

#### 4) Budget Allocation for Operation and Maintenance of Equipment

Budget is to be allocated continuously every year necessary for operation and maintenance of the equipment procured by the Project

### 3-3 Implementation Assumption

Following external factors are to be executed so that the Project effects may be produced and maintained.

#### 1) Training of Staff

On-going JICA Technical Cooperation Project for operation and maintenance of expressways is to be continued after completion of the Project, and traffic control staff is to be trained through education of traffic control techniques with equipment procured by the Project.

#### 2) Enhancement of Equipment

When traffic increases and traffic events to be monitored significantly increase in the project site, number of equipment such as CCTV camera should be added, and the system should be developed so that surveillance in the targeted area may be thoroughly executed.

#### 3) Provision of Uniform Service through Expressways

If there is large difference in the service levels of traffic information between the neighboring sections in expressway, it might confuse users passing through both sections. Therefore traffic control system should be developed so that there may not be considerable difference in the service levels between the section improved by the JICA Project and neighboring section.

### 3-4 Project Evaluation

#### 3-4-1 Relevance

##### 1) Beneficiaries of the Project

Direct beneficiaries of the Project are the vehicles passing through expressways in the project site (20,000 vehicles per day) and their users. Indirect beneficiaries of the Project are 6.5 million residents in Hanoi City.

##### 2) Objective of the Project

The purpose of the Project is to introduce technology of traffic control system (ITS) in the expressways in Hanoi metropolitan area where traffic congestion and incidents are increasing. Consequently road information on the expressways can be collected promptly and precisely, and proper actions can be taken against the incidents and other events. It will contribute to ensure smooth traffic in the expressways in the area, and will be useful for improvement of life and stabilization of people's livelihood.

##### 3) Compatibility with Medium/Long Term Development Plan of Vietnam

In the Five-year Social and Economic Development Plan of Vietnam (2011 – 2015), further

development of infrastructures including transportation infrastructures is the important issues in order to realize sustainable development under continuous economic growth. Furthermore, in the development strategies for transport sectors for the year 2030, importance of development of trunk road network in major cities such as Hanoi and Ho Chi Minh is indicated.

The Project corresponds to these development plan and strategies, and coincides with the higher plans of the nation.

#### 4) Compatibility with Aid Policies of Japan

Traffic control system procured by the Project is based on the advanced technologies of Japan. It coincides with Japanese economic strategies for Asian countries which utilize excellent technologies and experiences of Japan through assistance for development of infrastructures.

### 3-4-2 Effectiveness

#### (1) Quantitative Effect

Table 3-4-1 Quantitative Effect

Effect Indicators	Base Line (Year 2011)	Target (Year 2016)
Required Time to provide Traffic Information to Road Users	Approx. 30 to 40 min. (Interval of updating of information in radio broadcasting)	Approx. 5 min.
Required Time to Dispatch Emergency Vehicle after Event Occurred	Approx. 30 min.	Approx. 5 min.

#### (2) Qualitative Effect

- 1) Accuracy of traffic information will be improved and convenience of road users will be upgraded.
- 2) Response time to traffic incidents will be shortened, and smooth traffic will be recovered in shorter time.
- 3) Road safety will be strengthened by providing meteorological information and incident information.

Consequently it is concluded that implementation of the Project is appropriate, and effectiveness of the Project is expected.

## **APPENDIX**

## Appendix 1. Member List of the Survey Team

### (1) Field Survey

Name	Position	Organization
Mr. Kohtaro Nishigata	Leader/Coordinator	JICA
Mr. Keigo Konno	Chief Consultant / Planning for Traffic Control 1	Oriental Consultants Co., Ltd.
Mr. Shinichi Sakabe	Deputy Chief Consultant / Procurement for Equipment and Materials	Oriental Consultants Co., Ltd.
Mr. Hiroaki Kurita	Designing for Equipment and Materials of ITS	Oriental Consultants Co., Ltd.
Mr. Masaaki Goto	Designing for System of ITS/Planning for Traffic Control 2	Oriental Consultants Co., Ltd.
Mr. Toshikage Ito	Designing for Equipment of Data Communication	Oriental Consultants Co., Ltd.
Mr. Munetoshi Oikawa	Designing for Road Facilities/ Construction Planning	Metropolitan Expressway Company Limited
Mr. Toshinori Kanazawa	Procurement Condition/Cost Estimate	Oriental Consultants Co., Ltd.

### (2) Outline Explanation of the Preparatory Survey

Name	Position	Organization
Mr. Shuntaro Kawahara	Leader	JICA
Mr. Keigo Konno	Chief Consultant / Planning for Traffic Control 1	Oriental Consultants Co., Ltd.
Mr. Shinichi Sakabe	Deputy Chief Consultant / Procurement for Equipment and Materials	Oriental Consultants Co., Ltd.
Mr. Masaaki Goto	Designing for System of ITS/Planning for Traffic Control 2	Oriental Consultants Co., Ltd.



## Appendix 2. Survey Schedule

### (1) Field survey

Order	Date		Leader/ Coordinator	Chief Consultant/ Planning for Traffic Control 1	Designing for Equipment and Materials of ITS	Designing for System of ITS/Planning for Traffic Control 2	Deputy Chief Consultant/ Procurement for Equipment and Materials	Designing for Equipment of Data Communication	Designing for Road Facilities/ Construction Planning	Procurement Condition/ Cost Estimate
			Mr. Kotaro NISHIGATA	Mr. Keigo KONNO	Mr. Hiroaki KURITA	Mr. Masaaki GOTO	Mr. Shinichi SAKABE	Mr. Toshikage ITO	Mr. Munetoshi OIKAWA	Mr. Toshinori KANAZAWA
1	30-Oct	Sun	Movement to Hanoi from Japan							
2	31-Oct	Mon	Courtesy Visit on MOT, VEC, JICA office and EOJ/Explanation of Inception Report							
3	1-Nov	Tue	Discussion with MOT and VEC on Inception Report and Minutes of Discussion							
4	2-Nov	Wed	Site Survey, Visit to relevant organization							Movement to Hanoi
5	3-Nov	Thu	Minutes of Discussion (MD) with MOT and VEC				Survey for relevant market of Equipment and Materials			
6	4-Nov	Fri	Minutes of Discussion/Signing on MD with MOT and VEC, Report to EOJ and JICA office				Survey for Procurement Condition			
7	5-Nov	Sat	Movement to Japan	Data Arrangement/Meeting in Survey Team						
8	6-Nov	Sun		Data Arrangement						
9	7-Nov	Mon		Site Survey, Data Collection, Procurement Condition Survey						
10	8-Nov	Tue	Movement to Japan	Data Collection in MOT	Site Survey/Procurement Condition Survey					
11	9-Nov	Wed		Ditto	Ditto					
12	10-Nov	Thu		Ditto	Ditto					
13	11-Nov	Fri		Ditto	Ditto					
14	12-Nov	Sat		Meeting in Survey Team						
15	13-Nov	Sun		Data Arrangement						
16	14-Nov	Mon		Data Collection in MOT	Site Survey/Procurement Condition Survey					
17	15-Nov	Tue		Ditto	Ditto					
18	16-Nov	Wed		Ditto	Ditto					
19	17-Nov	Thu		Data Analysis	Ditto					
20	18-Nov	Fri		Ditto	Ditto					
21	19-Nov	Sat	Movement to Japan	Meeting in Survey team						
22	20-Nov	Sun		Data Arrangement						
23	21-Nov	Mon		Preparation of Survey Result and Discussion Materials						
24	22-Nov	Tue		Discussion with MOT and VEC for Equipment/Materials Borne by the Viet Nam Government Side						
25	23-Nov	Wed		Data Analysis	Movement to Japan			Data Collection		
26	24-Nov	Thu		Ditto				Movement to Japan		
27	25-Nov	Fri		Discussion with MOT and VEC, Report to JICA office						
28	26-Nov	Sat		Data Analysis						
29	27-Nov	Sun		Ditto						
30	28-Nov	Mon		Movement to Japan						

(2) Outline Explanation of the Preparatory Survey

Order	Date		Leader	Chief Consultant/Planning for Traffic Control 1	Designing for System of ITS/Planning for Traffic Control 1	Deputy Chief Consultant/Procurement for Equipment and Materials	
				Shuntaro Kawahara	Keigo Konno	Masaaki Goto	Shinichi Sakabe
1	Jan.	8	Sun		Movement to Hanoi		
2		9	Mon	Movement to Hanoi	Explanation to JICA Experts/SAPI Team		
3		10	Tue	Explanation/Discussion with MOT and VEC for Draft Final Report (DFR)			
4		11	Wed	Discussion with MOT and VEC for Minutes of a Meeting, Report to Embassy of Japan			
5		12	Thu	Discussion with MOT and VEC for Minutes of a Meeting, Signing on Minutes, Report to JICA Vietnam office			
6		13	Fri	Movement	Supplementary Field Survey		
7		14	Sat		Movement		

## Appendix 3 List of Parties Concerned in the Recipient Country

### Ministry of Transport of Vietnam

Ms Nguyen Thanh Hang	Deputy Director General, Department of Planning and Investment
Mr. Le Tuan Anh	Deputy Director General, Department of Planning and Investment
Mr. Nguyen Ngoc Hai	Chief officer of Expressway Management Office Senior Official of Project Management Division Department of Planning and Investment
Mr. Nguyen Xuan Hung	Senior Expert, Vietnam Expressway Management Office
Mr. Nguyen Trung Them	Senior Expert, Transport Infrastructure Department
Mr. Le Thanh Tung	Deputy Manager, Database and Software Development Department Information Technology Center
Mr. Phung Van Trong	Deputy Manager, Technical and Network Management Department Information Technology Center
Mr. Nguyen Quang Tuan	Senior Expert, Science and Technology Department.
Dr. Dang Cong Chien	Vice Director General, Science and Technology, Environment and International Cooperation Department Directorate for Vietnam Road Administration
Mr. Pham Thanh Binh	PMU Thang Long

### Vietnam Expressway Corporation

Mr. Mai Tuan Anh	General Director
Mr. Pham Hong Quang	Deputy General Director
Mr. Nguyen Hai Long	Deputy Director of Project Department
Mr. Le Quang Hao	Director of Technical, Technological Environmental Department
Mr. To Kim Tuan	Expert of Technical, Technological Environmental Department
Mr. Pham Thanh Tung	Project Officer of Project Department
Mr. Nguyen Hoang Ha	Co-Team Leader, ITS Division

### Ministry of Planning and Investment

Mr. Nguyen Hoang Linh	Head of Japanese Division, Foreign Economic Relation Department
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### Embassy of Japan

Mr. Ken Furudo	First Secretary
Mr. Shigeru Kishida	Second Secretary
Ms. Kazuko Maruyama	Second Secretary

### JICA Vietnam Office

Mr. Toshio Nagase	Senior Representative
Mr. Daisuke Watanabe	Representative
Mr. Phan Le Binh	Senior Program Officer

### JICA Expert

Mr. Shunji Hata	Advisor for Management, O&M of Expressway System
Mr. Shigeo Murata	Expressway Management Institution Advisor

MINUTES OF DISCUSSIONS  
ON THE PREPARATORY SURVEY  
ON THE PROJECT FOR DEVELOPMENT OF TRAFFIC CONTROL SYSTEM  
FOR EXPRESSWAY IN HANOI

In response to a request from the Government of the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), the Government of Japan decided to conduct a Preparatory Survey on the Project for Development of Traffic Control System for Expressway in Hanoi (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Vietnam the Preparatory Survey Team (hereinafter referred to as "the Team" ), which is headed by Mr. Kotaro Nishigata, Deputy Director, Transportation and ICT Division 2, Economic Infrastructure Department, JICA and is scheduled to stay in the country from October 30th to November 27th, 2011. The Team held discussions with the officials concerned with the Government of Vietnam and conducted a field survey in the study area.


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

November 4th, 2011




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Mr. Le Anh Tuan  
Deputy Director General  
Department of Planning and Investment  
Ministry of Transport of Vietnam




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Mr. Kotaro Nishigata  
Leader/ Coordinator  
Preparatory Survey Team  
Japan International Cooperation Agency



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Mr. Pham Hong Quang   
Deputy General Director  
Vietnam Expressway Corporation

## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to improve logistics environment in Hanoi metropolitan area using ITS technologies to realize smooth transportation.

### 2. Project site

The site of the Project is located on Ring Road No.3 between the intersection with NH-5 and Phap Van, and Road Section between Phap Van and Cau Gie as shown in ANNEX 1.

### 3. Responsible and Implementing Agency

The Responsible Ministry is the Ministry of Transport (MOT).

The Implementation Agency is the Vietnam Expressway Corporation (VEC).

### 4. Confirmation of the items requested by the Government of the Vietnam

After discussions with the Team, the requested components were confirmed as shown in ANNEX 2. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

### 5. Japan's Grant Aid Scheme

5-1. Vietnamese side understands the Japan's Grant Aid Scheme explained by the Team, as described in ANNEX 3.

5-2. Vietnamese side will take the necessary measures, as described in ANNEX 4, for smooth implementation of the Project.

### 6. Environmental Consideration

Vietnamese side explained that detailed environmental impact assessment is not required for the Project because the components of the Project are mainly related to the installation of equipment. However, an environment protection commitment should be presented at basic design stage according to Decree 29/2011/ND-CP issued by Government of Vietnam in 2011. And the Team agreed to provide necessary information to prepare the commitment.

### 7. Schedule of the Study

7-1. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around January, 2012.

7-2. JICA will finalize the final report and send it to the Government of Vietnam by the end of April, 2012.



## 8. Other issues

8-1 Vietnamese side explained that the organization which was in charge of operation of the traffic control system was not yet officially decided at the moment. However, it is planned that VEC will be appointed to operate the system after installation.

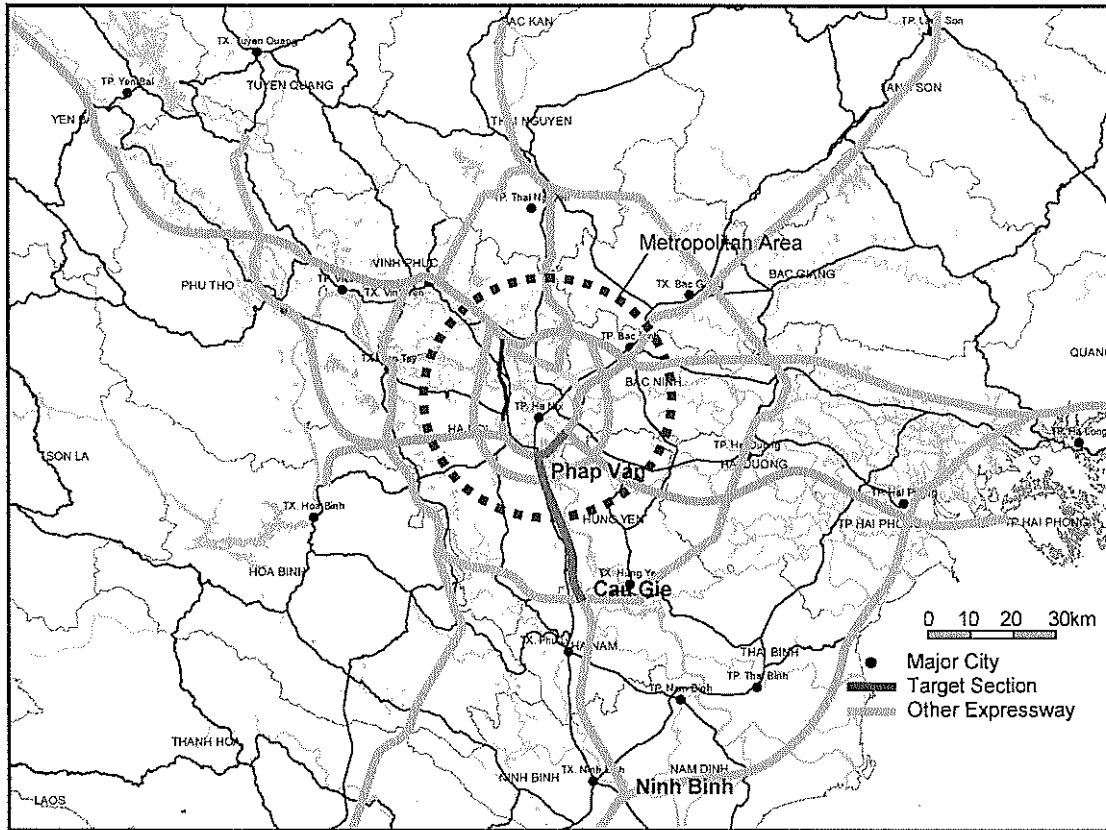
8-2 Vietnamese side agreed to prepare the official application form for the Project by the end of December, 2011.

8-3 The Team requested to prepare the space and the building for the control center of the ITS equipment nearby the target section of the Project. It was informed by VEC that the control center would be located at Vuc Vong interchange (under Cau Gie- Ninh Binh project) while the Team recommended that the control center should be located nearby Ring Road No.3 in Hanoi City. Vietnamese side agreed to inform the Team of the candidate site of the control center by 27<sup>th</sup> November, 2011.

8-4 Vietnamese side agreed that local taxes (including import tax) and other fiscal levies to be imposed on the Project would be borne by the Government of Vietnam.

8-5 The team explained that the item No.3 listed in ANNEX 4 meant supports or arrangements to be secured by the Government of Vietnam for the all Japanese parties concerned in the Project, e.g. VISA acquisition, work permission. However, the fee to get VISA or the permissions would be covered by the Project.

# Site Map



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## Requested items

No.	Item	Other remarks
<b>1. Roadside Equipment Components</b>		
1-1	CCTV Camera for Traffic Monitoring (PTZ type)	
1-2	Vehicle Detector (Fixed Type CCTV Camera for Image Recognition)	
1-3	VMS (including Gantry for VMS)	
1-4	Mobile VMS	
<b>2. Center System</b>		
2-1	Network Video Recorder (NVR) for CCTV Monitoring	
2-2	Server for Information Collection and Analysis including Console	
2-3	Server for Information Dissemination Control including Console	
2-4	Monitor Screen for CCTV Monitoring	
2-5	Monitor Screen for Traffic Control	
<b>3. Communication System</b>		
3-1	SW-Hub includes Media Convertor for Roadside Equipment Components	
3-2	Transmission Equipment Component	
3-3	SW/Router	
3-4	Network Management System	
3-5	Optical Fiber Cable between Base Station and Center System	
3-6	Wireless Communication System between Base Station and Roadside Equipment Component	
3-7	Ducts and Cable Chamber for Optical Fiber Cable	

## Note

- 1) Necessary software components are studied and included in the related equipment components.
- 2) Each equipment component includes necessary auxiliaries such as communication cable, power supply cable, UPS, lightning protection system, earthing system, and others required to complete it.



## JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as “the GOJ”) is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

### 2. Preparatory Survey

#### (1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.

- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

#### (2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

#### (3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

### 3. Japan's Grant Aid Scheme

#### (1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

#### (2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

#### (3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

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

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

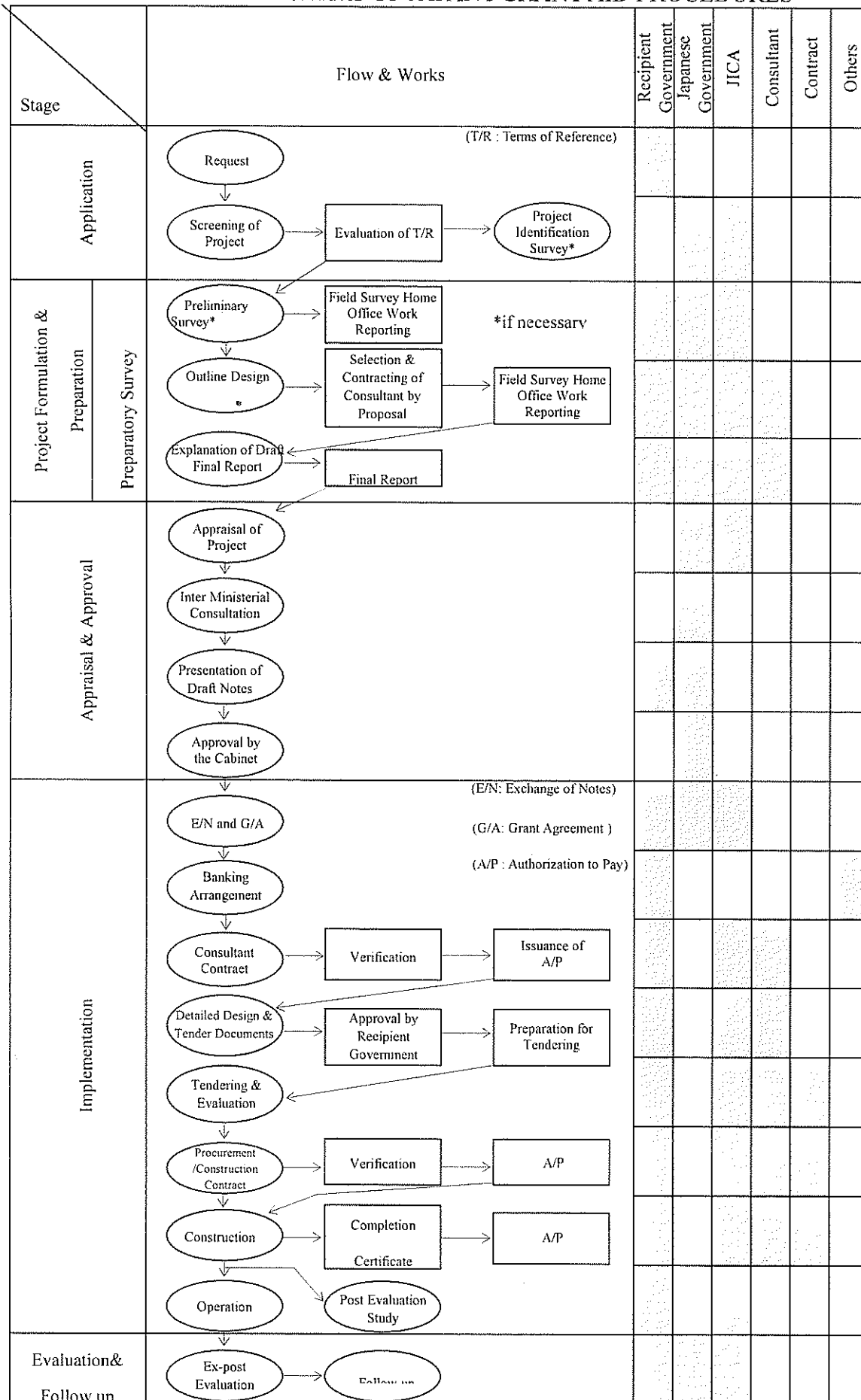
(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

## FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



### Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
2	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be borne by the Authority without using the Grant]		•
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
4	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		•
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
6	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•

(B/A : Banking Arrangement, A/P : Authorization to pay)

MINUTES OF DISCUSSIONS  
ON THE PREPARATORY SURVEY  
ON THE PROJECT FOR DEVELOPMENT OF TRAFFIC CONTROL SYSTEM FOR  
EXPRESSWAY IN HANOI  
(EXPLANATION ON DRAFT FINAL REPORT)

In November 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted the Preparatory Survey (hereinafter referred to as "the last survey") on the Project for Development of Traffic Control System for Expressway in Hanoi (hereinafter referred to as "the Project") in the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), and through discussions, field surveys and technical examination of the results of the surveys in Japan, JICA prepared a Draft Final Report of the Outline Design.

In order to explain and to consult with the concerned officials of the Government of Vietnam about the component of the Draft Final Report, JICA sent Vietnam the Preparatory Survey Team for Draft Final Report Explanation (hereinafter referred to as "the Team"), which was headed by Mr. Shuntaro KAWAHARA, Senior Advisor, Economic Infrastructure Department, JICA, from January 8<sup>th</sup> to 13<sup>th</sup>, 2012.

As a result of discussion, both sides confirmed the main items described in the attachment.

Hanoi, January 12<sup>th</sup>, 2012

川原 俊太郎

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Mr. Shuntaro Kawahara  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency

Hang

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Ms. Nguyen Thanh Hang  
Deputy Director General  
Department of Planning and Investment  
Ministry of Transport of Vietnam

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Mr. Mai Tuan Anh  
General Director  
Vietnam Expressway Corporation

## ATTACHMENT

### 1. Project Components

After the explanation of the contents of Draft Final Report by the Team, the Vietnamese side and the Japanese side agreed the project components included in it.

### 2. Japan's Grant Aid Scheme

The Vietnamese side understood the Japan's Grant Aid scheme and the necessary measures to be taken by the recipient country as explained by the Team and described in Annex-2 and Annex-3 of the Minutes of Discussions signed by both sides on November 4<sup>th</sup>, 2011.

### 3. Schedule of the Study

JICA will complete the final report and send it to the Government of Vietnam by the end of April, 2012.

### 4. Project Cost

The Vietnamese side was informed that the Project cost should not exceed the upper limit of amount agreed on in E/N and G/A and understood that the Project Cost Estimate attached as Annex is not final and is subject to change by the result of examination through revision of the Outline Design.

### 5. Environment and Social Considerations

The Team agreed that the final report would include necessary environment and social considerations during installation work of the Project to prepare an environmental protection commitment before the Vietnamese's approval of the Feasibility Study on the Project.

### 6. Other Issues

6-1. Both sides agreed the location of the control center near Vuc Vong interchange. And Vietnamese side agreed to prepare the rooms for the control center in the road management office in Vuc Vong by June, 2012.

6-2. The Vietnamese side explained that ITS equipment for Phap Van- Ninh Binh section would be installed by June, 2012 based on the detailed design which was prepared by Vietnam Expressway Corporation (VEC) and approved on January 9<sup>th</sup>, 2012 by Ministry of Transport (MOT). Regarding the section neighboring to the Project site, the Team and Vietnamese side agreed:

- The detailed design of the Project should be considered to accommodate data collected by monitoring cameras to be installed on Phap Van- Ninh Binh section. On the other hand, compatibility to the systems and software installed in the control center by the Project must be considered in case that ITS equipment on Phap Van- Ninh Binh section is expanded so as to enhance traffic control function.

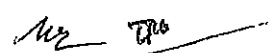


- JICA and MOT are now preparing the “Study for Assistance of ITS Integration Project Implementation over National Highway No.3 & Hanoi Metropolitan Area” (Study on ITS Integration Project). Expansion of ITS equipment on Phap Van- Ninh Binh section should be considered so as to be adapted to the Study on ITS Integration Project.

6-3. The Team explained that official request for the grant-aid towards the Project should be submitted to the Embassy of Japan in Vietnam by January 21<sup>st</sup>, 2012, on which JICA, Ministry of Finance of Japan, Ministry of Foreign Affairs of Japan would have meeting for appraisal of the Project. The Vietnamese side explained that Ministry of Planning and Investment (MPI) was requesting relevant agencies comment for the Project to make government decision, and that MOT and VEC would exert their effort to make the earliest decision.

6-4. Both sides confirmed that the equipment procured under the Project must be maintained and used properly for the implementation of the Project under the responsibility of the Government of Vietnam. And if the Vietnamese side will intend to change the purpose or the ownership of the equipment in the future, the Vietnamese side should consult with Embassy of Japan and JICA Vietnam Office in advance.

6-5. Both sides confirmed that the Vietnamese side should prepare the power supply to each distribution panel of center system and roadside equipment by June 2013. The cost for power supply work should be reviewed in detail by MOT and VEC based on the final report to be submitted in April 2012.





## Project Cost Estimate

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant Aid.

### 1. Cost to be borne by the Japanese side:

< This part is closed due to the confidentiality. >

### 2. Cost to be borne by the Vietnamese side

- |  |               |                   |
|--|---------------|-------------------|
| (1) Power supply work, custom clearance, and so on | Approximately | VND 10 billion    |
| (2) Operation and maintenance (every year)         | Approximately | VND 1,000 million |

### 3. Conditions for estimate

- |                            |               |   |              |
|----------------------------|---------------|---|--------------|
| (1) Time of estimate:      | November 2011 |   |              |
| (2) Foreign exchange rate: | USD 1.00      | = | JPY 79.67    |
|                            | VND 1.00      | = | JPY 0.003858 |
| (3) Others:                |               |   |              |

The above estimate was carried out in accordance with relevant rules and the guideline of Japan's Grant Aid.

## **Technical Notes**

### **on the Preparatory Survey on the Project for Development of Traffic Control System for Expressway in Hanoi**

The JICA Preparatory Survey Team on the Preparatory Survey on the Project for Development of Traffic Control System for Expressway in Hanoi (hereinafter referred to as “the Team”), the Ministry of Transport (hereinafter referred to as “MOT”) and Vietnam Expressway Corporation (hereinafter referred to as “VEC”) confirmed the following technical points.

#### **1. Priority for Draft Plan for Roadside Equipment**

The Team proposed four (4) alternatives for road side equipment plan.

The Team explained the rough estimated cost ratio for each alternative. Alternatives 3-1 and 3-2 are close to the requested amount, however, Alternative 2 and Alternative 1 are two times and three times of the requested amount respectively.

Excluding Alternatives 1 and 2, which will exceed the budget, the Team will further study based on Alternatives 3-1 and 3-2.

As for Alternative 3-2, the Vietnamese side will inform the Team the availability of the space to install control center equipment near Phap Van JCT by the first week of December, 2011. As for Alternative 3-1, the Vietnamese side informed that the cable and conduit under ITS package in Cau Gie- Ninh Binh project will be installed and completed by June 2012.

#### **2. Design Conditions for Traffic Control System**

The Team summarized the comparison of design conditions for traffic control system among ITS Standard (JICA), Design of ITS package under Cau Gie- Ninh Binh project, and Grant Aid Project. Although some minor comments were submitted, VEC and MOT basically agreed with the proposed design condition for the Grant Aid Project including attached requirements to the system design conditions.

#### **3. Future Expandability**

Vietnamese side requested the Team to design the system so that the server equipment may easily cope with the system expansion when the system is extended from Cau Gie to Ninh Binh.

#### **4. Owner of Equipment, and Responsibility of Operation and Maintenance**

MOT and VEC confirmed that the equipment procured by the Project will be owned by VEC under MOT, and VEC will be assigned by MOT as responsible organization for operation and maintenance of the equipment procured by the Project.

5. Obligations of Recipient Country

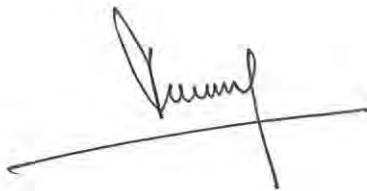
1) All parties confirmed that the work items mentioned below are to be executed by the designated time as the obligations of the Vietnamese side:

- a) Preparation of the space to install the center system such as servers, monitor screens and network video recorder (by June 2013).
- b) Preparation of conduit for optical fiber cable from Vuc Vong Control Center to Phap Van in case of Alternative 3-1 (by June 2013).


Note: The above month and year in parenthesis are based on the assumption that the Project implementation is approved by the Cabinet in February 2012, and the contract with the supplier is completed by August 2012.

2) As for power supply, the Team requested to supply power to each distribution panel of the center system and roadside equipment by June 2013. The Vietnamese side informed that they will be responsible for the power supply to the above points, however they proposed that the power connection works from power station to the above points should be borne by the Project. The Team requested to reconsider it not only by VEC but also as the whole Vietnamese side since, in principle, power supply to the site is to be borne by the recipient country in Japan's Grant Aid projects.

Hanoi, November 24, 2011




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Mr. Pham Hong Quang  
Deputy General Director  
Vietnam Expressway Corporation 



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Mr. Shinichi Sakabe  
Deputy Chief Consultant  
JICA Preparatory Survey Team 

## Requirements to the System Design Conditions

## 1. General

- 1) The system design and development should be proceeded with the confirmation process with parties concerned so as to connect, exchange necessary data/information, and control camera/VMS/CSS without trouble. Further detailed procedure or conditions should be confirmed during project implementation period.
- 2) Basic Specification of the system in ITS package under Cau Gie- Ninh Binh project shall be disclosed to the Contractor of the Grant Aid Project.

## 2. CCTV Monitoring

- 1) In order to control designed CCTV camera in ITS package under Cau Gie- Ninh Binh project, which equips digital PTZ function, from Traffic Control Center planned under this Grant Aid Project, it will be required that recorder of the monitored moving image, layer 3 switch and the function to transmit its original recorded image to both Cau Gie-Ninh Binh ITS's network video recorder and the network video recorder which is planned under this Grant Aid Project. The necessary equipment components will be clarified further in the preparatory study and will be installed by the grant aid project.
- 2) Device driver of the PTZ type CCTV camera of ITS design under Cau Gie- Ninh Binh project shall be disclosed to the Contractor of the Grant Aid Project if the Contractor of the Grant Aid Project has the control authorization of equipment from the competent authorities of Vietnam.
- 3) As for data storing, data access from the Traffic Control Center to the above mentioned recorder will be basically possible. This procedure should be confirmed among the parties concerned during project implementation period.

## 3. Event Detection/Vehicle Detection

- 1) As for data storing, data sending from Expressway Management Center to the Traffic Control Center will be basically possible. This procedure should be confirmed among the parties concerned during project implementation period.
- 2) Data format and event category should be confirmed during project implementation period.

## 4. VMS/CSS (VLS in ITS design under Cau Gie- Ninh Binh project)

- 1) Device driver which control VMS and CSS to be installed in ITS design under Cau Gie- Ninh Binh project shall be disclosed to the Contractor of the Grant Aid Project in order to control those equipment components remotely from the Traffic Control Center whenever it is required if the Contractor of the Grant Aid Project has the control authorization of equipment from the competent authorities of Vietnam. However, both sides agreed that it is necessary to clarify further a responsible agency for control of individual VMS .




2) IP address of VMS and CSS to be installed under ITS under Cau Gie- Ninh Binh project also required to inform to the Contractor of the Grant Aid Project to identify those equipment components individually from the Traffic Control Center.

5. Network Management System (NMS)

The function of NMS to be equipped under the Grant Aid Project is recommended to integrate in the ITS design under Cau Gie- Ninh Binh project.



PREPARATORY SURVEY on the DEVELOPMENT of  
TRAFFIC CONTROL SYSTEM for EXPRESSWAY in HA NOI  
FACILITIES for TRAFFIC CONTROL SYSTEM

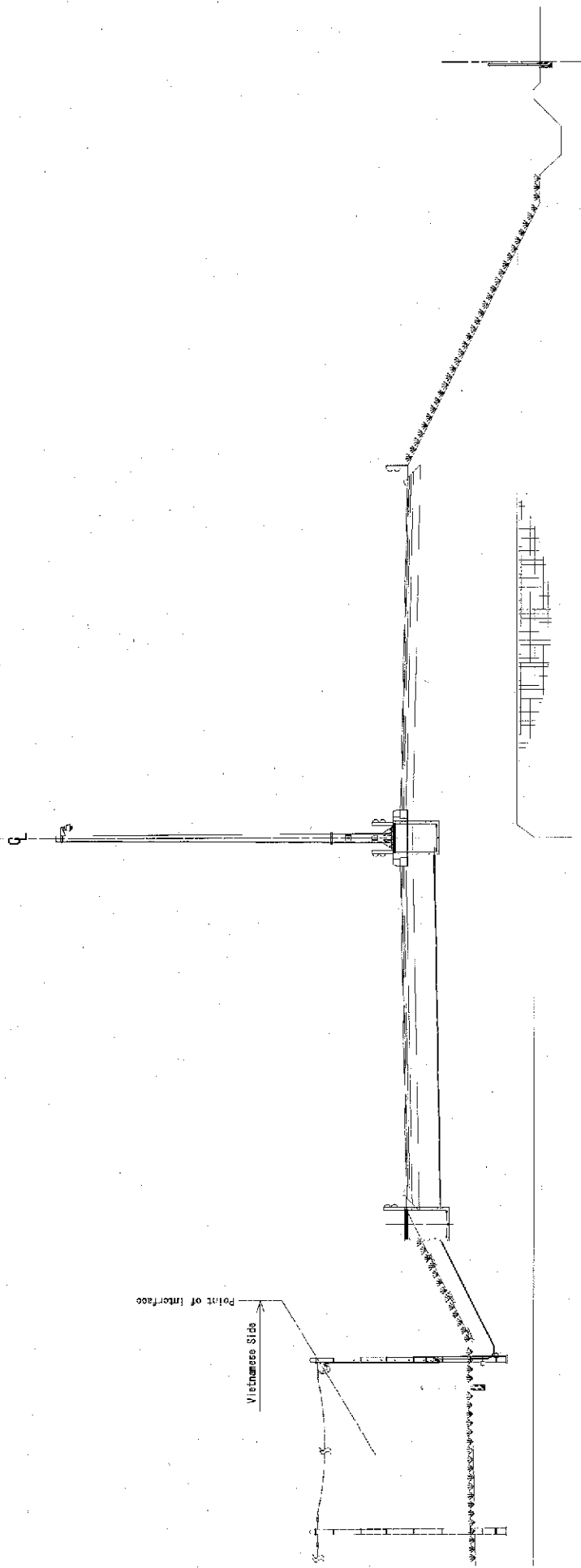
DRAWING

March, 2012

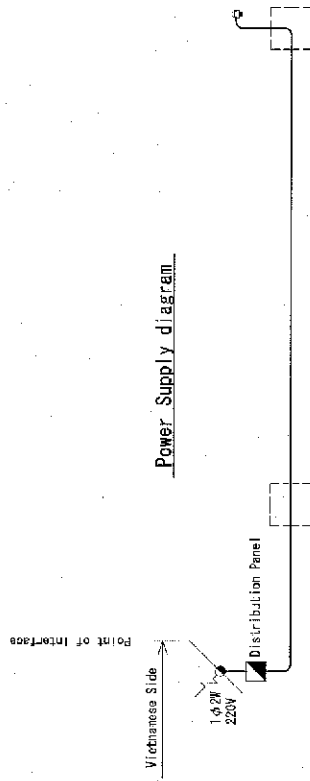
# GENERAL INDEX

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Individual Lead-in Power Supply (Reference)



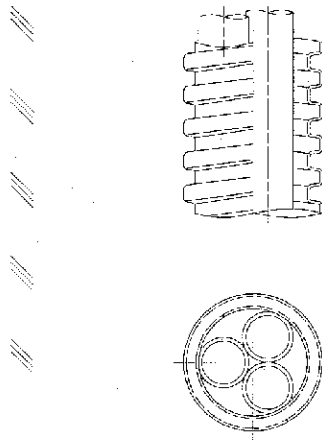
Power Supply diagram



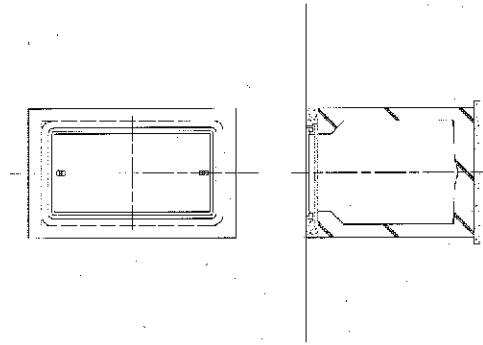


COMMUNICATION DUCT - HANDHALL

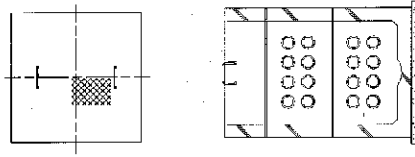
COMMUNICATION DUCT



HANDHOLE for Communication



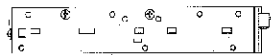
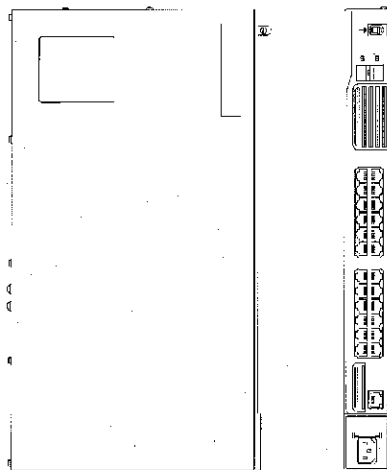
HANDHOLE for Power Supply



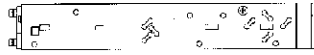
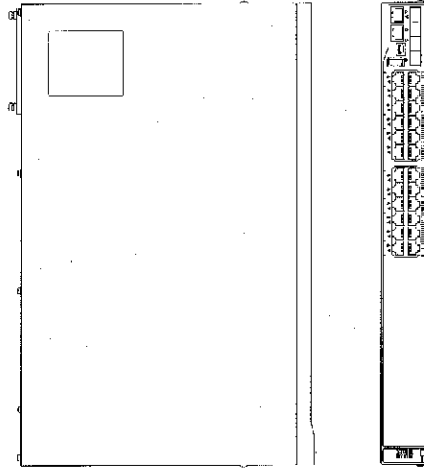
NOTE:  
The equipment and their layout shown on the expressway are  
for reference purpose only.

MEDIA CONVERTER L2, L3-SW

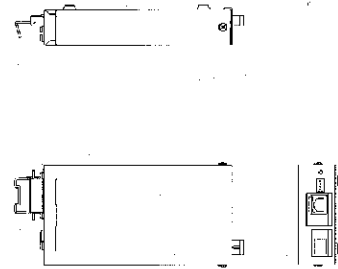
L3-SW



L2-SW, SW-HUB



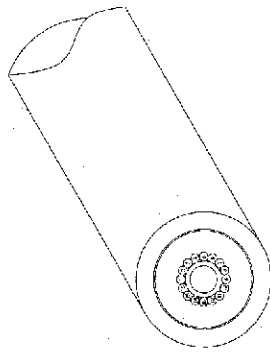
MEDIA CONVERTER



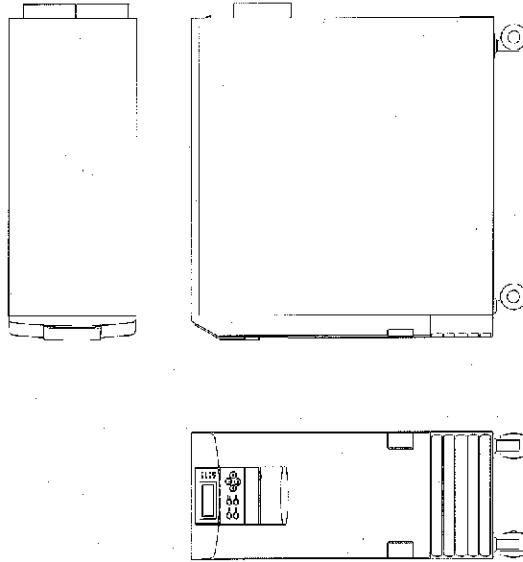
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OPTICAL FIBER CABLE - UNINTERRUPTIBLE POWER SUPPLY

OPTICAL FIBER CABLE



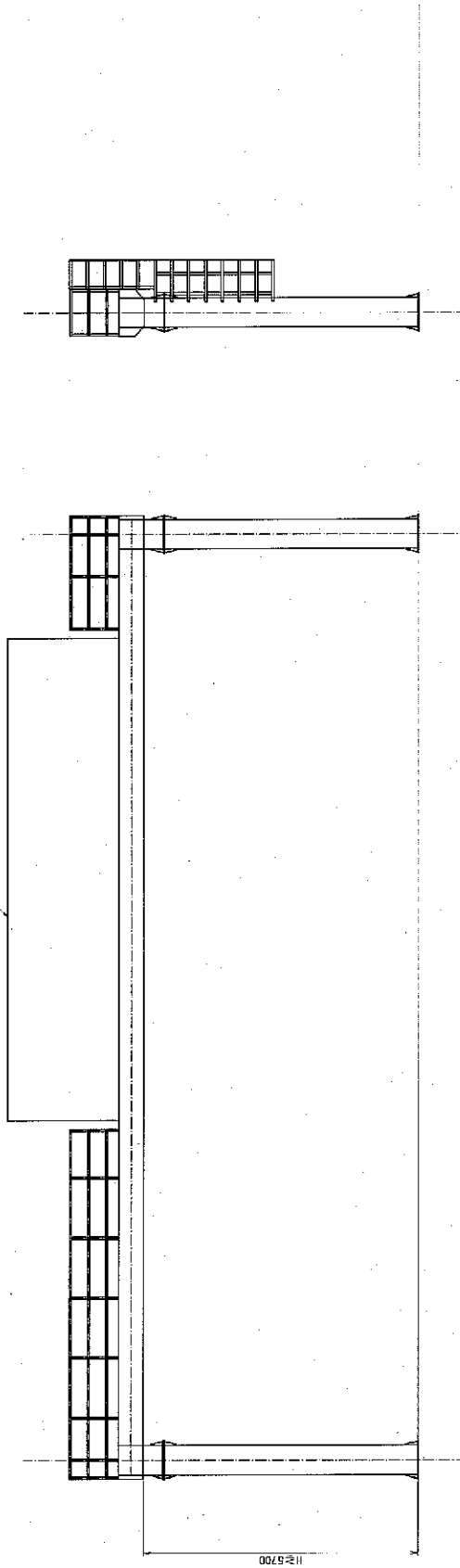
UNINTERRUPTIBLE POWER SUPPLY (2KVA, 5KVA)



NOTE:  
The equipment and their layout shown on this expressway are  
for reference purpose only.

VMS (Variable Message Sign Board)

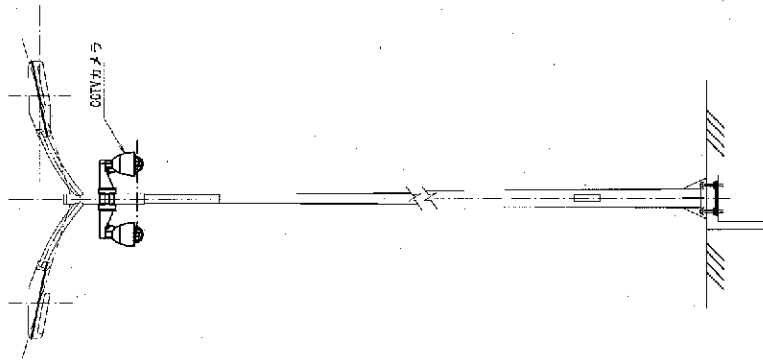
High Definition LED Type  
23 Characters x 2 lines



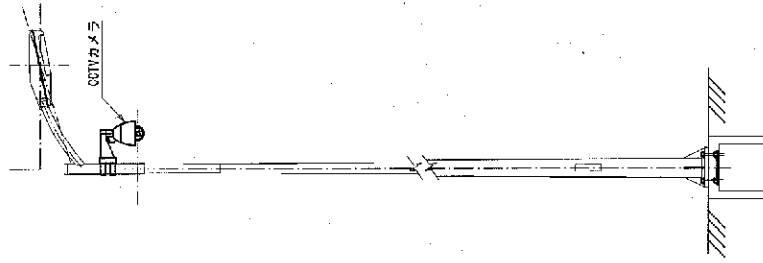
NOTE:  
The equipment and their layout shown on the expressway are  
for reference purpose only.

CCTV CAMERA (for Traffic Monitoring, Event and Vehicle Detection) on LIGHTING POLE

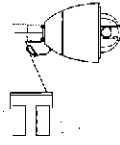
LIGHTNING POLE (H=11m: Median)



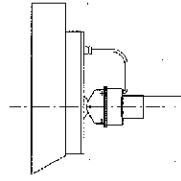
LIGHTNING POLE (H=10m: Shoulder)



CCTV CAMERA (for Traffic Monitoring)

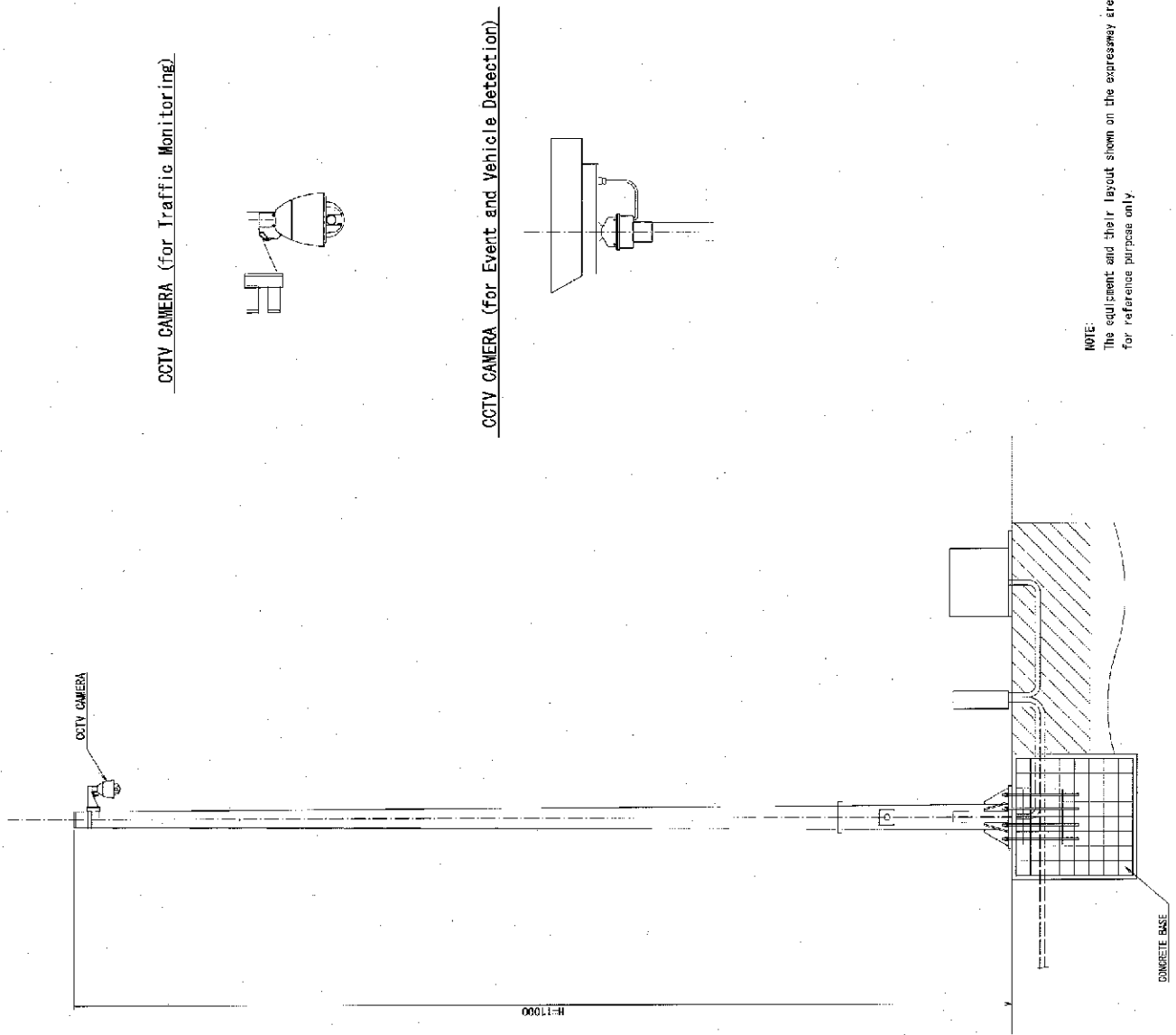


CCTV CAMERA (for Event and Vehicle Detection)



NOTE:  
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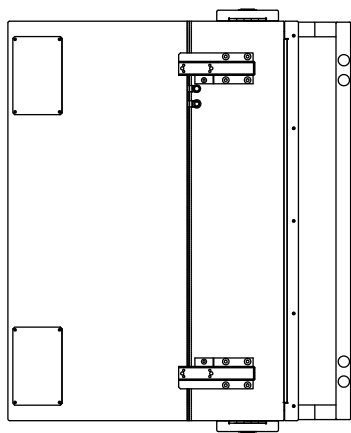
CCTV CAMERA (for Traffic Monitoring, Event and Vehicle Detection) POLE AND BASE



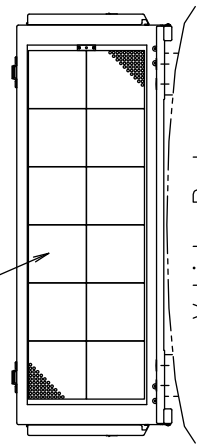
MOBILE VMS (variable Message SignBoard)

Controle Unit

SIGNBOARD on VEHICLE

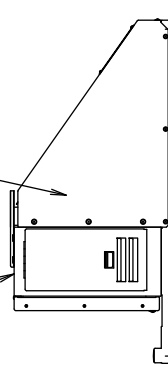


Display Unit



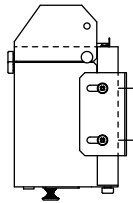
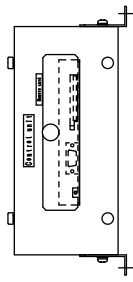
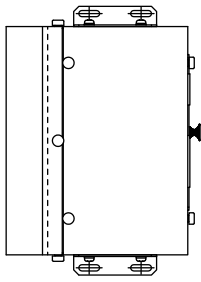
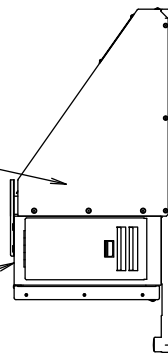
Vehicle Body

Main Body

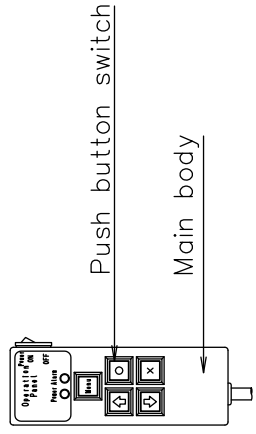


Vehicle Body

Roof Cover



OPERATION PANEL



Note :  
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expressways are for reference purpose only.