



# Hai Van Tunnel Construction Project

## Reasons for Taking Up This Project

During The Vietnam War the lifelines connecting the North-South national corridor was destroyed completely. The Vietnamese Government, “Socialist Republic of Vietnam”, after united into one nation, started the reconstruction of those lifelines soon after the ending of the war time. The Japanese Government resumed the Japanese ODA in 1992 and both road and railways had been reconstructed for decades under the ODA scheme, accordingly the national economy had been recovered and logistic volume were increasing along National Route No.1 (NH1) which connects the capital city between Hanoi and commercial capital Ho Chi Minh City along the coastal line of Vietnam.

The “Hai Van Pass” is the biggest traffic bottleneck on NH1. More than ten times of fatal traffic accidents occurred within one year, because of steep grade with small radius pass road, and the pass road had been closed because of those traffic accident many times in one year.

Hai Van Tunnel Construction Project, was formulated, in cooperation of The Vietnamese and Japanese Governments, for overcoming such traffic bottleneck and it was one of the best symbolic construction projects that demonstrating the economic growing of the country in 1990s.

The project was completed in time successfully. Not only the contribution of development of the national economy but also Japanese tunneling technologies were transferred to Vietnam and Vietnamese construction contractors acquired the tunnelling technologies at the level of doing by themselves.

Through the project implementation, all engineers were enjoying the cooperation in the construction works, not only civil works but also mechanical and electrical works as well. After the opening ceremony, the friendships built during the project had been closely maintained and many times of “Reunion Parties” are being held to date.

# 1 Introduction

## 1.1 Project Background

The Hai Van Pass located in coastal Central Vietnam, is the biggest traffic bottleneck on the National Route No.1, which is the most important north-south arterial linking the capital Hanoi with Ho Chi Minh. That Pass is to an elevation of 475 m for approximately 20 km with continuous small curves and steep grade. From the late 1990's, the rapid development of the national economy has increased the logistic volume

through the pass; however, the heavy tracks has been forced to run slowly and fatal traffic accidents increased year by year. In addition, the road is often blocked due to landslides and slope failure during the rainy seasons. Under such circumstances, the Vietnamese Government decided to construct a new highway segment with a tunnel under the Hai Van Pass by the Prime Minister's Decree in March 1994 (Figure 1).

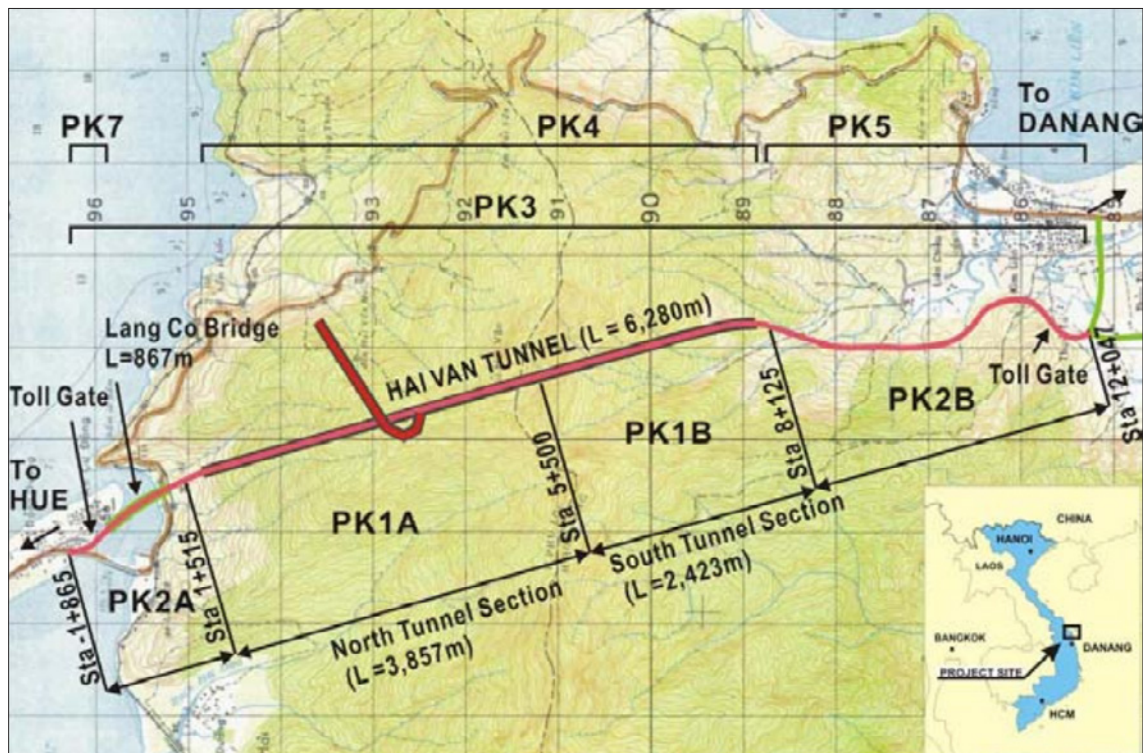


Figure 1: Project Location Map

## 1.2 Traffic Safety Benefits by the Project

The Hai Van Pass was infamous for a “traffic bottleneck” because traffic jam had frequently occurred, and road-closure happened almost once a month. Moreover, many motorcyclists have caused fatal

accidents when they travel on the downslope of the pass. The opening of the Hai Van Pass dramatically improved the traffic safety of the pass road (Table 1).



Table 1: Record of Traffic Accidents before Opening of Hai Van Tunnel

Year	# of Major Accident	Fatal	Injured	Road Closure
1996	14	6	20	28
1997	9	4	24	29
1998	14	10	35	33
1999	17	13	14	30
2000	32	5	57	29
2001	19	6	16	26
2002	16	4	7	53
2003	26	5	10	55
2004	31	9	16	62
Toral	178	62	199	345
Ave.	20	7	22	38

## 2 Project Chronology

### 2.1 Consulting Services

The consulting service of the project commenced in January 1998, consisting of 1) Special Survey, 2) Detailed Design,

3) Contract Tendering Assistance, 4) Construction Supervision, and 5) Training and Technology Transfer (Figure 2)

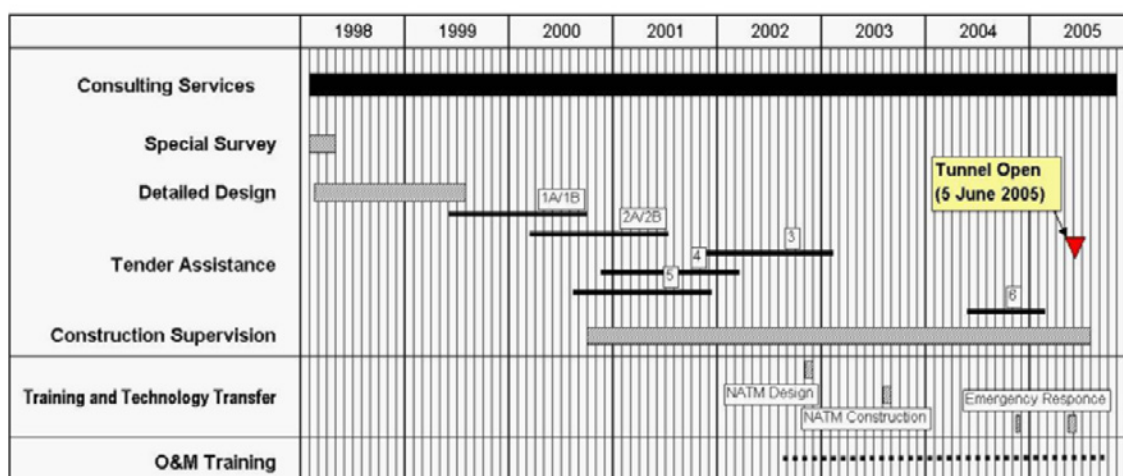


Figure 2: Consulting Services Schedule

### 2.2 Construction Works

The tunnel construction started on 1st October 2000, the project had basically progressed on schedule (Figure 3), although the tunnelling works encountered some unforeseeable geological conditions (Figure 4). The tunnel traffic-opening

ceremony was celebrated on 5 June 2005 (Figure 5). Since the opening, the long highway tunnel has been operated and maintained to date without any serious operational problem.

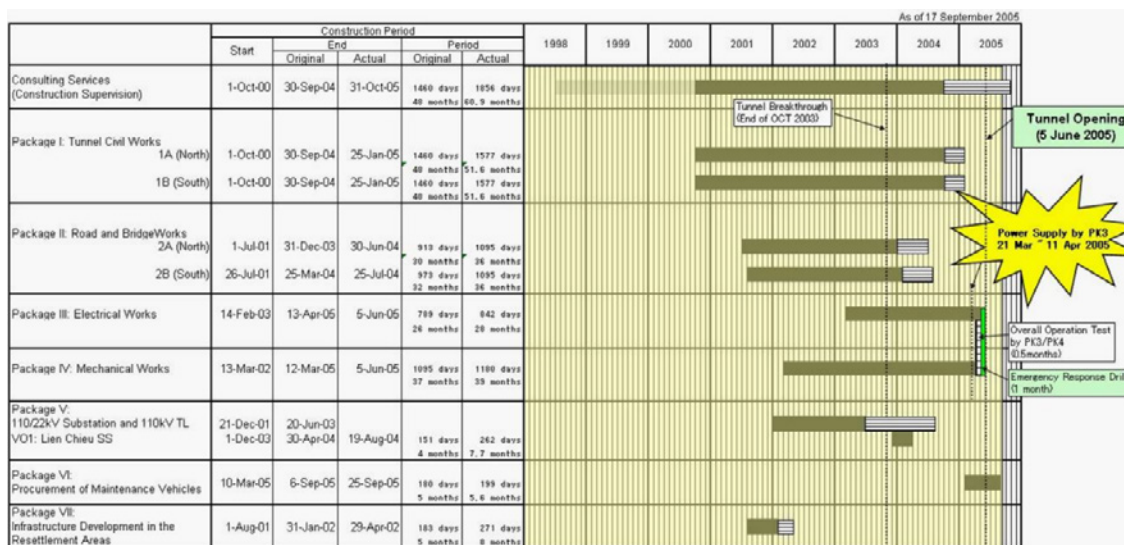


Figure 3: Project Implementation Schedule



Figure 4: Encountered Unforeseeable Geological Condition



Figure 5: Tunnel Opening Ceremony (broadcasted by NHK)

## 3 Project Features

### 3.1 Outline of the Project

Project major features are summarized in the following (Table 2). The characteristics of project can be summarized in five (5) items; 1) 6.3km long highway tunnel, 2) 1st NATM (New Austrian Tunnelling

Method) tunnel in Vietnam, 3) Longitudinal Ventilation System (Figure 2), 4) SCADA (Supervisory Control And Data Acquisition) for Overall System Control, 5) O&M Company required (Figure 6).

Table 2: Project Major Features

1) Project Length	12,182m (incl. Tunnel = 6,280m, Bridges = 1,653m)
2) Traffic Lane	2 Lanes (Stage 1) 1.25 (shoulder) +3.75 (Carriageway) +3.75+1.25, Total 10.0m wide
3) Operation System	SCADA (Supervisory Control And Data Acquisition)
4) Tunnel Length	6,280m (Main Tunnel, MT), 6,286m (Evacuation Tunnel, ET), 1,888m (Ventilation Adit, VA)
5) Tunnelling Method	NATM (New Austrian Tunnelling Method)
6) Cross-section	89m <sup>2</sup> (MT), 15.5 (ET), 36.2 (VA)
7) Cross-Passage	400m interval
8) Ventilation System	Longitudinal System, 23 Jet Fans, 3 EPs, 1 VA
9) Bridge Number and Length	8 bridges, 1,653m in total length
10) Toll Plazas	Two plazas on both ends of project roads



Figure 6: Tunnel Ventilation System

## 3.2 Project Organization

Project organizations are summarized in the table below (Figure 7, Table 3 and Table 4).

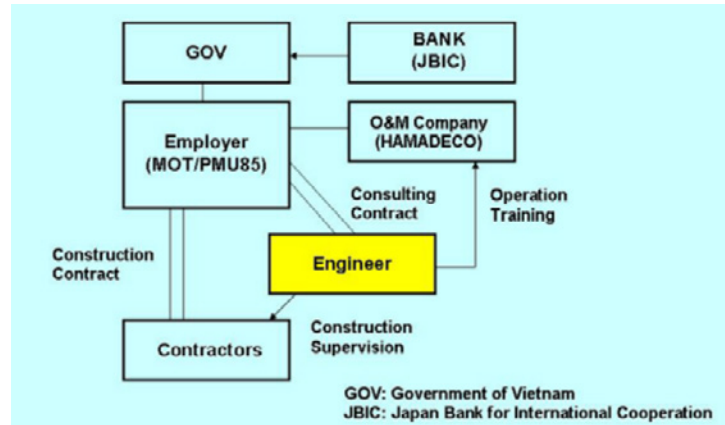


Figure 7: Project Organization

Table 3: Project Organization

Financing Agency	Japan Bank for International Cooperation (JBIC)
Loan Amount	L/A No. VNIV-5, March 26, 1997, Loan Amount: JPY 5.5 billion L/A No. VNVI-5, March 30, 1999, Loan Amount: JPY 10.0 billion L/A No. VNIX-4, March 29, 2002, Loan Amount: JPY 3.359 billion (Total JPY 18.859 billion)
Executing Agency	Project Management Unit No. 85 (PMU85) under Ministry of Transport and Communications (MOT)
O&M Company	HAMADECO (HAI van tunnel MANagement and DEVELOPMENT COMPANY)
Consultant	Joint Venture of Nippon Koei Co., Ltd., Japan and Louis Berger International Inc., USA in association with Transport Engineering Design Incorporation (TEDI), Vietnam

Table 4: Awarded Contractors

Contract Package	Awarded Contractor	Amount (USD)
1A: Tunnel Civil Works, North Tunnel Section	JV Hazama — Cienco 6	43,256,000
1B: Tunnel Civil Works, South Tunnel Section	JV Dong Ah — Song Da	27,863,000
2A: Road and Bridge Works, Lang Co Bridge Section	JV Thang Long — Truong Son	4,633,000
2B: Road and Bridge Works, Southern Highway Section	JV Cienco 1 — Lung Lo — Vinawaco	3,920,000
3: Electrical Works	JO of ABB — Kinden — Vinainco	20,686,000
4: Mechanical Works	Matsushita — Itochu Consortium	23,055,000
5: 110/22kV Substation and 110kV Transmission Line	JO of ABB — Kinden — Vinainco	7,256,000
6: Procurement of Maintenance Vehicles	Itochu Corporation	1,623,000
7: Infrastructure Development in the Resettlement Areas	Construction Company No. 185	413,000
		132,705,000



### 3.3 Record of Disbursement

As shown in Table 2, there were three (3) loans provided by JBIC totaling 18.859 billion JPY. However, the third lone (3.359

billion JPY) was not used and returned to JBIC (Figure 8).

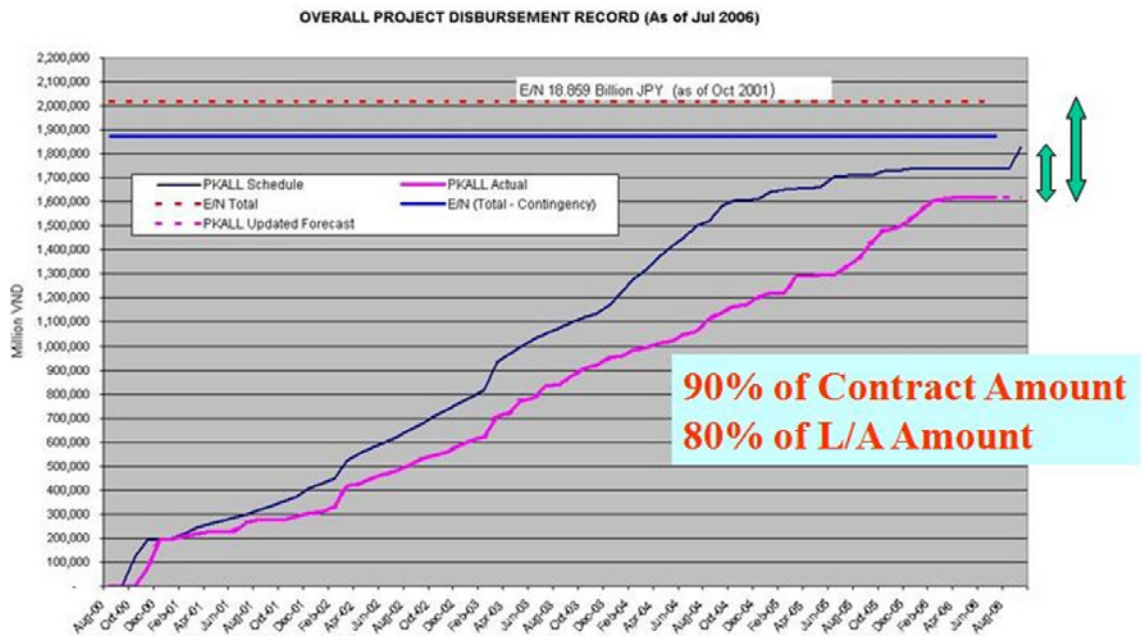


Figure 8: Overall Project Disbursement Record

### 3.4 Tunnel Emergency Training

The Consultant developed Standard Operation Plan (SOP) for the tunnel operation, and executed tunnel operation training for Vietnamese tunnel operation

company that was established in April 2004. Several times of evacuation drills inside the tunnel were carried out until the fire police persuaded (Figure 9).



Figure 9: Tunnel Emergency Training

### 3.5 FIDIC Based Project

The International Federation of Consulting Engineers (FIDIC) is widely used as conditions for international construction

contracts. The following FIDIC conditions were used in the project (Table 5).

Table 5: FIDIC Used in Project

Contract Package	FIDIC Conditions of Contracts
Civil Works 1A: Tunnel Civil Works, North Tunnel Section 1B: Tunnel Civil Works, South Tunnel Section 2A: Road and Bridge Works, Lang Co Bridge Section 2B: Road and Bridge Works, Southern Highway Section	Conditions of Contract for Works of Civil Engineering Construction, PART I GENERAL CONDITIONS, 4th Edition, 1987  (Red Book)
Electrical and Mechanical Works 3: Electrical Works 4: Mechanical Works 5: 110/22kV Substation and 110kV Transmission Line	Conditions of Contract for Electrical and Mechanical Works, 3rd Edition, 1987  (Yellow Book)

### 3.6 Monthly Progress Tracking Report

Work Breakdown Structure (WBS) was developed for the tunnel civil works, the electrical works and the mechanical works in order to establish the Critical Path Method (CPM) scheduling by utilizing Primavera P3. Since April 2004, the consultant had issued a “Monthly Progress Tracking Report” to the Employer, copied to the contractors,

informing of 1) Change of WBS and work linkage during the previous month, 2) Overall progress of the project (summary), 3) Critical works (TF < 30 days), 4) Site hand-over and Energization Forecast, 5) The report was also presented at URL:[https://haivantunnel.com/05\\_progresstodate/work.htm](https://haivantunnel.com/05_progresstodate/work.htm) (Figure 10 and Figure 11).

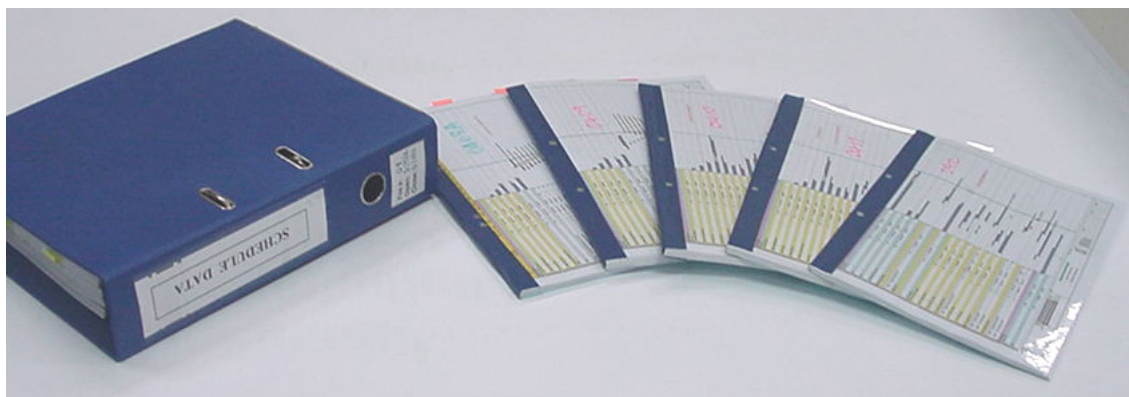


Figure 10: Monthly Progress Tracking Reports





Table 6: Responsibility Assignment Matrix (RAM) for Project based on PMBOK Knowledge Areas

Knowledge Area	Team	Overall Project			Each Package		
		PMR	RE	Other	PMR	RE	Other
4. Project Integration Management		●	○		●	○	
5. Project Scope Management		●	○	QS	○	●	
6. Project Time Management		●	○		○	●	
7. Project Cost Management		●		QS		○	QS
8. Project Quality Management		●				●	GEO
9. Project Human Resource Management		●	○		●	○	
10. Project Communication Management		●	○	ADM	○	●	ADM
11. Project Risk Management		●	○	QS	○	●	
12. Project Procurement Management		●		ADM	●	○	ADM
13. Project Safety Management		●	○		○	●	
14. Project Environmental Management		●	○		○	●	
15. Project Financial Management		●		QS	●	○	QS
16. Project Claim Management		●		QS	●	○	QS

PMR: Project Manager, RT: Resident Team, GEO: Geotechnical Team

QS: Quantity Surveyor Team, ADM: Administration Team

●: Primary Responsibility ○: Secondary Responsibility

## 4.2 Time Management with WBS

Time is the most important target in the construction project in changes that should be kept traceable in the project to avoid unnecessary Extension Of Time (EOT) claim, which multiple contractors are involved in. An effective monitoring unit should be established for overall work coordination. The PMBOK recommends a unit equivalent to about 80 working hours; however, physical working areas for 80 hours are usually very different in civil works and electrical and mechanical works. It is requested to establish acceptable work

units for each contractor, and such an agreed unit should be used in the process of WBS development.

Milestone in the project, especially hand-over and hand-back between the contractors, should be clearly indicated in the WBS and the monitoring schedule. Progressive detailing of the schedule can be made when a milestone is realized; however, such configuration changes should be kept traceable in the project to avoid unnecessary EOT claims.

## 4.3 Utilization of Web, as Communication Tool, in PMO

The Author reported that there were four objects for IT management in the Project Management Office (PMO); 1) Office Infrastructure, 2) Work Tools, 3) Data Management, and 4) Web, and he had been updating on the innovative application of the Web technology for the project management.

The Author proposed standardized contents of Project Office WEBSITE (POWEB), including modules of public, project-consultant, project-coordination, company, etc. Please visit the site below for more details. URL: <https://haivantunnel.com> (Figure 12).

# Haivan Pass Tunnel Construction Project

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**Welcome to the official website of Haivan Tunnel Construction Project, the longest Highway Tunnel in Southeast Asia and one of six National Projects of Vietnam!**

Last Update: July 13, 2005 (GMT +7:00)

**Thank you very much for your support to our project for last 5 years. In spite of several difficulties, we could overcome them by your advices and support. The tunnel opening was gracefully celebrated on 5 June 2005.**

**Tunnel Opening Ceremony on 5 June 2005**  
**Hai Van Tunnel As of 12 June 2005**  
**Photo Library of Construction Progress**

**HAIVAN PASS TUNNEL Facts-At-A-Glance**

**Consultants**

Joint-venture of Nippon Koei Co., Ltd. (Japan) and Louis Berger International Inc.(USA), in association with Transport Engineering Design Incorporation - TEDI, (Vietnam) >>>

**What**

The Project will complete a new two-lane highway segment of **12,182m in total length**. It includes a **6,280m long tunnel** section, bridge sections (eight bridges) of 1,635m in total length, and highway sections of 4,273m in total length. In parallel with the main tunnel, an evacuation tunnel will be constructed to its east. >>>



**Where**

The project area is situated in the **Hai Van massif**, central coastal area of Vietnam, starting from Lang Co on the existing National Highway No. 1 (Sta. -1+865) and ending at Lien Chieu on the planned bypass (peripheral artery) in the Lien Chieu Industrial Zone (Sta. 12+047) >>>

**When**

According to the current implementation program, the Haivan Pass Tunnel Construction Project was

**NEWS**

**PROJECT**  
**June 05, 2005, Tunnel Opening Ceremony has PERSONNEL**  
**at the end of July 2004. 1) Pham The Giang**  
**PUBLIC MEDIA**

**June 05, 2005 PM Khai op**

**INSIDE THE SITE**

**Monthly Report on Work progress in May 2005 is AVAILABLE now!**  
 \*\*\*

A photo tour with take you to spectacular scenery of Vietnam from **Hanoi** thru **Danang**, **Hoi An** down to South, or study some basic characters of history, culture, people of Vietnam and Danang... All available at **Our Gallery**.  
 \*\*\*

**GUESTBOOK**

**"Robert from United States:** A very interesting site about a very amazing project. I have not been to Da Nang since 1972. I would love to return one day and see the city and the completed project."

**"J Houston on September 17, 2003 :** This project demonstrates just how advanced VietNam truly is and that some projects (usually in Asia) actually can be completed to schedule. The detail provided by this web site is absolutely fascinating and demonstrates the confidence that the project partners have

**Good Morning, Welcome to Our Site!**

**Progress To Date**

- By Figure
- By Primavera

**Tunnel Excavation Record**

- By Number
- By Figure
- By Plan
- By Chart

**Monthly Progress**

- Package IA
- Package IB
- Package IIA
- Package IIB
- Package III
- Package IV
- Package V
- Package VI
- Package VII

**News and Events**

- Project
- Public Media
- Visitor List

**Organization Charts**

- The Employer
- The Consultant
- The Contractors
- Others

**Consultant Office**

- List of Staff
- Members Only

**Project Information**

- Introduction (MS-PowerPoint)
- Project Map
- Background
- Major Features
- Chronicle
- Contract Packages
  - Package IA
  - Package IB
  - Package IIA
  - Package IIB
  - Package III
  - Package IV
  - Package V
  - Package VI
  - Package VII
- Natural Conditions
- Socio-Economic Dev.

**Public Relations**

- Site Map
- Contact Us
- Related Agencies
- Link
- FAQs
- Knowledgebase
- Guest Book

**Our Gallery**

- Computer Graphics
- Perspective
- Vietnam
  - Introduction
  - Photo Selection

**Around Project**

- Highway Network in Vietnam
- Large-scaled Highway Projects in Central of Vietnam

**Tiếng Việt**

**Members Only**

Figure 12: Project Office Website (Hai Van Tunnel Construction Project)  
 (URL:https://haivantunnel.com/)



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- 13) Primavera Systems, Inc., <http://www.primavera.com/>

## Author

### Ichizuru ISHIMOTO

Born in 1961, he completed a master's degree in the Faculty of Engineering at Kanazawa University in March 1988. In April 1988, he joined the transportation engineering department of Nippon Koei Co., Ltd. In August 2000, he joined the Hai Van Tunnel Construction Project as Construction Engineer/Resident Engineer. In February 2002, he was promoted as Project Manager and completed the project timely in quality. In May 2005, Hai Van Tunnel was officially open to the public. His achievements were highly appreciated, and he received "President Award" at the tunnel-breakthrough ceremony in October 2003 and "Prime Minister Award" at the opening ceremony in May 2005. After the project completion, he joined several road tunnel projects in Vietnam, like Deo Ca Tunnel(2017), Danang Tunnel(2018), Cu Mong Tunnel (2019), 2nd Hai Van Tunnel (2021), as project manager.