Introduction of
Hai Van Pass Tunnel Construction Project
in Vietnam

Session W37: Bridge and Tunnel II

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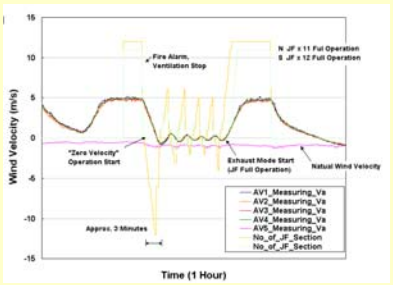
Nippon Koei Co., Ltd., Japan

Today's Topics Are….

- **Overall Emergency Response Drill**
- **Introduction of Project**
- **Works by the Contractors**
- **Project Management by the Consultant**
- **Tunnel Traffic Open Ceremony**

- **Overall Emergency Response Drill**

- **Overall Emergency Response Drill**



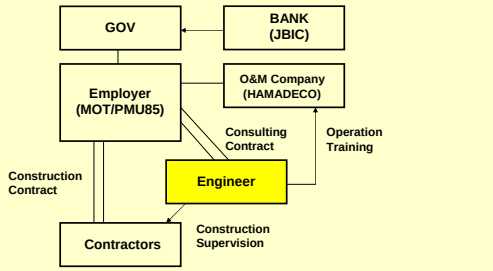
Zero-Velocity Operation for Fire Fighting

- Introduction of Project
  1) Project Organizations
  2) Location of the Project
  3) Project Photos
  4) Background of the Project
  5) Project Measure Features
  6) Traffic Demand Forecast
  7) Distinct Points of the Project
  8) Project Implementation Program
  9) O&M Company Required
  10) Project Financial Report

Project Organizations

Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

- **Introduction of Project**, Project Organizations



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Location of the Project

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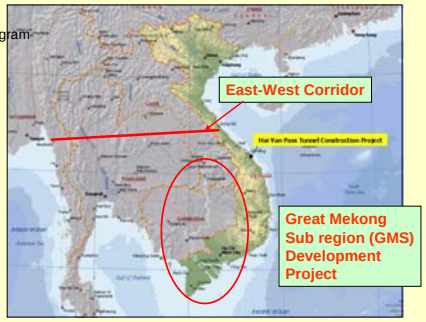
- **Introduction of Project**, The Hai Van Pass, Location Map (1)

East West Corridor Program
-Vietnam
-Laos
-Thailand
-Myanmar

GMS Program
-Vietnam
-Laos
-Cambodia
-Thailand



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- **Introduction of Project**, The Hai Van Pass, Location Map (2)

Present Pass Road

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- **Introduction of Project**, Project Location Map

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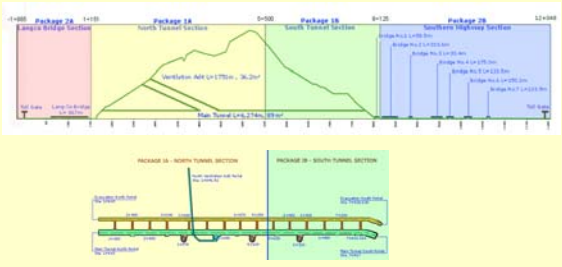
- **Introduction of Project**, Project Layout



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Project Photos
(As of 12 June 2005)

Hai Van Bridge (North Approach)

Hai Van Bridge (North Approach)

North Portal (Hue Side)

View from North Portal (Hue Side)

View from North Portal (Hue Side)

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Tunnel Monument and Portal (North)

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Jet Fans in Main Tunnel

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View From South Portal (Danang Side)

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South Portal (Danang Side)

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South Approach Road

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Background of the Project

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- **Introduction of Project**, Background of the Project

The Hai Van Pass located in coastal Central Vietnam, is the biggest traffic bottleneck on the National Highway No.1, which is the most important North-south longitudinal arterial linking the capital Hanoi with Ho Chi Minh.

The Pass rises 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 national economy has increased the logistic volume through the Pass, however, the heavy tracks have been forced to run slowly and fatal traffic accidents increased year by year.

In addition, the road is often blocked due to the landslide and slope failure during the rainy seasons.

Under such circumstances, the Government of Vietnam decided to construct a new highway segment with a tunnel under the Hai Van Pass by the Prime Minister's Decree in March 1994.

Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

Project Major Features

Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

- **Introduction of Project**, Project Major Features

1) Project Length:	12,182m (incl. Tunnel = 6,280m, Bridges = 1,653m)
2) Traffic Lane:	2 Lanes (Stage 1, Bi-directional)
	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) **Total 14,454m**
5) Tunneling Method:	NATM (New Austrian Tunneling Method)
6) Cross-section:	89m2(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

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Traffic Demand Forecast

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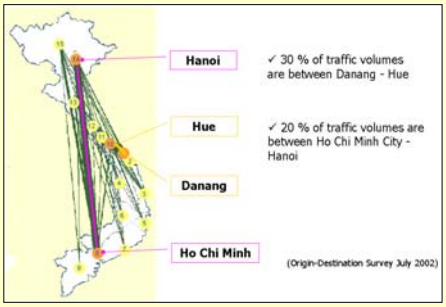
- **Introduction of Project**, The Hai Van Pass, Traffic Through Hai Van Pass (1)



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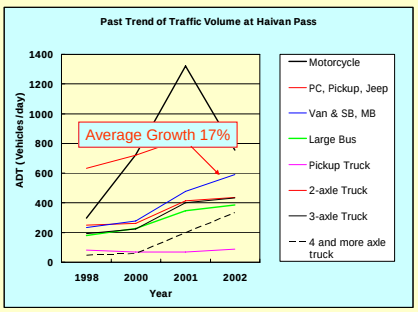
- **Introduction of Project**, The Hai Van Pass, Traffic Through Hai Van Pass (2)



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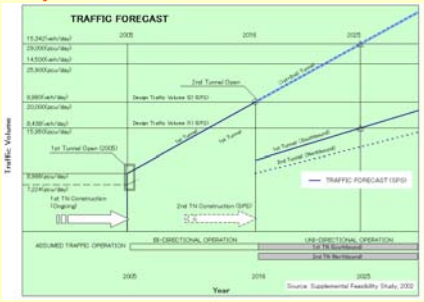
- **Introduction of Project**, The Hai Van Pass, Traffic Forecast



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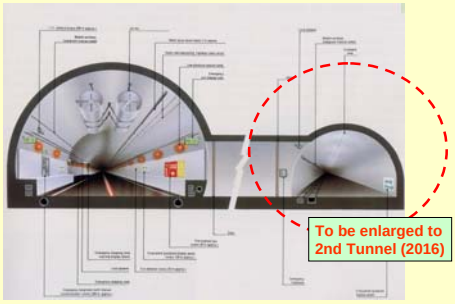
- **Introduction of Project**, 2nd Tunnel Construction



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Distinct Points of the Project

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- **Introduction of Project**, Distinct Points of the Project

1) **6.3km long tunnel; longest highway tunnel in Southeast Asia,**
2) **First Application of New Austrian Tunneling Method (NATM) in Vietnam,**
3) **Application of Longitudinal Ventilation System, including Electrostatic Precipitator (EP), Ventilation Adit and 23 Jet Fans,**
4) **Application of integrated overall operation control system said SCADA (Supervisory Control And Data Acquisition), and**
5) **Operation and Maintenance (O&M) Company Required.**

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Project Implementation Program

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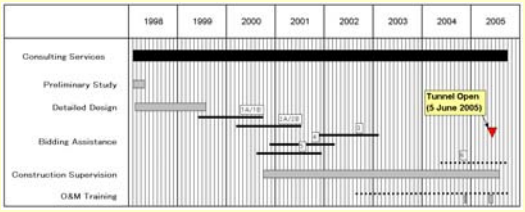
- **Introduction of Project**, Implementation Program of Project



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- **Introduction of Project**, Implementation Program of Project (2)

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O&M Company Required

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- **Introduction of Project**,
  Operation and Maintenance Company Required

For the operation and maintenance of the first long highway tunnel in Vietnam, HAMADECO, O&M Company, was established by referring the Japanese practice.

Followings have been advised:

O&M Company (Established in April 2004)
O&M Manuals
O&M Training
Emergency Response Training
Tunnel Standard Operation Plan (SOP)

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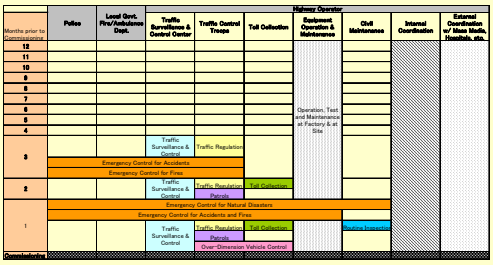
- **Introduction of Project**,
  Operation and Maintenance Company Required (2)



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Project Financial Report

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- **Introduction of Project**, Project Scale

1) Organization Structure

Organization	Name
Financing Agency	Japan Bank for International Cooperation (JBIC) 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)
Consultant	Joint Venture of Nippon Koei Co., Ltd., Japan and Louis Berger International Inc., USA in association with Transport Engineering Design Incorporation (TEDI), Vietnam

2) Contract Packages

Contract Packages	Major Works	Sub Packages	Package Title	Contract Amount (1000USD)	
Consulting Services				14,724	Contracted
Package I	Tunnel Civil Works	Package IA	North Tunnel Section	43,256	Contracted
		Package IB	South Tunnel Section	27,863	Contracted
Package II	Road and Bridge Works	Package IIA	Lang Co Bridge Section	4,633	Contracted
		Package IIB	Southern Highway Section	3,920	Contracted
Package III	Electrical Works			20,606	Contracted
Package IV	Mechanical Works			23,055	Contracted
Package V	110/22kV Substation and 110kV Transmission Line			7,256	Contracted
Package VI	Procurement of Maintenance Vehicles			2,000	Estimate
Package VII	Infrastructure Development in the Resettlement Areas			413	Contracted
			Total	147,306	

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- **Introduction of Project**, Project Scale, JBIC Loan Conditions

Loan No.	VN - IV - 5	VN - VI - 5	VN - IX - 4
Date of Agreement	26-Mar-97	23-Jul-99	29-Mar-02
Agreed Loan Amount (JPY)	5.500 billion	10.000 billion	3.359 billion
Status	Closed 5.487 billion	On going	Not used yet
Interest (% / Year)	2.3%	1.7%	1.8%
Grace Period (Years)	10	10	10
Repayment Period (Years)	30	30	30
Start to Repayment	2007	2009	2012
Finish to Repayment	2036	2039	2041

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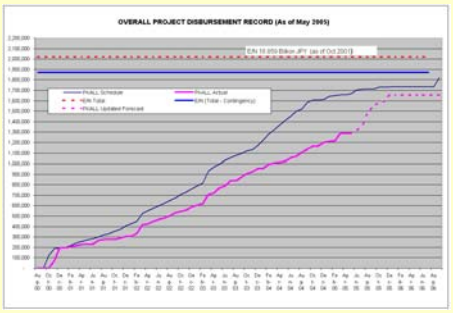
- **Introduction of Project**, Disbursement Record (As of May 2005)



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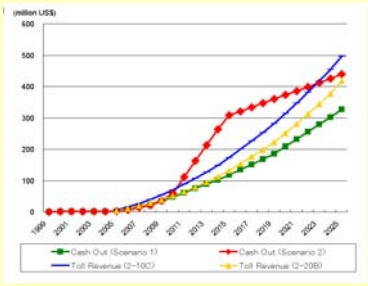
- **Introduction of Project**, Project Cash Flow Analysis



Project Cash Flow Analysis (By Consultant)

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Works by the Contractors

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Tunnel Civil Works

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- **Works by the Contractors**, Tunnel Civil Works (1)

(m)

	PK1A (North)		PK1B (South)	
TYPE VI	39	1.01%	79.4	3.31%
TYPE V	36	0.94%	35.6	1.48%
TYPE IV	6	0.16%	41	1.71%
TYPE III	111.7	2.90%	170.2	7.10%
TYPE II	324.2	8.43%	753.8	31.44%
TYPE I	3328.9	86.56%	1317.825	54.96%
Subtotal	3845.8	100.00%	2397.825	100.00%
Cut & Cover	10		25.585	
TOTAL	3855.8		2423.41	

Tunnel Support Type

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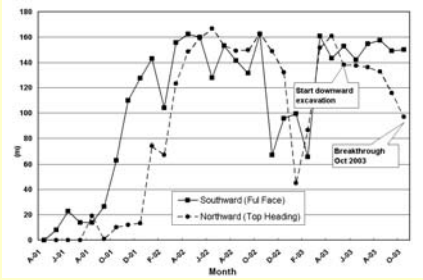
- **Works by the Contractors**, Tunnel Civil Works (2)



Tunnel Excavation Rate (Main Tunnel)

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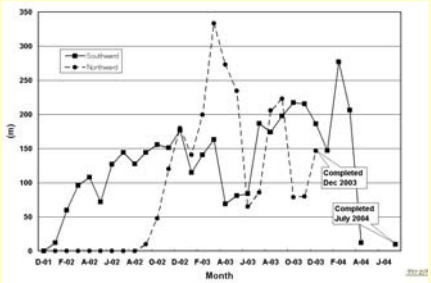
- **Works by the Contractors**, Tunnel Civil Works (3)



Tunnel Concrete Lining Rate (Main Tunnel)

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- **Work Difficulties Encountered**

Water Hardship at Ventilation Tunnel

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- **Work Difficulties Encountered**

Water Hardship at Ventilation Tunnel

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Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

- **Work Difficulties Encountered**

Water Hardship at Ventilation Tunnel

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Electrical Works

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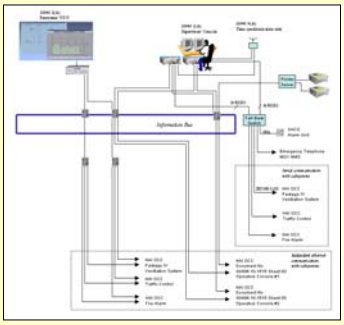
- **Works by the Contractors**, Electrical Works, SCADA System

1) Power Distribution System
2) Tunnel Lighting System
3) Traffic Management System
4) Telecommunication System
5) Fire Detection System
6) Fire Protection System
7) CCTV System
8) Radio Rebroadcast System
9) Ventilation System



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- **Works by the Contractors**, Electrical Works, SCADA System

Operation Control Center

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Mechanical Works

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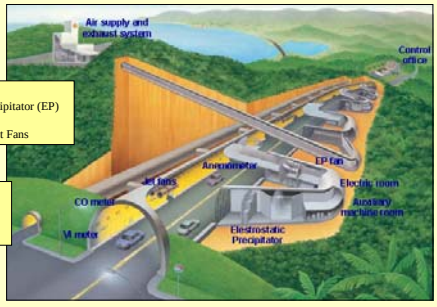
- **Works by the Contractors**, Mechanical Works, Tunnel Ventilation System (1)

Ventilation Facilities
1) 3@ Electrostatic Precipitator (EP)
2) 23@ Jet Fan
3) 1@ Supply & Exhaust Fans

Ventilation Measurements
1) VI Meters
2) CO Meters
3) Anemometers



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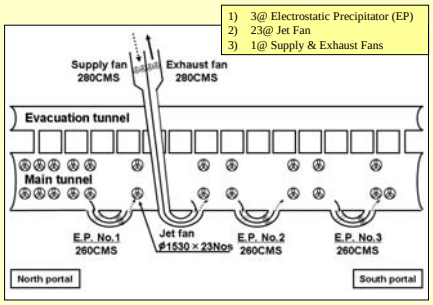
- **Works by the Contractors**, Mechanical Works, Tunnel Ventilation System (2)



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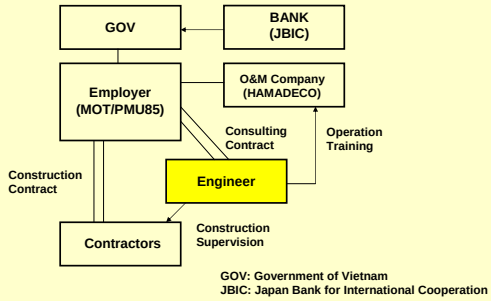
Project Management by the Consultant (Referred to PMBOK)

- **Project Human Resource Management**
- **Project Time Management**
- **Project Communication Management**
- **Summary**

Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

- **Introduction of Project**, Project Organizations



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Human Resource Management

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- **PM Practice (1): Human Resource Management**,
  Three Objectives for Project Management

The Project Manager (PMR) of the Consultant team is responsible for both the management of the Consultant Team and the overall project.

No.	Management Object
A	Consultant Team
B B-1 B-2	Project Overall Project Each Contract Package

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- **PM Practice (1): Human Resource Management**,
  RAM (Responsibility Assignment Matrix) for Consultant Team

Team / Knowledge Area	PMR	CT	RT	GEO	QS	OM	ADM
4. Project Integration Management	●	○					
5. Project Scope Management	●	○					
6. Project Time Management	●	○					
7. Project Cost Management	●						○
8. Project Quality Management	●	○	○	○	○	○	○
9. Project Human Resorce Management	●	○	○	○	○	○	○
10. Project Communication Management	●	○	○	○	○	○	○
11. Project Risk Management	●	○	○				
12. Project Procurment Management	●						○
13. Project Safety Management	●	○	○				
14. Project Environmental Management	●	○	○				○
15. Project Financial Management	●						○
16. Project Claim Management	●	○	○		○		

PMR: Project Manager, CT: Core Team, RT: Resident Team, GEO: Geotechnical Team
QS: Quantity Surveyor Team, OM: Operation and Maintenane Team, ADM: Administration Team

●: Primary Responsibility ○: Secondary Responsibility

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- **PM Practice (1): Human Resource Management**, RAM for Overall Project and Each Contract Package

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 Resorce Management	●	○		●	○	
10. Project Communication Management	●	○	ADM	○	●	ADM
11. Project Risk Management	●	○	QS	○	●	
12. Project Procurment 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

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Time Management

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- **PM Practice (2): Time Management**, Project Milestone

No.	Milestone	Actual (Schedule)	Delay
1	Commencement of Each Contract Package	CP3 (Feb 2003), CP4 (Mar 2002)	
2	Tunnel Breakthrough	28 Oct 2003	4 months
3	Site Hand-Over from Tunnel Civil to Mechanical	Oct 2003 – Mar 2004	0.5 month
4	Site Hand-Over from Mechanical to Electrical	Nov - Dec 2004	0.5 month
5	Site Hand-Over from Tunnel Civil to Electrical	Nov 2003 – Aug 2004	0.5 month
6	Power Distribution from Electrical to Mechanical	Mar - April 2005	0.5 month
7	Commissioning of Each Facility	Apr - May 2005	0.5 month
8	Emergency Response Training	May – June 2005	0.5 month
9	**Tunnel Open**	**5 June 2005**	**0.5 month**

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- **PM Practice (2): Time Management**, Diagram Type for Scheduling of Work Coordination

No.	Diagram Type	Tool	Work Zone Interval	Applied Period
0	Bar Chart	MS-Excel	No Work Zone	Tunnel Civil Contractors
1	Time:Chainage Program	AutoCAD	Approx. 1000 m	May 2003 – Oct 2003
2	CPM (BLP 1)	Primavera P3	Approx. 1000 m	Jun 2003 – Mar 2004
3	CPM (BLP 2)	Primavera P3	Approx. 400 m	Apr 2004 – Jan 2005
4	CPM (BLP 3) With Commissioning Schedule	Primavera P3	Approx. 400 m	Feb 2005 – To date

BLP: BaseLine Program

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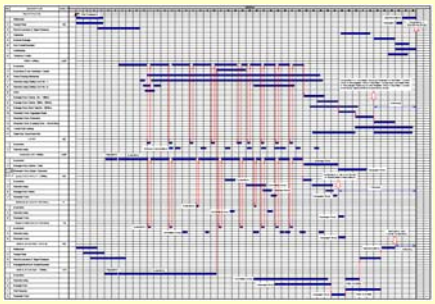
- **PM Practice (2): Time Management**, Diagram Type for Scheduling, Bar Chart



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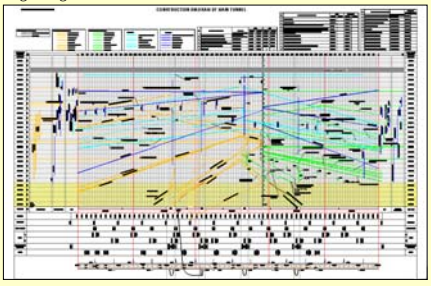
- **PM Practice (2): Time Management**, Diagram Type for Scheduling, Time: Chainage Program



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- **PM Practice (2): Time Management**, Diagram Type for Scheduling, Critical Path Method (CPM) Scheduling, WBS (1), Electrical Works

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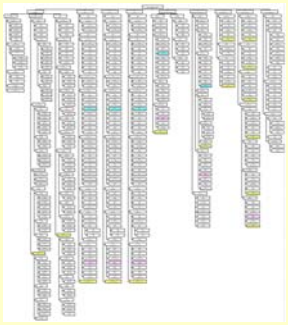
- **PM Practice (2): Time Management**, Diagram Type for Scheduling, CPM Scheduling, WBS (2), Mechanical Works



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- **PM Practice (2): Time Management**, Diagram Type for Scheduling, CPM Scheduling, WBS (3)

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- **PM Practice (2): Time Management**, Diagram Type for Scheduling, CPM Scheduling, Progress Tracking by Primavera P3

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- **PM Practice (2): Time Management**, Monthly Progress Tracking Report, Attachments: Primavera P3 Output, Overall Progress

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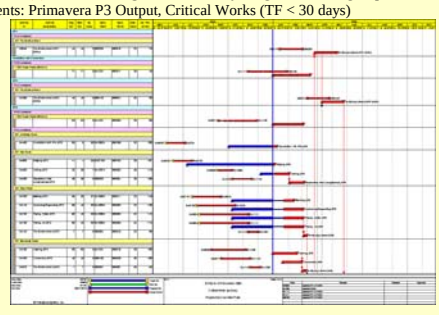
- **PM Practice (2): Time Management**, Monthly Progress Tracking Report, Attachments: Primavera P3 Output, Critical Works (TF < 30 days)



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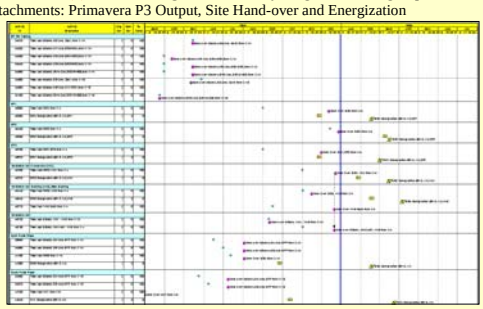
- **PM Practice (2): Time Management**, Monthly Progress Tracking Report, Attachments: Primavera P3 Output, Site Hand-over and Energization



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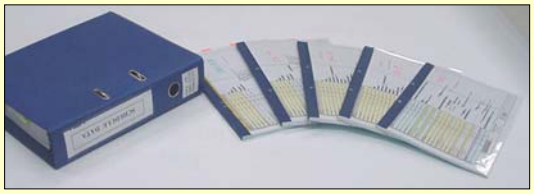
Introduction of Hai Van Pass Tunnel Construction Project in Vietnam

- **PM Practice (2): Time Management**, Monthly Progress Tracking Report, Attachments: Primavera P3 Output, Detailed Progress Tracking Report



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Communication Management

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- **PM Practice (3): Communication Management**, POWEB, Public

URL:http://haivan.cup.com

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- **PM Practice (3): Communication Management**, POWEB, Public

URL:http://haivan.cup.com

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- **PM Practice (3): Communication Management**, POWEB, **Project-Coordination**

17 June 2005 IRF2005 in Bangkok 84

Summary of Project Management

- **PM Practice: Summary**

Keys to Successful Project Management

1. Communication Management with Clear Responsibility Assignment Matrix (RAM)
2. Time Management with Appropriate Depth of Work Breakdown Structure (WBS)
3. Utilization of Web, as Communication Tools, in Project Management Office (PMO)

Tunnel Traffic Opening Ceremony On 5 June 2005

- **Tunnel Opening Ceremony (5 June 2005)**

Contact Information

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