

**Mid-Term Review (Safety Management) Report
of
On-going Japanese ODA Loan Projects 2008
(Turkey and Uzbekistan)**

November 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

Katahira & Engineers International

EVD

JR

09-31

Mid-Term Review (Safety Management) Report
of Japanese ODA Loan Projects 2008

Table of Contents

Preface	i
Disclaimer.....	ii

“Seismic Reinforcement for Large Scale Bridges in Istanbul”

1. Outline of the Project	
1-1 Objective	1-1
1-2 Outline of the Project	1-1
1-3 Background and reason for Mid-Term Review	1-2
1-4 Outline of Mid-Term Review	1-2
2. Result of the Mid-Term Review	
2-1 Safety Performance	1-4
2-2 Process.....	1-5
2-3 Current Status of the Executing Agency	1-9
3. Conclusion, Lessons Learned and Recommendations	
3-1 Conclusion.....	1-12
3-2 Lesson Learned	1-13
3-3 Recommendations	1-13
Source and Reference Literature	1-14
Notes.....	1-14

**“Construction of Five Railway Bridges,
Tashguzar - Kumukurgan New Railway Line Construction Project”**

1. Outline of the Project	
1-1 Objective	2-1
1-2 Outline of the Project	2-1
1-3 Background and reason for Mid-Term Review	2-2
1-4 Outline of Mid-Term Review	2-2

2. Result of the Mid-Term Review	
2-1 Safety Performance	2-4
2-2 Process.....	2-5
2-3 Current Status of the Executing Agency and Safety Environment noted.....	2-10
3. Conclusion, Lesson Learned and Recommendation	
3-1 Conclusion.....	2-14
3-2 Lesson Learned	2-15
3-3 Recommendation.....	2-16
Source and Reference Literature	2-16
Notes.....	2-16

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 Loan Agreement is made 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.

November 2009

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.

No part of this report may be copied or reprinted without the consent of JICA.

“Seismic Reinforcement for Large Scale Bridges in Istanbul”

External Evaluator: MITANI Katsuaki

Katahira & Engineers International

Field Survey: JUNE 2009

1. Outline of the Project



Location of the Project



General view of Mecidiyeköy Viaduct

1-1 Objective

The objective of this project is to preserve functions, assets and lives of residents of Istanbul, which is a center of economies of Turkey and connects Asia and Europe, by seismic reinforcement of the first Bosphorus Bridge, the second Bosphorus Bridge, the old and new Golden Horn Bridges and relevant viaducts which connect to these bridges with the retrofitting technologies, which are widely being applied in Japan and other advanced countries.

1-2 Outline of the Project

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

Table 1-1 Outline of the Project

Items	Contents
Loan Number / Loan Amount	L/A No. TK-P16 / 12,022 million yen
Loan Agreement Signing Date	5 July 2002
Executing Agency	Karayolları Genel Müdürlüğü (KGM) General Directorate of Highways, Ministry of Transport (at the time of Loan Agreement signing, Ministry of Public Works and Settlement)
Main Contractor	IHI Corporation (IHI) (at the time of the Contract signing, Ishikawajima Heavy Industry Co., Ltd)
Main Consultant	Japan Bridge & Structure Institute, Inc. (JBSI)

1-3 Background and Reason for Mid-Term Review

A Mid-Term Review is initiated based on the recommendation 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 in 2007. The committee recommended JICA to carry out the review for Safety Management for Special ODA Loan projects or **Special Term for Economic Partnership (STEP) projects** which include large scale and technically complex civil works.

Basically the review is carried out 5 years after Loan Agreement is made and at a suitable time after civil works commenced by an external evaluator. Because a quality management is recognized as an important measure to ensure the Safety of the Works, the review focuses on the quality management as well. The Project is selected as the object for this Mid-Term Review as it satisfies the above criteria.

Note: In this report, the following definition of “Works” in FIDIC Conditions of Contract is used.

“Works mean the Permanent Works and the Temporary Works, or either of them as appropriate.”

1-4 Outline of the Mid-Term Review

1-4-1 Basic Principles

“Safety” has the following two definitions,

- a. Safety of the workers (or a group of workers, safety of work)
- b. Safety of the Works

In the opposite side of Safety, there is Risk. In this report, Risk at the opposite side of Safety of workers is defined as “Labor Risk” and Risk at the opposite side of safety of the Works is defined as “Construction Risk”.

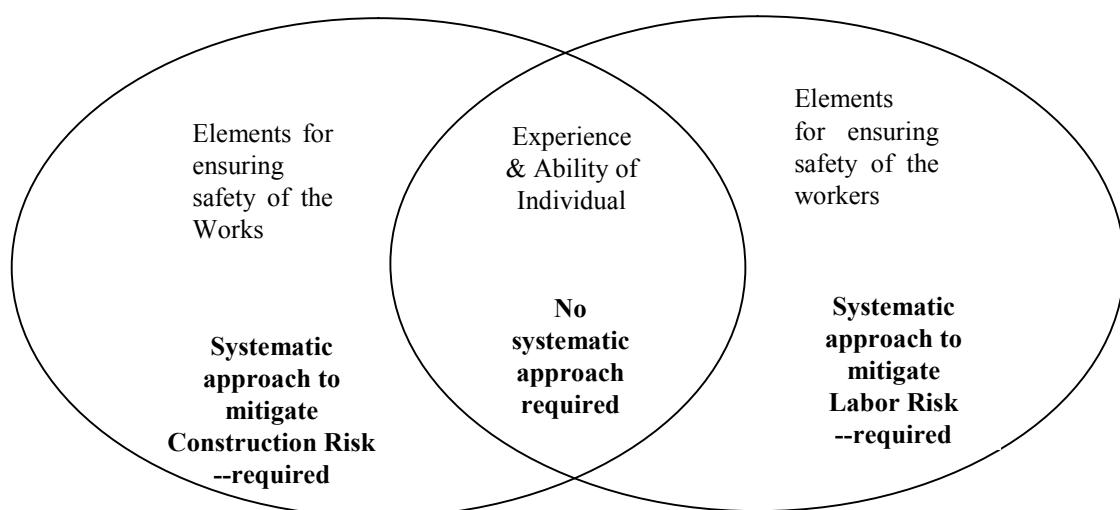


Fig. 1-1 Conceptual Figure for Risk Mitigation

Where the scale of the construction work is small and there are only skilled labors on site,

risk can be hedged depending on the experiences and abilities of the individual workers and no systematic approach is required. Recently as the scale of construction works becomes large and technical complexity increases, it appears substantially more difficult to hedge construction risk and labor risk, if it only depends on the experiences and abilities of the individual workers. A systematic approach, ie introduction of safety Management System etc., is required to deal with the above situation.

1-4-2 Items to be reviewed

Items to be reviewed are as per Table 1-2. A confirmation of the situation will be made from both performance and process point of view. The review has been carried out 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 1-2 Reviewed items

	Construction Risk	Labour Risk
Clause 2.1 Safety Performance	- Damage or Accidents to the Works	- Accident Severity Rate and Accident Frequency Rate (To compare those in Japan)
Clause 2.2 Process	- Principles and method for Safety Management - 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 (specifically for corrective/preventive actions)	- Degree of Achievement for requirements in Safety Management System - Measures for mitigating Labour Risks - Important Safety Environment
Clause 2.3 Executing Agency	By obtaining answers to questionnaires, confirm the current situation and attitude of executing agency to the safety and safety environment in Turkey	

2. Result of the Mid-Term Review

2-1 Safety Performance

2-1-1 Result of mitigation of Construction risk

Neither damage nor accidents to the Works were reported.

2-1-2 Result of mitigation of Labour risk

Accident Severity Rateⁱ and Accident Frequency Rateⁱⁱ are shown in Table 2-1. Because the cumulative working hours are 720 thousand hours which are less than 1,000 thousand hours and actual rate is multiplied by 1.4, Accidents Frequency Rate looks high compared to that in Japan. However it is judged that there is no statistically-significant difference.

Table 2-1 Comparison of Accident Severity Rate and Accident Frequency Rate

	Accident Severity Rate	Accident Frequency Rate	Remarks
The Project	0.006	2.78	Days away from work is for over a day
Civil works in Japan	0.06	2.04	
Bridge works in Japan	0.07	1.93	

The above figures are calculated as follows.

Cumulative working hours: 720,000 man-hours, from commencement of works to the end of May 2009. No Labour statistics were available and estimation was made from the several records.

Number of accidents:2 (Downfall from 1 meter high scaffolding and collision with a heavy machine lifted)

Days lost: 4days (No 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

2-2-1 Principles and method for Safety Management

Principles for Safety Management by JBSI and IHI are as shown in Table 2-2 below.

Table 2-2 Principles for Safety Management

	JBSI (Basic Design& Construction Supervision)	IHI※ (Detailed Design& Construction)
Construction Risk	1.Comprehensive review of Method Statement (MS) 2. Monthly Safety Patrol and follow-up of actions identified	1.Elimination of risks in planning; ◇Extensive check of MS, ◇Utilization of Head Office support ◇Carrying out self-inspection on site
Labour Risk		2.Elimination of risks by Human Error ◇Assistance to workers to understand safety by providing accidents information and to train them to act proactively in safe manner ◇Inclusion of safety reminder in regular meeting ◇Holding a monthly safety meeting with all workers attendance

※Extracted from IHI principles for the Project

2-2-2 Measures to Mitigate Construction Risk

2-2-2-1 Safety Measures for the Works

(1) Employment of an Independent Design Checker

In Basic Design stage, it is required that a Seismic Reinforcement Structural Expert shall carry out review of the basic design of JBSI as per TOR of Clause 5.2 Basic Design Stage (5)Entrustment of the Experts of the Consultancy Contract. The review was made by two Professors of Bosphorus University who are authority in Seismic filed in Turkey.

KGM has employed the same Professors to independently check detailed design by IHI, after a review of the same by JBSI.

(2) Review of traffic diversion by Traffic Chief Engineering Department

Because a traffic diversion is likely to cause a big impact on the traffic flow in Istanbul city, the Traffic Chief Engineering Department of KGM reviewed IHI's proposal in detail including positions of traffic signs, and gave an instruction to correct or modify, if necessary.

2-2-2-2 Method of Risk Management and its effectiveness

At the time of tender preparation, IHI carried out an analysis to identify associated risks and calculate expected loss value=(probability of risk occurrence)x(consequences of risk) to include costs for risk mitigation into tender price.

In Mecidiyeköy site, IHI carried out risk analysis to identify risks and corresponding mitigation measures and explained the result to the staff and workers of his main subcontractor, Mak-Yöl.(MY)

In addition to the above, JBSI and IHI have made a kind of risk management on the basis of MS.

(1) MS Prepared by IHI in Collaboration with MY

Before preparation of MS, discussion between IHI and MY have been made to explore the method to suit the local conditions (work experience & skill, plants available etc.) In order to enjoy a merit of Design and Build contract, the Main Contactor is required to consider a method of construction and adjust his design to some extent.

(2) MS further elaborated by JBSI's review

JBSI carried out comprehensive review not only by an engineer in charge but also by review meeting members. IHI modified or corrected his MS according the comments received, if necessary.

(3) Pre Inspection by IHI and Inspection by JBSI

IHI carried out his own inspection to reduce the loss time which is needed for correction. JBSI carried out Inspection for all items agreed by JBSI and IHI as per the Contract.

2-2-2-3 Manual for Emergency situation of the Works

Although an emergency contact list was prepared and displayed on site, there was neither written manual nor procedures for handling an Emergency (Crisis) of the Works. IHI stated that his detailed design includes enough redundancy.

In respect of Mecidiyeköy Viaduct, four bentsⁱⁱⁱ are designed so that the same horizontal resistance capacity as Mecidiyeköy Viaduct had before seismic reinforcing works was made can be kept even during seismic reinforcing works.

If unexpected large magnitude of earthquake would occur, the Viaduct might collapse irrespective of “before” or “during” seismic reinforcing works.



Installation of Bent at Mecidiyeköy

2-2-2-4 Degree of achievement for requirements in Quality Management System

Both JBSI and IHI have obtained ISO 9001 certification and operate Quality Management System in Japan. However both companies did not apply a Quality Management System in the Project. They applied quality control concept rather than Quality Management^{iv}. Quality has been controlled by an inspection and testing in the traditional way.

IHI's main subcontractor, MY obtained a certification for an integrate system of Quality, ISO9001+Environment, ISO14001+Health and Safety, OHSAS18001.

2-2-3 Measures to mitigate Labour Risk

2-2-3-1 Degree of achievement for requirements in Safety Management System

Confirmation results of items in a checklist based on the requirements of Safety Management System are shown in Table 2-3. Although IHI did not apply Safety Management System in the Project, MY maintains the certificate for the Integrated Management System as mentioned in Sub-Clause 2-2-2-4.

Table 2-3 Confirmation results of the checklist

No	Requirements	Confirmation Results
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's Safety policy, Action plan and Safety Management Policy of the Project Manager (PM) were checked. Safety Management Policy of PM was translated into Turkish and displayed in each site offices.
2	Are the requirements, ie social, regulatory, contractual, internal etc, made clear and properly documented?	The local subcontractor (MY) controlled the site work based on his internal standard complied with safety rules in Turkey. Also, the main contractor applied Japanese safety rules which requires equivalent or rigorous standard than that of Turkey.
3	Are the risk assessments (risk and hazard assessment) on site made and hazards extracted properly? Are measures for mitigation of such hazards reviewed?	In respect of Mecidiyeköy Viaduct which was being under construction, a qualitative risk assessment which covered both construction risks and labour risks and mitigation measures has been compiled. It was translated into Turkish and IHI has been explained to staffs and workers of MY.
4	In order to achieve objectives, does preparation, execution, evaluation and improvement of Safety and Health Plan?	No revision to Safety and Health Plan has been made since it was prepared in 2006. Items to be reminded for respective activities of work have been included in MS.
5	Is communication between the top management and workers of relevant Subcontractor as well as internal staffs made effectively? Are opinions collected from those persons?	PM of IHI has been keeping good communication with his local staffs and PM of MY. There are no direct communication between the top management and workers in MY.
6	Are Trainings and Educations to the engineers and workers carried out and documented properly?	MY kept all training and education record as per a procedure of his OHSAS Management System.
7	Are procedures of work which reflects policy and objective made?	Procedures of works were included in respective MS which was prepared in collaboration with IHI and MY.

No	Requirements	Confirmation Results
8	Are the possible Emergency situation identified and corresponding procedures prepared? Are specific trainings for the above carried out and recorded properly?	Emergency Contact List was prepared. Education and Training for an emergency has not been carried out. (Refer to Recommendation 3-3-3)
9	Are Corrective Action procedures for the accidents or Non-conformance prepared? Are preventive actions procedures also prepared? Are corrective action taken properly and documented?	Causes of accidents were identified, and corrective (preventive) measures were developed.
10	Are procedures for keeping records prepared and implemented? Are the records kept properly as per the above procedures?	Internal procedure of IHI requires keeping records for Safety and Quality for ten years.
11	Is the continual improvement of Safety Management System made by applying PDCA (Plan-Do-Check-Action) cycle and mitigating potential risks?	Although IHI made daily improvement of the site through safety patrol, there was no improvement from a systematic point of view.
12	Is the Internal Audit carried out in respective of Safety Management System?	MY, IHI's main subcontractor, has been carried out an internal Audit twice a year under Integrated Management system (ISO 9001+ISO 14001+OHSAS 18001)
13	Is the effectiveness of System ^v included in the above Internal Audit?	Internal Audit in the System, mainly focus on what was done as per stipulated procedures..
14	How is the CS Consultant involved in the Safety Management?	<ul style="list-style-type: none"> ● Implementation of monthly patrol and checking the actions taken in the follow-up meeting ● Making comments from Safety and Quality aspects on MS ● Making comments on daily inspection etc. in respect of Safety

Note: Some negative points above are not included in “Recommendations”, because the reviewer, judging from his own experience, does not consider that these are items which have significant influence on safety management.

2-2-3-2 Measures for mitigating Labor Risk

In order to mitigate Labour Risk, following measures have been taken by JBSI, IHI and MY.

(1) Monthly Safety Patrol and Follow-up of Actions identified

After the monthly patrol with KGM/JBSI/IHI is completed, a follow-up meeting is held to discuss the actions to be taken. The first agenda of this meeting is confirmation of the actions taken.

(2) Management by sharing roles between IHI and MY

MY is mainly responsible for giving induction to new labour, education & training, HSE risk assessment, accident statistics, combined internal audit, corrective action procedure etc. IHI is responsible for explaining



Explanation of MS by IHI engineer

the contents of approved MS to all workers involved on Site.

(Refer to Recommendation 3-3-2)

2-2-3-3 Safety Environment noted

In Turkey, which wishes to join EU, and make a progress in the field of Safety and Environment. New Laws and Regulations which are compatible with EU directives will be enacted as a policy of Turkish Government. A new Labour Law is expected to be in force in July 2009. Under this new Law, preventive actions based on the health and safety risk assessment will be required and new regulations which is in harmony with EU directives will also be in force. (A new regulation for noise was already in force in advance of the new Law enactment)

Frequency of Industrial Site Inspection carried out by Labour Inspection Group of the Ministry of Labour and Social Security has been increased. MY has experienced the above inspection twice from commencement of works to date. However no instruction for an improvement was received. Full harness type safety belt which is specified in the Turkish safety regulation is shown in the figure in right side. This type of safety belt is common in EU and other foreign countries. A waist belt type widely used in Japan is not common.



2-3 Current status of the Executing Agency

At the time of starting review work, questionnaires regarding Safety and Quality Management were sent to the Executing Agency and answers have been collected during the field survey. Results are shown in Table 2-4.

Table 2-4 Questionnaire and Answer

Items to be confirmed	Questionnaire and Answer
(1) Laws and various Standards related to Safety and Quality Control/Management	<i>The Constitution of the Republic of Turkey, Article 56, Labour Law(No.4857) Article 77 and 78 etc.</i>
	Availability of Safety and Quality Control/Management Manuals at the Executing Agency <ul style="list-style-type: none"> ● Provisions in Relevant Laws and regulations (ie. Structure Inspection Law, No.4708 Article 2f etc.) are applied instead of manual. Therefore no manual made by KGM is required.
(2) Name of Departments in the executing agency in charge of Safety and Quality	<ul style="list-style-type: none"> ● Nos. of Staffs in Executing Agency : 40 persons ● Staffs in charge of the Project : 5 persons including part time staff ● Name of the Safety and Quality Control/Management Department : KGM has no specific Department. Functions are divided into the following three Department <ol style="list-style-type: none"> i) Bridge Chief Engineering Department

Items to be confirmed	Questionnaire and Answer
<p>Control/Management and the job description of the staff</p>	<p>ii)Traffic Chief Engineering Department iii)Research Chief Engineering Department (in charge of Laboratory Testing)</p> <hr/> <p>Details of the authorities/activities of the Department in charge of Safety and Quality Control/Management</p> <p>1) Site patrols performed within the last one year . . . 4 times 2) Availability of accident statistics related to all projects under jurisdiction of the executing agency . . . Preparation of such documents is under scope of the Police Department. General accident statistics are compiled by the Ministry of Labour and Social Security. 3) Guidance and instructions for consultants and contractors . . . In respect of traffic diversion, such guidance and instruction are done and followed by the Traffic management Department. 4) Documents on the authorities/activities of the department in charge of safety and quality control . . . Not applicable 5) Others . . . Not applicable</p>
<p>(3) Assignment Schedule for staffs in charge of Safety Management related to the Japanese ODA loan project</p>	<p><i>None for this Project but some staffs assigned by the general frame of above mentioned three Departments (Bridge Chief Engineering Department, Traffic Chief Engineering Department, and Research Chief Engineering Department), although it is regulated by the law and contracts that Safety Management is the responsibilities of the contractor.</i></p> <p>1) No. of the total staffs in the Executing Agency: . . . Nil Is there any specific assignment schedule, with a specific job description for each person? . . . There is no assignment schedule.</p> <hr/> <p>2) Status of implementation of training for staff in charge of Safety and Quality Control/Management . . . Not applicable</p> <hr/> <p>Information concerning past accidents in construction, etc.</p> <p>1) Has the information concerning past accidents been accumulated? . . . Information is handled by project basis. IHI prepared and submitted accident report. 2) Items to be recorded in accident information . . . Items included in the form are as follows.</p> <ul style="list-style-type: none"> ● Report date, Incident place and date ● Name of machinery or equipment ● Details of Injured (Name, Address, Date of Birth, Social Insurance Registration Number, Experience, Job description and Duty) ● Description of Accident and sketch and/or Photos ● Witness (Name, Signature and Address) ● Suggested Measures (Correction and/or Corrective Action) ● Details of Investigators (Name and Signature) ● Signature of Project Manager and HSE Engineer of IHI
<p>(4) Competence and experience of staff in charge of Safety and Quality Control/Management</p>	<p><i>Such information is explained at the above items for the Project. For other project, system is similar according to the nature and other requirements of the Works.</i></p>

Items to be confirmed	Questionnaire and Answer
<p>(5) System of confirming Safety and Quality Control/Management in the executing agency</p>	<ul style="list-style-type: none"> ● Method of confirming Safety and Quality Control/Management in the Executing Agency . . . <i>Safety Patrol is being carried out on monthly basis. Safety and Quality issues are discussed in Monthly Progress Meeting with the Engineer (the Consultant) and the Contractor.</i> ● Involvement of the Executing Agency in the procedure of review or Approval . . . <i>Implementation of the Project and all of Method of Statement documents are approved by KGM.</i>
<p>(6) Emergency plan responding to accidents</p>	<p>Specific method of sharing information within the Executing Agency when an accidents occurs . . . <i>In case of an accident the procedure to be followed is given in Laws and regulations, such as Labour Law no. 4857, Article 81 Physician at the establishment. So it is followed accordingly.</i></p> <p>1) The manual for responding to an accident . . . <i>No manual required.</i></p> <p>2) Is the Department to act as the main contact and manage procedures in the case of an accident specified in the manual? . . . <i>Not applicable</i></p> <hr/> <p>Method of keeping staffs in the executing agency informed about the Emergency plan for responding to an accident . . . <i>Such reports are prepared by Police and related Agency.</i></p>
<p>(7) Method adopted by the executing agency to confirm training programs in Safety and Quality Control /Management provided by Contractor for workers</p>	<p>Method of confirmation adopted by the Executing Agency . . . <i>Such issues are discussed in the Monthly Progress Meeting when required.</i></p>
<p>(8) Public Authorities with jurisdiction over safety issues</p>	<p>1) Names of the Public Authorities : <i>The Ministry of Labour and Social Security</i></p> <p>2) Demarcation between those Public Authorities and the Executing Agency regarding safety . . . <i>In normal situation, the safety of the Project is responsibility of Executing Agency. Once fatal or severe accidents happen, the Ministry carries out through investigation together with police.</i></p> <p>3) Availability of an official qualification or licensing system governing skilled labor (heavy-construction-equipment operator, etc.)—<i>Yes</i></p> <p>4) Whether a power to carry out on-site inspections of construction sites and a power to issue instruction, are delegated to such Authority by relevant law, or not. . . . <i>The inspection of compliance with the legislation is the duty of the Labour Inspection Board of the Ministry under its inherent authority. Labour Inspection Group, which is now formed in all cities under the Board located in Ankara, carries out the inspection service.</i></p>

3. Conclusion, Lessons Learned and Recommendations

3-1 Conclusion

3-1-1 Safety Performance

At the time of Mid-Term Review when the construction progress rate has reached to 82%, neither damage nor accident were reported. In respect of Accident Severity Rate and Accident Frequency Rate there were no significant difference when compared to those obtained for the works carried out in Japan.

3-1-2 Process

3-1-2-1 Measures to Mitigate Construction Risk

(1) Design

An independent check has been carried out for Basic Design by JBSI and Detailed Design by IHI, after a review by JBSI. With respect to traffic diversion, KGM has thoroughly reviewed the Contractor's proposal and made advices or instructions, if necessary.

(2) Risk Management

Following measures have been attempted for risk mitigation and avoidance.

- ◇ Preparation of MS after due consultation of MY concerning availability of skilled workforce, constructional plant, material etc.
- ◇ A review by JBSI with comments from Safety and/or Quality aspects.
- ◇ Pre-Inspection by IHI and Inspection by JBSI

(3) Emergency (Crisis) Control Manual

There was neither written manual nor procedures for handling an emergency (crisis) of the Works. Because Mecidiyeköy Viaduct is located at the center of Istanbul city, it is not tolerable for the Works, such as viaduct, to fall into an emergency situation, such as collapse etc. Fundamental concept is to allow redundancy in design and to employ well-proven construction method in order to hedge such risk.

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

Both JBSI and IHI obtained ISO 9001 certification and operate Quality Management System in Japan. However both companies did not apply a Quality Management System in the Project. Quality has been controlled by an inspection and testing in the traditional way.

3-1-2-2 Measures to mitigate Labour Risk

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

By confirmation results of items in a checklist based on the requirements of Safety Management System, it is important to verify the effectiveness of corrective actions taken and to patently include the effectiveness of System into checklist of Internal Audit.

(2) Measures for mitigating Risk

Monthly Safety Patrol with KGM/JBSI/IHI and follow-up meeting for actions taken and to be taken has been continuing and IHI/MK has shared responsibilities for carrying out the activities in Safety Management.

3-1-2-3 Safety Environment noted

In Turkey who wishes to join EU and renew Laws and regulations in compatible with EU directives, Safety Environment including Industrial Inspection by the Labour Inspection Group of the Ministry of Labour and Social Security is being improved.

3-2 Lesson Learned

This is an example in which the contractor tries to manage Safety and Quality through the certified Integrated Management System (Quality+ Environment+ Health and Safety) of his main subcontractor. In the near future, contractors who have a certificate of ISO and OHSAS Management System will increase in recipient countries. A technique and skill to manage Safety and Quality through the certified Management System will be required for Japanese contractors engaged in Japanese ODA Loans projects.

3-3 Recommendations

3-3-1 Continued Presence of KGM to Monthly Safety Patrol

Because Monthly Safety Patrol is one of the main activities of Safety Management, it is recommended for KGM to attend the Patrol continuously in order to express his concern for Safety.

3-3-2 Management through MY's Integrated Management System

In order to enhance IHI's management through MY's Integrated Management System, it is recommended for IHI to carry out following two actions.

- ① Attend as an observer at an Internal Audit carried out by MY
- ② Carry out the Second Party Audit as the customer on the Integrated Management System of MY

3-3-3 Execution of Safety Drill for emergency

It is said that an ambulance arrive at the site within one minute upon phone call. However there is possibility that the ambulance does not come due to some unexpected reason. With this assumption, it is recommended for IHI with attendance of JBSI to carry out safety drill for providing first aid by a qualified instructor of first aid, and give the fundamental first aid training.

-END-

Source and Reference Literature

Figure: Full harness type Safety Belt
C42, YAPITAŞLARI Güvenli Çalış-Sağlıklı Kal,
İş Sağlığı ve Güvenliği Genel Müdürlüğü , October 2006

Photos

Provided by JBSI

General View of Mecidiyeköy Viaduct and Installation of Bent at Mecidiyeköy

Provided by IHI

Explanation of MS by IHI engineer

Reference Literature:

Study for ensuring Safety in the Projects carried out in developing countries, June 2008

Japan Bank for International Cooperation (JBIC)

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/2004/tok_0301.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/2004/tok_0301.html

iii **Bent:** Steel column made of rectangular shaped frame. It is used for temporary support column and false work for bridge construction. In the Project, bents are used to support the loads acting on a pier during seismic reinforcement works of such pier.

iv **Quality Control and Quality Management:** A concept of Quality Control is considered as a superordinate concept of Quality Policy and Quality Management in ISO 9001:1994 "Quality

systems-Models for quality assurance in design, development, production, installation and servicing”. However in ISO 9001:2000 “Quality Management Systems-Requirements”, Quality Control is regarded as one of the components of Quality Management System. ISO 9001:2000 develops Quality Assurance and requires an establishment of an organization respecting customer’s satisfaction by introducing continual improvement of the System

Source: SHIRAKATA Toshiro: Latest version, Easy to understand ISO 9001、 Chuukei Publishing, pp.34, November 2000

^v **Effectiveness of System:** In JIS Q 9000, a Japanese version of ISO9000:2000 Quality Management System-Fundamentals and Vocabularies, defines Effectiveness and Conformity as follows.

Effectiveness: extent to which planned activities are realized and planned results achieved

Conformity: fulfillment of a requirement

Previously, it is emphasized whether requirements of Standards are fulfilled and organization’s procedures are followed. Recently emphasizing points has been changed to whether process has been done as planned and the results are obtained as planned. It is reported that at initial stage of obtaining ISO certification there is tendency to emphasizing keeping Conformity rather than perusing Effectiveness of System.

Source : JIS Q 9000 Quality Management System-Fundamentals and Vocabularies

Annex: Language used in Safety and Quality Documents

Name of Documents	Language
Health and Safety Plan	Original in Turkish Translated into English and submitted to the Consultant
Method Statement (MS)	Original in English Translated in Turkish
Extract of MS for briefing to MY's staffs and workers	Original in English Translated in Turkish
Work standard & work procedure	Prepared by MY Original in Turkish, no English translation
Quality Manual and other documents related to System	Prepared by MY Original in Turkish, no English translation
Othr documents related to Safety and Quality	*Meeting minutes for Safety Patrol(English for JBSI), only in English *Quality Control Record Records related to concrete(compressive strength, slump, air contents), Turkish Penetrant Test Report for welding, in Turkish Painting thickness measurement of steel member, in English Torque of High Tention Bolt, in English As-built drawings etc. , in English to be prepared in future

Note) MY: Mak-Yöl, the main subcontractor of IHI for the Project

“Construction of Five Railway Bridges, Tashguzar - Kumukurgan New Railway Line Construction Project”

External Evaluator: MITANI Katsuaki

Katahira & Engineers International

Field Survey: JULY 2009

1. Outline of the Project



Location of the Project



Erection of Steel Deck for Bridge No.5

1-1 Objective

The objective of this project is to reduce transportation cost, transportation distance and time, enhancement of transportation capacity, and increase in transportation reliability by construction of a new railway and rehabilitation of the existing railways to shift from the southern side of Uzbekistan, which is in Turkmenistan territory, to mountainous region of Uzbekistan, thereby contributing to social and economical development of South region of Uzbekistan.

1-2 Outline of the Project

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

Table 1-1 Outline of the Project

Items	Contents
Loan Number / Approved Amount	L/A No. UZB-P8 Special Term for Economic Partnership (STEP) projects) / 16,359 million yen
Loan Agreement signing date	15 October 2004
Executing Agency	Uzbekiston Temir Yollari (UTY) State Joint Stock Railway Company, Republic of Uzbekistan

Items	Contents
Main Contractor	Shimizu-Nippon Steel Engineering-Yokogawa Joint Venture (SNY)
Main Consultant	Japan Transportation Consultants, Inc., (JTC)

1-3 Background and Reason for Mid-term Review

A Mid-Term Review is initiated based on the recommendation 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 in 2007. The committee recommended JICA to carry out the review for Safety Management for Special ODA Loan projects or **Special Term for Economic Partnership (STEP) projects** which include large scale and technically complex civil works.

Basically the review is carried out 5 years after Loan Agreement is made and at a suitable time after civil works commenced by an external evaluator. Because a quality management is recognized as an important measure to ensure the Safety of the Works, the review focuses on the quality management as well. The Project is selected as the object for this Mid-Term Review as it satisfies the above criteria.

Note: In this report, the following definition of “Works” in FIDIC Conditions of Contract is used.

“Works mean the Permanent Works and the Temporary Works, or either of them as appropriate.”

1-4 Outline of the Mi-Term Review

1-4-1 Basic Principles

“Safety” has the following two definitions,

1. Safety of the workers (or a group of workers, safety of work)
2. Safety of the Works

In the opposite side of Safety, there is risk. In this Report, Risk at the opposite side of safety of workers is defined as “Labor Risk” and risk at the opposite side of Safety of the Works is defined as “Construction Risk”.

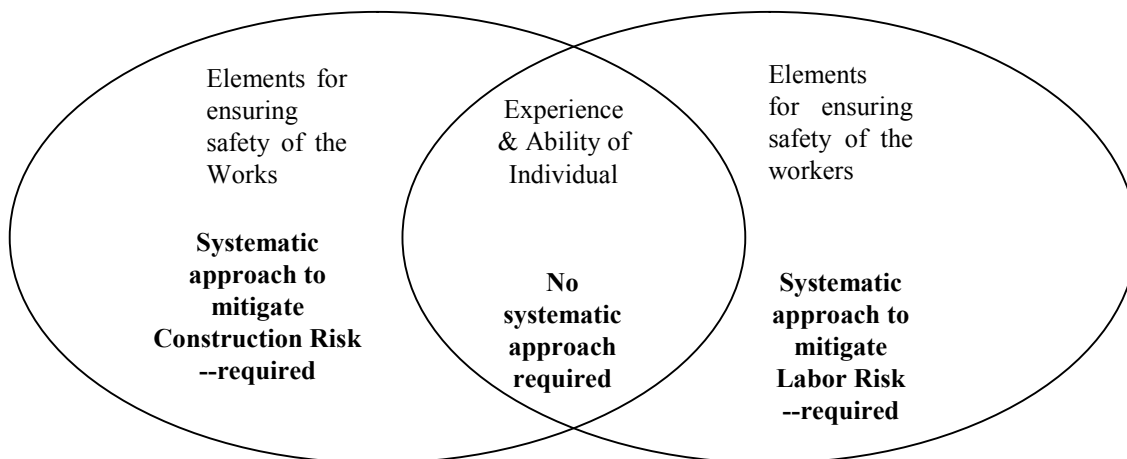


Fig. 1-1 Conceptual Figure for Risk Mitigation

Where the scale of the construction work is small and there are only skilled labors on site, risk can be hedged depending on the experiences and abilities of the individual workers and no systematic approach is required. Recently as the scale of construction works becomes large and technical complexity increases, it appears substantially more difficult to hedge construction risk and labor risk, if it only depends on the experiences and abilities of the individual workers. A systematic approach, ie introduction of safety Management System etc., is required to deal with the above situation.

1-4-2 Items to be reviewed

Items to be reviewed are as per Table 1-2. A confirmation of the situation will be made from both performance and process point of view. The review will be carried out 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 1-2 Reviewed Items

	Construction Risk	Labour Risk
Clause 2.1 Safety Performance	<ul style="list-style-type: none"> ⚡ Damage or Accidents to the Works 	<ul style="list-style-type: none"> ⚡ Accident Severity Rate and Accident Frequency Rate ⚡ To compare those in Japan
Clause 2.2 Process	<ul style="list-style-type: none"> ⚡ Principles and method for Safety Management ⚡ 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 (specifically for corrective/preventive actions) 	<ul style="list-style-type: none"> ⚡ Degree of achievement for requirements in Safety Management System ⚡ Measures for mitigating Labour Risks ⚡ Important Safety Environment
Clause 2.3 Executing Agency	<ul style="list-style-type: none"> ⚡ By obtaining answers to questionnaires, confirm the current situation and attitude of executing agency to the safety and safety environment in Uzbekistan 	

2. Result of the Mid-Term Review

2-1 Safety Performance

2-1-1 Result of mitigation of Construction risk

Neither damage nor accidents to the Works were reported.

2-1-2 Result of mitigation of Labour risk

Accident Severity Rateⁱ and Accident Frequency Rateⁱⁱ are shown in Table 2-1. Accident Frequency Rate is lower than that of in Japan which shows a good daily safety control. Accident Severity Rate severely affected by one fatal accident, which gives 7,500 days lost.



Truss Pier (Bridge No.4)

Table 2-1 Comparison of Accident Severity Rate and Accident Frequency Rate

	Accident Severity Rate	Accident Frequency Rate	Remarks
The Project	6.35	0.85	Days away from work is for over 4 days
Civil works in Japan	0.06	1.41	
Bridge works in Japan	0.07	1.29	

The above figures are calculated as follows.

Cumulative working hours: 1,181,302 man-hours, from commencement of works to the end of June 2009. For Shimizu Construction, the figure is based on records. For Nippon Steel Engineering and Yokogawa, estimation was made from the several records.

Number of accidents: 1 (downfall)

Days lost: 7,500 days

※Figures for Japan was 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

2-2-1 Principles and method for Safety Management

Principles for Safety Management by JTC and SNY are as shown in Table 2-2 below.

Table 2-2 Principles for Safety Management

	JTC (Design& Construction Supervision)	SNY (Construction)
Construction Risk	1. Comprehensive Review and Approval of Method Statement (MS), Shop drawings etc. 2. 100% Inspection for BQ Pay Items	1. Double check for preparation of MS etc. by Construction Manager and Project Manager 2. Pre-Inspection (self inspection) before JTC's Inspection
Labour Risk	3. Site Visit before Monthly Project Meeting and Daily joint inspection with SNY Follow up by issuing Engineer's Instruction	3. Prevention of Falling Accidents *Apply Japanese work standard Japanese Supervisors (Japanese SV) & Safety Facilities including personal protective equipment, ie safety belt etc. *Construct as Planned Briefing session between SNY (Engineers/ Supervisors) & Subcontractor with a translator *Briefing session between Subcontractor & workers *Daily tool box meeting between SV and workers with a translator

※Local Law and regulation requires rest of 14 day, after continuous working of 14 days. After such rest. It is not usual for the same workers to come back to the site. It is considerably big issues for Safety and Quality Management.

2-2-2 Measures to Mitigate Construction Risk

2-2-2-1 Safety Measures for the Works

(1) Employment of Independent Design Checkers

According to the regulations in Uzbekistan, an approval of the State Construction Committee (Gosstroy) is required for design of structure. In order to obtain the approval of the State Construction Committee, JCT applies for the independent design checks of his design by the following design institutes.

- * Superstructures . . . Heavy Industry Design Institute (HDMI, Uzogirsanoatloyiha)
- * Substructures . . . Chief Transportation Design Institute (Boshtransloyiha)

(2) Employment of Independent Quality (Site) Checker

UTY requires HDMI to check qualities of site works in addition to construction supervision by JTC. (UTY made direct contract with HDMI)

(3) Final tests for dead and live loads based on the standard of the Republic of Uzbekistan

In accordance with Item 8.0 Independent Laboratory, Chapter 011104 of Technical Specification, SNY shall carry out final tests for dead and live loads based on standards of Republic of Uzbekistan. As of the end of June, final tests have been carried out by HDMI in respect of Bridge No. 1, 2, 3 & 5 which have completed and they have passed the above tests. At the time of review, UTY has commenced using 4 of bridges as partial use under the construction contract.

(4) SNY's Check of Permanent Works Design

Pursuant to Sub-Clause 8.1 Contractor's General Obligation, SNY carried out check of JTC's design of the Permanent Works and submitted a document to JTC.

2-2-2-2 Method of Risk Management and its effectiveness

In respect of Construction Risk, mitigation measures stated above was taken, and in respect of Labour risk, SNY mitigated it by introducing work standard in Japan (employment of Japanese SV+temporary works according to standards in Japan such as bitty scaffolding, safety belts etc.)

Moreover,, JCT and SNY have made a kind of risk management by respecting MS.

(1) MS scrutinized by JTC's review and approval with comments, SNY

JTC carries out comprehensive review with a double check system and make comments in respect of Safety and/or Quality, where necessary. SNY carries out briefing of methods with safety points to concern to their staffs and Subcontractor with a help of a translator. Subcontractor also carries out the same in his language to workers. Japanese SV further reminds workers of safety points briefed in a daily tool box meeting.



Daily Safety Meeting on site

(2) Pre-Inspection by SNY and Inspection by JTC

JTC carried out 100% Inspection for all pay items under the Contract. Before JTC's Inspection, pre-inspection by SNY had been carried out.

(Note : examples of Inspection Item . . . bottom surface condition before foundation concrete is placed, condition of Re-bar assembly , formwork installation, concrete cover of re-bar, thickness or width of concrete etc.)

2-2-2-3 Manual for Emergency Situation of the Works

Although an emergency contact list was prepared and displayed on site, there was neither written manual nor procedures for handling an Emergency (Crisis) of the Works. As a structure, ie Truss bridge with upper deck slab is well proven as a railway bridge, and design and construction quality checks for each stage have been carried out as stated in clause 2-2-2-1, it is

a low possibility that the works becomes such an emergency or critical situation

2-2-2-4 Degree of achievement for requirements in Quality Management System

Both JTC and each member of SNY have obtained ISO 9001 certification and operate Quality Management System in Japan. However none of these companies applied a Quality Management System in the Project. They applied quality control concept rather than Quality Managementⁱⁱⁱ. Quality was controlled by pre-construction or post-construction inspections and testing of quality.

It is noted that a manual and procedures of SNY were not updated from its original version, although construction progressed and situation changed. (Refer to Recommendation 3-3-1)

2-2-3 Measures to mitigate Labour Risk

2-2-3-1 Degree of achievement for requirements in Safety Management System

Confirmation results of items in a checklist based on the requirements of Safety Management System are shown in Table 2-3.

Table 2-3 Confirmation results of the checklist

No	Requirements	Confirmation Results
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?	SNY partners take all responsibilities including Safety for the following works. <ul style="list-style-type: none"> ● Substructure (Foundations and Piers) · · · Shimizu ● Steel Bridge Fabrication, Transportation and on-site repairing · · · Nippon Steel Engineering ● Super-structure (Erection of Bridge) · · · Yokogawa Each member provided safety policy etc. Sub-structure: Prevention of Fall down accident during working at height Super-structure: Achievement of Zero-Fall down accidents, Prevention of accidents by a human error, Promotion of ensuring health (Refer to Lesson Learned 3-2)
2	Are the requirements, ie social, regulatory, contractual, internal etc, made clear and properly documented?	Safety control on site was made by applying safety standard in Japan. Where a knowledge regarding safety laws and regulations of Uzbekistan, SNY Safety Officer was consulted.
3	Are the risk assessments (risk and hazard assessment) on site made and hazards extracted properly? Are measures for mitigation of such hazards reviewed?	A kind of risk management was carried out during toolbox meeting as KYK, an activity for predicting labour risks. A Japanese SV was accompanied by a translator in order to keep good communication with local workers. No records were kept in respect of KYK. Work standards of Nippon Steel Engineering include hazard identifications, mitigation and removal of such hazards; associated accidents etc. and they were appropriately compiled.
4	In order to achieve objectives, does preparation, execution, evaluation and improvement of Safety and Health Plan?	Although Safety and Health Plan was compiled at the commencement of works, no update has been made to date. (Refer to Recommendation 3-3-1)
5	Is communication between the top management and workers of relevant Subcontractor as well as internal staffs made effectively? Are	Subcontractor (Mostostroy) is in charge of employment and health control of workers. When the conditions of workers' lodging, SNY issued an instruction for improvement. Project Manager

No	Requirements	Confirmation Results
	opinions collected from those persons?	(PM) of SNY communicated with a project manager of the subcontractor, but not with local works directly. PM kept good communications with local staffs of SNY.
6	Are Trainings and Educations to the engineers and workers carried out and documented properly?	Education and Training of local works were carried out by subcontractor with an attendance of SNY Safety Officer. Records were kept properly. In case of Yokokawa, which was in charge of Superstructure erection works, the works was carried out with labour supply subcontract, because there was no subcontractor who had an experience of steel bridge erection. In this regard, training of workers was also done by Yokogawa and records were kept properly.
7	Are procedures of work which reflects policy and objective made?	Procedures and work standards were prepared. The method for briefing them to local workers was as follows. Substructure: After work standards were made, they were translated into Russian by SNY. A briefing meeting was held with SNY local staff and staffs of subcontractor. Superstructure: Before commencement of works, Japanese staff and Japanese SV made a meeting for the works to be carried out and another meeting with local workers on site was carried with helping of a translator.
8	Are the possible Emergency situation identified and corresponding procedures prepared? Are specific trainings for the above carried out and recorded properly?	Safety Management System of Shimizu has a check list for initial reaction after an occurrence of Major Accident and Procedures for dealing with Major Accident. However they were not introduced to the Project.
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?	Investigation of cause of accident, presumption of possible cause and establishing corrective action etc. were carried out. There were no records of verification of effectiveness of corrective action, in respect of two accidents days away from works of which is less than 3 days.
10	Are procedures for keeping records prepared and implemented? Are the records kept properly as per the above procedures?	Under laws and regulations of Uzbekistan, records of fatal accidents shall be kept for 45 years in the city hall of Karshi. Also pursuant to the Regulation of accident at the enterprise, approved by the Resolution of Republic of Uzbekistan cabinet of Ministers dated 06 June 1997, Protocol H-1 with materials of investigation is kept during 45 years at the enterprise. For others, there is no rule for storage period.
11	Are the continual improvement of Safety Management System made by applying PDCA cycle and mitigating potential risks?	SNY Safety Officer, with full back-up of SNY PM, improved safety situation by carrying out daily safety inspection etc.
12	Is the Internal Audit carried out in respective of Safety Management System?	Because SNY did not operate Management System, no Internal Audit was carried out. Shimizu Head office carried out a patrol once per three months.
13	Is the effectiveness of System ^{iv} included in the above Internal Audit?	This item was not applicable, because no Management System was operated.

No	Requirements	Confirmation Results
14	How does the CS Consultant involve in the Safety Management?	<ul style="list-style-type: none"> ● Joint Inspection with UTY/JCT/SNY before Monthly Progress Meeting and discussion regarding Safety and Quality issues in the same meeting. ● At the review and approval of MS, shop drawing and calculation report for temporary works etc. JCT made comments in respect of Safety and Quality to draw SNY's attention. ● Daily joint inspection with JCT/SNY and issuance of Engineer's Instruction for important issues and its follow-up

2-2-3-2 Measures for mitigating Labour Risk

In order to mitigate Labour Risk, following measures have been taken by JCT and SNY.

(1) Joint Inspection with UTY/JCT/SNY and discussion in Monthly Progress Meeting

Before Monthly Progress Meeting, a joint inspection with UTY/JCT/SNY is held and its findings is also discussed together with issues raised by SNY in the Monthly Progress Meeting.

(2) Daily joint inspection with JTC/SNY

Issues identified in daily joint inspection with JTC/SNY are basically to be corrected immediately. However, in case that immediate correction is difficult with due reason or issue is very important for safety and/or quality, JCT issued an Engineer's Instruction and followed up until an appropriate action was completed.

(Example for issue identified in a joint inspection and issuance of an Engineer's Instruction: Because there was not enough Nos. of scaffolding boards and a passageway width was also not enough, an Engineer's Instruction was issued to suspend construction works until SNY rectified the situation to keep enough passageway width for preventing falling accidents.

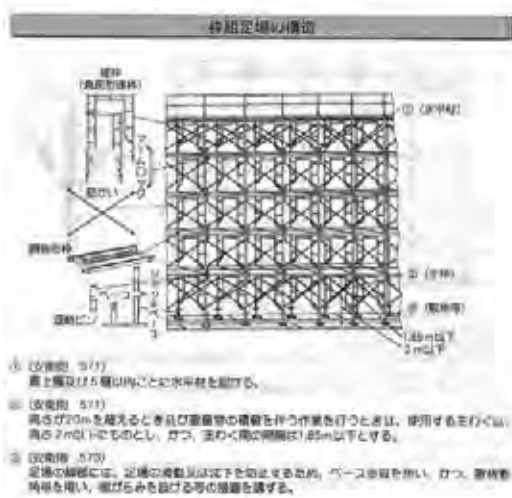
(3) Daily Safety Inspection by SNY Safety Officer

(Action of the Accident Prevention Officer as per Sub-Clause 34.6 of Conditions of Contract for the Construction Contract)

SNY Safety Officer (local staff), with a full back up and authority given by SNY Project Manager, has carried out daily safety inspection and instructed subcontractor to rectify method of working, conditions of safety facilities etc.

(4) Introduction of work standard (environment) in Japan ・ ・ ・ **Japanese SV and Safety facilities**

In order to mitigate labour risk, SNY introduced work standard (environment) in Japan.



Scaffolding structure in Japan



Formwork and scaffolding for bridge No.3

In order to construct the erection works of steel bridges which was very seldom in Uzbekistan, SNY employed 9 Japanese SV and work standard which is similar to that in Japan. (An average Nos. of local workes are 120.) Because it was quite difficulet to procure appropriate scaffolding in Uzbekistan, SNY imported bitty type scaffolding and stair case unit as per Japanese standard to mitigate labour risks during working at height for a high piers. In respect of safety measures for erction of steel bridge works, SNY introduced safety belt and main rope (self-belay), safety net for preventing falling down etc. and SNY tried to familialized subcontractor and its workers with using them.

2-3 Current status of the Executing Agency and Safety Environment noted

At the time of starting review work, questionnaires regarding Safety and Quality Management were sent to the Executing Agency and answers were collected during the field survey. Results are shown in Table 2-4.

Table 2-4 Questionnaire and Answer

Items to be confirmed	Questionnaire and Answer
<p>(1) Laws and various Standards related to Safety and Quality Control/Management</p>	<p><i>On Safety:</i></p> <ol style="list-style-type: none"> <i>1. The Law of the Republic of Uzbekistan «On Labor Safety» dated of May 6, 1993, No. 839 - XII</i> <i>Article 1: the life and health of the workers are the higher priority than the results of their labor activities</i> <i>2. Labor Code of the Republic of Uzbekistan with amendments and additions dated till March 1, 2008</i> <i>3. Regulation on investigation and recording of accidents and other health damages, approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 06.06.97. No. 286</i> <i>4. Standard manual on organization of labor safety training and knowledge checks. Registered at the Ministry of Justice under No. 272 of 14.08.96</i> <p><i>Others ----Please refer to the Attachment 1</i></p>

Items to be confirmed	Questionnaire and Answer
	<p><u>On Quality:</u></p> <ol style="list-style-type: none"> 1. Construction regulation # KMK 2/05/03-97 “Bridges and pipes. Manufacturing regulations and work acceptance” 2. Construction regulation # KMK 3.03.02-98 “Metal structures. Manufacturing regulations and work acceptance” 3. Construction regulation # SHNK 3.01.01-03 “Organization of construction manufacturing” 4. Construction instruction # GIN 07-036-03 “Maintenance of man-made structure” <p>Availability of Safety and Quality Control/Management Manuals at the Executing Agency <i>The Labor Safety Department of UTY has developed and issued the following regulations:</i></p> <ol style="list-style-type: none"> 1. Regulation on organization of labor safety activities at UTY, No. HBT-307/07 <p><i>Chapter I. General Provisions</i> <i>Chapter II. Issues of ensuring labor safety of staff</i> <i>Chapter III. Organization of labor safety activities in UTY</i> <i>Chapter IV. Organization of labor safety activities at enterprises of UTY</i> <i>Chapter V. Control and analysis of labor safety conditions</i> <i>Chapter VI. Method of organization and implementation of three-stage control of labor safety conditions</i> <i>Chapter VII. List of documents to be developed at the enterprise</i> <i>Others</i></p>
<p>(2) Name of Departments in the executing agency in charge of Safety and Quality Control/Management and the job description of the staff</p>	<p>Nos. of Staffs in Executing Agency : <i>Approx. 70,000 persons</i></p> <ul style="list-style-type: none"> ● Name of the Safety and Quality Control/Management Department : <i>The Labour Safety Department of UTY</i> ● Nos. of Staffs in the above Department : <i>approx. 140 persons of safety officers in subdivision of UTY (3 in UTY Head Office)</i> <p>Details of the authorities/activities of the Department in charge of Safety and Quality Control/Management <i>Regulation on the Labor Safety Department at UTY specifies details of the authorities/activities.</i></p> <ol style="list-style-type: none"> <i>I. General Provisions</i> <i>II. Main Duties and Responsibilities</i> <i>III. Rights and Responsibilities of the Management</i> <i>IV. Rights of the staff members of the Labor Safety Department</i>
<p>(3) Assignment Schedule for staffs in charge of Safety Management related to the Japanese ODA loan project</p>	<p>Staffs in charge of the Project as PIU-JBIC : <i>4 persons</i></p> <ul style="list-style-type: none"> ● <i>No staff is involved in Safety of the Project.</i> <p><i>The Labour Department of UTY involves safety of activities of UTY and UTY's enterprise. However the Department does not involve safety of the Project.</i></p> <p>Status of implementation of training for staff in charge of Safety and Quality Control/Management • • • <i>Regulation on the Labor Safety Department at UTY also covers training and education issues.</i></p> <p>Information concerning past accidents in construction, etc.</p> <ol style="list-style-type: none"> 1) Has the information concerning past accidents been accumulated? • • • <i>Accident statistics is carried out at only those enterprises that are under management of UTY. Accidents are to be reported as per Regulation on investigation and recording of accidents and other health damages approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of</i>

Items to be confirmed	Questionnaire and Answer
	<p>06.06.97. No. 286.</p> <p>Items to be recorded in accident information • • • <i>The record of accidents is made in accordance with Protocol H-1. Accident information is recorded in a special form N-1, which includes</i></p> <ul style="list-style-type: none"> ● <i>Report date, accident place and date</i> ● <i>Details of a company, on which the accident occurred</i> ● <i>Details of Injured (Name, address, date of birth, profession, experience, past training records on safety, past records on medical condition)</i> ● <i>Background and cause of accident</i> ● <i>Name of equipment that caused the accident</i> ● <i>Medical record on whether injured was under alcoholic or drug intoxication</i> ● <i>Description of accident</i> ● <i>Diagnosis</i> ● <i>Corrective Actions (Implementation date, responsible person, etc)</i> ● <i>Responsible persons who violated the safety regulations</i> ● <i>Witness</i> ● <i>Professional comments which identifies the responsible persons who violated the safety regulations</i> ● <i>Final report by Chief state technical labor inspector</i>
(4) Competence and experience of staff in charge of Safety and Quality Control/Management	N/A.
(5) System of confirming Safety and Quality Control/Management in the executing agency	<ul style="list-style-type: none"> ● Method of confirming Safety and Quality Control/Management in the Executing Agency • • • <i>In the Project, Safety and Quality management issues are discussed in regular Monthly Progress Meeting.</i> ● Involvement of the Executing Agency in the procedure of review or Approval • • • <i>The Consultant is delegated a power to approve the design of Temporary Works, Shop Drawing and Method Statement submitted by the Contractor under the Contract.</i>
(6) Emergency plan responding to accidents	<p>Specific method of sharing information within the Executing Agency when an accidents occurs • • • <i>Regulation on investigation and recording of accidents and other health damages approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 06.06.97. No. 286 specifies the procedures in detail.</i></p> <p>I. General Clauses, II. Investigation and recording procedure of an accident, III. Special investigation of an accident, IV. Accident reporting and analysis of its cause</p> <ol style="list-style-type: none"> 1) The manual for responding to an accident • • • <i>Not required.</i> 2) Is the Department to act as the main contact and manage procedures in the case of an accident specified in the manual? • • • <i>Not applicable.</i> <hr/> <p>Method of keeping staffs in the executing agency informed about the Emergency plan for responding to an accident • • • <i>Trainings regarding the above Regulation are conducted by the Labour Safety Department at UTY.</i></p>
(7) Method adopted by the executing agency to confirm training programs	<p>Method of confirmation adopted by the Executing Agency</p> <p>• • • <i>When necessary, such issues are discussed in the Monthly Progress Meeting.</i></p>

Items to be confirmed	Questionnaire and Answer
<p>in Safety and Quality Control /Management provided by Contractor for workers</p>	
<p>(8) Public Authorities with jurisdiction over safety issues</p>	<p>① Names of the Public Authorities : <i>The Ministry of Labour and Social Security</i></p> <p>② Demarcation between those Public Authorities and the Executing Agency regarding safety • • • <i>In normal situation, the safety of the Project is responsibility of the Contractor. Once fatal or severe accidents happen, the Ministry carries out thorough investigation together with police.</i></p> <p>③ Availability of an official qualification or licensing system governing skilled labor (heavy-construction-equipment operator, etc.) • • • <i>State Inspection Company for construction “Sanoatkontekhnadzor” carries out the inspection of training centres for availability of special certificate to train.</i></p> <p><i>“Republic Technical Inspection Organization (RTIO)” under the Cabinet of Minister and “Technical Inspection Organization” are organized in main cities. Those organizations carry out site inspections for checking the license conditions and ownership of construction equipment.</i></p> <p><i>A license for an operator is issued by “Open Joint stock Company MUTAHASIS” (previously it belongs to RTIO and the largest license issuing “public corporation” for an operator of heavy construction equipment. There are many medium to small issuing “public corporations.”) They carry out education and training</i></p> <p>④ Whether a power to carry out on-site inspections of construction sites and a power to issue instruction, are delegated to such Authority by relevant law, or not. • • • <i>The inspection of compliance with the legislation is the duty of the Ministry of Labour and Social Security under the following legislative documents:</i></p> <ul style="list-style-type: none"> - <i>Decree of the Cabinet of Ministers of the Republic of Uzbekistan «On approval of the Regulations on the State Legal Labor Inspection, and on State Assessment of Labor Conditions under the Ministry of Labor and Social Protection of the Republic of Uzbekistan» of July 29, 1993, No. 378.</i> - <i>Decree of the Cabinet of Ministers «On approval of the Regulations on the Labor Protection Administration at the Ministry of Labor of the Republic of Uzbekistan» of February 16, 1995, No. 58.</i> - <i>Decree of the Cabinet of Ministers «On labor activities of citizens of the Republic of Uzbekistan abroad, and of foreign citizens in the country» of October 19, 1995, No. 408.</i> <p><i>Central Committee of Labour Union for Railway Transportation (“Tsentralniy Commitet PROFSOYUS”) which had a branch in UTY Head office, sent staffs on site and made an inspection. This Union has acted for ensuring safety on site together with the Ministry of Labour and Social Security.</i></p>

3. Conclusion, Lesson Learned and Recommendation

3-1 Conclusion

3-1-1 Safety Performance

At the time of Mid-term Review when the construction progress rate has reached to 98%, neither accidents nor damages were recorded. Accident Severity Rate became considerably high due to one fatal accident. Accident Frequency Rate of 0.85 was lower than those in Japan (Civil works: 1.41, Bridge works: 1.29) and it showed that daily safety control was good.

3-1-2 Process

3-1-2-1 Measures to Mitigate Construction Risk

(1) Design and Construction

The following steps have been taken for checking design and construction process.

- ◇Independent Design Check on the detailed design of JCT by different Design Institutes for Substructure and Superstructure
- ◇Design approval of State Construction Committee
- ◇Check on construction quality by HDMI
- ◇Final tests for dead and live loads based on standards of Republic of Uzbekistan by HDMI
- ◇Design check by SNY

(2) Risk Management

For design, risks were mitigated by steps stated above. Following measures have been attempted for risk mitigation of labour risk.

- ◇Introduction of work standard in Japan (employment of Japanese SV and safety facilities, such as scaffolding, safety belt etc.)
- ◇Detailed review of MS and approval with comments in respect of Safety and Quality
- ◇Make every efforts to keep all workers informing of main points of MS
- ◇Pre-inspection of SNY and inspection of JCT

(3) Emergency (Crisis) Control Manual

There was neither written manual nor procedures for handling an emergency (crisis) of the Works. Because the structure, ie Truss bridge with upper deck slab, is well proven as a railway bridge and design and construction quality checks for each stage have been carried out as stated in clause 2-2-2-1, it is a low possibility that the works becomes such an emergency or critical situation.

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

Both JTC and each member of SNY have obtained ISO 9001 certification and operate Quality Management System in Japan. However none of these companies applied a Quality Management System in the Project. They applied quality control concept rather than Quality Management. Quality was controlled by pre-construction or post-construction inspections and testing of quality.

It is noted that a manual and procedures of SNY were not updated from its original version, although construction progressed and situation changed. (Refer to Recommendation 3-3-1)

3-1-2-2 Measures to mitigate Labour Risk

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

By confirmation results of items in a checklist based on the requirements of Safety Management System, no records were kept for verification of effectiveness of corrective action^v for accidents days away from works of which was less than 3 days. It is noted that Health and safety Plan of SNY were not updated from its original version, although construction progressed and situation changed.

(Refer to Recommendation 3-3-1)

(2) Measures for mitigating Risk

Mitigation of labour risk has made Joint Inspection with UTY/JCT/SNY and discussion in the Monthly Progress Meeting, daily joint inspection with JTC/SNY, daily safety inspection by SNY Safety Officer as the Accident Preventive Officer and introduction of work standard in Japan.

3-1-3 Safety Environment noted

By a system introduced by ex-Soviet Union, there were many laws and regulations in which detailed procedures were specified and specific manual may not be required due to existence of such laws and regulations. A license system for ownership and operation for construction plant was also established.

Although UTY itself does not involve in health and safety of the Project, Central Committee of Labour Union for Railway Transportation (“Tsentralniy Commitet PROFSOYUS”) which have a branch in UTY Head office, sent staffs on site and made an inspection. This Union has acted for ensuring safety on site together with the Ministry of Labour and Social Security.

3-2 Lesson Learned

In Japanese safety control, Zero accident is ideal and also it is designated as an achievement objective. In the Project, Zero accident of falling down is one of objectives. On the other hand, it is recognized that Zero accident is practically impossible from statistical point of view. Therefore, although Zero accident can be regarded as ideal, the fact that accidents on site will happen as works progress is to be accepted. It is required to set an achievable object (for example, Accident Frequency Rate is to be lower than certain figure) and to take actions including mitigating degree of accidents. (Safety measures on site are mainly to prevent occurrence of accidents and measures for mitigating degree of accidents are not entertained in Japan, because those are based on the idea that accident occurs.)

3-3 Recommendation

3-3-1 Update of manual, procedures etc.

The objective of manual, procedures etc. is not preparation of those. Manual and procedures are to be used in works and to be updated to reflect current change or modification made for an improvement. It is recommended for SNY to check manual, procedures etc. and update them to incorporate an improvement made after those were prepared.

Source and Reference Literature

Figures: extracted from Safety Digest revised version in 2007 by TSUKUSHI KOBO CO., Ltd.

Photos: Shimizu-Nippon Steel Engineering-Yokogawa
Joint Venture

Reference Literature:

HANAYASU Shigeo : Current situations and problems in risk management at the construction stage,

Feature article-Introductions to risk management, JSCE Magazine “Civil Engineering”, No. 7
July 2000, pp.32-34

Study for ensuring Safety in the Projects carried out in developing countries, June 2008
Japan Bank for International Cooperation (JBIC)

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/2004/tok_0301.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/2004/tok_0301.html

ⁱⁱⁱ**Quality Control and Quality Management:** A concept of Quality Control is considered as a superordinate concept of Quality Policy and Quality Management in ISO 9001:1994 “Quality systems-Models for quality assurance in design, development, production, installation and servicing”. However in ISO 9001:2000 “Quality Management Systems-Requirements”, Quality Control is regarded as one of the components of Quality Management System. ISO 9001:2000 develops Quality Assurance and requires an establishment of an organization respecting customer’s satisfaction by introducing continual improvement of the System

Source: SHIRAKATA Toshiro: Latest version, Easy to understand ISO 9001、 Chuukei Publishing、 pp.34, November 2000

^{iv} **Effectiveness of System:** In JIS Q 9000, a Japanese version of ISO9000:2000 Quality Management System-Fundamentals and Vocabularies, defines Effectiveness and Conformity as follows.

Effectiveness: extent to which planned activities are realized and planned results achieved

Conformity: fulfillment of a requirement

Previously, it is emphasized whether requirements of Standards are fulfilled and organization’s procedures are followed. Recently emphasizing points has been changed to whether process has been done as planned and the results are obtained as planned. It is reported that at initial stage of obtaining ISO certification there is tendency to emphasizing keeping Conformity rather than perusing Effectiveness of System.

Source : JIS Q 9000 Quality Management System-Fundamentals and Vocabularies

^v**Corrective Action (Measure for preventing a recurrence) :** In ISO9000:2000 Quality Management System-Fundamentals and Vocabularies, the definitions of Corrective Action and Preventive Action are as follows. Measure for preventing a recurrence is included in the definition of Corrective Action in ISO 9001.

Corrective Action---action to eliminate the cause of a **detected** nonconformity or other undesirable situation

Preventive Action---action to eliminate the cause of a **potential** nonconformity or other undesirable **potential** situation

(Nonconformity:---Non-fulfillment of a requirement)

Source : ISO9000:2000 Quality Management System-Fundamentals and Vocabularies

Annex: Language used in Safety and Quality Documents

Name of Documents	Language
Health and Safety Plan	Original in English (using a template) Translation in neither Russian nor Uzbek language was available
Method Statement (MS)	Original in English (using a template) Translation in neither Russian nor Uzbek language was available
Extract of MS for briefing to Mostostroy's staffs and workers	Original in English (using a template) Translation in neither Russian nor Uzbek language was available
Work standard & work procedure	Original in English (or Japanese) Translated into Russian by SNY
Quality Manual and other documents related to System	Not applicable (SNY did not operate Quality Management System)
Other documents related to Safety and Quality	Daily safety check lists, Check list for construction plant, Instruction for corrective action etc. were written in Russian. Where Safety Officer issued an instruction for corrective action, he wrote such instruction to field book of the worker who received an instruction.

Note) Russian was used in safety and quality documents. For oral communication, Uzbek language and Russian were used. Most of translators can speak English, Russian and Uzbek language.
Mostostroy: a subcontractor of SNY for construction of Sub-structure.