

**CIB2007-028**

# **Characteristics of Accidents on Construction Work in Thailand and Prevention Guide**

Korb Srinavin

Department of Civil Engineering, Ubonratchathani University,  
Thailand

## **ABSTRACT**

There are two major causes of accidents in construction work in Thailand: unsafe working conditions and unsafe working behaviours. To reduce the number of accidents in construction work, both unsafe working conditions and unsafe working behaviours must be monitored and improved.

The main objective of the study is to analyse causes of accidents on construction sites in Thailand. Data are collected from two sources: primary and secondary. Data collected from Workmen's Compensation Fund, Social Security Office, Department of Labour Protection and Welfare and Ministry of Labour are considered to be secondary data. Questionnaires and interviews are given at five selected construction sites (primary source) to obtain accident characteristics of construction work. Job Safety Analysis technique (JSA) is used for planning and preparing to prevent accidents in construction work. The JSA is a guideline used for improving working methods and conditions for the safety reasons. This technique refers to the Thai Government Law (17 issues) and the Safety Standard for Building Construction issued by the Engineering Institute of Thailand under HM the King's Patronage (EIT).

The study found common accident characteristics among the data gathered from both primary and secondary sources. The top two construction accidents are that workers were cut or pierced by sharp objects and injured by the collapse or falling of objects, respectively. These accidents occurred through both unsafe working conditions and unsafe working behaviours that can be prevented.

**Keywords: Construction safety, Accident prevention, Job Safety Analysis Technique**

## 1. INTRODUCTION

It is known that construction is a dangerous industry in both developed and developing countries. U.S. Department of Labour and National Safety Council statistics indicate that although construction employees are accounted for only about six percent of the total labour force, they incur twelve percent of all occupational injuries and illnesses, and nineteen percent of all work-related fatalities (Barrie and Paulson, 1992). The recent statistics of the Ministry of Labour shows that construction industry has the highest injuries and illness rates among ten major U.S. industries. The statistics of The Ministry of Labour in Thailand also shows that the number of injuries and illnesses in construction industry appear to be the first in the rank (<http://www.labour.go.th>).

Construction sites exhibit unique hazardous characteristics; for example, workers are crowded together on sites, operating at high working areas and outdoors, with the use of heavy machine and equipment. These may lead to serious on-site accidents or even fatalities. A study from China (Tam *et. al.*, 2004) indicates that half of the accidents on construction sites are occurred from 'falling from height', the most serious accident recognized by workers.

Accidents at construction sites normally occur through either unsafe working conditions or unsafe working behaviours. The majority of accidents are due to unsafe working behaviours such as disregard of safety regulations, absence of engineering oversight, poor planning, and lack of training on the part of workers. Construction personnel often fail to determine when engineering assistance must be sought to address construction problems relating to the means and methods of construction. Consequently, solutions to these problems are left to construction personnel who generally lack the engineering skills to evaluate the potential problem thoroughly (Ratay, 2000).

From the abovementioned, safety has become a fundamental part of any successful management of construction projects. Besides being more and more a part of law, safety is now recognized as an important aspect of good business practice. Some people say that a project in which there is even one serious accident is a failure, regardless of profit gained. Therefore, in the past few decades, the construction industry has been working hard to improve its safety records. It is now very essential to be aware of the health and safety issues, therefore; the demand for qualifications of both employers and employees in this area is increasing.

## 2. METHODOLOGY

The main objective of the study is to identify and analyse causes of accidents in Thailand's construction sites. In order to achieve the objective, data are collected from two sources: primary and secondary. The data collected from Workmen's Compensation Fund, Social Security Office, Department of Labour Protection and Welfare and Ministry of Labour are considered to be secondary data. Questionnaires and interviews are given at five construction sites in Thailand (primary source) to obtain accident characteristics of construction work. Details of these sites can be summarised in Table 1.

The Job Safety Analysis (JSA) technique is used for planning and preparing to prevent accidents in construction work. The JSA also gives guidelines to improve working methods and conditions for the safety reasons. This technique refers to the Thai Government Law (17 issues) and the Safety Standard for Building Construction issued by the Engineering Institute of Thailand under HM the King's Patronage (EIT).

**Table 1** Sites characteristics

Site no.	Types of construction	Number of workers	Equipment on site
1	5-story RC building and 1-story plant	150	1 tower crane 1 mobile crane 1 electric generator
2	10-story RC building	320	1 tower crane 1 mobile crane 1 concrete pump 3 temporary lifts
3	6-story RC building	200	1 tower crane 1 temporary material lift 2 concrete lifts
4	20-story RC building	330	2 tower cranes 2 concrete pumps 3 temporary material lifts 2 temporary passenger lifts
5	Steel frame and RC structure factory	130	1 piling rig 1 tower crane 2 tractors 2 piling rigs

### 3. RESULTS AND DISCUSSIONS

The data collected from Workmen's Compensation Fund, Social Security Office, Department of Labour Protection and Welfare and Ministry of Labour have shown that the majority of injuries and illnesses on construction sites is occurred from four types of accidents: 'Cut or pierced by sharp objects', 'Objects collapsed or fell on', 'Objects got into workers' eyes' and 'Hit or attacked by objects'. The rest of the injuries are categorised and shown in Table 2.

Five construction sites were selected, and then questionnaires and interviews were given. It was found that almost half of the workers' injuries were caused by 'Pierced by nails or sharp steel' followed by 'Small or large objects fell onto the head' (33%). The rest of the injuries are categorised and shown in Table 3.

The JSA technique was used to analyse causes of all the accidents shown in Table 2 and Table 3. The causes of the four major accidents were drawn and summarized in Table 4. The analysed results show that most of the major injuries were caused by unsafe working behaviours. These injuries presented in Table 4 were caused by accidents. The construction industry could reduce some of these accidents if the regulations (referred to the Thai Government Law and the Safety Standard for Building Construction issued by EIT) were strictly followed and practiced.

It is suggested that the regulations should be reviewed and revised so that people responsible are strictly compelled and that some unregistered accidents causes are under the coverage of the law.

**Table 2** Number of construction workers injured reported by the Ministry of Labour (2003)

No.	Type of accidents	Number of workers injured (percent)
1	Cut/pierced by sharp objects	2,440 (21.1)
2	Objects collapsed/fell on	2,415 (20.9)
3	Objects got into workers' eyes	2,102 (18.2)
4	Hit/attacked by objects	1,808 (15.6)
5	Falling from high working areas	1,022 (8.8)
6	Sliding/slipping/falling down	375 (3.2)
7	Accidents caused by vehicles	370 (3.2)
8	Pressed/pulled by objects	320 (2.8)
9	Illnesses caused by sunlight	220 (1.9)
10	Electric shock	161 (1.4)
11	Burns caused by touching hot surfaces	158 (1.4)
12	Building/heavy objects collapsed on	48 (0.4)
13	Injuries caused by explosives	36 (0.3)
14	Injuries caused by animals	31 (0.3)
15	Other causes	29 (0.2)
16	Illnesses caused by the exposure to toxic chemical	13 (0.1)
17	Illnesses caused by heavy objects	7 (0.06)
18	Assaulted by co-workers	3 (0.02)
19	Illnesses caused by wrong working positions	3 (0.02)
Total		11,561 (100)

**Table 3** Summary of accidents on the selected construction sites

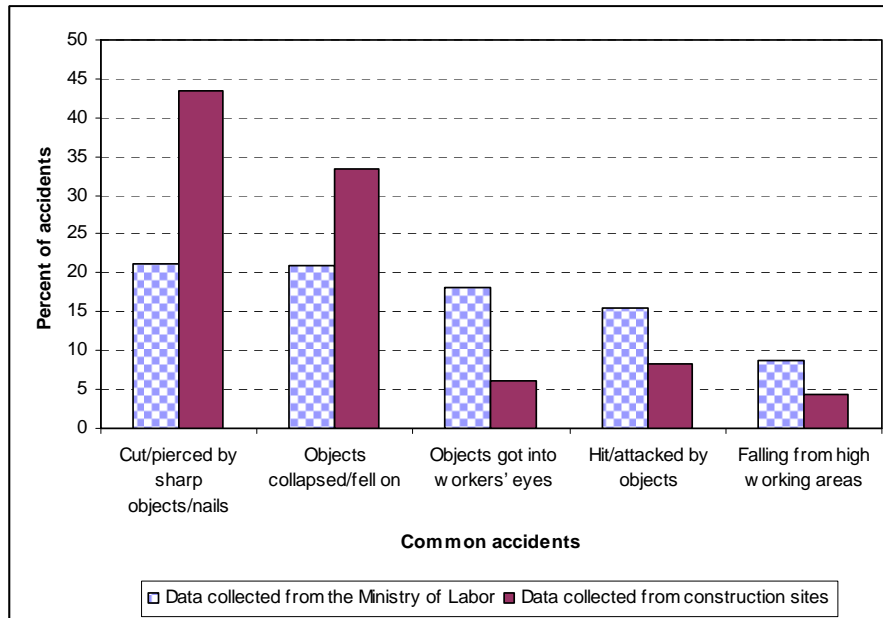
No.	Types of accidents	Number of workers injured (percent)
1	Pierced by nails/sharp objects	120 (43.48)
2	Small/large objects fell onto the head	92 (33.33)
3	Large objects fell on the body	23 (8.33)
4	Falling from high working areas	12 (4.35)
5	Cut on the face by sharp objects/broken fibre blade	9 (3.26)
6	Objects flown into the eyes	8 (2.90)
7	Fire	7 (2.54)
8	Explosion of gas/explosives	5 (1.81)
Total		276 (100)

For this study, five common types of the accidents obtained from the two sources of the data (primary and secondary sources) were categorized and presented in Figure 1. It is interesting to see that only two out of the five common accidents can result in fatality. One of them occur even less than ten percent of total accidents.

The results from this study were then compared with the ones taken from a study made by OSHA. From the data compiled (by OSHA) for the years 1985 to 1989, four major categories of accident causes severe enough to lead to fatalities are falls, being hit by, being caught in between, and electric shock, respectively. The compared data indicate different order of accidents categorized. It may be implied that OSHA has paid more attention to serious accidents causing fatalities.

**Table 4** Causes of the major accidents

Types of accidents	Causes
Cut/pierced by sharp objects	- Unorganised of the construction site - Unfolded/unpulled nails on wood
Objects collapsed/fell on	- Unorganised materials on high working areas - Poor-conditioned lifting equipment - Poor material transportation method - No safety net/guards on high working areas
Objects got into workers' eyes	- No eyes protection equipment - No protection in high working areas
Hit/attacked by objects	- Unawareness of moving objects - Unsafe method used for materials transportation



**Figure 1** Common accidents from the data collected from the Ministry of Labour and the data from the construction sites

According to Thai Government's law and regulations, and the Safety Standard for Building Construction issued by EIT, these common accidents categorized in Figure 1 can be prevented. Take one of the five common cause which is "Falling from high working areas" as an example. There are regulations for safety stating that construction projects' employers must prevent their employees from falling by providing guardrails, safety nets or safety belts, as well as by not letting the employees work when it is stormy, gusty and rainy.

However, there is no regulation to prevent accidents caused by "cut/pierced by sharp objects" which have found to be the most frequently occurred among the five common causes in Thailand. It is quite obvious that these accidents can be prevented or reduced only if there are regulations to cover all types of accidents commonly found. And more importantly, these regulations must be strictly practiced and followed. The problems are left to how can these law and regulations be reinforced and used as tools to compel those involved to follow them accordingly.

#### 4. CONCLUSIONS

The study found a common accident characteristic among the data gathered from both primary and secondary sources. The top two causes of

construction accidents are “being pierced by objects” and “being hit by falling objects”, respectively. It is to suggest that these accidents aforementioned are occurred from both Unsafe Conditions and Unsafe Acts, and they can be prevented.

Research findings have shown as well that in construction industry, most successful and profitable firms have the best records in safety and health. It is also observed and reported that these firms have many of the best and most productive workers, foremen, superintendents, and top managers. These findings are no coincidence, and they serve as a goal for the rest of the industry.

It has been well accepted that successful construction projects must have effective project planning and control of costs and schedules, procurement, and quality. However, this study was done and found that apart from the concerns mentioned earlier, safety and health are as much important and can never be neglected. Indeed, these concerns are all closely interrelated.

Therefore, in order to prevent accidents to occur or at least reduce them, the guideline suggested from this study should be taken into consideration. Implementing these practices from the guideline will result in more productive and effective work which will be beneficial for both construction firms and workers themselves.

## 5. REFERENCES

- Barrie, D. S. and Paulson, B. C. 1992, *Professional Construction Management*, (Singapore: McGraw-Hill, Inc.).
- Culver, C. G., Florczak, G., Castell, R. Jr., Connolly, C. and Pelton, G. 1990 *Analysis of Construction Fatalities—The OSHA Data Base 1985–1989*, Occupational Safety and Health Administration.
- EIT. 1996, *Safety Standard for Building Construction*, (Bangkok: Chulalongkorn University Press).
- <http://www.labour.go.th>
- <http://www.mol.go.th>
- <http://www.sso.go.th>
- Ministry of Labour. 1985, *Summary of the Construction Law: 17 Issues*, (Bangkok: Ratchakitjanubeksa).
- Ratay, R. T. 2000, *Forensic Structural Engineering Handbook*, (New York: McGraw-Hill).
- Ritz, G. J. 1994, *Total Construction Project Management*, (Singapore: McGraw-Hill, Inc.).
- Tam, C. M., Zeng, S. X. and Deng, Z. M. 2004, Identifying elements of poor construction safety management in China. *Safety Science*, **42**, pp. 569-586.