

**Mid-Term Review (Safety Management) Report
of
On-going Japanese ODA Loan Projects 2009
(Vietnam)**

December 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

Katahira & Engineers International

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Preface

Mid-Term Review (Safety Management) of Japanese ODA Loan Projects is initiated based on the recommendation in July 2008 made by the committee deployed by Ministry of Foreign Affairs, Japan, in order to discuss the measures to prevent re-occurrence of the similar accident as that of Can Tho Bridge in Vietnam.

The review is carried out by an external evaluator from FY2008, for Special ODA Loan projects or Special Term for Economic Partnership (STEP) projects which include large scale and technically complex civil works, 5 years after conclusion of Loan Agreement and at a suitable time after civil works commenced.

The purpose of the review is to ensure the current Safety management system and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these reviews will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of reviews.

December 2010
Atsuo KURODA
Vice President

Japan International Cooperation Agency (JICA) Disclaimer

This volume of reviews shows the result of objective Mid-Term Review (Safety Management) made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

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Midterm Review (Safety Management) Report of On-going ODA Loan Project 2009 (Vietnam)

1. Outline of the Mid-Term Review

1-1 Objective

This review is initiated based on the recommendation in July 2008 made by the committee deployed by Ministry of Foreign Affairs, Japan, in order to discuss the measures to prevent re-occurrence of the similar accident as that of Can Tho Bridge in Vietnam. The review for Fiscal Year 2009 was carried out by an external evaluator for Special ODA Loan projects or Special Term for Economic Partnership (STEP) projects in Vietnam which include large scale and technically complex civil works, after approximately 5 years from the date of signing Loan Agreement and at a suitable time after civil works commenced.

Two projects mentioned below were selected for this review, because both projects satisfy each criterion mentioned above.

- ◆ Cai Mep - Thi Vai International Port Development Project
- ◆ Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project

1-2 Outline of the Mid-Term Review

1-2-1 Basic Principles

“Safety” has the following three definitions,

1. Safety of the workers (or a group of workers, Safety of work)
2. Safety of the Works
3. Safety of third party or the public

In the opposite side of Safety, there is Risk. In this Report, Risks are defined as shown in Table-1.

Table-1 Definitions of Risks

Name	Description	Insurance
Labour Risk	Risk at the opposite side of safety of workers (or a group of workers, Safety of work)	Workmen’s compensation insurance
Construction Risk	Risk at the opposite side of safety of the Works	Contractor’s all risk insurance
Third Party Risk	The risk at the opposite side of safety of third party (the public)	Third-party insurance (this insurance is normally included in the same insurance policy as that of the contractor’s all risk insurance)

Third Party Risk is considered as a part of Construction Risk in this Report, because Third Party Risk generally materializes incidental to Construction Risk, especially in case of large scale accidents.

Where the scale of the construction work is small and there are only skilled labors on site, risks can be hedged depending on the experiences and abilities of the individual workers and a systematic approach is not significantly required. Recently as the scale of construction works becomes large and technical complexity increases, it appears substantially more difficult to hedge construction risks and/or labor risks, if it only depends on the experiences and abilities of the individual workers. A systematic approach, ie introduction of safety Management System, is required to deal with the above situation.

1-2-2 Items to be reviewed

Items to be reviewed are as per Table-2. A confirmation of the situation will be made from both performance and process point of view. The review has been carried out mainly on the Contractor who has carried out Safety and Quality Management mainly and involvement of the Design Consultant, Construction Supervision (CS) Consultant and the Employer (Executing Agency) is confirmed, if necessary.

Table-2 Reviewed items


	Construction Risk	Labour Risk
Performance	<ul style="list-style-type: none"> 🚧 Levels of Damage, and frequency of Accidents against the Works, Third Parties, Workers (See Table-3 on Page General-3) 	<ul style="list-style-type: none"> 🚧 ASR and AFR (To compare those in Japan)
Process	<ul style="list-style-type: none"> 🚧 Principles and method for Safety Management 	
	<ul style="list-style-type: none"> 🚧 Safety Measures on Permanent Works 🚧 Method of Risk Management and its effectiveness 🚧 Preparation of a Manual for Emergency or Crisis 🚧 Degree of Achievement for requirements in Quality Management System 	<ul style="list-style-type: none"> 🚧 Degree of Achievement for requirements in Safety Management System 🚧 Measures for mitigating Labour Risks

1-2-3 Performance Index for the mitigation of Construction Risks

The categories of Accidents as mentioned in Table-3 are applied in this report as the performance index

for the mitigation of the Construction Risks tentatively.

Table-3 Categories of Accidents

Categories	Description of the Accidents	Degree
A	Accidents with damage to the Works <u>and</u> injury to the workers or Third Parties (public)	Major
B	Accident which falls under one of the following conditions. 1. Accidents with damage to the Works, but no physical injury on the personnel 2. Accidents with physical injury on Third Parties 3. Accidents with damage to Third Party's properties	
C	Accidents other than that in the category A or B	

1-2-4 Performance Index for the mitigation of Labour Risk

In this report, “Accident Frequency Rate”ⁱ (AFR) and “Accident Severity Rate”ⁱⁱ (ASR) are used as a Performance Index. AFR links with “event occurrence probability”. This AFR has been accepted as the typical safety index in Japan. It is reasonable to consider AFR reflects degree of day-to-day safety management. On the other hand, ASR links with the total days away from work (DAFW) of the workers, and shows the “Severity” of the accidents. In this Report, AFR and ASR are calculated in respect of number of the incidents when the injured workers have at least 4 DAFW.

As the figures to be compared in this review, those in domestic public construction works of Japan are applied. The figure of ‘Civil Works’ can be applied as the data of comparison, although the individual figure based on each ‘work-types’, such as port works and bridge works, of Civil Works are available. This is to avoid the misinterpretation of the figures in Japan, because these figures from individual work-types are drastically influenced by an occurrence of one fatal accident.

To applying the figures of Civil Works, which are calculated large numbers of denominator, would eliminate the risk of misinterpretation.

Note) In United Kingdom, where concept of Risk Assessment was born, ASR has been prevailing over AFR in the safety policy of the Government. This reflects the attitude of the Government on the accident severity that “the accidents which has beyond allowable severity could not be acceptable, although it is not possible to achieve zero-accident by eliminating all accidents”.

Reference :

- 1) Tsutomu Kahamura, “Promoting the Safety and Health”, *JTCCM Journal*, May 2009, Japan Testing Center for Construction Materials, pp24-25.

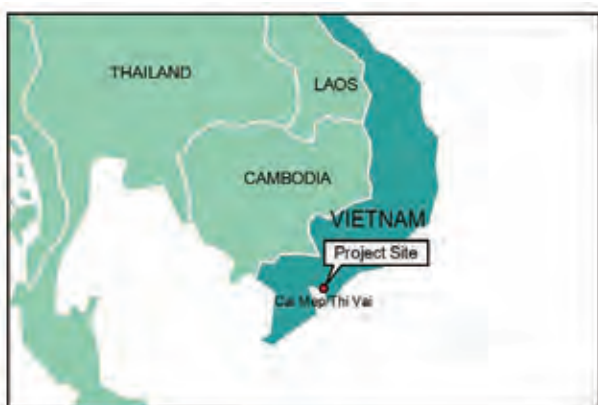
“Cai Mep - Thi Vai International Port Development Project”

External Evaluator: MITANI Katsuaki, TOYOTOME Ichiro

Katahira & Engineers International

Field Survey: SEPTEMBER 2010

1. Outline of the Project



Location of the Project



Wind whipped ‘Flag of the Safety’ in Package 1 site

1-1 Objective of the Project

The objective of this project is to improve capacity of the cargo transportation in order to handle increasing cargo demand by constructing two new terminals and relevant facilities, one for container in Cai Mep area and the other for general cargo in Thi Vai area, Ba Ria- Vung Tau District, thereby contributing to the economic development of Southern Vietnam.

1-1-1 Outline of the Project

Outline of the Project is shown in Table 1-1.

Table 1-1 Outline of the Project (1/2)

Items	Contents
Loan Number/ Loan Amount	L/A No. VNX II-2 (STEP) /36,364 million yen
Loan Agreement signing date	31 March 2005
Executing Agency etc.	Project Owner: Ministry of Transport Employer: Project Management Unit 85 (PMU 85) Authority for Operation and Maintenance: VINAMARINE (Vietnam National Maritime Bureau) Operator: To be employed

Table 1-1 Outline of the Project (2/2)

Item	Contract	Description	Contractor
Construction Contract	Package 1 (P1)	Construction of Port Facilities and Buildings for Cai Mep International Container Terminal	TOA Corporation /TOYO Construction Co., Ltd JV
	Package 2 (P2)	Construction of Port Facilities and Buildings for Thi Vai International General Cargo Terminal	Penta-Ocean Construction Co., Ltd /Nissan Rinkai Construction Co., Ltd JV
	Package 3 (P3)	Navigation Channel Dredging	Penta-Ocean Construction Co., Ltd /TOYO Construction Co., Ltd JV
	Package 4 (P4)	Equipment Procurement	to be employed
	Package 5 (P5)	Access road to Cai Mep terminal	CIENCO6/ Truong Son JV (P5 JV)
Consultancy Contract		Japan Port Consultants, ltd /Nippon Koei Co., Ltd JV in association with PCC (JPC JV)	

Note) Package 5 is not included in the scope of this review, because Japanese ODA Loan does not include Package 5 which is funded by the Government of Vietnam.

2. Results of the Mid-Term Review

2-1 Performance

2-1-1 Measures for mitigating Construction risks

Performance Index conformed to Accident Categories (refer to Table-3 in General section) is given in Table-2-1.

The land slide occurred in Package 2 neither caused any damage against the SP PSA terminal operated by a joint venture of Saigon Port and Port of Singapore Authority, nor caused out flow of soil into the fairway, although the land slide occurred nearby SP PSA which has already been in service.

The design of Package 2 can be evaluated from the Risk Management point of view, by the reason that it could prevent secondary damage against the existing terminal in operation, although the fact of occurrence of land slide should not be underestimated.

Table 2-1 Performance Index by Accident Categories

Package	Major← Category →Minor			Remarks
	A	B	C	
Total	0	1	2	
Package 1	0	0	0	
Package 2	0	1	0	Land slide during surcharge
Package 3	0	0	2	The barge “Takuyo-maru” had accidents twice.

The geological site investigation for identifying the cause of land slide occurred on 12 July, 2010 was completed by 31 August, 2010. The task force comprised of the Consultant and the Contractor has been discussing the causes and Countermeasures of this accident, as of the middle of September.

The barge “Takuyo-maru” had minor collision with fishing boat in the early morning of 15 April, 2010 (already amicably settled), and also it was hit by a coal ship on 18 August, 2010. The Port Authority deliberated latter case as of the middle of September. Both cases are categorized as “C” for the reason that relevant authorities did not rule the responsibility of “Takuyo-maru” side.

2-1-2 Measures for mitigating Labour Risk

Table-2-2 shows “Accident Frequency Rate”ⁱ (AFR) and “Accident Severity Rate”ⁱⁱ (ASR) of this project.

ASR of this project is considerably higher than that of Japan, for the reason that a fatal accident happened on July 2009 in the Package 2 was affected on the rate. AFR of this project is 0.33 for entire project and 1.20 for the Package 2 alone. In the case that if the total working hours are less than a million hours, the figure of AFR appears higher than the other cases. Taking account of the condition mentioned above, the figure of Package 2 is evaluated as equivalent to the figure of Japanese domestic civil works. Therefore it is reasonable to say that the daily safety management for this project has been implemented effectively.

Table-2-2 Comparison of AFR and ASR

	AFR (DAFWC*: Nos.)	ASR (DAFW**: man-days)
Project Total	0.33 (1)	2.46 (7,500)
Total man-hours	3,049,905 hours	
Package 1	0.00 (0)	0.00 (0)
Total man- hours	1,363,071 hours	
Package 2	1.20 (1)	8.98 (7,500)
Total man-hours	835,090 hours	
Package 3	0.00 (0)	0.00 (0)
Total man-hours	851,744 hours	
Civil Works in Japan	0.94	0.21

(As of the end of July, 2010)

*DAFWC (days away from work case: Nos.)

**DAFW (days away from work: man-days)

The figures in this review are calculated from the basic data DAFW of which are 4 days or more, as shown below.

The number of accident: 1 (One)

(A worker who engaged the marine operation had disappeared after the end of work, when he left his life jacket with his co-worker, and while his co-workers looked away on him. Later his drowned body was discovered at the bottom of the barge.)

Total working days lost: 7,500 days (One fatal accident)

* Figures for Japan were obtained from the domestic works contract, carried out in Fiscal Year 2007, the contract price of which was more than 1,000 million yen.

(Source: Home page of Japan Advanced Information Center of Safety and Health, Occupational Accidents Statistics)

2-2 Process

The review results for the Consultant and the Contractors for P1, P2 and P3 with respect to the process for mitigating Construction Risks and Labour Risks are shown in Sub-Clause 2-2-1 to 2-2-4. The Contactor is a joint venture of two Japanese Construction Companies. Whole checklists for Safety Management System used in the hearing of P1, P2 and P3 JVs are attached in Reference section at the end of this Report. Summary is included in Sub-Clause 2-2-2 to 2-2-4.

JICA Detailed Design Study was awarded to a joint venture of Pacific Consultants International (PCI) and Japan Port Consultants Ltd. (JPC) and PCI was in charge of design portion. Because at the time of the Study, there was no performance record in Vietnam for ground improvement by PVD (Prefabricated

Vertical Drain) method, the improvement depth of which is more than 35m, the Government of Vietnam requested JBIC to arrange an independent design check. JBIC employed a joint venture of the Port and Airport Research Institute of Japan and Resonator International AB of Sweden as a checking consultant and design check was carried out from October 2006 as “Review of Detailed Design of Soil Improvement in Cai Mep – Thi Vai International Port Construction Project”. The objective of review was to confirm the effectiveness and appropriateness of the selected PVD method.

2-2-1 Consultant (for Construction Supervision)

The terms of reference of the Consultant covers from a review of Detailed Design to Construction Supervision. The Construction has being managed with the original target completion date, ie October 2010. The overall progress rate of the Project is 33.6% as of the end of August 2010. The results of review are as shown in Table 2-3 and Table 2-4.

Table 2-3 Results of review of measures for mitigating Construction Risks by the Consultant

Contents and Results of Review	
Safety Measures for the Permanent Works	<p>The Consultant required the Contractor to carry out a design review based on the results of additional boring, laboratory tests after award of the Contract. The Consultant recommended PMU 85 the Variations to the Works after examination of the results of above review and proposal of the Contractor. The following Variations to give further redundancy to the Works were made.</p> <p>Package 1: By shifting slope line to yard side by 30m, slope stabilization is to be made by changing slope gradient milder and adding more embankment as counter weight. Trestle is to be extended by 30m.</p> <p>Package 2: Adjustment of design by changing slope gradient milder and by adding Deep Mixing Method (DMM) columns on river etc.</p>
Comprehensive Review of Documents	<p>Review of Construction Documents is to be carried out by Expatriate Engineer(s) and Lead Local Engineer(s) and to be submitted to Project Manager (PM) for his approval. Upon the approval of the Consultant, the Contractor may start construction works. SD is to be subject to the final approval of PMU 85.</p> <p>Note) Construction Documents means Shop Drawing (SD):the drawings for Permanent Works on which the Contractor adds the construction details based on the Contract drawings, Working Drawing(WD): Drawings for construction which includes Temporary Works, Method Statement (MS): Statement and drawings which shows the method how to construct the Works, Project Safety Plan(PSP) ,Project Quality Plan(PQP).</p>
Application of Quality Control System (QCS)	<p>QCS specifies the flowcharts and procedures with respect to the following process, in order to keep the Required Quality Standard, RQS.</p> <ul style="list-style-type: none"> ■ Quality control of materials---Inspections at testing laboratory and Inspection at the Site ■ Quality control of the Works---Inspections before and after carrying out the works <p>QCS applied to the Project was used by PMU 85 and the Contractors.Sub-Clause 8.1 of Conditions of Contract, Part II Particular Application requires the Contractor to implement Quality Assurance System.</p>

Table 2-4 Results of review of measures for mitigating Labour Risks by the Consultant

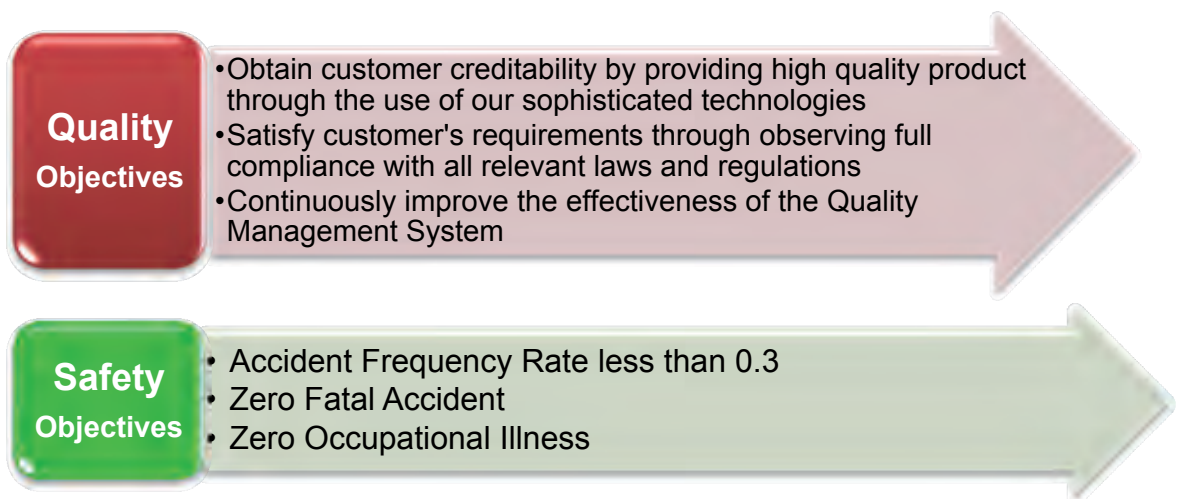
Contents and Results of Review	
<p>Joint Safety Patrol with PMU 85 and the Contractor</p>	<p>Monthly joint safety patrol with PMU 85 and the Contractor were carried out to point out unsafe actions/items with attendance of Expatriate Engineers. After the patrol, a meeting was held to discuss corrective actions to be taken and follow up the actions agreed in the previous patrols. Records of patrols were kept by the person in charge of attending parties including PMU 85.</p>
<p>Attendance of Local Engineers to Regular Patrol</p>	<p>Local Engineers were attended to the regular patrols, other than Monthly joint safety patrol stated above, organized by the Contractor and where he identifies non-conformance actions/items, he reports them to Expatriate Engineers. Expatriate Engineers, after examining the situations by himself and if necessary he takes actions, such as issuing instruction for corrective actions to the Contractor.</p>

Special Notes:

In respect of manpower of the Consultant, recruiting of local engineers and inspectors with appropriate qualifications and experiences is essential to keeping the control of the Consultants over Safety and Quality, and is also necessary for further technology transfer.

2-2-2 P1 JV (Construction of Port Facilities and Buildings for Cai Mep International Container Terminal)

At the time of review, PVD works and subsequent surcharge embankment works have nearly been completed and preparation works for steel pipe piling works for jetty, drainage and pavement for yard, building works, are on-going. Quality and Safety objectives for P1 JV are as follows.



Review of the Permanent Works was carried out in the manner stated below.

After commencement of the Works, additional site investigations were carried out and based on the result of such investigations, design review in accordance with Sub-Clause 8.1 “Contractor’s General Responsibilities” of Conditions of Contract were carried out by the design department of JV leading firm Head office. By this review, a necessity of variation of the Works was recognized and proposal for varied

design was compiled by the same department and a proposal for varied design was submitted to the Consultant for his review and further recommendation to PMU 85. Design review and varied design were carried out under the procedures of Quality Management System of International Division which has the certification of its conformance to ISO 9001 requirements issued by Lloyds. The Variation to the Works was authorized within the framework of traditional FIDIC conditions in which design responsibilities rest on the shoulder of the Employer (the Consultant).

Review Results of P1 JV are shown in Table 2-5.

Table 2-5 Review Results of P1 JV

Items	Contents and Results of Review	
Measures to mitigate Construction Risks	Internal Review of Documents(MS/SD) by the Contractor	
	The Contractor	Team of construction department (Team) makes a draft of Construction Documents based on a discussion with Subcontractor(s). (Generally speaking, Subcontractor is not able to prepare Construction Documents by himself) Primary review: Construction Manager Final review: Project manager (PM) After approval of PM, Construction Documents are to be submitted to the Consultant at least 14 days prior to the commencement of the works.
	Communication method with workers of the contents of the documents approved by the Consultant and checking measures on Site	At the commencement, a kick off meeting with attendance of Subcontractor’s management, staff and workers is arranged. Compliance is checked by Team staff daily on site and also by weekly Quality Control Audit carried out by QC section. A site instruction is to be issued for major non-compliance identified requesting rectification by Subcontractor.
	<p>➤ Internal Inspection Procedures QC section, who is familiar with Inspection & Test Plan (ITP), organizes internal inspection (Material---QC section, Works---Construction staff) and submission of Request for Inspection (RFI) to the Consultant.</p> <p>➤ Quality Management System (QMS) Quality Management System of International Division of JV leading firm is applied to the site quality management. The above QMS was certified by Lloyds for its compliance to the requirements of ISO 9001.</p>	
Measures to mitigate Labour Risks	<p>➤ Risk Management Job Safety and Environmental Analysis (JSEA) which has the same objectives as Risk Management of Labour Risks are carried out by a leadership of Vietnamese Safety Manager who studied JSEA in United States of America. Hazards/Risks are identified for each step of works, ie delivery of piles, lifting piles and so on. Considering Consequences, Reduction measures, risk rating is made. After compiling JSEA table, Safety Manager explains the contents of JSEA table to the workers at toolbox meeting before commencing works.</p>	

Items	Contents and Results of Review
	<p>➤ Safety Activities Upon entry to the site: Safety induction training is carried out for all new workers. Daily Activities: Toolbox meeting, Daily safety meeting (normally it is carried out first thing in the afternoon. The agenda of the meeting are Progress of the work after daily meeting of previous day, Today's work schedule, Coordination between Subcontractor's work and Safety instructions by the Contractor. The contents and intent of the meeting is the same as that specified in Article 636 of Ordinance on Industrial Safety and Hygiene in Japan, in which coordination between Subcontractor's works are carried out and the records of meeting are to be kept in certain period.) Weekly Activities : Weekly Safety Patrol Monthly Activities: Safety Promotion Meeting, Monthly Joint Safety Patrol with PMU85/ the Consultant/ Safety Officer(s) of Subcontractor(s). After joint patrol, Safety Committee is to be held with the same attendants.</p> <p>➤ Safety Training Based on HSE Program and Training Plan 2010 prepared by Safety Manager, emergency drill, fire drill and responsive actions towards Vietnam National Safety Week in 2010 were carried out systematically.</p> <p>➤ Safety Management System (SMS) Safety Management System of International Division of JV leading firm is applied to the site safety management. The above SMS was certified by Lloyds for its compliance to the requirements of OHSAS 18001.</p>

2-2-3 P2 JV (Construction of Port Facilities and Buildings for Thi Vai International General Cargo Terminal)

At the time of review, it is expected that PVD, Deep Mixing Method (DMM) columns and surcharge embankment works have been completed and the same preparation works as those of Package 1 would commence. However due to the occurrence of local land slide in July 2010, most of the Works was suspended. Quality and Safety objectives of P2 JV are as follows.

Quality Objectives

- To execute all the Works without any "Non-conforming" Product
- To eliminate any delay and to complete the Project Works in timely manner based on Construction Programme
- Execute the Works with zero fatal accident, and with due regard to the safety and welfare of the workforce

Safety Objectives

- To achieve ZERO in the number of fatality, and reduce labour & public incident
- Accident Frequency Rate: Less than 0.90
- Accident Severity Rate : Less than 0.05
- Prevention of Falling, Heavy equipment & Crane Accident: Less than 10
- Reduction in accidents in the measure of full implementation of Risk Assessment

After the review of Permanent Structure, the same procedures as those applied in Package 1 Variations to the Works in which DMM columns on river are added and slope gradient is changed to be milder. Design review and proposal for varied design were made and prepared by International Construction Department in International Division of JV leading firm. A proposal was submitted to the Consultant for his review and recommendation to PMU 85. The Variation to the Works were authorized within the framework of traditional FIDIC conditions in which design responsibilities rest on the shoulder of the Employer (the Consultant).

Review results of P2 JV are shown in Table 2-6.

Table 2-6 Review results of P2 JV

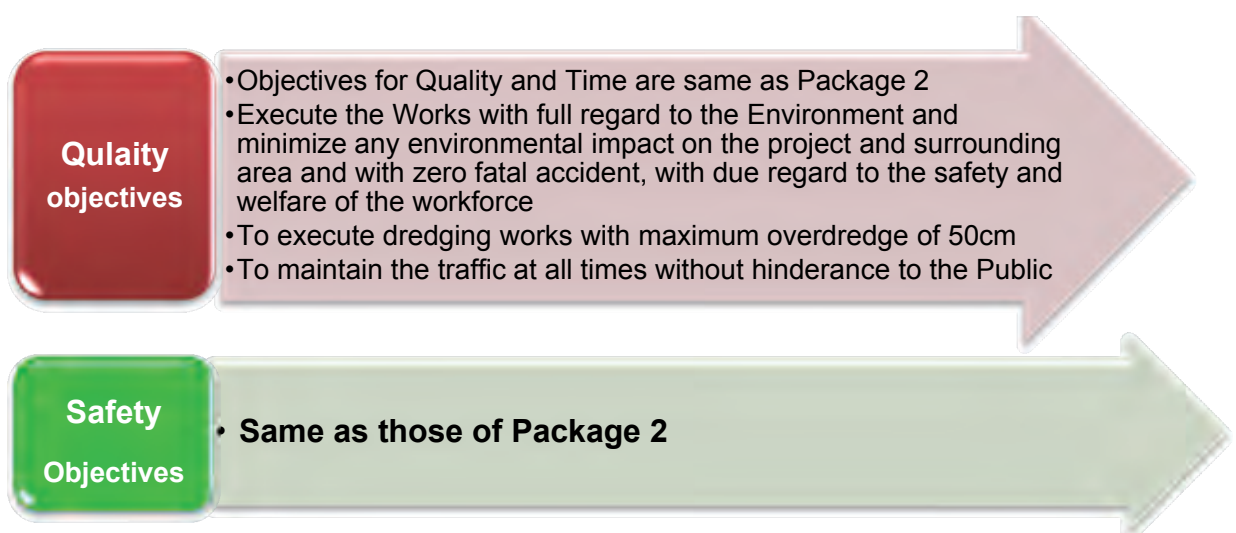
Items	Contents and Results of Review	
Measures to mitigate Construction Risks	The Contractor’s Internal Review of the Construction Documents (MS/SD etc.)	
	The Subcontractor	Prepare a draft of the Construction Documents based on a discussion with the person(s) in charge of the Contractor
	The Contractor	Primary Review: CM or equivalent engineer(s) Final Review: PM After PM approves the Construction Documents (specifically MS), those are circulated in all the staffs of the site office.
	Communication method with workers of the contents of the documents approved by the Consultant and checking measures on Site	Approved Construction Documents by the Consultant are sent to the Subcontractor with a submittal form and receipt by the Subcontractor is sent in return. It is the Subcontractor’s responsibility to keep every worker informed and understood about the contents of MS. The engineers of the Contractor and staffs of the Subcontractor checks whether the works are carried out in accordance with MS on site.
<p>➤ Internal Inspection Procedures QC section, with a cooperation of construction section, arranges all internal inspection. Based on the results, QC section submits Request for Inspection to the Consultants.</p> <p>➤ Risk management Risk Management for Construction Risks were carried out the construction, specified in QMS, such as before contract award and after contract award.</p> <p>➤ Quality Management System Quality Management System of International Division of JV leading firm is applied to the site quality management. The above QMS was certified by Lloyds for its compliance to the requirements of ISO 9001.</p>		

Items	Contents and Results of Review
Measures to mitigate Labour Risks	<p>➤ Risk assessment for Safety and Environment Before preparing detailed MS for each work, hazard identification is carried out and based on the seriousness and frequency, a primary risk assessment is made. After considering the mitigating measures, a secondary assessment is carried out with such mitigation measures. The results are reflected in MS.</p> <p>➤ Safety Activities Upon entry to the site: Safety induction training is carried out for all new workers. Daily Activities: Toolbox meeting, Daily safety meeting (same as Package 1) Weekly Activities : Weekly Safety Patrol By-weekly activities: Safety Check including electric facilities Monthly Activities: Safety Promotion Meeting, Monthly Joint Safety Patrol with PMU85/ the Consultant/ Safety Officer(s) of Subcontractor(s). After joint patrol, Safety Meeting is to be held with the same attendants. Monthly safety report is briefed by HSE (Health, Safety and Environment) Manager of the Contractor.</p> <p>➤ Safety Training Although a training schedule like Package 1 did not exist, fire drill, Oil Spill Response Plan etc. were carried out on-demand basis. As responsive actions towards Vietnam National Safety Week in 2010, educations on Safety and Hygiene, competition between workers in respect of safety knowledge, safety award to the workers who shows good safety practice in the work.</p>

2-2-4 P3 JV (Navigation Channel Dredging)

Progress rate of Package P3 reached to 98% of original quantities in contract Bills of Quantities as of July 2010, only dredging of upstream sections and trimming of the downstream by local dredgers were carried out at the time of review.

Quality and Safety Objectives of P3 JV are as follows. Because JV leading firm of P3 JV is the same company as that of P2 JV, the same Quality and Safety Objectives are applied.



The results of P3 JV are shown in Table 2-7.

Table 2-7 Review result of P3 JV

Items	Contents and Results of Review	
Measures to mitigate Construction Risks	The Contractor's Internal Review of the Construction Documents (MS/SD etc.)	
	The Subcontractor	Prepare a draft of the Construction Documents based on a discussion with the person(s) in charge of the Contractor
	The Contractor	Primary Review: CM or equivalent engineer(s) Final Review: PM or Deputy PM Numbers of MS are low compared to other works because navigation channel dredging is main work of the Contract.
	Communication method with workers of the contents of the documents approved by the Consultant and checking measures on Site	Communication method of approved Construction Documents is as follows. The Contractor's staff carry out the meeting at 07:20 every morning on duty, 1. Communication is made at the time of regular meeting in Japanese or English for Foreign dredgers 2. The Contractor's staff explains a local staff of the Subcontractor when he comes to JV office for reporting progress and he keeps the workers on Local dredgers informed and understood.
Measures to mitigate Labour Risks	<p>➤ Internal Inspection Procedures Internal Inspections by the Contractor carried out at the same time as the daily confirmation of as-built of dredged shape.</p> <p>➤ Risk Management Risk Management for Construction Risks were carried out the construction, specified in QMS, such as before contract award and after contract award.</p> <p>➤ Quality Management System Quality Management System of International Division of JV leading firm is applied to the site quality management. The above QMS was certified by Lloyds for its compliance to the requirements of ISO 9001.</p>	
	<p>➤ Risk Assessment for Dredging works In respect of maneuvering of dredgers and dredging works, hazards were identified and mitigation measures were studied and established. MS were prepared to reflect results of Risk Assessment and the contents of MS were briefed to the Contractor's staffs, the Subcontractor's staffs and workers.</p> <p>➤ Safety Activities Upon entry to the site: Safety induction training for new works on the dredgers etc. was made on the dredgers by the Contractor's staffs. Daily: Toolbox meeting, Daily Safety Meeting (same as Package 1, but in early morning) Weekly: Weekly Safety Patrol on every Tuesday Monthly: Monthly Joint Safety Patrol with PMU85/ the Consultant/ Safety Officer(s) of Subcontractor(s). After joint patrol, Safety Meeting is to be held with the same attendants.</p> <p>➤ Emergency Response Procedures Typhoon Evacuation Emergency Procedures, Emergency Contact List for dredging works etc. were established and trainings were done accordingly.</p>	

3. Mid-Term Review Results, Lesson Learned and Recommendation

3-1 Mid-Term Review Results

3-1-1 Performance

As of the end of August 2010 at progress rate of 33.6%, there is no Category A accident. Although a local land slide during surcharge embankment, damage to the SP PSA terminal next to package 2 site and outflow of soil into the fairway could be avoided. In this regard, this accident is classified as category B.

ASR of the Project, ie 2.46, is approx. ten times of that of Civil Works in Japan, ie 0.21. This is because one fatal accident occurred in 2009 significantly affected. On the other hand, AFR, ie 0.33, is well below of that of Civil Works in Japan, ie 0.94. It can be judged that a day to day safety management activities were carried out well.

3-1-2 Process

3-1-2-1 Measures mitigating Construction Risks

(1) Design of Permanent Works

Detailed Design was carried out as “JICA Detailed Design”. Upon the request of government of Vietnam, JBIC arranged a joint venture of the Port and Airport Research Institute of Japan and Resonator International AB of Sweden to independently review the design of PVD.

In Package 1 and Package 2, because the necessity of Variation to the Works was identified in design review of the Contractor, the Contractor prepared and submitted his proposal for varied design. The Consultant reviewed the proposal submitted by the Contractor and recommended PMU 85 for authorizing variation. Variations to the Works were made by PMU 85 upon recommendation of the Consultant.

(2) Risk Management

Risk Management was made in the construction review meeting before contract award, after contract award and/or before commencement of the Works in accordance with the procedures in QMS applied for P1, P2 and P3 JV.

(3) Emergency Response Manual

Each JV has prepared emergency manual which handles an expected emergencies, such as Typhoon Evacuation procedure prepared by P3 JV, Oil Spoil Response Plan prepared by P2 JV, Emergency procedure for injured workers and transportation to the hospital prepared by all JV.

P2 JV had no emergency response manual for a local land slide in P2 because it is not normal practice for Japanese contractor to anticipate such accident. Judging from the results, the design of Package 2 is considered to include reasonable redundancy to avoid the serious damage to the existing terminal or affects to the fairway.

(4) Degree of achievement for requirements in Quality Management System

QMS of International Division of Head office of JV leading firm, which has a certificate issued by the internationally recognized certification body, was applied to the site work of P1, P2 and P3 JV. Particular Application of Conditions of Contract specifies the requirement for introduction of QMS and Decree No. 209/2004 on Quality Management of Construction works in Vietnam includes provisions for QMS encouraged the Contractor to do so. Input errors were identified in fundamental items of Project Quality Plan and confirmation field of Safety Documents of P2 JV.

3-1-2-2 Measures for mitigating Labour Risks

(1) Degree of achievement for requirements in Safety Management System (OHSAS)

With respect to P1 JV, the requirements of SMS were fulfilled because the certified SMS to OHSAS 18001 of JV leading firm was applied and maintained as per OHSAS 18001. Regarding P2 JV and P3 JV nearly the same procedures were applied for Safety Management. Although internal audit for safety management was not carried out because OHSAS itself was not introduced, both JVs includes safety aspects in internal audits of QMS.

(2) Measures for mitigating Labour Risks

In addition to Monthly joint safety patrol with PMU 85/ the Consultant/ the Contractor, the following safety management activities which becomes normal exercise of the construction sites in Japan, were carried out.

- Safety induction training for workers newly entered into the site
- Daily toolbox meeting before start of works
- Daily Safety meeting for reporting, coordination, discussion of safety issues etc.
- Weekly and Monthly Safety patrol
- Monthly Safety Promotion meeting with attendance of all workers on site (“Anzen Taikai” in Japanese)

When a method statement was prepared, due considerations were made to the hazards and countermeasures identified in Risk Management for Labour Risks.

3-2 Recommendations

3-2-1 Recommendation for Executing Agency

It is recommended to let the personnel assigned to Safety management to attend at the Monthly joint safety patrol with the Consultant and the Contractor and state opinions of PMU 85 as the Employer.

3-2-2 Recommendation for the Contractor

3-2-2-1 Recommendation for P1/P2 JV

Current Safety Management activities, ie safety induction training, weekly patrol etc., are to be continued against increased operations for drainage works, pavement work and building works on site. Necessary modification should be made to suit the conditions on site.

3-2-2-2 Recommendation for P2 JV

Project Quality Plan requires correction for removing discrepancy in wordings. Other documents are to be reviewed in respect of correct English wording.

It is recommended for the Consultant and P2 JV to re-evaluate their Quality Control System and/or Quality management System in order to prevent occurrence of the accidents in the future construction activities. Based on the results of re-evaluation, where necessity is identified, the System should be improved.

3-3 Lesson Learned

Safety objectives for three JVs for the Project are to lower the AFR within target and Zero fatal accident, but not “Zero Accident” which has been the traditional safety policy for Japanese contractors. It is considered that introduction of Risk Assessment and Safety Management System into civil works in Japan spreads rapidly and the contractors are gradually obliged to apply the same into overseas works.

Introduction of risk management into overseas works will require the Japanese contractors to apply policy, such as “the accidents which has beyond allowable severity could not be acceptable, although it is not possible to achieve zero-accident by eliminating all accidents” as stated in Note of Sub-Clause 1-2-4 of this Report, instead of traditional policy of “Zero Accident”.



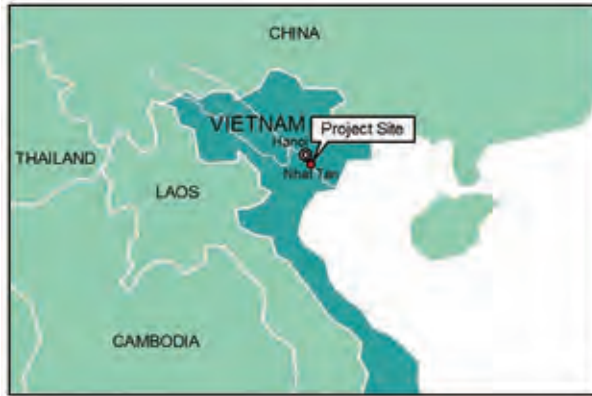
“Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project”

External Evaluator: MITANI Katsuaki, TOYOTOME Ichiro

Katahira & Engineers International

Field Survey: AUGUST 2010

1. Outline of the Project



Location of the Project



General view of construction of the pier P14

1-1 Objective of the Project

The objective of this project is to enhance transportation capacity for absorbing increasing traffic demand by constructing a bridge over Red River and its approach roads, thereby contributing to the economic development of Hanoi district.

1-2 Outline of the Project

Outline of the Project is shown in Table 1-1

Table 1-1 Outline of the Project (1/2)

Items	Contents
Loan Number/ Loan Amount	L/A No. VNX III-2 (STEP) /13,698 million Yen
Loan Agreement signing date	31 March 2006
Executing Agency etc.	Project Owner: Ministry of Transport Employer: Project Management Unit 85 (PMU 85) Authority for Operation and Maintenance: To be decided

Table 1-1 Outline of the Project (2/2)

Item	Contract	Description	Contractor
Construction Contract	Package 1 (P1)	Main Bridge and North Approach bridge	IHI Corporation (Leading firm)/ Sumitomo Mitsui Construction Co., Ltd. (member)JV (P1 JV)
	Package 2 (P2)	South Approach including approach bridge	Not yet awarded
	Package 3 (P3)	North Approach	Tokyu Construction (P3 Contractor)
Consultancy Contract		Chodai/ Nippon Engineering Consultant JV in association with TEDI (Chodai JV)	

Note) Bridge Department of IHI, Matsuo Bridge Co., Ltd. and Kurimoto, Ltd. were merged into IHI Infrastructure Systems Co., Ltd. in November 2009. However in this Report, IHI which was named in the Contract Documents is used.

2. Review of the Mid-Term Review

2-1 Performance

2-1-1 Measures for mitigating Construction Risks

Performance Index conformed to Accident Categories (refer to Table-3 in General section) is given in Table-2-1. There are 6 minor accidents.

Table 2-1 Performance Index by Accident Categories

Package	Category			Remarks
	Serious← A	B	→Minor C	
Total	0	0	6	
1	0	0	1	Near-miss
3	0	0	5	Property damages 3 Nos. , Accidents without DAFW 2 Nos.

Near-miss of Package 1 is that a pin of pre-installed shackle for setting a leader to a diesel hammer (pile driving machine) was dropped by vibrations generated. After this near-miss, anti-drop function was added to all pins.

Property damages in Package 3 includes turning over of re-bar cage for in-situ pile by an operation mistake of a crane operator, falling by 1.5m of concrete pile by using un-appropriate lifting gear.

2-1-2 Measures for mitigating Labour Risks

Table-2-2 shows “Accident Frequency Rate”ⁱ(AFR) and “Accident Severity Rate”ⁱⁱ(ASR) of this project. Because both AFR and ASR are 0.00 and 0.00, it is excellent if compared to those of Civil Works in Japan, rates of which are 0.94 and 0.21 respectively. It shows that daily safety activities were well managed by the Contractors.

Table 2-2 Comparison of AFR and ASR

	AFR (DAFWC*: Nos.)	ASR (DAFW**: Days)
Project Total	0.00 (0)	0.00 (0)
Total man-hours	1,577,007 man-hours	
Package 1	0.00 (0)	0.00 (0)
Total man-hours	708,970 man-hours Leading firm 182,750 +member 526,220	
Package 3	0.00 (0)	0.00 (0)
Total man-hours	868,037 man-hours	
Civil works in Japan	0.94	0.21

(As of the end of July 2010 except P1 JV leading firm, the figure of which is as of August 2010)

* DAFWC (days away from work case: Nos.)

**DAFW (days away from work: man-days)

The figures in this review are calculated from the basic data, DAFW of which are 4 days or more, as shown below.

The number of accident: 0

Total working days lost: 0 day (No fatal accident)

*Figures for Japan were obtained from the domestic works contract, carried out in Fiscal Year 2008, the contract price of which was more than 1,000 million yen.

(Source: Home page of Japan Advanced Information Center of Safety and Health, Occupational Accidents Statistics)

2-2 Process

The review results for the Consultant and the Contractors for P1 leading firm, P1 JV member and P3 with respect to the process for mitigating Construction Risks and Labour Risks are shown in Sub-Clause 2-2-1 to 2-2-4. The Contactor of Package 1 is a joint venture of two Japanese Construction Companies. Because leading firm and member of P1 JV mainly engaged in Super structure and Sub-structure of bridge respectively, review was carried out separately. Whole checklists for Safety Management System used in the hearing of P1 JV leading firm, P1 JV member and P3 Contractor are attached in Reference of this report. Summary is included in Sub-Clause 2-2-2 to 2-2-4.

2-2-1 Consultant (for Detailed Design and Construction Supervision)

The terms of reference of the Consultant covers from a review of Feasibility Study to Construction Supervision, and includes Detailed Design. The results of review are as shown in Table 2-3 and Table 2-4.

Table 2-3 Results of review of measures for mitigating Construction Risks by the Consultant

Contents and Results of Review	
Safety Measures for the Permanent Works	<p>The following checking consultants carried out independent design checks of the detailed design made by the Consultant</p> <p>Structural design of cable stay bridge: Schlaich Bergermann Und Partner (Germany)</p> <p>Whole of detailed design including street lighting etc.: local expert group including University professors</p> <p>Comment reply was made by local office and design department of head office jointly. Final approval for revising the design was made by Project Manager (PM).</p>
Comprehensive Review of Construction Documents	<p>PM nominates a team of Foreign engineer and Local engineer for reviewer. Depending on the importance of the works, members of the team selected are minimum two and maximum 4. If necessary, the construction documents are sent to Head office for review. After checking the contents of review by the team, PM extracts the comments to be sent to the Contractor for his action. When the contents of construction documents satisfy the required standard, PM approves the construction documents. SD requires the final approval of PMU 85 and the work shall not be commenced on site without the approval of PMU 85.</p>
Strict application of Technical Specification to the Works	<p>In order to confirm the quality, quantities and safety, inspections by the staffs of the Consultant is carried by applying Technical Specification (TS) strictly after internal inspections by the Contractor.</p> <p>The following points in TS are specifically noted.</p> <ul style="list-style-type: none"> ■ Loading tests and Monitoring on main temporary structures to check the structural integrity as a completed structure ■ Temperature control of placing in-situ concrete

Table 2-4 Results of review of measures for mitigating Labour Risks of the Consultant

Contents and Results of Review	
Joint Safety Patrol with PMU 85 and the Contractor	<p>Under a policy that “Prevent an accident which can be expected to occur.”, Monthly joint safety patrol with PMU 85 and the Contractor is carried out and unsafe actions/facilities etc. are pointed out. After patrol, a meeting is convened to record corrective actions identified and status of corrective actions identified in the previous meeting is also checked.</p>

Contents and Results of Review	
Introduction of extensive requirements of Safety in TS	<p>Extensive requirements are listed in Part I-Section 6 Project Safety of TS.</p> <ul style="list-style-type: none"> ■ Safety induction training for workers newly entered into site ■ Guarantee of direct reporting line of Safety Officer to PM in respect of safety issue <p>■ Introduction of statistic Indexes for monitoring and measurement of safety management activities</p>

Special Note)

In respect of manpower of the Consultant, further shortage is anticipated according to Appendix 1 & 2 to the Answer to Questionnaire once Package 1 Superstructure and Package 2 works commences.

2-2-2 P1 JV leading firm (Superstructure)

At the time of review, fabrication of steel members for the bridge, such as steel girders and anchor box etc. was on-going in the following factories, which have ISO 9001 certifications.

- Aichi factory of JV leading firm in Japan
- Factory in Vietnam operated by IHI Infrastructure Asia, 100% shares of which is owned by JV leading firm
- Mitsui Thang Long Steel Construction operated by a joint venture of Mitsui & Co., Mitsui Engineering and Shipbuilding Co., Ltd and Thang Long Bridge Co.

Staffs of JV leading firm in the site office were engaged in preparing, submitting and revising the Construction Documents according to the comments made by the Consultant. No site works were commenced. Policies of Quality and Safety of JV leading firm are as follows.



Quality policy has following 4 items for its crystallization.

- i. Restructuring of product manufacturing mentality to “Make it with our own initiative”
- ii. Enhancement of Interface Management for various parties engaged in construction
- iii. Remove problematic factors by QC patrol
- iv. Eliminate mistake at the beginning stage (prevent mistake in advance)

Safety policy also has the following 4 items for its materialization.

- i. Establish and effectively utilize PDCA cycle
- ii. Give safety training to all new workers
- iii. Eliminate all dangerous factors by KY (risk assessment) activities
- iv. Eliminate plan mistake and human mistake (human error)

The results of review are shown in Table 2-5.

Table 2-5 Review Results of JV leading firm

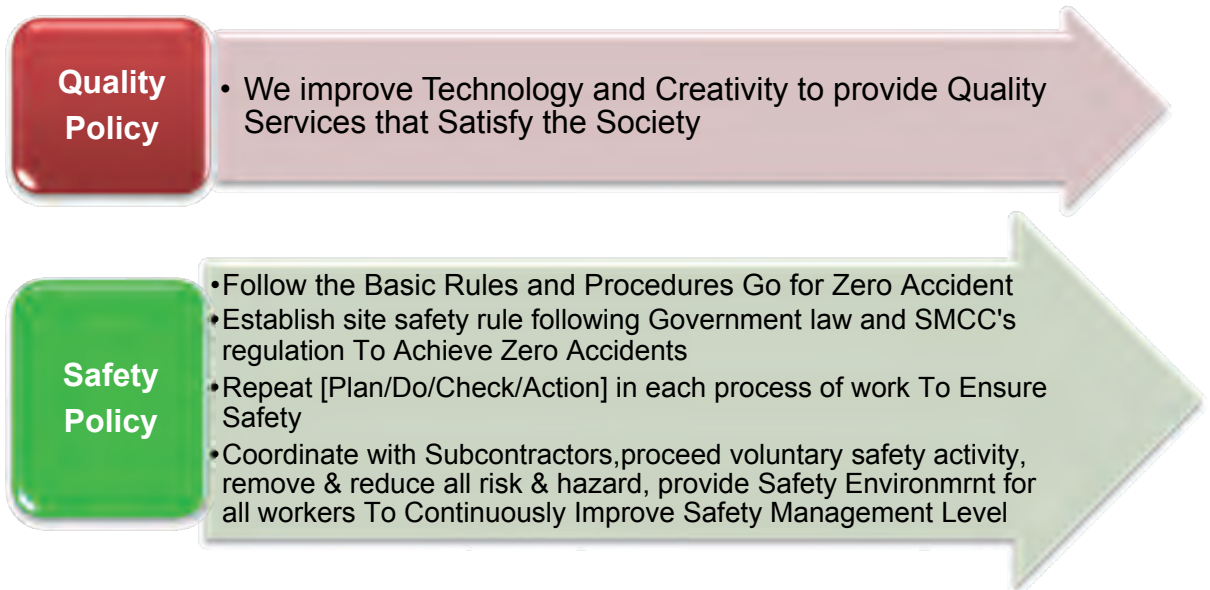
Items	Contents and Results of Review			
Measures to mitigate Construction Risks	The Contractor's Internal Review of the Construction Documents (MS/SD etc.)			
		Preparation by Subcontractor	Preparation by the Contractor	
	Subcontractor	Prepare	*****	
	The Contractor	Authorized Designer	Review	Prepare
			Marked on the organization chart. Designer nominated by experience and ability based on internal rules	
		Authorized Key Personnel including PM	Review	Review
			Engineers approved by PMU 85 after evaluation of experience, qualifications and ability written in CV	
	Communication method with workers of the contents of the documents approved by the Consultant and checking measures on Site		Construction Manager (CM) explains the approved documents to Japanese Supervisor (SV), Site Engineer (SE), Subcontractor's Site Manager (SM) and Forman (FM) at weekly or monthly meeting. Briefing to workers was carried out by SV or SE of the Contractor, or otherwise by SM or FM of Subcontractor. Checking on site was done by SE and when he identified non-conformance, he reported CM for his action. If necessary, CM issued an instruction requesting corrective actions. The Contractor provided thorough instruction that drawings without any "Approved" stamp were not able to use for construction.	
	<p>➤ Internal Inspection Procedures</p> <p>After an internal inspection by Subcontractor, SE and QC engineer of the Contractor carries out an internal inspection. Head of department such as CM, Fabrication Manager, Material Engineer etc. check the results of the inspection. Upon an approval of manager of QC department, Request for Inspection (RFI) is submitted to the Consultant.</p> <p>➤ Risk Management</p> <p>The Construction Documents for major works were reviewed by Erection Review Board (ERB) of head office with involvement of experts who has the same or similar works experiences, in which risk assessment was also carried out.</p>			

Items	Contents and Results of Review
	<p>➤ Loading Tests on temporary facilities A loding tests will be carried out using concrete blocks the weight of which are equivalent to the loads acting on temporary facilities, such as a bent truss for installing concrete slab and false works for concrete bridge cast insitu.</p> <p>➤ Quality Management System Quality Management System of Head office of JV leading firm is applied to the site quality management. The above QMS was certified for its compliance to the requirements of ISO 9001.</p>
Measures to mitigate Labour Risks	<p>➤ Utilization of past experience in Vietnam, such as Binh Bridge Construction JV leading firm wishes to utilize his first experience in Vietnam of Binh Bridge Construction The same Japanese SV and local operators for cranes etc. will be employed. Construction of steel bridges will be carried out by labour supply subcontractor under supervision of Japanese SV and that of concrete bridges will be made under the subcontract with local experienced subcontractor(s).</p> <p>➤ Safety Activities and Trainings Safety induction training for new workers, Safety Patrol, Safety Committee, Safety Officer, Emergency evacuation drill, subscription of river information including forecast etc., the same system applied P1 JV member will be applied.</p> <p>➤ Safety Management System A safety management system and manual implemented by Head Office will be employed. The above SMS includes Fault Tree Analysis (FTA) system in which ,when an accident occurs on the site of JV leading firm in the world, primary report will be sent to staffs by e-mail within several hours and the results of FTA and corrective actions established and approved by Head Office will follow.</p>

2-2-3 P1 JV member firm (Substructure)

Piling for piers for a main cable stay bridge No. P13, P14 and P15 by steel pipe sheet pile foundations have been completed and a full scale test of assembling re-bar for a segment of Pylon was carried out in order to check effectiveness of detailed design and corresponding method statement.

Policies for Quality and Safety are as follows. JV member firm applied his original Project Management System (PMS) for Safety Management and Quality Management on site works. Quality Management System, which is a part of PMS, of International Division of member firm was certified for its compliance to the requirements of ISO 9001.



Quality policies include the following 6 commitments to materialize them.

- i. We Deliver Quality Construction Service that meets Customer's Requirement.
- ii. We develop & Improve Construction technology to meet Society's requirements
- iii. We establish Quality Objectives and Make regular Review
- iv. We educate Staffs & Conduct Internal Audit to achieve Quality Management Target
- v. We communicate Internally and Externally to exchange views and learn from it
- vi. We Continue to Review & Improve Quality Management System

Internal Audis of PMS operated by a local office are carried out by auditor team which consists of not only auditors of Head office, but also one regional auditor appointed from regional office in Shanghai, Jakarta, Bangkok or Singapore.

Review results of JV member firm are shown in Table 2-6. Because procedures up to Internal inspection is the same as those of JV leading firm, those portions are omitted in Table 2-6.



Net for falling prevention and unit scaffold

Table 2-6 Review results of JV member firm

Items	Contents and Results of Review
<p>Measures to mitigate Construction Risks</p>	<ul style="list-style-type: none"> ➤ Risk Management At the time of preparation of Project Safety Plan required by PMS, not only Construction Risks and Labour Risks, but also credit risks and other risks were identified and countermeasures were discussed. Before award of contract and before commencement of works, construction review meetings were held with involvement of design and technical department of Head Office. ➤ Loading Test for temporary facilities etc. In addition to the measurement of bearing capacity of foundation piles for a temporary jetty, a loading test was carried out after completion of the jetty using a crawler crane planned to use on the jetty. A full scale re-bar assembling test was on-going to verify the space of re-bar in the design and check the effectiveness of method statement. ➤ Quality Management System QMS, which is a part of PMS, was applied to the site works. Quality/Safety manager carried out site patrol by himself more than once a month and he compiled his findings and proposed corrective actions as a Monthly Audit Report and he submitted it to International Branch via. Regional office. ➤ Emergency Preparedness Under the requirements of procedures for Emergency Preparedness in SMS, which is also a part of PMS, Emergency Evacuation Plan from sandbar in Red River during high flood season and emergency drill was carried out as per the same Plan.
<p>Measures to mitigate Labour Risks</p>	<ul style="list-style-type: none"> ➤ Introduction of Safety Activities and Facilities as per Japanese style Upon entry to the site: Safety induction training is carried out for all new workers. Daily Activities: Toolbox meeting, Daily safety meeting Weekly Activities : Weekly Safety Patrol Monthly Activities: Monthly Joint Safety Patrol with PMU85/ the Consultant. After joint patrol, Monthly Safety and Environmental Protection Meeting is to be held with the same attendants. Meeting minutes are made for follow up action. In addition to the above, Safety Promotion Meeting (Anzen Taikai) with attendance of all workers, Monthly Safety Patrol and Safety and Hygiene Committee with attendance of management of Subcontractors are carried out. Temporary unit scaffolds, staircases etc. were introduced as safety facilities and Safety officer team consists of two Japanese Safety officers and local safety officers. In case safety standard of Vietnam is not clear, then Japanese safety standard is applied. ➤ Risk Assessment for Labour Risks Items to be reminded for safety were added to Work procedures. Preparation was made for explaining the contents of Risk Assessment by its Vietnamese translation. ➤ Sharing accident information (Lateral spread or Horizontal development) By a procedure of Safety Management System(SMS), when a labour accident which has 4 DAFW or more, an accident which has considerable affect to the Employer and/or public , a primary report should be made to International Branch within 24hours. After further report to the Head Office, an Accident/Incident Report- Preliminary will be distributed to all regional office. Accident Report with corrective actions to be taken will follow shortly.

2-2-4 P3 Contractor (North Approach Roads)

Due to the delay of handover of work site, drainage works, foundation for piers for viaducts, surcharge embankment for soft ground improvement etc. were under construction in the limited area. Diversion of high voltage (110 kV and 35kV) lines into underground was being carried out by other contractors.

Safety policy and Quality objectives of P3 Contractor are as shown below.



Progress of Customer’s Satisfaction of Quality policy includes 5 commitments.

- i. Understand the Customer’s requirements clearly
- ii. Deliver and complete the work on time
- iii. Keep high quality performance by implementing Quality Management System
- iv. Perform the customer’s work request promptly
- v. Keep the work safe by implementing Safety Plan

The review results of P3 Contractor are shown in Table 2-7.

Table 2-7 Review results of P3 Contractor

Items	Contents and Results of Review	
Measures to mitigate Construction Risks	The Contractor’s Internal Review of the Construction Documents (MS/SD etc.)	
	Approved Subcontractor	Prepare a draft based on a discussion with an engineer in charge, of the Contractor. (45days before commencement)
	The Contractor	Primary Review: engineer in charge Secondary Review: CM or equivalent engineer(s) Final Review and Internal approval: PM Internal approval of PM is to be made within two weeks after receipt of Construction Documents.

Items	Contents and Results of Review
	<p>Communication method with workers of the contents of the documents approved by the Consultant and checking measures on Site</p> <p>Before commencement of works, Safety Officer (Vietnamese) and engineer in charge arranges a meeting for explaining the contents of documents with the following personnel. Records of meetings are kept.</p> <ul style="list-style-type: none"> ■ Site agent of the Subcontractor ■ Site agent or foreman of Subsidiary company (Sub-Subcontractor) who is responsible for actual site works ■ Workers, operator of cranes etc. , electrician etc. who works on site <p>Engineers in charge of the Contractor and of the Subcontractor check the compliance with MS on site.</p> <p>➤ Internal Inspection Procedures</p> <p>Before internal inspection, an inspector prepares an inspection sheet based on the drawings for construction included in approved MS. If no problems are identified, he submits RFI to the Consultant. Qualifications for an inspector of the Contractor are university graduates who majored in Road, Bridge and Civil or equivalent. Vietnamese engineers who had experience of working for Japanese contractors as an inspector were employed.</p> <p>Internal inspections for materials are carried out by QA/QC staffs.</p> <p>➤ Risk Management including third-party (Public) risks</p> <p>Following risks were identified in the risk management and countermeasures were established.</p> <ul style="list-style-type: none"> ■ Existence of high voltage power line of 110kV and 35kV ■ Accidents by construction vehicle, such as a traffic accident and an accident against residential people (third-party accident) ■ Falling down accident and/or accident caused by cranes, bulldozers etc. <p>➤ Quality Management System</p> <p>QMS of Head Office which has ISO 9001 certification was applied to site works. Internal Audit by Head Office was carried out annually, which is scheduled in September 2010.</p>
<p>Measures to mitigate</p> <p>Labour Risks</p>	<p>➤ Risk Assessment for Labour Risk</p> <p>Refer to Risk Management including third-party (Public) risks.</p> <p>➤ Safety Activities</p> <p>Upon entry to the site: Safety induction training is carried out for all new workers.</p> <p>Daily: Toolbox meeting, Safety Walk, Daily safety meeting</p> <p>Weekly: Weekly Safety Patrol on every Friday</p> <p>Monthly Activities: Monthly Joint Safety Patrol with PMU85/ the Consultant. After joint patrol, Monthly Safety and Environmental Protection Meeting is to be held with the same attendants. Meeting minutes are made for follow up action.</p> <p>In addition to the above, on the first working day of the month, Safety Patrol with attendance of management of Subcontractors are carried out and Safety Promotion Meeting (Anzen Taikai) with attendance of all workers are carried out. Workers who showed good safety practice were commended.</p> <p>➤ Emergency Training</p> <p>Employment of First Aiders, liaison with emergency hospitals, preparation of emergency contact lists etc. were made as per Emergency plan and education of such plan to all</p>

Items	Contents and Results of Review
	<p>workers was made. However no emergency drill was carried out.</p> <p>➤ Safety Contributions The predetermined sum is deducted from the payment due to the Subcontractor whose workers made many unsafe acts, in other words, the Subcontractor makes safety contribution, and such sum is provided for resource of safety award etc.</p>

3. Mid-Term Review Results, Lesson Learnd and Recommendation

3-1 Mid-Term Review Results

3-1-1 Performance

As of the end of August 2010, work progress rates of Package 1 and Package 3 were 14.2% and 12.8% respectively. There were neither Category A accident nor Category B accident. Only 6 Nos. of Category C accidents were recorded.

Beacuse no accident of worker which has 4 days away from works (DAFW) or more, Accident Frequency Rate and ASR for the Project become 0.00. it is excellent to keep AFR as 0.00 where total working hours exceeded 1.5 million hours.

3-1-2 Process

3-1-2-1 Measures mitigating Construction Risks

(1) Design of Permanent Works

Sclaich Bergerman Und Partner ofGermany, employed by PMU 85 as a checking consultant, independently checked the structural design of main cable stay bridge and whole of detailed design including street lighting etc. were checked by the local expert group including University professors. The Consultant arabnge his head office design department to carry out the review of the Construction Documents which are considered to be important.

(2) Risk Management

The Consultant specified in the Technical Specification that the Consultant reserves the right to request loading tests of main temporary facilities to check the structural integrity as a completed structure. P1 JV carried out a loading tests of temporary jetty and further loding tests will be carried out for a bent truss for installing concrete slab and false works for concrete bridge cast insitu.

By the records, it is confirmed that P1 JV leading firm carried out risk management in Erection Review Board for important Project specified in QMS and with invlvement of experts and managers of head office. In rsk management of P3 Contractor main focuses were on the works adjacent to the high voltage power lines and third party (public) accident.

(3) Emergency Response Manual

P1 JV, who worked around sandbar in Red River, an Evacuation Plan during high flood season was made and training was carried out. P3 Contractor has prepared an emergency manual for injury of workers.

(4) Degree of achievement for requirements in Quality Management System

P1 JV and P3 Contractor applied QMS of their head office or International division of head office which has ISO9001 certification. There are detailed provisions in respect of Quality Management in Vietnam domestic laws and regulations, such as Decree No. 209/2004 on Quality Management of Construction works. That fact encourages the Contractor to apply his ISO 9001 certified QMS to the site works.

3-1-2-2 Measures mitigating Labour Risks

(1) Degree of achievement for requirements in Safety Management System (OHSAS)

Because P1 JV member applied SMS, which is a part of his own Project Management System (PMS) ,to the site works, all requirements were fulfilled. Although P1 JV leading firm or P3 Contractor was not applied a safety management system, requirement of SMS were regarded to be substantially fulfilled judging from the checking results using a check list.

(2) Measures for mitigating Labour Risks

In addition to Monthly joint safety patrol with PMU 85/ the Consultant/ the Contractor, the following safety management activities which becomes normal exercise of the construction sites in Japan, were carried out.

- Safety induction training for workers newly entered into the site
- Daily toolbox meeting before start of works
- Daily Safety meeting for reporting, coordination, discussion of safety issues etc.
- Weekly and Monthly Safety patrol
- Monthly Safety Promotion meeting with attendance of all workers on site (“Anzen Taikai” in Japanese)

Method statements were prepared reflecting the results of risk management and/or assessment.

It is noted that P1 JV member assigned Safety Officers and applied safety standard in Japan to the safety facilities, such as net for preventing workers falling down inside of steel pipe pile, a diameter of which is 1.2m, and unit type temporary scaffold.

3-2 Recommendation

3-2-1 Recommendation for Executing Agency

It is recommended to let the personnel assigned to Safety management to attend at the Monthly joint safety patrol with the Consultant and the Contractor and state opinions of PMU 85 as the Employer.

It is also recommended to accelerate the diversion works, carried out by other contractor, of the high voltage lines, which are located in relatively low position and located at the middle of work site, to implement the works below such power lines. Longer the high voltage lines exist in the existing position, the higher probability of the occurrence of accident becomes.

3-2-2 Recommendation for Contractor

3-2-2-1 Recommendation for P3 Contractor

The works adjacent to the above high voltage lines should be carried out after all workers are kept informed and understood of the risks identified in risk assessment and corresponding countermeasures.

3-2-2-2 Recommendation for P1 JV/P3 Contractor

It is recommended for P3 Contractor to carry out safety drill for an emergency. It is also recommended to repeat safety drills on regular basis against anticipated risk events.

Note)

MOT TCQM suggested reviewer to include the following items into recommendation for the Contractor, who engaged in the projects funded by ODA Yen loan.

1) In addition to safety talks with newly employed workers, enough safety training to the workers should be carried out.

2) It is recommended for the Contractor to select Subcontractor who employs vocationally trained or educated workers, such as graduates of vocational training school etc.

However the above 2 items are not included in recommendation, because 1) our review results showed that the Contractors carried out necessary safety training to the workers employed on site. 2) employment of trained or educated workers was not able to check within timeframe of mid-term review.

3-3 Lesson Learned

Although it is very physical and primitive method, lesson has learned that a method to check the function of the completed temporary facilities by carry out physical loading test has been applied and effective where there are unknown factors in ground conditions. From the point of reliability, this method is considered to be the best. However this method has inherent problems in costs and time. It is aspired for the Japanese consultants and/or Japanese contractors to research and develop an alternative method in substitution for physical loading tests, by analyzing accumulated data of physical loading tests, and effective utilization of those.



Confirmation results of the checklist for achievement for requirements in Safety Management System: Cai Mep – Thi Vai International Port Development Project

No	Requirements	Confirmation Results (P1 TOA/TOYO JV)	Confirmation Results (P2 Penta/Rinkai JV)	Confirmation Results (P3 Penta/Toyo JV)	No
1	Commitment by Top Management of Safety and Health Policy and Setting Objective of Safety and Health are made properly? Are the stakeholders kept informed of Policy and Objective?	<ul style="list-style-type: none"> - Company's Safety Policy and Objectives set by the International Division's manager in Head office are translated into English and displayed in each site offices. - Company's Safety policy and objectives are informed to all the staffs and workers at the daily Tool Box Meeting or the other meetings. 	<ul style="list-style-type: none"> • Commitment by Top Management of Safety and Health Policy and Setting Objective of Safety and Health are made and displayed in each site offices. • Company's Safety and Health Policy set by the International Division's manager in Head office are translated into English and displayed in each site offices. 	<ul style="list-style-type: none"> • Commitment by Top Management of Safety and Health Policy and Setting Objective of Safety and Health, and Company's Safety and Health Policy set by the International Division's manager are translated into English and displayed in each site offices. • These Policies and Objectives are notified to Contractor's staffs and Subcontractor's staffs and workers, through Daily Safety Meeting and Weekly Safety Patrol, as Safety Measures. 	1
2	Are the requirements, ie social, regulatory, contractual, internal etc, made clear and properly documented?	<ul style="list-style-type: none"> - TOA Corporation has obtained OHSAS 18001 certification in their Head office. TOA Corporation complied the Project Safety Plan based on this OHSAS. 	<ul style="list-style-type: none"> • CSR (Company Social Responsibility) Activity Schedule is prepared and carried out in each sites, every year, as the company's policy. Year-end review is conducted. 	<ul style="list-style-type: none"> • CSR (Company Social Responsibility) Activity Schedule is prepared and carried out in each sites, every year, as the company's policy. Year-end review is conducted. • Construction works are carried out in conformity with Vung Tau Port Regulation, because of the Marine works. 	2
3	Are the risk assessments (risk and hazard assessment) on site made and hazards extracted properly? Are measures for mitigation of such hazards reviewed? (Risk Management against Labour Risk)	<ul style="list-style-type: none"> - Safety Manager (Vietnamese) conducts JSEA (Job Safety and Environment Analysis), and Hazards/Risks are identified for each work, and countermeasures are taken. - The result of JSEA is explained to the workers by Safety Manager at toolbox meeting, and attention among the workers is claimed. 	<ul style="list-style-type: none"> • Construction review meeting is held prior to the commencement of the works for examining the method of Construction, Safety and Risk Assessment is made. • When MS for each work is prepared, Risk Assessment for identification of hazard and consideration of mitigating measures, are made. 	<ul style="list-style-type: none"> • Construction review meeting is held prior to the commencement of the works for examining the method of Construction, Safety and Risk Assessment is made. • When MS for each work is prepared, Risk Assessment for identification of hazard and consideration of mitigating measures, are made. 	3
4	In order to achieve objectives, does preparation, execution, evaluation and improvement of Safety and Health Plan?	<ul style="list-style-type: none"> - Safety Plan are made and approved by PMU85 and the Consultant. - Weekly Safety Patrol and Regular Patrol are conducted. The evaluation and Improvement are made through these patrols. 	<ul style="list-style-type: none"> • Health, Safety and Environmental Management Plan is prepared and approved by PMU85 and the Consultant. 	<ul style="list-style-type: none"> • Safety Management Plan is prepared and approved by PMU85 and the Consultant. 	4
5	Is a procedure for collecting opinions of the top management and workers of relevant Subcontractor as well as internal staffs, in order to reflect those on Safety and Health Plan, established, documented and executed accordingly?	<ul style="list-style-type: none"> - Opinions are gathered through Weekly Safety Patrol and Regular Safety Patrol. 	<ul style="list-style-type: none"> • Weekly Safety Patrol and Joint Site Patrol is conducted together with Subcontractors and collected opinions are reflected. 	<ul style="list-style-type: none"> • Opinions are collected and reflected through Weekly Safety Patrol (Tuesday) with Contractor and Subcontractor, and Joint Site Patrol. 	5
6	Are Trainings and Educations to the engineers and workers carried out and documented properly?	<ul style="list-style-type: none"> • Safety induction training is carried out for all new workers, and recorded. • Training and Education are carried out as per HSE Program and Training Plan prepared by Safety Manager. 	<ul style="list-style-type: none"> • Safety induction training is carried out for all new workers, and recorded. 	<ul style="list-style-type: none"> • Safety induction training is carried out for all new workers, and recorded. 	6
7	Are procedures of work which reflects policy and objective made?	<ul style="list-style-type: none"> • MS is prepared in conformity with Safety Policy and Safety Objective. 	<ul style="list-style-type: none"> • When MS for each work is prepared, Risk Assessment for identification of hazard and consideration of mitigating measures, are made, and approved by the Consultant. 	<ul style="list-style-type: none"> • When MS for each work is prepared, Risk Assessment for identification of hazard and consideration of mitigating measures, are made, and approved by the Consultant. 	7
8	Are the possible Emergency situation identified and corresponding procedures prepared? Are specific trainings for the above carried out and recorded properly?	<ul style="list-style-type: none"> • Emergency Contact Network Chart is prepared. • Procedures upon occurrence of Worker's Accident is prepared, educated and trained. Training has been conducted 4 times. 	<ul style="list-style-type: none"> • Emergency Contact Network Chart is prepared. • Oil Spill Response Plan is prepared, and education/training are provided. • Fire drill is carried out. 	<ul style="list-style-type: none"> • Emergency Contact Network Chart and Contact List are established. • The manual for "Typhoon Evacuation Emergency Procedures" is prepared, and Education is carried out in the meeting after Weekly Safety Patrol. 	8
9	Are Corrective Action procedures for the accidents or Non-conformance prepared? Are preventive action procedures also prepared? Are corrective action taken properly and documented?	<ul style="list-style-type: none"> • Accident Report/Incident Report which describes the details, causes, and corrective/preventive action for Accident is prepared and reported to PMU85 and the Consultant, on an accident basis. 	<ul style="list-style-type: none"> • The causes of Accident, and corrective/preventive action against Accident is reported to PMU85 and the Consultant, as a form of the submission of Accident Report/Incident Report. • Afterwards each measurements are taken, implementation status of corrective/preventive action are checked and recorded by the Patrol. 	<ul style="list-style-type: none"> • The causes of Accident, and corrective/preventive action against Accident is reported to PMU85 and the Consultant, as a form of the submission of Accident Report/Incident Report. • Afterwards each measurements are taken, implementation status of corrective/preventive action are checked and recorded by the Patrol. 	9

No	Requirements	Confirmation Results (P1 TOA/TOYO JV)	Confirmation Results (P2 Penta/Rinkai JV)	Confirmation Results (P3 Penta/Toyo JV)	No
10	Are procedures for keeping records prepared and implemented? Are the records kept properly as per the above procedures?	Internal procedure of TOA/TOYO requires keeping records of Safety and Quality for two years.	<ul style="list-style-type: none"> Daily Safety Reports and Weekly Safety Patrol Reports are kept during 2 years after the completion of the work. Monthly Safety Reports and Accident Reports are kept during 5 years after the completion of the work. 	<ul style="list-style-type: none"> Daily Safety Reports and Weekly Safety Patrol Reports are kept during 2 years after the completion of the work. Monthly Safety Reports and Accident Reports are kept during 5 years after the completion of the work. 	10
11	Are the continual improvement of Safety Management System made by applying PDCA cycle and mitigating potential risks?	Evaluation and improvement is made through Weekly Safety Patrol, and Regular Safety Patrol.	Penta/Rinkai JV made daily improvement for mitigating the risks through Weekly Safety Patrol, Joint Site Patrol, and Safety Meeting after joint patrol.	Penta/Toyo JV made daily improvement for mitigating the risks through Weekly Safety Patrol, Joint Site Patrol, and Safety Meeting after joint patrol.	11
12	Is the Internal Audit carried out in respective of Safety Management System?	Internal Audit is carried out by executive-level staffs every six months.	Internal Audit of Safety Management System is conducted in conjunction with Internal Audit of Quality Management System.	Internal Audit of Safety Management System is conducted in conjunction with Internal Audit of Quality Management System.	12
13	Is the effectiveness of System included in the above Internal Audit?	The effectiveness of System included in the contents of the Internal Audit.	The effectiveness of System included, because common check list for Internal Audit is used in the company.	The effectiveness of System included, because common check list for Internal Audit is used in the company.	13

Note) Regular Safety Patrol: Joint Site Patrol with PMU85/ the Consultant/ Contractor/ Subcontractor conducted on a monthly basis.

Confirmation results of the checklist for achievement for requirements in Safety Management System: Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I)

No	Requirements	Confirmation Results (P1 JV, IHI)	Confirmation Results (P1 JV, SMCC)	Confirmation Results (P3 Tokyu Construction)	No
1	Commitment by Top Management of Safety and Health Policy and Setting Objective of Safety and Health are made properly? Are the stakeholders kept informed of Policy and Objective?	Company-wide Objective of Safety and Health which is determined on January each year ("Zero Accident" for this year), was displayed in each site offices.	Safety Policy and Quality Policy established by PMS (Project Management System), which is utilized in all overseas work sites by order of Top Management of Head Office, are displayed at multiple locations of work site, and be acknowledged by workers.	Safety and Quality Management Policy set by Top Management are displayed in English at each site offices.	1
2	Are the requirements, ie social, regulatory, contractual, internal etc, made clear and properly documented?	Safety laws and regulations of Vietnam are studied and confirmed in the process of preparation of MS which is submitted prior to the commencement of each work. In the case that there are no equivalent standards in Vietnamese laws and regulations, safety standard in Japan is applied.	<ul style="list-style-type: none"> Company's policy [3S: Shingi (Faith), Shinjitsu (Truth), Shinwa (Fellowship)] are displayed in Japanese, English, and Vietnamese, and read loud when morning meeting every day. In terms of Safety and Health, Key Safety Objectives are specified in Project Safety Plan (PSP). 	<ul style="list-style-type: none"> Requirements by Company are documented and displayed in each site office. Method Statements, which are submitted prior to the commencement of each work, are prepared upon study and confirmation of safety laws and regulations of Vietnam. 	2
3	Are the risk assessments (risk and hazard assessment) on site made and hazards extracted properly? Are measures for mitigation of such hazards reviewed? (Risk Management against Labour Risk)	The risk assessments are carried out in conformity with internal procedure of IHI. In the process of preparation of MS, hazards and countermeasures on Safety and Health is examined, and included into MS.	"Pre-Risk Control Chart" is prescribed in Project Safety Management Plan (in-company), and the measures to mitigate these risks are specified in "Risk Countermeasure column". Vietnamese translation version of "Risk Management on Labour Risk" are planned to be utilized, from September.	Identification of Labour Risks and consideration of mitigating measures for this project are carried out through Risk Assessment conducted as per Health and Safety Plan. Risk Assessment is reviewed and modified as needed.	3
4	In order to achieve objectives, does preparation, execution, evaluation and improvement of Safety and Health Plan?	"Project Safety Management Plan" is prepared after commencement of the work, and approved by the Consultant. Items to be reminded with respect to Safety and Health are listed in MS, and measures are taken, as per "Project Safety Management Plan".	<ul style="list-style-type: none"> PSP is prepared as per in-company system. PSP is reviewed internally on regular basis, and evaluation and modification are made. PSP is submitted to PMU 85 and the Consultant, and utilized under approval of PMU and the Consultant. 	Health and Safety Plan is prepared and carried out. Health and Safety Plan is reviewed and modified through daily meeting.	4
5	Is a procedure for collecting opinions of the top management and workers of relevant Subcontractor as well as internal staffs, in order to reflect those on Safety and Health Plan, established, documented and executed accordingly?	IHI holds Monthly Safety Promotion meeting with attendance of all workers in the site, and carries out Safety Patrol with managers of Contractor. (in each factory)	<ul style="list-style-type: none"> Communication is enhanced and opinions are collected through Daily Safety Meeting, Weekly Meeting, and Monthly Safety Promotion meeting. Safety committee comprised of the representative of Contractor and Subcontractor which is established aside from Joint Site Patrol, conducts Monthly Safety Patrol and collect the opinions. Safety Patrol conducted by a foreman group is planned to hold on the 15th of each month. 	Contractor and Subcontractor conduct Safety Patrol aside from Joint Site Patrol, and collect the opinions. Note) Although, there are no attendants from Subcontractor with Joint Site Patrol in Nhat Tan Bridge work-site, Contractor carry out Regular Safety Patrol and Monthly Safety Promotion meeting.	5

No	Requirements	Confirmation Results (P1 JV, IHI)	Confirmation Results (P1 JV, SMCC)	Confirmation Results (P3 Tokyu Construction)	No
6	Are Trainings and Educations to the engineers and workers carried out and documented properly?	The records of Trainings and Educations are kept properly.	<ul style="list-style-type: none"> • Safety induction training is carried out for all new workers, and recorded. • Safety induction for new workers is carried out with instructional materials written in English/Vietnamese. 	<ul style="list-style-type: none"> • Safety induction training is carried out for all new workers, and recorded. 	6
7	Are procedures of work which reflects policy and objective made?	Procedures are not prepared separately, but procedures in respect of Safety and Quality are included in MS.	Safety and Quality Management procedures are included in MS on which is submitted prior to the commencement of the work, and approved by the Consultant.	Procedures are not prepared separately, but procedures in respect of Safety and Quality are included in MS.	7
8	Are the possible Emergency situation identified and corresponding procedures prepared? Are specific trainings for the above carried out and recorded properly?	Emergency Contact Network Chart is prepared.	<ul style="list-style-type: none"> • Emergency Contact Network Chart is prepared. • Evacuation Plan which assumes the flood is prepared. Evacuation Drill has been carried out on July, 2010. • Fire Drill which assumes the fire accident in work site has been carried out. 	<ul style="list-style-type: none"> • Emergency Contact Network Chart is prepared. • Emergency Response Procedures are prepared, and drill will be carried out hereafter. 	8
9	Are Corrective Action procedures for the accidents or Non-conformance prepared? Are preventive action procedures also prepared? Are corrective action taken properly and documented?	Fault Tree Analysis is used for analysis of cause of accident and establishment of countermeasures, by internal procedure of IHI. Corrective actions are confirmed and documented.	<ul style="list-style-type: none"> • Internal Inspections are carried out as a part of material tests for re-bar and concrete, pre-shipment testing of Steel Pipe Sheet Pile etc., prior to the Inspection by the Consultant. • In the report of the case of excessive Pile Driving, corrective/preventive action is prescribed and recorded. 	<ul style="list-style-type: none"> • The causes of Accident, and corrective/preventive action against Accident is documented as Accident Report/Incident Report. 	9
10	Are procedures for keeping records prepared and implemented? Are the records kept properly as per the above procedures?	Records are kept as per internal procedure of IHI.	In principle, documents are kept until the end of the Defect Liability Period. (2 years for this project)	Documents are kept during 3 years after the completion of the work.	10
11	Are the continual improvement of Safety Management System made by applying PDCA cycle and mitigating potential risks?	MS is prepared in manner of reflects lessons learned from MS of Binh Bridge construction project which IHI previously engaged.	Improvement of defects is instructed in daily Safety check and Safety meeting. Status of the improvement has been checked and reflected to Safety of the Works. SMCC aims further expansion of the records.	Tokyu Construction made improvement for mitigating the risks through Daily Safety Walk by managers of Subcontractor and Safety Manager, Daily Safety Meeting, Weekly Safety Meeting, and Monthly Safety Patrol.	11
12	Is the Internal Audit carried out in respective of Safety Management System?	Internal Audit is carried out when Head office patrol organized by safety division of Head office and Employer-Employee joint patrol are carried out.	<ul style="list-style-type: none"> • Internal Audit is conducted in conformity with PMS, in-company system. <p>On-site audit is carried out every month, Internal Audit by head office is conducted in every 6 months.</p>	On-site audit is carried out on an as-needed basis, Internal Audit by head office is conducted annually.	12
13	Is the effectiveness of System included in the above Internal Audit?	Not included in the item of Internal Audit.	Included in the item of Internal Audit.	Included in the item of Internal Audit.	13

ⁱ **Accident Severity Rate:** Cumulative working days lost per 1,000 cumulative working hours. It shows a degree of seriousness of the accidents. (description shortened by author)

$$AccidentSeverityRate = \frac{CumulativeLostDays}{CumulativeWorkingHours} \times 1,000$$

Source: Home page of Japan Advanced Information Center of Safety and Health

<http://www.jaish.gr.jp/user/anzen/tok/h21/kyo31-2-10.html>

Lost Days: Days Away From Works of injured or deceased workers by occupational accidents

Type	Definition	Lost Days
Death	Death by occupational accident including not only immediate death but also death due to injury.	7,500days
Permanently and Totally Disabled	The person who has a disability which corresponds to Disability Grade 1 to 3 specified in Ordinance for Enforcement of the Labor Standards Act (Ordinance).	Days shown in Grade 1 to 3 in Appendix (max 7,500 days)
Permanently and Partially Disabled	The person who has a disability which corresponds to Disability Grade 4 to 14 specified in Ordinance.	Days shown in Grade 4 to 14 in Appendix (between 50 to 5,500 days)
Temporary Disabled	From next day of an injury, the person is not able to work at least one day. However after certain time, he recovers and he does not suffer any Disability listed in Ordinance.	Lost Days=(Days away from works in calendar days)x 300/365

Appendix

Table for Lost Days by Disability Grade

Disability Grade(grade)	1~3	4	5	6	7	8	9	10	11	12	13	14
Lost Days(days)	7,500	5,500	4,000	3,000	2,200	1,500	1,000	600	400	200	100	50

Source: Home Page of the Ministry of Health, Labour and Welfare

<http://www-bm.mhlw.go.jp/toukei/itiran/roudou/saigai/03/2.html>

ⁱⁱ **Accident Frequency Rate:** Numbers of injury or death by accidents per cumulative one million working hours. (description shortened by author)

$$AccidentsFrequencyRate = \frac{\text{Numbers of injury and death by accidents}}{\text{Cumulative Working Hours}} \times 1,000,000$$

Source: Home page of Japan Advanced Information Center of Safety and Health

<http://www.jaish.gr.jp/user/anzen/tok/h21/do31-2-10.html>