

## **Safety Management Practices in the Bhutanese Construction Industry**

Kin Dorji<sup>1</sup> and \*Bonaventura H. W. Hadikusumo<sup>2</sup>

**Abstract:** The construction industry is considered as one of the most hazardous industrial sectors wherein the construction workers are more prone to accidents. In developed countries such as United Kingdom and United States of America, there is strict legal enforcement of safety in the construction industry and also in the implementation of safety management systems which are designed to minimize or eliminate accidents at work places. However, occupational safety in construction industry is very poor in developing countries such as Bhutan. This study investigates the prevalent safety management practices and perceptions in the construction industry in Bhutan. The study was conducted among 40 construction contractors and 14 government officials through method of questionnaire survey, interview and discussion. The results of the study revealed that there are many occupational safety problems in the construction industry in Bhutan, problems such as lack of safety regulations and standards, low priority of safety, lack of data on safety at construction sites, lack of competent manpower, lack of safety training, lack of safety promotion, and lack of documented and organized safety management systems. Furthermore, the study also proposes some recommendations for safe construction in Bhutan.

### **INTRODUCTION**

It is commonly known that accidents have serious implications to the construction industry both in financial and humanitarian terms. Construction accidents may cause many problems, such as demotivation of workers; disruption of site activities; delay of project progress; and adversely affecting the overall cost, productivity and reputation of the construction industry (Mohamed, 1999). In

Hong Kong, the cost of accidents accounts 8.5% of the total tender price (Rowlinson, 2003).

Considering the adverse impacts of accidents, construction safety management is of genuine concern to all stakeholders in the construction industry. Government, unions and insurers have spent a great deal of time and effort attempting to evolve legislation, rules and regulations to help reduce the large loss of life and limbs, and the high number of "lost-work days" (Goldsmith, 1987). In USA, the practice of safety in construction is regulated by governmental agencies such as the Occupational Safety and Health Administration (OSHA), which provides strict rules and regulations to enforce safety and health

---

<sup>1</sup>Standards and Quality Control Authority, Ministry of Works and Human Settlement, ROYAL GOVERNMENT OF BHUTAN <sup>2</sup>Construction Engineering and Infrastructure Management, Asian Institute of Technology, Pathumthani, THAILAND. \*Corresponding author: kusumo@ait.ac.th

standards on job sites. However, legislation alone cannot reduce accident rates unless craftsmen and management take positive actions to integrate these rules into their everyday activities by implementing a safety management programme. Safety management is an approach aimed at removing or minimizing the forces which cause losses through injured workers, or damaged equipment and facilities.

In most developing countries, including Bhutan, safety consideration in construction project delivery is not given a priority, and employment of safety measures during construction is considered a burden (Mbuya and Lema, 2002). The construction industry in Bhutan is one of the fastest growing and largest sectors. It is also one of the highest contributing sectors to the national gross domestic product (GDP) next to agriculture. However, occupational safety and health in the construction industry in Bhutan is at the very basic level. It lacks all of the three fronts of engineering, education and enforcement ("Three E's) of safety. Safety concerns have been raised, of late, and earnest efforts are being made to promote safety and health in the Bhutanese construction industry. The industry, as such, needs to assess the safety situation, and accordingly plan and implement safe construction in Bhutan. Currently there is a genuine set of data on safety at construction sites in Bhutan. Apparently, there are no systematic and organized studies conducted specifically

on the safety aspects of the construction industry in Bhutan. Therefore, this research study was aimed to assess the existing safety management practices and perception in the Bhutanese construction industry. The assessment was useful in providing information in terms of current safety practices administered in Bhutan. Meanwhile the perception was useful in finding out what are the main reason, and whether the regulator and construction companies have different perceptions in identifying problems related to safety management. If they perceive different opinions on safety problems, the safety policy and law might not be able to solve the problems. The health issues are not covered in this study because the impact of health is long term; and at present the data is not available in the Bhutanese construction industry.

#### **BHUTANESE CONSTRUCTION INDUSTRY AND GOVERNMENT ROLES IN SAFETY**

The construction industry is one of the fastest growing and largest employing industries in Bhutan. It is also, like in any other developing countries, one of the major stakeholders of the national economy. Its contribution to the national GDP rose from 6.7% in the early 1990s to about 12% in 2002. The construction industry, however, is dominated by the government since most of the major infrastructure developmental works are owned by the government.

During the Eighth Five Year Plan (8 FYP) (1997–2002) the construction sector, with an estimated growth rate of 17.3%, had a major influence on the GDP growth rate mainly because of the construction of large hydropower projects. The Ninth Plan (2002–2007) has placed much emphasis upon the infrastructure development such as urban housing projects; and because of this, construction sector has been projected to grow at an average of around 16.4% per annum. The construction sector is also expected to contribute 17.8% to the national GDP at the end of the Ninth Plan.

In order to support the construction development, technological and managerial aspects of the Bhutanese contractors must be improved. Many new government agencies have been created in response to these needs. Some of them are Standard and Quality Control Authority (SQCA), Construction Association of Bhutan (CAB), Construction Training Centre (CTC), Department of Labour (DOL) and others. The role of the CAB is to represent as a forum for the construction industry, and to address problems and policy issues at national, regional and international level for the development and promotion of Bhutanese construction industry. SQCA is currently one of the main government regulatory agencies entrusted with the tasks of regulating the quality aspects of the construction works in the country. In the past, the former Public Works Department (PWD) used to be the only

central agency entrusted with all the engineering works of the government. However, over time, with increasing volume of works it has been proliferated to several other government agencies. As such, today, every Royal government agency possesses a small team of engineers to oversee its engineering functions. This over stretch has resulted in the variations in the construction and engineering standards.

The Ministry of Works and Human Settlement takes its roles in overseeing the construction industry in Bhutan. The Ministry carries out most of the developments and implementation of various rules and regulations, policies, bye-laws and standards, etc. that has general bearing on the construction industry. However, there is no single specific government agency that regulates the construction safety. There is no concrete legislative standard either for construction safety and health. The only legal instrument protecting the working conditions of national and foreign workers is the Chathrim for Wage, Recruitment Agencies and Workmen's Compensation 1994 passed by the National Assembly and implemented by the Ministry of Home Affairs. Even the applicability of this labour regulations is limited to the five categories of workers (designated by skill levels) identified in the Chathrim. The Chathrim and its related amendments also establish the minimum wage levels and welfare such as accident

insurance coverage, medical coverage and safe working conditions.

The Ministry of Labour and Human Resources which has been recently established in June 2003 has been entrusted with the responsibility for labour administration policies and laws. The occupational safety and health related laws and regulations are currently encompassed in the overall labour administration policy and law, which are still at the draft stage. The DOL under the same Ministry is mandated to assume responsibility for labour inspection and labour relations functions. Over the next few years, the DOL will be striving to achieve the following objectives in terms of safety and health management (MLHR, 2004):

- a. Labour laws and regulations concerning labour inspection and labour relations will be drafted, submitted to the national assembly, enacted, widely publicized and enforced.
- b. All workers, both national and foreign, will benefit from labour protection activities through a safer and healthier working environment, and improved working conditions.
- c. A national occupational safety and health policy will be in place, and supporting laws and regulations will be enacted, implemented and enforced.

- d. An integrated labour inspection system will be established and become operational.
- e. A system for bargaining by the Department on behalf of the employees on a range of labour relations issues, including wages and working conditions, will be established until the finalization of the nation's constitution.

### **SAFETY MANAGEMENT SYSTEM**

Management approach to health and safety in construction industry can be seen in three important ways – firstly, from legal point of view, the need to abide the rules and regulations of the place; second, the socio-humanitarian aspects which is to consider human lives involved; and finally, the financial-economic aspects of the accidents which have high direct and indirect costs.

Construction safety management deals with actions that managers at all levels can take to create an organizational setting in which workers will be trained and motivated to perform safe and productive construction work (Levitt and Samelson, 1987). The system should delineate responsibilities and accountabilities. It should also outline procedures for eliminating hazards and identifying

potential hazards before they become the contributing factors to unfortunate accidents.

### **Safety Policy**

A health and safety policy is a written statement of principles and goals embodying the company's commitment to workplace health and safety (CSAO, 1993). It demonstrates top management's commitment to ensure safe working methods and environment at the construction sites. Koehn et al. (1995) states that in order to reduce financial risk, management support for safety programmes in both developed and developing countries should be considered as an economic necessity since accidents had proved quite costly to the contractor. This is in addition to the ethical and professional responsibility of the management for providing a safe work site for all employees. Sawacha et al. (1999) also stresses the importance of management's viability and participation in achieving successful safety performance. The safety policy elements which are applicable in Bhutan are written safety policy, proper posting of policy, effective implementation and policy updating.

### **Organizing**

One of the essential elements of the safety management is the designation of individual with responsibilities and

accountabilities in the implementation of the construction safety programme and plan. The organization should demonstrate how accountabilities are fixed, how policy implementation is to be monitored, how safety committees and safety representatives are to function, and how individual job descriptions should reflect health and safety responsibilities and associated accountabilities (Stranks, 2000). As such, in order for the safety policy to be effective, both management and employees have to be actively involved and committed (Holt, 2001). In the research finding of Sawacha et al. (1999), it indicates that having a well-trained safety representative on site can improve safety performance by undertaking fault spotting and insisting on corrective action being taken. Also having full-time safety personnel will somewhat relieve the pressure on the on-site construction project team (Koehn et al. 1995). Sawacha et al. (1999) further indicates that companies with effective safety committees are more likely to take steps that improve safety performance than those without. This means that safety committees can play a positive role in the improvement of safety performance. In UK, the Safety Representatives and Safety Committees Regulations 1977 which was implemented by the HSC, describes the appointment and functions of safety representatives and the establishment of safety committees (Davies and Tomasin, 1996). Similarly, in USA the OSHA standards for the construction industry had listed the necessary requirements for a minimum standard of

safety and health (Koehn et al. 1995). The committee is empowered to research, discuss, coordinate and make suggestions related to labour safety affairs at the job site. Organizing elements which are applicable to Bhutan are safety representative, safety committee, safety responsibilities and accountabilities, and organizational commitment (i.e. resources).

### **Planning and Implementing**

Planning is a critical area in the control and enforcement of a safety program (Goldsmith, 1987). It is a process that prepares, creates, implements and monitors the safety programme, thereby addressing the workplace health and safety through an organized, step-by-step strategy (CSAO, 1993). Planning starts with the company's written health and safety policy. It ensures that health and safety efforts of all job-site personnel really work by designing a programme that translates policy into practice. Planning, as such, entails identifying the objectives and targets which are attainable and relevant, setting performance standards for management, considering and controlling risks to all employees and to other people who may be affected by the organization's activities, and ensuring documentation of all performance standards (Holt, 2001). The safety and health programme covers a range of general safety procedures and practices. Some of them are safety training, safety meeting, safety inspection,

accident investigation and reporting, job hazard analysis and control, safety promotion, and personal protective equipment (PPE), etc.

The elements of planning and implementing safety programme which are applicable to Bhutan are safety plan, safety programme, safety training, safety inspection, job-site hazard identification and control, safety meeting, accident investigation and reporting, safety promotion and PPE.

### **Measuring Safety Performances**

Safety performance measures are used primarily for comparisons among companies and supervisors. In addition, they are also used as a means for pinpointing problem areas (Levitt and Samelson, 1987). Also according to Laufer and Ledbetter (1986), a key factor in the control and improvement of any performance aspect on site is the ability to measure the performances. Measuring safety performances is important to check the effectiveness of various training methods and it also serves as an instrument in choosing a contractor. There are various methods of measuring the safety performances. Some of the common methods are experience modification rating (EMR), accident costs, frequency rate, behaviour-based safety and OSHA-recordable incidence rates. The elements of

safety performance measurement which are applicable to Bhutan are accident cost and accident frequency rate.

### **Reviewing Safety Performances**

The review of safety performances serves as a feedback loop to improve the performances. Safety audit can be undertaken to review the safety performance in terms of whether the safety plan is implemented and whether the plan is effective to attain the organization's safety goal.

### **RESEARCH METHODOLOGY**

A questionnaire, covering essential elements for safety management system and factors responsible for safety management problem, was designed and distributed to different construction companies in Bhutan. This questionnaire was followed up by direct interviews with key managers in these companies to gain an insight of their safety management system. Visits to on-going construction project sites were also made to compliment the data collection process. The questionnaire survey, interviews and discussions were also conducted with the relevant government regulatory agencies concerned with the safety and health administration in the construction industry in Bhutan. The data collected from the government officials were mainly in terms of safety

standards, safety rules and regulations, and safety laws being implemented and enforced by the government to ensure safety at the construction sites. Further, both the construction companies and government regulatory agencies were asked to give their opinions on the relative importance of the list of factors attributable to the safety problems in order to study how they perceive the safety problems in the Bhutanese construction industry.

The major part of this research is an exploratory or investigative study intended to evaluate the prevalent site safety management practices and procedures of the construction companies in Bhutan. It also investigates and explores the steps taken by the government regulatory agencies to promote safety and health in the construction industry. As such, the data collected were analyzed using descriptive statistics primarily to reflect the current overall safety situations in the construction industry of Bhutan. The descriptive or summary statistics have been basically used to describe the sample chosen for the study.

In order to compare the safety management activities between two classes of contractor, Fisher Exact Test was chosen. One of the reasons is that it can be used to analyze a case where one of the cells has numbers less than 5.

The other part of the research is concerned with how contractors as well as the government regulatory organizations perceives the safety problems in the construction industry of Bhutan. In order to achieve this objective, 13 factors attributable to safety problems were identified from the literature review (Table 5). Respondents were then asked to rank these factors according to their importance in addressing the safety problems. Spearman's Rho ( $\rho$ ) correlation was used to analyze the ranking of the factors.

## **RESPONDENTS OF THE STUDY**

The study covered the following respondents:

- a. construction companies; and
- b. government regulatory agencies.

### **Construction Companies**

There are four different levels of construction companies operating in Bhutan. All four construction companies, depending on their financial capacity, human resources, equipment and facilities, and track record are classified into four levels. These four levels are categorized as class A, class B, class C and class D, with class A being the largest in terms of size and capacity, and class D being the smallest

construction companies. The research study includes only the class A and class B construction companies as the respondents since they have maximum involvement in the major construction works being carried out in Bhutan. According to the CAB, (2004) there were 1,956 national contractors registered with the Construction Development Board (CDB) as of March 2003. Out of this total number of contractors 58 were of class A and 43 were of class B category, respectively. However, out of this total number, some of the companies have closed down, their licences have been revoked or down graded by CDB, did not have proper establishments such as offices, and have not been in active operation for many years. So, the effective sample size for the study was calculated to 40 construction companies which were selected by means of simple random sampling method.

### **Government Regulatory Agencies**

The respondents of this study also include the government regulatory agencies which oversee the overall regulatory framework of the construction industry in Bhutan including safety and health. They are the SQCA, DOL, Department of Human Resources, CDB and Thimphu City Corporation.



## ANALYSIS AND DISCUSSION

### General Information of the Respondent Construction Companies

Out of the total respondents of the construction companies, 40.85% of them were of class A and only 15% were of class B. This is because most of class B contractors are out of work and dormant, and many operated from their residences without proper establishments. However, most of the respondent companies were well-based into the construction business since majority of them had work experiences of above 15 years. The building works form a major part of the infrastructure's developmental works carried out in the country followed by roads and bridges. About 80% of the respondent companies have taken up the building, roads and bridges works in 2003–2004. Although there were a couple of big hydropower projects being executed in the country, the participation of the national contractors were minimal since they were contracted out to foreign contractors owing to their higher financial and technical strength. These respondent companies, on an average, had 30 permanent workers and 181 temporary or contract workers working for their company in 2003–2004. Most of the temporary or contract workers were non-nationals imported from the neighbouring country, India. In one year alone, 7,087

temporary or contract workers were employed in 39 construction companies.

### Safety Policy

Bhutan is one among the least developed countries where construction techniques employed is basically traditional and largely labour intensive with little or no mechanization, and where the occupational safety and health is at the very basic level. It was not surprising to note that less than 10% of the respondent companies claimed to have written safety policies. And unfortunately, even those groups of respondents did not have their written safety policies posted in a conspicuous place where it could have been easily seen by all employees and visitors alike. Using Fisher Exact test (Table 1), the result reveals that not using a written safety policy has been practiced by 91% of class A contractor and 100% of class B contractor, a difference that was not statistically significant ( $p = 1$ ).

Table 1. Safety Policy Practice of Two Groups of Respondents (Fisher Exact Test)

Written Safety Policy	Class A	Class B
Yes	3	0
No	31	6

$p$  value = 1.000

Respondents were also asked to rank the level of priority (1 – highest priority to 4 – lowest priority) that the company placed on the four main project objectives: cost, schedule, quality and safety. The data was summarized in Table 2. Using Spearman rank correlation coefficient, the result reveals that the two classes of contractor had different priorities ( $t < p$  value). However, both of the classes perceived that safety was the least priority.

### Organizing

As shown in the Figure 1, it is interesting to note that none of the respondents, large or small companies, indicated to have a safety department, section or unit. Having a separate safety department would mean

extra unwaranted pressure on the already tight human and financial resources of the company. Ten percent of the respondent is project-tied depending on the requirements of the clients. This is especially true if the projects are funded by international donor agencies that are genuinely stringent on the safety procedures at the project sites. Another 22.5% of the respondents also claimed to have budget set aside for safety purposes at the site. These safety budgets are normally used to procure medicines and to pay compensation in case of injury or death of the workers, and not for managing safety procedures as such at site. Only 2.5% (i.e. 1 respondent) claimed to have safety committee. Thirty one percent of the respondents indicated to have individual safety responsibilities for each level of employee. These

Table 2. Priorities Perceived by Contractors

Priority	Class A (n = 34)		Class B (n = 6)		Spearman's Rho	
	Mean Value	Ranking	Mean Value	Ranking	d	d ^ 2
Cost	2.15	2	1.33	1	1	1
Schedule	2.47	3	3.00	3	0	0
Quality	2.06	1	2.50	2	-1	1
Safety	3.32	4	3.17	4	0	0
Total					2	
rs					0.8	
t					1.885618	
p value					4.3027	

individual safety responsibilities were rather ambiguous as to whether they were actually meant for managing company's overall safety system or meant only by holding each individuals responsible for his/her own safety at site. Similarly, 65% of the respondents claimed to have site safety responsibilities for the subcontractors.

Comparing the two classes of contractor, differences were not statistically significant in terms of full-time safety representative, safety committee, individual safety responsibility, safety budget and subcontractor safety responsibility since the p values were 1.00, 1.00, 0.602, 0.602 and 0.646, respectively (Table 3).

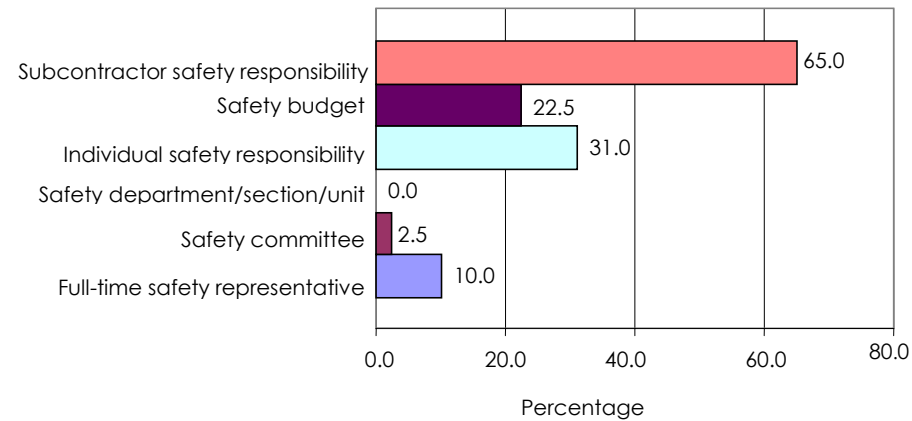


Figure 1. Respondents' Safety Organizing (N = 40)

Table 3. Safety Organization Issues of Two Classes of Contractor (Fisher Exact Test)

Safety Organization Issues		Class A	Class B
Full-time safety representative	Yes	4	0
	No	30	6
		p value = 1.000	
Safety committee	Yes	1	0
	No	33	6
		p value = 1.000	
Safety department/section/unit	Yes	0	0
	No	34	6
		p value = N/A	
Individual safety responsibility	Yes	27	4
	No	7	2
		p value = 0.602	
Safety budget	Yes	7	2
	No	27	4
		p value = 0.602	
Subcontractor safety responsibility	Yes	23	3
	No	11	3
		p value = 0.646	

### Planning and Implementing of Safety Management

Figures 2 and 3 show the questionnaire survey results of the respondent companies regarding their safety management practices. The study indicated that only 15% of the respondents claimed to have a formal safety plan in place for site safety management, while majority of the

respondents, i.e. 85% did not have such plan. As such, many of the respondents meetings have never been held specifically to discuss the safety issues. Should the safety issues arise at times, they are discussed during their on-site coordination meetings. As shown in the Figure 3, 40% of the respondents never had safety meetings.

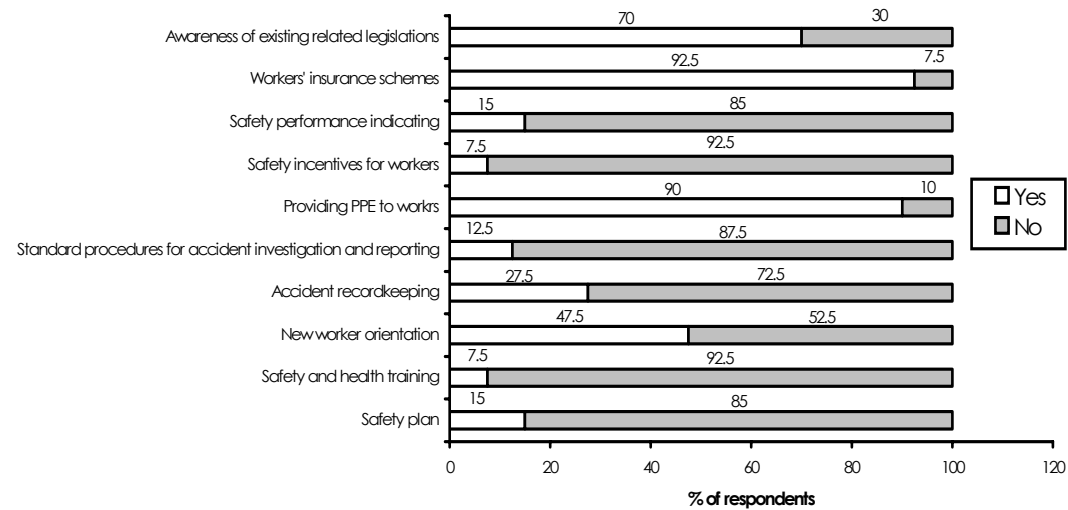


Figure 2. Questionnaire Survey Result of Safety Management Practices of the Respondents (N = 40)

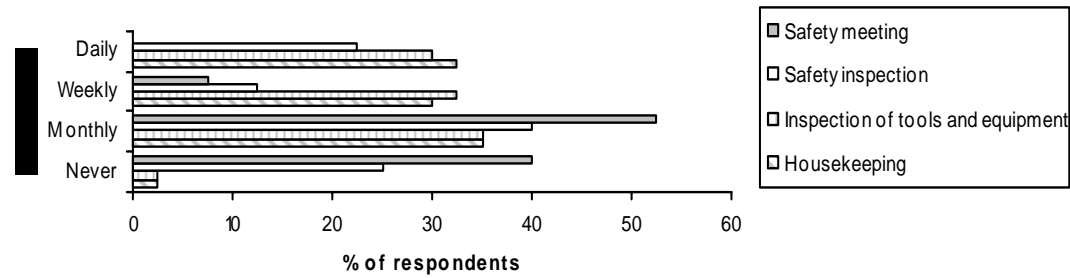


Figure 3. Questionnaire Survey Result of Safety Management Practices of the Respondents (N = 40)

Many of the respondents also indicated that it is not within their capacity to provide safety and health trainings to their workers. Even for some respondents who had the means to provide such trainings, it was not feasible to do so due to the high turn over and transient nature of the workforce. As a result, no training programmes exist for supervisors and workers at construction sites concerning safety problems. It is quite evident from the result shown in the Figure 2 that only 7.5% claimed to provide safety and health trainings to their people on-site and at the managerial level. These trainings which were provided by the respondents were mainly related to handling explosives at the site which are used for blasting rocks in the road construction works. The lack of effective labour training is a major concern in safety management (Tam et al. 2004). Moreover, specific site safety inspections are rarely conducted in the Bhutanese construction industry due to lack of technically qualified safety inspectors. The site engineers and supervisors are mainly concerned with monitoring the workers and the quality of works they perform, and are not trained to carry out safety inspections. As such, as shown in Figure 3, 25% of the respondents indicated that safety inspections are never done at their construction sites. There are also no predefined schedules for checking the machines, tools and equipment in order to ensure that they are working in safe order and in compliance with the relevant standards. It is mostly done on ad hoc basis, and when the mainte-

nance and repair is necessitated due to equipment breakdown or other problems. Although 30% of the respondents claimed daily inspect their tools, equipment and inspection, there was no methodical approach to it. These are more of a random inspection to check mostly the obvious problems and needs such as lubricants, oils, gas, etc. and also to check if the equipment are actually working.

In terms of PPE, majority of the respondents (90%) provided PPE to the workers. Only 10% of the respondents indicated that they do not provide any kind of PPE to the workers as shown in the Figure 2. Many of the respondents also claimed that although they provide the necessary PPE to the workers, the workers do not want to wear it with various reasons. First of all, the workers have never wore such protective gears before and when they are provided now they are not used to wearing it. They feel uncomfortable with the gears while performing their job at site and consider it as a barrier to their work output. Moreover, the workers are not well instructed or trained on the use and maintenance of the PPE. The most important reasons of all is there are no laws requiring contractors to ensure that their workers wear PPE on-site. As such, in many of the construction sites one would notice that workers are doing their job without any personal protective gears. Figure 4 shows the different types of PPE provided by the respondents to their workers. Safety helmets and hand

gloves have been provided by almost all of the respondents. The respective percentages of respondents indicated 87.5% and 80.0%. Majority of them also provided safety goggles and safety boots to the workers. Less than half of the respondents provided ear plugs and respiratory masks to their workers at the site. About half of the respondents have also provided safety harness and face shields.

It was also surprising to note that the only legislation (i.e. Chattrim for Wage, Recruitment Agencies and Workmen's Compensation 1994) protecting the interest of the workers in the construction industry was not known to all of the respondents. Only 70% of the respondents were aware of the existence of such legislation. The rest 30% of the respondents were not aware as shown in the Figure 2. As such, the respondents did not fully comply with the

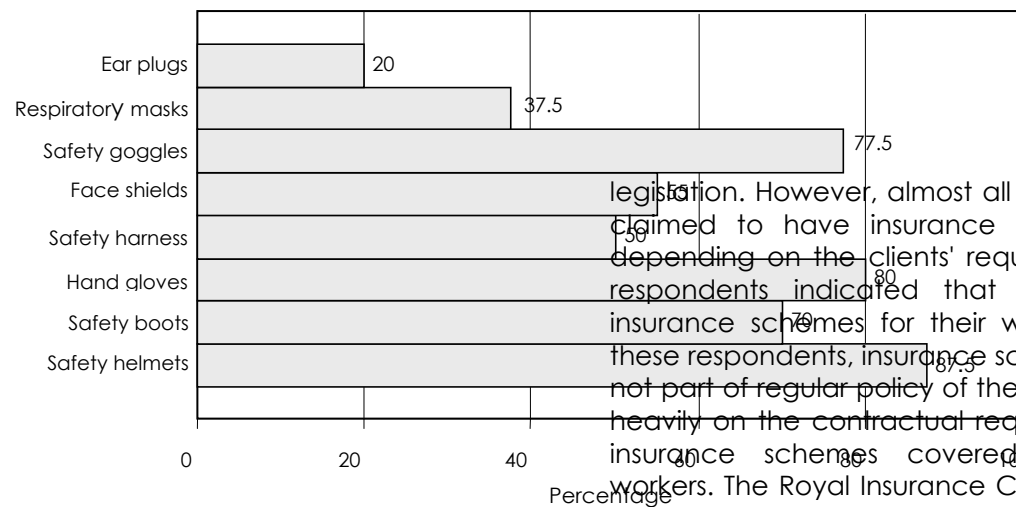


Figure 4. Types of PPE Provided by Respondents (N = 40)

legislation. However, almost all the respondent companies claimed to have insurance schemes for their workers depending on the clients' requirements. Only 7.5% of the respondents indicated that they did not have any insurance schemes for their workers. For the majority of these respondents, insurance schemes for the workers were not part of regular policy of the company but it depended heavily on the contractual requirements. Moreover, these insurance schemes covered mainly the permanent workers. The Royal Insurance Corporation of Bhutan which is a state owned insurance company offers several types of insurance schemes out of which three are more relevant to construction industry, such as Personal

Accident Insurance/Group Personal Accident Insurance, Contractors All Risk Insurance (CAR), and Contractors Plant and Machinery Insurance (CPM). Most contractors subscribe the Group Personal Accident Insurance for insuring their workers. The extents of coverage or benefit included in this insurance scheme are death, total/partial or permanent/temporary disablement, loss of limb, loss of sight, etc.

Comparing the two classes of contractor, differences were not statistically significant in terms of safety planning and implementation since the p values were greater than 0.3 (Table 4).

### Measuring Safety Performances

Non-availability of quantitative and historical data on the number of accidents as well as the cost of accidents are serious barriers to having any meaningful measurement of the safety performances in the Bhutanese construction industry. Many of the respondents did not have proper

Table 4. Safety Planning and Implementation of Two Classes of Contractor (Fisher Exact Test)

Safety Planning and Implementation		Class A	Class B
Awareness of related existing regulations	Yes	23	5
	No	11	1
		p value = 0.648	

records to give indication on the number of any kind of accidents that had occurred at their construction project sites. Worst still, many of them did not consider minor cuts, scrapes and bruises as accident cases and were simply ignored as inherent part of the construction activities. Likewise many accidents at the construction sites go unaccounted. In fact, very few come to the notice to the relevant authorities.

### Reviewing Safety Performances

The study showed that respondent companies reviewing their safety performances were very rare since most of them did not have any established safety procedures at construction sites in the first place. As such, 90% of the respondents indicated that they do not conduct any safety auditing. Comparing the two classes of contractor, differences were not statistically significant in terms of safety planning and implementation since the p value was equal to 1.0 (Table 4).

Safety Planning and Implementation		Class A	Class B
Standard procedures for accident investigation	Yes	4	1
	No	30	5
		p value = 1.000	



Worker insurance scheme	Yes	32	5
	No	2	1
p value = 0.394			
Safety performance indicator	Yes	5	1
	No	29	5
p value = 1.000			
Safety incentive	Yes	3	0
	No	31	6
p value = 1.000			
Aproviding PPE to workers	Yes	30	6
	No	4	0
p value = 1.000			

Table 5. Safety Audit of Two Classes of Contractor (Fisher Exact Test)

Conducting Safety Audit	Class A	Class B
Yes	4	0
No	30	6

p value = 1.000

### Perception of Site Safety Management Problems

Accident recordkeeping	Yes	10	1
	No	24	5
p value = 1.000			
Safety orientation for new workers	Yes	16	3
	No	18	3
p value = 1.000			
Safety and health training	Yes	3	0
	No	31	6
p value = 1.000			
Safety Plan	Yes	6	0
	No	28	6
p value = 0.565			

Respondents from the construction companies as well as the officials in the relevant government regulatory agencies were asked to directly rank according to its importance a list of 13 factors attributable to the site safety management problems in the Bhutanese construction industry. The result is shown in Table 6. The factor with the lowest mean value is ranked 1 followed by other factors with corresponding higher mean values. As discussed in the research methodology, Spearman's Rho ( $\rho$ ) correlation has been used to determine whether the construction companies and the government organizations generally agree on the important ranking of the factors.

As shown in Table 6, the T was greater than p value. This means that factors affecting the safety problems in the Bhutanese construction industry are perceived in the same

light by both contractors as well as the government officials. It is important to have both parties generally agree on the ranking according to the importance of these factors in order to find durable solutions on priority basis to the safety problems in the Bhutanese construction industry.

From Table 6, it is concluded that the five most important factors affecting safety management problems perceived by contractors are (1) lack of safety training facilities, (2) lack of safety awareness and understanding of safety benefits, (3) lack of safety professionals, (4) lack of

knowledge about safety management, and (5) lack of safety regulation enforcement. The government officials, however, also believe that financial constraint is one of the important reasons.

Table 6. Factors Affecting Safety Management Problems

SI No	Factors	Contractors (n = 40)		Government (n = 14)		Spearman's Rho	
		Mean	Ranking	Mean	Ranking	d	d <sup>2</sup>

1	Lack of safety regulations and standards, and their enforcement	5.98	5	1.43	1	4	16
2	Lack of safety awareness and understanding of safety benefits in the construction industry	4.7	2	2.5	2	0	0
3	Lack of safety training facilities	4.05	1	6.21	5	-4	16
4	Finance/budgetary constraint	7	8	5.36	3	5	25
5	Extensive use of foreign contract labour	7.42	9	7.36	7	2	4
6	Lack of format labour union organization	10.88	13	8.29	9	4	16
7	Lack of certifies skilled labour	6.05	6	8.71	10	-4	16
8	Extensive use of subcontractors	1	12	10.29	13	-1	1
9	Poor safety consciousness of workers	6.45	7	6.71	6	1	1
10	Lack of PPE	8.32	10	9.64	11	-1	1
11	Poor equipment	9.18	11	9.93	12	-1	1
12	Lack of safety professionals	5.5	3	8.07	8	-5	25
13	Lack of knowledge about safety management system	5.73	4	6	4	0	0
Total							12.2
rs							0.66484
T							2.95186
p value							2.201

## RECOMMENDATIONS

The study has revealed the current safety management practices in the construction industry in Bhutan. Based on

the existing practices and perceptions on factors affecting safety management problems, recommendations for safe construction in Bhutan are suggested as detailed in the subsequent subtopics.

### **Safety Legislations and Corresponding Regulations**

Health and safety legislation supported by a regulating body is non-existent in Bhutan. As such, there is ever-growing need for realistic safety legislative standards to enforce safety in construction. The existing legislation needs to be updated or amended to keep pace with the changing times. Currently, there is no safety agency in any of the government organizations related to construction industry in Bhutan to support the safety legislations. To this effect a safety agency could be established under the Ministry of Labour and Human Resources in Bhutan to act as a central agency for coordinating the efforts of safety implementation and enforcement in the Bhutanese construction industry. Such a safety agency could also enact, implement and enforce safety regulations in the construction industry in Bhutan. A safety agency can enforce safety regulations by frequently visiting construction project sites and levying high penalties against defaulting contractors who do not conform to these regulations. Safety standards and codes for various construction operations should also be established and widely publicized to the industry people. The agency could coordinate and impart the necessary education and trainings for such purposes. Therefore, the establishment of a safety body or institution supporting the safety legislations

would go a long way in improving the safety situation in the Bhutanese construction industry.

### **Safety Awareness**

The level of safety awareness among the construction industry personnel is very poor in Bhutan. Improved safety awareness can be created by promoting and communicating safety to the people in the construction industry through safety and health trainings, workshops and seminars, incentive programme, and safety campaigns through public media. Engineers, supervisors and workers need to be adequately trained in safety requirements at construction sites. More so, workers need to be educated about common safety hazards and safety problems at worksites, their right to a safe working environment, and also their right to injury claims against accidents at worksites. It is also important that management personnel in the construction companies are aware of the safety benefits in the construction industry. Education and training needs should be focused on the company management based on safety regulations, safety management systems, and their requirements and benefits since the role of the management is crucially important for achieving results in safety. Such education and training needs could be addressed by introducing safety chapters in the academic engineering institutions as well as the construction training institutes and centers in the country. Special safety

literatures and training materials could also be published by the concerned agencies in the government.

### **Safety Incentives**

Safety will not improve unless there is a demand or incentive provided to the contractors (Larcher and Sohail, 1999). So, where the main concern of a contractor is how to save money and reduce costs (Kartam et al., 2000), the initiative for improved safety must come from the client. The clients should insist on having safety measures at the construction sites by incorporating the specific terms and conditions for safety provisions in the project contract documents.

Apart from this client-oriented safety improvement, the national insurance companies in Bhutan could also play a vital role in improving safety in construction by varying the current fixed system of insurance premium payment for the contractors as per their record of safety performances. Such a step would encourage contractors to implement safety practices at their work sites.

### **Safety Records**

Currently there are no official sources for any information on safety at construction sites in Bhutan. There are no accident statistics and profiles, and safety reports available

on the Bhutanese construction industry. As such, there is an immediate need to have an effective accident data collection system in place. The proposed safety agency under the Ministry of Labour and Human Resources in Bhutan, as discussed above could collect and compile data on safety at construction sites by distributing standardized data collection forms and formats to the construction companies. The construction companies should be required to report their accident data to the safety agency at a regular interval time for necessary compilation, monitoring of the safety records and publishing of the information. Without the safety records, the impact of accidents on construction industry in Bhutan both in terms of humanitarian and economic losses cannot be assessed.

### **Safety Management Practices**

The current safety management practices of the contractors in Bhutan need to be drastically improved in terms of documentation and effective implementations. It has to be manifested clearly in safety manuals and procedures. Standard forms and formats have to be used for safety inspections, accident investigations, accident reporting, safety meetings, etc. for proper recordkeeping and follow-up actions. Above all, top management's awareness and support is vital for the successful implementation of the safety management system at the

worksites. The management should develop company safety policies, procedures and goals; allocate safety budgets; assign specific site safety responsibilities and duties to the project staff and workers; give trainings; and also monitor safety performances.

## **CONCLUSION**

A survey has been conducted with 40 construction companies and the government regulatory agencies relevant to construction industry in Bhutan to better understand their safety management practices. The five key elements of a construction safety management system were inadequately applied in the Bhutanese construction industry. In terms of safety policy, most of the companies did not have safety policy and they had poor safety awareness. In terms of organizing, most of them did not have safety department, safety representative and safety committee. Less than 25% of them did not have safety budget. In terms of planning and implementation, most of them were aware of the safety regulation and claimed to have insurance schemes for the workers depending on the clients' requirements. Most of them also claimed that they provided PPE to workers although some of the workers did not want to use the PPE because they felt uncomfortable. However, most of the companies did not have a formal safety plan. In terms of measuring and reviewing safety

performance, many of the companies did not have proper records to give indication on the number of any kind of accidents occurring at their construction project sites. In addition, many did not employ safety audits.

Our study also concludes main reasons for why the application of safety management system was not adequate. The contractors perceive that the five top most reasons were (1) lack of safety training facilities, (2) lack of safety awareness and understanding of safety benefits, (3) lack of safety professionals, (4) lack of knowledge about safety management, and (5) lack of safety regulation enforcement. While the government officials perceived that financial constraint was one of the most important reasons instead of lack of safety professionals. The data showed that basically the contractors and government officials were not statistically different in their opinions.

## **REFERENCES**

- CSAO. (1993). *Health and Safety Program Planning for Construction*. Ontario: Construction Safety Association of Ontario.
- Construction Association of Bhutan. (2004). <http://www.cab.org.bt>.

- Construction Development Board. (2004). <http://www.cdb.gov.bt>.
- Davies, V.J. and Tomasin, K. (1996). *Construction Safety Handbook*. London: Thomas Telford Publishing, Thomas Telford Services Ltd.
- Goldsmith, D. (1987). *Safety Management in Construction and Industry*. New York: McGraw Hill.
- Holt, A.S.J. (2001). *Principles of Construction Safety*. Great Britain: MPG Books Ltd.
- Kartam, N.A., Flood, I. and Koushki, P. (2000). Construction safety in Kuwait: Issues, procedures, problems and recommendations. *Safety Science*, 36: 163–184.
- Koehn, E.E., Kothari, R.K. and Pan, C.S. (1995). Safety in developing countries: Professional and bureaucratic problems. *Journal of Construction Engineering and Management*, 121(3): 61–65.
- Larcher, P. and Sohail, M. (1999). *Review of Safety in Construction and Operation for the WS & S Sector: Part I. Task No. 166*, UK: WELL Study, Loughborough University.
- Laufer, A. and Ledbetter, W.B. (1986). Assessment of safety performance measures at construction sites. *Journal of Construction Engineering*, 112(4): 530–542.
- Levitt, R.E. and Samelson, N.M. (1987). *Construction Safety Management*. New York: McGraw Hill.
- Mbuya, E. and Lema, N.M. (2002). Towards development of a framework for integration of safety and quality management techniques in construction project delivery process. *Proceeding of the 1st International Conference of CIB W107- Creating a Sustainable Construction Industry in Developing Countries*, 11–13 November.
- Ministry of Home Affairs (MoHA) (1994). *Chathrim for Wage Rate, Recruitment Agencies and Workmen's Compensation 1994*. Royal Government of Bhutan: Thimphu.
- Ministry of Labour and Human Resources (MLHR). (2004). <http://www.employment.gov.bt>.
- Mohamed, S. (2002). Safety climate in construction site environments. *Journal of Construction Engineering and Management*, 128(5): 375–383.
- \_\_\_\_\_. (1999). Empirical investigation of construction safety management activities and performance in Australia. *Safety Science*, 33: 129–142.
- Rowlinson, S. (2003). *Hong Kong Construction - Safety Management and the Law*, Second Edition. Hong Kong: Sweet and Maxwell Asia Publisher.
- Sawacha, E., Naoum, S. and Fong, D. (1999). Factors affecting safety performance on construction sites. *International Journal of Project Management*, 5: 309–315.
- Stranks, J. (2000). *The Handbook of Health and Safety Practice*. New Jersey: Pearson Education Limited.
- Tam, C.M., Zeng, S.X. and Deng, Z.M. (2004). Identifying elements of poor construction safety management in China. *Safety Science*, 42: 569–586, Elsevier, Science Direct.