Chapter 2 Statistics and Analysis of Industrial Accidents

2-1 Statistical survey of industrial accidents

2-1-1 Objective

The objective of statistical survey was to identify the various causes of industrial and public accidents (third party accidents) in the course of construction work in order to contribute to facilitating review on the countermeasure against industrial accidents in the future construction work by comprehending the trends of accidents reported to JICA in the past.

2-1-2 Targets and considerations of statistical survey

(1) Target

Targets of survey are the industrial accidents, without regard to the country and region, reported to JICA in the course of the scheme and years shown in the table below.

Scheme	Years
Construction projects through Grant Aid	From 2000 to 2010
Construction projects under ODA Loans	From 2008 to 2010

(2) Considerations

Since the detailed information of the projects, such as the number of workers, man-hours, size of the work, construction contract amounts, are not understood, considerations must be paid on the following points concerning the statistical survey results:

① Indices for evaluation of the occurrence state of industrial accidents, such as the frequency rate (frequency of occurrence of industrial accidents and the severity rate (significance of industrial accidents), cannot be identified.
② Because of the reason described in ①, the numerical values in the statistical survey results do not refer directly to the likelihood or severity of industrial accidents.
③ Though the statistical survey result may help understand the trend of industrial accidents as a whole, relative comparison of individual numerical values must be done on the basis of previously-reviewed relation conditions.
④ For the sake of convenience, the survey results are compiled and tabulated for Grant Aid and ODA Loan Projects separately, but simple comparison of numerical values of both assistance projects is not allowed.

2-1-3 Method of statistical survey

The survey involves mechanical processing of JICA's accident report data, which is followed by compilation and tabulation for each survey item. Analysis as described in 2-2 was carried out on the trend of industrial accidents.

2-1-4 Survey items

The survey items were as follows according to the JICA's accident report data:

① Region
② Name of country
③ Year of industrial accidents concerned
④ Month/day of industrial accidents concerned
⑤ Category of the work
⑥ Type classification of the type of industrial accidents (according to the classification method of the Ministry of Health, Labor, and Welfare)*1

⑦ Casualties

⑧ Fatalities

⑨ No. of injuries

⑩ With/without significant accidents*2

⑪ With/without public accidents*3

⑫ With/without induced accidents*4

⑬ Classification of industrial accidents by causal agents (according to the classification method of the Ministry of Health, Labor, and Welfare)[*1]

*1: For classification of the type of industrial accidents as well as their causative agent, refer to the description below.

*2: The significant accidents means the one with three or more casualties at a time.

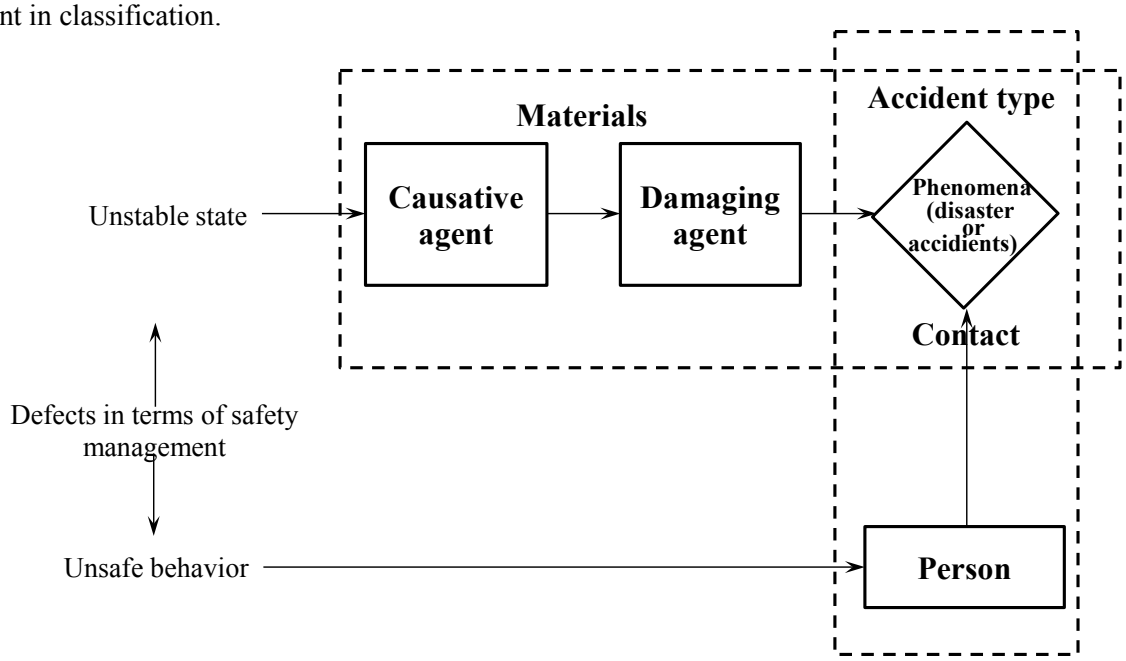
*3: The public accidents mean the one involving the third party other than those related to the work.

*4: The induced accidents means the one caused by the third party.

2-1-5 Classification of the type of industrial accidents as well as their causative agent

(1) Outline of the classification

Classification of the type of industrial accidents as well as their causative agent of the Ministry of Health, Labor, and Welfare has been established for the purpose of grasping the trend of their occurrences (fatal and injury accidents distribution state, etc.) by means of large numbers. This is the classification of two of various factors in the basic model of accident occurrence as shown in Figure 2-1; they are the type of industrial accidents and the causative agent, which can be grasped specifically and which have less allowance for subjectivity. The damaging agent is not taken into account in classification.



Quoted from P. 13 of the "Guide to Classification of Industrial Accidents" (edited by the Safety Division, Industrial Safety and Health Department, the Ministry of Health, Labor, and Welfare and published by the Japan Industrial Safety and Health Association)

Figure 2-1 Basic model of accident occurrence

(2) Classification of the type of industrial accidents

The "type of industrial accidents" means the phenomena to which the causative agent or a cause of injury is related. Table 2-1 shows the classification of the type of industrial accidents.

Table 2-1 Classification of the type of industrial accidents

Type of industrial accidents	Description
Crashing and falling	This is the case of a person falling from the tree, building, scaffold machine, vehicle, ladder, staircase, slope, which includes crashing due to collapse and rolling of a place on which a person has rested as well as the bed-of-quicksand state of sand tank. This also includes the case of crashing together with vehicular machinery, but excludes traffic accidents. Falling by the electric shock is classified under electric shock.
Overturn	This means tumbling of a person on an almost the same flat surface, including tumbling due to tripping or slipping. This also includes overturn together with vehicular machinery, but excludes traffic accidents. Overturn because of electric shock is classified under electric shock.
Impact	This is the case of a person proactively knocking against a stationary or moving object, but excludes falling/crashing and overturn. This corresponds to a case of a person proactively knocking against or jumping onto the lifted cargo and machine part. This also includes impact together with vehicular machinery, but excludes traffic accidents.
Incoming, downcoming	This is the case of an incoming or downcoming object proactively knocking against a person, which includes a case of incoming piece of grinding wheel, chip, swarf and of dropping of what the person holds onto his foot. Incoming/downcoming of objects due to rupture of container is classified under rupture.
Collapse, destruction	This is the case of collapse or destruction of deposited materials (including ash), scaffold, building, etc., resulting in knocking against a person. This includes the case of falling of an object placed against something, cave-in, snowslide, and landslide.
Impacted	This is the case of an object proactively knocking against a p erson, excluding the case of incoming/downcoming, collapse, and destruction. This also includes impact from the lifted cargo and moving machine part, but excludes traffic accidents.
Crushing, trapping	This is the case of being crushed or twisted in a state held between objects and trapped by objects. This includes the case of crushed wound caused by the press dies, forging machine hammer, etc. and also the case of being run-over, but excludes traffic accidents.
Cutting, abrasion	This is the case of being abrased or cutting in the abrased state, including cutting with edged tool, cutting by object during handling of tool, and rubbing.
Treading through	This is the case of treading nail and metallic piece into the sole of shoes, including treading through the floor, slates, etc. Crashing after treading-through is classified under crashing.
Drowning	This is the case of falling into water and being drowned.
Contact with high- and low-temperature materials	This is the case of contacting with high- or low-temperature materials, including a case of being exposed to the high- or low-temperature environment. [Case of high-temperature] - This is the case of contacting the flame, arc, molten metal, hot water, steam, etc. This includes a case of being exposed to the high-temperature environment during work before furnace (heat prostration, etc.). [Case of low-temperature] - This is the case of being exposed to the low-temperature environment, such as inside the freezer.
Contact with harmful substances	This includes exposure to radiation, disturbance caused by harmful beam, CO intoxication, anoxia, and exposure to harmful environment with high or low atmospheric pressure.
Electric shock	This is the case of contact with the live parts or being impacted by electric discharge. [Relationship with causative agent] - Causative agents in case of electric shock via a metallic cover or material are classified as included in the equipment or machine concerned to which they have contacted.
Explosion	This is the case of expansion with explosion sound as a result of sudden generation or release of the pressure, excluding rupture. This includes phreatic explosion. If explosion occurs inside the container or device, such explosion is classified to be included in this case even when the container or device suffers rupture. [Relationship with causative agent] - Causative agent in case of explosion inside the container and device is classified to be included in the case of container or device concerned. In case of explosion in a state in which the content has been taken out or leaking from the container or device, the causative agent is not classified to be included in the container or device, but in the content concerned.
Rupture	This is the case of rupture of the container or device under physical pressure and includes crush. Mechanical breakage, such as rupture of the grinding wheel, is classified into incoming and downcoming. [Relationship with causative agent] - The causative agents include the boiler, pressure vessel, cylinder, scientific equipment.
Fire	[Relationship with causative agent] - For fire of hazardous materials, the hazardous materials are considered as the causative agent. For cases other than hazardous materials, the source of fire is classified as the causative agent.
Traffic accidents (road)	Among traffic accidents, this is the case subject to the Road Traffic Law.
Traffic accidents (others)	Among traffic accidents, this is the case of accidents involving ships and vessels, airplanes, and public transport railway and electric trains. Except for public transport railway and electric trains, traffic accidents in the premises of work place is classified to each corresponding item.
Reactive motion, excessive efforts	This is the case not classified as described above and corresponds to cramp, wrenching, strained back and similar state due to body motion, uncomfortable posture, reactive action, such as strained back while lifting heavy load, etc. Crashing due to loss of balance, overturn due to holding excessive heavy load are to be classified into crash and overturn even when such result has involved unreasonable action.
Others	Purulent wound, tetanus not included in any of above classifications
Unclassifiable	This is a case of classification being difficult because of lack of data for determination of classification.

Quoted from pp64 – 66 of the "Guide to Classification of Industrial Accidents" (edited by the Safety Division, Industrial Safety and Health Department, the Ministry of Health, Labor, and Welfare and published by the Japan Industrial Safety and Health Association)

(3) Classification of causative agent of industrial accidents

Causative agent means the machine, device, or other sources or environments that have caused accidents. The causative agent can be roughly classified into eight items as follows:

① Power machinery, ② Lifting system and transport machinery, ③ Other devices, ④ Temporary facilities, buildings, structures, ⑤ substances, materials, ⑥ cargoes, ⑦ environment, etc. and ⑧ others.

Table 2-2 shows middle and small classifications for each large classification.

Table 2-2 Large classification ①: Middle and small classifications of the power machinery

Middle classification	Small classification
Prime mover (11)	Prime mover (111)
Power transmission mechanism (12)	Power transmission mechanism (121)
Wood working machinery (13)	Circular saw machine (131), band saw machine (132), planning machine (133), hollow chisel mortiser, wood borer (134), chamfering machine, router, wood milling machine (135), chain saw (136), and other wood working machinery (139)
Construction machinery, etc. (14)	Land grading・transport・loading machine (141), excavating machine (142), foundation work machine (143), compacting equipment (144), demolishing machine (145), vehicle for high lift work (146), other construction machines (149)
Metal working machinery (15)	Lathe (151), drilling machine, milling machine (152), grinding machine, buffing machine (153), press machine (154), forging pressure hammer (155), shear (156), other metal working machines (159)
General power machinery (16)	Centrifugal machine (161), mixer, crusher (162), roller machine (excluding the print roll) (163), injection molding machine (164), food processing machine (165), printing machine (166), industrial robot (167), other general power machines (169)

Table 2-3 Large classification ②: Middle and small classifications of the lifting system and transport machinery

Middle classification	Small classification
Power crane, etc. (21)	Crane (211), traveling crane (212), derrick (213), elevator, lift (214), winch (215), gondola (216), skyline logging cable crane, logging cableway (217), other power cranes (219)
Power transport machinery (22)	Truck (221), forklift (222), track system (223), conveyor(224), loader (225), straddle carrier (226), uneven terrain hauler (227), and other power transporter (229)
Vehicles (23)	Passenger cars, buses, motorcycles (231), railway vehicles (232), others vehicles (239)

Table 2-4 Large classification ③: Middle and small classifications of other devices

Middle classification	Small classification
Pressure vessel (31)	Boiler (311) , pressure vessel (312), other pressure vessels (319)
Chemical equipment(32)	Chemical equipment (321)
Welding equipment (33)	Gas welding equipment (331), arc welding equipment (332), other welding equipment (339)
Furnace, kiln (34)	Furnace, kiln (341), drying equipment (342), other furnaces and kilns (349)
Electric equipment (35)	Transmission and distribution line, etc. (351), power equipment (352), other electric equipment (359)
Manual machine and tools (36)	Manual crane, etc. (361), manual transport machine (362), manual machine (363), manual tools (364)
Appliances (37)	Ladder, etc. (371) , slinging equipment (372), other tools (379)
Other devices and equipment(39)	Other devices, equipment (391)

Table 2-5 Large classification ④: Middle and small classifications of temporary facilities, building, and structures

Middle classification	Small classification
Temporary facilities, buildings, structures (41)	Scaffold (411), support (412), staircase, piers (413), opening (414), roof, beam, purlin, girder, principal rafter (415) , work floor, tread plate (416), passageway (417) Buildings, structures (418), other temporary facilities, buildings, and structures (419)

Table 2-6 Large classification ⑤: Middle and small classifications of substances and materials

Middle classification	Small classification
Hazardous and harmful substances, etc. (51)	Explosive materials, etc. (511), inflammable materials (512), combustible gas (513), harmful substances (514), radiation (515), other hazardous and harmful substances (519)
Materials (52)	Metallic materials (521), woods, bamboo (522), stone, sand, and gravel (523), other materials (529)

Table 2-7 Large classification ⑥: Middle and small classifications of cargoes

Middle classification	Small classification
Cargo (61)	Packaged cargoes (611), machinery (612)

Table 2-8 Large classification ⑦: Middle and small classifications of environment, etc.

Middle classification	Small classification
Environment, etc. (71)	Ground, rock (711), timber, etc. (712), water (713), abnormal environment, etc. (714), High- and low-temperature environments (715), other environments (719)

Table 2-9 Large classification ⑧: Middle and small classifications of others

Middle classification	Small classification
Other causative agents (91)	Other causative agents (911)
No causative agent (92)	No causative agent (921)
Unclassifiable (99)	Unclassifiable (999)

Table 2-2 – 2-9: Quoted from pp71 – 78 of the “Guide to Classification of Industrial Accidents” (edited by the Safety Division, Industrial Safety and Health Department, the Ministry of Health, Labor, and Welfare and published by the Japan Industrial Safety and Health Association)

2-1-6 Statistical survey compilation results

(1) Transition of the number of industrial accidents (2000 to 2010)

The number of industrial accidents has been in the upward trend for past three years.

The number of industrial accidents for the projects through Grant Aid decreased temporarily during the period from 2004 to 2005, which was nine cases in the year 2006 and further increased to the two-digit number (13 cases) in the year 2010.

The number of industrial accidents of the projects under ODA Loans was a total of 71 cases for three years from 2008 to 2010.

Table 2-10 Transition of the number of industrial accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	7		7
2001	7		7
2002	8		8
2003	7		7
2004	3		3
2005	2		2
2006	9		9
2007	6		6
2008	6	22	28
2009	6	27	33
2010	13	22	35
Total	74	71	145

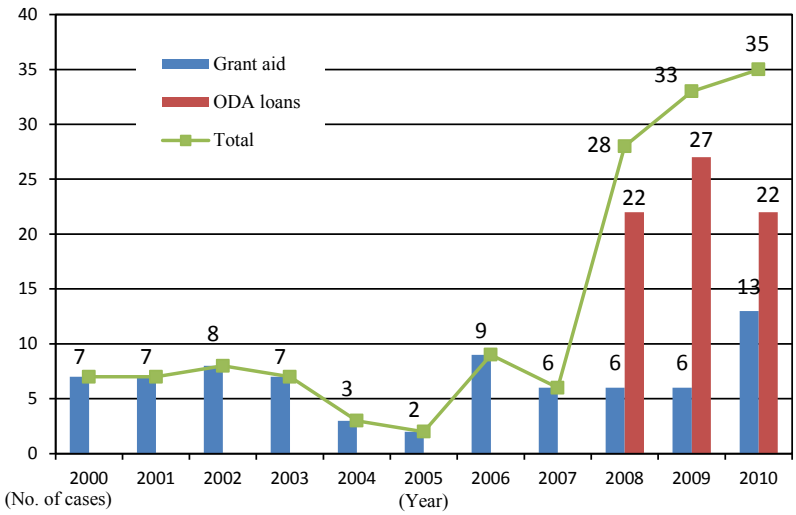


Figure 2-2 Transition of the number of industrial accidents

(2) State of occurrence of industrial accidents by region and country (2000 to 2010)

The trend by region shows the number of industrial accidents; 45 cases (31.0%) in Southeast Asia, 39 cases (26.9%) in South Asia, and 32 cases (22.1%) in Africa. These three regions account for 80% of the total number of occurrences.

The trend by country shows 26 cases (17.9%) in Vietnam, 18 cases (12.4%) in Sri Lanka, 10 cases (6.9%) in Nepal, nine cases (6.2%) in Ethiopia, seven cases (4.8%) in Tanzania, and six cases (4.1%) in the Philippines. These six countries account for about one half (52.4%) of the total number of industrial accidents.

Table 2-11 Number of occurrence of industrial accidents by region

Region	No. of disasters and accidents	Component ratio
Southeast Asia	45	31.0%
South Asia	39	26.9%
Africa	32	22.1%
Central and South America	14	9.7%
Middle East	7	4.8%
Central Asia and Caucasia	3	2.1%
Europe	3	2.1%
East Asia	1	0.7%
Oceania	1	0.7%
Total	145	

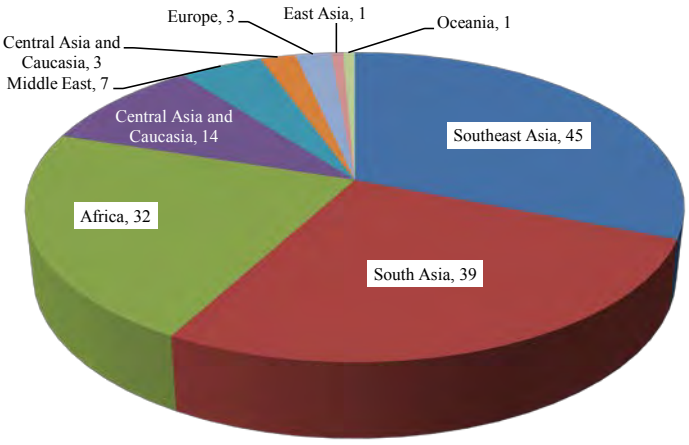


Figure 2-3 Number of occurrence of industrial accidents by region (2000 to 2010)

Table 2-12 Number of occurrence of industrial accidents by country

Country	No. of disasters and accidents	Component ratio	Accumulated ratio
Vietnam	26	17.9%	17.9%
Sri Lanka	18	12.4%	30.3%
Nepal	10	6.9%	37.2%
Ethiopia	9	6.2%	43.4%
Tanzania	7	4.8%	48.3%
Philippines	6	4.1%	52.4%
India	5	3.4%	55.9%
Cambodia	5	3.4%	59.3%
India	4	2.8%	62.1%
Indonesia	4	2.8%	64.8%
Peru	4	2.8%	67.6%
Kenya	3	2.1%	69.7%
Jamaica	3	2.1%	71.7%
Tunisia	3	2.1%	73.8%
Bolivia	3	2.1%	75.9%
Mozambique	3	2.1%	77.9%
Laos	3	2.1%	80.0%
Yemen	2	1.4%	81.4%
Kazakhstan	2	1.4%	82.8%
Turkey	2	1.4%	84.1%
Niger	2	1.4%	85.5%
Pakistan	2	1.4%	86.9%
Burkina Faso	2	1.4%	88.3%
Jordan	2	1.4%	89.7%
Uzbekistan	1	0.7%	90.3%
Guiana	1	0.7%	91.0%
Gabon	1	0.7%	91.7%
Cameroon	1	0.7%	92.4%
Guatemala	1	0.7%	93.1%
Zambia	1	0.7%	93.8%
Cenegal	1	0.7%	94.5%
Saint Vincent	1	0.7%	95.2%
Parao	1	0.7%	95.9%
Bulgaria	1	0.7%	96.6%
Honduras	1	0.7%	97.2%
Mari	1	0.7%	97.9%
Mortania	1	0.7%	98.6%
Mongor	1	0.7%	99.3%
East Timor	1	0.7%	100.0%
Total	145		

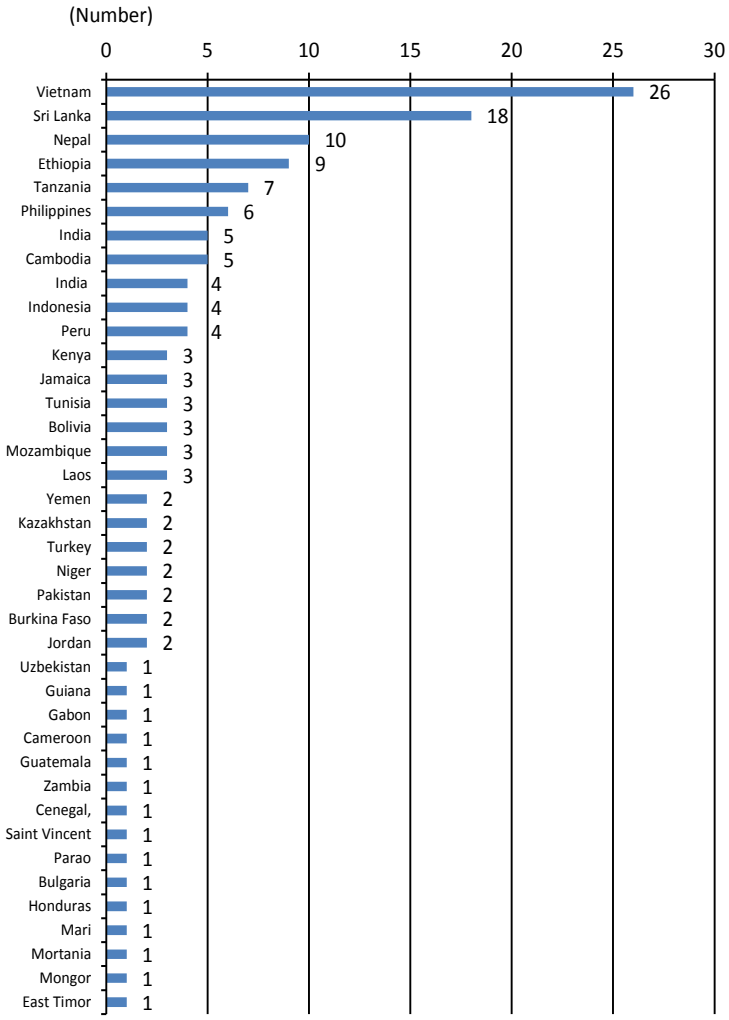


Figure2-4 Number of occurrence of industrial accidents by country (2000 to 2010)

(3) Transition of the casualties and fatalities (2000 to 2010)

The casualties of the Grant Aid Projects were 152 persons as a total of 11 years from 2000 to 2010. Though the state of transition varies from year to year, the casualties show the increasing trend for past three years. The fatalities were 83 persons as a total of 11 years from 2000 to 2010.

On the other hand, the casualties of the ODA Loan Projects were 283 persons as a total of three years from 2008 to 2010 and show the increasing trend for past three years. The year 2010 showed the casualties of 110 persons. The fatalities of the projects under ODA Loans were 136 persons as a total of three years from 2008 to 2010.

Table 2-13 Transition of casualties

Year	Scheme		Total	No. of cases
	Grant aid	ODA loans		
2000	32		32	7
2001	14		14	7
2002	30		30	8
2003	18		18	7
2004	7		7	3
2005	2		2	2
2006	14		14	9
2007	7		7	6
2008	6	85	91	28
2009	7	88	95	33
2010	15	110	125	35
Total	152	283	435	145

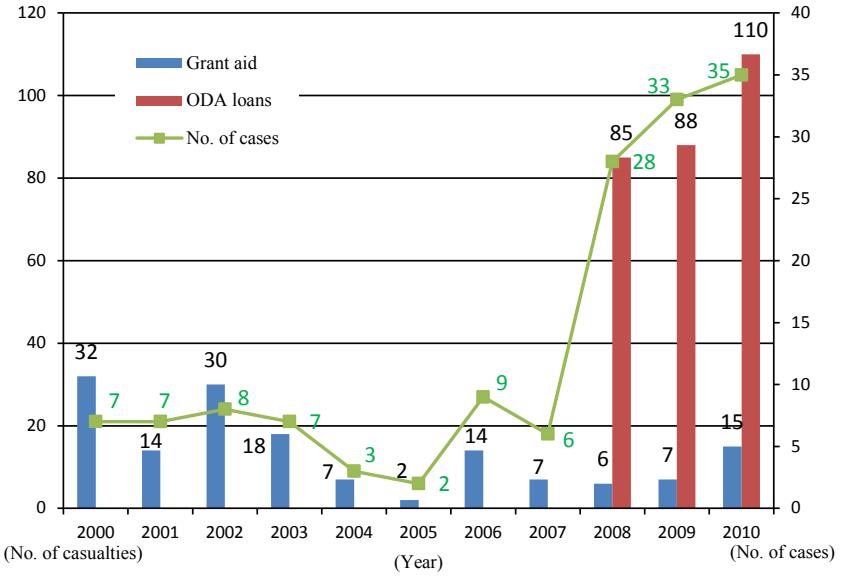


Figure 2-5 Transition of casualties

Table 2-14 Transition of fatalities

Year	Scheme		Total	No. of cases
	Grant aid	ODA loans		
2000	12		12	7
2001	7		7	7
2002	16		16	8
2003	9		9	7
2004	5		5	3
2005	2		2	2
2006	8		8	9
2007	6		6	6
2008	6	63	69	28
2009	5	31	36	33
2010	7	42	49	35
Total	83	136	219	145

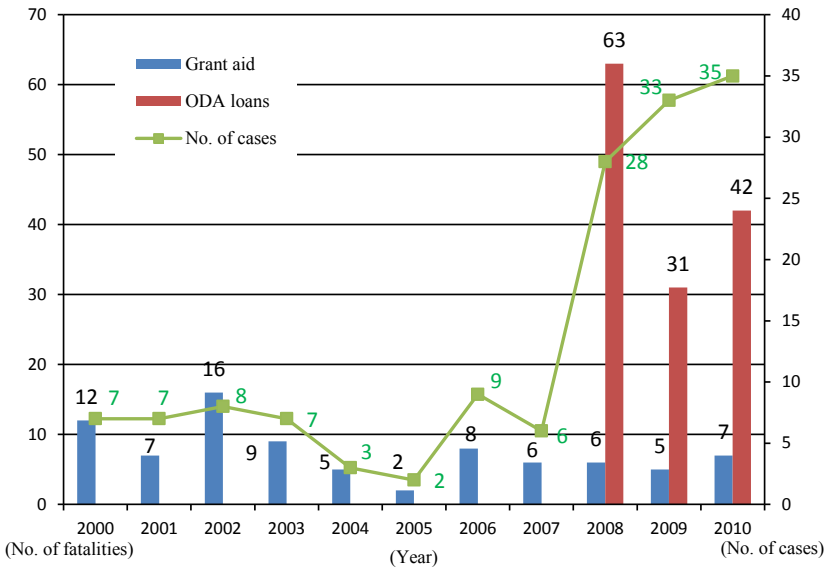


Figure 2-6 Transition of fatalities

(4) Accident occurrence state by the category of work (2000 to 2010)

According to the summarized casualties by the category of work, accidents with casualties are occurring in such a manner as 156 persons (35.9%) for roads, 111 persons (25.5%) for railway, 51 persons (11.7%) for water and sewerage, and 36 persons (8.3%) for school. These four categories of work account for 81.4% of the total of casualties.

Fatalities summarized similarly indicate 110 persons (50.2%) for road, 29 persons (13.2%) for water and sewerage, 19 persons (8.7%) for railway, 14 persons (6.4%) for others, and 14 persons (6.4%) for school. These five categories of work account for 84.9% of the total of fatalities.

Table 2-15 Casualties by category of work

Category of work	Casualties	Component ratio	Accumulated ratio
Road	156	35.9%	35.9%
Railway	111	25.5%	61.4%
Water and sewerage	51	11.7%	73.1%
School	36	8.3%	81.4%
Others	24	5.5%	86.9%
Bridge	22	5.1%	92.0%
Life infrastructures of rural and urban areas	12	2.8%	94.7%
Irrigation	9	2.1%	96.8%
Port and harbor	4	0.9%	97.7%
Hydraulic power generation	3	0.7%	98.4%
Sabo	2	0.5%	98.9%
Thermal power generation	2	0.5%	99.3%
Power transmission	1	0.2%	99.5%
Bridge and sabo	1	0.2%	99.8%
Tourism	1	0.2%	100.0%
Forestry	0	0.0%	100.0%
Fisheries	0	0.0%	100.0%
Total (persons)	435		

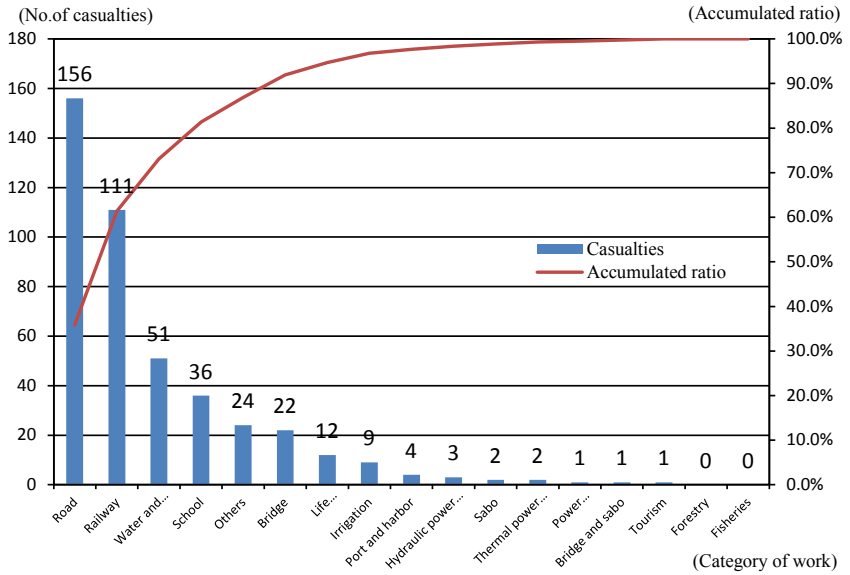


Figure 2-7 Pareto diagram: Casualties by category of work

Table 2-16 Fatalities by category of work

Category of work	Fatalities	Component ratio	Accumulated ratio
Road	110	50.2%	50.2%
Water and sewerage	29	13.2%	63.5%
Railway	19	8.7%	72.1%
Others	14	6.4%	78.5%
School	14	6.4%	84.9%
Bridge	8	3.7%	88.6%
Irrigation	8	3.7%	92.2%
Life infrastructures of rural and urban areas	7	3.2%	95.4%
Port and harbor	3	1.4%	96.8%
Sabo	2	0.9%	97.7%
Hydraulic power generation	2	0.9%	98.6%
Thermal power generation	1	0.5%	99.1%
Tourism	1	0.5%	99.5%
Power transmission	1	0.5%	100.0%
Bridge and sabo	0	0.0%	100.0%
Fisheries	0	0.0%	100.0%
Forestry	0	0.0%	100.0%
Total (persons)	219		

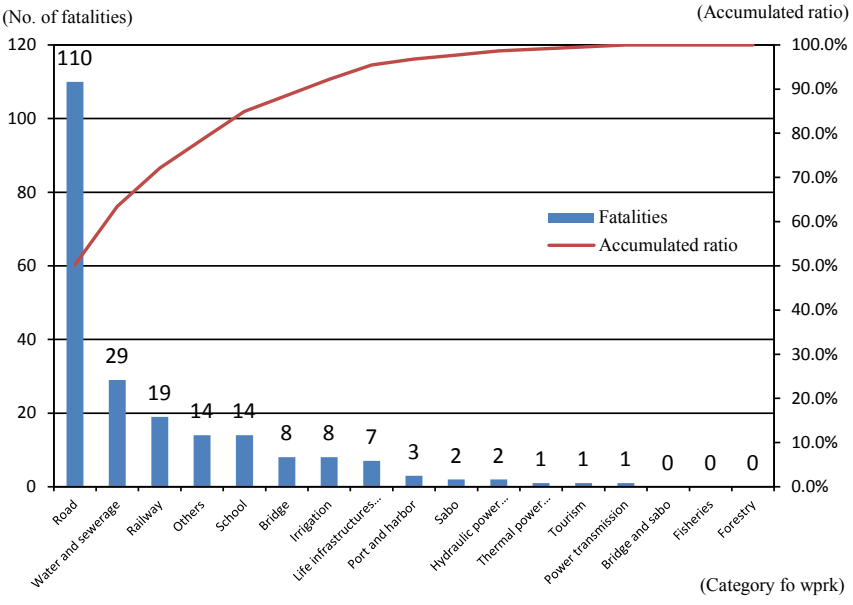


Figure 2-8 Pareto diagram: Fatalities by category of work

(5) Accident occurrence state by type of industrial accidents (2000 to 2010)

When summarized according to the classified type of industrial accidents, the casualties indicate 117 persons (26.9%) for traffic accidents (road), 95 persons (21.8%) for traffic accidents (others), 71 persons (16.3%) for collapse and destruction, 39 persons (9.0%) for explosion, 24 persons (5.5%) for incoming and downcoming, and 17 persons (3.9%) for crashing and falling. These six types of industrial accidents account for 83.4% of the total casualties.

When summarized similarly, the fatalities indicate 54 persons (24.7%) for collapse and destruction, 51 persons (23.3%) for traffic accidents (road), 33 persons (15.1%) for explosion, 16 persons (7.3%) for traffic accidents (others), 14 persons (6.4%) for crushing and trapping, and 13 persons (5.9%) for crashing and falling. These six types of industrial accidents account for 82.6% of the total fatalities.

Table 2-17 Casualties by type of industrial accidents

Type of disasters and accidents	Casualties	Component ratio	Accumulated ratio
Traffic accident (road)	117	26.9%	26.9%
Traffic accident (others)	95	21.8%	48.7%
Collapse and destruction	71	16.3%	65.1%
Explosion	39	9.0%	74.0%
Incoming and downcoming	24	5.5%	79.5%
Crashing and falling	17	3.9%	83.4%
Crushing and trapping	15	3.4%	86.9%
Overturn	13	3.0%	89.9%
Electric shock	12	2.8%	92.6%
Drowning	11	2.5%	95.2%
Contact with harmful substance	11	2.5%	97.7%
Impacted	5	1.1%	98.9%
Shooting	4	0.9%	99.8%
Cutting and abrasion	1	0.2%	100.0%
Fire	0	0.0%	100.0%
Unclassifiable	0	0.0%	100.0%
Total	435		

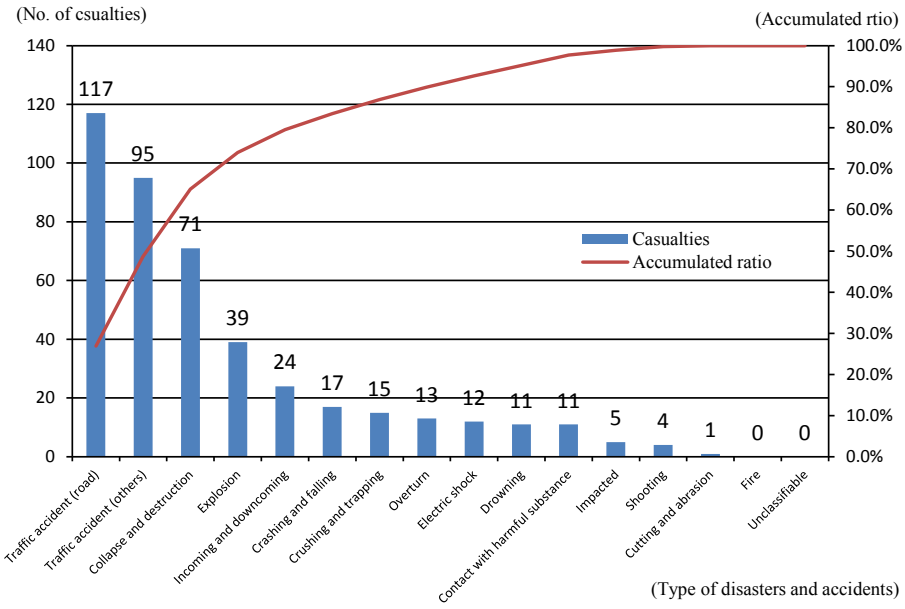


Figure 2-9 Pareto diagram: Casualties by type of industrial accidents

Table 2-18 Fatalities by type of industrial accidents

Type of disasters and accidents	Fatalities	Component ratio	Accumulated ratio
Collapse and destruction	54	24.7%	24.7%
Traffic accident (road)	51	23.3%	47.9%
Explosion	33	15.1%	63.0%
Traffic accident (others)	16	7.3%	70.3%
Crushing and trapping	14	6.4%	76.7%
Crashing and falling	13	5.9%	82.6%
Drowning	11	5.0%	87.7%
Incoming and downcoming	8	3.7%	91.3%
Electric shock	5	2.3%	93.6%
Impacted	5	2.3%	95.9%
Overturn	3	1.4%	97.3%
Shooting	3	1.4%	98.6%
Contact with harmful substance	2	0.9%	99.5%
Cutting and abrasion	1	0.5%	100.0%
Fire	0	0.0%	100.0%
Unclassifiable	0	0.0%	100.0%
Total	219		

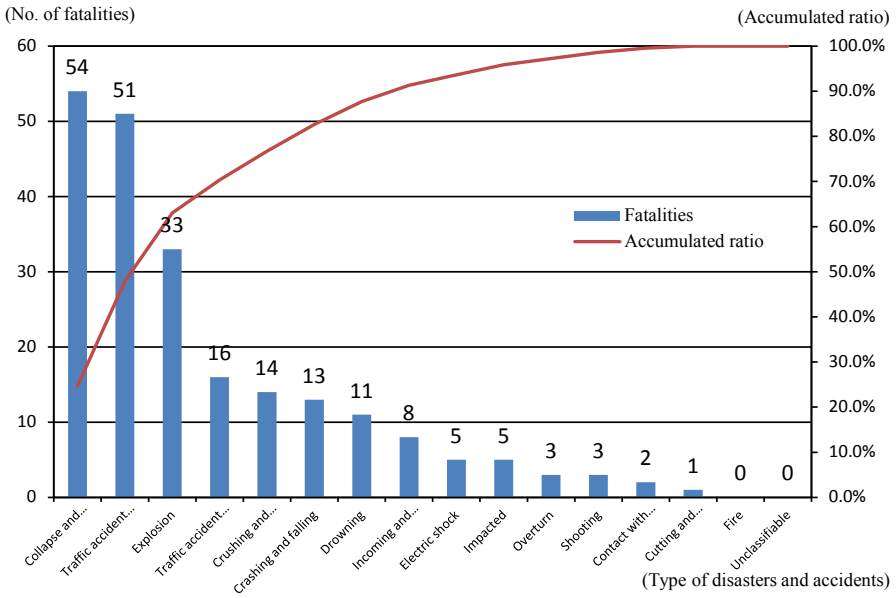


Figure 2-10 Pareto diagram: Fatalities by type of industrial accidents

(6) Accident occurrence state by causative agent (2000 to 2010)

When summarized according to the small classification of causative agent, the casualties indicate 70 persons (16.1%) for passenger cars, bus, motorcycle, 62 persons (14.3%) for truck, 59 persons (13.6%) for railway vehicles, 45 persons (10.3%) for ground and rock, 32 persons (7.4%) for other temporary facilities, buildings and structures, 29 persons (6.7%) for excavation machine, 25 persons (5.7%) for explosive materials, 16 persons (3.7%) for building and structure, and 14 persons (3.2%) for traveling crane. These nine causative agents account for 80.9% of the total casualties.

Table 2-19 Casualties by causative agent (small classification)

Causative agent (small classification)	Casualties	Component ratio	Accumulated ratio
Passenger car, bus, motorcycle	70	16.1%	16.1%
Truck	62	14.3%	30.3%
Railway vehicle	59	13.6%	43.9%
Ground and rock	45	10.3%	54.3%
Other temporary facilities, building, and structure	32	7.4%	61.6%
Excavation machine	29	6.7%	68.3%
Explosive material	25	5.7%	74.0%
Construction and structure	16	3.7%	77.7%
Traveling crane	14	3.2%	80.9%
Water	12	2.8%	83.7%
Other hazardous and harmful materials	12	2.8%	86.4%
Harmful materials	11	2.5%	89.0%
Scaffold	9	2.1%	91.0%
Land grading, transport and loading machine	5	1.1%	92.2%
Compaction machine	5	1.1%	93.3%
Unclassifiable	4	0.9%	94.3%
Other construction machines	3	0.7%	94.9%
Foundation work machine	3	0.7%	95.6%
Manual crane	3	0.7%	96.3%
Combustible gas	2	0.5%	96.8%
Opening	2	0.5%	97.2%
Arc welding equipment	1	0.2%	97.5%
Other materials	1	0.2%	97.7%
Other electric equipment	1	0.2%	97.9%
Loader	1	0.2%	98.2%
Packaged cargo	1	0.2%	98.4%
Staircase and pier	1	0.2%	98.6%
Circular saw machine	1	0.2%	98.9%
Slinging equipment	1	0.2%	99.1%
Metallic material	1	0.2%	99.3%
Support	1	0.2%	99.5%
Transmission and distribution line	1	0.2%	99.8%
Timer	1	0.2%	100.0%
Other causative agents	0	0.0%	100.0%
Other vehicles	0	0.0%	100.0%
Other power transport machines	0	0.0%	100.0%
Pressure vessel	0	0.0%	100.0%
Total (persons)	435		

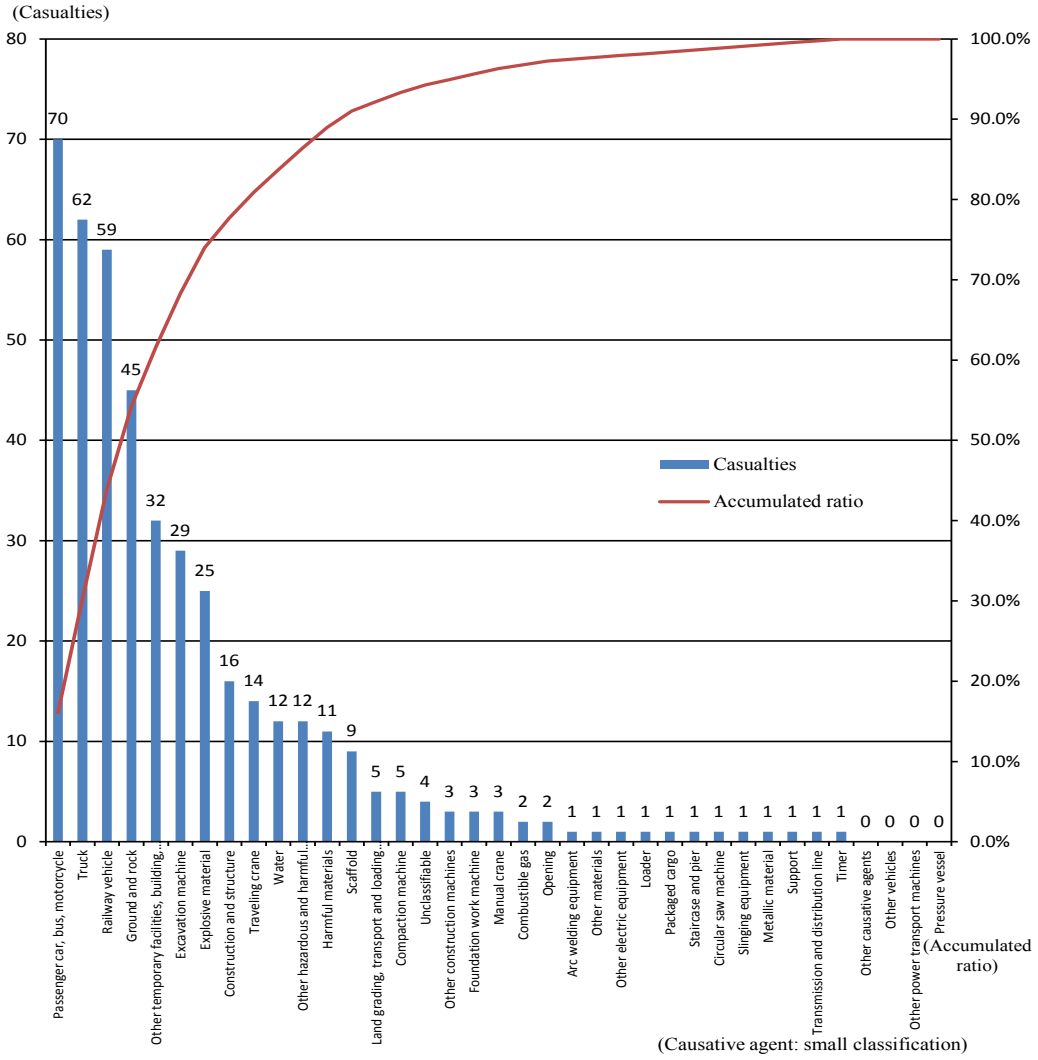


Figure 2-11 Pareto diagram: Casualties by causative agent (small classification)

When summarized according to small classification of causative agent, the fatalities indicate 43 persons (19.6%) for the ground and rock, 36 persons (16.4%) for truck, 27 persons (12.3%) for passenger car, bus, and motorcycle, 25 persons (11.4%) for explosive materials, 11 persons (5.0%) for water, 10 persons (4.6%) for other temporary facilities, building, and structure, eight persons (3.7%) for excavation machine, eight persons (3.7%) for scaffold, and seven persons (3.2%) for other hazardous and harmful materials. These nine causative agents account for 79.9% of the total fatalities.

Table 2-20 Fatalities by causative agent (small classification)

Causative agent (small classification)	Fatalities	Component ratio	Accumulated ratio
Ground and rock	43	19.6%	19.6%
Truck	36	16.4%	36.1%
Passenger car, bus, motorcycle	27	12.3%	48.4%
Explosive material	25	11.4%	59.8%
Water	11	5.0%	64.8%
Other temporary facilities, building, and structure	10	4.6%	69.4%
Excavation machine	8	3.7%	73.1%
Scaffold	8	3.7%	76.7%
Other hazardous and harmful materials	7	3.2%	79.9%
Traveling crane	5	2.3%	82.2%
Compaction machine	5	2.3%	84.5%
Land grading, transport, loading machine	4	1.8%	86.3%
Other construction machines	3	1.4%	87.7%
Construction and structure	3	1.4%	89.0%
Opening	2	0.9%	90.0%
Foundation work machine	2	0.9%	90.9%
Railway vehicle	2	0.9%	91.8%
Unclassifiable	3	1.4%	93.2%
Harmful materials	2	0.9%	94.1%
Arc welding equipment	1	0.5%	94.5%
Other materials	1	0.5%	95.0%
Other electric equipment	1	0.5%	95.4%
Loader	1	0.5%	95.9%
Combustible gas	1	0.5%	96.3%
Packaged cargo	1	0.5%	96.8%
Circular saw machine	1	0.5%	97.3%
Slinging equipment	1	0.5%	97.7%
Metallic material	1	0.5%	98.2%
Support	1	0.5%	98.6%
Manual crane	1	0.5%	99.1%
Transmission and distribution line	1	0.5%	99.5%
Timer	1	0.5%	100.0%
Other causative agents	0	0.0%	100.0%
Other vehicles	0	0.0%	100.0%
Other power transport machines	0	0.0%	100.0%
Pressure vessel	0	0.0%	100.0%
Staircase and pier	0	0.0%	100.0%
Total (persons)	219		

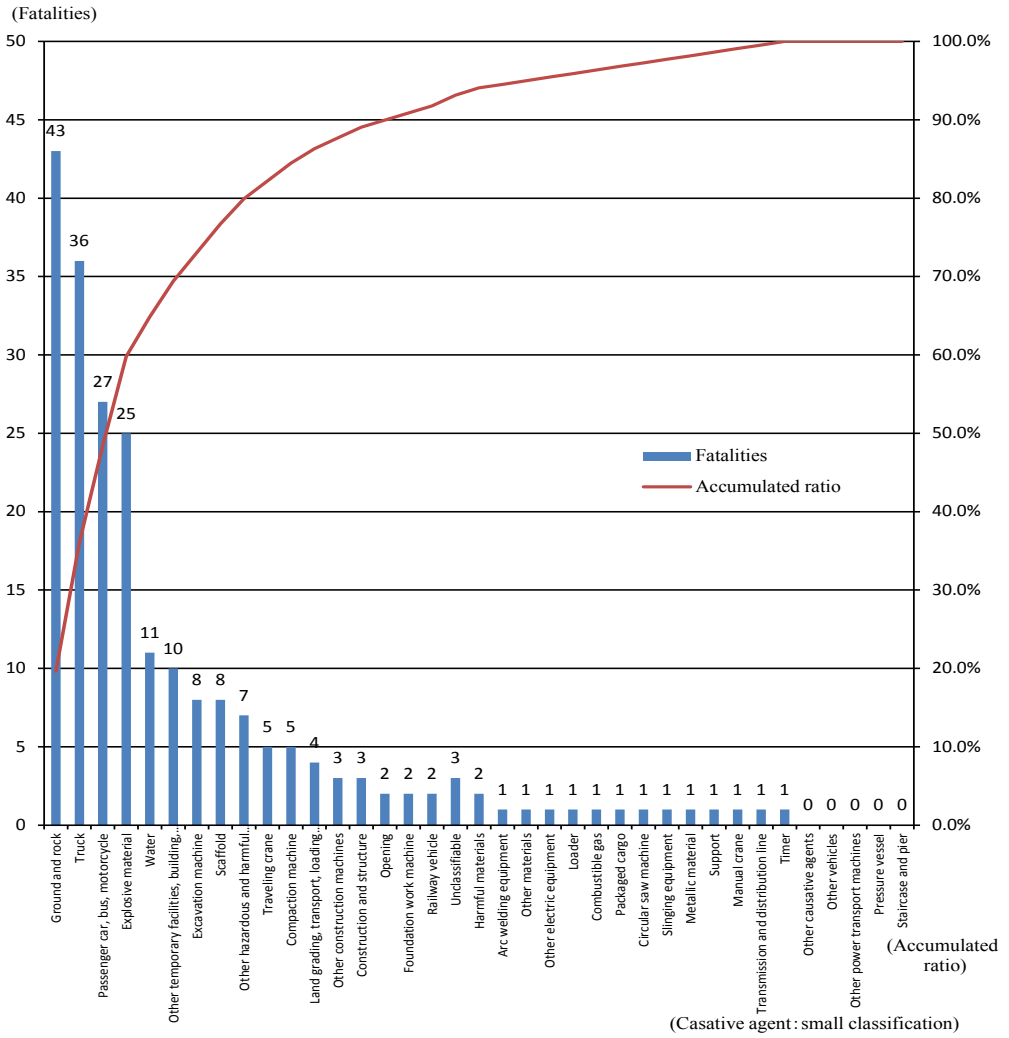


Figure 2-12 Pareto diagram: Fatalities by causative agent (small classification)

(7) Significant accident occurrence state (2000 to 2010)

As for the period of 2000-2010, 24 significant accidents (those involving three or more casualties) occurred, with the accumulated casualties being 310 persons and the accumulated fatalities being 118 persons. The projects through Grant Aid program indicate that the number of significant accidents is decreasing when compared with the first half of 2000. But there were two cases in 2006 and one case in 2010. In the case of projects under ODA Loans, 12 significant accidents occurred in past three years.

Table 2-21 Transition of the number of occurrence of significant accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	2		2
2001	1		1
2002	3		3
2003	1		1
2004	2		2
2005	0		0
2006	2		2
2007	0		0
2008	0	4	4
2009	0	5	5
2010	1	3	4
Total	12	12	24

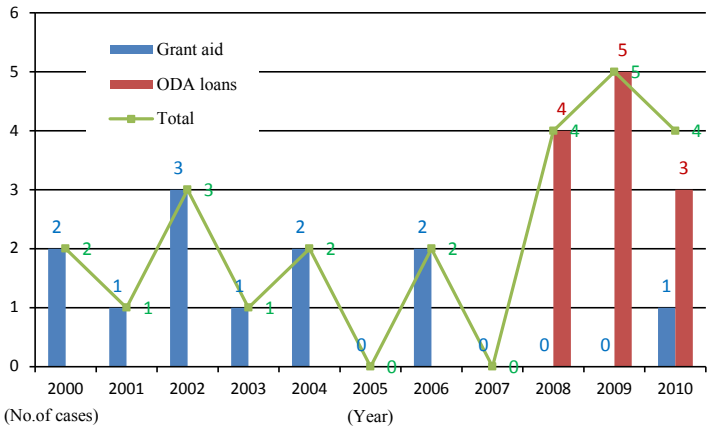


Figure 2-13 Transition of the number of occurrence of significant accidents

Table 2-22 Transition of casualties of significant accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	26		26
2001	7		7
2002	24		24
2003	11		11
2004	6		6
2005	0		0
2006	6		6
2007	0		0
2008	0	67	67
2009	0	66	66
2010	4	93	97
Total	84	226	310

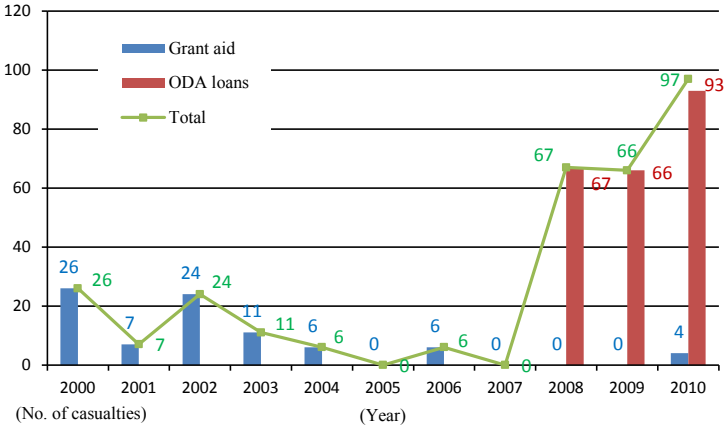


Figure 2-14 Transition of casualties of significant accidents

Table 2-23 Transition of fatalities of significant accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	7		7
2001	0		0
2002	11		11
2003	3		3
2004	4		4
2005	0		0
2006	2		2
2007	0		0
2008	0	47	47
2009	0	15	15
2010	2	27	29
Total	29	89	118

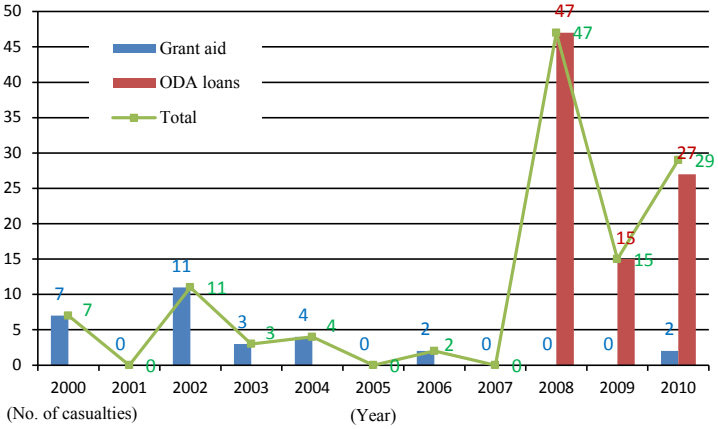


Figure 2-15 Transition of fatalities of significant accidents

When summarized according to the type of industrial accidents, the casualties of significant accidents indicate 86 persons (27.7%) for traffic accidents (road), 85 persons (27.4%) for traffic accident (others), 60 pe rsons (19.4%) for collapse and destruction, and 37 persons (11.9%) for explosion. These four types of industrial accidents account for 86.5% of the total casualties.

Table 2-24 Significant accidents and type of industrial accidents

Type of disasters and accidents	Casualties	Component ratio	Accumulated ratio
Traffic accident (road)	86	27.7%	27.7%
Traffic accident (others)	85	27.4%	55.2%
Collapse and destruction	60	19.4%	74.5%
Explosion	37	11.9%	86.5%
Incoming and downcoming	17	5.5%	91.9%
Overturn	10	3.2%	95.2%
Contact with harmful materials	9	2.9%	98.1%
Electric shock	3	1.0%	99.0%
Shooting	3	1.0%	100.0%
Total	310		

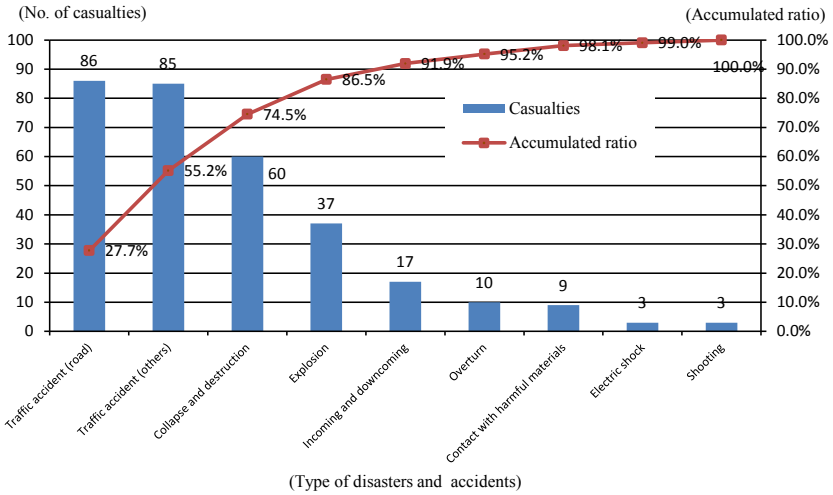


Figure 2-16 Pareto diagram: Significant accidents and type of industrial accidents

(8) Public accidents occurrence state (2000 to 2010)

During the period of 2000-2010, 55 public accidents (involving the third parties other than those concerned with the work) occurred, of which 14 cases are induced accidents. The induced accidents (those attributed to the third party) were occurring about once a year in average.

Table 2-25 Transition of the number of occurrences of public accidents

Year	No. of public accidents excluding induced accidents	No. of induced accidents	Total of public accidents
2000	1	2	3
2001	2	3	5
2002	4	0	4
2003	2	2	4
2004	0	1	1
2005	1	0	1
2006	3	0	3
2007	1	1	2
2008	9	1	10
2009	5	1	6
2010	13	3	16
Total	41	14	55

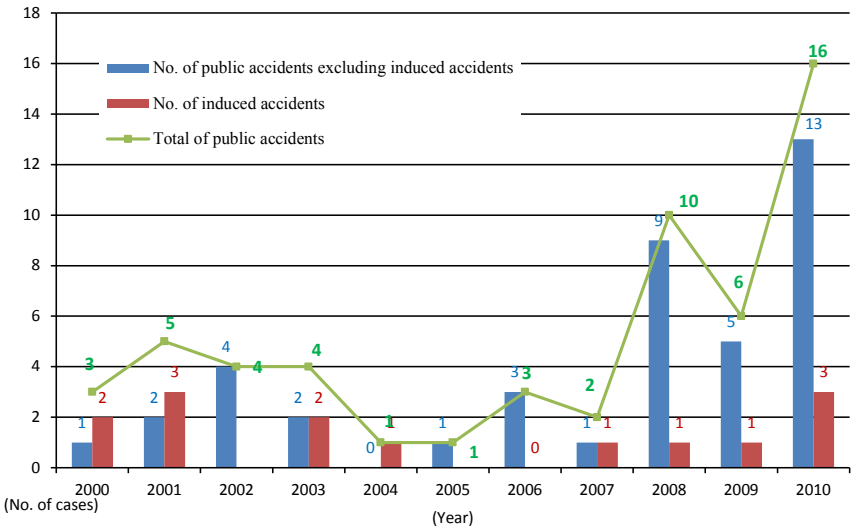


Figure 2-17 Transition of the number of occurrences of public accidents

Table 2-26 Transition of casualties of public accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	27		27
2001	12		12
2002	24		24
2003	15		15
2004	3		3
2005	1		1
2006	4		4
2007	3		3
2008	5	55	60
2009	0	41	41
2010	9	103	112
Total	103	199	302

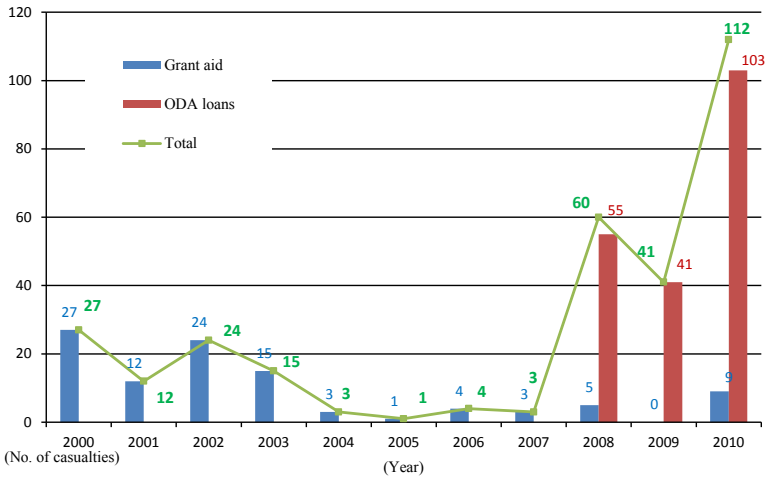


Figure 2-18 Transition of casualties of public accidents

Table 2-27 Transition of fatalities of public accidents

Year	Scheme		Total
	Grant aid	ODA loans	
2000	8		8
2001	5		5
2002	12		12
2003	7		7
2004	2		2
2005	1		1
2006	1		1
2007	2		2
2008	5	43	48
2009	0	11	11
2010	4	37	41
Total	47	91	138

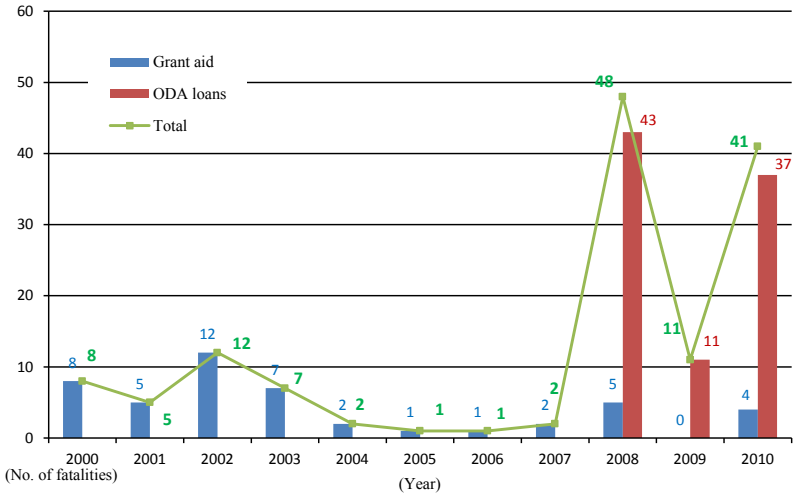


Figure 2-19 Transition of fatalities of public accidents

Table 2-28 Public accidents and type of industrial accidents

Type of disasters and accidents	Casualties	Component ratio	Accumulated ratio
Traffic accident (road)	111	36.8%	36.8%
Traffic accident (others)	87	28.8%	65.6%
Collapse and destruction	39	12.9%	78.5%
Explosion	25	8.3%	86.8%
Incoming and downcoming	15	5.0%	91.7%
Drowning	10	3.3%	95.0%
Contact with harmful substance	9	3.0%	98.0%
Shooting	3	1.0%	99.0%
Crashing and falling	2	0.7%	99.7%
Impacted	1	0.3%	100.0%
Total	302		

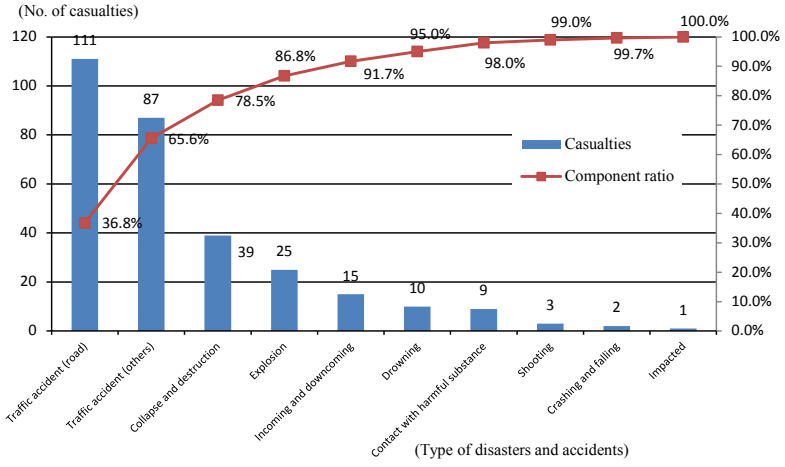


Figure 2-20 Pareto diagram: Public accidents and type of industrial accidents

2-2 Trend analysis of industrial accidents

2-2-1 Outline of trend analysis of industrial accidents

(1) Indices

To understand the trend of industrial accidents, five basic indices as shown below are set for analysis of the trend.

Basic index 1	No. of industrial accident occurring in the year 2010
Basic index 2	Casualties of the year 2010
Basic index 3	Fatalities of the year 2010
Basic index 4	Significant accidents in the year 2010
Basic index 5	Public accidents in the year 2010

In addition, from viewpoints of "scheme," "category of work," "type of industrial accidents," and "by causative agent," industrial accident indices as follows are set for analysis of respective trends.

Industrial accident index 1	Annual average of occurrences (2008 to 2010)
Industrial accident index 2	Average casualties per case (2008 to 2010)
Industrial accident index 3	Average casualties per case by category of work
Industrial accident index 4	Average casualties per case by type of industrial accidents
Industrial accident index 5	Average casualties per case by type of causative agent

Finally, focusing on "significant accidents" and "public accidents" that may cause social and economic loss and other substantial influences, significant accident indices and public accident indices as follows are set for analysis of respective trends.

Significant accident index 1	Annual average number of occurrences of significant accidents (2008 to 2010)
Significant accident index 2	Average casualties per case of significant accident (2008 to 2010)
Public accident index 1	Annual average number of occurrences of public accidents (2008 to 2010)
Public accident index 2	Average casualties per case of public accidents (2008 to 2010)
Public accident index 3	Annual average casualties of children (2008 to 2010)

<Indices>

As described in "2-1-2 Targets and considerations of statistical survey," this survey cannot identify the severity rate and frequency rate. Accordingly, the index values are based on the casualties per case. In this sense, due considerations must be paid on the fact the index values do not refer directly to the probability or severity of industrial accidents and that simple comparison of numerical values between Grant Aid and ODA Loan Projects cannot be evaluated.

(2) Trend analysis by type of industrial accidents

Cross tabulation is made on the type of industrial accidents and the causative agents from the statistical result, and the relationship between the types of industrial accidents and the causative agent is identified and analyzed.

2-2-2 Trend analysis of industrial accidents

(1) Basic index 1: No. of industrial accidents occurring in the year 2010

a. The number of industrial accidents occurring in the year 2010 was 35 (reference value:30.5 cases)
b. The number of industrial accidents occurring in Grant Aid Projects in the year 2010 was 13 (reference value: 6.0 cases)
c. The number of industrial accidents occurring in projects under ODA Loans in the year 2010 was 22 (reference value: 24.5 cases).

a. The reference value for the number of industrial accidents occurring in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.

b. The reference value for the number of industrial accidents occurring in Grant Aid Projects in the year 2010 is the two-year average of cases occurring in Grant Aid Projects for 2008-2009.

c. The reference value for the number of industrial accidents occurring in projects under ODA Loans in the year 2010 is the two-year average of cases occurring in projects under ODA Loans for 2008-2009.

(2) Basic index 2: Casualties in the year 2010

a. The casualties in the year 2010 amounted to 125 persons (reference value: 93 persons)
b. The casualties in Grant Aid Projects in the year 2010 amounted to 15 persons (reference value:6.5 persons)
c. The casualties of projects under ODA Loans in the year 2010 amounted to 110 persons (reference value:86.5 persons)

a. The reference value for the casualties in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.

b. The reference value for the casualties of Grant Aid Projects in the year 2010 is the two-year average of cases occurring in Grant Aid Projects for 2008-2009.

c. The reference value for the fatalities of projects under ODA Loans in the year 2010 is the two-year average of cases occurring in projects under ODA Loans for 2008-2009.

(3) Basic index 3: Fatalities in the year 2010

a. The fatalities in the year 2010 amounted to 49 persons (reference value: 52.5 persons)
b. The fatalities in Grant Aid Projects in the year 2010 amounted to 7 persons (reference value: 5.5 persons)
c. The fatalities of projects under ODA Loans in the year 2010 amounted to 42 persons (reference value: 47 persons)

a. The reference value for the fatalities in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.

b. The reference value for the fatalities in the year 2010 is the two-year average of cases occurring in Grant Aid Projects for 2008-2009.

c. The reference value for the fatalities of projects under ODA Loans in the year 2010 is the two-year average of cases occurring in projects under ODA Loans for 2008-2009.

(4) Basic index 4: Significant accidents in the year of 2010

a. The number of significant accidents occurring in the year 2010 amounted to 4 cases (reference value: 4.5 cases)
b. The casualties of significant accidents in the year 2010 amounted to 97 persons (reference value: 66.5 persons)
c. The fatalities of significant accidents in the year 2010 amounted to 29 persons (reference value: 31 persons)

a. The reference value for the number of significant accidents occurring in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.
b. The reference value for the casualties of significant accidents in the year 2010 is the two-year average of cases with casualties occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.
c. The reference value for the fatalities of significant accidents in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.

(5) Basic index 5: Public accidents in the year 2010

a. The number of public accidents occurring in the year 2010 amounted to 16 cases (reference value: 8.0 cases)
b.The casualties of public accidents in the year 2010 amounted to 112 persons (reference value: 50.5 persons)
c. The fatalities of public accidents in the year 2010 amounted to 41 persons (reference value: 29.5 persons)

a. The reference value for the number of public accidents occurring in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.
b. The reference value for the casualties of public accidents in the year 2010 is the two-year average of cases with casualties occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.
c. The reference value for the fatalities of public accidents in the year 2010 is the two-year average of cases occurring in Grant Aid Projects and those under ODA Loans for 2008-2009.

(6) Industrial accident index 1: Annual average of occurrences (2008 to 2010)

a. Annual average number of occurrences in the Grant Aid Projects: 8.3 cases
b. Annual average of occurrences in projects under ODA Loans: 23.7 cases

Table 2-29 Number of annual average occurrences

Period	No. of occurrences		Annual average number of occurrences	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	74 cases		6.7 cases	
Eight years of 2000-2007	49 cases		6.1 cases	
Three years of 2008-2010	25 cases	71 cases	8.3 cases	23.7 cases

(7) Industrial accident index 2: Average casualties per case (2008 to 2010)

a. Average casualties per case in Grant Aid Projects: 1.1 persons.
b. Average casualties per case in projects under ODA Loans: 4.0 persons

Table 2-30 Average casualties per case

Period	Casualties		Average casualties per case	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	152 persons		2.1 persons	
Eight years of 2000-2007	124 persons		2.5 persons	
Three years of 2008-2010	28 persons	283 persons	1.1 persons	4.0 persons

(8) Industrial accident index 3: Average casualties per case by category of work

a. The average casualties per case by category of work in Grant Aid Projects are increasing in the order of (1) school, (2) road, and (3) water and sewerage.
b. The average casualties per case by category of work in projects under ODA Loans are increasing in the order of (1) railway, (2) road, and (3) water and sewerage.

The period concerned is from 2000 to 2010 in Grant Aid Projects and from 2008 to 2010 in projects under ODA Loans.

Table 2-31 Average casualties per case by category of work

Category of work	Casualties		No. of occurrences		Average casualties per case	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans	Grant Aid	ODA Loans
Road	46 persons	110 persons	31	18	②1.5 persons	②6.1 persons
Railway	0 persons	111 persons	0	13	0 persons	①8.5 persons
Water and sewerage	26 persons	25 persons	17	14	②1.5 persons	③1.8 persons
School	35 persons	1 persons	7	1	①5.0 persons	1.0 persons

(9) Industrial accident index 4: Average casualties per case by type of industrial accidents

a. The average casualties per case in Grant Aid Projects by type of industrial accidents in Grant Aid Projects are increasing in the order of ① traffic accident (road), ② explosion, ③ incoming and downcoming.
b. The average casualties per case by type of industrial accidents in projects under ODA Loans are increasing in the order of ① explosion, ② traffic accident (others), ③ collapse and destruction.

The period concerned is from 2000 to 2010 in Grant Aid Projects and from 2008 to 2010 in projects under ODA Loans.

Table 2-32 Average casualties per case by type of industrial accidents

Type of industrial accidents	Casualties		No. of occurrences		Average casualties per case	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans	Grant Aid	ODA Loans
Traffic accident (road)	103 persons	14 persons	31	6	① 3.3 persons	2.3 persons
Traffic accident (others)	5 persons	90 persons	5	8	1.0 persons	②111.3 persons
Collapse and destruction	7 persons	64 persons	6	8	1.2 persons	③ 8.0 persons
Explosion	2 persons	37 persons	1	2	② 2.0 persons	① 18.5 persons
Incoming and downcoming	4 persons	20 persons	3	8	③ 1.3 persons	2.5 persons
Crashing and falling	6 persons	11 persons	6	12	1.0 persons	0.9 persons

(10) Industrial accident index 5: Average casualties per case by causative agent

a. The average casualties per case by causative agent in Grant Aid Projects are increasing in the order of ① passenger cars, bus, motorcycle, ② truck, ③ ground and rocks, and ④ other temporary facilities, buildings, and structures, and ④ traveling crane.
b. The average casualties per case by causative agent in projects under ODA Loans are increasing in the order of ① railway vehicles, ② explosive materials, ③ ground and rocks, ④other temporary facilities, buildings and structures, and ⑤ excavation machines.

The period concerned is from 2000 to 2010 in Grant Aid Projects and from 2008 to 2010 in projects under ODA Loans.

Table 2-33 Average casualties per case by causative agent

Causative agent	Casualties		No. of occurrences		Average casualties per project	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans	Grant Aid	ODA Loans
Passenger cars, buses, motorcycles	66 persons	4 persons	20	4	①3.3 persons	1.0 persons
Trucks	47 persons	15 persons	19	7	②2.5 persons	2.1 persons
Railway vehicles	0 persons	59 persons	0	1	0 persons	①59.0 persons
Ground, rocks	5 persons	40 persons	4	4	③1.3 persons	③10.0 persons
Other temporary facilities, buildings, structures	1 persons	31 persons	1	4	④1.0 persons	④ 7.8 persons
Excavation machines	0 persons	29 persons	0	4	0 persons	⑤ 7.3 persons
Explosive materials	0 persons	25 persons	0	1	0 persons	②25.0 persons
Buildings, structures	0 persons	16 persons	0	3	0 persons	5.3 persons
Traveling cranes	6 persons	8 persons	6	7	④1.0 persons	1.1 persons

2-2-3 Trend analysis of significant accidents

(1) Significant accident index 1: Annual average number of occurrences of significant accidents (2008 to 2010)

a. Annual average number of occurrences of significant accidents in Grant Aid Projects is 0.3 cases.
b. Annual average number of occurrences of significant accidents in projects under ODA Loans is 4.0 cases.

Table 2-34 Annual average numbers of occurrences of significant accidents

Period	No. of occurrences of significant accidents		Annual average number of occurrences	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	12 cases		1 case	
Eight years of 2000-2007	11 cases		1.4 cases	
Three years of 2008 to 2010	1 case	12 cases	0.3 cases	4.0 cases

(2) Significant accident index 2: Average casualties of significant damages per case (2008 to 2010)

a. Average casualties of significant accidents per case in Grant Aid Projects: 4.0 persons
b. Average casualties of significant accidents per case in ODA Loan Projects: 18.8 persons

Table 2-35 Average casualties of significant accidents per case

Period	Casualties of significant accidents		Average casualties per case	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	81 persons		7.0 persons	
Eight years of 2000-2007	80 persons		7.3 persons	
Three years of 2008 to 2010	4 persons	226 persons	4.0 persons	18.8 persons

2-2-4 Trend analysis of public accidents

(1) Public accident index 1: Annual average number of occurrences of public accidents (2008 to 2010)

a. Annual average number of occurrences of public accidents in Grant Aid Projects: 3.3 cases
b. Annual average number of occurrences of public accidents in ODA Loan Projects: 7.3 cases
c. Regarding induced accidents, an average of around one case of accident has occurred per year commonly for all schemes.

Public accidents as dealt with here include induced accidents.

Table 2-36 Annual average number of occurrences of public accidents

Period	No. of occurrences of public accidents		Annual average number of occurrences	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	33 cases		3.0 cases	
Eight years of 2000-2007	23 cases		2.9 cases	
Three years of 2008 to 2010	10 cases	22 cases	3.3 cases	7.3 cases

Table 2-37 No. of occurrences of induced accidents and public accidents by scheme

	Grant Aid		ODA Loans	
	No. of induced accidents	No. of public accidents excluding induced accidents	No. of induced accidents	No. of public accidents excluding induced accidents
2000	2	1		
2001	3	2		
2002		4		
2003	2	2		
2004	1	0		
2005		1		
2006		3		
2007	1	1		
2008	1	4		5
2009			1	5
2010	2	3	1	10
Total	12	21	2	20

(2) Public accident index 2: Average casualties of public accidents per case (2008 to 2010)

a. Annual average casualties of public accidents in Grant Aid Projects: 1.4 persons
b. Annual average casualties of public accidents in ODA Loan Projects: 9.0 persons
c. The casualties of public accidents account for about 70% of the casualties of all of industrial accidents.

Public accidents as dealt with here include induced accidents. The indicated casualties refer to the third party only other than those concerned with the work.

Table 2-38 Average casualties of public accidents per case

Period	No. of casualties of public accidents		Average number of casualties per case	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	103 cases		3.1 cases	
Eight years of 2000-2007	89 cases		3.9 cases	
Three years of 2008 to 2010	14 cases	199 cases	1.4 cases	9.05 cases

(3) Public accident index 3: Annual average casualties of children (2008 to 2010)

a. Annual average casualties of children in Grant Aid Projects: 1.3 persons
b. Annual average casualties of children in ODA Loan Projects: 3.3 persons

Children as dealt with here refer to the third party younger than 18 years old other than those concerned with the work.

Table 2-39 Transition of casualties and fatalities of children

Year	Grant Aid		ODA Loans		Total of casualties of children	Total of fatalities of children
	Casualties of children	Fatalities of children	Casualties of children	Fatalities of children		
2000	0				0	
2001	0				0	
2002	1	1			1	1
2003	1	1			1	1
2004	0				0	
2005	0				0	
2006	1				1	
2007	0				0	
2008	2	2	1	1	3	3
2009	0		2	2	2	2
2010	2	1	7	5	9	6
Total	7	5	10	8	17	13

Table 2-40 Annual average casualties of children

Period	Casualties of children		Annual average casualties of children	
	Grant Aid	ODA Loans	Grant Aid	ODA Loans
11 years of 2000-2010	7 persons		0.6 persons	
Eight years of 2000-2007	3 persons		0.4 persons	
Three years of 2008 to 2010	4 persons	10 persons	1.3 persons	3.3 persons

2-2-5 Trend analysis by type of industrial accidents

(1) Analysis of "type of industrial accidents – causative agent" based on the casualties

The relationship between nine small classification items of causative agents (small classification), which account for 80.9% of the total casualties of 2000 to 2010, and causative agent of items with five or more casualties and the type of industrial accidents is shown below.

Table 2-41 Relationship between causative agents and types of industrial accidents (based on casualties)

Causative agents	Principal types of industrial accidents
Passenger cars, bus, motorcycle	○ Traffic accident (road) 96%
Truck	○ Traffic accident (road) 77%
Railway vehicle	○ Traffic accident (others) 100%
Ground, rock	○ Collapse, destruction 98%
Other temporary facilities, buildings, structures	○ Collapse, destruction 69%
Excavation machine	○ Traffic accident (others) 90%
Explosive materials	○ Explosion 100%
Buildings, structures	○ Incoming and downcoming 88%
Traveling crane	○ Electric shock 50%, ◆ The remaining half is due to multiple types.
Water	○ Drowning 83%
Other hazardous and harmful substances	○ Explosion 100%
Harmful substances	○ Contact with harmful substances 100%
Scaffold	○ Crushing, falling 89%

The relationship between six items of type of industrial accidents, which account for 83.4% of the total casualties of 2000 to 2010, a nd type of industrial accidents of items with five or more casualties and the causative agent is shown below.

Table 2-42 Relationship between types of industrial accidents and the causative agent (based on the casualties)

Type of industrial accidents	Principal causative agents
Traffic accidents (road)	○ Passenger cars, bus, motorcycle 57%, ○ Truck 41%
Traffic accident (others)	○ Railway vehicles 62%, ○ Excavation machine 27%
Collapse, destruction	○ Ground, rock 62%, ○ Other temporary facilities, buildings, and structures 31%
Explosion	○ Explosive materials 64%, ○ Other hazardous and harmful substances 31%
Incoming and downcoming	○ Buildings and structures 58%, ◆ The remaining cases are due to multiple causative agents.
Crashing, falling	○ Scaffold 47%, ◆The remaining cases are due to multiple causative agents.
Crushing, trapping	○ Truck 33%, ◆The remaining cases are due to multiple causative agents
Overturn	○ Other temporary facilities, buildings, and structures 53%, ◆The remaining cases are due to multiple causative agents.
Electric shock	○ Traveling crane 58%, ◆The remaining cases are due to multiple causative agents
Drowning	○ Water 90%
Contact with harmful substances	○ Harmful substances 100%

Table 2-43 Cross tabulation Type of industrial accidents – Causative agents (based on casualties)

Casualties	Type of disasters and accidents																
Causative agents (small classification)	Traffic accident (road)	Traffic accident (others)	Collapse and destruction	Explosion	Incoming and downcoming	Crashing and falling	Crushing and trapping	Overturn	Electric shock	Drowning	Contact with harmful substances	Impacted	Shooting	Cutting and abrasion	Fire	Unclassifiable	Total
Passenger cars, bus, motorcycle	67	2				1											70
Truck	48	5				1	5	3									62
Railway vehicle		59															59
Ground, rock			44		1												45
Other temporary facilities, buildings, and structures			22			1		7		1		1					32
Excavation machine		26	1				1					1					29
Explosive materials				25													25
Buildings, structures			1		14	1											16
Traveling crane	2				3		2		7								14
Water							2			10							12
Other hazardous and harmful materials				12													12
Harmful materials											11						11
Scaffold						8			1								9
Land grading, transport, loading machine		1					2	2									5
Compacting equipment		2				1	1	1									5
Unclassifiable													4				4
Other construction machines							1					2				0	3
Foundation work machine					1				2								3
Manual crane					3												3
Combustible gas				2													2
Opening						2											2
Arc welding machine									1								1
Other materials			1														1
Other electric equipment									1								1
Loader							1										1
Packaged cargo								0				1					1
Staircase, piers						1											1
Circular sawing machine														1			1
Slinging equipment					1												1
Metallic material			1														1
Support			1														1
Transmission/distribution wire						1											1
Timber					1												1
Other causative agents															0		0
Other vehicles						0											0
Other power transport machine		0															0
Pressure vessel															0		0
Total	117	95	71	39	24	17	15	13	12	11	11	5	4	1	0	0	435

(2) Analysis of types of industrial accidents – causative agents based on fatalities

The relationship between nine small classification items of causative agents, which account for 80.3% of the total fatalities of 2000 to 2010, and causative agent of items with five or more fatalities and the type of industrial accidents is shown below.

Table 2-44 Relationship between the causative agent and type of industrial accidents (based on the fatalities)

Causative agents	Principal types of industrial accidents
Ground and rock	○ Collapse, destruction 98%
Truck	○ Traffic accident (road) 69%
Passenger cars, bus, motorcycle	○Traffic accident (road) 93%
Explosive materials	○ Explosion 100%
Water	○ Drowning 91%
Other temporary facilities, buildings, structures	○ Collapse and destruction 70%
Excavation machine	○ Traffic accident (others) 63%
Scaffold	○ Crushing and falling 88%
Other hazardous and harmful substances	○ Explosion 100%

The relationship between six items of type of industrial accidents, which account for 83.0% of the total fatalities of 2000 to 2010, and type of industrial accidents with five or more fatalities and the causative agents is shown below.

Table 2-45 Relationship between types of industrial accidents and the causative agents (based on fatalities)

Type of industrial accidents	Principal causative agents
Collapse, destruction	○ Ground and rock 78%
Traffic accident (road)	○Truck 49%, ○ Passenger cars, bus, motorcycle 49%
Explosion	○ Explosive materials, 76%
Traffic accident (others)	○ Excavation machine 31%, ◆The remaining cases are due to multiple causative agents
Crushing, trapping	○ Tuck 36%, ◆The remaining cases are due to multiple causative agents
Crashing, falling	○ Scaffold 54%, ◆The remaining cases are due to multiple causative agents
Drowning	○ Water 91%

Table 2-46 Cross tabulation Types of industrial accidents – causative agents (based on fatalities)

Fatalities	Type of disasters and accidents																
Causative agents (small classification)	Collapse and destruction	Traffic accident (road)	Explosion	Traffic accident (others)	Crushing and trapping	Crashing and falling	Drowning	Incoming and downcoming	Electric shock	Impacted	Overturn	Shooting	Contact with harmful substances	Cutting and abrasion	Fire	Unclassifiable	Total
Ground, rock	42							1									43
Truck		25		4	5	1					1						36
Passenger cars, bus, motorcycle		25		2		0											27
Explosive materials			25														25
Water					1		10										11
Other temporary facilities, buildings, and structures	7					1	1			1	0						10
Excavation machine	1			5	1					1							8
Scaffold						7			1								8
Other hazardous and harmful materials			7														7
Traveling crane		1			2			1	1								5
Compacting equipment				2	1	1					1						5
Land grading, transport, loading machine				1	2						1						4
Other construction machines					1					2						0	3
Buildings, structures	1					0		2									3
Opening						2											2
Foundation work machine								1	1								2
Railway vehicle				2													2
Unclassifiable												3					3
Harmful materials													2				2
Arc welding machine									1								1
Other materials	1																1
Other electric equipment									1								1
Loader					1												1
Combustible gas			1														1
Packaged cargo										1	0						1
Circular sawing machine														1			1
Slinging equipment								1									1
Metallic material	1																1
Support	1																1
Manual crane								1									1
Transmission/distribution wire						1											1
Timber								1									1
Other causative agents															0		0
Other vehicles						0											0
Other power transport machine				0													0
Pressure vessel															0		0
Staircase, piers						0											0
Total	54	51	33	16	14	13	11	8	5	5	3	3	2	1	0	0	219

2-3 Summary of statistics and analyses of industrial accidents

(1) Trends of Industrial Accidents in 2010

The number of occurrences of industrial accidents of 2010 are 35 cases, increasing when compared with 30.5 cases of past two years of 2008 to 2009.

The casualties are 125 persons, increasing when compared with the annual average of 93 persons (reference) for past two years of 2008 to 2009). The fatalities are 49 persons, decreasing when compared with the annual average of 52.5 persons (reference) for past two years of 2008 to 2009.

The number of occurrences of significant accidents are four cases, decreasing when compared with 4.5 cases for past two years of 2008 to 2009. These significant accidents brought about the casualties of 97 persons and the fatalities of 29 persons, with the casualties increasing and the fatalities decreasing. Namely, as the average reference, the casualties were 66.5 persons and the fatalities 31.0 persons for past two years of 2008 to 2009.

The number of occurrences of public accidents are 16 cases, increasing when compared with 8.0 cases (annual average reference) of past two years of 2008 to 2009. These public accidents brought about the casualties of 112 persons and the fatalities of 41 persons, both increasing when compared with the casualties of 50.5 persons and the fatalities of 29.5 persons (annual average reference) of past two years of 2008 to 2009.

(2) Trends of industrial accidents for nearest three years of 2008 to 2010 (Grant Aid Projects)

Since the data on industrial accidents for ODA Loan Projects is limited to three years of 2008 to 2010, this section deals only with the trends of those for Grant Aid Projects.

The annual average number of occurrence of industrial accidents for the period from 2008 to 2010 for Grant Aid Projects are 8.3 cases, increasing when compared with the average number of 6.1 for past eight years (2000 to 2007) prior to 2008.

Similarly, the average casualties per case are 1.1 persons, decreasing when compared with the average casualties per case (2.5 persons) for past eight years (2000 to 2007) prior to 2008.

(3) Trends of significant accidents for nearest three years of 2008 to 2010 (Grant Aid Projects)

Since the data on industrial accidents for ODA Loan Projects is limited to three years of 2008 to 2010, this section deals only with the trends of those for Grant Aid Projects.

The annual average number of occurrences of significant accidents of the period from 2008 to 2010 for Grant Aid Projects is 0.3 cases, decreasing when compared with 1.4 cases for past eight years (2000 to 2007) prior to 2008.

Similarly, the average casualties per case are 4.0 persons, decreasing when compared with 7.3 persons (average casualties) for past eight years (2000 to 2007) prior to 2008.

(4) Trends of public accidents for nearest three years of 2008 to 2010 (Grant Aid Projects)

Since the data on industrial accidents for ODA Loan Projects is limited to three years of 2008 to 2010, this section deals only with the trends of those for Grant Aid Projects.

The annual average number of occurrence of public accidents from 2008 to 2010 for Grant Aid Projects is 3.3 cases, increasing when compared with 2.9 cases (average) for past eight years (2000 to 2007) prior to 2008.

Similarly, the average casualties per case are 1.4 persons, decreasing when compared with 3.9 persons

(average) per case for past eight years (2000 to 2007) prior to 2008. The average casualties of children (the third party younger than 18 years old other than those concerned with the work) are 1.3 persons, increasing when compared with 0.4 persons (average) for eight years (2000 to 2007) prior to 2008.

(5) Trends of the average casualties per case by category of work

<Grant Aid Projects (Period: 2000 to 2010)>

Viewing the trends of industrial accidents by category of work in terms of the average casualties per case results in 5.0 persons for school, 1.5 persons for road, and 1.5 persons for water and sewerage. Industrial accidents for school may be broken down to three cases for traffic accident (road), one case for crashing and falling, one case for collapse and destruction, and one case for contact with harmful substances.

<ODA Loan Projects (period: 2008 to 2010)>

Similarly, the trend for ODA Loan Projects shows 8.5 persons for railway, 6.1 persons for road, and 1.8 persons for water and sewerage. Industrial accidents for railway may be broken down to three cases for crashing and falling, three cases for incoming and downcoming, two cases for impacted, two cases for collapse and destruction, one case of traffic accident (others), one case for cutting and abrasion, and one case for overturn.

(6) Trend of the average casualties per case by type of industrial accidents

<Grand aid projects (period: 2000 to 2010)>

Viewing the trends of industrial accidents by type in terms of the average casualties per case results in 3.3 persons for traffic accident (road), 2.0 for explosion, and 1.3 persons for incoming and downcoming. Specific cases of industrial accidents as classified into traffic accidents (road) are as follows:

- Minor contact of an ordinary small bus to a parked construction vehicle on the local street (23 casualties)
- Minor contact of an ordinary vehicles to a construction vehicle on the local street (three casualties)
- Collision of a construction vehicle transporting materials with a large trailer on the local street (11 casualties)
- Collision of a following ordinary vehicle to a construction vehicle that applied sudden brake to avoid a dog rushing suddenly into the local street (10 casualties)
- Collision of a trailer transporting materials with blown-out tires and running into the opposite lane with an ordinary running vehicles on the local road (11 casualties)

<ODA Loan Projects (period: 2008-2010)>

Similarly, the trend for ODA Loan Projects shows 18.5 persons for explosion, 11.3 persons for traffic accident (others), and 8.0 persons for collapse and destruction. Specific cases of industrial accidents classified into explosion are as follows:

- Claymore mine detonated during traveling with four-wheeled tractor-trailer within the project site (12 casualties)
- Blasting powder detonated in the common powder storage of the police station distanced from the project site (25 casualties)

(7) Trends of the average casualties per case by causative agent

<Grand aid projects (period: 2000 to 2010)>

Viewing the trends of industrial accidents by causative agent as the average casualties per case results in 3.3 persons for passenger cars, bus, motorcycle, 2.5 persons for truck, and 1.3 persons for ground and rock. Specific cases of industrial accidents classified into passenger cars, bus, and motorcycle are as follows:

- Minor contact of a small bus to a parked construction vehicle on the local street (23 casualties)

- Collision of a following ordinary vehicle to a construction vehicle that applied sudden brake to avoid a dog rushing suddenly into the local street (10 casualties)
- Traffic accident of a vehicle on which the persons concerned with the work were riding with an ordinary vehicle on the local street (7 injured)
- Collision of work-related vehicle with the donkey cart in the front because of dazzling lights of oncoming large truck on the local street (four casualties)
- Collision of a vehicle on which the persons concerned with the work were riding with an ordinary vehicles running out of the opposite lane (three casualties)

<ODA Loan Projects (period: 2008 to 2010)>

Similarly, the trend for ODA Loan Projects indicate 59.0 persons for railway vehicles, 25.0 persons for explosive materials, and 10.0 persons for ground and rock. Specific cases of industrial accidents classified into railway vehicles are as follows:

- Rear-end collision of the metropolitan commuter train to the long-distance train in the train route section to be electrified under ODA Loan Project (59 casualties)

(8) Trends of the type of industrial accidents, and causative agent

By type of industrial accidents, the casualties are ranked as follows: 117 for traffic accident (road), 95 persons for traffic accident (others) and 71 persons for collapse and destruction. Principal causative agents are as follow:

<Principal causative agents for traffic accident (road)>

Principal causative agents for traffic accidents (road) are 57% for passenger cars, bus, motorcycle and 41% for truck. Since the specific cases of industrial accidents are already dealt with previously, they are not discussed here.

<Principal causative agents for traffic accident (others)>

Principal causative agents for traffic accident (others) are 62% for railway vehicles and 27% for excavation machine. Specific cases of industrial accidents classified into railway vehicles are already dealt with previously, they are not discussed here. Some examples of cases for excavation machine are shown below:

- Contact of the shovel car arm with the nearby transmission line during road excavation work, followed by crushing of poles and street lamps, resulting in the death of the operator (one fatality)
- Excavation machine contacting the worker during excavation for earth retaining, resulting in the death of this worker (one fatality)

<Principal causative agent for collapse and destruction>

Principal causative agents for collapse and destruction are 62% for ground and rock and 31% for other temporary facilities, building, and structure. Specific cases of industrial accidents for each of them are shown below:

Ground and rock

- Large landslide collapse (at the accident site, the civil engineering work related to the project is not yet started) (38 fatalities)
- During excavation for earth retaining, side soil collapsed resulting in the death of a worker who failed to escape (one fatality)
- Local worker dead by falling rocks (one fatality)

Other temporary facilities, building, and structure

- Worker rides onto the top of small concrete mixing plant to repair the failure, accidentally falling into the plant (one fatality)

(9) Summary

In Japan, the frequency rate (frequency of occurrence of industrial accidents) and severity rate (seriousness of industrial accidents) are used as indices of industrial accidents. Since the data necessary for calculation could not be obtained in this study, the trend analysis was made on the basis of the casualties per case of project. If the severity rate and frequency rate are to be used in the future as basic indices, it is necessary to make it mandatory to report regularly the total actual working hours, the casualties of industrial accidents, and total number of days of loss of work for each project. Though this is considered effective for establishing awareness of the safety, specific measures are not dealt with here.

For the benefit of convenience, this study summarized data for each of grand aid and ODA Loan Projects separately. Since their numerical values cannot be compared directly, however, the number of industrial accidents and the casualties are not compared between them. When the frequency of occurrence of industrial accidents is to be compared, the frequency rate must be calculated first for evaluation of frequency. Similarly, to evaluate the seriousness of industrial accidents, the severity rate must be determined. The comparison elements may be assumed to be the recipient country, client, project scale, work size, work period, construction extension, consultant (Japanese firm, local firm, firm of the third country), contractor (Japanese firm, local firm, firm of the third country) and design specification, this study could not cover up to their identification.

The study results offer the highlighted point that the casualties of significant accidents account for about 70% of the whole and, similarly, the casualties due to public accidents account for about 70%. In addition, the casualties of public accidents and significant accidents account for about 60% of the whole. On the basis of this fact, it is considered necessary to focus on preventive measures of public accidents while leading to elimination of significant accidents.

When the statistical results of this study are compared with the accident pattern of Japanese construction industry, it is known that the principal cause of significant accidents is commonly the traffic accident. The Japanese construction industry indicates the number of significant accident due to traffic accident at 53.7% (two year average of 2009 and 2010) while the study result showed the similar percentage of 55.2% for the traffic accident as a cause of significant accident.

When the trend of average casualties per case by category of work is viewed in connection with traffic accidents, the casualties are high in the road work. Though a matter of speculation, the reason may be due to the large number of road projects and also the road work is difficult to perform in a completely closed state by its nature. Besides, the work must be implemented in the vicinity of private land and in the environment normally exposed to the danger of contact with pedestrians or ordinary vehicles. Though simple assertion cannot be made, there may be cases in which the possibility of industrial accidents tend to be higher with longer period of construction work. It is no exaggeration to say that such possibility is naturally higher when the work is to be done in developing countries where the traffic rules and manners are not so well observed.

Now, on the basis of above description, this study performs hearing and questionnaire, on the risk of public accidents and significant accidents, directed to contractors in the course of construction of the country concerned. As one of measures to deal with significant accidents, “near miss” data latent in significant accidents is collected from contractors. For details, refer to Chapter 5. 5-1 Present state of construction work in foreign countries.

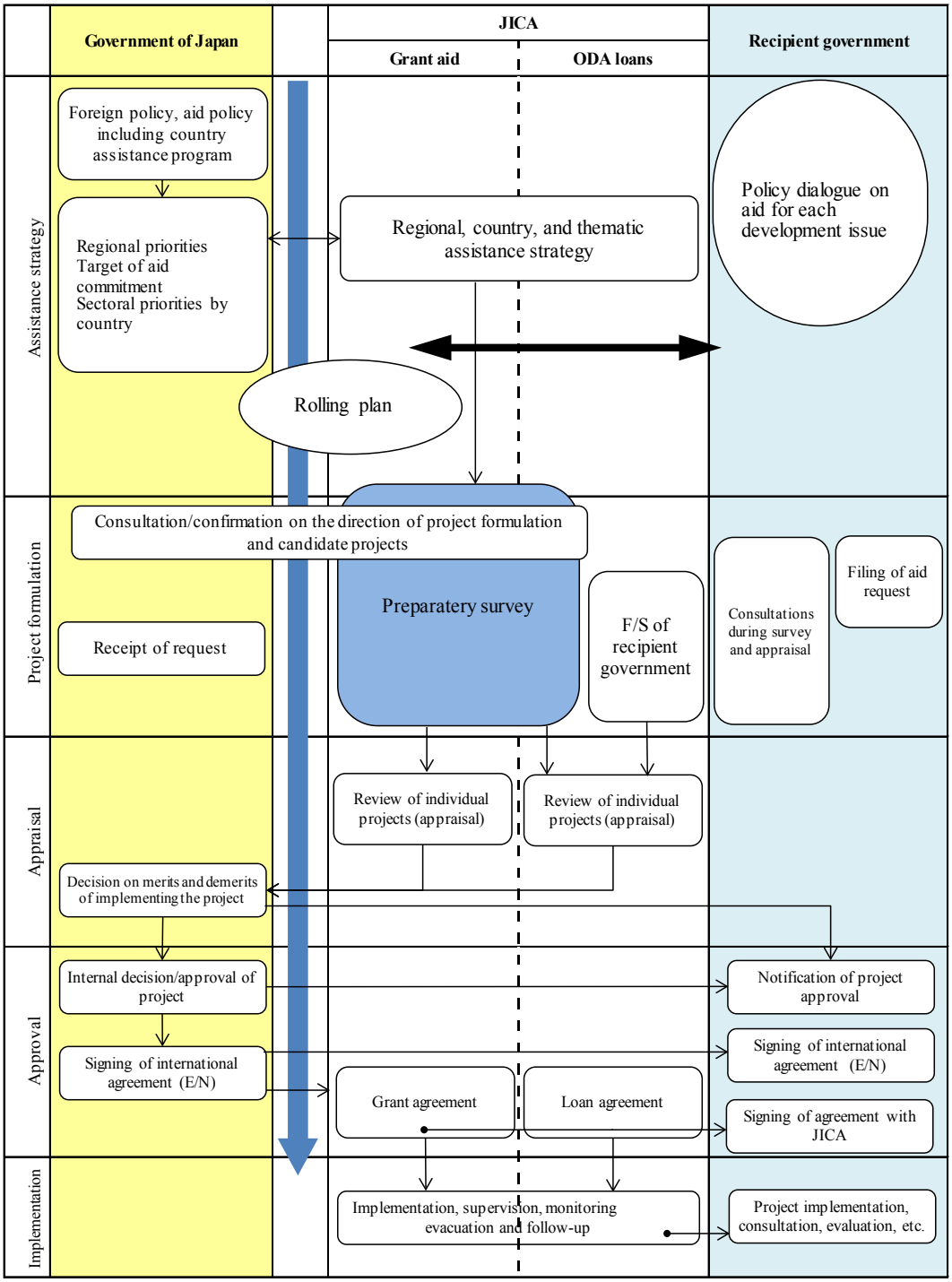
Chapter 3 Present State of Institutional Approach of the ODA Projects

3-1 Outline of the ODA Projects

3-1-1 ODA projects operating system

(1) Flow of ODA projects

The flow of the ODA project as a whole is as shown in Figure 3-1. This study intends to survey and summarize the present approaches toward the safety management of JICA as well as the client, consultant, and contractor of the construction work while focusing on grant aid and ODA loans mainly in the implementation phase.



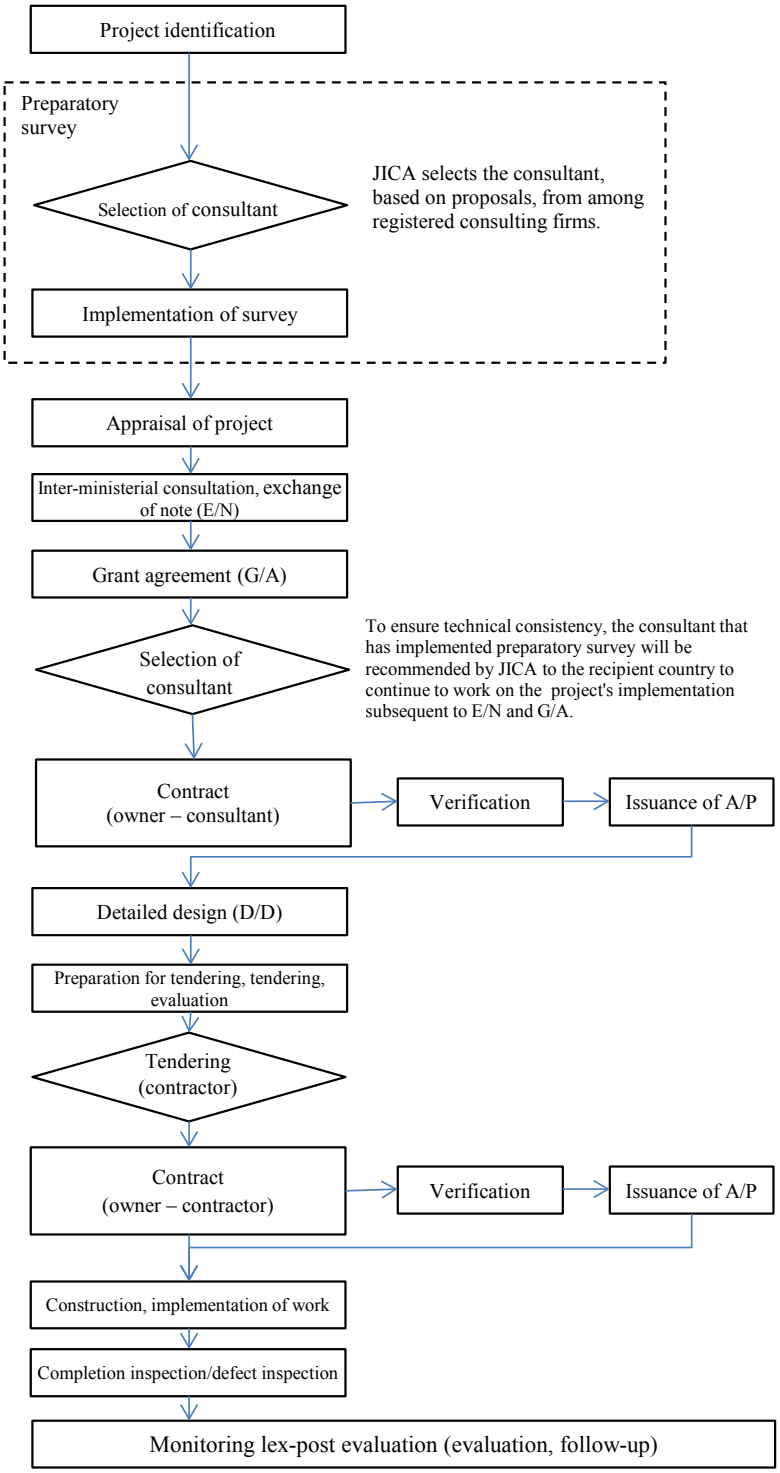
Excerpt from "An Overview of New JICA" in the JICA's web site

Figure 3-1 Operational flow of the whole ODA project

(2) Implementation flow by scheme

The implementation flow of ODA construction project is shown in Figures 3-2 and 3-3 respectively for each scheme of “Grant Aid” and “ODA Yen Loans.”

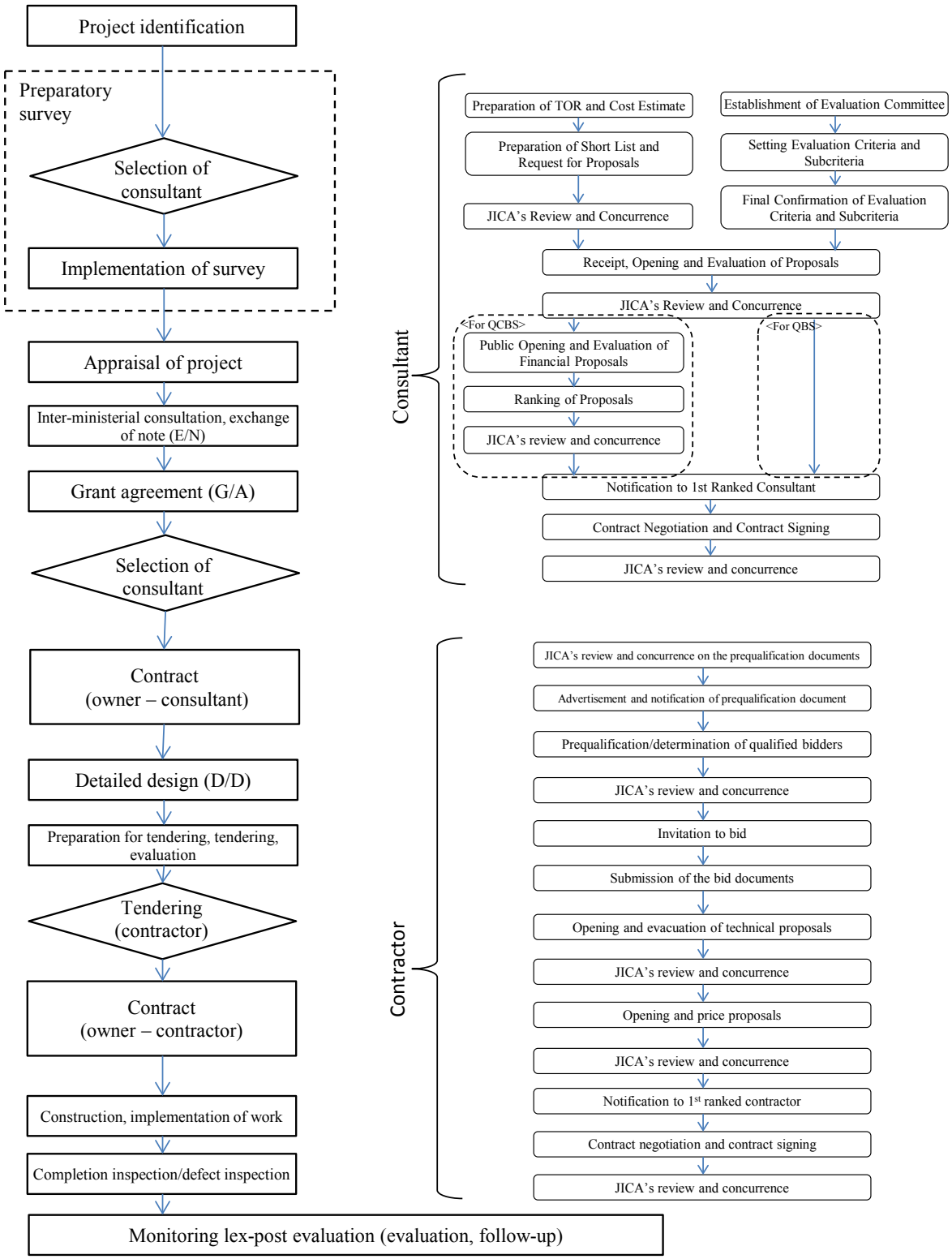
1) Flow chart of grant aid procedure



Prepared while referring to the “flow chart of grant aid procedure”, “grant aid flow chart”, and “description of grant aid scheme” in the JICA web site.

Figure 3-2 Flow chart of Grant Aid Project procedure

2) Flow chart of ODA Yen Loan Project procedure



Prepared while referring to "Guide for Evaluation Procedures for Employment of Consultants under Japanese Loans (temporary translation), amended in December 2009" and "Handbook related to the Guidelines for Procurement and Employment of Consultants under Japanese ODA Loans (Japanese) (temporary translation) in JICA site

Figure 3-3 Flow chart of Japanese ODA Loan Project procedure

3-1-2 Parties concerned in the ODA construction projects

Figure 3-4 shows the parties concerned in the ODA construction projects.

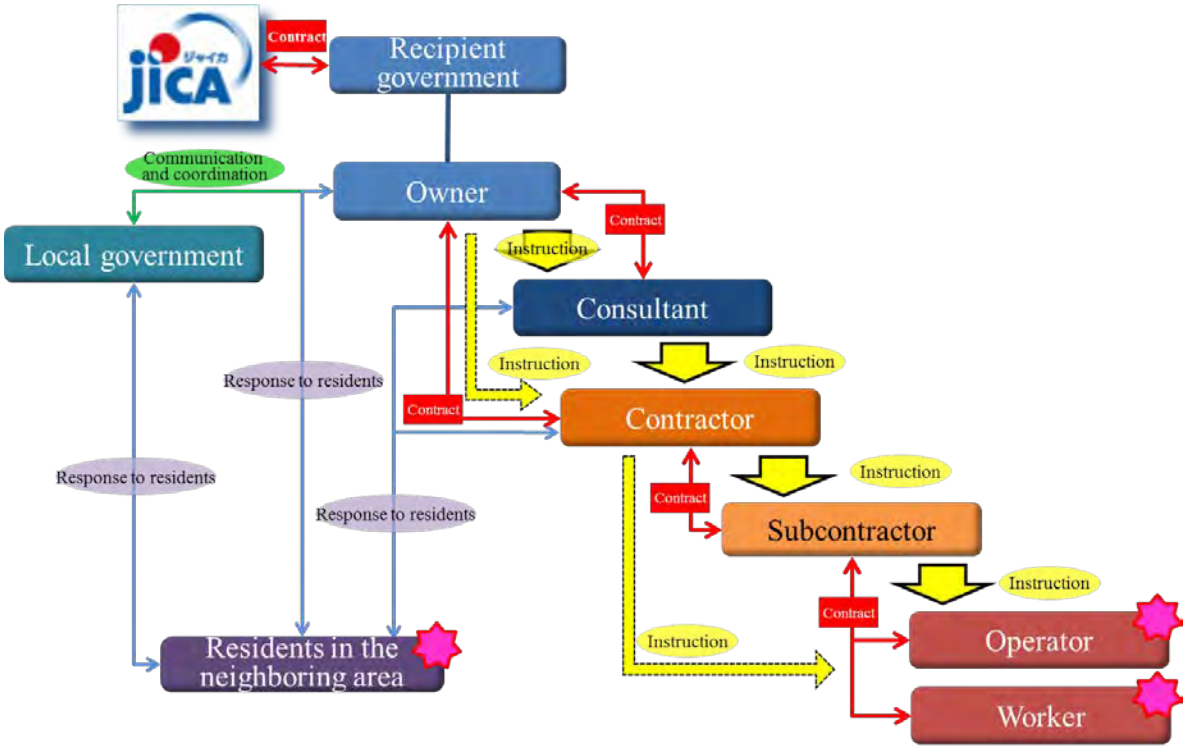


Figure 3-4 Parties concerned in the ODA construction projects

3-2 Present state of institutional approach to secure the safety

3-2-1 Present state of institutional approach for Grant Aid Projects

(1) Documents applicable to Grant Aid projects

Principal documents (standards, manuals, guidelines, etc.) applicable to grant aid projects are summarized for each stage in Tables 3-1 and 3-2.

<Project formulation stage>

Table 3-1 Documents applicable to project formulation stage (Grant Aid)

Nomenclature	Outline
Guidelines for preparatory survey	Contains the framework, flow, and considerations of the whole of preparatory survey.
Design and cost estimation for the preparatory survey	Contains details, basic form, basis deliverables required for design and cost estimation implemented in the preparatory survey
Guideline for preparation of basic design study report	Contains the B/D report preparation method and contents to be covered
Guideline for preparation of basic design outline information	Contains the format and considerations to be taken when preparing the outline information.
Guideline for preparation of the report related to grant aid	Contains the guideline for the way of summarization and contents of the preparatory survey.
Detailed regulations on the procedure for consultant and contract	Contains the requirements for office procedure concerning the operation contract or service agreement to be concluded by JICA with the consultant.

<Implementation stage>

Table3-2 Documents applicable to implementation stage (Grant Aid)

Nomenclature	Outline
Guideline for procurement under grant aid (under Japanese grant aid for general projects, etc.)	Contains general rules that the recipient country must observe for the development project agreed in the exchange of note.
Guideline for consultant services under grant aid	Contains details of bidding, construction supervision, technology transfer and consultant services including follow-up.
Consultant contract form	Contract form between the client of recipient country and the consultant
Standard bidding document (Bidding instruction standard)	Contains preparation and submission of bidding documents and bid documents, opening, evaluation, and award.
Contractor contract form	Contract form between the client of recipient country and the contractor

(2) Present state of institutional approach to secure the safety

Principal institutional approaches to secure the safety in implementation of ODA projects are summarized below by parties concerned.

1) Approach to the recipient government and client

Table 3-3 Approach to the recipient government and client (Grant Aid)

Item	Method/outline
Checking for possible accident	○ Guideline for Environment and Social Considerations (April, 2010)
	The column "Accident" provided for each check item.
Proposal concerning the safety measures	For large projects that may require the long time for construction, the considerations related to safety management are included in the study content already in the B/D (Basic Design) stage. As a result of study, JICA will make proposal related to the safety measures to the client.
Observation of the safety standard	○Procurement Guidelines of the Japanese Grant Aid
	The standard describes that the recipient country must observe all of applicable safety standards and is necessary to pay maximum attention on all of safety measures.

2) Approach to the consultant

Table 3-4 Approach to the consultant (Grant Aid)

Item	Method/outline
Adequate safety measures	Guideline for Consultant Services under Grant Aid (revised in July 2010)
	This describes that the adequate safety measures established through appropriate negotiation with the implementing agency and contractor must be thoroughly informed to the parties concerned with the work and that such measures must be put into practice completely through daily safety patrol.
Allocation of the safety measures cost	○Manual for Design and Cost Estimation of Preparatory Survey (March, 2009)
	The construction plan must include the safety measures and specify the obligations of preventing the industrial accidents and of consideration to secure the safety of the third party (residents, passengers, etc.). Items of project costs are to include the safety measures cost (common temporary facilities – traffic control, safety facilities, safety management; field administration costs – Labor safety and health costs, training costs, etc.).
Arrangement of verifying engineers	The preparatory survey including implementation of D/D (Detailed Design) will include the verifying engineer in the employees executing the consultant services.
Study on safety management	For large projects whose construction period will be long, the matters related to safety management will be added to the study content already in the stage of B/D (Basic Design).
Stipulation on appraisal of bidding	○ Guideline for Consultant Services under Grant Aid
	For the construction contract of facility construction project, PQ (prequalification of bidders) in terms of technical capabilities and financial capacities, technical appraisal of prequalified bidders, and bid evaluation for those having proved satisfactory in technical appraisal according to the procedure of opening of price proposal are to be stipulated.
Establishment of the safety management system	At a time of P/Q (Prequalification)
	This is to confirm the safety management system of bidders (contractors). The "Facility Construction Conditions including large or special methods" includes the conditions on the number of engineers qualified as the First Class Construction Management in the number of qualified engineers.
Considerations in terms of construction supervision	○Guideline for Consultant Services under Grant Aid
	Considerations to be specified for construction supervision are as follows: correct construction while securing the required quality

	according to the specification and design drawings stipulated in the contract document for facility construction project; management to ensure adequate filing and storage of data, photos and other work records; confirmation, in case of trouble, whether or not the client accepts; securing of the satisfactory labor environment while paying due considerations on the safety of those concerned with the work and the visitors; consultation with JICA when the delay of work is expected due to war, insurrection, natural disaster; and dispatching of plan researcher (grant aid) to check the implementation state.
Manual check	○Progress report (monthly report)
	Quality control and safety measures check is made by means of the construction photo in the monthly report.
Final inspection	○Final inspection
	The consultant carries out inspection and provides guidance to the contractor and reports to the client and JICA the problem if any detected. The plan researcher (grant aid) may be present at the final inspection.
Measures in case of defect	○Defect inspection
	The consultant carries out inspection and provides guidance to the contractors and reports to the client and JICA the defect if any detected. The plan researcher (grant aid) may be present at the defect inspection.

3) Approach to the contractor

Table 3-5 Approach to the contractor (Grant Aid)

Item	Method/outline
Common conditions	○Tender bid documents (Prototype of Instruction to Tenderers)
	Common conditions are specified to include observance of safety regulations, securing of the workers' safety, removal of obstruction (so far related to the facility projects), fencing, lighting, guarding of the work site as well as temporary work to protect the residents in the neighborhood and passengers.
Safety management of contractor	○Contractor's contract form (revised in November, 2010)
	Article 8. Contractor's Obligations 8.4 The Contractor shall be responsible for the implementation means, methods, techniques, sequences or procedures, and safety control in connection with the Work Specify that the contractor bear responsibility for safety management concerning the work. The contractor is to bear responsibility for installation and guidance on operation in case of equipment projects.

4) Overall approach

Table 3-6 Overall approach (Grant Aid)

Item	Method/outline
Establishing the safety committee	○Establishing the Safety Measures Committee for Facilities Construction Projects
	Established in December, 2008. As a rule, the committee is held once a year and temporarily as required.
Coordination with industry groups concerned	During irregular coordination with the industry group, accident cases will be introduced and awareness on safety management is called.
Standards and manuals	○Safety Measures Regulations of JICA (October, 2008)
	○Manual of Initial Response in case of Emergency Situations Overseas (November, 2009)
	○ Manual for Expulsion in case of Urgencies (August, 2011)
Site visit	○Dispatching "Plan Researcher (grant aid)/experts of international cooperation
	Checking of the quality and output, in terms of the project under

	way and construction supervision, by comparing the contract document as required and informing the findings to the consultant in a written form. C heck is also made on the safety management.
Thorough implementation of securing of the safety	○Guideline for Implementation Management Service under Grant Aid <overseas offices> (August, 2009) (Reference material for execution)
	This specifies thorough implementation of safety management. Specify also that continuation of work in case of accident will principally be entrusted to the "parties to the contract."
Accident report	○The information is submitted according to the Accident Report Format.
Penal rules	○Regulations of Measures for Those involved in Illegal Acts in the Grant Aid assistance implemented by JICA"
	For the recipient or those wishing to receive the grant aid, the rules specify arrest, public prosecution, definitive judgment, administrative measures. If the following fact is recognized by means of either recognition of the person concerned or by means of recognition of JICA, the contractor concerned will not be approved as eligible for contract or the contract concerned may not be the object of grant aid program except when such measure will provide any disadvantage explicitly to the recipient country. When the penalty is not so much as to taking of measures, the warning or the attention for caution will be provided either in a written form or orally. Those who have received warning repeatedly within one year may not be approved as eligible for contract or the project concerned may not be the object of grant aid program. • Fatalities or casualties or damage in the public are considered due to inadequate safety management measures in the course of implementation of services concerning the procurement contract; • Fatalities or casualties in those concerned with services of procurement contract are considered due to inadequate safety management measures in the course of implementation of services concerning procurement contract.

3-2-2 Present state of institutional approaches for ODA Yen Loan Projects

(1) Documents applicable to ODA Yen Loan projects

Principal documents (standards, manuals, guidelines, etc.) applicable to ODA loan projects are summarized for each stage in Tables 3-7 and 3-8.

<Project formulation>

Table 3-7 Documents applicable to project formulation stage (ODA Loans)

Item	Outline
Guidelines for preparatory survey	Contains the framework, flow, and considerations of the whole of preparatory survey.
Design and cost estimation for the preparatory survey	Contains details, basic form, basis deliverables required for design and cost estimation implemented in the preparatory survey
Detailed regulations on the procedure for consultant and contract	Contains the requirements for office procedure concerning the operation contract or service agreement to be concluded by JICA with the consultant.

<Implementation>

Table3-8 Documents applicable to implementation stage (ODA Loans)

Item	Method/outline
Guide for Evaluation Procedures for Employment of Consultants under Japanese Loans	Provides the borrower of Japanese ODA loans and the executing agency with a clear understanding of the evaluation methods and procedure for selection of the consultants
Guidelines for the Employment of Consultants under Japanese ODA Loans	Presents the JICA view to allow the borrowing organization to select and employ the consultant adequately for maximum utilization of the capacity of consultant while indicating the general rule to be observed for securing of the neutrality of the consultant and for utilization of the consultant by the borrowing organization.
Guidelines for Procurement under Japanese ODA loan	Specifies the relationship between JICA and the borrower responsible for procurement of goods and services
Evaluation Guide For Prequalification and bidding under Japanese ODA Loans	Specifies how the evaluation should be according to the procurement guideline, how the consultant should be utilized, and standard evaluation procedure concerning prequalification on materials/equipment and services as well as on bid evaluation.
Sample Prequalification Documents under Japanese ODA loans (P/Q)	Presents sample bid document forms containing the sample bidding conditions along the procurement guideline and consultant employment guideline for each type of materials/equipment and services to be procured, so that procurement procedure is implemented smoothly.
Sample Request for Proposals under Japanese ODA loans (consultants)	
Sample Prequalification Documents under Japanese ODA loans (procurement of works)	
Check List for One Sided Contracts	Check list contributing to preparation of adequate bid documents on the side of recipient country

(2) Present state of institutional approach to secure the safety

Principal institutional approaches to secure the safety in implementation of ODA projects are summarized below by parties concerned.

1) Approach to the recipient government and client

Table3-9 Approach to the recipient government and client (ODA Loans)

Item	Method/outline
Specification of safety measures	○E/N (Exchange of Notes)
	Specifies the safety measures by the recipient country for labors and the public
Checking for possible accident	○Guideline for Environment and Social Considerations (April, 2010
	The column "Accident" provided for each check item.
Safety management obligation and report of accident	○"GTC (General Terms and Conditions for Japanese ODA Loans)" (March, 2009 edition)
	"Section 6.06. Administration of Loan" specifies the obligation to implement, subject to thorough safety management, the project under Japanese ODA loans for the borrower organization and to report to JICA as required by JICA in case of accident.
Report in case of accident	○"M/D (Minutes of Discussion"
	The borrower or implementing agency agrees to inform JICA rapidly in case of significant accident.
Agreement on items describing the safety measures in the work bid document	○"M/D (Minutes of Discussion)"
	The borrower or implementing agency agrees as follows: • The bid documents for civil engineering and plant construction are to contain "the persons to be engaged in principal services must include the person in charge of safety measures", "submission of the safety measure plan," and "The construction plan must include specific safety measures (to be submitted before commencement of the work)."
Agreement on confirmation of the state of description on safety in the work bid documents of consultant TOR	○ "M/D (Minutes of Discussion"
	The borrowing organization or implementing agent agrees as follows: • The consultant TOR contains "confirmation whether the above contents are adequately contained in the bid documents," "review of the safety measure plan," "review of the construction plan," and "Confirmation whether the construction in compliance with the construction plan is adequately implemented and request improvement to the contractor for the trouble in any.
Confirmation of the safety management system	○Check List to Confirm the Safety Management System (reference data for execution) (August, 2008)
	○For the project requiring cautions particularly for safety measures, JICA checks the safety management system of the implementing agency according to the check list before appraisal.

2) Approach to the consultant

Table 3-10 Approach to the consultant (ODA Loans)

Item	Method/outline
Consultant selection according to QBS (selection based on quality)	○Guidelines for Procurement and Employment of Consultant under Japanese ODA Loans (March, 2009 edition)
	Consultant selection by QBS (Quality Based Selection) for the significant services with construction supervision of large and complicated construction work requiring considerations in terms of safety measures
Checking the contents of safety measure plan	○Guidelines for Procurement and Employment of Consultant under Japanese ODA Loans (March, 2009 edition)

	The consultant checks the contents of safety measure plan for the project prepared by the contractor, if necessary.
Clear notification of safety measures in the construction plan	○Manual for Design and Cost Estimation of Preparatory Survey (March, 2009)
	The construction plan is to contain the safety measures while clearly notifying the obligation of consideration to prevent industrial accident and to secure the safety of the third party (residents, passengers).
Allocation of the safety measures cost	○"Manual for Design and Cost Estimation of Preparatory Survey (March, 2009)
	Items of project costs are to include the safety measures cost (common temporary facilities – traffic control, safety facilities, safety management; field administration costs – Labor safety and health costs, training costs, etc.
Arrangement of verifying engineers	The Preparatory Survey including implementation of D/D (Detailed Design) will include the verifying engineer in the employees executing the consultant services.
Confirmation of the safety measure plan	○Guidelines for Procurement and Employment of Consultant under Japanese ODA Loans (March, 2009 edition)
	The consultant checks, as required, the content of the project safety measure plan prepared by the contractor.
Measures in case of defect	○Defect inspection
	The consultant carries out inspection and provides guidance to the contractors and reports to the client and JICA the defect if any detected.

3) Approach to the contractor

Table3-11 Approach to the contractor (ODA Loans)

Item	Method/outline
Clear notification of safety measure	○Guidelines for Procurement and Employment of Consultant under Japanese ODA Loans (March, 2009 edition)
	Clearly notify that the safety measure must be emphasized for implementation of the project and that the safety measure to be taken by the contractor must be clearly identified in the contract document.
Evaluation of the safety measure	○Evaluation Guide For Prequalification And Bidding under Japanese ODA Loans
	Specifically notify that, in evaluation of technical proposal, evaluation must be made on the safety measures and the person in charge of safety measure and other safety-related staff must be evaluated as those engaged in principal services.
Safety measure plan	○Sample Bidding Documents Under Japanese ODA loans, Procurement of Works (prepared in June, 2009)
	The safety measure plan is included in the bid documents.
Person in charge of safety measure	○Sample Bidding Documents Under Japanese ODA loans, Procurement of Works (prepared in June, 2009)
	The person in charge of safety measure is to be included in those engaged in principal services, for which the person having the required number of experience years is to be designated. This information is contained in the bid document.
Observation of the labor law, hazard preventive measure, first-aid measure, compensation, report	○Sample Bidding Documents Under Japanese ODA loans, Procurement of Works (prepared in June, 2009)
	The contractor must observe the labor law, take the measure to prevent hazard to the workers and the public, take the first-aid measure in case of accident, and perform compensation. Details will be recorded for report to the consultant.
Measures in case of defect	The consultant carries out inspection and provides guidance to the contractors and reports to the client and JICA the defect if any detected.

4) Overall approach

Table3-12 Overall approach (ODA Loans)

Item	Method/outline
Establishing the safety committee	○Establishing the Safety Measures Committee for Facilities Construction Projects
	Established in December, 2008. As a rule, the committee is held once a year and temporarily as required.
Establishing the Technology Advisory Group	○Establishing the Technology Advisory Group under Japanese ODA Loans
	Established in July, 2008
Coordination with industry groups concerned	During irregular coordination with the industry group, accident cases will be introduced and awareness on safety management is called.
Standards and manuals	○Safety Measures Regulations of JICA (October, 2008)
	○Manual of Initial Response in case of Emergency Situations Overseas (November, 2009)
	○Manual for Expulsion in case of Urgencies (August, 2011)
Strengthening the safety measure	○Official telegram "Strengthening of Safety Measures for Projects Under Japanese ODA Loans (October 5, 2010)
	• Confirmation made on description related to safety measures at a time of checking and concurrence of bid documents (civil engineering, plant construction). If no description is made, addition of such description is demanded. • Confirmation made if the item related to safety measures is contained in the consultant TOR at a time of checking and concurrence of documents for selection of consultant. If no description is made, addition of such description is demanded.
Site visit	○Dispatching "Plan Researcher (loan aid)/experts of international cooperation
	For large and complicated projects requiring considerations in terms of safety measure, site patrol is made as required to call attention.
Accident report	○The information is submitted according to the Accident Report Format.
Penal rules	○Regulations of Measures for Those involved in Illegal Acts in the Loan Aid implemented by JICA"
	For the recipient or those wishing to receive the loan aid, the rules specify arrest, public prosecution, definitive judgment, administrative measures. If the following fact is recognized by means of either recognition of the person concerned or by means of recognition of JICA, the contractor concerned will not be approved as eligible for contract or the contract concerned may not be the object of loan aid except when such measure will provide any disadvantage explicitly to the recipient country. When the penalty is not so much as to taking of measures, the warning or the attention for caution will be provided either in a written form or orally. Those who have received warning repeatedly within one year may not be approved as eligible for contract or the project concerned may not be the object of loan aid. • Fatalities or casualties or damage in the public are considered due to inadequate safety management measures in the course of implementation of services concerning the procurement contract; • Fatalities or casualties in those concerned with services of procurement contract are considered due to inadequate safety management measures in the course of implementation of services concerning procurement contract.

Chapter 4 The Legal System and Administration in the Surveyed Countries

4-1 Legal system relating to occupational safety and health

4-1-1 Occupational safety and Health Law

Concerning occupational safety and health laws, the development conditions vary among the surveyed countries. Basic occupational safety and health laws are roughly developed despite details of the contents and various applicabilities to the construction site. In Japan, the basis of regulating occupational safety actions substantially like work steps and accident prevention are, as Figure 4-1 shows, the Enforcement Order of the Occupational safety and Health Act and Ordinance on Occupational safety and Health. In the surveyed countries, it was confirmed that there is no laws providing for specific work methods and steps to secure safety, with some example in Kenya though.

(Vietnam)

The provisions on occupational safety and health are provided for in the Chapter 9 (Article 95-Article 108) of the Labor Code (enforced in May 1995). An ordinance was promulgated in January 1995 to provide for the details of safety and health of the same code.

(Indonesia)

There is an act on occupational safety and health (Act No. 1 on Safety, 1970). This is the basic act concerning occupational safety and health which provides for the scope of application of occupational safety and health, requirements, responsibilities of administrators, responsibilities and rights of employers and workers, and penalties. Further, the Act No. 13 of 2003 Labor Laws has provisions on occupational safety and health in its Articles 86-87.

(Sri Lanka)

There is no labor safety and health act but an independent Factories Ordinance No. 45, 1942 is applied to construction sites as well. The most of the origin of this Factories Ordinance comes from the acts relating to labor safety and health of Britain which was the former colonial power but the ordinance has been used with gradual amendments over time. The Government of Sri Lanka is amending the ordinance with help from ILO (the International Labor Organization) to expand the scope of application from factory to other areas.

(Cambodia)

There is no act on labor safety and health which is systematically developed. As drafts of the acts on labor safety and health in the Kingdom of Cambodia, Labor Law, Social Security Scheme and 18 Ministerial Regulations (called Prakas) are promulgated by the ministries relating to labor. The Labor Law was approved in January 1997 by the parliament. The Chapter 8 of the law has provisions on safety and health of workers, which are applied to all employers excluding small businesses such as family businesses. Among Articles 228 through 247, Article 228 provides for

policy of application, Articles 229 t hrough 232 g eneral provisions, Articles 233 t hrough 237 inspections and Articles 238 through 347 labor health services.

(Kenya)

There is the Occupational Safety and Health Act 2007 enforced in 2007, which provides for implementation of the act, powers of the persons in charge of labor safety and health, registration of workplaces, general provisions on health, general provisions on machinery and chemical substances, and general provisions on wages. Further, the Work Injury Benefit Act 2007 provides for responses of clients and contractors, compensation, and obligation of accident report. There are many acts enforced or renewed in 2007 including Labor Institutions Act, National Social Security Fund Act, Industrial Litigation Act, Industrial Training Act, Employment Act, labor related acts, and Work Injury Benefit Act.

4-1-2 Safe construction technology guideline and standard

As mentioned in the previous paragraph, on the occasion of preparing and enriching laws related to labor safety and health in 2007, Kenya has been enacting and renewing "rules" as set forth below concerning specific standards on safe construction, and fully informing them in the industry.

-Building Operation and Works of Engineering Construction Rules

-Electric Power Special Rules

-Docks Rules

-Cellulose Solutions Rules

-Noise Protection Rules

-Fire Protection Rules

-Eye Protection Rules

-Medical Examination Rules, etc.

What is especially related to construction industry is the "Building Operation and Works of Engineering Construction Rules," which provides for various rules on safety at construction and civil engineering work sites.

Details of technical guidelines and standards on safe construction prescribed by the national government and ordering organizations in Cambodia and Sri Lanka are unknown. However, in many operation sites, (1) the consultant confirms and the client approves, or (2) the consultant approves on b ehalf of the client the construction plan prepared by the contractor before starting construction. On the other hand, there are some sites which obligate contractors to submit safety management plan in addition to construction plan. In any case, if anything that must be improved is found by the client or the consultant in the submitted plan, the applicable items must be renewed and re-approved before starting construction.

On the next page, the system of Japanese Occupational safety and Health Law and related ministerial ordinance is shown for reference.

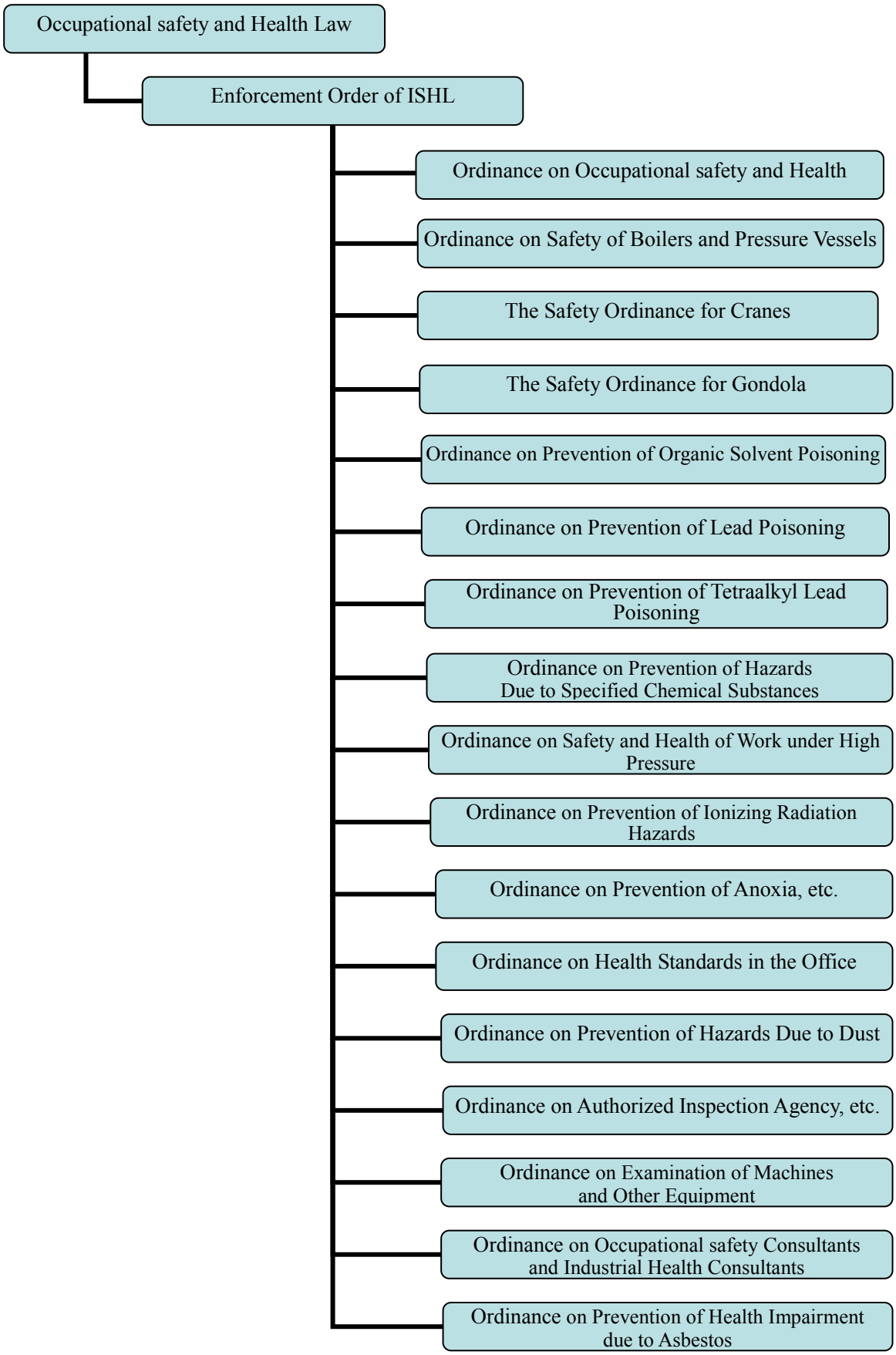


Figure 4-1 System of Industrial safety and Health Law and related ministerial ordinances

4-1-3 Laws on construction machinery and facilities

To secure qualities of construction machinery, inspection and maintenance are very important. In many of the surveyed countries, operators are rarely aware of inspection of machinery, and it is a custom that they repair the machinery after it breaks down. It is necessary to call for startup inspection and periodical inspection by the prime contractors. It is considered that the custom is due to the delay in developing laws concerning inspection of construction machinery.

In the surveyed countries, the systems of training and qualification of operators are developed to a certain extent but it is often the case that the technique at the site is insufficient. At each site we surveyed this time, they employ operators through skill (ability) confirmation test in order to distinguish whether an operator has an enough ability on manipulating various heavy machineries or equipments required at the site, even if it is qualified in the country.

(Sri Lanka)

As a result of hearing by the Department of Labor, there is no standard concerning quality of construction machinery. There is a qualification for cranes and electric chiefs concerning construction machinery and facilities, but there is no qualification for slinging. The provisions of transportation of construction machinery are included in the Road Traffic Ordinance issued by the Ministry of Transport.

(Cambodia)

As a result of hearing at the surveyed site, they said that the driving qualifications for manipulation of heavy machines are not yet developed in Cambodia, including that for manipulation of cranes needed in construction sites. Further, as qualifications are not needed for special works such as electric works and welding, Japanese engineers give as a matter of fact basic education on crane operation and slinging operation to proceed with the work, and that is a great load on the part of the contractor.

Also, the underdeveloped qualification system is linked to the fact that local workers have low awareness of wearing protective gears.

(Kenya)

There is no provision on quality of machines in relation to standards of construction machinery. The laws obligate performance of safeguarding and maintenance of all machines at sites. It is important that machines perform normal functions for certain periods in plants and construction sites, and the laws obligate infallible maintenance.

As a result of hearing from contractors, they said qualifications for operators are insufficient. As part of the economic integration by the East African Community (EAC) to which Kenya belongs, they mutually approve professional qualifications (certificate, experience, requirements, licensing, etc.), and harmonize subjects, tests, standards and admissions for education and training concerning the former.

4-1-4 Relations with ILO

ILO (the International Labor Organization) has 189 conventions and 201 recommendations, and Japan has ratified 48 conventions. In the countries under this survey, some of them ratified several conventions, and even if they have not ratified them, it is generally the case that they develop legal systems with reference to the conventions. Further, many of the countries receive technical assistance from ILO in developing legal systems relating to occupational safety and health.

ILO has 4 major objectives in developing activities for each country. (1) To assist improvement of occupational safety and health environment in each country by diffusing the international labor standard, and assistance in ratification by each country of Article 155 and Article 187[1] of the ILO Conventions, (2) Increase of employment opportunities, development of SME (Small and Medium Enterprises) and promotion of Micro-financing, (3) Development of social security system, and (4) Increased dialogue between the clients and workers. ILO has its regional office in Bangkok in Asia, covering 15 countries in the Asia-Pacific Region. There is only one country office of ILO in Sri Lanka, among the surveyed countries.

(Sri Lanka)

The ILO Country Office for Sri Lanka assists the procedure to ratify Articles 155 and 187 of the ILO Constitution mentioned above by Sri Lanka, and developing seminars and training activities to raise awareness relating to labor safety and health. Specifically, it held training for labor officers concerning the necessity of site survey for protection of site safety. In addition, it has conducted similar activities (for two days) for large construction companies in the country, and participated in developing human resources in charge of safety management at sites in cooperation with NIOSH (National Institute of Occupational Safety & Health).

(Cambodia)

Cambodia ratified Convention No. 105 “Abolition of Forced Labor” (ratified in 1999) and other 11 conventions as of April 2011 in the field of labor safety and health.

(Kenya)

Although Kenya has not ratified ILO conventions in the field of labor safety and health, it has enacted OSH Act, 2007 with assistance from the ILO consultant in 2007. The act incorporates the contents relating to labor safety and health recommended by ILO.

[1] Article 155: The Convention on Occupational Safety and Health, and Working Environment.
Article 187: The Convention on the Framework to Promote Occupational Safety and Health

4-2 Qualification system relating to labor safety and health

Among the surveyed countries other than Kenya, national qualification relating to labor safety and health is not developed. It is thought to be in the process of development like the laws relating to labor safety and health. In the surveyed countries, some qualifications of skills are developed, but majority of them is related to plants (boiler, forklift, etc.). As qualified persons may have problems in abilities, each contractor conducts, in fact, ability confirmation test when a person is employed at sites. In Kenya where national qualification system has been developed, some persons in the Government Agencies consider that the number of qualifications is insufficient yet.

(Sri Lanka)

As national qualifications relating to labor safety and health, there are boiler operators, crane/fork lift operators and explosive handlers as well as "highly risky" machine operators, which are mainly qualifications in plants. The country conducts training on labor safety and health to raise safety managers in charge of safety management at sites, and grants training completion qualifications (diploma or certificate depending on courses), but they are not recognized as national vocational qualifications.

Concerning construction qualifications, there is an association established with contributions from the World Bank, which is called Institute of Construction, Training and Development, and the institute conducts training for manipulation of construction machinery.

(Cambodia)

No national qualifications pertaining to safety and health in the construction industry is developed. There are some qualifications in the sewing industry but they are time-limited qualification systems (3 months, 6 months, etc.).

(Kenya)

Concerning qualifications of human resources pertaining to labor safety and health, it is necessary that the person has a qualification as an engineer or doctor to perform audit of labor safety and health, or he has graduated from masters' program or doctors' program on labor safety and health. These human resources are employed as occupational safety and health services advisors (cf. 4-4-3) or work environment monitorers. However, inspectors of lift or boiler in plants are exceptions. An Occupational Safety and Health Services Advisor conducts audit of labor safety and health of a workplace once a year as privately registered auditor. The Ministry of Roads and other ordering organizations think that these private labor safety and health experts are insufficient and the construction industry has not fully utilized such human resources yet.

Although subjects pertaining to "safety" are incorporated in each vocational training curriculum, qualification system has not been developed for the vocational trainees, and there is no system to grant certificate or diploma systematically.

4-3 Administration relating to labor safety and health

4-3-1 Mechanism of administration relating to labor safety and health

While the Ministry of Health, Labor and Welfare administers occupational safety and health in Japan, the surveyed countries have ministries of labor and, although there is certain difference, they have related organizations such as research institutes for occupational safety and health as well as vocational training centers. In addition, they conduct, as necessary, administrations and activities relating to occupational safety and health in cooperation with subordinate research institutes, Ministry of Vocational Training, Ministry of Construction, and associations as well as international organizations such as ILO.

(Sri Lanka)

The Department of Labor oversees occupational safety and health in general and prescribes labor standards, and standards relating to safety and health. The Government of Sri Lanka planned and administered training for clients pertaining to occupational safety and health as well as training for trade unions. It is expanding administrative functions concerning occupational safety and health by establishing NIOSH (National Institute of Occupational Safety & Health)[*1]. NIOSH is currently training safety officers to be dispatched to the industries in the future.

*1 This is an institute established in 2010 to promote awareness of workers (especially individuals) on safety, because the Government pursued legislation relating to occupational safety and health but it did not take root at sites and there was a period which its effects were not revealed in the society.

(Cambodia)

The Ministry of Labor administers occupational safety and health but the Ministry of Construction and other ministries are also related. The Ministry of Labor conducted preparation of master plan relating to occupational safety and health between 1990 and 2013. Although laws prescribing supervision and guidance of safety management at sites were put into force, the people of the Government has not achieved full understanding of the application of the laws, which is in the process of systematization, and being performed as a safety management activities by the ministries in charge.

(Kenya)

Director-Occupational Safety & Health of the Ministry of Labor overseas occupational safety and health. The legislation and administration relating to occupational safety and health are greatly assisted by ILO in recent years, but the concepts and ideas of the United Kingdom as the former suzerain power were the basis of them. The various laws pertaining to occupational safety and health enacted (or revised) one after another in 2007 call for establishment of organizations for various researches, diffusion and improvement of skills in the field, and the Government is focusing its powers on occupational safety and health.

4-3-2 Administrative organizations for oversight and approval

The Labor Standards Inspection Offices as arms of the Ministry of Health, Labor and Welfare are the administrative organization overseeing occupational safety and health. Likewise, in each surveyed country, the Ministry of Labor that mainly controls occupational safety and health oversees occupational safety and health. In Japan, it is necessary to get permit of the Minister of Land, Infrastructure, Transport and Tourism or a Prefectural Governor for doing construction business, but the surveyed countries do not have such permit system like that of Japan.

(Sri Lanka)

The Department of Labor gives documentary approval on starting construction of building, etc. based on Factories Ordinance, but it has no power to give license, which institutional design is not completed yet. Concerning renewal of laws and regulations pertaining to occupational safety and health, they are to be renewed when a new law or regulation is enacted, and the future plan in the field of occupational safety and health of the Department of Labor is called for as part of the 10-year National Development Plan.

(Cambodia)

Concerning approvals and permits relating to construction industry, the registration of corporations must be submitted to the Ministry of Commerce, and companies submit documents to the Ministry of Land Management, Urban Planning and Construction, approved ones of which must be submitted to the Ministry of Labor and Vocational Training as well.

(Kenya)

The Ministry of Labor is in charge of oversight and approval in the field of occupational safety and health. It has 18 county officers and about 50 inspectors for overseeing safety and health perform audit of sites in individual areas (mainly confirmation of compliance with laws and regulations). It has powers to issue recommendation to stop construction until response is completed in case where problems are found in maintenance of safe work environment, and to perform consultation and propose specific measures in improving occupational safety environment against clients and contractors.

4-3-3 Plans to prevent industrial accidents

In the case of Japan, the guidelines of labor administration are shown in “Industrial Accident Prevention Plan” formulated every 5 years, “Policy for Operation of Labor Standard Administration” formulated every year, and “Notices and Guidelines” issued as needed. “Industrial Accident Prevention Plans” are formulated to secure safety and health of workers in response to changes in the industrial structure, diversification of work forms, increase in the aged workers, and other changes in the society and the economy surrounding workers.

Among the countries surveyed this time, there is no country which has construction-specific labor administration guidelines equivalent to the Industrial Accident Prevention Plan of Japan. However, Kenya has Vision 2030, which refers to guidelines pertaining to occupational safety and health in the country’s medium term and long term plans.

4-3-4 Accident report system and response to accident

(1) Accident report system

In Japan, for any occurrence of accident at construction site, it is an obligation to report it promptly to the related organizations corresponding to the contents of industrial accidents. It is obligated to inform the Labor Standards Inspection Office of such accidents as overturn of cranes, etc., collapse of buildings, failure of ground, explosion and fire, even if industrial accident has not occurred.

In the surveyed countries, report is given to the Ministry of Occupational or the client as a system but not all of them are reported in fact. In addition, there was no case that the surveyed country compiles a database of accidents and disaster information, and conducts specific examination to prevent recurrence through diagnosis.

(Sri Lanka)

The Item 16 of Factories Ordinance like an Occupational Safety and Health Act requires report of accident to the Ministry of Labor by the firm which caused the accident. In each sector, the client of a project knows that it has to report any occurrence of accident to the Ministry of Labor, and reports it thereby. Sometimes, the Ministry of Labor acquires information of accident from media reports or the report from its regional officers, hospitals, the police, or report from other ministries. In fact the reports vary among administrative organizations which can be clients, and the Ministry of Labor would like to improve collection and accumulation of accident information.

ADB Sri Lanka Resident Mission considers it necessary to grasp fatal accidents partly due to the advice from the headquarters as a matter of organizing accident information. In addition to monthly reports from consultants, it has a mechanism to receive immediate reports from the project executing body in case of fatal accidents, and reports on avoiding recurrence. Other than the organization of information, it has not accumulated accident information in a smart way. Recently, many of the construction companies ranked C1 or C2 (upper two ranks) have acquired ISO 9001 for quality control, and the ISO has provisions upon occurrence of accidents.

(Cambodia)

The department in charge of ODA in the Ministry of Public Works and Transport has not accumulated accident statistics. In an ODA project led by the Ministry, there is a rule to provide information to the client and JICA from the consultant in the case of any accident.

(Kenya)

If an accident happens in the project controlled by the Ministry of Roads, the site will directly report to the relevant department in the Ministry of Labor as a mechanism of accident reporting. This is based on the guideline on accident reporting provided for by the Directorate of Occupational Safety and Health Services of the Ministry of Labor. Further, in road projects to which FIDIC Agreement is applied, Article 117 of the Standard Specifications for Road and Bridges Construction provides for accident reporting, and KURA (Kenya Urban Road Authority) pointed out that dual obligations of

accident reporting are imposed. It is stipulated that a fatal accident should be reported within 24 hours, and a material accident should be reported within 7 days.

The Ministry of Labor of Kenya conducts aggregation of statistics for occupational and other accidents but the database is not developed, and no detailed classification of information is made for each industry. The accidents are finalized with on-the-spot reporting and recording, and no database is developed to allow diagnosis and countermeasures from data. The format of accident reporting from the site is already developed.

On the other hand, in the projects (erection of public buildings, coastal seawall, pedestrian bridge, etc.) controlled by the Ministry of Public Works of Kenya, there is no systematic accident reporting system, and statistical information on accidents. It says that information is organized for material accidents but not for trivial accidents.

(2) Response to accident reporting

Specific cases of response to accidents and disasters in each country based on hearing are described below.

(Sri Lanka)

When an occupational accident happens, the Department of Labor has the authority to implement investigation. It will issue recommendation for improvement required after site investigations.

(Cambodia)

A communication system is put in place among related organizations upon occurrence of work-related accidents at sites. A hot line round the clock is available for accidents at sites and the Ministry of Labor and Vocational Training will receive the information as well. In an ADB project in Cambodia, it is clearly stipulated in the contract that response will be made to accidents based on the Labor Law. Specifically, if an accident happens, the contractor will basically notify the consultant and the client, and the client will inform the ADB.

(Kenya)

If an accident happens at a site, the Ministry of Labor will receive the accident report, and dispatch human resources to the site to investigate the accident with reference to the Occupational Safety and Health Act. Depending on the cause of the accident, the ministry will urgently consider improvements for accident that may occur again at the same site, and give directions to the related parties.

We heard that the Ministry of Roads of Kenya would respond to accidents in accordance with Work Injury Benefit Act, 2007 and OSH Act 2007, and identify the cause of accident involving resident engineers and the supervisor of the specific work in the accident investigation. When an accident happens, the police will be called to inspect the accident. We also heard that, in order to prevent recurrence of similar accidents based on the accident investigation, they considered specific countermeasures over the short term and the long term, and were implementing them.

4-3-5 Penalties

As the laws in general concerning occupational safety and health are not well developed in the subject countries, the penalties against the operators which caused accidents are often trivial fines. Further, there are no clear penalties against operators which hid accidents. There is not a system to suspend tender qualification like the one in Japan, and the systems are not strong enough to check occurrence of accidents.

While Japanese Industrial safety and Health Act impose fines as well as imprisonment, the similar system is called for in the Occupational Safety and Health Act in Kenya.

Due to underdevelopment or insufficient diffusion of Occupational Safety and Health Act in Cambodia, there is no clear penalty system against accidents. Sri Lanka imposes penalty by fines. While Japan has a system of imposing suspension of tender qualifications by the client organization in addition to legal penalties, the surveyed countries have no such measures. When you cause an accident in Japan, you will be downgraded in terms of construction abilities, which may be a disadvantage in the next tender. In the surveyed countries, there is no such penalty mechanism due to underdeveloped merit evaluation system, and it is considered that the check against occurrence of accident is weak as compared to Japan.

(Sri Lanka)

There are penalty provisions based on laws against firms which caused accidents, but the penalties are only fines depending on the seriousness of the accident. A firm which has caused a material accident may be fined 100,000Rp (about ¥70,000). There is no such system as suspending qualification for participation in tender. When you fail to report on a material accident, the current provision fines you 5,000Rp (about ¥3,500). The Department of Labor has an opinion to amend this provision amid the prospects of construction boom in the future.

(Cambodia)

There is no penal provision for the constructor which caused an accident. The Ministry of Labor says that fines were paid actually but that was not based on laws. There is a penalty against “hiding of accident” by the operator who caused an accident. Concerning development of penalty provisions, the Ministry of Labor consider it as follows: the law on safety management at construction sites is partly developed and has penalty provisions, but full application at sites is insufficient due to inadequate understanding of the law; therefore, it is important to fully promote sufficient understanding of the law and thoroughly enforcing it.

In an ODA project in which Ministry of Public Works and Transport (MPWT) is the original client, there is a rule that the consultant reports to the client and JICA of any accident. Basically, there is no penalty against hiding accident. There is no penalty such as fines against accidents by the construction company, but MPWT has an authority to judge suspension of works.

In an ADB project, there is no provision in the contract to penalize contractors upon occurrence of any problem, concerning how to sanction operators which failed (or hid) accident report. Concerning the mechanism to exclude, from PQ, operators which caused an accident in the past or committed injustice, there is no limitation on participation in the tender of an operator which caused

an accident from the safety point of view, but there seemed to be a case where participation in the tender was not allowed for the operators which failed to perform the contract because of not fulfilling the tender conditions.

(Kenya)

There are provisions in the Occupational Safety and Health Act to penalize the parties which caused work injuries. In the case of a fatal accident, the employer (construction company or plant client) may be fined up to 1,000,000Ksh or imprisonment up to 12 months. It is based on a clear proof of the cause of accident. They said it may be reduced or acquitted according to the cause. When a corporation tries to hide an accident, the obligation of report is as provided for in the Work Injury Benefit Act. It is recognized that a lack of report leads to nonpayment of insurance money, which offends the victims and disables hiding of the fact. There is no measure to suspend the qualification for tender for a certain period of time, concerning the corporation which caused disaster or accident.

4-4 Education and training relating to occupational safety and health

4-4-1 Education system concerning occupational safety and health

As training relating to occupational safety in construction, some of them are conducting training for occupational safety and health as one of the curricula of training focusing on occupational safety and health, vocational training, and machine operation. Other than Cambodia, they have developed training system focusing on occupational safety and health.

(Sri Lanka)

There is a public organization doing education and human resources development concerning occupational safety and health called Ministry of Youth Affairs & Skills Development, which is performing activities focusing on vocational training for the youth. The Ministry has 18 vocational training organizations which conduct all the public training.

The NIOSH mentioned above (see 4-3-1) has a purpose of activities to foster safety awareness of the persons concerned in the industry through training activities and research pertaining to occupational safety and health. Specifically, it raises safety officers (National Diploma of Occupational Safety & Health). The 1-year course has 4 components: Occupational Safety for Engineering Aspects, Occupational Health, Occupational Health Management Systems, and Research Project. The persons completed the course will be given certificates of completion to be qualified as safety officer.

As construction-specific organization, there is the Institute of Construction, Training and Development (ICTAD funded by the World Bank) to give training for manipulation of construction machines.

(Cambodia)

No systematic education and training have been conducted in construction. There are some examples in the sewing industry, and they have conducted nationwide training. ILO and labor

unions are performing education and training focusing on construction industry in Cambodia. The Ministry of Public Works has not performed safety education from the standpoint of client, but the consultant supervising the project does it. Concerning safety management at construction sites, we got the following comment from the Government officials: “the law on supervision and guidance of safety management at sites were enforced, but the Government officials have not fully understood the contents especially concerning its application. It is currently in the process of systematization and the Ministry in charge is performing it as safety management activities.”

(Kenya)

The administrative organizations having jurisdiction over education and training include the Ministry of Labor and the Ministry of Higher Education, Science and Technology. The latter provides political targets as higher research organization for education in various areas, and oversees equality of occasions, fairness and removal of disparity by closer ties with the universities, diffusion of the opportunity of equal education nationwide, confirmation of integrity between market strategies and educational curricula, and monitoring occurrence of inequality (of education) between men and woman. The education relating to occupational safety and health in construction is actively promoted by the Ministry of Labor.

The Ministry of Labor has compiled various curricula to improve skills concerning occupational safety, and have started training activities mainly for employers and private workers.

4-4-2 Implementation of education and training

The current status of education and training on occupational safety and health at each surveyed country is described below. The surveyed countries have conducted professional education through ministries of vocational training and higher education, but the training course for construction and building is conducted for stone cutting, plumbing, and masonry structure building. Concerning driving and operation of construction machines used in the site of large-scale civil engineering, there is an example in the construction machine training center (Cambodia), but public qualification has not been developed yet.

(Sri Lanka)

The Ministry of Youth Affairs & Skills Development mentioned above have developed about 110 skill standards, and providing 4 major vocational training for the youth. The training program follows National Vocational Qualification Framework which is recognized internationally, and if the training program under development is completed, the National Vocational Qualification System will be built up, and 7 levels will be set, which include Certificate level and Diploma level. Training will be given according to the course curricula, in which there are safety-related subjects. In the training course in construction, there are courses for workers including mason, plumber and constructor, including Diploma course and Certificate course.

The technical universities perform skill training of human resources. Sri Lanka plans to develop human resources who can manage safety in various industries without limiting the area, and safety

officers are raised over a year at NIOSH.

(Kenya)

At present, there is no education or training organization for safety management focusing on construction industry. However, each vocational research institute has incorporated “safety” in the education curriculum. The Ministry of Labor has planned and is performing education and training pertaining to occupational safety and health for 7,000 persons a year in the past 4 years through Directorate of Occupational Safety & Health Services. Persons who completed the curriculum receive certificate of completion but many of the curriculum is as short as about 5 days. Therefore, the training does not lead to a merit upon employment. It is just a lesson to perform safe work at sites.

According to the Ministry of Roads in Kenya, education and training on occupational safety depends on contractors in the field of roads. On the other hand, we heard that Kenya Rural Roads Authority (KeRRA) independently performs education and training pertaining to occupational safety and health for the Ministry staff.

4-4-3 Presence of occupational safety and health experts (private consultants)

In the surveyed countries, the number of private consultants as experts in occupational safety and health are limited in number. Individual plans are certainly ongoing in each country for education of such experts. The human resources who acquired academic qualification overseas in the field of occupational safety and health, or were trained are endeavoring to ensure occupational safety and health mainly from the Ministry of Labor.

(Sri Lanka)

Currently, there are consultants who can supervise occupational safety and health at sites, though not many. Retention of a consultant is up to the judgment of clients, but the Department of Labor is in the position of giving advice.

(Cambodia)

Some of the human resources to play roles of consultants specializing in occupational safety and health are supplied by the employees of Ministry of Labor and Vocational Training. There are medical doctors and trainees trained in Japan from the non-private sector. The master plan of the area mentions that advice and guidance for site safety management is conducted by the request of private constructors. A law providing for site safety management and advice has been enforced but the Government officials do not have full understanding of it. It is in a transition period for systematization, and the Ministries in charge conduct consulting as safety management activities.

(Kenya)

There are human resources called Occupational Safety and Health Services Advisors (54 persons as of November 1, 2011), who perform consulting roles on behalf of the Ministry of Labor, monitor safety management situations at sites, and report to the Ministry of Labor. (The inspector of the Ministry of Labor focuses on confirmation of legal compliance, and the Service Advisor focuses on guidance for improvement in order to realize safe labor environment.) The Ministry of Roads and other client organizations recognize that the number of occupational safety and health experts is still small and such human resources are not fully utilized in the construction sector.

4-4-4 Outsourcing of safety audit and guidance

The client organization retains an external entity or use inner resources for safety audit, unless that is provided for in laws. This depends on the organizational policy, human resources, and staff.

(Sri Lanka)

It was explained that RDA (Road Development Authority) executes contracts with consultants as Safety Officers in the Greater Colombo Urban Transport Development Project, entrust safety audit to them, and get reports from them. So, there is a system of outsourcing of safety audit and guidance.

(Kenya)

Apart from the inspector (see 4-3-2) at a site office dispatched by the Ministry of Labor, there are human resources called OSH Services Advisor, who act for the Ministry of Labor concerning site occupational safety and health. The contractor of a project individually contacts either one of the 54 OSH Service Advisors to request their safety audit based on the contract. The system is applied to all projects assisted by overseas entities as well as all domestic projects in Kenya, which depends on the Occupational Safety and Health Act enacted in 2007. The legal site audit is conducted once in a year by an OSH Services Advisor, but it varies depending on needs of the site, contractor and the Advisor.

The Ministry of Labor goes to the site in response to reports from each office to discuss and advise improvement of site issues, and confirm whether the related laws are properly complied with by the contractor.

Responses are varied in the road sector. Kenya Urban Road Authority (KURA) has practical provisions concerning occupational safety and health audit (in Code of Practice for Occupational Safety and Health Auditing), and maintains the list of safety and health advisors as external auditors approved by the Director of the Directorate of Occupational Safety and Health Services. They commented that they have recording and registering system now, differently from the past, about the various events arisen at sites (daily events, near miss, etc.), and thought that the data accumulation and organization will contribute to the safety management in the future. On the other hand, Kenya Rural Roads Authority (KeRRA) performs safety audit internally and does not retain external

resources. The responses depend on the road construction entities.

For building projects ordered by the Ministry of Public Works, its Fire Department conducts safety audit directly, and does not outsource it.

4-5 Workmen's compensation and construction insurance

4-5-1 Workmen's compensation

Each country has developed laws to prescribe compensation, etc. concerning workmen's accident compensation. The compensation amount is small as compared to that of Japan and it cannot be said that the compensation system against third party (public) accident is not well developed. As compared to the cost of safety facilities, the amount of compensation is small. There is an opinion that a concept of cheaper works than payment on safety measures is prevailing. It is thought that workmen's accident compensation is a weak incentive for prevention of occupational accident.

(Sri Lanka)

A contractor is 100% responsible for accidents occurring at sites. An accident as a result of trespassing by a local resident at the construction site is also a responsibility of the contractor now. It is up to the judgment of the client to prevent trespassing from the outside by erecting fences at the construction site or otherwise.

The Workmen's Compensation Ordinance prescribes occupational accident, and 550,000Rp (about ¥385,000) should be paid in the case of death.

(Cambodia)

There is a compensation system for work-related accident and an emergency medicine system by which the Ministry of Labor and Vocational Training bears the cost for free for the occupational accident at a corporation registered in advance. There is however no compensation system for injury of a third party and property damage. There is a law to prevent third party accident, and the description is included in the master plan. Other than the Ministry of Labor and Vocational Training, no client organization like MPWT (Ministry of Public Works and Transport) pays workmen's accident compensation.

(Kenya)

Concerning compensations in the case of accidents at sites, it is stipulated that necessary information shall be compiled for compensation procedure based on the Work Injury Benefit Act. The section in charge at the Ministry of Labor will calculate the insurance payment (medical cost and compensation) according to certain calculation formula (age of the subject, degree of injury and income are considered). In the case of work injury, there is no mechanism that the government pays compensation to victims, but only to government staff encountering disaster at the site.

Concerning response to third party accidents, there is a provision in the Occupational Safety and Health Act providing that the contractor is responsible for the safety of site workers and nearby third parties. If any third party encounters an accident near the site, the payment by the contractor shall be evaluated by litigation according to customs and based on Work Injury Benefit Act. Although it varies depending on kinds and scales of accident, it may take 5 or more years until award. There are many numbers of legal actions concerning accidents. There is no tentative payment system for victims until award is given. There are 7 private insurance companies registered at the government.

The Ministry of Public Works commented as follows concerning the site problems from the

viewpoint of possibility of third party accident, citing the site of an arterial road under construction in Nairobi (constructed by Chinese companies):

- As the construction site is not completely segregated, it is highly possible that a third party accident may occur by the local resident coming into the site.
- The construction site is in a position that the yard cannot be completely enclosed because of the site situations, and the point is how the contractor performs safety management. The only thing that can be done is to promote improvement of safety awareness at site and to encourage improvement of awareness (for safety), but it will take time.
- It takes cost to some extent to erect fences at the site, and the concept of keeping construction cost low rather than using money for fences may prevail, unlike advanced countries.
- Rather than selecting costly measures, it may be better to place flagmen. In the case of the site, we could not see any flagmen. It is basically problematic that the area of the site is narrow.

4-5-2 Workmen's accident compensation insurance and contractors' all risks insurance

Concerning insurance of construction against occurrence of work injury and accident, the situation varies for each country and each site. In most of the cases, the contracts obligate participation in major insurances (comprehensive contractors' all risks insurance, workmen's compensation insurance, etc.). Some sites have participated in comprehensive insurance of Japanese insurance companies, but the response varies like participation in insurance handled by private insurance companies of the subject country for third party insurance.

(Sri Lanka)

The private insurance companies provide various insurance conditions. In RDA, there are RDA insurance (for employees) participated by the organization itself and contractor's insurance. Contractor's Workers Compensation Insurance covers works by workers of the contractors, and all persons related to construction are insured. The amount of compensation is assessed in consideration of various conditions like the degree of injury, the degree of disability by injury (loss of functions of the limbs), age and earning ability. There are three kinds of ordinary construction insurance, namely, contractor's all risks insurance, third party's insurance and workmen's compensation insurance, which should be purchased in all projects conducted on the basis of FIDIC terms and conditions.

(Kenya)

Generally, the insurance company discusses with a contractor or an client for each work to select the insurance to be purchased (comment of the Ministry of Labor). As the Work Injury Benefit Act does not have provisions on the third party accident, insurance is purchased to cover compensation to third parties. The prime contractor is responsible for accidents caused by the subcontractors. The Ministry of Roads administers workers' compensation for employees only, and all road sites are

obligated to purchase two kinds of insurance, namely, all risks insurance and third party insurance.

(Vietnam)

In Vietnam, there is a system for the Government to pay compensation to occupational accident, and there are provisions in social insurance act and labor act. As insurances purchased by the contractors at site, there are insurance for construction materials and equipment, workmen's accident compensation insurance, third party compensation insurance, and contractors' all risks insurance.

4-6 Labor environment and customs pertaining to occupational safety and health

4-6-1 Labor environment

In order to maintain safe work environment at construction sites, it is necessary to remove disturbances occurring from various factors such as n atural and weather conditions, social conditions and human conditions, improve them as necessary and create good working conditions. The information obtained by local hearing only shows the various obstacles in maintaining safe working environment. Specific examples are shown below and supplements will be made on the basis of local information as to cases characterizing the developing countries overseas.

[Natural and weather conditions]
- Landslide, falling rocks, sediment disaster
- High temperature, dust

[Human and social conditions]
- Land mines, unexploded ordnance (UXO)
- AIDS/HIV
- Sites in cities

[Other]
- Severe environmental conditions in unstable slopes
- Wide work areas beyond vigilance by the person in charge of safety management

Land mines and unexploded ordnance:

This problem is a characteristic in Cambodia among the surveyed countries. According to the timing of discovery and removal of mines, the construction schedule may be affected and small unexploded bombs may be found during construction, and it is a concern that the bombs may inflict direct damage. At a site in Cambodia, the employer did not recognize existence of small unexploded bombs at the site, and the contract explicitly provided the steps to make just in case when unexploded bombs are confirmed to exist. The site was not examined closely before the start of construction. It was assumed bombs were mixed in the soil imported from other site, and this is the case of possibly leading to accident. Likewise, similar event may arise in other areas in Cambodia, and a response may be needed to perfect prior investigation of the subject site.

AIDS/HIV:

According to hearings in Cambodia and Kenya, some sites took measures against AIDS. Depending on the scale of construction, many workers come from overseas or other places in the country temporarily to the vicinity of the site to stay during the construction period. They may encounter various problems while contacting with the region's social environment. To take measures against AIDS, contractors often bore the burden of educating workers.

Sites in cities:

In road construction sites adjacent to arterial roads where traffic increases during the commuting hours, risk of disaster and accident increases among passing traffic in general, construction vehicles, and the workers at site. In sites at cities, there are many sites in fact, without exception, which have the risk of accidents to third parties who enter the site. In the construction sites in developing countries, there are not many sites which enclose the sites completely by barricades, and there are cases that the sites have rooms to be improved. The adjacent area often lacks the recognition on the danger of construction site. If you have explanation sessions to the locality of the outline of work, many sites are in fact obliged to make efforts in restraining access to the sites without notice. In the case of certain type of construction, it is often the case that proposal on site safety must be made while considering the local circumstances.

4-6-2 Social customs, etc.

When we grasp the social customs of the subject countries that affect the safety of the site, we point out driving manners of vehicles (car, motorcycle, etc.) as concerns derived from hearings. Instead of accidents at site, there were cases that a worker caused traffic accident during commuting to the site, drunken driving, and an accident occurred at site by overspeed in spite of the speed limit set for construction vehicle. There were examples of increasing the risk of traffic accident by workers who come and go between the residential areas and the site, and bringing the ordinary living customs into the site.

Further, we heard from the Ministry of Higher Education, Science and Technology of Kenya commenting on the current status on increasing employment opportunity of women in construction: "In recent years, women are increasingly employed at sites, after people are interested in 'human rights'. The equal employment opportunity between men and women is not completely achieved in the society. Also, it is often the case that the religious provision on clothing (as compared to safe uniforms) harms safe working environment. Female workers are increasing at construction sites for works including drawing water for cement mixing, soup-run, making aggregates, and transportation of bricks."

In addition to Kenya, the employment opportunity at construction sites for women will steadily increase in other countries, and the types of work-related accident may be diversified due to increase of female workers whose physical strength is generally different from that of male workers.

4-7 Initiatives by other donors for reduction of industrial accidents

4-7-1 Initiatives on occupational safety and health

In other donors, the involvement to safety management differs among countries, although they are same organizations. They manage safety and health by allocation of safety managers at contractors, and separate agreement for safety audit consultants. JICA also makes the same activities by allocating persons in charge of safety management in the positions of safety experts and consultants. Overall, we did not feel the risk awareness that JICA has in other donors concerning safety management.

(ADB Sri Lanka Resident Mission)

Normally, it has construction supervision consultants that are active in the international market. Concerning involvement in the safety management at sites, ADB feels obligation to review work safety even though it is just a financer, and confirms that worker wears safety gears such as helmets at the time of viewing the sites. However, ADB indicated responsibility for safety management as follows: “Contractors are responsible for securing quality and safety, required to give full consideration to the protection of sites before construction, and explain how they secure site safety. The engineer has the authority to suspend approval of starting construction until written safety measures are submitted, and the engineer (consultant) is obligated to review the safety plan made by the contractor before construction.” Thus, they expressed the opinion on division of basic responsibilities on safety management by consultants and contractors.

Concerning selection of a contractor, it evaluates participating companies with respect to construction and safety management upon confirmation of qualification before tender, in order to eliminate factors leading to disaster and accident as much as possible. In contracts, the contractor is obligated to perform smooth site management while raising related contractors such as subcontractors, etc. for quality control and progress of works. In many of the contracts, there are provisions on safety in the specifications.

For example, in the contract for the Southern Highway Construction Project, the engineer is obliged to approve registration of the expert staff of the contractor, and safety manager, erosion control engineer and other expert staff were allocated to sites. The project is a large-scale project, and the contractor allocated safety manager (a Sri Lankan who has experience in safety management) to the site. Safety managers are allocated to all of the 3 sections of the Southern Highway Construction Project, and, in the contractual requirements, the safety manager (of the contractor) has responsibilities to assure safety at sites before the engineer perform inspection at the sites in the case of major construction work. In this sense, the engineer gives “approval” only, and the condition of contract stipulates obligation of placing safety manager by the contractor.

The provisions pertaining to safety in contracts are not standard terms but written in ADB Standard Contract for Consultancy Services, and TOR has provisions on construction safety, they said.

(ADB Cambodia Resident Mission)

For securing safety of works, it has contracts in addition to the contract based on FIDIC. Concerning works, they execute contract with a consultant for site supervision, and let him submit monthly reports. The ADB Cambodia Resident Mission inspects the sites twice a year to confirm work progress and safety management. What they emphasize upon site survey is the confirmation of the appropriateness of machine operation. If they find unsafe actions, they guide the contractor to improve the practices. If the contractor does not comply with the contract, they may suspend works. The safety management is considered to be a part of the project, and they do not budget safety management cost separately. There is no provision of specifically placing person in charge of safety management at the site in the consultant agreement. The representative of the consultant as the engineer or the site engineer customarily performs the role of the safety specialist, and he will inevitably perform safety management at the sites, they say.

They do not prepare any statistics on work-related accidents occurring at sites. Individual work report is the basic record.

As a specific circumstance in Cambodia, concerning construction at sites where land mines are buried, they describe the fact in the contract when ADB judges that land mines are buried at part of the sites, they write the fact in the contract, provide for removal of land mines in the contract, and cost of removal of land mines is included in the contract amount. In addition, they execute contracts with the consultant concerning any existence of land mines, and allocate experts to confirm removal of land mines in the contract. If the consultant reports that there are no land mines, and if they are found after starting construction, they execute another contract as other project to remove them. The cost for removal of land mines is included in the contract at the sites where land mines are judged to exist originally, but if removal of land mines are not included in the contract, the cost for it will be borne by the client.

There are CMAC (Cambodian Mine Action Centre) and other NGOs which remove land mines. If removal of land mines is provided for in the contracts, they outsource removal at the responsibility of the contractor. After removal, CMAA (Cambodian Mine Action and Victim Assistance Authority) other than CMAC makes the confirmation.

(Kenya)

Other than JICA, there has been DANIDA as one of the international organizations, which actively assisted occupational safety and health in Kenya. It deployed Local Training Program for about 5 years. Earlier, the country received assistance from FINIDA. There has been no involvement by WB and AfDB in this area.

4-7-2 System of accident reporting and penalty provisions

(ADB Sri Lanka Resident Mission)

As to the penalty against contractors which caused accidents, ADB Sri Lanka Resident Mission commented as follows: “ADB is a financer but not a party to the agreements. It is necessary to consider it as a relation between the client (the Government of Sri Lanka) and the contractor. ADB has prospectuses on safeguard, but is not involved in the penalties in Sri Lanka.” In FIDIC Conditions of Contract, it is explicitly indicated that a contractor is responsible for the third party accidents. Therefore, an affected third party cannot sue the client. It is a basic concept that the contractor is responsible for accidents occurring at sites. The person in charge of ADB suggested possibilities to incorporate penalty provisions in contracts.

(ILO Country Office for Sri Lanka)

It does not collect and arrange accident and disaster information in the Sri Lankan industries, but accumulates data of accident per site. The website of ILO publishes statistical data on accidents and disasters in the world, but they arranged and published the results of the collections of ILO Headquarters from the labor department of each country.

On the other hand, concerning the difficulty in evaluating occupational safety and health based on the accident statistics, ILO Country Office for Sri Lanka commented as follows: “We evaluate and analyze accidents by the reported fact only. If they start to focus on occupational safety and health and to steady accident report to the Government and related organizations, you might feel that accidents increased, but it is difficult to precisely evaluate increase or decrease of the number of actual accidents at sites. After a civil war which lasted for nearly 30 years, Sri Lanka has accomplished an economic growth close to 8% per year now. The economic growth increased construction works. Immediately after a long-term civil war, construction works and infrastructure development have started intensively. The rapid increase in occupational accidents and in the number of accidents is inevitable to some extent. It is difficult to evaluate that the level of safety management in the country is low in general in the country.”

Chapter 5 Present State and Issues of Safety Management in Countries under study

5-1 Present state of the construction work in foreign countries

5-1-1 Construction work and risk

In April 28, 1941, the comprehensive Workmen's Compensation Act was established in Canada. Since 2003, ILO (International Labor Organization) has designated this April 28 as the World Day for Safety and Health at Work, that is, the day when awareness on the importance of prevention of industrial or occupational accidents and diseases will be enhanced all over the world. ILO estimates fatalities of about 2.2 million persons in occupational accidents every year and 270 million persons for those injured heavily, but not so much as to die. In Japan, on the other hand, the casualties are 197,759 persons and the fatalities are 1,195 persons (as of 2010). When focused on the construction industry, they are 21,398 persons and 365 persons (as of 2010) respectively. In particular, the fatalities of the construction industry account for 30.5% of all industries. Namely, the construction industry is the type of industry with most frequent fatal accidents.

The construction industry involves therefore many risks (risk defined below) because it is highly possible that occupational accidents, once occurring, will result in fatalities. In particular, construction works in developing countries faces various risks, including certain risks that will never happen in Japan.

For example, risks facing construction works in developing countries are ranging wide from risks caused by occupational accidents to country risks originating from emergencies such as war, coup d'état, etc.as well as sudden fluctuation in exchange, soaring price, insurgency of residents against government, and natural disasters such as flood, volcanic eruption. Among them, such risks related to occupational accidents during the construction work as dealt with in this study occur very frequently while exerting significant effects widely on the society as well as on the country concerned.

<Definition of risk>

The risk is defined variously. This paper adopts the definition shown in "Official Notice No.1 for Guideline concerning the Study on Hazard and Harm (May 19, 2006", namely;

○**Risk: Seriousness and possibility of occurrence of injury or sickness likely to occur due to hazard or harm**

As supplement, reference is made to a part of "Guideline and Explanation (Safety Division, Occupational safety and Health Department, Ministry of Health, Labor and Welfare." "Hazard and harm" in the definition of risk are latent sources of injuries or sickness of workers, which are equivalent to "hazard", "hazardous and harmful factors" as used in ISO and ILO.

Once occupational accidents occur, not only damage (physical damage) to the target of work, but also casualties of those concerned with the work as well as the third parties (passengers and neighborhood residents) and damage to properties like underground utilities may result. This in turn results in workers' accident compensation and third party damage compensation and causes delay in completion of the work, cost increase, and delay in production of effects. With growing seriousness of occupational accidents, the society of the country concerned suffers larger negative effects. This applies similarly to Japan and foreign countries. In particular, occurrence of such accidents in the course of projects under Japanese financial assistance overseas may cause negative impact like possible loss of credit of the recipient country against Japan.

Occupational accidents of construction works may occur in all types of industry. Even in the field where the sufficient amount of safety equipment is provided and the site manager with thorough knowledge and well experienced in safety management is stationed, an accident may occur because of carelessness of workers or nonperformance of daily safety confirmation procedure. The casualties of industrial accidents in Japan are as described above. From analysis of the number of occurrences of significant accidents in Japan, it is known that the construction industry accounts for the largest number of 87 cases in 245 cases of the number of significant accidents of all industries for 2010. Evidently, the risk of industrial accidents is extremely high in the construction work.

Occurrence of work-related accidents involves various factors (human error, faulty maintenance of machinery and devices, deficient knowledge of workers on the safe work, etc.). Therefore, in the field where large number of workers is engaged in jobs under the multilayered contractual pattern, it is essential to make efforts to enhance the safety level of workers and their groups and to establish an organized, systematic, and continuous approach without depending on personal experiences and skills.

With this situation in the background, Japanese contractors engaged in construction works in foreign countries are commonly trying to ensure the safety by positioning the Japanese professional staff (qualified personnel, skilful technicians) or the foreigner staff experienced in safety management as the safety manager to make up for deficient experiences of the local staff.

Presently, Japanese contractors have to manage by means of various contrivances and efforts with the limited number of Japanese staffs. In the case of the subcontract with local contractors, it would be a substantial burden on Japanese contractors to proceed with the work while training and educating large number of local staffs under the work environment unfamiliar even to Japanese if the work period is two to three years.

5-1-2 Risk of significant accidents and public accidents

The statistical data in the past ODA construction projects (see Chapter 2) shows that about 70% of the total casualties of work accidents account for casualties of significant accidents and public accidents. Accordingly, hearing was done on the risk of significant accidents and public accidents to the contractors engaged in the works of three countries (Sri Lanka, Cambodia, and Kenya) under site survey. Similarly, questionnaire and hearing were made on contractors engaged in works of two countries (Vietnam and Indonesia) under domestic study, On the basis of information returned from contractors, the assumed risks of expected significant accidents and public accidents are summarized by the type of work accidents as follows.

(1) Risks of significant accidents

Assumed risks of significant accidents as presented from sites are shown below.

Table 5-1 Assumed risks of significant accidents in the countries under study

Type of work accidents	Assumed specific examples	Country	Category of work
Crashing and falling	Crashing from elevated place during construction of viaduct	Sri Lanka	Road work
	Falling from embankment of roller	Sri Lanka	Road work
	Crashing readily occurring during demolition or work at elevated place	Sri Lanka	Hydraulic power plant work
	Crashing from elevated place	Cambodia	Industry (land improvement)
	Crashing during construction of superstructure/substructure of bridge, high piers, and main tower of cable-stayed bridge, and temporary installation of girder	Cambodia	Bridge work
	Overturn of heavy machinery during earth work or temporary work	Cambodia	Bridge work
	Crashing during elevated work (building scaffold)	Vietnam	Port and harbor work
	Bridge work	Vietnam	Bridge work
	Construction of building structure, erection of steel frame	Vietnam	Port and harbor work
	Assembling and erection of steel bridges	Vietnam	Railway work
	Crashing and falling from elevated place	Vietnam	Railway work
	Crashing during form assembling and disassembling	Indonesia	Debris barer work
	Relay pump work (elevated work)	Indonesia	Sewerage work
	Elevated work (erection of steel girder)	Indonesia	Bridge work
	High risk of crashing and falling during bridge superstructure work	Indonesia	Road work
Overturn	Overturn of crane during girder erection	Sri Lanka	Road work
	Overturn of crane and heavy machines during bridge superstructure/substructure work, earth work, temporary work	Cambodia	Bridge work
	Risk of accident caused by heavy machinery	Kenya	Hydraulic power plant work
	Crane operation (placement of temporary steel sheet pile)	Vietnam	Water and sewerage works
	Pile driving	Vietnam	Port and harbor work
	Bridge work	Vietnam	Bridge work
	Assembling and erection of steel bridge	Vietnam	Railway work
	Track work	Vietnam	Railway work
	Accident caused by heavy machinery	Vietnam	Bridge work
	Overturn of heavy machinery during earth work	Indonesia	Debris barrier work
	Excavation of the slope	Indonesia	Disaster preventive work
	Concrete work by the side of slope	Indonesia	Disaster preventive work
Incoming, downcoming	Third-party accident by fly rocks during blasting of rock mass	Sri Lanka	Road work
	Girder falling during erection of girder	Sri Lanka	Road work
	Falling of hanged cargo	Cambodia	Bridge work
	Hit by falling load against a person entering below the hanged cargo	Cambodia	Industry (land improvement)
	Blasting	Kenya	Hydraulic power plant work
	Crane operation (Installing temporary steel sheet piles)	Vietnam	Water and sewerage works
	Pile driving	Vietnam	Bridge work
	Crane operation (lifting)	Vietnam	Port and harbor work
	Incoming and downcoming due to work at elevated place (building scaffold)	Vietnam	Port and harbor work
	Building structure work, erection of steel frame	Vietnam	Port and harbor work
	Bridge work	Vietnam	Bridge work
	Assembling and erection of steel bridge	Vietnam	Railway work
	Lifting of manhole and pipe	Indonesia	Sewerage work
	Elevated work (erection of steel girder)	Indonesia	Bridge work
Collapse and destruction	Risk due to natural disasters (flood, landslide)	Sri Lanka	Hydraulic power plant work
	Destruction during works of bridge superstructure/substructure, high piers, and main tower of cable-stayed bridge, and temporary erection of girder	Cambodia	Bridge work
	Collapse of slope due to deep excavation	Cambodia	Industry (land improvement)
	Building structure work	Vietnam	Port and harbor work
	Building work	Vietnam	Bridge work
	Assembling and erection of steel bridge	Vietnam	Railway work
	Track work	Vietnam	Railway work
	Structural work in the neighborhood of railway	Vietnam	Railway work

	Accident caused by vehicular construction machinery	Vietnam	Road work
	Excavation	Indonesia	Sewerage work
Impacted	During supply under pressure at elevated place, there is high risk of work accident due to bouncing of piping because the piping was cut off in the state with residual pressure	Sri Lanka	Hydraulic power plant work
	Crane operation (Installing temporary steel sheet piles)	Vietnam	Water and sewerage works
	Pile driving	Vietnam	Port and harbor work
	Bridge work	Vietnam	Bridge work
	Assembling and erection of steel bridge	Vietnam	Railway work
	Track work	Vietnam	Railway work
	Accident during placement of concrete	Indonesia	Debris barrier work
	Concrete work by the side of slope	Indonesia	Disaster preventive work
Crushing, trapping	Crushing/trapping by earth-work machines	Sri Lanka	Road work
	Trapping by heavy machines during pavement	Sri Lanka	Road work
	Contact with bulldozer during soil spreading	Sri Lanka	Road work
	High risk of the worker contacting with the heavy machinery during soil spreading	Sri Lanka	Hydraulic power plant work
	Contact with heavy machine during earth work	Cambodia	Bridge work
	Contact by entering the operating and rotating range of excavation machine, vibratory compacter, grader, pile driver, crane	Cambodia	Industry (land improvement)
	Risk of accident caused by heavy machine	Kenya	Hydraulic power plant work
	Crane operation (Installing temporary steel sheet piles)	Vietnam	Water and sewerage works
	Pile driving	Vietnam	Port and harbor work
	Building structure work, erection of steel frame	Vietnam	Port and harbor work
	Bridge work	Vietnam	Bridge work
	Assembling and erection of steel bridge	Vietnam	Railway work
	Track work	Vietnam	Railway work
	Accident caused by heavy machine	Vietnam	Bridge work
	Accident caused by vehicular construction machine	Vietnam	Road work
	Crushing during earth work by heavy machine	Indonesia	Debris barrier work
	Work by heavy machine (narrow area)	Indonesia	Bridge work
	Excavation of the slope	Indonesia	Disaster preventive work
Drowning	Drowning during work on the water	Cambodia	Bridge work
	Diving operation	Vietnam	Port and harbor work
Electric shock	Many electric equipment is faulty, causing electric leakage or short-circuits frequently.	Sri Lanka	Hydraulic power plant work
	Electric equipment (electric shock)	Vietnam	Port and harbor work
	Welding (electric accident)	Vietnam	Road work
	Appliances, equipment, and cable of electric wiring are rather faulty in terms of quality, with copper wire portion exposed readily. As dewatering was made at the excavation point, the submerged pump was used frequently and the voltage was as high as 200 V. The possibility of electric shock was a big concerned particularly during wet season.	Cambodia	Industry (land improvement)
Explosion	Bomb disposal	Cambodia	Industry (land improvement)
Fire	High risk of fire due to the use of gas welder during dismantling of arch center	Sri Lanka	Hydraulic power plant work
	Risk of catching fire from mountain burning as is the custom of the region	Sri Lanka	Hydraulic power plant work
	Many electric equipment is faulty, causing electric leakage or short-circuits frequently.	Sri Lanka	Hydraulic power plant work
Traffic accident (road)	Traffic accident most common in overseas construction projects	Kenya	Water work
	Accident caused by driver	Kenya	Hydraulic power plant work
	Traffic accident by heavy machine	Vietnam	Port and harbor work
Traffic accident (others)	Accident caused by driver	Kenya	Hydraulic power plant work
	Structural work in the neighborhood of railway	Vietnam	Railway work
	Accident caused by vehicular construction machine	Vietnam	Road work
Others	Risk of causing significant accidents latent in all of types of industries, such as excavation, form, concrete, and piping installation works	Kenya	Water work
	Flood and other natural phenomena	Kenya	Hydraulic power plant work

The result of study through hearing, etc. shows that the risk of significant accident varies widely over types of industry and operation. Notwithstanding this, risks that are recognized as particularly significant by the job-site staffs include “operation involving heavy machine, such as vehicular

construction machine and power crane", "temporary work involving work at elevated places", "large scale operation such as bridge building", and "deep excavation." Highly-important additional points are that the risk of "electric shock" is considered significant ant that "bomb" and "natural disasters" are recognized as risks in certain job site. "Bomb" brings about increased seriousness if resulting in occupational accidents though rarely happening and the degree of recognition of "natural disaster" as risk may vary by region.

As will be described later, on the other hand, workers of the countries under study are less safety conscious and deficient in the capacity of hazard prediction. They are also restricted in experience of the operation involving vehicular construction machines and heavy machines and are not fully aware of the hazard of operation with heavy machines. This is one of factors inducing significant accidents.

Practically, in each job site, it is necessary to take these workers by the hand and teach and guide them step by step beginning with such elementary steps as wearing and use of safety tools including safety shoes. Moreover, in the road and railway projects with the long work period and the long sections in contact with private land or the power plant projects involving many and wide construction points, safety management by the Japanese staff (persons in charge of safety measures) only is not possible. Actually, therefore, the local staffs are employed for safety management for implementation of the management.

Locally procured construction machines and equipment are also pointed out as substantial factors causing significant accidents. For these locally procured machines and equipment, as described previously, the basic maintenance practices of "inspection and servicing" are not firmly established because of lack of well-established laws concerning construction machines and equipment of the country concerned. This in turn caused highly frequent industrial accidents attributed to insufficient maintenance of these machines and equipment, which must be eliminated if significant accidents are to be reduced there.

Categories of the job-site work under this study include various works including "road", "bridge", "dam (hydraulic power generation and sabo)", "development of water works", "industry (land improvement)", "railway", and "port and harbor." This means naturally that risks assumed in the site during work vary infinitely depending on the category of work. However, when safety securing is considered from a viewpoint of work environment of developing countries different from Japan, risks characteristic of these countries as compared with the construction site in Japan, risks due to unfamiliarity with social and natural environments of the recipient country, etc. are observed latent commonly in job sites.

Though certain items may be repetitions of the replay from job sites as above described, principal risks assumed for the construction environment of developing countries are shown below.

<Risks characteristics of developing countries>
- ○ Incomplete safety equipment[*1]
- ○ Accident during transport (transfer) of work-related vehicles on out side roads of poor condition
- ○ Public accidents due to poor driving manner during transport (transfer) of work-related vehicles and during transport of materials and equipment
- ○ Risk increasing due to operation of local staffs who are less safety conscious and deficient in the capacity of hazard prediction
- ○ Accident caused by faulty and insufficiently maintenance of construction machines and equipment procured locally
- ○ Residents' low-moral character and low risk consciousness with work, such as unauthorized access to the work area, etc.

In addition to the above, those who were familiarized with living with sandals had to put on unfamiliar safety shoes suddenly and were about to overturn and fall from the elevated place with handrails. In this way, there are several reports of near accident because of bringing different habits into the site with complete set of safety equipment. Namely, there are cases that the local living

practice makes it difficult to secure the safety in the site. In many cases, local workers are less safety conscious and actually the Japanese staffs are in charge of their education and training while proceeding with the jog. Practically this puts considerable burden on the Japanese contractors.

*1: The Japanese side can do something to improve if the Japanese contractor is in charge of the main portion of the work.

<Risks due to unfamiliarity with social and natural environments of developing countries>
- ○ Accident due to insufficient communication with local workers
- ○ Construction environment of unfamiliar ground and meteorological conditions
- ○ Flood (unusual flood, under-developed or non-developed drainage environment)
- ○ Weakening of the ground, collapse of slope, rock fall due to unexpected rainfall conditions (heavy precipitation within short time)
- ○ Slope collapse because of fragile ground

In the site where the Japanese contractors are to be engaged in construction, there may be risks increasing due to their unfamiliarity with the ground and meteorological conditions of recipient country even if the they are well experienced under diversified environments in Japan. There are also risks increasing due to deficiency in communications or mutual understanding with workers including the local staff.

Risks caused by natural environment are latent, though varying in the degree, in all countries. However, even the difference in the way of raining itself from the case in Japan may cause complete change in the ground and work conditions within the short period in the site, which in turn increases the risk.

Risk in operation with heavy machine

Risk in temporary work at elevated place

Risk of natural disaster (rock fall)

Risk of electric shock

(2) Risk of public accidents

Assumed risks of public accidents based on data presented from job sites are shown below.

Table 5-2 Assumed risk of public accidents in the countries under study

Type of work accidents	Assumed work type and specific examples	Country	Category of work
Crashing and falling	Crashing after entry into the protected opening	Sri Lanka	Road work
Impact	Earth retaining wall	Vietnam	Bridge work
	Road work	Vietnam	Bridge work
	Track work	Vietnam	Railway work
Incoming and downcoming	Girder erection work above Route 11 and village road	Cambodia	Bridge work
	Falling of vehicle, persons, animals onto the excavated portion for piping along the public road	Kenya	Water work
Collapse and destruction	Rock mass falling from above the cliff	Sri Lanka	Hydraulic power plant work
	Heavy rainfall, causing outflow of soil from the site and spoil area into private land	Kenya	Water work
	Earth-retaining wall	Vietnam	Bridge work
	Structural works in the neighborhood of railway	Vietnam	Railway work
Crushing, trapping	Road work	Vietnam	Bridge work
	Earth retaining work	Vietnam	Bridge work
	Track work	Vietnam	Railway work
Traffic accident (road)	Traffic accident at an intersection between pilot road and local road	Sri Lanka	Road work
	Contact between work-related vehicle and general vehicles and with passengers	Sri Lanka	Hydraulic power plant work
	Traffic accident due to road blockage	Cambodia	Bridge work
	Accident with old dump trucks and trailers	Cambodia	Industry (land improvement)
	Accident at the access point to the site	Cambodia	Industry (land improvement)
	Traffic accident during nighttime work	Kenya	Road work
	Road work	Vietnam	Bridge work
	Earth-retaining work	Vietnam	Bridge work
	Material transport (traffic accident)	Vietnam	Bridge work
	Traffic accident during material transport	Indonesia	Debris barrier
	Contact with the third party during excavation	Indonesia	Sewerage work
	Since the work is down while regulating the traffic of local road with extremely large traffic volume, there always exists the risk of accidents to the third party by heavy machine and vehicle throughout the work period.	Indonesia	Road work
	Transport (traffic accident)	Indonesia	Bridge work
	Contact between general vehicles/motor cycles and commuting vehicles/work-related vehicles	Indonesia	Bridge work
Traffic accident (others)	Contact with the work-related vehicles	Sri Lanka	Road work
	Vessel accidents with the river vessels	Cambodia	Bridge work
	Risk of obstruction by drifting materials to the ferry route	Cambodia	Bridge work
	Contact of heavy machine with average citizen and general vehicles during excavation along the public road	Kenya	Water work
	Dredging and marine works	Vietnam	Port and harbor work
	Track work	Vietnam	Railway work
	Structural work in the neighborhood of railway	Vietnam	Railway work
	Navigation within rivers (contact with vessel)	Vietnam	Bridge work
	Road work (because the third party can enter the site quite readily)	Vietnam	Road work
Others	Fine dusts, vibration	Sri Lanka	Hydraulic power plant work
	Damage to the buried cable crossing the land	Cambodia	Bridge work
	Risk of shutting off the water work, electricity, and communication lines	Cambodia	Bridge work
	Accident due to entry of the third party into the site (type varying widely)	Cambodia	Industry (land improvement)
	Effects of ground deformation caused by pile driving on the houses	Cambodia	Water work
	Complaint on nose of generators, concrete plants	Kenya	Water work
	Risk of equipment and materials being stolen	Kenya	Road work
	Noise and vibration, water quality contaminated by flushing water of the batcher plant	Indonesia	Road work

According to the result of hearing/questionnaire of the study, job sites take commonly the risks caused by traffic accident as risks of public accidents. Actually, the statistical data of past work-related accidents show that about 70% of public accidents are caused by traffic accidents.

Though specified beforehand in the contact conditions with the client, certain sites where the Japanese contractors are engaged hold the orientation meeting for residents in the stage before commencement of the work, explaining the objectives, outline, and safety securing measures of the work. However, by nature of the social practices of the countries under study, residents do not fully understand the hazard of the site where the construction machine and other heavy machines are working daily, entering the construction site often any time night and day. In most of the cases, the reason is as simple as shortcut available to the destination if the construction site is used for passage. The worse case is that not a few accidents occurred while playing after entry to look for a wide place for children to play or simply because of curiosity. Considering these conditions, it is necessary to take thoroughly the measures to prevent entry of the third party into the site.

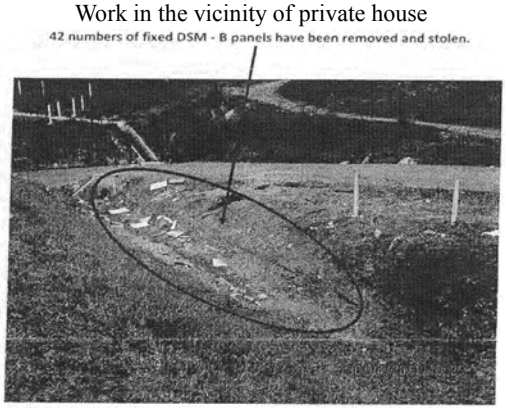
On the other hand, however, there are malignant cases of intentional entry even when the site is totally enclosed by fence and barbed wire. As a co untermeasure, the guardsmen are located. Certain sites suffer gigantic security costs because of the necessity of increasing the number of guardsmen to cope with longer construction period.

In countries under study, it is observed that the traffic rules and driving manners are not observed so strictly and general vehicles are poorly maintained. This means the risk that the work-related vehicles and commuter vehicles of those concerned with the work may suffer traffic accident (induced accident) on the local road outside the site.

Risk of traffic accident (dump truck and the third party)

Work in the vicinity of private house

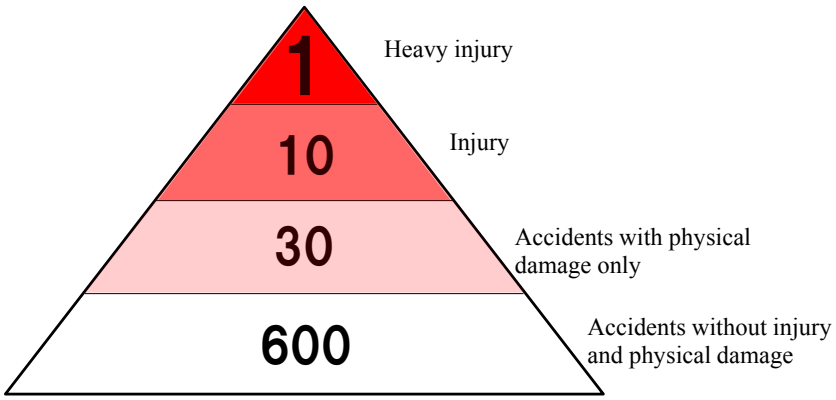
State allowing ready entry of the third party



Damage or stealing of the boundary panel

5-1-3 significant accidents and near misses

The basic guideline for risk assessment in Japan, that is, "Official Notice No.1 for Guideline concerning the Study on Hazard and Harm (May 19, 2006)" stipulates that the preliminary study be made on the hazard in 7 (2). One of the methods is to collect the cases of "near misses." For these near misses, the "1:29:300" law presented by H.W. Heinrich, a safety engineer of the US non-life company is well known. One case of heavy injury occurs after 29 cases of light injury and 300 cases of non-injury accidents. Though the numerical numbers of ratio was established rather a long time ago and is not exact, this is one of important concepts for prevention of occupational accidents. The similar study was made by Frank E.Bird Jr., which shows the ratio of occupational accidents of Figure 5-1.



Quoted from P47 of "For Safe Management of the new Age", written by Shin Ozeki, published by the Japan Industrial Safety and Health Association

Figure 5-1 Ratio of occupational accidents according to Bird

Moreover, the result of internal statistics of a certain enterprise with a long history on the safety management in the US points out that, for one case of significant accidents, there are 3,000 to 30,000 cases equivalent to First Aids, so-called near misses.

Namely, the law of Heinrich, the law of Bird, and further the US enterprise's concept of accident ratio commonly argue that there are numerous First Aids latent for occupational accidents. For the hazard including near missed for the site, collection of the information and analysis of the background factors and causes, thereby leading to the countermeasure, is sober, but may be exploited for the construction site of developing countries as one of effective safety measures.

Though near misses offer small information individually, compilation and analysis of these near misses and leading the result to the countermeasure if possible (for example, revision of the procedure) can prevent significant accidents.

On the basis of above discussion, hearing and questionnaire on the near miss cases were done in sites during field and domestic studies. Since near miss cases are generally held within enterprises and the opportunity of publicizing them is few, the number of collected cases is limited. In the future, this will be one of effective reference information for developing the near miss report system in the site. Collected cases of near misses are shown in Table 5-3.

Table 5-3 Examples of near misses in the countries under study

Type of accidents	Typical near missed
Crashing, falling	○ While the subcontractor was operating the machine, the machine became uncontrollable suddenly, which may possible result in crashing and falling and thus in significant accidents. (This was due to failure of the hydraulic system because of deficient maintenance of the machine owned by and brought into site by the subcontractor.)
	○ When a worker who had never put on shoes was working with shoes ON at the elevated place, he slipped from the scaffold with handrails and was about to fall.
	○ The third party was about suffer accident (contact with the vehicle or falling into the protected opening)
	○ Materials/equipment or tools were placed carelessly during pipe installation in the cut-and-cover pit, and about to fall to knock against the workers operating below.
	○ The scaffold plates were not fixed on the frame scaffold, and they got loose to enter the state in which the plates were held like a balance. This was about to cause falling.
Overturn	○ Local road was in the poor state. During transport of materials, the truck avoided the opposing vehicle by moving to the unpaved portion. This resulted in burying of wheels in mud and the vehicle was about to overturn.
	○ The rolling tower for coating of the wall and ceiling was used at the position very close to the opening.
	○ Overturn of steel pipe piles because of faulty meshing of vibro-hammer
	○ Overturn of the wheeled mobile scaffold during travel. Luckily no one was injured.
Impacted	○ The worker was about to contact the heavy machine.
	○ Backhoe was trying to lift the I steel, lost balance and contacted a person. Luckily he was just injured lightly.
	○ The worker entered the backhoe swing range and was about to be run-over because he was in the blind corner of the operator.
Incoming and downcoming	○ Cross-beam fell during form assembling work in the course of UP/DOWN operation with another, and was about to knock against the worker.
	○ During excavation and filling of concrete, rock fall from the excavated surface was about to knock against the worker.
	○ Bolt fell off from the temporary truss scaffold for ceiling work and was about to knock against the worker down below.
	○ Rim flying due to punctuation of tires of dump truck
	○ Falling of lifted cargo
Traffic accident	○ Traffic accident was about to occur within the work area because of excessive speeding and drive dozing.
	○ Contact of general vehicle with the persons concerned with work is possible because of excessive speeding of the former. (Near miss involving the third party)
	○ Vehicles transporting materials and equipment on the local road and ready-mixed concrete mixer were about to contact general vehicles and passengers.
	○ During excavation in the cut-and-cover work, backhoe turned toward the road where motorcycles and general vehicles run, so as to load soils to the truck. As motorcycle and general vehicles run past before the site, the driver was surprised and put the backhoe into emergency stop.　Pileup was about to occur.
Drowning	○ The third party entered the work area without permission, playing with water, and was about to suffer accident.
	○ Flood was about to overflow the cofferdam.
Collapse and destruction	○ Collapse of ground in place of poor geological conditions
	○ Evacuation was not complete during blasting because of negligent notification of blasting
	○ Slope in the neighborhood of shaft collapsed, with collapse soil falling into the shaft. This was about to inflict damage to the workers.
	○ Slope collapse due to heavy rainfall
	○ Rock fall and landslide on the steep slope
	○ Landslide of 1 m height occurred at the sabo dam construction point. The staffs were about to be trapped.
Electric shock	○ The third party entered the work area without permission, flying a kite. The kite hooked into the wire, and this person was about to suffer electric shock.
	Electric shock through energization via reinforcement bar on which the bar-cutter was used.
Fire	○ Fire (extinguished while in small)
	○ The work area was about to be burnt by catching mounting burning.
Others	○ Work road inside the site was inundated by flood. Heavy machines were about to be submerged.

5-2 Present state of safety management of the client

5-2-1 Present state of safety management

Projects covered by this study were on-going construction projects under ODA loans in developing countries and the clients (the proprietors) are mostly the government agency or extra governmental organization, For construction supervision including the safety management in the site, the consultant resides in the site on b ehalf of the client according to the contract, and has a responsibility for supervising construction, work quality, and securing of the safety. In the project under ODA loans to which the FDIC covenants are applied, the consultant acts as "The Engineer" to supervise site in a position more independent from the client and the contractor.

(1) Contractual stipulations concerning safety management

Table 5-4 shows the details of the roles that each of the client, the contractor, and the consultant must implement to protect the site, as stipulated in the contract concluded between the client and contractor and between the client and consultant, on the basis of the result of questionnaire.

Table 5-4 Contractual stipulations concerning safety management

Stipulated items	Description
Stipulations concerning the safety in the consultant agreement	○ The consultant agreement contains no specific stipulation. Recognizing that construction management includes also the safety management, measures have been taken to ensure management and checking in terms of occupational safety.
	○ To ensure implementation of the safety method prepared by the contractor before and during the work, all of preparations are to be checked and approved.
	○ According to the approved design, specification, and technical standard, supervision of the site work, construction and installation, method and technology, and health and safety management are to be made.
	○ One person in charge of safety management has obligation to inspect the site work and the procedure implemented by the contractor, so as to protect the safety of the life and facilities.
	○ After commencement of the work, the safety management service contract is to be concluded as an additional agreement. The Japanese safety manager and the Vietnamese safety manager are arranged as stipulated in the contract. Monthly safety patrol and submission of the environment protection report.
	○ The general obligation includes the work safety and compliance with the domestic law. Exchange of opinions with the authority concerned and the checking to be made concerning the construction plan (including guarantee of safety management) ○ Monthly report
Stipulation concerning the safety in the contractor agreement	○ Stipulation to comply with related laws. Protection of temporary and main facilities. Fire prevention measures
	○ Various stipulations in the technical specification
	○ Arrangement of the person dedicated to safety. The contractor is to prepare the safety plan and submit this document to the engineer to obtain approval of the content.
	○ Compliance with the safety standard of recipient country in the railway work
	○ Obligation to submit the site safety plan
	○ Stationing of the safety manager, arrangement of the certified (traffic) safety manager
	○ Subscription to the contractors' all risks insurance (CAR). Subscription to the workmen's compensation insurance
	○ Measures are to be taken to ensure that workers wear safety shoes and helmet and to prevent electric shock during cargo handling and crashing during vertical operation.

(2) Safety guidance in the site by the client

Examples of safety guidance provided by the client in the site, which were determined from questionnaire, are as follows:

- Weekly (monthly) patrol made compulsory in the contract between the client and contractor. Report of the result of patrol and, as required, instruction for correction of the safety
- Issuance of the safety notification related to the government
- Guidance through daily safety patrol and participation to the monthly safety meeting and the safety and health councils
- Participation to the safety patrol performed in line with the regular progress meeting held every other month. Reporting of the safety achievement and safety indices demanded in the monthly report
- Instruction for correction concerning excavation slope depending on the ground condition (3) Examples of safety management of contractors in foreign countries

(3) Examples derived from hearing during field study concerning safety management of the client authority in foreign countries are shown below.

i) Road Development Authority, Sri Lanka

The information below is concerned with the Greater Colombo Urban Transport Development Project under Japanese ODA loans.

The FDIC covenant is applied to the project contract and safety management in the site is done according to the rules of FDIC. Among other things, these rules refer to “Preparation of equipment related to the safety of work/cautions against infectious diseases/preparation of dust-protective mask.”

It was commented that, in the design stage, no special approach is taken specifically to protect the site and that the sections related to safety management in the construction plan are not necessary checked by the client himself. The concept here is that the responsibility of securing the safety in the site rests on the consultant (the Engineer) and contractor. The role of consultant for advising the contractor in terms of safety management or for monitoring of safety management is recognized to be significant.

For risk management of the work as a whole, the contract document stipulates subscription to the insurance, including insuring of the facilities and workers. RDA also commented that, though the Occupational Health and Safety Management System (OHAMS) is not employed, RDA is in the position of recommending the contractor to introduce this system.

Recently, moreover, there are many cases in which the contractor does not follow the rules of the Engineer’s Guideline concerning issues related to the site environment and occupational safety and health. Notwithstanding the consultant’s calling to the contractor to pay attention on these issues, the consultant advice is often ignored, which, in certain extreme cases, the client has decided such neglect ion as contractual default, resulting in cancellation of the contract. RDA commented, on the basis of above examples, that RDA is considering the measures to encourage the contractor to implement the field rules (including safety management) thoroughly.

ii) Ministry of Public Works & Transport, Cambodia

The description below is based on the reply in the course of hearing from those in charge of projects

under ODA loans of MPWT concerning general cases of these projects.

MPWT stipulates in the contract with the consultant that the consultant is to “ensure the safety in the site”, except that no specific measures are specifically provided. RDA will also check, as the client, the construction plan prepared by the contractor. The construction plan is prepared by the contractor and submitted to the consultant, and returned to the contractor if the consultant points out any corrections. The plan is resubmitted after correction. The client receives the plan that has been approved by the consultant, then issues permission to proceed.

The safety-related agreement at a time of concluding the contract with the contractor contains the stipulation of “securing the safety in the site” as in the case of the consulting contract. However, no specific rules, such as how many safety managers are to be arranged for safety management, etc., are provided. Regarding the site in operation, MPWT performs site visit at least once a month in addition to receiving of the report on safety management in the site from the consultant once a week. If necessary, MPWT performs visit to the site and gives instruction directly on safety if there is any problem factors in this respect.

Regarding the safety management standard in the site, it was commented that Cambodia has its own standard, which however is not as strict as the safety management standard of Japan. Though not the recognized international standard, the Cambodian standard will be employed in case of ordering of Cambodia.”

iii) Ministry of Roads, Kenya

The present state of safety management as derived from hearing of staffs mainly of both KURA (Kenya Urban Road Authority) and KeRRA (Kenya Rural Road Authority) is described below.

[Approach related to occupational safety and health in the contract with the consultant]

For the procurement and contract of the road development project, reference is made to the Environmental Safety and Health Manual (KURA). For the contract, the FIDIC covenant (2010) containing stipulations on securing of the safety in the site are applied. Moreover, the obligation to make efforts for safety management according to the Occupational Safety and Health Act, 2007 of the country is applied to the contractor in the site.

[Considerations in the design stage]

KeRRA and KURA use the same design manual while confirming the geometric design from the standpoint of client so as to ensure the safety. Before approval of the design, they request confirmation of the design content not only to the internal organization, but also to the committee of outside experts. In the course of implementation, they perform detailed confirmation of the construction plan from the standpoint of client.

[Risk management in the site]

For the Project for the Construction of Nairobi Western Ring Roads under jurisdiction of KURA, the particular specification of the contract sets forth that the contractor must perform TBM (Tool Box Meeting) every day. For other projects, KURA, as the client, may perform monthly safety visit according to the content of contract as well as more frequent site patrol. Objectives of safety patrol

are to review the measures for quality control and improvement of the work schedule as well as checking on the safety.

For this project, the safety meeting is held twice a month. In case of issues to be discussed in the site, the meeting is held in the site. When the meeting is to be held in the office, the contractor and consultant are requested to submit the report.

In the KeRRA's site, site patrol is made at least once a month. Review on is made on the specific measures of securing the safety in the site and the guidance is also provided to install fences to prevent unauthorized entry of the third party.

Note that the project supervision team comprising resident engineers is arranged to all of construction works. The inspection team is also established separately, which is responsible for preparation and reporting of the daily inspection report (containing not only safety issues, but also those concerned with the quality). Though the site should have a safety officer, this is not mandatory at present.

[Subcontractor control]

As the client, KURA recognizes the importance of the control of subcontractor in view of securing the safety in the site and is developing the system of registering the subcontractors to the Ministry of Road. For registration, the predetermined requirements must be complied with. In addition, the subcontractors are requested to submit various documents according to the guideline if registration is to be made. Efforts are therefore focused on thorough implementation of the procedure.

The contract specifies the prime contractor to bear the responsibility of safety management in the site and subcontractor control (also specified in FIDIC covenant). As the client, KURA commented that it confirms the safety and operability of equipment held by the subcontractor. Finally, KURA calls attention of the prime contractor for improvement if any defect is detected in the subcontractor's work content or equipment/materials during site visit.

[Elimination of disqualified contractors]

For the projects under control of KURA, the contract document contains the article of canceling the contract against failure of implementation of the instructions by the contractor. Elimination of contractors concerned may also be made through prequalification based on the past performance. For large projects, in particular, the ex post evaluation is made from the viewpoint of whether or not adequate personnel arrangement and sufficient preparation have been made to ensure occupational safety in the site. (This also applies to the Construction of Nairobi Western Ring Roads.)

In terms of contract, the responsibility for safety management and accident still rests on the prime contractor. In order to maintain the safety of the site as a whole, KURA, as the client, considers it important to encourage the subcontractor to proceed with the work while observing the contractual requirements of work (between the client and master contractor). In this context, KURA commented that it requested the subcontractors to submit various documents through the prime contractor in the Construction of Nairobi Western Ring Roads project.

Since there is no standard to evaluate the performance of construction enterprises of past projects concerning safety management, it is not yet possible to select "disqualified" contractor on safety in the PQ stage.

KeRRA sets forth according to the OSH Act that the penalty of six-month imprisonment or fine of 500,000Ksh is to be inflicted on the contractor when such act as intentional negligence of achieving safety management is detected after conclusion of contract.

iv) Ministry of Public Works, Kenya

The Ministry of Public Works is in charge of mainly buildings of government agencies, coastal breakwaters, overpasses and does not have any activities under the control based on O DA. Therefore, hearing was made to this Ministry for the purpose of understanding the general situations of projects ordered within the country. The results of hearing are shown below.

In the order placement procedure of the Ministry of Public Works, the contract refers to subscription to the normal insurance, protection of site, etc. while including the article in which the contractor is to secure the safety of the workers. The contract also requests achievement of safety management on the basis of details specified in the Factory Act. The Factory Act sets out specific details concerning occupational safety and health in all industrial sites. This Act has been introduced and utilized while referring to the similar act established in England in 1940s.

The Ministry commented that reference to the best practices in the past is made as the approach for protection of the site in the design stage or reflection of safety considerations in the design by assuming various situations in the preliminary study stage. Regarding checking related to the occupational safety in the construction plan in the implementation stage, confirmation is not so much as to develop the check list for checking. It was commented also that safety considerations are already made in the design process of the documentation process, so that any attempt to increase the safety items of the construction plan is not made. For the building work in the private sector, the specialist dispatched from the local government performs check. If the contractors fail to perform the design based on the (safety) specifications in the preparatory stage, the Ministry of Public Works and the local government are authorized to suspend the work. For the contractors who do not observe the safety agreements, such as the site workers not wearing the safety gears, the Ministry of Public Works and the local government are authorized to suspend the work.

In the Nairobi City area, the Development Control Unit of Nairobi City Council performs approval of building projects. The City Council also has the Occupational Safety & Health Department. The local authorities (Mombasa, Kisumu) have the similar function. It was commented that this applies not only to the building projects, but also to various construction projects (the fields under control of the Ministry of Public Works: coastal breakwater, overpasses).

The guidelines, etc. for guidance to the contractors in terms of occupational safety management are not specifically prepared. In addition, there exists a mechanism of eliminating the disqualified contractors in the PQ stage, for which the Ministry has the data for evaluation of the past achievements of individual enterprises. The punitive articles are said to exist for contractors causing industrial accidents.

v) ADB, Cambodia (reference)

As special cases related to safety management, examples of ADB projects are shown to illustrate the case in the site where mine planting is identified.

When it was confirmed that a part of the site is mined, ADB identifies the fact and mine clearance in the contract document. In addition, the cost for mine clearance is added to the contract price. On the other hand, the contract is concluded with the consultant as a specialist skilled in determination of existence/non-existence of mines, clearance and confirmation. Even if the consultant reports no mine, detection of mines after commencement will result in a separate project with the contract concluded for mine clearance. The cost for mine clearance is added as the clearance cost to the contract for the site where mines are determined to exist from the beginning. If the contract does not set forth mine clearance, the mine clearance cost is born by the client. Apart from CMAC (Cambodian Mine Action Centre), certain NGO organizations undertake mine clearance. If the contract sets forth mine clearance, such clearance will be subcontracted to the outside on the responsibility of the contractor. After removal, CMAA (Cambodian Mine Action and Victim Assistance Authority) other than CMAC makes the confirmation.

5-2-2 Issues related to safety management

Approaches to safety management by the contractor vary depending on the country and agent. However, this study involving the site visit and exchange of opinions with the client, contractors, and consultants has enabled understanding of issues on the side of client.

Certain clients have the experienced persons who have completed trainings on safety management in foreign countries and Japan, and may be highly conscious of the site protection. Certain clients, on the other hand, allows safety management to be done by the contractor according to the rules on safety in the work contract while including the checking of safety-related construction plan and safety measures in the work into the scope of work of the consultant. This approach is considered due to insufficient opportunity to provide guidance in the site because of limited manpower of the client. In this context, certain clients strengthen safety management by entrusting the safety manager to the consultant who is a representative of the client, but this is not the widely employed practice. We had the impression that the initiative for safety was not sufficient on the part of the client though it is necessary to identify the responsibility system in case of work accident and to encourage stakeholders (client, consultant, and contractor) to make efforts to reduce the possibility of accident occurrence from respective standpoints.

In the site under study this time, there were cases of delay in land acquisition and transfer of utilities (wire and water pipes), which the client should have completed beforehand, alteration or non-establishment of the project plan. In consequence, commencement was delayed or construction was started beginning with the portion where the work was possible in an unmanageable manner. Delay in commencement will apply pressure on the site schedule, which in turn makes it necessary to execute the work in a hazardous nighttime or causes work congestion. Scattered work locations lead to unmethodical work management, leading to more hazard in safety management.

Though the case is special due to civil war, etc., mines or unexploded bombs that should have been cleared by the client before commencement may be found in the site. This makes safety management difficult to execute because of enhanced hazard for workers and tightening of the schedule for survey and operation for clearance.

The work under study is the project based on international bidding and uses the FIDIC covenant as a

base. These covenants stipulate the obligation of safety management, but not their specific details. Namely, the specific safety management activities that the client demands the contractors are not identified. Besides, recipient countries do not have laws that stipulate details of safety management. Namely, there is no bastion for guidance of safety management, which currently makes it impossible to provide enforceable guidance and instruction for unsafe behaviors.

In the course of study, we had the opportunity to visit the site of various contractors. Certain contractors were found to be unskilled in the safety management technology and low in the awareness level, and the contractors' managing of safety management varied substantially from site to site. At present, however, the client does not have a mechanism to eliminate faulty or disqualified contractors in terms of safety management.

Accumulation of data on industrial accidents will provide the materials for review of the measures to prevent similar accidents beforehand. Therefore, it is essential for the Ministry of Labor and competent authorities related to public works to develop accident statistics individually. Though all of clients asserted that they understand industrial accidents of each project, no attempts have been made to aggregate, database, or analyze these data. This is a state in which each organization is not utilizing the experiences of accident.

From above description, the issues to be solved on the client side to achieve site protection are as summarized below.

Table 5-5 Problems and background in terms of safety management of the client

	Background	Issued (present state)
Manpower	Insufficient knowledge and experience of the client for site protection	○ Client's awareness of safety not enhanced
		○ Manpower not arranged who can supervise the project adequately
		○ Excessive dependence on the project supervising consultant
Work environment	Land acquisition, relocation of residents, delay in transfer of utilities, change of plan	○ Increased hazard when there exists pressure on the site schedule ○ Scattered work locations causing distraction of safety management
	Leaving negative legacy during war and the period of civil war	○ Increased hazard due to uncleared mines and unexploded bombs ○ Survey and clearance procedure, causing tightened schedule
Contract	Application of the FIDIC covenant	○ Obligation of contractors and consultants for safety activities not specific and identified
	Insufficient awareness of the client	○ No obligation to entrust the safety manager to the consultant ○ Responsibility system in case of accident not defined
Management	Occupational safety and health laws not established	○ Enforceable instruction concerning safety management not possible
	Basic shortness of schedule setting	○ Application of physical and psychological pressures from tight site schedule on the site
	No system to eliminate faulty and disqualified contractors	○ Entry of contractors who are inferior in safety management technology and awareness
Others	Environment of databasing from work accident information not established	○ Reviewing of measures against accident not possible because of incapability of accident analysis

Projects under this study are all located in developing countries where laws related to occupational safety and health are not established generally. To ensure site protection in this environment, the relationship of so-called “trinity” for safety management is expected. Namely, this refers to the relationship among the operator (client) with strong contractual authorities who must have the strong will and necessary knowledge and technology to achieve safety management, the consultant in charge of construction supervision, and the contractor (including subcontractor) to follow the guidance. Actually, however, certain clients entrust safety management to the site as described above. On the other hand, certain clients highly conscious of safety management do not have well-defined laws and regulations to use as a basis of activates. Besides, there are no penalties for unsafe behavior of those concerned with the work. Accordingly, there is no way of enhancing the awareness of safety management, and enforceable guidance cannot be provided.

Issues originating from lack of well-defined laws and standards related to safety management cannot be solved by the client independently. In countries where the laws and standards concerning occupational safety and health for the construction site are not well defined, the client cannot give instructions with legal binding force and enforceability and has no way but to depend on the discretion of the consultant and contractor for safety management.

As is known from hearing, in the site of developing countries where Japanese enterprises participate as contractors, the Japanese contractors are often more familiar with the safety management experience and technology as well as the way of proceeding with safety management than the local stakeholders such as the ordering organization, consultant, and subcontractor. When the contractors are a local enterprise or an enterprise of the third country, they often lack the experience and technology for safety management as is observed with the Japanese contractors. If the client or the consultant does not have the sufficient capability, there may arise a concern of failure of achieving the adequate safety management as a whole of stakeholders.

5-3 Present state and issues of safety management of the consultant

How the consultant should deal with safety management in the site and the consultant's actual authority depend on the details of the contract between the client and consultant in individual sites. The patterns of the consultant's participation in the project include a case of participation in the project as an in-house engineer and a case of participation as the Engineer in the so-called tripartite structure[*2]. The authority in the site is considered to vary little by little depending on the details of individual contracts.

The role of the consultant is generally to perform the site supervision, as an agent of the client, to achieve the targets of the project in terms of cost, quality, safety and construction period.

*2: Actually, the consultant contract integrating the support to the client, detailed design, and construction supervision may be concluded in certain cases.

5-3-1 Practical examples of safety management

To illustrate specific roles of the consultant concerning safety and health management in the construction site, summarization has been made below concerning the descriptions of major items below while referring to the Safety and Health Management Plan (hereinafter called the "plan").

Typical Composition of the Safety and Health Management Plan (prepared by consultant)

Contents
Section 1: General
1. Objectives
2. Target
3. Major Items of Supervision
4. Schedule of Supervision
5. Consultant's Safety Diary
6. Emergency Communication Network

Section 2: Policy, Procedure, Record and Custody for Each Supervision Items
1. Confirmation of Status of Unexploded Ordnance (UXO) Clearance
2. Review of Plan for Major Temporary Works
3. Supervision on the Contractor's Safety Management
4. Safety Measures for Neighboring Residents
5. Securing of Navigation and Safety Measures for the Works on the Water
6. Health and Hygiene Control on and around the Site

Section 3: Procedure for Nonconformance/Observation Report (NOR)

Sec1-2) [*3] Target of the safety management activities by the consultant

*3 Numbers correspond to those shown in the Contents of the Safety Plan.

The safety plan sets forth the targets of safety management activities as follows.

[Excerpt from the original text]
"The Project shall target "NO" accident, incident and injuries caused by the construction activities to all personnel in the Project, residents, vehicles and passersby on the adjacent roads and boats and vessels navigating on the River and to maintain good condition on the hygiene for all construction area and surroundings from the commencement to the completion of the Project."

Sec1-3) Major items of safety management activities by the consultant

- Confirmation of clearance of unexploded bombs
- Review of the temporary plan of principal temporary works
- Supervision of safety management by the contractor
- Review of the means to secure the safety for surrounding residents
- Securing of navigation and safety means of boats and vessels during work on the water
- Health and hygiene control around the site

In the above example, the roles of consultant for safety management in the site are services such as review of the construction plan prepared by the contractor and supervision of activities that the contractor performs independently concerning safety management. The consultant will not take any specific measures voluntarily. The consultant may confirm the safety of the site before commencement and review the specific means of safety measures related to the surrounding area and residents during work period in conjunction with the contractor, and yet the specific safety measures in terms of work are to be planned and implemented by the contractor.

Sec1-5) Consultant's safety diary

The plan sets forth the role of the consultant as a person in charge of safety management as follows: "Daily patrol of the site and recording of individual events and safe/unsafe behaviors of workers by photographs and sketches in the form of the safety diary."

Sec1-6) Emergency communication network

In case of emergency, such as occurrence of industrial accident, the plan describes specifically the role that "immediate communication to local authorities concerned, such as the Japanese Embassy, JICA, client, and the Ministry of Public Works must be made."

Sec2-2) Review of principal temporary plan

Concerning the principal temporary works among the whole of project, the plan notes that "though the responsibility of design, temporary installation, and safety of the temporary works rests basically with the contractor, the consultant will positively participate when there is concern of possible direct or indirect effects on the permanent structures or in the design and implementation of the temporary works possibly related to industrial accidents." The consultant receives the temporary facilities implementation plan and design calculation submitted from the contractor and approves these documents after verification of the safety of the design and implementation plan. In certain

contractors, such design verification is done with the support of the dedicated technical team of the headquarters (in Japan).

Sec2-3) Supervision of the safety management activities by contractor

The contractor is responsible for adequate, safe, and stable implementation of the work in the site according to the contractor's own safety plan. In order to ensure the safety in the field, the consultant is responsible for supervising whether or not the work is implemented according to the safety plan.

[Excerpt from the original text]

"The Contractor shall be fully responsible for the adequacy, stability and safety of all site operations in accordance with the Safety Plan established and implemented by the Contractor. The Consultant shall be responsible to supervise the implementation of the Safety Plan to confirm safety of the Project."

Specific details of the safety management activities under supervision of the consultant are as follows:

- Holding of the safety meeting
- Storage and control of the safety record
- Preventive (corrective) means proposed from the safety patrol
- Holding of the orientation on safety for newly-employed persons
- Planning and implementation of various trainings
- Establishment and implementation of the emergency system
- Explanation of work for the workers and surrounding residents in the preliminary stage
- Guidance and establishing the rule of wearing of PPE
- Presentation of the safety and traffic rule inside the site
- Response to unauthorized trespasser
- Notation of hazard area and obstruction at the position where they exist
- Cleaning of the work area and implementation of putting the equipment and materials in neat and clear order
- Rule setting and implementation of inspection of facilities, equipment and materials, related
- Rule setting and implementation of inspection for the scaffold, support, and step
- Procurement of contractors'' all risks insurance, third party liability insurance, and workmen's compensation insurance

Moreover, if any unsafe facility, equipment and material, appliance are detected in the course of site visit, the person in charge of safety management of the consultant is to record them and request the contractor in written form to correct them.

Sec2-4) Reviews of the means to secure the safety for surrounding residents

The essential point for prevention of public accidents beforehand is to ask the surrounding residents to understand the purport and policy of safety and health management activities of the work. The plan sets forth that the consultant must, in conjunction with the client and contractor, explain the outline of the work and individual work flows before commencement and obtain their approval.

5-3-2 Present state of safety management

On the basis of information obtained from field study and hearing, the present state of safety management of the consultant is summarized below.

(1) Contractual stipulation related to safety management by the consultant

According to an example of a certain site, the authorities related to consultant's safety management in site are described as follows.

"There are two types of contracts between the client and those concerned with the work: ① consultant contract between the client and construction supervising consultant and② contract agreement between the client and contractor. The latter contains stipulations concerning the consultant's position as The Engineer, so that the authorities and duty assignment are clearly defined. On the other hand, the former contains the stipulations concerning the safety. This being the consultant contract, however, the consultant remains to be in the position of providing assistance and advice to the client. Namely, the responsibility related to the safety rests with the client. In addition, the General Specification sets forth the items requiring approval of The Engineer concerning the safety, environment, and hygiene. However, the contract contains no specific stipulation to arrange the consultant specifically as the Safety Manager. Basically, the consultant's position of providing advice on the safety is defined in the ① consultant contract.

The roles required of the consultant in terms of safety management in site are shown below.

[Role of the consultant in terms of safety management]
- Ensuring the safety of the work and observance of the domestic laws as general duty
- Confirmation of the construction plan/temporary work plan/safety and health plan/quality assurance plan/schedule plan/environment conservation plan, etc. prepared by the contractor
- Confirmation of the temporary work/temporary structure plan and design plan/temporary works construction procedure/temporary work monitoring and load test plan
- Participation to the safety meeting held every other month or every month/week and advice in terms of safety management
- "Approval" of the safety manual prepared by the contractor
- Participation to the safety meeting and safety guidance
- Notification of issues pointed out in terms of safety management from daily site patrol to the contractor
- Safety management rule making and proposal of improvement to the contractor on the basis of results of daily site patrol
- Report of the safety management state of the contractor to the client
- Report to the client and advice on the response measure in case of natural disaster and other force majeure
- Presence at removal of temporary works
- Special attention on the progress state of the process and calling attention of the contractor so that the work space does not become unreasonable due to lagging of the process
- Checking and recording of the safety management implementation state in the weekly meeting for every work lot within the site
- Preparation of the emergency communication system chart
- Preparation and submission of the monthly report including the safety indices to the client

Two examples of practical site cases are shown below.

Example in the project related to railway in Vietnam;

The client approves the safety management plan submitted from the contractor after authorization as the Engineer. Moreover, for any safety management related points requiring improvement, the consultant requests the contractor for correction in the weekly work meeting and the regular meeting. The consultant is also entitled to take part in regular safety patrol together with the client, point out issues related to the safety management, and instruct improvement.

Regarding responses to the subcontractor, the consultant will not provide guidance for improvement directly and is actually not in such a position by contract.

The current position of the consultant is limited to guidance and advice on the safety and cannot be the effective and enforceable party.

Example in the road development project in Sri Lanka:

Safety management of the project is done independently or after the consultant checks and approves the safety management plan in the construction plan submitted from the contractor. The consultant monitors the safety management activities of the contractor on the basis of content of the safety management plan and performs guidance in each opportunity of site inspection, safety patrol, and safety meeting.

This safety management plan was initially approved as a basic document during the initial period of work, and then renewed twice to ensure the better plan on the basis of the comment we submitted for improvement as the work proceeded. Certain consultants have the standard safety management manual within the company, which is often utilized as a guideline for checking of the contractor's safety management plan and for providing the site guidance normally for safety management. Certain consultants also use such manual as the internal regulation for safety management activities of consultant.

(2) Example of the safety management by the main office or overseas branch

A certain consultant enterprise that was selected this time for hearing replied that the main office and overseas branch (office) took part in the event held by the client or JICA concerning the site safety management, functioning to notify the required safety-related information and instruction to the site. On the other hand, these offices provide instruction as required for development of safety management and emergency communication systems in the site.

Since safety confirmation cannot be executed thoroughly in the field for the safety of temporary structures (support work, earth retaining work, work girders, work piers), the staff in charge of construction supervision in the site commented that it is desirable that the main office and branch have a mechanism to support the examination function.

(3) Present state of construction supervision by the consultant

Tables 5-6 to 5-10 summarize the information obtained from the field study including the result of hearing on the present state of construction supervision by the consultant. Note beforehand that, in view of respecting the contents of hearing and questionnaire, the notification and terms are not unified in certain portions.

Table 5-6 Present state of construction supervision by the consultant (Sri Lanka)

Upper Kotmale Hydro Power Project
○ The safety Section is established concerning the monthly morning meeting on safety, safety training, and safety, ensuring viewing of the site as a whole. ○ The consultant (The Engineer) is in a position to "approve" correctly the safety manual prepared by the contractor. The consultant also checks the safety plan while holding a position similar to the case of approval of the construction plan. ○ For the consultant, there are ① the consultant contract between the client and construction supervision consultant and ② the contractor agreement between the client and contractor. ・ The contract ② stipulates the position of the consultant, defining clearly the authority and duty. ・ The contract ① stipulate the safety, but this is a consultant contract, so that the consultant is in a position to provide assistance and advice only to the contractor. Namely, the responsibility of safety rests with the client. ・ The contract ② stipulates the consultant authority as The Engineer. ・ In addition, the General Specification contains the items concerning the safety, environment, and health that require approval of The Engineer. ・ Provision of the Safety Manager is not described in the contract. Basically, the consultant is obliged to provide advice on the safety in ① the consultant contract.
Greater Colombo Urban Transport Development Project
○ Basically, the consultant performs guidance on safety management, including monitoring of safety management of the contractor, safety patrol, and safety meeting, which is based on the safety management plan submitted from the contractor and approved by the consultant. ○ The safety management plan is initially approved as a basic document during the early period of work, then revised as required on the basis of comments on improvement by the consultant as the work proceeds.
Southern Highway Construction Project
○ The safety meeting was held once a month. One safety specialist was designated as the consultant. Halfway of the project, no consultant exited any more. ○ Site supervision by the local engineer with deficient experience and knowledge was observed here and there, resulting often in ambiguous instruction or work interruption and finally in delay in the schedule. ○ Because of limited number of engineers who could make decision concerning response in case of trouble, there were cases of taking time in handling of trouble.

Table 5-7 Present state of construction supervision by the consultant (Cambodia)

Project for Construction of Neak Loeung Bridge
○ The person in charge of safety supervision (Safety Specialist) is located in the site. ○ The consultant office is located in the neighborhood of the construction office, where five engineers are arrange and take charge of supervision of both construction and safety. ○ The safety council and monitoring meeting are held once a month. In addition, activities such as the quality/safety seminar, the orientation meeting on safety measures, are made (in conjunction with the client and JICA Cambodia office.)
Niroth Water Supply Project
○ The principal duty of the consultant in the site is the supervision of the site. ・ Safety management involves daily site patrol and notification of issues on safety management directly to the contractor. ・ Principal functions of the consultant are daily control, daily reporting & daily adjusting of the problems on site. ○ In case of natural disaster or other force majeure in the site, the site is to report to the client for advice or instruction. ○ The scope of work of the consultant is said to include the responsibility of safety management. However, FIDIC applied to the site sets forth independence of the Safety Super Attendant and this role is more important than the consultant. ・ In this site, the Safety Super Attendant is provided with the function of rule setting of safety management

and recommendation (for improvement) on the basis of daily patrol results. ・ In some other sites, the function of consultant may be set as fully safety management. In this site however, the Safety Super Attendant checks first the safety management plan of the contractor. ・ The approved plan is then approved as the safety policy by client and consultant. ・ The consultant must refer to the safety policy when preparing the progress report every month.
Sihanoukville Port SEZ Development Project
○ The consultant takes part in the safety meeting held every week and month and provides advice in terms of safety management.

Table 5-8 Present state of construction supervision by the consultant (Kenya)

Project for Improvement of the Water Supply System in Embu and the Surrounding Area
○ For the safety, normal instruction and guidance is provided. For special points, strict guidance is provided. ○ Discussion is made on quality control, schedule control, and safety control in regular weekly meeting (Tuesday every week), with the discussed contents recorded in the minutes. The meeting consists of the client (implementing agency), consultant, and contractor. ○ The consultant side includes two persons; a Japanese consultant and an inspector. It was told that one more inspector is to be added. ○ Currently, there are about 220 workers. If any worker is observed to do something against instruction, such worker is given warning directly in the site and the comment and guidance is provided later to the responsible person of subcontractor.
Project for the Construction of Nairobi Western Ring Roads
○ There are one Japanese consultant, one local Engineer, and one person in charge of general affairs, Basically, they are stationed in the same office, so that the Japanese consultant takes charge of the safety management as a whole. ○ The consultant has a policy of uncompromising in any respects concerning safety management. ○ The work in the site does not proceed smoothly unless the consultant and contractor cooperate with each other. ○ The contractor must aware that delay in the work due to accident may affect adversely the work period and costs. ○ In this site, delay in relocation of poles resulted in widening of the construction site. To cope with this situation, priority of work commencement was placed on the readily available project portions, so that the work must be preceded in several locations at the same time. ○ It is hardly expected that the preliminary costs are available for safety measures and are limited to the case of natural disasters only. Actually, such costs cannot be accommodated for relocation of posts of this site.
Sondu-Miriu Hydropower Project Sang'oro Power Plant
○ For safety management, the consultant deals with safety items during the weekly meeting and performs safety inspection in the site. Every meeting has 10 or more participants. ○ Regular inspection is made according to the technical specification. ○ There are four resident police officers, providing support for comprehensive site protection. ○ The police authority provides the support system in response to the request from the client. ○ The guard room for local police officers was provided apart from the main project. Because of this, the police authority made efforts to ensure higher security of the site. ○ To establish the relationship with local residents, we have cooperated for transportation of local residents in case of stormy weather or flood.

Table 5-9 Present state of construction supervision by the consultant (Vietnam)

Vietnam as a whole
○ 1) The consultant is requested to approve the client on the safety management plan after examination and approval of the plant, 2) the consultant request the contractor to correct any point to be improved for safety management in the weekly work meeting and regular meeting, 3) the consultant takes part in regular safety patrol together with the client, pointing out issues for safety management and instructing improvement.
○ 1) Safety management state checking and guidance are stipulated as the duty of consultant in the consultant contract, 2) participation to safety patrol is stipulated in the contractor agreement. In particular, the authority and role are not specified, and it is recognized that 1) covers everything.
○ 1) Participation in safety patrol to request the contractor for improvement, 2) approval of temporary works, and 3) order to remove temporary work
○ 1) Participation in safety patrol once a month and in the safety council. 2) interruption of the work by the inspector only when it is deemed hazardous
○ 1) Holding of the safety meeting, safety guidance, and follow-up, 2) report of the safety management state from the contractor to the client
○ 1) Implementation of weekly safety patrol, confirmation after correction, and submission of the report, 2) participation in the monthly safety patrol, confirmation after correction, and submission of the report, 3) examination of documents submitted concerning temporary structures, temporary interruption of the work because of inspection during and after completion of assembly work, 4) instruction, guidance, and correction of the loading test for form and support
○ 1) Review and approval of the Safety Control Plan and construction plan, 2) holding of the Safety Risk Management Committee and guidance on the safety, 3) participation to safety patrol and report to the client
○ 1) Advice and guidance on the safety aspect, 2) participation in the safety-related event, 3) report of the safety management state from the contractor to the client
○ 1) Check, approval, and confirmation of operation state of the safety management plan, 2) check, approval, and implementation state confirmation of safety management related items of the construction plan, 3) check of the state related to the safety of daily works, issue of the improvement instruction, and instruction, 4) Order of work interruption in the written form when the state is hazardous for implementation of the work. Work resumed after confirmation of improvement.
○ 1) Participation to the safety meeting and guidance on safety, 2) report of the safety management state from the contractor to the client, 3) spot check of the support, 4) check of the temporary work calculation sheet and verification of the design with the site staff

Table 5-10 Present state of construction supervision by the consultant (Indonesia)

Indonesia as a whole
○ Participation to the safety meeting and guidance on safety
○ Report of the safety management state from the contractor to the client
○ Presence at a time of removal of temporary work
○ Visiting the site everyday and provision of instruction of points noticed during visit to the person in charge of the site
○ Reporting any significant issues to the client for discussions on specific measures

5-3-3 Issues of safety management

Issues on the consultant side were identified through field study and exchange opinions with the client, contractor, and consultant, and from questionnaire.

The duty of the consultant is to perform project management on behalf of the client. Normally, the duty is not specialized to safety management, but covers the wide project supervision duties including process management, quality control, technology examination, and contractual jobs. In certain cases of projects, the safety manager is specifically contracted to reinforce the safety management duty. Generally, the safety management duty is done as one of work management by the limited number of persons.

In many cases, the consultants were implementing duties by means of their own safety plan and safety management manual. Considering personnel resource, checking of all aspects while implementing wide-varying duties was difficult, For dams and roads where the work scale or site size is large, the work locations are scattered in the mountains, causing longer time for travel, or are dotted along the long route. Namely the management was difficult.

It was also observed that confirmation was not made or the understanding was rather deficient concerning local laws related safety and health. Local legal system was often intricate and modified frequently; It may be rough on the consultant to demand understanding these laws because the consultant is not a specialist in the legal field and has lots of other duties. Yet understanding of pertinent laws is quite fundamental for guidance of safety management.

On the other hand, in Japan, specific safety management is promoted proactively by the contractor. It is rather difficult to acquire the knowledge of equal level to the contractor unless the consultant has experienced proactively the safety management. This study identified certain consultants with site job experience as contractors and with abundant knowledge and technologies in terms of safety management. Actually, however, such experienced consultants were not always assigned. We had also the impression that machinery and equipment are out of their scope of specialty and not well monitored.

The contractor like Japanese enterprise may have not many items to be guided and can preserve a certain level with relative ease. Troubles are difficult to occur. In the case of local enterprise and that of third country, the contractor itself is less capable of safety management. Only after considerable guidance, these contractors can be expected to maintain a certain safety management level, which leads to increased burden on the side of consultant.

By contract, the consultant does not have any strong authority over the contractor. In particular, certain contractors of the third country or local contractors refused often to follow the instruction of consultant. In such an event, the consultant had finally to ask the client to give instruction. If this kind of event occurs in the course of instruction for improvement of unsafe operation, the unsafe situation is to continue for the time being.

On the other hand, the contractor pointed out concerning the local consultant that such consultant had no sufficient knowledge and technology in terms of safety management, not explicit in the instruction, or took time for determination and handling for occurrence of problem.

The issues in terms of safety management by the consultant are summarized below.

Table 5-11 Issues and background for safety management by the consultant

	Background	Issues (present state)
Manpower	Deficient fundamental knowledge and experiences on occupational safety and health, safety management of the site and safety management. Limited project environment where safety management can be experienced (Japanese consultant)	○ Less consciousness and understanding of occupational safety and health
		○ Deficient technology and knowledge of safety management itself
	Deficient experience of engineer	○ Ambiguous instruction from engineer (local consultant)
		○ Limited number of engineers who can determine appropriate response in case of trouble
Work environment	No experience in Japan (Japanese consultant)	○ Check not possible on hazard elements concerning temporary works and construction machine
	Check list not developed	
Contract	No stipulation in the contract	○ Person specialized in safety not provided
	Safety measures specified in the laws and design documents Lack of punitive stipulation (during work contract) for failure of instructions of the consultant	○ Instruction of consultant not followed by the contractor in certain cases
Management	Manpower not enough for the scale of the work	○ Deficient safety check in the site
	Emergency communication network not established	○ Time taken for response in case of trouble
	Arranged manpower not enough for the scale of work and the operation to be checked	○ Safety Plan and safety management manual, though prepared, not put into practice completely
	Site under charge of overseas contractor for construction (generally the contractors not so high in safety management level)	○ Burden on the safety manager and guidance increased depending on the experience point
	Safety measures not specified in the law and design documents	○ No strong authority on the contractor
Others	Recognition not enough for contract stipulation (when the contract requires obligation to observe occupational safety and health laws and regulations)	○ Sufficient authority not demonstrated as the safety manager

5-4 Status and issues of safety management by contractor

5-4-1 Examples of safety management

We cite the example of safety plan applied to actual works, and arranged summary of the descriptions for major items below, in order to indicate the specific roles pertaining to safety and health management which a contractor performs at sites in construction.

Sample configuration of safety plan (contractor)

PART A: SAFETY MANUAL

1.1 POLICY
1.2 O BJECTIVES
1.3 SAFETY ORGANIZATION CHART AND RESPONSIBILITY
1.4 S AFETY TRAINING
1.5 S AFETY MEETING
1.6 PERSONAL PROTECTIVE EQUIPMENT (PPE)
1.7 ACCESS CONTROL ON SITE
1.8 SAFETY CONTROL AND ACTIVITY
1.9 SAFETY INSPECTION / REMEDYING DEFECTS
1.10 PENALTIES FOR SAFTY VIOLATIONS / FAILURE TO COMPLY
1.11 F IRST AID
1.12 SPECIAL OBLIGATIONS AND CARE OF THE WORKS
1.13 WORKING UNDER EXTREME CONDITIONS
1.14 E MERGENCY PREPAREDNESS
1.15 M OTIVATION
1.16 EFECTIVE COMMUNICATION FOR SAFETY
1.17 SAFETY REPORTS AND NOTIFICATION OF ACCIDENTS

PART B: SAFETY WORKING PRACTICES

1.18 OBJECTIVES
1.19 STATUTORY REQUIREMENTS ON SAFE WORK PRACTICES
1.20 PRELIMINARY REQUIREMENTS ON SAFE WORK PRACTICES
1.21 EXCAVATION AND BACKFILLING
1.22 ROADWORKS
1.23 T EMPORARY JETTY WORK
1.24 BORED PILIMG WORK
1.25 SHEET PILING WORK
1.26 PILE CAP/PIER COLUMN WORK
1.27 CONSTRUCTION OF BRIDGE SUPERSTRUCTURE (MAIN BRIDGE)
1.28 PYLON WORK
1.29 ERECTION OF STAY CABLE
1.30 CONSTRUCTION OF BRIDGE SUPERSTRUCTURE (APPROACHBRIDGE)
1.31 MAINTENANCE WORKS
1.32 BREACH OF SAFETY PLAN

PART C: SAFETY DOCUMENT FORM (SAMPLE)

1-2)*[4] Purpose of safety plan *4 The numbers show the nos. of safety plan items.

The purposes of safety plan are listed as follows:

- Comply with the guidelines of safety plan, and implement the site works by exerting the best measures which can be considered for safety
- Minimize the damage to existing structures and assets in the neighborhood by preventing accidents and loss of production time
- Make efforts in raising the safety awareness of all site workers
- Bear in mind the development and renewal of safety education and training for all site workers

1-3) Organization system and responsibility concerning safety

The responsibility of each of project manager, safety manager, safety staff, construction manager, site engineer and subcontractors, and the roles borne by health and safety representative of the subcontractor, operators and workers in realizing safety management are specifically shown:

[Roles of Project Manager]

- Appointment of Safety Manager and delegation of authority
- Authorization of safety plan
- To be the chairman of the monthly safety committee
- Prompt cause identification and follow-up for any accident
- Support Safety Manager as necessary

[Roles of Safety Manager]

Safety Manager is responsible for management of safety plan, and in a position to direct and supervise compliance and performance of safety plan by all workers of the contractor, subcontractor, sub-subcontractor, and operator.

Safety Manager's responsibility includes:

- Drafting, review and amendment of safety plan
- Supervise Safety Staff
- Review and confirmation of safety records
- Response to and rectification of NOR[*5] of the consultant
- Preparation of accident report
- Safekeeping of daily reports
- Participation in safety consultation
- Safety patrol in the site and the vicinity

*5 : Nonconformance/Observation Report

[Roles of Safety Staff]

Safety Staff are human resources having the ability to act on behalf of the Safety Manager concerning the latter's obligations and functions at any occasion and time as necessary.

- Performance of safety meeting in every morning
- Check of tool box meeting and keeping of records

- Performance of entrant education
- Make, install and maintain signs in the site
- Everyday site safety patrol and management of checklist
- Preparation of accident report in cooperation with the consultant
- Maintenance of safety inspection program and management of inspection records
- Implementation of safety training activities in response to site requirements

[Responsibilities of the subcontractors]

- Secure all workers to act in line with the contents of safety plan
- Provision of appropriate safety devices and gears
- Participation in the safety consultation by contractors and implementation of safety consultation within the subcontractor as needed
- Removal of unsafe situations and obstacles in response to demand from the Safety Manager of the contractor and/or its staff
- Maintenance of good working environment
- Prompt reports to the Safety Managers of the contractor and the staff for all accidents
- Search and designate appropriate first-aid facility for all injury accidents
- Comply with the rules of the company to which the workers belong and bear the total responsibility for site work under safety methods
- Performance of works in line with safety plan. If the subcontractor wants to apply its own safety plan, get approval of the Safety Manager of the contractor.
- Endeavor to secure the working environment which assures health of the workers and the performance of individual work obligations relating to the works.

1-5) Safety meeting

For monthly meeting, weekly safety and progress meeting, and daily safety meeting, participants and roles of the meetings and the matters for confirmation are provided for in detail.

[Example of monthly meeting]

- Setting safety objectives (monthly)
- Clarification of specific methods to achieve safety targets
- Compilation of monthly safety report
- Implementation of monthly safety patrol
- Confirmation of key points in safety for each work item
- Consultation on related matters pertaining to safety

1-8) Safety control and activities

The site stipulates that work safety is achieved by "continuation of systematic safety activities," and perfects the daily safety cycle activities based on participation of all workers as shown in the figure below.

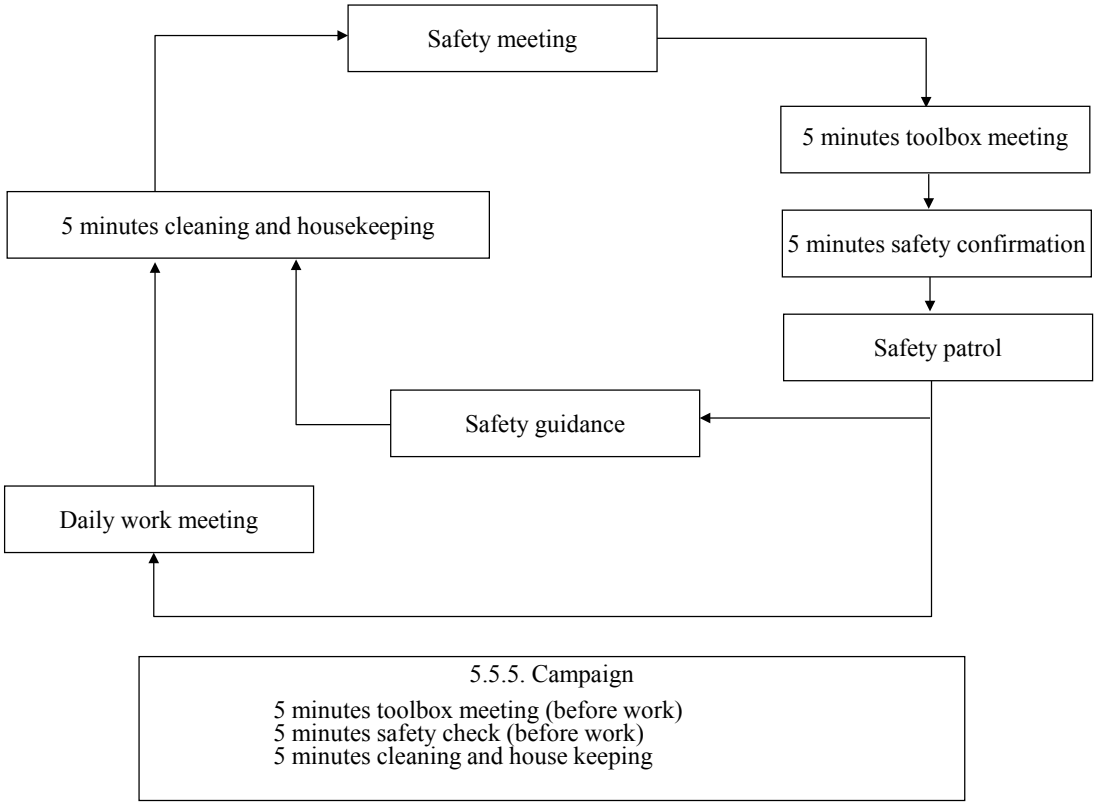


Figure 5-2 Safety Construction Cycle Chart

Table 5-12 shows the contents of safety activities of various levels.

Concerning participation in each safety meeting, all workers including subcontractors participate in the daily safety meeting, and the consultant, Construction Manager, Safety Manager, the operator-related staff and Safety Representative participate in the weekly safety meeting. The client participates in the monthly safety conference. For any entrant, Safety Staff of the prime contractor will give education as necessary.

Table 5-12 Contents of safety activities

Item	Frequency	Time	Participants	
◆Daily				
Exercise Safety meeting 5 minute tool box meeting		Everyday	Before work (at the office)	All related to the work
5 minute safety confirmation		Everyday	Before work (at the site)	All related to the work
Safety patrol		Everyday	As needed	Safety Manager、Safety Staff
5 minute cleaning and housekeeping	Everyday	After work	All related to the work	
◆Weekly				
Meeting for safety and process control		Friday	16:00	Consultant, Construction Manager, Safety Manager, Contractor-related staff and Safety Representative
◆Monthly				
Safety conference		As decided by a meeting	As decided by a meeting	Client, Consultant, Project Manager, Safety Manager, Contractor-related staff, and Safety Representative
◆Quarterly				
Safety group	As appropriate	As appropriate	All related to the work	
As appropriate				
Safety orientation	As appropriate	As appropriate	Entrants, Safety Staff, and group leader of subcontractor	

1-9) Safety inspection and repair of defects

The purpose of safety inspection and repair of defects is to discovery unsafe factor that may lead to occupational accident, and to promptly and precisely make improvements. Through this activity, we endeavor to fully inform safety plan to the parties including each worker of subcontractors.

Further, “Standard Inspection” is conducted for the detailed contents of inspection of safety devices, check and trial run of cranes, tools and equipment. “Safety Operation” includes the preparation of daily activities, precautions in work at height, work around the materials and equipment, handling of presses, hand tool, welding and cutting (precautions in gas treatment and welding), unloading and slinging, treatment of electricity, treatment of hazardous materials (transportation, safekeeping, use and disposal), transportation of materials and equipment, fire prevention, and deep excavation. Thus, they list the precautions in sites in detail for workers to pay attention to.

1-10) Penalties for violation or negligence of safety

It is clearly stated that, concerning drinking, theft, destruction, accumulation of default in response to safety guidance, and threat to the staff of the prime contractor, the worker will be demanded to leave the site by confiscation of ID, and handed over to the local police in some cases.

In the case of minor offence by neglecting or not improving the attitude in response to the direction of the person in charge of safety, the prime contractor will impose penalty on the subcontractors, and reduce installments of the contract amount. It is also provided for that violation of safety rules of the site, smoking near combustibles, and non-installment of safety belt in work at height are subject to oral instruction for improvement by the person in charge of safety, and recording ID card and violation to report to the Safety Manager.

1-17) Safety and accident report

[Safety report]

The report pertaining to the safety of the site will be prepared by incorporating confirmations and results of the safety patrol as part of the monthly progress report to be submitted to the consultant.

[Accident report]

Concerning labour accident involving a worker (including all of prime contractor and subcontractors), all events, regardless of its extent, should be reported to the consultant. Concerning fatal accident and other accidents recognized by the third parties and mass media, report to the client and the consultant by phone, and report the related information by facsimile. Further, detailed accident report should be submitted to the client and the consultant by the prime contractor within 24 hours.

If an injury happens, the injured party will promptly report to the Site Engineer, and the report from anyone other than the party in question will not be received.

Further, it is obligated that all accidents should be promptly reported to the Safety Manager, and thereafter, concerning the accidents indicated below, improvements will be examined after detailed investigation to identify the cause. The accident information and improvement measures will be informed to all workers at safety meeting after that.

Detailed accident investigation will be conducted for:

- Fatal accident
- Accident requiring hospitalization of the injured person
- Electric shock accident
- Event requiring hospitalization of the person concerned suffering from contagious disease.
- Occurrence of a near miss accident

1-19) Legal requirements in performing construction

The safe construction steps should be planned in accordance with the regulations provided for in the subject area of the subject country, and the steps should correspond to the legal requirements of the subject country.

[Excerpt of the original]

"Safe works practice have to be established in compliance with the code of practice to each region. This safe work practice shall comply with the statutory requirements of the 'country name'"

1-20) Preparations before commencement of construction

As preparation before commencement of construction, it is stipulated that the following steps should be taken:

- Investigation of the surroundings of the site to secure safety of third parties;
- Permits and approvals of the government should be finalized before construction;
- Enclose the site by barricade concurrently with installation of signs and notice board;
- Supply helmets, safety shoes, safety gloves, and other PPE to all workers;
- House or store all building materials, materials, and instruments, distantly from places where third parties come and go, and at a designated place in the site which does not prevent actions by the workers;
- Protect by protective equipment the moving part of the machines;
- Electrical works must be handled by qualified people; and
- On the approach road accessing the site from the third party areas, install sufficient number of tentative signals to show the existence of a site to the vehicle drivers.

Concerning various works (excavation and backfilling, road civil engineering, temporary piers, construction of steel towers, piling, etc.) in the construction in question, points to be especially cared are specifically mentioned for work process including points that should be prepared before work from the safety standpoint (indication of dangerous spots, confirmation of work steps, etc.).

1-32) Violations of safety plan

It is written that any violation or neglect of the safety plan and the legal rules may be subject to exercise of powers for expulsion or dismissal of workers and project managers of the contractor or subcontractor by the client or the consultant.

[Excerpt of the original]

"Any breaches of Safety Plan or the statutory regulations or disregard for the safety of any persons may be the reason for the Consultant or the Client to exercise his authority to require the Contractor's employees, Sub-Contractor's employee's and/or the Contractor's Project manager's removal from the site."

5-4-2 Current status of safety management

Activities and current status of the contractor pertaining to site safety management are arranged as follows based on the site survey and existing report[*6]. The example given below corresponds to the activities and current status mainly of the site by Japanese work management consultant and contractor. Some of it includes the case of Japanese consultant/other country's contractor, and of other country's consultant/other country's contractor.

*6"An Entrusted Study on Securing Safety of Development Projects in Developing Countries," JBIC, June 2008

-Activities and Current Status of Site Safety Management by Contractors by Items-

[Occupational safety and health management]*Corporate policy of Japanese construction companies

- Posting at the site the policy and objectives of safety and health in English (local language) prepared by the management.
- The company acquired OHSAS 18001, and prepared the Safety Plan of the site based thereon.
- Based on the results of the weekly patrol and regular patrol, continuous improvement of occupational safety and health activities is independently conducted.
- Set the safety policy and objectives of the headquarters and the site and reflect them in the plans. Conduct PDCA cycle based on the policy and objectives.
- Implement plans and management in accordance with the safety and health manual prepared for all of the company.

[Site risk assessment]

- Screening and information sharing of risks at Tool Box Meeting by the person in charge of safety.
- Preparation of risk register and information sharing at safety meetings.
- Implement risk assessment through prior examination of preparations for construction, execution of construction and safety.
- Preparation of written evacuation procedure and implementation of regular drills at the site where natural disaster may occur.

[Construction plan, safety management plan and safety management system]

- Write overall safety management plan in the Project Safety Management Plan to be approved by the engineer and the client.
- Clarify the persons in charge of safety and health of the shop and the company and station a person responsible for overall safety and health, the person responsible for safety and health of the prime contractor, and the person responsible for safety.
- Incorporate provisions on entrants, safety education and training in the safety management plan.
- Preparation of construction plan.

⇒to reflect the laws and regulation of the subject country/to reflect the hazardous factors and countermeasures of the site/It is important to utilize construction experience of the site in previous time (or of the other country).

- Description on work steps in consideration of the safety and quality of the construction plan.
- Preparation of safety and health plan and environmental management plan for approval by the client and the consultant.
- In the construction plan to be submitted before start of each work, write work procedure for safety and quality control, and get the approval of the consultant.
- The number of engineers in charge of safety management is few in consideration of the site width, types of construction and the number of workers.

[Procurement of materials and equipment needed for safety measures (scaffold, covering plates, sheathing materials, pumps, etc.]

- Although materials and equipment may be procured in the subject country (for expense reasons), it is "rare" that materials and equipment to sufficiently secure safety functions can be procured.
- It is also advisable to process the materials procurable on site for use at site.

[Safety consultation, patrol]

- Placing Safety Managers
- Against a small number of Safety Managers, educate Foremen for each site to secure safety of each site.

- Practice of safety management according to the Safety Plan (stationing of a person dedicated for safety).
- Implementation of Tool Box Meeting, KY activities, etc.
- Evaluation and improvement are conducted by weekly patrol and regular patrol.
- Conduct monthly safety conference (by the client, the consultants and subcontractors).
- Safety patrol only by the contractor and the subcontractors.

Examples of safety management cycles

Safety management cycle	Monthly	<Typical example> Joint safety patrol, safety conference (client, consultant), safety patrol (prime contractor, subcontractors, executives), safety council, safety award, confirm safety management at the monthly meeting, JV monthly meeting, process adjustment meeting, industrial accident prevention council, safety education, monthly safety and health meeting
	Weekly	<Typical example> Joint safety patrol (client, consultant, contractor), safety conference, weekly safety patrol, confirm safety management situations at the conference
	Daily	<Typical example> Morning assembly, Tool Box Meeting, daily safety patrol (person in charge of safety at prime contractor and subcontractors), safety discussion (site, subcontractors), risk prediction activities, inspection before starting machines, safe process discussion Safety meeting, confirmation of safety matters at work discussions, lunchtime discussions, cleaning and clearance, safety patrol by employees
	Others	Education for entrants

[Management of and facts about subcontractors]

- Education of entrants (including AIDS education), safekeeping records
- Regular patrol including the subcontractors
- Perfection of wearing PPE and others

⇒cost sharing by workers, lack enforceability due to underdeveloped laws in the subject country.

- It is necessary to confirm the skills of workers to withstand the requirements of the site even though they are qualified.

⇒Necessary to confirm operation abilities for heavy machines and transport vehicles.

- Education for workers concerning crane operation, slinging and welding.
- Make code of conduct on safety at sites, and dismiss the incompliant people.
- Regular risk prediction activities
- Guidance for inspection before starting work

[Response to accidents]

- Preparation of emergency network.
- Implement cause analysis, correction measures, and preventive measures by making incident report/accident report.
- Assigning industrial physician or a nurse
- Provide First Aid Kit (may be provided in the site vehicles

[Cooperation with the local police]

- Request mainly for traffic control based on a formal contract.

[Buying insurance]

- Comprehensive insurance (Japanese insurance company)
- Worker's accident compensation insurance, third party insurance (insurance company of the subject country)

[Regular drills, etc.]
- Evacuation drill (the flood-prone sites)
- Firefighting drill

[Others]
- As the client's ability for safety management is insufficient, the safety management at the site is based on the experience in Japan.
- Store safety activity records for a few years based on the internal rules.
- Storing site education and training records.
- Internal audit upon corporate patrol and labor/management patrol.

We discuss below the common issues pointed out in each site of the developing countries.

(1) Low awareness on safety management of local human resources due to underdeveloped laws and regulations pertaining to occupational safety and health

There are many developing countries which have been legalizing occupational safety and health provisions, receiving assistance from the former suzerain state or cooperation from ILO. The progresses are varied. Even if the occupational safety and health law is enforced, there are cases where it is not spread in the society. Even if the law is enforced with might, it is not certain whether it will be effective due to lack of understanding by the related people and lack of experience in the safety actions and works. In such case, it would be necessary to firmly build up safety management rules at site, and the client, the consultant and the contractor need to create and maintain safe environment based on rules.

(2) Underdeveloped qualification system and the immature ability pertaining to driving and operation of heavy/special machines used at sites.

At a site where local operators are invited as cooperating firms and subcontractors, confirmation of the skills of workers is a necessary procedure for the contractor in order to assure quality in construction and to realize safe site environment. When employing workers for driving heavy machines and cranes as well as welding, Japanese special engineer often confirms whether a worker has the skill equivalent to the level of technique required at each site, and whether he can operate the heavy machine while considering safety, even though he has qualifications of the homeland. At most of the sites, Japanese staff educates a person in charge of special work like crane signing just after entry into the site, while proceeding with the work. Further, depending on sites, it is devised that drivers are designated by attaching ID cards on machines in operation of heavy machinery or crane.

(3) Difficulty in thoroughly applying safety rules when using local subcontractors

The subcontractors are often local firms, and often a small number of Japanese staff has to manage many local staff, leading to problems in communication. In fact, Japanese staff has to give guidance and work directions to workers through the person in charge of safety management and foremen selected from local people, but it takes pains to convey without misunderstanding safe actions and detailed work steps to workers of the subject country in which culture and social customs differ from those of Japan. It is without saying that, in a project in a country where the language is other

than English, safety at sites largely depends on the communication with the subcontractors.

As mentioned in (1), in a country where laws relating to occupational safety and health are not developed, it can be imagined that it would be difficult to thoroughly guide workers to take safe actions with the might of the laws. In such case, there are some sites where safety norms are developed independently to make evaluation system for safe actions, and violators are negatively evaluated to be dismissed for repeated violations.

(4) Safety awareness of the client at sites

According to certain country, the client as the project entity entrusts site safety to the consultant and/or contractors, and rarely visit the site. If the client judges the situations of the site based only on the regular report from the supervisory consultant, and the situations of the sites may change every second, it cannot make appropriate decisions as the entity responsible for the project, and it is a concern that accidents may happen.

On the other hand, if a person experienced by participating in the training by the other country or JICA and in the training activities for safety management overseas is in charge of a site, he may have relatively high knowledge on safety management and may form and maintain good working environment in cooperation with the consultant and the contractor.

(5) Limitation of allocating a person in charge of safety management

The types and scale of work are varied, but there are not so many sites where the persons in charge of safety are sufficiently allocated. Taking, for example, “long” work such as road construction projects where a section extends ten or more kilometers, there is no rule as to the appropriate number of persons in charge of safety management, because the same work as temporary work may proceed simultaneously at multiple spots. If the number of the person in charge of safety management is sufficient, he cannot observe every work, and labor accident cannot be prevented without raising the level of workers.

In many cases, a small number of Japanese staff of the contractor has to control local workers, who have low safety consciousness, even though supported by the local persons in charge of safety management. They have to issue individual work direction and also are obliged to give education to the local people simultaneously, which becomes a great burden.

(6) Public understanding and low consciousness on safety

At sites in the developing countries, there are many reports of accidents involving third parties. Consultants and contractors should pay special attention to accidents occurring by trespassing of third parties into the site, and accidents outside sites involving constructors, construction-related vehicles and third parties. Accidents resulting from trespassing by the third parties, traffic accidents during commutation of site workers, and accidents happening when the construction vehicles are running in the urban area near the site—often, we need to consider accident countermeasures by assuming accidents stemming from social and life styles of the subject countries. Depending on sites, we take initiatives to achieve understanding and cooperation of the community by explaining the outline of the construction, the heavy machines used at the site, and latent hazards as a direction of

the client or an independent initiative. Despite such occasions, we cannot prevent trespassing by the third parties and accidents happen. From Table 5-13 to Table 5-17, specific cases are presented concerning the contractor's safety management in this survey. To be precise about hearings and questionnaires, please excuse us for the non-unified expressions and terms.

Table 5-13 Status of safety management by contractors (Sri Lanka)

Upper Kotmale Hydropower Project	
<Safety management in general) ○The safety team include the Director-General, Safety Manager, and Safety Engineer in the order of reporting, and has persons in charge of safety at 5 sites. ○The safety inspection checklist is held down to the level of Safety Engineer. Inspection is conducted everyday. ○Safety management items are reviewed as needed by accident analysis. ○The safety team is organized and safety inspectors are allocated at the same time. ○To respond to special engineering, Japanese persons are supervisor of frameworks, reinforcement works, and tunnels. ○There are 3 clinics. Physicians, nurses and ambulance are standing by. There are 2 phy sicians upstream and downstream and, in addition to workers, their family can consult them. ○Upon accident, a supervisor or foreman advises the engineer in charge of the site, and through Manager of the Safety Section, the hospital and related Section Manager, the Director-General, the client, and the supervising consultant will be advised. The notice will arrive at the headquarters in Tokyo within 1 hour. ○In case of a material accident, the engineer will notify the embassy and JICA. Also, the contractor will notify JICA.	<Issues in safety management> ○Safety consciousness ⇒ low consciousness of the local people ○Labor laws ⇒ occupational safety and health standards are not legalized. ○Qualifications ⇒ low skills of drivers and operators. ○Due to acceleration, rush work was done round the clock, and safety management should be considered. ○A site warehouseman left the site, got drunken, and fell from the cliff and died. Thereafter, they asked cooperation of the police and the army for identifying accidents, and crime. At the upstream site near urban areas, the army is stationed. The police respond as required. These are security responses rather than safety issues.
Greater Colombo Urban Transport Development Project	
○A meeting is held with JICA experts once a month. ○The contractor teaches the safety policy to the subcontractors, who have to obey it. ○By stationing a Safety Manager, the site's safety management is implemented. ○Each of the client, the consultant and the contractor has its Safety Manager, and these 3 people maintains safety at sites. ○A nurse is stationed in the first-aid station.	<Issues in safety management> ○Due to the length of the construction, care should be taken against traffic accidents. ○Due to the proximity to the private houses, countermeasures against third party accidents are needed.
Southern Highway Construction Project	
<Safety management in general> ○There is no clear safety law in Sri Lanka, and safety is managed by standards of each company. ○Safety was managed by a manager of the safety section and 6 officers, who have made achievements in industrial accident prevention. ○Industrial accidents are prevented by safety patrol, meeting, entrant education, and thoroughgoing PPE wearing. ○The safety consciousness of the local workers is very low. It took time to persuade them and finally let them obey the safety instructions by penalty provisions. ○The consultant had a safety specialist, which is absent now. One person in charge of safety is too few. ○The RDA side placed a person in charge of safety during construction but he is inexperienced and actually a trainee.	<Issues in safety management> ○Even if wearing of PPE is obliged in the contract, subcontractors do not comply with it due to absence of legal enforcement. ○Many third parties trespasses the construction area (due to lack of morals), and the risk of traffic accident is great. ○Sri Lanka has no provisions for qualification of the persons in charge of safety, and there are a few persons experienced in safety. We made efforts to raise the persons in charge of safety through seminars.

Table 5-14 Status of safety management by contractors (Cambodia)

Project for Construction of Neak Loeung Bridge	
<Safety management in general> ○Safety management is practiced according to the Safety Plan • Stationing of a Japanese person dedicated to safety management • Entrants education, TBM, inspection before operation, manager meeting • Implementation of everyday safety cycle • Weekly Safety Meeting, Monthly Progress Meeting • Monthly safety and health council among the client, the consultant and the contractor • Quarterly safety conference ○A Japanese engineer is stationed for servicing and maintenance of heavy machinery. ○Abilities of a worker is confirmed upon employment. Basic education is given by professional engineers (Japanese) on crane operation, slinging and welding. ○If the permanent works begin, safety audit from the headquarters, and third party check by PMS (Project Management System) will be conducted.	<Issues in safety management> ○There is no occupational safety and health law like the one in Japan. ○Qualifications are not needed for cranes, operation of heavy machinery, welding, and electric works. ○Workers do not recognize the necessity of safeguards. ○Based on the issues listed above, if violations are made as to wearing of safeguards, wearing of safety belt upon work at height, or other basic matters, negative points will be added. If the negative points come to certain level, the worker will be dismissed. ○Construction may be suspended due to rise of water or flow velocity in the Mekong in the rainy season.
Niroth Water Supply Project	
<Staff management in general> ○The Project Manager of the client manage safety by direct site watching every day. ○Within 1 month after contracting, the contractor prescribes in a provision to establish Safety Superintendent at sites. ○Safety Superintendent has a responsibility to oversee quality management, to have ample site experience, and ability to manage quality and safety, and to have basic knowledge in teaching. ○On Monday, Safety Toolbox Meeting will be held, gathering workers of construction-related operators. Before a work to pour concrete, for example, the experienced person gives the instruction concerning (safety) precautions. Point out items on handling cranes on where the danger is hidden and precautions in handling electric devices. Give guidance on inspection before operation as well. ○Monthly, the contractor and the consultant prepares progress report and receive it at PPWSA.	<Issues in safety management Concerning the safety management by JICA, they met JICA every month to report site safety management plan. Thereafter, JICA had no experience of receiving accident report, and did not have an occasion to receive noteworthy comment in response to the donor and us. After the site could pursue the work smoothly, we held site meeting once in 3 months (the occasion to visit the site by JICA).
Sihanoukville Port SEZ Development Project	
<Safety management in general> ○Education of entrants (Safety Induction for New Workers). ○As education on AIDS, the physician PAS implemented education for entrants and distributed condoms (as necessary). ○Held Monthly Safety Meeting to gather workers for talk. ○Tool Box Meeting: work directions and safety direction immediately before work in the morning. ○Monthly safety patrol: point out problems by patrolling the site once a month gathering the client, the consultant, the contractor and the cooperating firms. Improve what is pointed out for report. ○Daily meeting for work and safety: confirm work contents after lunch. Discuss the contents of work for the next day and safety instructions, by the contractor's Japanese staff, local staff and staff of cooperating companies.	<Issues in safety management> ○The local cooperating companies have willingness to understand the importance of safety, but they do not move by themselves, and it is an issue that they do not move without directions. ○Basically, the people of Cambodia are obedient and excellent in understanding. When it is necessary, they act. ○Repetition is important concerning safety instructions.

Table 5-15 Status of safety management by contractors (Kenya)

Project for Improvement of the Water Supply System in Embu and the Surrounding Area	
<Safety management in general> ○Basically, it is based on standards derived from the experience and know-how on safety management, and safety management plans. Details of control items and its frequency are fully provided. ○ Hold a morning assembly every morning and regular discussion in the site office. ○In the safety conference one a month, we pursue activities to get workers point out issues by putting up an illustration. Illustrations are prepared by the company. ○For complex construction, do things pursuant to TBM. ○In every week, safety check is conducted by the consultant and the contractor (Weekly Safety Patrol). Subcontractor cooperating companies accompany the patrol. ○The monthly meeting discusses and confirms QPS (quality, process and safety), with participation from the client and the ministry. ○Network for work-related accident is created for response. ○A local employee trained in Japan and Kenya has become Safety Officer of the contractor.	<Issues in safety management> ○The subcontractor cooperating firms are passive about safety management, and the cost of safety management is severe in terms of structural aspects. Therefore, education on non-structural elements is conducted to raise safety consciousness of the workers. ○Concerning structural aspects, we make efforts in instructing the necessary minimum without concession.
Project for the Construction of Nairobi Western Ring Roads	
<Safety management in general> ○When contracting with the client, there is no chance of executing a separate contract for safety. The client does not obligate placement of Safety Manager. ○The safety management at the site is based on Japanese experience. ○As a safety guidance from the client or the consultant, there is Monthly Meeting. The client came to the site to point out increasing barricades and installation of reflective tape. However, the skills for safety of the client are insufficient. ○Monthly Meeting is held among the client, the contractor and the consultant. JICA never participate in it. ○There are 7 workmen from Japan, confirming while watching the works. ○They have cooperative relationship with the police by executing a formal contract for the purpose of traffic control. ○Daily Meeting confirms the contents of work for the next day.	<Issues in safety management> ○Education on safety and skills is not stabilized in the sites. It is planned that initiatives for “pointing and calling” will be deployed.
Sondu-Miriu Hydropower Project/Sang’oro Power Plant	
<Safety management in general> ○The contract provides for allocation of Safety Manager. There is only one Safety Officer but 20-30 foremen (Chinese people, local staff) are engaged in Safety Inspection in each site. ○Safety plan (obtained from Safety Officer) is required to be submitted in the contract, and amendments are made as necessary. ○Every morning, the number of workers and work contents/rules are confirmed to confirm the day’s work contents. TBM is conducted after lunch with the Safety Officer. After actual work, we repeat reconfirmation of dangerous elements at work site after experience by the workers. ○As the site involves various work items and workers, we conduct a meeting pertaining to safety weekly and for the types of work. ○On Monday, meeting is held among the 3 parties (the client, the contractor and the consultant). ○In every month, the Engineer and the contractor observes the sites as monthly inspection. ○Also, the client, the contractor and the consultant hold a meeting with the local community monthly. ○To prevent a third party accident, a signboard is installed at dangerous places, and efforts are concentrated in guiding low speed driving at sites for the workers. ○A physician and a nurse is stationed in the site clinic. There are 4 First Aiders. ○The contractor is performing work by independently deploying a Security System, and 4 police officers are stationed to cover the system.	<Issues in safety management> ○No material accident happened but a commuting employee contacted with a third party motorcycle on the national road. ○In the safety aspects, there is no problem relating to machines. The machines are operated without problem, and Safety Inspection of materials and equipment are conducted. Inspection before operation of construction machinery is conducted every morning. ○After commencement of construction, there have been 10 or less fracture accidents. It is considered to be the benefits of the safety guideline, and due to monitoring every morning and daily monitoring of the sites.

Table 5-16 Status of Safety Management by Contractors (Vietnam)

Vietnam in general	
<Safety management in general> ○Safety guideline and targets of the headquarters and the site will be enacted to be reflected in the management plan. Conduct PDCA Cycle based on the policies and the targets. ○Implementation of PDCA Safety Cycle based on the requirements of the contract, local laws, the company's policies and OHSAS. ○In addition to general safety management plan, safety management plan has been prepared for construction near railroads, river engineering, and road switching work, and approved by the client. A dedicated person in charge of safety is patrolling every day. ○The overall safety management plan is described in the Project Safety Management Plan, which is approved by the engineer and the client. Safety plan for each work is described in the individual detailed construction plan. ○Allocate a safety officer and a safety assistant for each site. ○To avoid theft, we requested the police to perform security control for value. ○Entrusted the guarding duties to a security company recommended by the local police. ○Liaison is in place concerning issues of construction in cooperation with the community people's committee (combination of a city hall and the police). ○To prevent theft, site patrol is conducted once a week in cooperation with the local police. ○Holding regular liaison conference with the local police. ○As the site is in the urban area, we prevent trespassing by third parties by allocating a guardsman in each area. ○Set up an oil fence to prevent oil spillage from the work on the sea. ○Clear indication of the scope of construction, placing "no-entry" signs. ○To prevent train disturbance accident, perfect safety within the construction limit, and utilize checklist for construction between train passages. ○Have meetings with the principal of the community and the community residents. ○1) Prevention of trespassing in the site, 2) indication of dangerous areas by placing guide plate, 3) restriction of traffic time (closure of the road near the adjacent primary school, and during commutation hours), placement of detours. ○Segregation of the construction area from the third parties by enclosing the construction area with safety fences.	<Issues in safety management> ○Insufficient safety consciousness and knowledge of the workers and subcontractors. Cost-first concept is prevailing. ○Low morals of the public (littering of rubbishes, no careful handling of objects, etc.) ○Due to absence of occupational safety and health act, there is no penalty and the subcontractors work as they like without obeying the directions of the contractor ○Communication between Japanese and Vietnamese require interpreters, and the communication is difficult. ○Many of the workers "do not obey the deadline," and "we can do everything." They do not say they cannot do. ○The subcontractors in Vietnam often offer obsolete construction machinery. ○The machines in general are old and there is no substitute. They use them in incomplete servicing (defects in lights, limiters, back mirrors and automatic stop system). ○Lack of inspection knowledge (machinery & electricity). Lack of repetition of inspection. ○The temporary materials are old and scant. There is also a modified item. ○Safety alarms and handrails are detached which had been equipped. ○The exchange of consumables is late and no regular inspection is conducted. Repaired components are handmade (use components of low strength). Lack of knowledge in repair and maintenance. ○As there is no maintenance standards for machinery, they do not service it unless it is broken. Subcontractors bring in old machinery, which is doubtful in safety functions. ○The temporary structure is installed by combining materials owned by subcontractors, and the reliability is doubtful. ○Work information and instructions are not conveyed to the distal workers. Nonexistence of managers. Lack of understanding by managers. Written work procedures are not made and informed. ○Insufficient working knowledge. They just follow the conventional method and do not make improvements. ○They do not obey the steps but cut short. They work while the scaffolding and safety corridor are not prepared. ○Low safety consciousness of subcontractors. We see many deviations from the written work procedures. ○Meetings are held for works, but there is few skilled person to be the core, and detailed instructions cannot be made. ○The works are conducted not with the work procedures when there is no Japanese person who is watching them. ○Due to the hot weather other than winter, wearing of work clothes and protective gears is incomplete. ○The subcontractors do not have work procedures, which is prepared completely by the guidance of the prime contractor. ○The person in charge of safety has insufficient knowledge and experience. The safety level in Vietnam is low, and it is difficult to find excellent persons in charge of safety. ○Low quality of risk assessment. Insufficient utilization of risk assessment to the practice. ○Mannerism of plans, and lack of understanding in education and training. ○Even if a work step is prepared, the step is not obeyed. There is disparity between plans and practices, and the plans are on the desk only. ○Improvement after guidance is not stabilized. The safety management of subcontractors and sub-subcontractors is insufficient. The organization cannot fully inform the workers. ○Even if you try to raise the safety consciousness of the workers and subcontractors, it does not bear fruit in a site. ○Due to frequent change of workers, safety instructions cannot be perfected.

Table 5-17 Status of Safety Management by Contractors (Indonesia)

Indonesia in general	
<Safety management in general> ○ 1) Concerning entrants, safety education and safety training during the period of the site, trainees and periods will be stipulated in the safety management plan, and we confirmed laws in Indonesia, screened risks of each type of work, and evaluated risks by assessment, stipulated important monitoring items and countermeasures, to inform fully all the workers in the site. 2) Concerning safety management system, we clearly indicate the persons in charge of safety management at the branch or the company, and placed the person responsible for overall safety and health, the person responsible for safety and health of the contractor, and the person in charge of safety at the site. ○Establishment of organization centering on the manager in charge of safety (local staff) and thoroughly pursuing daily safety cycles. ○We selected an employee who has national qualification on safety and health of the Republic of Indonesia, and appointed him as the person in charge of safety. 2) The person in charge of safety prepared list of workers and safety correction directions, and procured cooperation of the local hospital and the health center. 3) The person in charge of safety performs safety patrol with the employees of cooperating firms twice a month (every two weeks). ○Plans are made on the basis of OHSAS and local laws. ○Have requested the local police to guide heavy vehicles when they are brought in. ○At a prior construction explanation session, the client requested participation of the local police and related government agencies or organizations, to procure their understanding and cooperation, and to smoothly advance works by close communication with the persons in charge. ○Request and implementation of patrol by the local police. ○Regular (monthly) meeting with the local police. ○Reduction of material input in the site. Concrete material is limited to cement, and we use locally produced material for aggregate. Installation of caution board on public highway. ○By installing barricades and fences for construction, the construction area is clarified. By placing traffic control personnel, endeavoring to prevent third party accidents. ○Installation of construction boards near the site. Prior explanation to mayors of villages and counties. ○Placement of provisional enclosure and concrete barrier. Implementation of traffic control and patrol.	<Issues in safety management> ○Low safety awareness of subcontractors and workers. ○Lack of entrants' safety consciousness. ○Between the contractor workers (especially Japanese) and subcontractors/workers, there is difference in basic concept of safety and required levels. ○To keep safety, strong guidance is needed at all times. ○Lack of periodical inspection of machinery (no proactive measures as they repair them after they fail.) ○The issues of machinery being not standardized (unclear inspection organization and items). ○The old heavy machinery frequently goes wrong. ○The local machinery and equipment lacks safety systems, and the heavy machines and cranes are heavily obsolete. ○There is no custom of daily inspection by the employees and drivers, and the machines often fail due to harsh treatment. ○As the work areas exist in wide areas, there may be places that cannot be watched. ○There are issues of working environment such as traffic congestion and unclear underground installations. ○Severe environmental conditions in unstable slopes. ○Ordinary workers are often without skills and they cannot do works unless directed by foremen. There are persons who do not know which method is proper or improper, and stick to the conventional method. ○Instructions are given to subcontractors and workers by incorporating safety items in work procedure (English), but it cannot be conveyed due to language barrier. ○Lack of education and training (low safety consciousness leads to irresponsible responses by staff and workers, including customers). ○Lack of educational materials (lack of safety education materials in the Indonesian language). ○The gap of safety awareness is great and it is not easy to build a good management conditions in consideration of the national character and the nation's education level.

5-4-3 Issues in safety management

From the sit survey, discussions with the contractors and the consultants, and questionnaire survey, we grasped the issues of the contractor side. Many of the contractors subject to this study are often Japanese companies, but we could observe the site of and exchange opinions with the third country firms. We could also grasp the situations of local firms as subcontractors.

By watching the constructions, we renewed our recognition that there are much differences in safety management awareness and the technical levels among the contractors. We found that, other than certain firms, third country firms and local firms do not have sufficient safety awareness. In the case of local contractors, they lack basic knowledge and experience in safety management, are unable to educate workers without safety awareness, and the prime contractor took pains in giving guidance and management. In highly important temporary works and construction, there was an example that the prime contractor used directly employed team to assure safety and quality. On the other hand, the prime contractor's management ability was questioned by examples of trusting subcontractors, lack of guidance to subcontractors, and disobedience of subcontractors to the directions of the prime contractor.

In the surveyed country, the basic law for occupational safety is provided, but development of rules indicating its application and specific contents is not made yet. The contract documents and the design documents do not include specific safety management. The client and the consultant have no basis for safety management in order to give guidance with power, and things are left to the discretion of the contractor. As a result, the contractor varies in awareness, knowledge and technology, and a contractor pursuing profit may commit actions neglecting safety. On the other hand, the society as a w hole has delayed recognition of safety measures. As the compensation to victims in the case of causing accident is small, and the penalty against accident is not stricter than fines, and the restriction of industrial accidents did not fully function.

The workers' consciousness on safety is low, and the contractor made efforts in raising safety consciousness by various means. We felt that it is difficult due to the difference in language, culture, and living customs in the subject countries. They conducted guidance and education by such devices as making picture signs to fill the language gap, and educating safety through the local staff. There was a case where a nearby resident met with an accident by entering the site without recognizing the danger of the construction, which cannot be imagined in Japan, and it was required to have full measures against third party accident.

In terms of working environment, an ODA project is large in scale and it was necessary to cope with the situation where the scope of management is too small due to the vastness of the site, and the response to natural conditions that are different from those of Japan was required. In procuring materials and equipment, the electrical connection equipment and cables were bad in quality, the machinery and equipment were not standardized, and temporary materials cannot be procured locally, which was not a good environment for securing safety. The probability of theft of materials and equipment for construction was high. The installed safety materials may be stolen. The situation required securing safety by such means as management of goods and placing guards. In many of the countries under survey, there are no rules for inspection of work machines, and there was no custom for maintenance and inspection. Shock and surprise occurring due to defective servicing of heavy machinery are reported, and the contractors felt risk in this regard.

As a problem of the client, delayed land acquisition, resident relocation and relocation of utilities press the construction schedule, and the load to the contractor also heightens the danger on safety. In special cases, the existence of land mines and unexploded bombs at the site increases danger, and is a problem in safety management by a contractor with respect to shortened schedule due to removal work. As a result, the issues in safety management at contractors are arranged as follows:

Table 5-18 Issues and background of safety management by the contractor

	Background	Issues (current status)
Human resources	Gaps in safety consciousness and safety management technique among the country and companies. (Japanese firms⇔Third country/local firms)	○Safety consciousness and the level of construction technology are largely different among contractors.
	Lack of basic knowledge and lack of experience in occupational safety and health, and safety management	○Increased risk due to shortage of safety technologies of third country firms and local firms. ○Unsafe actions by the local workers
	Delays in providing laws and regulations, the society's lack of recognition on safety Insufficient penalties	○(Generally) third country firm and local firm lack consciousness and motivation of safety ○(Due to absence of legal powers) subcontractors do not obey instructions.
	Difference in language, culture and living customs	○Increased risk due to lack of communication
Machinery and equipment	Insufficient budget Non-succession of know-how for machine maintenance Operators cannot inspect and service. Lack of inspection knowledge, lack of habitual inspection. (In the case of third country firm and local firm)	○Risks heightened by continuous use of old machinery and lack of maintenance of machinery and equipment.
	The qualities of electric wiring devices and cables (procurement by the local party in general)	○Risk is raised on onsite facilities and equipment.
	Machinery and equipment are not standardized.	○Risk is raised by using fabricated materials and components lacking strength
	Readymade temporary materials cannot be procured locally.	○Increased risk on the safety equipment.
Work environment, etc.	Delayed land acquisition, relocation of residents and utilities, change of plans	○In the case of pressing site schedule, there are loads such as physical and psychological pressures to the site.
	Neglect of negative heritage after war or civil war	○Risk due to the unattended mines and unexploded bombs ○Pressed construction schedule due to investigation and removal
	Special natural conditions(Flood, landslide, natural fire, falling rocks High temperature, dust	○Increased risk due to force majeure
	Social customs near the site Insufficient local explanation on the outline of construction	○Increased risk of third party accident by trespassing ○Theft of materials, equipment and goods
	The work areas are scattered widely.	○Risk heightened beyond the control of the person in charge of safety
Contract	If there are provisions on the safety management responsibility for the entire site, specific safety measures are not provided in the special specifications.	○Safety rules are not enforced on the entire sites.
Management	Cost and time are not allocated to safety measures, due to the priority on profits.	○There is no safety facilities to realize safe construction environment. The danger increases when supervision is not enough.
	Shortage of persons in charge of safety at huge sites Careful safety guidance cannot be done.	○The increasing risk due to imperfection of guidance to subcontractors
	(Generally), the prime contractor lacks awareness of securing safety at all sites.	○Reliance on subcontractors ○Increased risk due to lack of guidance to subcontractors.
	Issues are involved in the subcontract. No measures against failure to obey instructions.	○Subcontractors do not obey instructions of the prime contractor.
	Incomplete construction plan and work steps (not specific)	○Insufficient compliance with construction plan and work steps.
	Lack of consciousness to comply with the site/work rules by the contractor	
	The compensation for industrial accident is very low.	○Local parties pay no money on safety.

5-5 Status and issues of subcontractors

5-5-1 Safety awareness and risk prediction by workers

As a result of site survey and interview, it is comprehended that the local or the third country workers' awareness for safety is low in general. In the nature of the case, it can be concluded that those workmen's risk prediction ability is not sufficient. Under the situation, contractors task at site increase because they have to train site workers to secure safe working condition through raising their awareness for safety. Each site has various devices to improve the safety awareness of workers. Awards and penalties are established by point system to give them incentives, and eliminate bad workers.

When local contracoters are involved, the safety awareness of the site does not reach a sufficient level in general. In the case of a contractor which had site experience for several times with the construction company of the advanced countries, or a contractor having people who experienced construction in the overseas, the understanding and system of safety management are developed well as an organization. However, in many cases, the local workers are inexperienced with the site where various construction machines utilized and special operation are frequently delivered. Human resources experienced in safety management have to educate workers at site and let them follow the instructions.

Further, according to types of work, subcontractors may often be in charge of designing and setting temporary structures. Large-scale temporary works may lead to significant accident if operation procedure and monitoring are overlooked. It is desirable that operators having sufficient experience in temporary structures will be in charge of operation. In fact, there are few such local firms, and in the case of large temporary works, it was often the case where work was conducted under thorough control of the contractor by applying Japanese or direct staff while taking care of safety. However, subcontractors are often relied on for temporary works of small and medium size, and it is important in safe construction to improve technology and safety awareness of subcontractors.

There are local firms which swiftly respond to the directions from the prime contractor with speed, because they shared construction experience with Japanese companies and other companies of the advanced countries to have certain level of safety awareness. This indicates that we can expect improved abilities on safety if they understand the importance of safety, and have experienced good cases.

5-5-2 Protective equipment and materials for safety

As a general circumstance in the developing countries, especially, local contractor do not prepare and wear PPE (helmet, safety shoes, safety belt, etc.) by themselves, if it is left to the workers in view of the burden of cost. At many sites, wearing PPE are compulsorily obligated in the contract with the prime contractor, but the provision is not strictly followed in many cases. As a result, the prime contractor procure PPE and supply workers. In some cases, prime contractor deduct the expense from the payment to the subcontractors. It is desirable that materials for temporary structure and equipment pertaining to safety could be procured near the sites, but, if that is impossible, it is obliged to bring them in from the neighboring countries or from Japan, which costs much.

Table 5-19 to Table 5-23 show the status of subcontractors.

Table 5-19 Status of subcontractors (Sri Lanka)

Item	Status
Worker safety awareness	○The safety awareness of workers in general is low. ○The workers' safety awareness is very low, and it takes time to educate them. ○Let them obey safety instructions with penalty provisions. ○Many workers have not undergone sufficient safety education, among the workers employed by the subcontractors. ○Subcontractors lack abilities on safety management. ○There are workers who have never seen heavy machinery such as construction machinery. So, they may not sufficiently understand the danger involved in heavy vehicle operations.
Professionals	○There are professionals but their abilities differ among types of work. ○Low abilities of drivers and operators. ○When you employ drivers and operators, it is necessary to confirm their abilities, not relying on licenses only. ○Due to low skills of the local professionals, Japanese supervisors are allocated (framework, reinforcement, tunneling, and operator of concrete pump vehicle) ○The professional of tunneling had no experience, so the employee from other country was allocated. ○They can rely on professionals for earthwork by heavy machines. But they are not reliable for structure building. They have technology on masonry.
Workers' risk prediction	○Many workers are not used to construction heavy machinery and other machinery, and they cannot imagine dangerous works, occupational accidents.
Safety protection gears (PPE)	○We have instructed subcontractors to wear PPE upon contracting with them by provisions on wearing PPE, but it takes time and cost to perfect it among all workers. ○Subcontractors have not much money and the management system is insufficient so that they cannot supply protective gears to the workers. ○The functions of the helmet are inferior to that of Japan. It is available at local market only. It is a question whether a helmet worth ¥5,000 can be supplied to a worker who receives a salary of ¥10,000 per month. ○The safety protection gears procured locally are problematic in terms of cost, quality and quantity.
Temporary materials and safety materials	○It is possible to procure domestically temporary materials such as round pipe. ○Due to high unit price of temporary materials such as round pipe, it is often the case that subcontractors do not have sufficient temporary materials. ○It is difficult to procure basic safety materials. If they can be procured, the kinds, quality and quantity are insufficient. ○If we rely on imports to secure quality and quantity, the cost will be very high.

Table 5-20 Status of subcontractors (Cambodia)

Item	Status
Worker safety awareness	○In the absence of safety and health act, and safety education/ training, the safety awareness is low on the whole. ○If a direction is ambiguous, they tend to interpret it and act as they like. ○The safety awareness of workers in general other than the professionals is very low. ○Their characters are obedient on the whole and do not resist safety guidance.
Professionals	○There are professionals like carpenters, welders and steeplejacks.
Workers' risk prediction	○The risk prediction ability of general workers other than professionals is low. ○Professionals have risk prediction ability as compared to general workers.
Safety protection gears (PPE)	○There are cases where the prime contractor supply safety belts and gloves. ○In certain sites, it is obligated to wear helmets, reflective vests, and safety shoes. ○The quality of the helmet procured locally is bad. ○They often omit wearing of safety protection gears when not instructed to do so. ○When they do not wear safety protection gears, or obey guidance, they receive warning for the 2nd time, and are fired for the 3rd time. ○Some sites has a device to distinguish third party entrants from workers by letting the latter wear reflective vests.
Temporary materials and safety materials	○Round pipes may be procured locally, but other temporary materials are procured from third countries. ○There are sites where safety tools such as signboards and barricades are handmade.

Table 5-21 Status of subcontractors (Kenya)

Item	Status
Worker safety awareness	○Safety awareness is relatively high (as compared to Central Asia). ○On the other hand, there are worksites where worker's safety awareness is not high. ○They have minimum safety awareness.
Professionals	○There are professionals such as reinforcement worker and welder.
Workers' risk prediction	○There is a basis for risk prediction ability. ○When a foreman speaks before the safety conference, he can speak definitely. ○They have awareness for risk prediction. ○To raise safely awareness periodically, they conduct risk prediction activities.
Safety protection gears (PPE)	○Some sites obligate all workers to wear helmets, boots, and safety vests. ○Some sites obligate all workers to wear helmets. Other safety gears are guided to be worn depending on the type of work. ○There are some sites which supply helmets, safety belts, gloves,

	boots, masks, goggles, and earplugs. Safety vests are not supplied. ○There are some cases where helmets are supplied by subcontractors and shoes are procured by individuals. Boots are supplied for concrete casting only.
Temporary materials and safety materials	○They can be procured in Kenya. Color cone and other materials cannot be used if they have no ISO certification. JIS standard products cannot be used. ○Procurable, but scaffolding members are in short supply. Especially, stair frames, etc. cannot be procured. ○Stairs which cannot be procured locally are made by hand. ○It is possible to procure locally the round pipes and clamps. ○Procurement of temporary materials is conducted by the assets of subcontractors.

Table 5-22 Status of subcontractors (Vietnam)

Item	Status
Worker safety awareness	○In total, the safety awareness of workers is low. ○They do not do anything costly, even if they feel the necessity. ○It is within an allowance in view of the status in Vietnam. ○The site's awareness is high as compared to other construction sites in Vietnam, but low as compared to other countries. ○They are often ignorant about safety.
Professionals	○There are professionals.
Workers' risk prediction	○Professionals and workers who have completed safety education and training have risk prediction ability to a certain extent, but other workers do not have it. ○Trained workers have risk prediction ability but untrained workers do not have it. ○Their risk prediction ability is low as compared to the situation in Japan. ○They can predict certain risks by natural instinct, but safety education is needed concerning human risks arising from machines, electricity, etc.
Safety protection gears (PPE)	○The degree of control varies among the contractor and subcontractors concerning safety protection gears. ○PPE is thoroughly worn and checked at entrance gate. They distribute helmets for each role: red (person in charge of safety), blue (electricity safety person), green (crane signal person), and white (staff and general workers). ○Enlightenment activities are conducted daily, and nearly 100% of the workers have appropriate gears. Some workers disregard safety gears by working at height without safety belts, for example, maybe because of mental looseness or not being watched by somebody else. ○Not worn at all. The delegated subcontractors do not spend costs for something unless forced by someone else. ○Subcontractors are obligated to supply gears to workers, but they do not supply them to all workers due to limited budget. Safety shoes are not supplied, and they are working with sandals with heel straps.

	○We strongly guided and almost stabilized wearing gears. New workers on site, especially farmer-workers, have low safety awareness, and it is necessary to provide safety education. Cost is also another issue. ○Even if they are given safety shoes, they work on bare foot, and wears shoes when they go to town. They do not care the helmets well, and they wear motorcycle helmets when we scold them. If we tell them that work on bare foot may cause tetanus, they wear shoes on the spot but take them off ultimately.
Temporary materials and safety materials	○We can roughly procure them locally, but some of them are imported from other country. ○If they can be procured, they may be defective in quality and second-hand inferior products. ○Recently, Japanese lease companies have moved into the local market.

Table 5-23 Status of subcontractors (Indonesia)

Item	Status
Worker safety awareness	○They have safety awareness on the whole, but not sufficient. ○There are differences in safety awareness among subcontractors.
Professionals	○There are professionals.
Workers' risk prediction	○They have risk prediction ability on the whole. However, it is required to raise the abilities of workers belonging to the local subcontractors. ○Thorough education on risk prediction will bear effects to some extent. ○Risk prediction is sometimes insufficient. It is possible to raise their abilities as the workers are young and have animal instinct.
Safety protection gears (PPE)	○Safety protection gears are not uniformly worn, depending on sites. ○When they are not completely worn, there are several reasons including insufficient safety education of the subcontractors, and lack of close guidance and perfection due to the widespread areas covered by the site supervisors.
Temporary materials and safety materials	○Local procurement is possible or impossible, depending on the sites. If they cannot procure them, each site responds to it in one way or another.

5-5-3 Issues in safety management

In order to maintain and continue safe working environment at construction sites, it is important how to treat subcontractors. Subcontractors are either local firms or third country firms. If sufficient communication cannot be achieved due to language barriers and differences in culture and living conditions, work instructions may not reach the distal workers, and lead to occupational accidents due to misunderstanding on the instructions. As subcontractors are in a position to perform various works including procurement of materials for and erection of temporary structures, actual construction, and dismantling for major works and various works supporting the major works, and may encounter various risks, and the safety awareness of individual workers is very important.

Table 5-24 shows the results of a questionnaire to the construction sites in developing countries. According to the response, safety awareness of subcontractors are relatively low in general, and, due to shortage of knowledge and experience for safety actions at sites, they may eventually take unsafe actions unconsciously, leading to accidents. Further, there are many reports of accidents caused by violating the safety rules prescribed for the site and bringing in the normal living customs (clothes, over accelerating upon driving, etc.) to the sites.

Table 5-24 Problems of subcontractors in safety management

Item	Problems
Worker safety awareness	○Overall, the workers' safety awareness is low. ○The safety awareness of workers is quite low, and it takes time to stabilize safe behaviors. ○There are many people who have not undergone sufficient safety education among the workers employed by subcontractors. ○The ability of subcontractors in safety management is insufficient. ○Workers interpret and act freely against ambiguous instructions. ○The safety awareness of general workers other than professionals is very low. ○They do nothing costly even if they understand the necessity. ○They do nothing costly even though they understand the necessity. ○Subcontractors do not comply with the deadlines. They say they can do everything and do not say they cannot do. The difference in the recognition of work instructions may heighten the risk.
Professionals	○Despite differences among countries, skills differ for professionals on the whole. ○Especially, the skills of drivers and operators are low. It is necessary to confirm the abilities, without believing the licenses. ○If the skills of local professionals are low, it may be necessary to place Japanese supervisors to respond to issues (framework, reinforcement, tunneling, operator of concrete pump vehicles, etc.).
Workers' risk prediction	○There are many people who are not familiar with construction heavy machinery and machines, and many workers who cannot imagine the dangerous works, and accident. ○Professionals and workers who have undergone safety education and training have risk prediction abilities to some extent, but other workers do not have them. ○Concerning risk prediction, patient education will have effects to some extent.
Safety protection gears (PPE)	○Responses are different among countries. Further, the perfection of wearing differs among contractors and subcontractor. ○One of the reasons for not wearing thoroughly is the worker's shortage of recognition for the necessity and individual workers or subcontractors

	cannot prepare safety protection gears due to cost considerations. If safety protection gears are supplied and lent, workers remove them during work at their discretion. The background is that they are not familiar with the safety protection gears. Therefore, contractors have to perform safety education continuously, give directions for wearing, and guide everyday the persons who do not wear them. ○On the other hand, if subcontractor has no enough funds to supply safety protection gears, the contractor covers it. The contractor's burden will thus be great in terms of costs then. ○In the contract with subcontractors, provisions are made to wear PPE as the responsibility of subcontractors. In spite of such provisions, it takes time and money to fully enforce the provisions. ○In many cases, warning will be given for the 2nd time of not wearing safety gears, or not obeying guidance, and the 3rd omission is subject to dismissal. ○The safety protection gears procured locally have problems in terms of cost, quality and quantity. Especially, the quality of helmet is bad for all countries. ○There are some cases where wearing is obligated. For example, safety protection gears are checked at the entrance gate. Helmets are classified into: red (person in charge of safety), blue (person in charge of electric safety), green (person giving slinging signs), and white (staff and general workers).
Temporary materials and safety materials	○Although there are some differences among countries, temporary materials such as round pipes can often be procured locally. However, if they can procure, they are insufficient in terms of kinds, quality and quantity. ○If temporary materials held by subcontractors are used, you need to be careful because used items include poorly maintained products and inferior products. ○They cannot often procure stair frames and other products locally, which can be procured in Japan as ready-made products. In that case, the contractor hand-mades it corresponding to the situations of each site. ○In Japan JIS products can be used but you need to take care that JIS cannot be used but ISO products may be used.

While the laws relating to occupational safety and health are not developed and there is no penalty for breach of rules and standards, subcontractors do not obey the instructions from the prime contractor. If the prime contractor cannot give compulsory instructions to the subcontractors, it is a concern that the risks for accidents in various working conditions may rise.

In many developing countries where compensation to the victims is very low in the case of labour accident, subcontractors do not spend necessary minimum cost for safety measures, and the prime contractor covers the subcontractors' procurement in terms of cost and materials.

5-6 Activities concerning safety management

5-6-1 National initiatives

In Sri Lanka, "Occupational Safety and Health Campaign" is regularly held a year to raise people' awareness and disseminate understanding of industrial safety, and to improve safety and health environment at sites. Also, they have initiatives concerning World Safety Day and hold a special campaign called National Occupational Safety & Health Week in the 2nd week of October (National Seminar, Regional Seminar, etc.) They also have introduced Safety Awards (commendation for firms which have been excellent performance in safety management once every two years). At the seminar, the personnel got awarded in this regard are sometimes invited and deliver good lessons for safety control at sites. Other than ministries, Board of Investment and members of Chambers participate in the seminar.

As a device in the country where occupational safety and health law is not developed to cover construction industry, before deploying at sites human resources who got vocational training, they give lectures and information concerning risk factors that may be encountered at sites, and an organization like the contractor or construction association give safety guidance for factors peculiar to the site.

In the private sector, several firms are conducting activities by developing unique safety management standards, and NIOSH, National Institute of Occupational Safety & Health, has several companies delivering advice for improvement of safety and health abilities. The construction companies rated as C1 and C2 of industrial classification by ICTAD*[7] have unique safety management standards, which are companies able to respond at sites requiring safety management levels of the international standard, but C3 and under has no safety management standards, and safety awareness of the employees are not high in general. It is said that if a company is highly rated, they raise safety management awareness, and endeavor to provide safety fixtures. As companies may be conditioned (for the above classification) depending on the type of works, each company need to help themselves*[8].

*7 A rating (C1-C10) based on the scale of company, financial balance, and number of professionals. Large construction companies have powers, achievements and construction capabilities. In the recent construction boom, it is a government's and this association's pressing needs to build capacities and raise technical abilities of small and medium companies. However, they have no many funds to perform technical training and are looking for sponsors. There are 26 C1 companies, 25 C2 companies, 24 C3 companies, and 90 C4 companies, accounting for about 9% of the Professional Construction Companies in Sri Lanka. Small and medium companies rated C5 and under have 10-20 employees per company. Companies rated C1-C4 is conditioned to have at least 1 Professional Engineer as a Permanent Staff. C5 and under are companies which cannot perform construction without outsourcing for certain works. The 9% of the companies accept 90% of construction projects in the construction market. The 26 C1 companies are multi-discipline companies capable of constructing buildings, roads, irrigation, water supply, and wastewater projects. About 15 companies have also participated in international bid projects to which ICB Terms & Conditions apply.

*8 In important construction (of high amount), companies of high levels only can submit bids. To maintain the level or pursue higher level, you must consider safety management at sites to win a successful bid.

Cambodia did not hold national events pertaining to occupational safety and health earlier than 2006. In an international workshop for occupational safety and health held in 2005, Cambodia decided to hold various campaigns by designating April 28 as the "Day of Occupational Safety and Health."

Thereafter, the country held seminars and workshops pertaining to occupational safety and health with financial support from ILO, Japan and South Korea.

The Department of Occupational Safety and Health of the Ministry of Labor and Vocational Training launched a training course in safety and health in 2010 for Cambodian Federation of Employers and Business Associations (CAMFEBA), training 45 pe rsons. Since 1998, the Department of Occupational Safety and Health of the same ministry trained 143 factory physician, and 160 foremen, focusing on "safety and health in workplaces." Thereafter, thanks to technical cooperation by ILO, the Government of Korea, and active cooperation by NGOs, about 3,700 persons were trained at site by March 2008, mainly developing human resources other than the construction sector.

Kenya has long-term national political targets called Vision 2030, and it lists political goals in various fields by a 5 year plan (2008-2012), the period of initiation of the project. The plan has goals of building an environment where workers can safely work at all sites, and eradication of labor-related illnesses. Campaign activities concerning occupational safety and health have been conducted every year for the past 5-6 years. In a campaign in 2010, initiatives of each workplace was introduced, pamphlets and materials were distributed, and news were transmitted through the media with participation of the Ministry of Labor (the Minister and officers), employers and employees to improve understanding and knowledge held by persons concerned in occupational safety and health.

5-6-2 Initiatives of the business entities

The Road Development Authority (RDA) of Sri Lanka, and Ministry of Public Works and Transport (MPWT) of Cambodia from which we had site hearing in this survey are supervising public works including road development projects. They confirm construction plans before groundbreaking as clients, but mainly rely on the consultant and the contractor in safety management at the sites, to which FIDIC Terms and Conditions are applied.

They confirm, as clients, the construction plans submitted from the sites before groundbreaking, but participate only in the safety conference once a month during construction. Basically, they receive safety management report in conjunction with the progress of construction from the consultant, and give directions as necessary. There are not many occasions to repeat site observation and to give directions for improvement. In Sihanoukville Port SEZ Development Project on the other hand, the client Harbor Bureau conducts regular safety patrol by sending a few engineers.

In Kenya, the Occupational Safety and Health Act was promulgated in 2007, and the Government and the project entity are observed to voluntarily deal with the safety of the construction sites. The road construction project involves different project entities for city roads and local roads. In the stage of designing, they consult experts committee on the geometric structures of roads to build safe structures and to assure safety upon c onstruction, and the client makes detailed confirmation. Further, it urges contractors to pay attention to dangerous factors assumed at sites before groundbreaking. At all road project sites, there are operation audit teams led by Resident Engineers. Safety Inspection Teams are established, and they prepare and submit Daily Inspection Report on safety and quality everyday.

5-6-3 Initiatives at sites

Concerning details of initiatives at the level of site, there are many different items depending on the type of construction. What are given below are examples of initiatives concerning issues that are common in many sites.

Table 5-25 Examples of safety activities at the surveyed sites

Issues	Examples of activities
The low safety awareness of local employees	○Collect safety slogans from local workers
	○Awarding excellent persons by point system[*9]
Local employees lack experience in safety actions, and they cannot imagine accidents.	○By thoroughgoing KY activities at the site, we devised measures to make them predict occupational accidents.
	○Entrants who completed education received a sticker (ID sticker) to get it on the helmet.
	○A mechanism to let entrants register the means of contacting.
	○Explained the accident cases and points to modify places to raise the consciousness of workers.
	○Introduced good safety management sites which the contractor experienced in the past to raise the awareness of workers.
Lack of common recognition of safety work among workers.	○We conducted joint patrol of the sites once every month with the person in charge of safety to diffuse common recognition on safety management.
	○Making and posting signboards for monthly safety targets.
	○English/local language indication in safety board, site safety rules, and signboards.
Violation of safety rules by workers	○If they do not wear safety gears stipulated in rules, or obey direction for improvement, warning will be given for the 2nd time, and they will be dismissed for the 3rd time.
Danger of third party accident	○They participate in the advance construction explanation with related ministries, asking about the construction outline, understanding, and cooperation, and smoothly advancing construction by close communication.
	○The local police cooperated in preventing third party trespassing and violations of road rules.
	○Holding safety committee composed of all local stakeholders (ownerclient, engineer, contractor, representatives of local residents, and the local police.
	○As the site is in an urban area, a guard is positioned at each work area to prevent third party trespassing.
	○Clearly indicate the construction area by barricades and construction fences, install “no trespassing” signboard, indicate the dangerous area, and install guide boards/detours (segregate third parties from the construction area.
	○Conduct traffic restrictions and patrol. For environmental concerns, they measured noise, vibration and water quality.
	○Requested the local police to guide carrying-in of heavy machines.
	○Request and implement patrol (against theft as well), and request the local police to guard the site.
	○Regular liaison meeting among the local police, the leaders of the community and local residents.
Occupational accidents relating to machinery and equipment	○Make it a rule to start work after inspection before operation
	○Gather heavy machinery at a spot after work to control them
Provision of information and technical guidance for site safety	○Regular site inspection from the headquarters and Tokyo branch. Safety management in addition to quality management.
	○Audit and inspection of the site office from domestic and overseas branches.

Improvement of first-aid for the injured	○Installment of First-Aid Kit to each site
	○Prompt emergency response by stationing First Aider
Increased risk of the speed of construction machinery at site	○Installed humps to reduce speed of construction vehicles at site
	○Installed barricades to reduce speed of construction vehicles.
Prevention of occupational accidents by improving work method and improvement of machinery/equipment	○To protect slopes, they use chicken wire mesh instead of green net.
	○They manufacture and utilize handmade stair frames at site (because scaffolding materials of stair frames cannot be procured at site)
	○By placing large sandbags to a place where slopes in rivers may erode to prevent erosion.
	○To streamline ventilation in tunnels, we modified ventilators to movable ones.
	○During dam crown work, we placed temporary piers between piers to reduce time of movement and we could restrain the risk involved with movement. Originally, movement between piers required going down the pier by stairs and moving to the other pier by stairs.
	○As the environment in the tunnel deteriorates by movement of trucks, we placed water muffler (exhaust improvement device) on the back of the truck to improve environment.

*9 Concerning award of excellent performers by point system:

To encourage safety awareness of local workers, there are sites which systematize point system for the workers. They collect safety slogans and proposals for realizing and continuing safe works, and give positive points to individuals if their slogans and proposals were adopted. Workers are also positively evaluated for perfect attendance. Contrarily, violation of the site safety rules may be negatively evaluated. Worker performance will be evaluated by points every day, and most excellent workers are commended quarterly.

5-6-4 Status of site safety management

We indicate below the status of site safety management by consultant and contractor. According to types of work, complex and extensive temporary works may arise. From the standpoint of construction supervision (consultant), it is imagined that they require technical support from the headquarters and overseas branches.

Table 5-26 Status of site safety management (consultant)

tem	Status
Relations with the headquarters and branch sites	○The headquarters regularly perform technical patrol.
	○Submit monthly safety report of the site to the headquarters and the subject field offices.
	○Write safety management contents in monthly report with safety patrol photographs and submit them to the headquarters.
	○The overseas department distributes overseas safety management manual and gives a lecture before going to the overseas.
	○The headquarters has a safety manual to distribute to each site.
	○Safety management in accordance with the company's safety manual is recommended.
	○Based on the accident information of other site, safety reconfirmation is demanded.
	○Attend the events of the client and JICA to convey safety related information and directions to the sites.
	○Concerning development of safety management system and emergency information system at sites, issue directions as necessary.
	○Guidance and communication are made as necessary for safety management but none for individual projects.
	○Distribute "Corporate Emergency Information System" and "Safety Management Manual" to perfect safety management and confirmation by mail before continuous holidays.
	○Establish a "Day for Safety Management of the International Projects," and reconfirm risk management and safety management by mail from the headquarters.
Intra-company information exchange	○The headquarters have established construction liaison system and share at each site causes of accident at other countries and countermeasures.
	○The headquarters and the sites share required information and cases.
	○Obtain for reference information on causes of significant accidents.
	○Submit report of accident by mail and convene PM Training Sessions at the headquarters.
	○Respond by circulation of monthly reports.
	○Share any occurrence of accidents at sites at liaison conference to be convened in the capital of the subject country once a month.

Table 5-27 Status of site safety management (Contractor)

Item	Status
The relation of the headquarters and branches to the sites	○The site safety plan is subject to the approval of the headquarters. Safety patrol and audit are conducted by the headquarters a few times a year.
	○Preparation and site guidance on annual safety plan. Site safety patrol and audit. They provide safety education and safety materials.
	○Periodical patrol by the safety personnel of the headquarters. Intra-company safety notice and guidance. Sharing of information upon accident and spreading prevention measures.
	○Safety patrol twice a year.
	○Information of safety-related instructions and accident cases. Examination of safety plan and construction plan.
	○Participation in advance study meeting for important construction plan. Regular guidance by patrol and prompt report of accidents in Japan to prevent similar accident.
	○Site safety patrol once a year by the branch person in charge of safety, site safety patrol once a month by the site chief, and all-company safety week event once a year.
	○Plan and implement safety campaign periodically and implement site safety patrol according to annual safety patrol plan.
	○Submission of safety documents. Regular patrol.
Information exchange between the site and the headquarters	○Branch/site safety meeting twice a year and submission of site safety report once a month.
	○Regular annual safety and health policy, president's policy and annual activity report. New year president message. President message for safety week. ○As needed: information exchange by accident report (prompt report and detailed report).
	○Safety management report, and planning and implementation of safety campaign once a month. Site safety patrol (twice a year).
	○Weekly report from the site to the headquarters.
	○Monthly report (with other items)
	○Mails are exchanged once a month.
	○Every month, the site submits a report. Safety notice is delivered as required. Patrols by the safety divisions of the headquarters and the branch.
	○No exchange of information focusing on safety management.

5-7 Requests to JICA concerning safety management

In this survey, we collected requests to JICA by hearings and questionnaires. We describe the requests from the counterpart countries and the contractors actually working at sites. We categorize the requests from contractors and consultants as they are multifaceted.

5-7-1 Requests from the government officers of the counterpart countries

(1) NIOSH (National Institute of Occupational Safety & Health) of Sri Lanka

We expect extended chances of getting training in Japan's occupational safety. We actually know such programs, and Sri Lanka has dispatched personnel to it already, but our desire has not been met in terms of the number of persons. We take time to prepare the proposal, and feel that the training is a narrow gate.

(2) Ministry of Public Works & Transport (MPWT) of Cambodia

We have experience in participating in the training by JICA. Concerning safety management, it is not sufficient in terms of technology and human resources. We think that safety management in Cambodia will be improved if you perform such training.

(3) Ministry of Labor of Kenya

We desire assistance to capacity development for organizations, and human resources development. The systems and activities have been established, but we request assistance in know-how and training materials concerning occupational safety and health, site monitoring, etc. in order to develop OSH Research Institute currently under construction. Monitoring materials includes instruments to measure vibration and noise, and vehicles for first aid (expressed as "mobile clinic").

5-7-2 Requests from surveyed contractors and consultants

(1)Assistance for enlightenment and legal systems

○We request you to be the sponsor of international occupational safety and health seminars to show a presence in the area of occupational safety.

○According to countries, safety awareness varies. It is a role of a construction company to improve "safety" matters as much as possible, but it is limited. JICA should clarify to what extent "safety" should be brought, and actively assist enlightenment of local construction-related parties and development of legal system.

(2)Guidance to clients and sites from JICA

○Please perform regular site inspection for safety audit.

○Please unify safety management levels at all sections.

○Please request the client to sufficiently allocate experienced safety managers.

○Please request the client to wear PPE and obey safety directions. JICA should point out over-speed in construction sites, and running outside the construction roads, which led to accidents.

○Requirements on safety are raised on the whole, but there are large variations among the government, organizations, cities, regions, construction scales, and types of work. To reduce them, guidance is required on safety for the construction of JICA yen-loan projects.

○Concerning the safety suggestions through consultants from JICA headquarters, we are embarrassed sometimes because they do not fit to the local situations. If you point out and require a level similar to Japan (objects that cannot be procured locally), please incorporate it in the drawings upon tender so that bidders can include it in the cost. Please consider site situations and the national characters, and judge and understand the functions of the contents devised by the sites.

○As a place where private houses closely gather, we had to dig 3m up to the public-private boundary in order to construct it up to that point. In such design, we would like it that the client acquires the local understanding before construction. It is very difficult to get the agreement of all residents which number several hundreds or more within specified construction period after groundbreaking.

○Please get the government to actively encourage Vietnamese operators to implement reform of consciousness and education for safety.

○Please apply with strict attitude the provision to prohibit 100% subcontracting to state-run enterprises as well.

○While safety specialist comes to the site to participate in the safety patrol and to give safety guidance, the materials are in Japanese and there is no local language version. The subjects of guidance cannot understand English, and precious lectures cannot be effectively utilized. Please consider better response by making materials that fit the local situation.

○Please devise safety award system and punishment provisions for the contractor.

(3) Sharing of information

○It will be nice if information is shared among site in a country. Information should be shared as to what unsafe action leads to significant accident depending on the types of work, and what should be taken care of to prevent accident.

○The contractor would like to know what accidents are peculiar to the country doing construction, and how they react to them.

○There is only a project for which safety management information can be shared with JICA, and we desire information sharing in other projects to learn lessons.

(4) Contracts (treatment of safety costs)

○To secure proper safety costs at each work, please clarify the required safety items upon tender, and include the cost. Upon construction in urban area, it is very difficult to restrict trespassing by third parties (locals). The client tends to shift all responsibilities onto the contractor because the site is handed over. Please write in contracts that the client is also responsible in responding to the third parties.

○In construction in a country of low safety awareness on the whole, the prime contractor bears the safety cost directly and indirectly. The cost may be different depending on the prime contractor's safety management policy. To implement safety management to a certain level as a Japanese company, it is necessary to secure corresponding safety cost. In a competitive bid, safety and other indirect cost tend to be minimized, and they are embarrassed by the gap after award. Therefore, the tender method should be devised so as to exclude safety cost from the competition by fixing the safety cost together with safety standard requirements in construction tender.

○To improve the safety management substantially, it is felt necessary to establish certain safety management standard in ODA construction, estimate achievable safety management cost, introduce merit system for local subcontractors, and enforce safety management. We would like JICA to establish a system to secure sufficient safety management cost upon contracting.

○During construction, JICA and the consultant demanded safety equipment equivalent to that of Japan. Strengthening of safety facilities require cost but no additional cost is allowed. Please review the system so that safety cost is provided as provisional sum separate from the tender amount, and pay it from there for any uncompensated direction.

○In this project, environmental protection cost is introduced based on the guidance of JICA, and the client's excessive response and shortage of understanding are irrationally materialized against it. While payment is made for responses belonging to the ordinary contractual duties of the contractor (measures against noise, water pollution, and air pollution), the contractor can do what are pointed out only as the monitoring is entirely the responsibility of the engineer. However, the consciousness on environmental protection has improved without fail. It is felt that safety management measures should start from reform of consciousness in the same way as the contractual binding, or anything may not change.

○Separate certain safety costs from the price competition as an independent item separate from the tender amount, and make it usable as provisional sum for the operators.

○To raise safety awareness of the counterpart country, clearly indicate the safety management implementation items in the contract of the prime contractor, and include it in budget, and implement payment by results (requiring safety cost of temporary facilities, and of positioning a person dedicated to safety management).

(5) Contract-related (Others)

○Please describe in the tender documents the safety management standard corresponding to the situations of the country.

○Include an operator's past accidents in PQ.

○Temporary structure should be designated temporary structures.

○Include safety experts in the consultant's manning.

○HIV/AIDS prevention program is included in the contract. Its implementation is up to the government-related organization, and the constructor does not to have to administer it, but is just a pay counter. However, the constructor should negotiate contracts and the amounts, and it may be obliged to pay additional amount according to the situations. It is not a problem that the constructor participates in the program, but the administration including settlement of costs should

be the client or the entity of the enforcement.

○In the FIDIC sub-clause 4.1 (Subcontracting), employment of subcontractors is subject to the approval of the engineer. In the Conditions of Particular Application, the client's consent is added, and substantially the employment of subcontractors is up to the client. With this provision, the client can exclude subcontractors other than those recommended by it, and force employment of subcontractors which the client can control. Such subcontractors have low safety management in general, and they do not obey the safety management by the prime contractor due to the umbrella of the client. That might lead to high probability of accident. The authority to approve subcontractors by the client is a part of a unilateral contract, and it must be deleted without regard to the safety.

○As safety requires cost, the local contractors do not respond to it well due to shortage of funds. Funds run short because the price for construction (advances and piecework payment) does not come to the site precisely. To eliminate the shortage of funds, the contract provides that the price paid for construction is transferred to the independent bank account of JV as payment from the client to the contractor in order to show that the money is used for the construction. To show that the money is used for the construction, it is required to submit the Bank Statement of that account to the client. If you see the Bank Statement, you can know the destination of payment. In order that the money comes to the site (to prevent delay, and assure safety of construction), JICA is requested to make a system to let the client submit the Bank Statement to JICA, and demand improvement to the client or the contractor.

Chapter 6 Issues in Safety Management and Directions of the Future Initiatives

6-1 Safety Management Issues

In order to offer some conclusive suggestions based on this study for bring forward safety management conditions in Japanese ODA projects, problematic issues have been finalized below in each category such as Personnel, Client, Machinery and Facility, Contract, Work and Environment and Management.

6-1-1 Client Issues

(1) "Manpower" Issues

Issues	○ Safety consciousness of the personnel concerned is not enhanced ○ Manpower with suitable business management capacity cannot be assigned ○ Excessive reliance on construction supervision consultant

Assumed causes	①Large scale construction projects are limited	②Manpower with project management are in short supply
	③Priority of safety management is low	④Mandatory control over safety management is fragile
	⑤Excessive reliance on consultant	⑥Lack of contract administration know-how

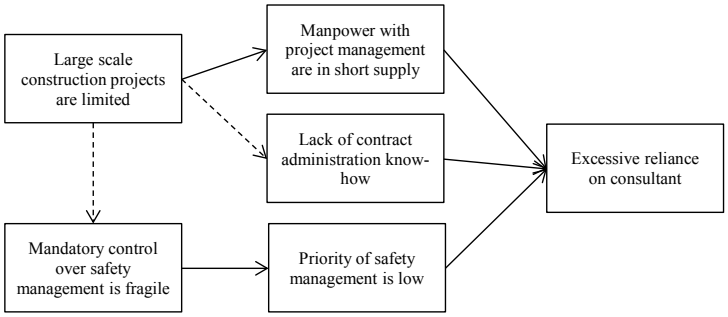


Figure 6-1 Causes of Client [Manpower] Issues

(2) "Contract" Issues

Issues	○Obligations by contractors and consultants for safety management are not clearly spcified ○Assigning a Safety Manager is not mandatory

Assumed causes	①Safety management standards are ambiguous	②Safety management cost sharing is not identified.
	③Safety consciousness is low	④Unsafe actions are not penalized
	⑤Force of law guidance is not practiced	

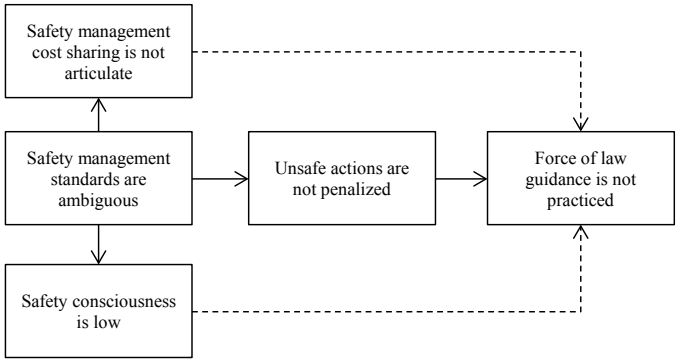


Figure 6-2 Causes of Client "Contract" Issues

(3) "Management" Issues

Issues	○Directing with legal binding force cannot be practiced ○Party to assume liability in an accident is obscure ○Physical and mental pressure at site of operation caused by site process oppression ○Entry of contractors with low level of safety management technology and consciousness ○Increased danger from undisposed mines and live bombs ○Inability to analyze the accident causes and to consider appropriate countermeasures ○Scattered construction work point at the same period leads diffused safety management

Assumed causes	①Laws, ordinances, regulations, etc. have still to be developed	②Coordinating and arranging affairs with other institutions and inhabitants is increasing work load
	③Safety management system is inadequate	④Reliant on contractor's discretion
	⑤System to eliminate delinquent and unqualified contractors is insecure	⑥Past lessons are not put to use

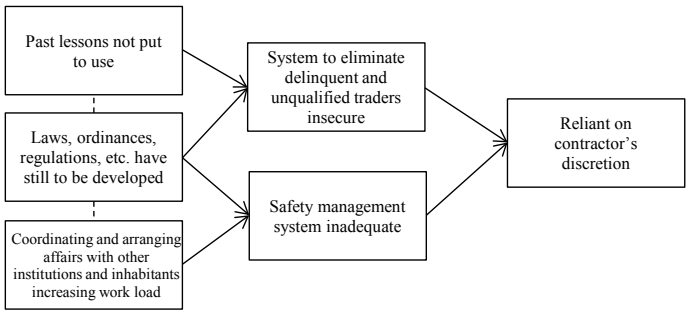


Figure 6-3 Causes of Client "Management" Issues

6-1-2 Consultant Issues

(1) "Manpower" Issues

Issues	○Consciousness and understanding of occupational safety and health are sparse ○Safety management technique and know-how are insufficient ○Instructions from local consultants are at times ambiguous ○Long time is required to address an issue when an accident occurs ○Hazardous elements in temporary work and construction machinery cannot be detected

Assumed causes	① Technical know-how is lacking	② Personnel with safety management capacity is lacking
	③ Safety management experience is lacking	④ Safety awareness and understanding is lacking
	⑤ Checking hazardous material is limited	⑥ Safety management leadership is lacking
	⑦ Safety standards are ambiguous	⑧ Information concerning laws and ordinances is not disseminated
	⑨ Opportunities to gain experience are insufficient	⑩ Types of practice are dissimilar to those in Japan

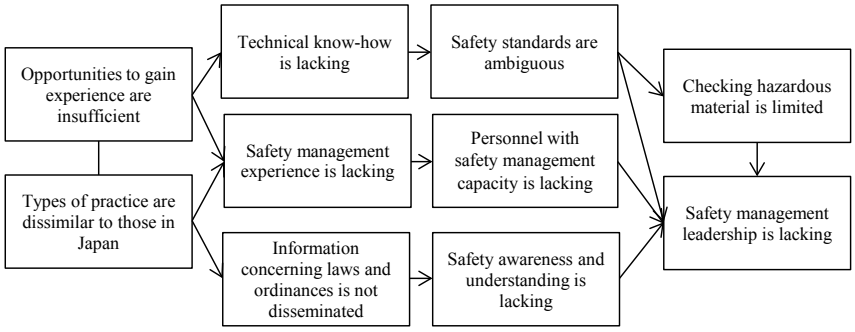


Figure 6-4 Causes of Consultant "Manpower" Issues

(2) “Contract” Issues

Issues	○There are times when an officer specializing in safety is not assigned ○There are times when contractors do not follow consultant’s instructions ○Safety manager is unable to amply demonstrate authority

Assumed causes	① Assignment of safety manager is obscure	②Safety policies are inadequate
	③Legal force is weak	④Safety management standards are ambiguous
	⑤Site safety management expenses are obscure	⑥Appropriation of expenses for safety officer is ambiguous
	⑦Adequate number of safety managers is lacking	

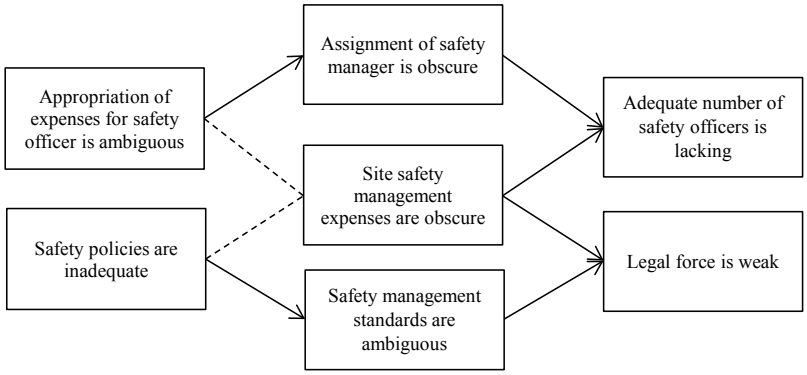


Figure 6-5 Causes of Consultant “Contract” Issues

(3) “Management” Issues

Issues	○Site safety check is lacking ○More time than required is being taken at times to deal with an incident ○Complete checking is impossible even if a Safety Plan and Safety Management Manual were to be prepared ○Safety supervision and guidance is overburdened by inexperienced contractor ○Strong authority cannot be exercised against contractors

Assumed causes	①Check sheets do not exist	②Manual is inadequate when an incident occurs
	③Number of consultants are assigned inadequate for work scale being performed	④Contractor’s capacity inadequate
	⑤Check function is inadequate	⑥Precautionary measure standards are ambiguous
	⑦Systematic management system is inadequate	⑧Safety management manual is unprepared

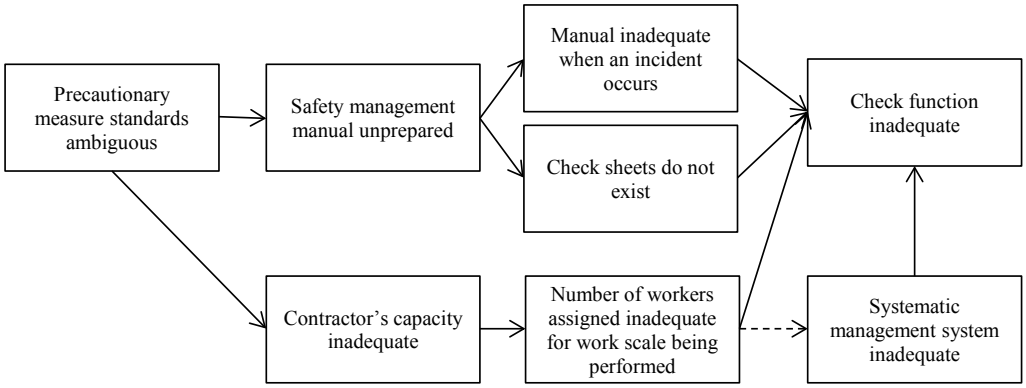


Figure 6-6 Causes of Consultant “Manpower” Issues

6-1-3 Contractor Issues

(1) "Manpower" Issues

Issues	○Considerable difference exists in the level of safety consciousness and execution of works dependent on contractor executing works ○Motivation to safely execute works is lacking ○Experience and capacity for safety measures is lacking ○Increased risk due to lack of communication

Assumed causes	①Lack of safety management	②Lack of actual execution vs plan
	③Providing guidance to sub-contractor is limited	④Management capacity differs considerably
	⑤Insufficient basic knowledge	⑥Understanding of laws and ordinances is insufficient
	⑦Communication ability is lacking	⑧Risk management ability is lacking

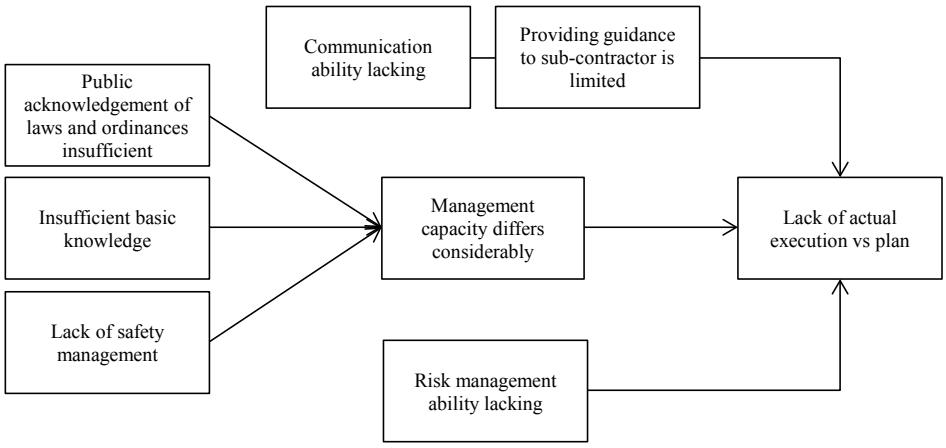


Figure 6-7 Causes of Consultant "Manpower" Issues

(2) "Machinery and Facilities" Issues

Issues	○Obsolescent equipment in use ○Maintenance of machinery and equipment is lacking ○Increased risk to site facilities and equipment

Assumed causes	①Budget inadequate to procure appropriate machinery and equipment	②Legal restrictions for machinery and equipment is insufficient
	③Inspection and maintenance are not habitual	④Skills of operators are not up to standard
	⑤Machinery and equipment are sub-standard	⑥Procurement of ready-made temporary material is difficult
	⑦Quality of safety gear is sub-standard	⑧Qualification system of operators still has to be developed
	⑨Practice is to use until destruction	⑩Quality of sub-contractor's materials, machinery, etc. are inferior

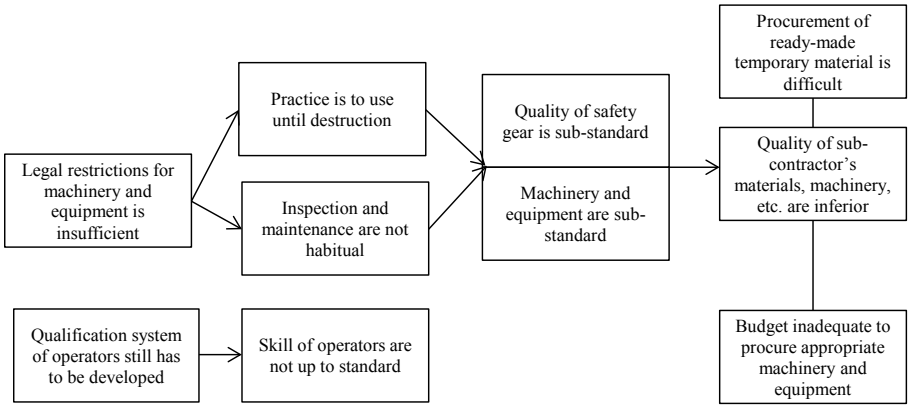


Figure 6-8 Causes of Contractor "Machinery and Facilities" Issues

(3) "Contract" Issues

Issues	○Suitable safety measure costs are not allocated ○Specific safety management items and standards are not specified ○Safety measures lack positive site execution enforceability

Assumed causes	①Safety measure items are indefinite	②Safety measures costs are inappropriate
	③Administrative standards for safety management do not exist	④Safety programs lack enforceability
	⑤Competent bidders end up becoming disadvantageous vendors	⑥An elimination system does not exist to disqualify inappropriate vendors
	⑦Client designating sub-contractor	⑧Specific penalty clauses are not specified

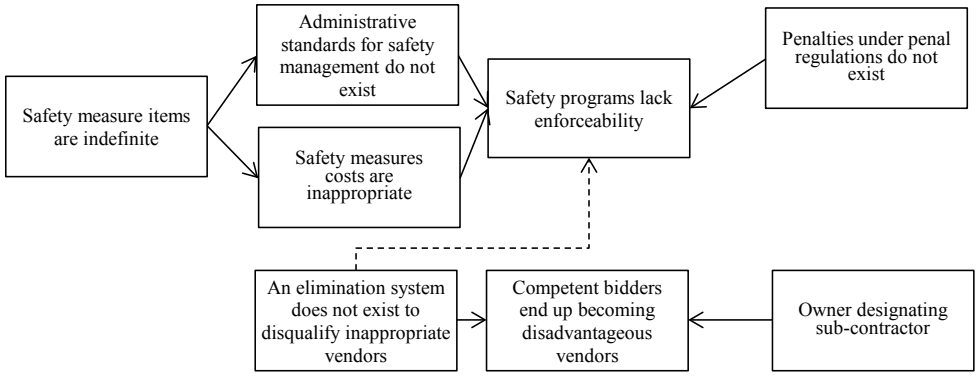


Figure 6-9 Causes of Contractor "Contract" Issues

(4) "Work and Environment" Issues

Issues	○Site processing endures physical and mental pressure in the event site operations are accumulated ○Construction period is compressed due to danger, study, removal procedures, etc. of mines, unexploded bombs, etc. ○Increased risk due to force majeure such as inundation, landslide, natural fire, rock fall, etc. ○Increased risk from public accident caused by illegal trespassing ○Theft of materials, personal property, etc.

Assumed causes	①Delay in client's liability matters	②Inadequate preliminary surveys and/or programs
	③Mines, unexploded bombs	④Inadequate preliminary coordination such as consultation, etc.
	⑤Area unsafe	⑥Plan and design without heed to work environment
	⑦Inadequate work execution process	⑧Land expropriation, relocating residents
	⑨Confirmation of utilities lacking	

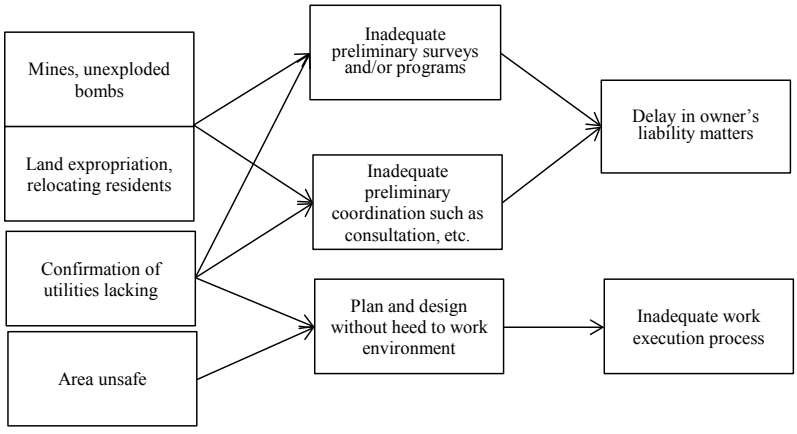


Figure 6-10 Causes of Contractor "Work and Environment" Issues

(5) "Management" Issues

Issues	○Inadequate sense of safety of local workers ○Difficulty of subcontractor's thorough apprehension of safety training ○Number of safety officers assigned compared to project scales are ill-matched ○Public understanding and consciousness towards safety in general is low ○Unsafe or hazardous actions are daily routine and performed under subcontractor's management ○Subcontractor does not adhere to prime contractor's instructions ○Compliance with construction plans and operational procedures insufficient ○There are differences in how Japanese enterprises and others go about in executing works ○Safety plan for "Plan, Do, Check, Action" is insufficient

Assumed causes	①Profit comes first	②Safety officers in short supply
	③Giving meticulous guidance is impossible	④Subcontracts have limitations
	⑤Locally employed workers lack skill	⑥Subcontractors lack capacity
	⑦Local laws and regulations still have to be developed	⑧Safety management system has to be set up
	⑨Construction plans are inadequate	⑩Working procedures require perfection
	⑪Culture and customs differ	⑫Lack of communication
	⑬Safety measures lack legal effect	⑭Consciousness of workers are low in many ways
	⑮Contracts are of overlapping form	

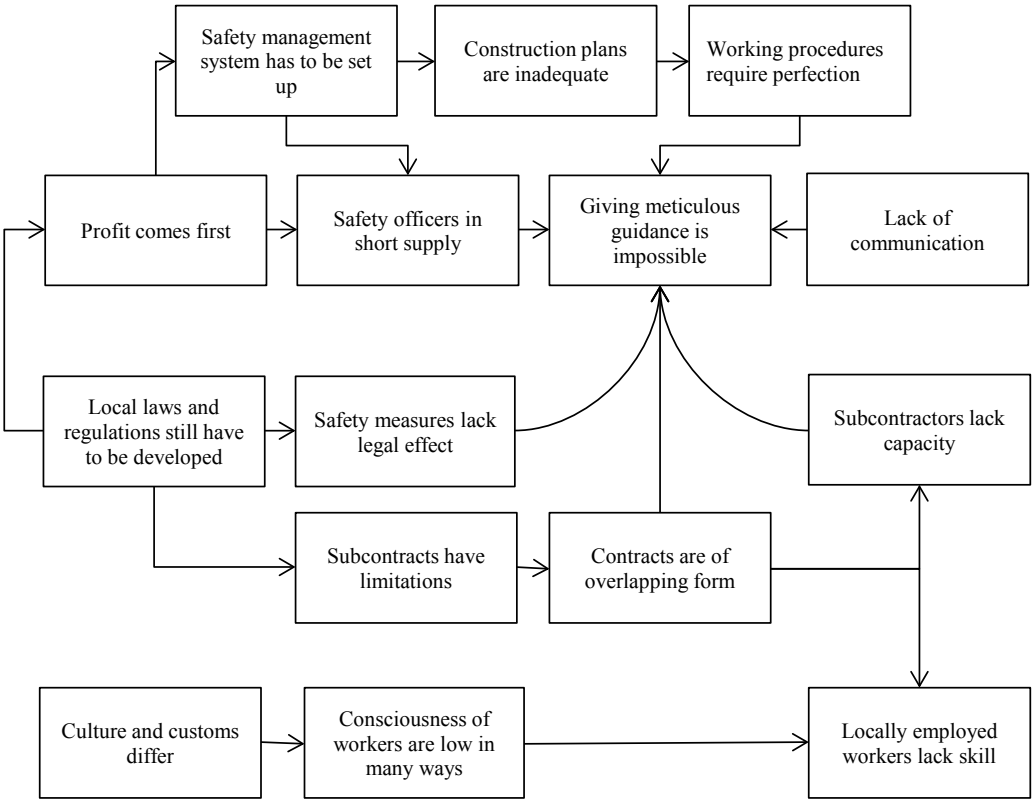


Figure 6-11 Causes of Contractor "Management" Issues

6-2 Issues requiring resolution

Based on cause figures and arranging causes assumed in Clause "6-1," issues per individual actor would be as described hereunder.

6-2-1 Client Issues

(1) "Manpower" issue	○Exert efforts to improve safety management of individual client and strive for safety awareness to take root.
(2) "Contract" Issue	○Materialize safety management regulations as much as possible when executing a construction project.
(3) "Management" Issue	○Structure a systematic safety management system independent of contractor's discretion.

6-2-2 Consultant Issues

(1) "Manpower" Issue	○Secure manpower amply possible to perform safety management for construction work.
(2) "Contract" Issue	○Secure an adequate safety manager and clarify safety management matters for constructions work. ○Perform study and design giving due consideration to securing safety.
(3) "Management" Issue	○Reinforce check function of construction work study and design, and clarify safety management matters.

6-2-3 Contractor Issues

(1) "Manpower" Issue	○Reinforce a comprehensive project management function inclusive of an individual's safety management.
(2) "Machinery and Facilities" Issue	○Make machinery and facilities well maintained. ○Secure operators who have suitable expertise.
(3) "Contract" Issue	○Structure an environment in which safe projects can be executed.
(4) "Work and Environment" Issue	*Listed under 6-2-2 (2) "Contract" Issue because this issue is consultant's one in the study and design stage.
(5) "Management" Issue	○Enhance safety management level for sub-contractors.

6-3 Directions of the future initiatives

In some developing countries, occupational safety and health related laws that is correspondent to the Industrial Safety and Health Act of Japan are in the process of being introduced. However, the enactment of laws and preparation of control standards for securing safety at sites are not in the practical stage. Further, there are not many human resources who have experienced participating large scale projects, and the knowledge and know-how in construction projects are not stabilized and infiltrated in the organization of the client. Under such conditions, to perform ODA construction project without delay, the role of consultant as the agent of the client is important. On the other hand, the client as the project entity needs to recognize the importance of securing safety, and raise awareness for safety management in construction sites.

While it is clear that the responsibility of securing safety in construction lies in the contractor, the client, the consultant and the contractor are required to deploy safety management activities together, by the strong leadership of the client as the project entity, in order to minimize accident.

Considering the role and responsibility imposed upon clients, contractors and consultants, we propose specific suggestions to be examined as follows, based on the current problematic issues, in order to bring the work environment and control systems forward.

6-3-1 Directions of the initiatives of the client

(1) Initiatives on human resources

As time and cost is required to develop human resources aiming at better safety awareness and acquisition of knowledge, it is necessary to perform steady and continuous initiatives.

1) Seminars utilizing technical cooperation project

For medium-term measures, it is suggested that the "Seminar on Safety Management" should be planned and held in other developing countries which has been held as part of JICA's technical project for quality control in Viet Nam and Cambodia. It is also an effective way to promote the cooperation with the Ministry of Land, Infrastructure, Transport and Tourism of Japan which has many experiences in safety management in Japan's public construction projects. We propose the contents of the seminar as follows:
<Contents of the proposal>

	Theme	Members
1	○ Combine quality management, safety management and contract management as a set.	Client, government organization -related persons
2	○ The counterpart government to explain rules about occpational safety and health ○ Introduction of accidents ○ Safety management initiatives of the subject country	Mainly the local contractor and workers

2) Enriched training contents in JICA's training course for specific issues such as "Project Supervision in Development of Infrastructure"

Currently, in the course of "Project Supervision in Development of Infrastructure" has subjects on "Safety and Health Management," which is composed of lecture by a person in charge of safety in Japan's construction firms, and a site tour during construction by the Japanese construction firms. We propose the following subjects and training method so that the client can raise their awareness, and acquire skills that can be exercised at their workplaces.

<Recommended subject and training method>

Subject	Risk assessment (related to safety and health management system)
Training method	Lecture + Group work + Group presentation
Outline	Explain the outline and methods of risk assessment. Thereafter, execute risk assessment based on actual cases by each group, which makes presentation as a result.

3) Effective utilization of this study

Concerning basic knowledge about safety management of ODA construction project, information provision on this time's survey results will be useful. It is often seen in the developing countries that knowledge and experience of an individual has not become knowledge and experience of the organization. Although drastic response is difficult, we propose to distribute the part of the survey results by manuals.

4) Utilization of external experts

If the expert of safety management is insufficient, we propose to implement safety management by entrusting it to external safety management experts depending on the scale of construction

project (large-scale construction in particular).

(Specific case) In the Greater Colombo Urban Transport Development Project, the client has dedicated Safety Officer employed from outside and is working together with the consultant and the contractor to perform safety management. The Safety Officer belonged to a Japanese contractor in the past, and has experience in safety control of ODA construction projects.

(2) Initiatives relating to contracts

In order that the client guides the safety management with legal power, it is necessary to provide for specific safety related performances in the construction contract with the contractor. Under the present contract conditions, the contractor shall perform works with responsibility on safety assurance, but no specific safety management items and standards to be managed are clearly stated. The developing countries has no standard specifications including requirements for safety management like "Standard Specifications for Civil Works" used in public works of the Ministry of Land, Infrastructure, Transport and Tourism, and other guidelines like "Technical Guideline for Safe Construction of Civil Works." The safety management in ODA construction projects now is up to the safety management by contractors.

1) Establishment of "Safety Management Guidelines" (tentative name; draft)

Based on the current situation that the safety management levels greatly differ among contractors to undertake construction projects, it is necessary to provide specific management items and standards required of a contractor. Especially on ODA loan projects, we propose establishment of Safety Management Guideline (tentative name; draft).

The details are described in 6-3-4.

2) Initiatives for fair tender evaluation concerning safety measures

As initiatives to realize fair tender evaluation concerning safety measures, we propose the following:

(Proposed items)

<ODA loan projects (two-envelope bidding procedure>

(1) The client indicates safety items concerning the project in tender documents, and obligates submission of "safety measures plan."

(2) The bidder shall submit "safety measures plan" covering the designated items. Together with the plan, the bidder shall prepare and submit particulars required with it.

(3) The client shall evaluate "safety measures plan" upon technical examination, and disqualify bidders which failed.

(4) Next, the client evaluates the price and contractual conditions of the bidder which passed the technical examination.

Concerning the evaluation by (4), A) you evaluate the particulars of safety cost provided by bidders, or B) evaluate disregarding the safety cost particulars submitted by the bidders, which are up to the decision by the client.

In proposing, we have to study in the future 1) how to set the safety measure items, or 2) how to evaluate and score safety measures plan. This time, detailed proposal may not be made, but it is possible to use "Safety Management Guideline (tentative name; draft)" and "Guideline for

Preventing Third Party Accidents (tentative name; draft)" as the basis.

Further, safety measure items need to be set after arranging the relationship between safety measure costs under the present estimation system and the safety measure items. This proposal needs sufficient examination for changing items of tender evaluation. We leave it for your consideration later.

<Grant aid project>

A grant aid project is based on a lump sum (overall cost) contract, and different from BQ contract (single cost contract) in ODA loan projects. Therefore, the tender evaluation systems proposed in ODA loan projects cannot be easily applied to grant aid projects. It is possible that bidder submit safety measure plan, but it is desired to fully examine timing of submission, and time and method of evaluation.

On the other hand, the construction contract for grant aid projects does not clearly provide for specific safety measure items and standards on the whole. The minimum safety measure items should desirably provided for in the special conditions of the contract. We propose that the special specifications shall set specific measure items and standards to clearly show it in the contract's special conditions.

Specific measure items and standards may be based on Safety Management Guideline (tentative name; draft) and Third Party Accident Prevention Guideline (tentative name; draft), depending on the development of laws, and technical guidelines and standards for safety of the recipient country.

(3) Administrative initiatives

While the laws and regulations are underdeveloped concerning safety management, strong leadership of the client is indispensable, and it is necessary to build an administration system not depending on the contractor only.

1) Utilize accident reporting system, and make it useful for effective safety measures by statistical processing/analysis

Many of the clients in developing countries do not utilize accident data of the past as information to prevent recurrence. Accident data is not for the summation only but are precious materials to effectively prevent accidents by arranging the common elements after statistical processing/analysis of the occurred accident. We propose that accidents report should be obligated, and summed data should be statistically processed/analyzed to build up a mechanism of preventing accidents.

(On classification of accidents) When you classify the causes of accidents, efforts to sum them will not be useful without unified standard. For this purpose, it is necessary to clearly set classifications.

Japan	The Ministry of Labor, Health and Welfare has designated "classification of accident type and cause type."
Developing countries	A) If the country designates method of classification, it is advisable to perform according to the classification.
	B) If the Ministry of Labour has no provision, it is advisable to follow "classification of accident type and cause type" of ILO.

2) Penalty provisions

The penalties against contractors which have caused accident are not severer than Japan. In the future, it is desired to examine penalties together with the development of laws of the subject

countries. Construction businesses, however, are likely to cause severe accidents, as is the case in Japan. Therefore, apart from development of laws by Ministry of Labour, and other upper organizations, we recommend that the client issue independent rules.

At present, there are no statistics for accidents, we recommend early incorporation of "Accident report system and drafting of safety measures by statistical processing," as were proposed in 1), and examine the contents of penalties and its rule of application, reflecting the result.

3) Infallible performance of the client responsibilities

The client has to perform responsibilities in the monetary cooperation project, but the client's responsibility in general peculiar to the project should be performed promptly without affecting construction, as it is directly related to safety management.

Particularly, default or delay in land acquisition, securing yards necessary for construction, relocation/removal of existing utilities, necessary traffic control (including ship navigation rules), securing temporary yard, and search for and removal of unexploded bombs (UXO: Unexploded Ordnance) and land mines may affect construction process and schedule, and hinder safety management to a great deal, it is desired that they prioritize them.

6-3-2 Directions of initiatives of the consultant

(1) Initiatives on human resources

As a means to secure human resources who can guide the contractor in safety management, it is thought that internal human resources can be developed. However, there are differences of operational forms between the domestic and the foreign, it is required to appoint external experts as ready-to-use personnel.

1) Employment of external safety experts

In the long term, it is necessary to raise internal human resources of the consultant. This cannot be realized in a short time, and time and cost are needed to raise human resources who have certain safety management abilities. To resolve the current issues, we propose appointment of "human resources familiar with safety management from the contractor" or "foreign consultant" as the person in charge of safety.

(Applicable human resources registering bodies)

(1) "Participatory Network for Expert Recruitment (PARTNER) (JICA)"

(2) "Human Resources Registration System for Overseas Construction (OCAJI)"

(2) Initiatives on contracts

1) Clarify in the contract specific safety items and the number of safety managers

In the present construction supervising consultant contract, it is often the case that safety items and the number of safety managers are not stipulated on the whole. We propose that by placing safety consultants in preparatory survey (proposal described later) to confirm specific safety items and the required number of consultant's safety managers, to clarify it in the special conditions of the contract, and to provide appropriate costs.

2) Concept of designated temporary structures

It requires careful study to designate temporary structures. It is desirable to follow the current standard, for the being, of "Preparatory Survey—Design and Estimation Supplementary Manual (Civil Engineering) (trial version) March 2009. The following is the current standard.

Temporary work and work methods coinciding with the following items should be properly instructed as designated temporary structure in the design documents after E/N.

1. Temporary structure needed for safety measures (temporary cofferdam structure, temporary piers)
2. Temporary structure offered for general public traffic (temporary bridge, road surface lining, detours, etc.)
3. Temporary structures with restrictions as a result of discussions with related government agencies.
4. Temporary cofferdam structure having the same functions as river dikes
5. When patented method or special method is employed.

Additionally, if any accident occurs in the designated temporary structure, it will be the responsibility of the contractor because of some issues in safety management, depending on the cause of accident. If the accident is due to inappropriate designated temporary structure beyond the responsibility of the contractor, it cannot be denied that the consultant or the client may be responsible. When employing designated temporary structures, advance survey should be

conducted sufficiently, the laws and technical guidelines of the subject country should be considered, and temporary structure suitable to the site should be examined, and sufficient site survey should be made with the cooperation preparatory survey. Based on the discussions above, if you employ designated temporary structure, it is desirable to technically examine the contents of the designated temporary structure based not only on the judgment of the consultant but also on "Safety Examination of ODA Construction Projects (tentative name; draft)" (separately recommended matter).

Regardless of whether it is a voluntary or designated temporary structure, we add that sufficient advance site survey is necessary in addition to compliance with the subject country's related laws.

(3) Initiatives on management

As duplicated with JICA's initiatives, will be described in 6-3-4.

6-3-3 Directions of contractor initiatives

(1) Human resources initiatives

1) Holding overseas training seminar (voluntary activities of the industry association)

For the purpose of raising abilities of the staff of contractors, we propose holding overseas training seminar (voluntary activities of the industry association)

The Overseas Construction Association of Japan, INC. holds overseas training seminar for contractor staff working abroad concerning practical themes at different meeting place every year. With safety management and communication ability as t hemes, they develop the skills of contractor staff.

(2) Initiatives relating to machinery and equipment

The machinery and equipment procured by the developing countries are old-fashioned and inferior in quality on t he whole. The skills of operators vary due to insufficient qualification system depending on the subject countries.

1) Startup inspection and regular inspection

As accidents frequently occur due to defective servicing of machinery and equipment, we propose that each site perform “startup inspection” before starting work and “regular inspection”. This item will be detailed in separately proposed “Safety Management Guideline (tentative name; draft).”

2) Introduction of the test for confirming operator skills

If you employ operators for construction machinery, we propose to introduce a system for employment test to confirm their skills. This item will be detailed in separately proposed “Safety Management Guideline (tentative name; draft).” The standard of skill confirmation test shall be the voluntary standard of the contractor. It would be a proposal to clearly indicate the standard in the safety and health plan, and to make it a basis of technical evaluation upon tender.

(3) Initiatives on contracts

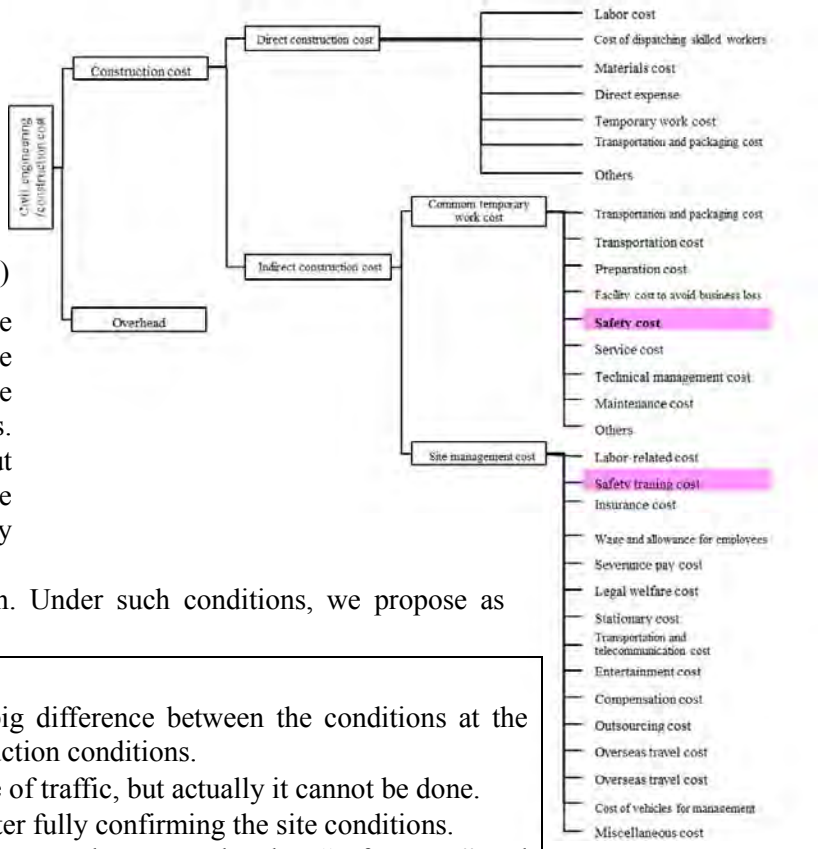
1) Proper and specific appropriation of safety response cost

To assure safety in the stage of project implementation, it is necessary to properly appropriate such costs for safety response, in order to eliminate disturbance in cost. Naturally, the items for estimation conditions should also be indicated in special specifications. Next, we make a proposal for proper appropriations in ODA loan assistance and grant aid assistance.

Before that, it is required to exactly perform responsibilities of the client. For this purpose, we need to fully confirm the client responsibilities upon survey, the parties concerned endeavor that no default occurs upon implementation, and build up a system to promptly perform the provisions in case of a default. Further, this proposal does not consider including the cost of client responsibilities in estimating the cost. The basic system of estimating civil engineering cost is indicated as follows ("Preparatory Survey-Supplementary Design and Estimation Manual (in Civil Engineering), March 2009, p. 16) Cost of safety are: common temporary cost's "Safety Cost" and "Safety Training Cost" for site management. They are broken down as follows:

① Safety cost = Direct construction cost x (Rate) + Accumulation

② Safety training cost = (Direct construction cost + Common temporary work cost) × (Rate) + Accumulation



(Proposal: in the case of grant aid project)

In the case of grant aid project, the scope of application for safety measure operation is quite limited despite the appropriation of preparatory expenses. Utilization of extra costs is possible but the amount of extra costs may change depending on project, and it is necessary to raise the precision of the estimation from the basic design. Under such conditions, we propose as follows:

<Recommendations>

○ Assure plans and designs with no big difference between the conditions at the stage of estimation and actual construction conditions.

(Example) ・A plan enabling blockade of traffic, but actually it cannot be done.
→Design and estimate after fully confirming the site conditions.

○ Properly appropriate safety measure cost to be accumulated as "safety cost" and clearly indicate it in the contract.

(1) Cost required for traffic control by traffic guidance personnel and machinery guidance personnel, (2) cost required for safety control personnel to be allocated to the entrance/exit at a site proximate to the railway or airport, (3) cost for barricade, fall prevention fences, lights, construction signs, etc., (4) cost for work under high pressure, (5) and cost to be accumulated for safety personnel and site conditions.

The safety cost not included in the item to be appropriated at (rates), will be estimated in the accumulation item above, and surely clarified in the special specifications.

(Proposal: in the case of ODA loan project)

ODA loan project is as the same as the proposal on grant aid project. Due to the large scale of construction and the construction period being elongated, we propose as follows:

<Proposal> (Addition to the proposal of grant aid project)

○ In the item of PS (Provisional Sum), add safety cost item.

Safety measures specified in the special specifications cannot cover it. For example, if the construction conditions and changes in the surrounding environment require unexpected measures, the purpose will be defined to remove cost barriers, and enable proper safety measures.

It is a precondition that you consider expected safety measures during design/ estimation stage, and write it in the contract. The safety measures to be included in PS as an item is not included in the conventional PS cost, and the rate of calculating PS cost shall include the safety measures cost.

(Example)

Summary of Specified Provisional Sums

Bill No.	Item No.	Description	Amount	
			Local	Foreign
1				
		Add safety cost item		
2	2.8	Supply and install equipment in pumping station	1,250,000	1,250
3				
4	4.32	Provide for ventilation system in subway tunnel	3,500,000	3,500
etc.				
		Total for Specified Provisional Sums (carried forward to Grand Summary (B), p. ___)	4,750,000	4,750

SAMPLE BIDDING DOCUMENTS UNDER JAPANESE ODA LOANS –PROCUREMENT OF WORKS-(JUNE 2009)

(4) Initiatives in management

1) Conducting joint safety patrol

We propose to hold joint safety patrol covering several constructions at certain areas. Contractor and consultant accept to be an organizer by rotation, led by the overseas office of JICA, and joint safety patrol shall be conducted including the client.

Concerning the ODA construction projects in Cambodia, they hold safety measure explanation sessions with participation from the Embassy of Japan, JICA, consultant, and contractor.

2) Introducing penalties and awards for subcontractors

We propose penalizing and awarding subcontractors in order to achieve tense construction and improve safety consciousness. The Japanese companies with rich experience in construction in the developing countries have introduced awarding system, and produced certain effects. We recommend that the other contractors adopt the successful example. It is a positioning of voluntary safety activities by contractors.

3) Introducing reporting of near miss events

We propose introduction of a system to report near misses at sites to the headquarters, in order to improve safety awareness of contractors and workers. This item will be detailed in the "Safety Management Guideline (tentative name; draft)" of separate proposal.

Construction involves many risks and their properties may differ greatly among the scales and types of construction, areas of construction and countries. It is certain that risk assessment and risk management are effective means. On the other hand, as described in 5-1-3, accidents involve invisible many dangers, and it is necessary to find out the latent dangers from the persons employed at construction sites.

<Expected effects>

(1) By collecting and analyzing danger information hidden accidents, it will be possible to take effective safety measures suitable to the site.

(2) It will be able to improve the safety awareness of workers (improvement of accident sensitivity).

<Remarks>

As it is negative information, it is necessary to give certain incentive to report near miss experience. If you penalize or scold a person for the near miss action, they will not report for the 2nd time. Bearing that in mind, labor accident may be prevented by letting them report experience continuously, increasing near miss information, and reflect them in safety measures.

4) Holding training seminars for local firms and subcontractors (the industry's voluntary activities)

We propose organization of a training seminar for local firms and subcontractors (as voluntary activities of the industry association).

Utilizing local association and federation such as IFAWPCA (International Federation of Asian & Western Pacific Contractors' Association), convene training seminars. OCAJI has held training seminars by dispatching its instructors, which should be strengthened.

6-3-4 Directions of the initiatives of JICA

Securing safety during construction is a responsibility of the contractor who undertook the construction, whether it is an ODA project or a domestic project (regardless of public or private). Of course, any accident during construction is a responsibility of the contractor, and is attributable to it administratively, criminally, and civilly. Further, if response to accidents is improper, and if there is material negligence leading to accidents, it will be socially punished as a responsible corporation through the mass media.

JICA is not a party to a construction project. However, as many Japanese firms are undertaking ODA construction project, JICA as the sponsor is indirectly responsible. If any accidents occur, it is accountable to the counterpart government and its people as well as in Japan. For this purpose, it is desirable to clarify JICA's initiatives to assure safety, and show its attitude not only to the counterpart country but also in Japan.

JICA is a bilateral assistance organization which is mobile as compared to multilateral organizations like the World Bank and the Asian Development Bank, and has an advantage of employing an assistance mechanism such as the technical cooperation projects.

Base on such background, we indicate below the measures to be examined, including the pros and cons of introduction.

<Standard (draft)>
Some proposal may include standard (draft). Its numerical ground is based mainly on that of the Ministry of Land, Infrastructure, Transport and Tourism. It should be set in consideration of construction results and environment of each country, but it is difficult to set standard for each country due to shortage of construction data. Therefore, we indicated the figures applied in the public works in Japan. It is thought necessary to undergo third party check for application.

1) Addition of safety provisions in E/N of grant aid projects

We propose to make an addition as follows concerning safety provision in grant aid projects:
(E/N) Like ODA loan project, add "safety provisions for workers and third parties by the counterpart government" in E/N in grant aid projects.

2) Implement survey by adding "Safety Consultant (tentative name)" to the ODA preparatory survey

As ODA construction project starts from preparatory survey, include "Safety Consultant (tentative name)" as a regular member of the preparatory survey team to let him conduct survey for securing safety.

(Outline) In a flow of a construction project, the results of the preparatory survey will be reflected in E/N after examination by JICA. It is desirable that preparatory survey will enable sufficient site survey, and safety issues and necessary costs of safety measures are defined. If they are not examined sufficiently to come to a stage of E/N, it is assumed that detailed design and estimation will be made without considering physical construction conditions that may endanger safety in addition to costs.

Specifically, we indicate 2 cases.

○ In a road construction project, the design was made on the assumption of road closure but a permit for road closure was not obtained. Therefore, the safety management cost of the contractor is increasing because the construction could not be advanced with the construction conditions as originally designed. (This project is not a subject of trial application of a preparatory expense, and it is difficult in fact to increase the design cost.) Also, the relocation of power poles did not progress as originally planned at construction sites for which the client is responsible, and the construction sites were divided in many place due to the influence of the existing power poles, and presented great disturbance in safety management.

○ In a road bridge project, the construction period is obliged to be extended, due to the delay in land acquisition, and relocation of high voltage cable, which the client is responsible for. Especially, the high voltage cable is laid above the installation place of the interchange, which must be the specially remarkable matter from the stage of survey to secure safety, and it is desired to promote performance as planned from the stage of designing.

The causes of the delay in performing the matters which the client is responsible for are scheduling, method and budgeting of responsible matters which are not properly planned according to the schedule of the permanent works. The plan is attributable to the responsibility of the client but affects process and period of permanent works as well as cost and construction safety. Therefore, it is desirable that the Japanese side assists the planning. By assigning an expert, "safety consultant (tentative name)," who is familiar with safety management and construction plan, in the preparatory survey in the upstream stage, for checking construction plan and estimate from the viewpoint of safety management, including assistance in the matters for which the client is responsible.

In section 2-1 "Policy for estimation" in the "Preparatory Survey Design and Estimation Manual Supplementary Volume (Civil Engineering Area) (trial version, March 2009)", the "Estimation" requires "Construction Plan" combining construction method, procurement plan and process plan, which supports the ability to perform construction safely, exactly and economically, as an indispensable precondition. If this is inappropriate, it will greatly influence detailed design and construction at sites Based on the above, we describe below the "Safety Consultant (tentative name)" should especially consider at the stage of preparatory survey.

Table 6-1 Matters to be noted in preparatory survey (draft)

Neighborhood environment	Situations surrounding the sites, density of nearby private houses, nearby structures and underground utilities, objects on the ground, houses to be relocated, detours during construction, traffic countermeasures, safety measures and security situations, etc.
Natural environment	Geology, hydrology, oceanography, disadvantageous natural conditions in construction (weather, spring, marshland, hypoxia, toxic gas, earthquake, landslide, flood, typhoon, violent wind, eruption), etc.
Procured material	Temporary materials and equipment, etc.
Transportation	Traffic restriction, safety, etc.
Approach path at the site	Status of approach path (width, alignment, pavement, bridge, waterway, overhead wires, underground utilities, etc.), necessity of widening, improvement, and reinforcement, necessary temporary facilities, etc.
Labor force	Skills of workers, etc.
Site subcontractors	Qualifications, abilities, outsourced types of work, achievements, etc.
Technical standards, laws and customs	Design standard, construction standard, method of construction, etc
Labor laws/ customs	Laws relating to occupational safety and health, etc.
Project implementation system	Organization, personnel, finance/budget, safety management abilities, etc. of the counterpart government's executive agencies, upper organizations and related organizations, etc.
Construction plan	Division into sections, phased construction, construction method and design drawings should be reviewed.
Construction supervision plan	Review of personnel required for construction supervision, and construction supervision system.
Process planning	Plan without contradictions (phased construction, division into sections, time of procuring materials and equipment, manufacturing period, types of work, construction order, construction method, installation and removal of temporary facilities, construction and removal of detours, construction scale, quantities, traffic restrictions, limitations from the neighborhood environment, rainy season, annual rainy days, etc.)

<Requirements of Safety Consultant (tentative name; draft)>

He should be familiar with "safety management" and "construction plan".

Specific conditions are written below.

○Designation of construction management experience years (criteria: 10-20 or more years), or

○Designation of safety management experience years (criteria: 5-10 years or more, or

○Designation of qualification (needs consideration due to absence of international qualification)

→Equivalent to "1st Grade Public Works Control Engineer" or "1st Grade Construction Work Control Engineer" in Japanese qualification

As professional engineer is not always familiar with safety management and construction plan, the requirements are not enough. If requirements are added, it is required to designate subjects limited to construction plan, etc. like professional engineer (construction sector-construction plan and facilities, estimation).

3) Survey, design and estimation by "Safety Consultant (tentative name)"

We propose to assign "Safety Consultant (tentative name)" to survey and design (add required number of M/M within the scope of business of consultant) from the stage of preparatory survey and of designing. Exactly execute the safety matters provided for in "Preparatory Survey/Design and Estimation Manual" or other rules, execute survey, design and estimation, and the results being reflected in contracts including special specifications.

4) Review of standards for “Projects requiring care under the safety measures upon construction

We propose review of the standards provided by JICA: “Standards of projects requiring special care under safety measures upon construction.

(Reasons) To raise safety further from the designing stage (relating to safety examination system described later.

According to “the Entrusted Report concerning Safety Assurance in Development Projects in Developing Countries, June 2008, Japan Bank for International Cooperation,” the standard is based on analysis of third party accidents and significant accidents occurred in Japan in construction requiring notices to the Minister of Labor, Health and Welfare and the head of the Labor Standards Inspection Office based on Japan’s Industrial Safety and Health Act. Concerning projects requiring care under the safety measures upon construction due to the formulation and enforcement of standards, safety measures are taken, but significant and third party accident are increasing.

The significant and third party accident in the past occurred not only on the projects especially requiring care under safety measures but also in other projects. Especially, traffic accidents occupy half of the accidents. The second cause is collapse and destructions of the structures, half of which is caused by landslides. In consideration of the properties of the past, we proposed reviewed standards (proposal), based on the current standards (see Table 6-3).

Table 6-2 Standards for projects especially requiring care under safety measures upon construction (the present state)

・Long span bridge, and continuous overpass (a structure with a length of roughly 1,000m or more in a single bridge (overpass) (including approach road)
・Suspension bridge such as cable stayed bridge, extra-dosed bridge
・Special surface, underground and underwater construction (tunnel, open cut and coffering construction in river areas, construction including large-scale temporary structures, large-scale foundation construction, construction using caissons, etc.)
・Construction requiring work at height (work at roughly 20m or more from the ground)
・Other constructions involving possibility of material accident.

(Reviewed proposal)

Table 6-3 Reviewed proposal: Standards for Projects Especially Requiring Care under Safety Measures upon Construction (proposal)

Standard items	Classification
1. Bridge construction	
a. Long span bridge, and continuous overpass (a structure with a length of roughly 1,000m or more in a single bridge (overpass) (including approach road)	Present
b. Suspension bridge such as cable stayed bridge, extra-dosed bridge	Present
2. Bridge construction	
a. Maximum span of 100m or more	New
b. Maximum span of 50m or more, and the bridge is constructed by other than truck crane method or erection beam method.	New
c. Influence on traffic is expected due to proximity to the railroad, road, etc.	New
3. Earth-retaining work and cofferdam work	
a. Road decking, temporary bridge, and other temporary structures sharing general traffic	New
b. Coffering method within the river area	Present
c. Cofferdam method and coffering method which are close to railways, roads and other important structure and may be affected by its structure and ground deformation in the area	New
4. Special works	
a. Tunnel (including shield method)	Present amended
b. Dam（including Sabo dam）	New
c. Case of pneumatic caisson foundation work (caisson work, etc.)	Present amended
5. Construction requiring work at height (work at roughly 20m or more from the ground)	Present
6. Other construction having the risk of material accident	
a. Construction including large-scale temporary structures	Present
b. Large-scale foundation work	Present
c. Construction designated by JICA	New

As elements to be considered concerning “6. Other construction having the risk of significant accident”, we propose the following items for reference purpose only.

a. Earth retaining works for soft ground with an excavation height of 7.0m or more

b. Earth retaining works supporting unsymmetrical pressure with an excavation height of 7.0m or more

c. Earth retaining works other than a. and b. with an excavation height of 9.0m or more

d. Construction securing current road traffic

e. Traffic restriction is necessary for the works on the road opened for common use.

f. There are underground utilities and obstacles to be relocated (power pole, overhead line, etc.) on the road of the construction section.

g. If it is necessary to install protective facilities against drilling of sediment and rocks, falling rocks due to vibration in construction, snow slide, sediment failure, etc.

h. Works adjacent to railways and power cables.

○Applied sources:

2. Bridge construction: “Measures on Safety in Construction,” MLIT

3. Earth retaining works and cofferdam: “Measures on Safety in Construction,” MLIT

4. Special works: “Measures on Safety in Construction,” MLIT

Reference item a. b. c.: “Measures on Safety in Construction” MLIT

Reference item d. e. f. g. h.: “Outline of Safety Measures in Construction concerning Order of Public Works,” MLIT

5) Formulation of "Safety Management Guideline (tentative name; draft)"

Considering that there is great difference in the levels of safety management among contractors who undertake construction project, it is necessary to provide specific management items and standards. We propose formulation of "Safety Management Guideline (tentative name; draft)" common to each country.

This proposal reflects the fact that developing countries on the whole do not have something like technical guidelines for safe construction. If they have them, they just have to follow them. In countries where they are not developed, the requirements in safe construction and management are ambiguous. In such situation, it is difficult to set management items and costs concerning safety measures. What is more, it will be an obstacle in safe management at actual sites. It will be significant for JICA to compile and submit to the client of the counterpart country certain management items and specific safety measures, which are required as a minimum in the safety management of ODA construction. The proposed guideline will be used as a reference guideline. It is assumed that its entire or partial application is up to the judgment of individual clients. In formulation, it is desirable to fully consider the preconditions of the particular developing countries.

(Outline) As a reference material, the Ministry of Land, Infrastructure, Transport and Tourism formulated "Technical Guideline for Safe Construction in Civil Works." It is recommended that a soft standard will be adopted to be utilized in response to the situations of each country, rather than stipulating in detail as provided for in the Technical Guideline. Concerning the contents, it is necessary to separately consider them in the future. The reference items are given below.

Table 6-4 Reference items of the safety management guideline (draft)

Safety in general	Safety management activities, daily management, safety education, wears and protection gears, housekeeping, safety aisles, first-aid tools, inspection (before work, etc.), accident report, operator skill tests, signs, awarding system, near miss report system, etc.
Prevention of falling accident	Scaffold, work floors, openings, safety nets, safety belts, lifts, safety aisle equipment, etc.
Prevention of flying objects	Scattering prevention equipment, etc.
Prevention of collapse accident	Form timbering, trench timbering, excavation work, etc.
Prevention of accident relating to construction vehicles	Machinery for site preparation, transportation and loading, excavation machinery, machinery for foundation work, compaction machinery, concrete pump vehicle, machinery for demolition, etc.
Prevention of accident relating to cranes	Crane operation, slinging operation, slinging tools, etc.
Prevention of electricity accident	Panel boards, temporary movable wires, lighting equipment, arc welding work, etc.
Prevention of accident from machinery and equipment	Circular saw, grinder, hoist, compressor, etc.
Prevention of traffic accident	Transportation work, etc.
Prevention of fire and explosion	Fire extinguishers, hazardous material handling work, gas welding and cutting work, etc.
Prevention of tunnel accident	Roof-fall, collapse of ground, explosion, fire, evacuation, timbering, rescue, etc.

6) Creation of "Safety Examination System for ODA Construction Projects (tentative name; draft)

Concerning the results of the preparatory survey, we propose a third party checking system from the viewpoint of safety assurance.

(Reason) The importance of conducting investigation from the viewpoint of safety assurance from the stage of the preparatory survey is as mentioned above. A Safety Consultant will be assigned for the investigation, which can be made safer with a third party check. As the function of the check, we create "Safety Examination System for ODA Construction Projects (tentative name; draft). The proposal is indicated below.

○Position:

A subcommittee of the "Committee for Safety Measures for Facility Construction Projects"

○Members:

The level of "Safety Consultant (tentative name)"

○Outline of examination:

The consultant will examine, in the preparatory survey, points at issue and required expenses for the safety measures. The Safety Consultant (tentative name) will check the result, before estimation, to confirm there is no problem in securing safety.

○Project subject to examination:

Projects falling under the "Review Proposal: Standard of Project Especially Requiring Care under the Safety Measures upon Construction (draft)" by the preparatory survey (whether it is an ODA loan project or grant aid project).

7) Formulation of "Third Party Accident Prevention Guideline (tentative name; draft)"

If we look at the results of statistics of accident data, about 70% of the total of casualties in ODA construction project is due to third party accidents. It is required to strengthen measures against accidents involving third parties. Although they are due to traffic situations and morals of developing countries, we propose formulation of "Third Party Accident Prevention Guideline (tentative name; draft)" including matters for minimum compliance.

It is an option to integrate it in the Safety Management Guideline (tentative name; draft) mentioned above.

(Outline) As the situations differ among countries, it will be a relaxed guideline. As an example, the items to be included are indicated below. However, separate examination is needed for items and contents.

○Prevention of traffic accidents near the entrance/exit of the construction site
○Matters relating to prohibition of entry into the construction area
○Matters relating to measures against traffic accidents by construction vehicles and commutation vehicles
○Matters relating to underground facilities and surface obstacles
○Matters relating to flagmen and guards
○Matters relating to consideration on the neighboring residents, etc.

8) Assisting the client and local operators by utilization of yen-loan account technical assistance

Utilizing the yen-loan account technical assistance, we propose assistance to the client and local operators.

(Assistance to the client) Concerning an client organization which does not have sufficient safety management system or a large-scale ODA loan project, we dispatch safety management experts to assist the client for a certain period before groundbreaking.

A point at issue may be the position of an expert. The purpose of dispatching experts is the assistance in safety management of the project, and it is important to gain understanding of the client that experts have no responsibility for occurrence of an accident. Although it is a yen-loan account technical assistance, it is advisable to execute an R/D with the client as it is assistance similar to a technical cooperation agreement.

(Assistance to local operators) For the purpose of improving safety awareness of the local operators, expert teams will be dispatched from Japan to each country, and perform safe construction session (basic safety education, etc.), investigate safety management situations of each site, and assist education.

9) Improvement of accident report system

Concerning report items of accident data, we propose that you report the information below following the instructions. To prevent delay of accident report, we propose to indicate the essentials in the primary report (quick report) without delay.

(Reason) In examining the prevention of recurrence, the following items are necessary for appropriate and effective statistical survey of accident. To grasp precisely the factual relations, it is necessary to clarify the reported items.

<Proposed items to be added to the current accident report form.>

○Construction outline (information to specify the type and scale of work) ○Information of the victim (nationality, type of work, years of experience, age, etc. ○Injured part ○Occurrence date (make sure to inscribe the time) ○“Form of accident” and “causal object.”

<Proposed essentials to reported in the first report (quick report)>

We indicate the proposed essentials to be reported in the first report (quick report). We also recommend that you make it a rule to submit a report promptly after occurrence of accident.

Department reporting the accident
Report date and time (local time)
Information source (e.g. executing agency, local news)
Name of country
Name of project
Name of executing agency
Outline of project
Awarded firm (including consultant)
Date and time of accident (local time)
Place of accident
Contents of accident
Scale of accident (victims information, situations)
Responses of parties relating to the accident (project executing agency, consultant, contractor, etc.)

Information sharing with the local Japanese overseas agency

10) Improvement of response upon occurrence of accident

If an accident happens, the headquarters of JICA will, after receiving accident report from the overseas office, and, in the case of a material accident, it will feed back the cause of accident, urgently needed measures, safety measures to be strengthened in the future, etc., and the overseas office will request improvement to the consultant and the contractor. In the future, we propose a system that an accident research team led by an expert from the headquarters (group member of technical consultation group of the yen-loan safety measures, JICA experts, etc.) is dispatched as necessary to the overseas office to investigate the accident and give advice to the related parties.

We indicate the requirements of dispatch below.

○In the case of significant accident (3 or more casualties)

○A consecutive accident in the same project, etc.

Check the presence of material negligence, and receive report on measures after accident from the consultant and the contractor (from the headquarters as necessary). Depending on the case, we may clarify the cause of accident while assisting the investigation body of the relevant country.

11) Examination of measures against material accident

According to the rules of measures against accident, JICA is able to suspend nomination, give warning or call for attention, if an objective fact such as wrongdoing is confirmed, without affirmation of judgment or disposition by judicial organization or administrative organization of the relevant country. If any laws or standards of the counterpart concerning safety management or Japanese guidelines are not sufficiently developed, it is not easy to acknowledge a wrongdoing. As it takes a long time to establish a judgment or disposal of the relevant country, it is unavoidable to take measures after long years from the time of occurrence of accident. We think careful examination is necessary to decide a disposal before judicial judgment of the relevant country. As an alternative, in the case of a significant accident, the contract for each project can indicate that construction should be suspended until investigation and guidance for improvement by the accident research team (proposed) of JICA are finalized. Upon occurrence of a significant accident, it will be investigated and, in general, sufficient examination will be made as to prevention of recurrence of accident including the cause of the accident. If the cause of accident is attributable to the responsibility of the contractor, the cost of suspension of work should be borne by the contractor. Otherwise, the contractor is not necessarily liable for the cost.

12) Towards realization of the proposal

We propose as set forth below in order to realize the proposal for securing safety of the construction project.

(1) JICA headquarters will have continuous position of total safety management department.

(2) Strengthen the alliance between JICA headquarters and the overseas offices.

(1): As safety requires cross-sectional initiatives, and initiatives from project inception to the implementation stage, it shall be an independent department.

(2): It is recommended to smooth communications between the overseas offices and the headquarters, and to make the safety initiatives practical. Based on the results of this survey, the directions (draft) of the initiatives of JICA in the future should be discussed with the overseas offices, and it is requested that JICA will inspect the actual sites, exchange opinions with the consultant and the contractor, and exchange opinions for the directions (draft).

Candidates for visit: (1) Southeast Asia, (2) South Asia, (3) Africa, and (4) Central and South America.

Reference Material

List of laws and Regulations in the Surveyed Countries

List of Laws and Regulations in the Surveyed Countries

＜Outline＞

Occupational Safety and Health Laws, Regulations and Ordinances in the targeting countries are shown below.

1. Sri Lanka

Country	Sri Lanka
Name of the Law	Mines and Minerals Law 1973, (No. 4 of 1973).
Governing Agency	Ministry of Environment and Natural Resources, Geological Survey and Mines Bureau (GSMB)
Legislation Year	1973
Outline	Sec.48 stipulates miner's health, safety, and welfares.

Country	Sri Lanka
Name of the Law	The Workmen's Compensation Ordinance (No. 19 of 1934) No.3(1946)、No.31(1957)、No.22(1959)、 No.4(1966)、No.15(1990)
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	No.31：1957 No.15：1990
Outline	No.31 : The law stipulates the employer's obligation to pay compensation to the employees when they encounter accident or disease. No.15：The law stipulates the range of application of occupational disease, that becomes subject to compensation.

Country	Sri Lanka
Name of the Law	Labor Legislations Chapter04 F actories Ordinance Factories Ordinance No.5 Chapter 128（This regulation is the combination of Factories OrdinanceNo.45 （Decree based on English Factories Regulations）and Factories Ordinance No.22（1946）） Later, revisions were made in 4 t imes. Revision No.54 1961 Revision No.12 1976 Revision No.18 1982 R evision No.33 2000
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1956
Outline	The regulation is enacted as a principle law for the safety of the laborers. The regulation stipulates the regulation concerning factory worker's safety, health, and welfares based on the Factory Law. Factories (first aid) Ordinance No. 1 of 1995 Factories (meal room) Ordinance, 1965 Factories (sanitary conveniences) Ordinance, 1965

	Factories (washing facilities general) Ordinance, 1965 Factories (No. 1) Ordinance, 1960（for the examination of lifts, steam boilers and steam receivers, etc.） Factories (protection of eyes) Ordinance, 1979 Factories (noticeable industrial diseases) Ordinance , 1972 Factories (dangerous occurrences notification) Ordinance, 1965 Factories (general standards of lighting) Ordinance, 1965 Factories (steam boiler attendants certificates of competency) Ordinance

Country	Sri Lanka
Name of the Law	Regulation concerning factory laborer's safety, health, and welfares (Enacted based on the Factories Ordinance)
Governing Agency	Chief of the Labor Bureau（Holds an authority over management of application of the Factories Ordinance） Occupational Safety Division（Established for the purpose of enforcement of the regulation）
Legislation Year	1956
Outline	The law stipulates facilities defined as factories. The law stipulates an application range of the Factories Ordinance as shown below. These are important regulations and increasing in number. (a)Regulations of health related facilities (b)Regulations of cafeteria (c)Regulations of first medical aid (d)General standard and regulations for lighting and day-lighting (e)Regulations of eye protection (f) Regulations when dangerous situation occurred (g)Regulations for qualification approval of steam boiler engineer (h) Regulations of washing facility

Country	Sri Lanka
Name of the Law	Factories Ordinance　Article 44（Labor supervisory system）
Governing Agency	Ministry of Labor Relations and Manpower Occupational Safety Section
Legislation Year	1956
Outline	The law stipulates periodical audit on the factory supervisor who are responsible for the regulation enforcement. The law stipulates the responsibility to confirm regulations are met in the field of safety, health, and welfare, and also implemented in an effective way.

Country	Sri Lanka
Name of the Law	Partial revision of a regulation. Revised portion is occupational accident reporting. （Factories Ordinance No.12 Revision）
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1976
Outline	Partial revision. Revised portion is occupational accident reporting The following accidents should be reported to the factory supervisor. (a)Accident involving loss of laborer's life (b)Such accident as laborer cannot work more than 3 days, and unable to receive full payment from the employer. (c) Such accident as laborer lost consciousness by heat stroke, electric shock, poisonous fume or gas.
Country	Sri Lanka
Name of the Law	Tertiary and Vocational Education Act (No. 20 of 1990) No.1
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1990
Outline	The law stipulates the installation of TVEC（The Tertiary and Vocational Education Commission）

Country	Sri Lanka
Name of the Law	Tertiary and Vocational Education Act (No. 20 of 1990) No.2
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1990
Outline	The law stipulates the installation of NAITA（The National Apprentice and Industrial Training Authority）. The law stipulates training through NAITA, on the job training, test, and vocational capability standard setting.

Country	Sri Lanka
Name of the Law	Tertiary and Vocational Education Act, National Youth Service Act NO.69 (1979)
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1979
Outline	The law stipulates the provision of vocational training and capacity building for the young people in Sri Lanka.

Country	Sri Lanka
Name of the Law	Tertiary and Vocational Education Act, Employment of Trainee（Private Sector） Act NO.8 (1978)
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1978
Outline	The law stipulates regarding the employment of trainee from private companies.

Country	Sri Lanka
Name of the Law	Tertiary and Vocational Education Act, Vocational Capability Judging System
Governing Agency	Ministry of Labor Relations and Manpower
Legislation Year	1985
Outline	The law stipulates　that NAITA（OJT and Vocational Training Bureau）has the power to conduct a test by setting own judgment criteria. Since 1985, NAITA has been conducting test in 50 vocational fields, in order to judge and certify the technology that the workers has obtained.

2. Cambodia

Country	Cambodia
Name of the Law	Labor Law　C hapter VIII　H ealth and Safety of Worker
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	This is the regulation regarding laborer's safety and health. This regulation is applied every employers running a company excluding minor family-run businesses.

Country	Cambodia
Name of the Law	Labor Law　A rticle 12-22. （Stipulates social welfare）
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates the compensation when laborer meets an accident. Right now, this law is the only law that stipulates labor accident compensation.

Country	Cambodia
Name of the Law	Labor Law　A rticle.233-237
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates an auditing regarding health and safety as well as auditing procedures. Article 233 stipulates that the labor auditors should periodically visit the construction site in order to validate regulations on safety and health at the site. The law also stipulates that safety expert should participate in the safety audit.
Country	Cambodia
Name of the Law	Labor Law　A rticle.238-247
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates provision of occupational health services to the laborer. Article 238 stipulates that an employer should provide free medical care to the regular employee. Article 242 stipulates that an employer should install medical treatment room at the working site, if the employer hires more than 50 employees.

Country	Cambodia
Name of the Law	Labor Law　C hapter IX Work-Related Accidents　Article248
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates the definition of an occupational accident.

Country	Cambodia
Name of the Law	Labor Law Chapter IX Work-Related Accidents Article243
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates the compensation for occupational accident.

Country	Cambodia
Name of the Law	Social Security Law　Article 6
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	2002
Outline	The law stipulates the regulation concerning insurance money payment to the National Social Security Fund (NSSF).

Country	Cambodia
Name of the Law	Article　243 Ministry of Labor Decree, Notice Concerning Compensation for the Labor Accident and Injury
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	September 10, 2002
Outline	The law stipulates compensation for occupational accident.

Country	Cambodia
Name of the Law	Labor Law　A rticle 299-230（occupational safety and health）
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates that an employer should maintain safe and healthy working environment for the laborers.

Country	Cambodia
Name of the Law	Labor Law　Article 252
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates compensation for absence from work, when a laborer meets accident and obliged to leave from work more than 5 days.

Country	Cambodia
Name of the Law	Labor Law　C hapter IX Work-Related Accidents　Article253
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates compensation for a laborer wounded deadly or having aftermath. Minister of Labor Decree 243 stipulates in detail regarding compensation of occupational accident.

Country	Cambodia
Name of the Law	Labor Law　Article 12-22
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates compensation for a laborer in the occupational accident from the social security viewpoint.

Country	Cambodia
Name of the Law	Labor Law　Article71-72
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	The law stipulates rights and obligations of the laborer in taking holiday with pay when he gets disease.

Country	Cambodia
Name of the Law	Social Security Law
Governing Agency	Ministry of Labor and Vocational Training
Legislation Year	1997
Outline	Article 3 stipulates the cabinet decision for the regularization of National Social Security Fund (NSSF) that is undertaking management of every organization relating laborer's health insurance, pension, accident compensation insurance.

3. Kenya

Country	Kenya
Name of the Law	The Occupational Safety and Health Act (Act No.15 of 2007)
Governing Agency	Ministry of Labor
Legislation Year	2007
Outline	The law stipulates to maintain safety and health of the laborer's working environment, also stipulates to prohibit hiring young laborer in the workplace where safety and health are exposed to danger. Furthermore, the law stipulates to discover dangerous place in the workplace and the cause of the disease, and through that action, try to prevent similar accident.

Country	Kenya
Name of the Law	The Occupational Safety and Health Act (Act No.15 of 2007) (Regulation concerning periodical inspection of the facilities and equipment)
Governing Agency	Ministry of Labor
Legislation Year	2007
Outline	The law stipulates periodical inspection of the facilities and equipment mentioned hereunder. The inspection should be carried out by the qualified personnel accredited by OSHealth Bureau. Hoist, Lift, Chain, Rope, Winch, Crane, Lifting Machine, Steam Boiler, Steam Receiver, Air Receiver, Gas cylinder for compression, liquefaction, dissolution.

Country	Kenya
Name of the Law	The Occupational Safety and Health Act (Act No.15 of 2007) （Obligation in the workplace to prevent from attacking every hazard possible）
Governing Agency	Ministry of Labor
Legislation Year	2007
Outline	The law stipulates an employer's obligation for the management of the laborer, mentioning that employer should equally protect laborers from dangerous working site surroundings.

Country	Kenya
Name of the Law	The Employment Act (Act No. 11 of 2007) Section 15
Governing Agency	Ministry of Labor
Legislation Year	2007
Outline	The law stipulates the employer's obligation to provide punishment procedures and safety health information to the laborers.

Country	Kenya
Name of the Law	Regulations for medical checkup
Governing Agency	Ministry of Labor
Legislation Year	April 2005
Outline	The law stipulates the employer's obligation to implement medical checkups of the laborer before employment, and periodical medical checkups after employment by the designated doctor accredited by the Chief of the Occupational Safety and Health Bureau.

Country	Kenya
Name of the Law	Work Injury Benefits Act（Act No. 13 of 2007） Obsolete "Laborer Compensation Law" is revised and enacted as a new labor law.
Governing Agency	Ministry of Labor
Legislation Year	2007
Outline	The law stipulates the employer's obligation, and laborer's right at the workplace, employer's responsibility for compensation of occupational accident and disease, and obligation of reporting to the agencies concerned.

4. Vietnam

Country	Vietnam
Name of the Law	Labor Code (2002, 2006 Revision, and Supplement) Chapter IX (Labor Safety, Labor Sanitation) Article95-Article108)
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1995
Outline	The law stipulates occupational safety and health standard, protection measure for laborer accident, measures to avoid danger.

Country	Vietnam
Name of the Law	Labor Code Chapter VIII (Labor Discipline, Material Liability) Article 82-Article94
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1995
Outline	The law stipulates regulations and standards for disciplinary punishment to the laborer, and relevant punishment clause.

Country	Vietnam
Name of the Law	Labor Code Chapter XI（Social Insurance） Article 140-Article 152
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1995
Outline	The law stipulates welfare responsibility for occupational accident and sickness.

Country	Vietnam
Name of the Law	Labor Code Chapter XII (Some Specific Regulations Concerning Minors and Other Types of Laborers) Article 119-Article 139
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1995
Outline	This law stipulates the duty to comply with a labor law and stipulates protection for foreigners and foreign companies or international organizations staying in Vietnam.

Country	Vietnam
Name of the Law	Decree 41-CP (Giving Detailed Stipulations and Guidance on The Implementation of a Number of Articles of The Labor Code on Labor Discipline and Material Responsibility)
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1995
Outline	This law stipulates coverage and range of application of the occupational safety and health laws.

Now the revision work of the labor law is in progress. The existing law contains 198 Articles and revised law will contain 275 Articles, hence major change is assumed. The revised law will come into force during the end of 2012 and spring 2013.

Country	Vietnam
Name of the Law	Law on Public Health Protection
Governing Agency	Ministry of Health
Legislation Year	1989
Outline	Major regulation regarding protection of public health Article 4. Health protection of the laborers Article 14, 20, 21 Provision of the safe labor environment

Country	Vietnam
Name of the Law	Law on Trade Union Article 6 CHAPTER II (Rights and Obligations of Trade Unions)
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	1990
Outline	The law stipulates the establishment of national program, scientific research program for labor protection, occupational safety and health, and labor union's activity for the arrangement of the concerned law.

Country	Vietnam
Name of the Law	Law on Environmental Protection
Governing Agency	Ministry of Natural Resources and Environment
Legislation Year	1993
Outline	The law stipulates environment protection.（Waste disposal management, Environmental accident prevention and countermeasure, Improvement of environment pollution, Environmental recovery and others）

Country	Vietnam
Name of the Law	Decree No. 12/ 2009/ND-CP (On Management of Investment Project on the Construction of works) Article 30. Management of Labor safe at construction sites
Governing Agency	Ministry of Construction
Legislation Year	February, 2009
Outline	Government ordinance on the safety of construction laborer The law stipulates that the safety management measure for the laborers should be posted on construction site. The law also stipulates the construction work suspension in case violation regarding occupational safety is found.

Country	Vietnam
Name of the Law	Decree No. 113/2004/NĐ-CP on administrative penalty for offences of the Labor Law Government
Governing Agency	Ministry of Labor, War Invalids and Social Affairs
Legislation Year	2004
Outline	The law stipulates administrative penalty regarding violation of occupational safety and health regulations in the labor law.

Country	Vietnam
Name of the Law	Decree No. 66/ 2003 Regulations on Tender/Bidding Regulation
Governing Agency	Ministry of Construction
Legislation Year	2003
Outline	The law stipulates to include the degree of satisfaction in technical construction standards regarding environmental health, fire protection, secure of safety, construction facility（quantity, type, quality, transportation method）and construction labor.

Country	Vietnam
Name of the Law	Law on Construction, Article 78 (safety during execution of building work) Construction contractor's general liability
Governing Agency	Ministry of Construction
Legislation Year	2003
Outline	The law stipulates safety during construction, and general obligation of contractors.

Country	Vietnam
Name of the Law	Education Law Chapter II Section 3 (Occupational education) （Article 32-Article 37）
Governing Agency	Ministry of Education and Training
Legislation Year	Enacted 1998, totally revised 2005
Outline	The law stipulates the objectives of vocational education. Also stipulates the content of education such as knowledge, occupational skill, morals, vocational ethics, professional understandings, job customs, health and others.

5. Indonesia

Country	Indonesia
Name of the Law	Act No.1 on Safety, 1970 （This is the law stipulating occupational safety and health 1970）
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	1970
Outline	A basic law governing occupational safety, and the law stipulates scope of application, requirement, administrator's responsibility, rights and obligations of employer and employee, penalty and others.

Country	Indonesia
Name of the Law	Act N0.14/1969 on employment－（This is the law stipulating fundamental employment principles of the laborers）
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	1969
Outline	A basic law governing laborer's protection, and the law is the foundation of other laws and regulations enacted afterward concerning occupational safety, accident compensation. Article 9 and Article 10 stipulates, "Government shall promote laborer protection such as occupational safety and health standard, labor standard, accident compensation for laborer, medical treatment, and rehabilitation, and laborer shall have the right to obtain these benefits"

Country	Indonesia
Name of the Law	Act No. 13 , 2003 concerning manpower Article 86～Article 87
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	2003
Outline	A basic law stipulating manpower. Article86－87 stipulates occupational safety.

Country	Indonesia
Name of the Law	The worker's compensation Act No.13 Law stipulating compensation for the laborer
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	Enacted 1951, revised 1992
Outline	The law stipulates various compensation system such as accident compensation for the laborer, compensation for death, aging compensation, medical treatment, and others.

Country	Indonesia
Name of the Law	Regulation No. 14 Year 1993, on Implementation of the Laborer Social Security Program
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	1993
Outline	The law stipulates how to deal with the situation, when occupational accident occurs, similar to the law regarding occupational safety No.1 1970.

Country	Indonesia
Name of the Law	PER.05/MEN/1996 （Minister of Labor Decree No.5, occupational safety and health management system）
Governing Agency	Ministry of Manpower and Transmigration
Legislation Year	1996
Outline	The law stipulates how to prepare occupational safety and health system in the working site and by using that system, the law stipulates how to create safe working environment, efficiency and productivity.

The Indonesian laws governing occupational safety and health are: “Act No.1 on Safety, 1970, stipulating occupational safety and health 1970” as listed above, and “Act No.113, 2003 concerning manpower, Article 86～Article 87 ” also as listed above.

In addition to the two laws, there are many relevant rules and regulations regarding occupational safety and health as shown below.

- Government ordinance, No.19, 1973, regarding agreement and audit of the occupational safety and health in mining industry
- Government ordinance, No.11, 1979, regarding safety and health in the industry of refining and manufacturing of petroleum and natural gas products
- Ministry of Manpower and Transmigration Decree Per-01/MEN/1978, regarding occupational safety and health in the transport and timber industry
- Ministry of Manpower and Transmigration Decree Per-03/MEN/1978 regarding safety auditor’s qualifications, job duty, power and authority, and obligations
- Ministry of Manpower and Transmigration Decree Per-01/MEN/1980 regarding safety and health in the construction industry
- Ministry of Manpower and Transmigration Decree Per-04/MEN/1980 regarding the installation of lightweight fire extinguisher and maintenance
- Ministry of Manpower and Transmigration Decree Per-01/MEN/1982 regarding pressure vessel
- Ministry of Manpower and Transmigration Decree Per-02/MEN/1982 regarding welder
- Ministry of Manpower and Transmigration Decree 02/MEN/1983 regarding installation of automatic fire alarm box
- Ministry of Manpower and Transmigration Decree 02/MEN/1985 regarding electric power facilities and power generation
- Ministry of Manpower and Transmigration Decree Per-05/MEN/1985 regarding lift and transport vehicle
- Ministry of Manpower and Transmigration Decree Kep-1135/MEN/1987 regarding label for the health and safety
- Minister of Manpower and Transmigration Order Kep-245/MEN/1990 regarding health and safety day
- Decree RI, Per-04/MEN/1987 regarding procedure of occupational safety and health for the specialized worker
- Ministry of Labor Decree Per-01/MEN/1989 regarding qualifications and licenses of steam boiler operators
- Ministry of Labor Decree Per-01MEN/1989 regarding qualifications and licenses of crane operators
- Ministry of Labor Decree Per-02/MEN/1989 regarding thunderbolt conductor rod installation and inspection
- Ministry of Labor Decree Per-02/MEN/1992 safety and health expert’s job duty, obligations, right and entitlement
- Ministry of Labor Decree 300.K/38/M.PE/1997 regarding safety of installation of the petroleum pipelines
- Government ordinance No.19, 1973 regarding the supervision and auditing of occupational safety and health

（Source: Home page of OVTA , Overseas Vocational Training Association, Japan）

Website and reference materials relating laws and regulations：

Website:

- Japan International Center for Occupational Safety and Health http://www.jniosh.go.jp/icpro/jicosh-old/
- KENYA LAW REPORTS http://www.kenyalaw.org/
- ILO http://www.ilo.org/asia/lang--en/index.htm#a3
- Overseas Vocational Training Association, Japan http://www.ovta.or.jp/
- Vietnam Ministry of Labor, Invalids and Social Affairs http://english.molisa.gov.vn/
- Laws of Sri Lanka http://www.lanka.info/Sri_Lanka/law
- The Japan Institute for Labor Policy and Training http://www.jil.go.jp/foreign/

Existing Documents:

- ”Construction Information Collection and Managing Study Report 2004＜Vietnam＞“ Ministry of Land, Infrastructure Transport and Tourism
- ”Practice of Asian Labor Law Q&A”：Shoji Houmu Ltd.　2011