

## CASE STUDIES ON THE SAFETY MANAGEMENT AT CONSTRUCTION SITE

TAN CHIN KENG\* AND NADEERA ABDUL RAZAK

*Department of Quantity Surveying, Kulliyah of Architecture & Environmental Design, International Islamic University Malaysia, Jalan Gombak, 53100 Kuala Lumpur.*

\*Corresponding author: [tan\\_chinkeng@yahoo.com](mailto:tan_chinkeng@yahoo.com); [tckeng@iium.edu.my](mailto:tckeng@iium.edu.my)

**Abstract:** Cases of construction site accidents always happen. In line with the efforts to reduce accidents at construction sites in Malaysia, the objectives of this research are to determine the current safety practices at construction sites, to identify the safety practices related problems, and to identify the strategies to reduce the safety practices related problems. Two case studies were conducted for data collection. Data were collected through semi-structured interviews with the safety officer of the respective project. It is concluded from the research findings that generally the construction site has good and structured as far as safety practices are concerned. Among the practices are safety policy, education and training, site safety inspection, safety auditing, safety meeting, site safety organization, personal protective equipments, emergency support and safety measuring devices, fall protective systems, and safety promotions. Nevertheless, several problems were encountered in the safety practices; ignorance of workers on work procedures, lack of financial allocation for safety management, lack of awareness among workers, and language barrier between supervisors and workers. Several strategies have been suggested to overcome the problems, such as to provide effective safety training, allocation of budget for safety management, full commitment from the top management, and to provide safety booklets in various languages. The suggestions cover three aspects for the implementation of safety practices, i.e. awareness of workers, commitment of top management and the allocation of resources. The findings of this research would reduce the gap of understanding on the aspect of safety practices at construction site in Malaysia and can be used as a source of reference in the site safety management.

**KEYWORDS:** Management, construction, site, safety, practices.

### Introduction

According to Dayang and Gloria (2011), from the year 2005 till 2008 major accidents occurred in the Malaysian construction site annually. They reported in the year 2007, the death of two workers and severe injuries of ten workers at a construction site where the cables of the workmen's lift at the posh condominium and shopping complex project snapped and plummeted 15 metres to the ground. In addition, it also has been reported that two Malaysian construction workers were buried alive by excavated sand pile in a construction site in 2008. All the accident cases contribute to the rise of statistics of accidents happening in Malaysia. Records of DOSH (2014) indicated

there is a total of 187 construction workers died due to accidents at construction sites in Malaysia during the period of 2011 to 2013.

The statistics of accidents at construction sites give us a picture that the Malaysian construction industry is one of the critical sectors that needs a huge and fast overhaul from the current site safety practices (Abdul Rahim *et al.*, 2008). According to Rosli Ahmad (2008), good safety programs would certainly help in reducing injuries at construction sites and also to minimize construction costs, increase productivity and profitability and more importantly it could save lives of workers and consequently contribute positively to the construction industry and the nation as a whole.

Ahmadon Bakri *et al.*, (2006) suggested that there is a need to look into a new way of improving the image of the construction industry by reducing the hazards at construction sites. He claimed that providing a safe and healthy workplace is one of the most effective strategies for holding down the cost of the construction business. Accidents do not only cause delays in operations and project delivered but also directly and indirectly incur costs. Therefore, it is a need to find a way on how to reduce accidents at construction sites.

### **Objectives**

In relation to construction sites in Malaysia, the objectives of this research are to determine the current safety practices, to identify the safety practices related problems, and to identify the strategies to reduce the safety practices related problems.

### **Literature Review**

Previous researches were reviewed by the researcher. The literature review was mainly focusing on the safety practices and problems in relation to safety practices at construction sites.

### **Safety Practices**

Griffith and Howarth (2001) defined safety policy as a published statement reflecting the organization's vision and mission in relation to the management of health and safety matters. The safety policy must define the organization's corporate philosophy towards health and safety matters, in the context of its business activities. It must be clearly presented in the form of a policy statement and originating from the organization's board of executive management. Furthermore, Kin and Bonaventura (2006) did a study on safety management practices in Buthanese construction industry explained that safety policy is a written statement of principles and goals which can demonstrate top management's commitment to ensure safe working methods and environment at the construction sites. Similarly, Ahmadon Bakri *et al.*, (2006) stated

that safety policy is a requirement of the safety and health policy that reflects the management commitment towards the organization's safety and health.

According to Paringga (2010), education and training are designed to prevent human error that may cause the accidents and to enable workers to perform a repetitive task with skill. It should involve the repetitive performance of the task until it becomes automatic. Lai *et al.*, (2011) stated that safety training is the most effective tool to mitigate hazard since training helps to improve workers' skills and abilities to identify hazards. Permana (2007) did a study on safety practices in Batam, Indonesia and through his findings, he discovered that one of the safety practices is education and training.

The safety inspection has been the main tool for maintaining safe conditions and monitoring unsafe practices at workplace. Other than that, the safety management systems created the requirement for the safety audit, which is a detailed examination and evaluation of all components of the system to ensure that they comply with prescribed standards. Safety audits includes safety inspections, inspection of documents and interviews (Nikolaos, 2010). Permana (2007) affirmed that safety inspection is one of the important safety practices based on the study he did in Batam, Indonesia.

Safety meeting is a gathering at workplace which involves all the construction team members to discuss on the health and safety matters. The purpose of safety meeting is to ensure that all the construction team are aware about the safety matters (Holt, 2001). Masayuki (2006) included morning safety meeting for all workers and safety meeting on danger prediction as safety activities at construction site.

Supervisors play a critical role in setting the expectations for safety on sites (Roelofs *et al.*, 2011). Masayuki (2006) stated that one of the important practices at the construction site is guidance and supervision during work progress.

Gordon (1999) studied Hong Kong safety culture and he found one of the practices

implemented in Hong Kong is pink tickets scheme. The scheme was introduced by the sub-contractor whereby their safety staff and managers carried a pad of small pink forms printed in English and Chinese version. The details of the failure and the offender's name were entered when there is any offense found. The original copy was handed to the worker and a copy was placed on his or her employment records.

Elbeltagi and Hegazy (2002) affirmed that the major cause of accidents in the construction is due to falls. Therefore, proper safety zones around the construction areas should be provided to prevent harm from falling objects. According to them, some of the regulations were described by the uniform building code (UBC 1985) including at least 10 feet clearance from buildings or structures shall be kept clear from using, driveways between and around open yard storage shall be at least 15 feet wide and free from accumulation of rubbish, and materials stored inside buildings under construction shall not be placed within 6 feet of any hoist way or inside floor opening. Other than that, Rosli Ahmad (2008) mentioned that the construction site will be divided into two zones which are 'green zone' (non-fabrication area) and 'red zone' (fabrication area). It is separated by installing boundary fences and putting safety signboards. 'Green zone' includes offices, car parks, surau, canteen, clinic and yard resting shades. It is considered as safety zone since it is non-fabrication area. Besides, in red zone or fabrication yard, it requires the workers to wear Personal Protective Equipment (PPE) because it can cause danger. Minimum PPE required in this area are safety boots, glasses, helmets and long-sleeved jacket.

DOSH (2005) explained PPE as any equipment worn by a person at work to protect him against risk to safety and health and any additional accessory designed to protect him while performing task. Rosli Ahmad (2008) stated that it is important to provide PPE at construction sites. Similarly, Paringga (2010) agreed that in order to have a safe and healthy

condition at construction sites, it is essential to PPE to the workers. There are several types of PPE that workers need at the construction site such as head protection equipment, face and eyes protection equipment, ear protection equipment, hand protection equipment, foot protection equipment, respiratory equipment and body protection.

According to Rosli Ahmad (2008), there will be an emergency drill conducted once in every three months. All the workers will be given a briefing on emergency procedure. They are reminded not to be panic and required to leave their workplace once an emergency siren is activated. They need to gather at designated assembly areas where their attendances will be recorded by appointed safety wardens and they will be briefed by the chief warden. Once the emergency situation subsides, they will be instructed to return back to their workplace and resume work. Permana (2007) identified that emergency support and safety measuring devices include work accident record, medicine and first aid, further medical treatment and emergency devices such as fire extinguisher, safety nets and hydrants. All of these items are important at construction sites when there are any emergency cases. It will reduce the risk of hazards at construction sites.

Abdul Rahim *et al.*, (2008) revealed that the most common type of accident at the construction site is due to fall. This is supported by Ohdo *et al.*, (2011) which also stated that the frequency of accidents due to fall is the most critical problems in the construction industry. Therefore, DOSH (2007) emphasized that fall protection systems shall be supplied and used in any place where an employee is at risk of a fall of 2 metres or more. The employer can select the fall protection systems that are most compatible with the type of work being carried out.

### ***Problems in Safety Practices***

Ilyani (2006) explained that any safety program is based on a policy insisting on the safety protection of the employees. "The policy

certainly encompasses safety while work and all matters relating to employment". However, Shim (2006) claimed that even though Malaysia has a very good law on safety policies but it lacks of enforcement from the authorities. As stated by Mohd Khairolden *et al.*, (2008), serious enforcement of the written policy has to be made especially for high rise building projects. This is to provide assurance and comfort for all the contractors and workers aware as they realize that the equipment and structures at worksites are not hazardous to the workers themselves and the public. However, the safety and health officers are facing a major problem as they do not have autonomy power to strictly enforce the regulations.

The major problem related to the safety issue at construction sites is the attitude of the workers (Mohd Khairolden *et al.*, 2008). Krishnamurthy (2006) found that most of the workers did not wear Personal Protective Equipment (PPE) properly due to ignorance, negligence, carelessness and over-confidence. In addition, Mahalingam and Levitt (2007) did a study on safety issues in the global projects and found that one of the critical safety issues in the global projects is on the attitudes of local contractors and laborers toward safety. He reported that the local laborers in India and Taiwan have low level of safety awareness on the construction site. For instance, the workers did not wear safety shoes, safety helmets and they used the leaked welding sets. Roelofs *et al.*, (2011) did a study on construction workers perspective regarding the factors that impact worksite safety and risk and he found that a lot of workers felt that training is favorable but none of them will allocate 30 minutes to an hour for the training as their focus is to get job done at a faster rate. He also stated that a lot of workers felt training is unnecessary, as their ultimate aim is just to finish their work and get their wages. This shows that the workers have a lack of awareness on safety and health culture.

Safety and health training plays a significant role in the enhancement of safety in construction industry. However, the level of contractors'

awareness on the need for such training is unsatisfactory. They often believe that their money is better spent on meeting necessities than to allocate it for training (Mohd Khairolden *et al.*, 2008). Kin and Bonaventura (2006) found that many contractors indicated that it was not within their capacity to provide safety and health trainings to their workers. Even for some contractors who had intention to provide such trainings, it was not feasible to do so due to the high turnover and temporary nature of the workforce. As a result, no training program exist for supervisors and workers at construction sites concerning safety problems.

Providing a safety training, personal protective equipment, safety signs, machine guarding or general safety maintenance are all the areas that contractors need to allocate amount of budget in order to manage the day-to-day operations (Gieseckin, 2006). However, most industry players only provide a tiny allocation and in some case none at all for site safety implementation. The financial aspect is utmost important as nothing is free of charge in implementation of safety practices at construction sites and someone has to pay for it (Foo, 2006).

Patrick (2008) highlighted that there is an urgency to allocate a fraction of budget on the safety and health cost in the contract for both the public and private projects. Currently most of the Safety and Health Cost in Bill of Quantity (BQ) has been made a mandatory for public projects because they are general in nature and are not clearly specified or itemized. However, it is not a mandatory practice for private projects. Foo (2006) concluded that the legislation and regulations implementation will not reduce the number of accidents unless there is a sufficient budget provided on health and safety management and its implementation.

Larry *et al.*, (2012) explained PPE is a passive safety device because it does not protectively warn or provide feedback to the wearer. A passive approach to safety is not sufficient to prevent the occurrence of contact collisions between workers and moving

construction equipment. The example of PPE in a particular work environment includes hard hats, safety shoes, goggles, face shields, reflective clothing, hearing protection, heavy or thin gloves and respiration or filter masks. According to Roelofs *et al.*, (2011), there were cases where the workers were given inadequate PPE. They were given a dust mask instead of half-face respirators or cloths to prevent breathing in dust.

### ***Strategies to Reduce Problems in Safety Practices***

In order to overcome problems in safety practices, actions against errant contractors and workers should be carried out continuously. It was found that in order to prevent the workers from repeating their offences; they should be penalised (Mohd Khairolden *et al.*, 2008). Zhou *et al.*, (2011) supported that heavier administrative penalties should be imposed on the organization or any person in charge and these penalties include warnings, charges of correction, confiscation of the legal income, charges to stop production, temporary detainment or even detention. Furthermore, Mahalingam and Levitt (2007) stressed on that once the workers found that they were going to lose money by following unsafe practices, they would start to comply with the manager's requirement. This is because they were afraid of losing their money in paying fines. Hence, they will learn to adopt the safe work practices quickly. In addition, the workers who oblige with the safety work procedures and always prioritize safety before starting their task should be awarded. This strategy can motivate the workers and others to enhance their safety awareness in performing their task. Masayuki (2006) identified one of the ways to inculcate safety culture at workplace is by giving award to the workers. In Japan, the award approach honour of awards from Authority to Foremen and Company, from Client to Foreman and Main Contractor as well as from Construction Company to Foreman and Sub Contractor. Dives (2011) wrote in his article that there are two types of awards that are given to the Hong Kong's construction workers which are Golden

Helmet Award, Client and Developers Award and also Consultant and Architects Award. Moreover, Chaikittiporn (2002) proposed to establish an Occupational Safety and Health (OSH) certifying system which will enhance the enforcement of OSH regulations. As a result, all the strategies reviewed can be implemented to overcome the problems on lack of enforcement by the authority. Additionally, Abudayyeh *et al.*, (2006) suggested the workers to get involve with the employees in making the safety policy. This is because workers will be more motivated to carry the policy and improve it through personal responsibility and continuous feedback.

Misnan and Mohammed (2007) stressed on the involvement of all management team in safety and health culture are important to cultivate the positive beliefs, practices, norms and attitudes between all the key players. Moreover, Abudayyeh *et al.*, (2006) underlined that safety should not only be viewed as Occupational Safety and Health Administration regulations that need to be adhered to, but it should be treated as values and a cultures with clear commitment from all levels of management. Choudry *et al.*, (2008) discovered that one of the good practices by team management to promote safety and health is by displaying safety materials on safety bulletin boards so that workers can read and understand them. Other than that, the project managers can also display the project site accident statistic on safety bulletin boards. This is one of the efforts that can be done by the managers to promote safety and health to their workers. Alternatively, Masayuki (2006) suggested that there should be a safety board to show the safety signs at the construction site provided by the management. As a result, workers will always be aware by looking at the safety board. Moreover, Ghani *et al.*, (2008) highlighted that the contractor and authorities need to collaborate to find the solution in reducing the hazards.

In other words, the management plays an important role in determining the safety and health of the workers as well as the workplace. This is because the key of successful project

are not only depends on the time, cost and quality of the projects but there are also major consideration for health and safety of the workers. In addition, Patrik (2008) suggested that the way to include the workers' attitude is through regular educational initiatives whereas Mohd Khairolden *et al.*, (2008) stressed that contractors must allocate a sum of money resources to organize safety programmes.

### **Methodology**

Two case studies are conducted for data collection. From the case studies, the current safety practices that have been adopted at the construction sites are identified, the problems in relation to safety practices at the construction sites are gathered and the strategies applied to overcome problems in relation to safety practices are identified. The projects of the case studies are: 1) A proposed building complex comprising three basement levels of car parking, seven levels plus one mezzanine level of podium for car parking, one level for amenities and swimming pool, and one tower of thirty eight levels for an office at the city of Kuala Lumpur, Malaysia, and 2) A proposed 40-storey condominium project. The construction projects were selected due to their appropriateness for this research; they are high rise buildings that facing high level of site safety risk. Also, the projects have to implement site safety to protect the public and adjacent buildings.

Semi-structured interview sessions with safety officer of the respective project have been conducted. The questions asked during the interview sessions were developed from findings of the literature review and they were structured according to the objectives of this research.

### **Data Collection**

#### **Case Study 1**

##### *Safety Practices at Construction Site*

According to the interviewee, accidents at construction site are daily issues especially in high rise building project. Basically, it is a high risk when workers are working at a height

that is vulnerable to accidents. However, the interviewee believed the risk may be reduced by implementing the safety practices at construction site.

The interviewee stressed that safety concerns everybody who involved in the project. Therefore, everyone has to play their part in order to prevent accidents. In addition, he believed that the prevention efforts will be successful if everyone cooperates in the evaluation and elimination of the risk and to the proper installation of collective protections. The safety practices implemented by the company are as follows:

#### **Safety Policy**

The company provides their own safety policy for the works on site. The contents of the safety policy will be formed by the project director. Normally, different companies have different safety policy but the overall content is similar. The contents of this company's safety policy are emphasized on the responsibilities of all the key players in order to prevent accidents from happening. The objective of this company is to achieve injury and incident-free workplace. Additionally, they have an effective arrangement to review the safety policy every 2 years. As for now, this company is under process of upgrading the safety policy.

This company implements a good practice as the safety policy is being displayed on the safety notice board, which is put up at the main entrance of the construction site, thus making it visible to all workers. The safety policy is important in order to emphasize the aim of the organization in relation to safety matters. All the workers on site are aware of the safety policy and carry out their works according to the safety policy.

#### **Education and Training**

In terms of education and training, the company provides several types of training to the key players. They have safety and health training plan which consists of a training schedule. This schedule is used as a guideline for the safety

officer to conduct training for the key players. Then, after conducting training, they must submit a monthly report to the Department of Safety and Health. The types of trainings that are conducted by the company are as follows:

a. Induction Training

Induction training is conducted daily by the safety officer from Monday to Saturday. It has two sessions every day which is at 9.30 am and 11.30 am. Induction training is provided for all new workers. According to the interviewee, there will be new workers coming in every day thus they need to attend the induction training.

Induction training is significant because the new workers will be briefed on the use of personal protective equipment (PPE), the safety act and unsafely acts during performing tasks and action that should be taken in case of emergency. Indeed, the safety officer will check whether the workers have permit and work permit or not before the induction training starts. Other than that, the safety officer will make sure workers have their own green card. Green card is mandatory for all the key players and, those who do not have green card will be not allowed to enter the construction site.

The interviewee explained that those who want to obtain the green card must attend an 8-hour training course conducted by the Construction Industry Development Board (CIDB). It must be renewed every year for foreign workers while for local workers, have to renew it every 2 years. One of the benefits of this green card is they will have insurance under 'Skim Takaful' which will cover limited hospitalization cost. Additionally, those who attend the training course to obtain the green card will be given a SIRIM-approved CIDB helmet for free.

b. Job Specific Training

Other than induction training, the company also provides job specific training for workers. The workers will be briefed on

safety matters related to their trade. The safety officer will conduct safety training based on the work progress. For example, the current work progress is that the workers need to work in confined space thus the topic for job specific training will be related to work in confined space. The workers will be instructed on the right way to work safely in a confined space. Apart from that, the company provides job specific training for supervisors and managers. The safety officer will emphasize on the roles and responsibilities of the supervisors and managers in order to ensure the workplace is safe. The safety officer will explain to the workers on the equipment that the supervisors and managers need to provide for the workers' safety such as self-contained breathing apparatus for works in confined space.

c. "Toolbox" Talk

Conducting a toolbox talk is one of the ways to educate the workers. Toolbox talk is organized by the safety officer where all workers assemble at one place and the safety officer briefs them on topics related to safety matters. The topics for the briefing will be determined by the safety officer. For example, briefing on hand injuries. Hence, he will provide slide presentations that include animation, photographs and sound effect to make the presentation more attractive. Plus, it is conducted in Malay version to ease the workers to understand the content of the presentation. The talk was held twice a week at 7.45 am.

From the interviewee's perspectives, education and training are important to all key players at construction sites especially when they are involved in high rise buildings project. The training will be more effective if there is an observation after the training given to the workers. The safety supervisor must observe whether the workers applied the knowledge that they obtained from the training or not.

### Site Safety Inspection

From the interviewee's point of view, site safety inspection is the most important practice that needs to be conducted regularly. The safety inspection will be held every Saturday by the safety officer and the safety manager. They will conduct a "safety tour" where all safety officers and safety managers will walk around the construction site and inspect the works done by all workers.

The safety committee will bring safety checklist together with them and if there are any workers who did not comply with the safety requirements, the safety committee will take note on it. In addition to that, the safety officer will check the air compressor, scaffold, welding set, vehicle and excavation support to ensure that these machineries are in a good condition.

Since this project consists of 2 towers the safety committee were divided into two groups and they were inspected by stages. Therefore, from the result of inspection, the safety committee will give notice to the subcontractor for any offences done by their workers. Then, the subcontractor may take necessary action on it. In addition, the interviewee believes that site safety inspection will be more efficient if the safety officer of the subcontractors cooperates with the safety committee who conducts the inspection. Thus, immediate action can be taken to those workers who have offended.

### Safety Auditing

The company conducts safety auditing twice a year. The interviewee explained that the safety audit is conducted by having an inspection from the representative of Department of Safety and Health (DOSH) together with the top management of the company. They will see to what extent the construction site meets the standard required by the International Organization for Standardization (ISO). Besides that, they will review the condition of site i.e. the excess, edge line and safety signs provided, the documentation such as monthly meeting report, the competent person and etc.

After the inspection done, the representative from DOSH has to present and report the results of inspection. If they found any practices that can bring to danger they will issue Notice of Implementation. Notice of Implementation is issued to the safety officer and the company has one week to implement the right practice. If this is fulfilled within the given week, the notice will be withdrawn by DOSH.

### Safety Meeting

In order to manage the safety matters at construction site, this company provides monthly safety meeting. This meeting is compulsory for all the key players such as main contractor, sub-contractor, engineer, quantity surveyor, architect, and safety committee to attend. The meeting will be led by the representative of the safety committee. During the safety meeting, they will discuss the current issues regarding safety matters such as current accident statistic, recent accident cases, the implementation of safety practices at construction sites and etc.

In fact, they also give awards to the workers who exhibit excellent safety performances during the meeting session. The main contractor collaborated with the sub - contractor to nominate three workers from the construction site before they choose the recipient of the awards. The award receiver will receive an appreciation certificate, a set of pen or mobile phone reload. Apart from that, they will also discuss the penalty that will be imposed on the workers who have offended the safety rules and regulations.

### Site Safety Organization

The company appointed a safety officer which directly coordinates the implementation of the company's safety policy. They also have a safety committee which consists of safety officers, safety supervisors, safety workers and others. Each of them has their own roles and responsibilities in order to ensure safety at the construction site.



According to the interviewee, the safety officer will be divided based on the site area. Each site will have one safety officer. In addition, this company also employs safety workers who will be in charge of the installation of the safety equipment such as handrails, guardrails, lifeline and etc. Other than that, the safety workers are also responsible to ensure that there is a clear access and stable working platform at the construction site to avoid hazards and accident.

Currently, they have twelve safety workers for two towers. It can be increased depending on the needs. For this construction site they also have a competent person specialized for scaffolding. He is in charge of the inspection of scaffolding. After the inspection, he is the one who has authority to tag the scaffolding and determine whether it is safe to be used or not. They are red tags for the scaffolding that is prohibited to use while green tags for the scaffolding which meets the requirement and can be used.

#### Personal Protective Equipment (PPE)

The company emphasized the importance of using and wearing the personal protective equipment (PPE) starting from the induction training for workers as well as the sub-contractor. The basic PPE that is compulsory to be used by all key players are safety helmets and safety boots. These are provided to avoid probabilities of accidents from happening. The safety officer will make sure the safety helmets have obtained the SIRIM approval and the workers used the helmets by following the colour code that has been identified.

Other than safety helmets and boots, this company also provides other personal protective equipment to the workers depending on the type of works carried out such as face and eye protection, ear protection, hand protection, foot protection and respiratory protection. In order to ensure the proper use of PPE as instructed by the safety committee, they will impose penalty by deduction of wages or fine for those who do not wear the PPE. Based on observations, the workers wear the PPE provided properly.

Moreover, this company provides a locker for each worker for them to keep the PPE after using it. Outside of the locker, there is a notice which is used to remind the workers that if they don't have PPE they cannot access the site.

#### Emergency Support and Safety Measuring Devices

As stated by the interviewee, this company provides a sufficient emergency support and safety measuring devices. It comprises of first aid and medical treatment for accident (for common injury). In fact, they have provided first aid room and have also appointed a site nurse to provide further treatment after accidents especially for hard injury cases. Moreover, the site nurse also plays an important role in conducting program or training for workers to educate them on the action that needs to be taken in case of emergency (i.e. accident or fire).

Other than that, they also provide fire prevention equipment such as fire alarm, fire poison and fire extinguisher. The fire extinguisher section is provided at the construction site, both inside and outside of the building. This fire extinguisher will be used when necessary. All workers must know how to handle the fire extinguisher.

The interviewee stressed that they should follow the uniform building by law (UBBL) requirement which requires them to have a temporary wet riser for a building that is 30 metres and higher. Thus, they provide temporary wet riser for this construction site to prevent fire. Other than that, this company also provides fire escape plan on each level. For example, the fire escape plan shows the direction to be followed in case of fire at the construction site. In addition, they also provide emergency access and ingress. This is important for the key players to rescue themselves in case of emergency.

#### Fall Protection Systems

Working at height is a high-risk task for the workers. They are prone to be involved in falls of person as well as object. Hence, this company provides fall protection systems which consist

of guardrails, safety nets, holes cover, life line, safety harnesses and catch nets to prevent falls at the construction site. For high rise building projects, catch net is important to protect any object from falls. The catch net is also capable to catch people who fall. In addition, this company restricted that worker who works at 1.7 meters and above must wear safety harness.

#### Safety Promotions

As far as the company is concerned, they also provide safety signs or safety warning signs in construction sites. The safety bulletin board and safety warning signs are displayed at the main entrance of the construction site where it can be seen by all workers. There are a lot of safety warning signs provided in the construction site to remind the workers on the site safety.

In addition, this company also supplies safety booklet to all key players, written in both Malay and English. The safety booklet is comprehensive as it covers reminders on safety protection, ways to handle accidents and emergencies, fire fighting and emergency action plan. This booklet consists of photographs and animations indicating good and bad practices at construction sites to make it more interesting and easier to understand by the workers.

#### Other Safety Practices

Safety access is provided by the company. At construction sites, the access must be clear to prevent accident from occurs. Other than that, this company is concerned on the condition of scaffolding before it is used. Scaffoldings are furnished to the workers in construction site as temporary frame used to support people and reach to the required height.

There are three different tags that are provided to scaffoldings based on it conditions. Scaffoldings will be inspected by safety supervisor to ensure they are functioning and safe to be used. Yellow tag indicates that the inspection is in progress, red tag shows that the scaffold is incomplete thus cannot be used while

green tag shows the scaffold is ready to be used.

Furthermore, this company also provides a signboard where they put their safety target on the board. This can increase the awareness of workers and they will be encouraged to achieve the target. Hence they will be more concerned on safety matters while performing the tasks. This board is located at the main entrance of the construction site so that it will be visible to all workers. Lastly, this company provides specific places for chemical materials in order to prevent the workers from danger.

Overall, this company has a well-managed safety management on site. It can be clearly seen that this company puts safety as a priority to this project. Most of the safety practices have been implemented except for pink ticket scheme and demarcating boundaries between green (construction sites) and red (non-construction sites).

#### *Problems in Safety Practices at Construction Site*

Even though there are safety practices implemented at the construction site, there are some problems in safety practices that need to be improved. According to the interviewee, lack of staff in the safety department is one of the problems that they face recently. They need more staff in the safety department to control and manage the site's safety well.

Other than that, the interviewee reveals that the biggest problem that they are facing is the attitude of workers. Based on the interviewee's experience, accidents happen usually due to the carelessness of workers in performing their tasks. The workers always feel that they are working in a safe condition hence they just ignore the safety procedure required by rules and regulations.

Furthermore, the interviewee states that the attitude of workers show that most of the workers lack awareness on safety matters. The interviewee strongly believes that there must be strategies to be executed in order to inculcate the awareness of safety culture among workers.

In addition, lack of experience of workers on safety matters is also one of the problems that occur at the construction site. Most of the workers do not have experience working in high rise building project. The workers need to take some time to adapt with the environment of working in high rise building project. They must be aware that working in high rise building project is much more risky than working in low rise building project.

On the other hand, the problems in safety practices occur due to language barriers between supervisors and workers since most of the workers at the construction site are from Myanmar and Bangladesh. Besides, the interviewee also agrees that management commitment needs to be improved. Some of the employers just want their work to finish faster and ignore on safety matters.

The interviewee realizes that one of the problems in safety practices is lack of budget allocation on safety management. The employers and workers need to attend safety training to improve their skills and enhance their safety awareness. However, the interviewee reveals that the cost for attending the training course is high. Therefore, the company needs to allocate more budgets on safety to provide safety equipment, training and others.

Lastly, the interviewee stresses that the problems in safety practices need to be reduced in order to minimize accident, injury and hazard at construction site. Thus, next section will discuss the suggested strategies by the interviewee in order to reduce the problems.

#### *Strategies to Reduce Problems at Construction Site*

In order to reduce the problems, the company needs to recruit more staffs for the safety department. The interviewee suggests that the workers need to have knowledge on principles in working at high rise building before they get involved in high rise building project. Therefore, they will be aware of which area they need more safety precautions and the action that can cause an accident.

Moreover, the interviewee strongly believes that the top management must give full commitment towards safety matters. They must be aware on safety matters first to provide knowledge to the workers. Among the commitments that can be adapted by the top management is to ensure that safety equipment is adequate, they have to conduct safety practices properly and enhance their awareness on safety matters.

On the other hand, the interviewee suggests the content of safety training programme needs to be improved. This is to attract the workers' interest to attend the safety training. He also believes that the safety training will be more effective if the safety officer carry out inspection after the training programme and see whether the workers apply the knowledge that they get through the safety training. In term of cost of the training, it may be reduced by conducting in-house training whereby the training will be held at the construction site and the speaker will come to the site.

The interviewee stresses that since there is a language barrier problem, the company can do an extra initiative by providing safety booklet in various languages such as in Indonesian, Myanmar and Bangladesh language. Additionally, the interviewee suggests conducting a safety campaign and it needs to be conducted by having specific theme monthly. For example, it is executed by allocating a month to campaign 'free from hand injury' campaign. So, for that particular month, they must achieve no hand injury at construction sites. This may enhance the key players' awareness on safety matters.

Lastly, the interviewee suggests that the contractor to provide an allocation of budget for safety management since it is needed to improve the safety condition at construction site. He believes by having an allocation budget for safety management, all strategies suggested above can be implemented.

## **Case Study 2**

### *Safety Practices at Construction Site*

#### Safety Policy

In order to implement safety practices at construction site, the company provides safety and health policy for all key players in compliance with the occupational safety and health act 1994. The policy of the company is to conduct its operation in a manner that will ensure reasonable practice of safety, health and welfare at work for the employees. In addition, it also ensures that the prevention of risk to employees and property comply fully with all relevant laws and regulations.

The objective of this company is to ensure zero major accidents for all personnel on site. It is also stated in the safety policy that all employees shall ensure that the workplace is safer, applies a safe system of work and to take reasonable care for the safety and health of themselves and other person who may be affected by their individual acts. The safety policy of this company emphasizes that safety, health and environment is everyone's responsibility. The safety policy will be reviewed annually and will be endorsed by the director.

#### Education and Training

The company always emphasizes the significance of safety and health on construction sites. One of the ways to inculcate safety culture among the key players is by educating them through training courses.

The company will ensure that all new workers will attend the induction training that is provided weekly. All new workers will be given an introduction of safety and health matter during the induction training. The safety officer will show them the safety symbol signage that is typically used at the construction site. The workers are reminded of the safety measures that have to be practiced while performing the tasks.

Moreover, the company provides job specific training to all workers every month

based on the current progress of works. The workers will be briefed on the procedure to perform the tasks considering the aspects of safety while performing it. This job specific training is important especially for the trade that involves in high rise building project.

Other than job specific training, this company also provides health and safety training for supervisors and managers. They will send the management team to attend training courses organized by National Institute for Occupational Safety and Health (NIOSH).

#### Site Safety Inspection

Site safety inspection is a compulsory practice that needs to be conducted to ensure the safety practices at the construction site are running smoothly. Based on the interviewee's opinion, the majority of the safety officers at the construction site will conduct safety inspection but the effectiveness of the safety inspection has always been questioned.

For this project, the safety officer will conduct weekly safety inspection by having a site safety walk. During the safety inspection session, the safety officer will strictly take immediate action for workers who fail to comply with the safety regulations. Furthermore, the safety officer will fill in the checklist which includes with score system to indicate the level of safety implementing at the construction site.

#### Safety Auditing

The company conducts safety auditing twice a year. Normally, it will be carried out by International Organization of Standardization's representatives. It includes safety inspections, inspection of documents and by interviewing the safety officer in charge. Safety auditing is important to measure the level of safety at the construction site. After the auditing session, the safety officer may discover the level of safety at the construction site whether it meets the safety standard requirement or not.

### Safety Meeting

The interviewee stressed that these projects involved thousand number of workers in the construction site at times. Thus, the risk of hazard is higher compared to other projects. Therefore, it is important to conduct a monthly safety meeting in order to discuss how to manage and control the safety of workers at the construction site. During the safety meeting sessions, the safety committee will discuss current safety issues at the construction site and the committee will plan strategies to always keep and maintain the site safety level.

Apart from that, the safety officer will conduct daily toolbox meeting for all sub-contractors. It will be conducted based on the work scope of the particular workers. This company has provided a checklist for each topic that needs to be discussed during tool box talk meeting. The examples of the topics are personal protective equipment (PPE), personal health, security, fire prevention, safety facilities and others.

### Site Safety Organization

According to the interviewee, safety is the most important factor in this project thus the company has appointed safety officers and safety supervisors to control the safety on site. Due to the significance of safety and health at construction site, this company establishes a safety and health committee which consists of all key players who are involved in the project.

The interviewee stated that it is important to have the safety and health committee because this committee will be responsible to manage and supervise the safety and health at the construction site. Everyone in the committee will play their roles to sustain the safety and health at construction site. Hence, the objective of the company to have zero major accident for all site personnel can be achieved.

### Personal Protective Equipment (PPE)

As the safety officer for this project, the interviewee strictly urges all workers at the construction site to wear and use basic personal protective equipment such as safety helmet and safety boots. He will also make sure all personnel such as team management, authority or visitors who are on site to wear safety helmet and safety boots. The company provides other PPE depending on the kind of work which include face and eye protection for welding works (clear safety glasses, full face welding masks and etc.), ear protection to prevent from noise (ear plugs or ear muffs), hand protection (gloves, armlets and etc.) and respiratory protection (face mask respirators, half mask dusk respirators, high efficiency respirators and etc.).

In addition, the safety officer applies a systematic way to record the issuance of PPE to the workers by having a PPE record. The safety officer also provides PPE checklist every time he conducts site inspection on PPE.

### Emergency Support and Safety Measuring Devices

The availability of emergency support and measuring devices is important especially in high rise building project. Normally, in case of emergency such as short circuit or fire fighting, this company has provided an assembly point for all workers to gather should the need arise. Furthermore, the first aid equipments are available on site. Other than that, they also provide emergency access and ingress at workplace in case of emergency.

### Fall Protection Systems

The interviewee stated that involvement in a high rise building project is more risky than other projects. In order to reduce a risk of falls during performing tasks for this project, the company provides safety harnesses to all workers who work at a 2.5 metre height. Other than that, they also provide safety nets, handrails and guardrails, safety ladder to prevent falls.

### Safety Promotions

In terms of safety promotions, this company provides safety signs and warning signs at construction site. As most of the workers are from Myanmar, they have safety signs written in Myanmar language.

### Other Safety Practices

The contractor provides a two-way direction for the access. The left side is for those who come in while the right side is for those who exit from the passenger lift.

### *Problems in Safety Practices at Construction Site*

In relation to the second objective, the interviewee was asked to give his views on problems encountered in safety practices at construction site based on this project. Based on his point of view, one of the problems encountered is lack of awareness on safety matters among workers and the management team. Some of the workers did not wear safety helmet while performing their tasks because they feel uncomfortable wearing it. The interviewee adds that sometimes the team management does not take any action to the workers who do not obey the safety rules. This shows that the level of awareness among the team management is low.

Moreover, the interviewee reveals that language barrier between supervisors and workers are one of the problems in safety practices at the construction site. The employer has recruited workers from Indonesia, Bangladesh and Myanmar. Usually, the supervisors will have problems to communicate with workers coming from Bangladesh and Myanmar.

Furthermore, the interviewee stresses that they need commitment from the management to deliver information on safety to the workers. In this project, the safety officer will deliver messages through the supervisors, and the supervisors need to deliver it to their workers, however, most of the supervisors did not deliver it as they were told.

Besides, in order to finish their work faster, the workers will usually use defective equipment or tools. As long as they can complete their task on time, they will proceed with any tools that are available. In fact, sometimes the workers also use the tools in a wrong way. From the interviewee's view, it can be seen that some of the workers ignore the work procedure required by the rules and regulations. This is dangerous and prone to cause an accident.

Lastly, the interviewee expresses that there is a lack of financial allocation for safety management. For this project, it needs more budget allocation to help in safety promotion (i.e. provides safety bulletin board, add more safety signs or warning signs and etc.). All of these problems need to be highlighted in order to inculcate safety health and culture at construction site.

### *Strategies to Reduce Problems at Construction Site*

In relation to the problems that have been encountered in safety practices at construction site, the interviewee also gives suggestions on strategies to reduce the problems.

Firstly, to inculcate the awareness of the workers and the management team, the interviewee suggests conducting an effective training course for the workers by having a briefing through photographs, video graphs and animations. In fact, he emphasizes that the content of current training course needs to be revised and improved.

Secondly, he also suggests having a multilingual safety manual, safety warning signs and safety booklets in order to solve the language barriers between workers and supervisor. So far, they have done safety warning signs in Myanmar language and they have proven to be effective. All the workers from Myanmar understand it and follow the rules accordingly.

Thirdly, he hopes that commitment from the management team can be enhanced by having a systematic information delivery among the management team and workers.

The management team must ensure that all the information will be delivered to the workers as supposed.

Fourthly, the interviewee suggests enforcing the safety rules strictly by imposing penalty to the workers who have offended the safety rules and regulation. On the other hand, the company can also give reward to the workers who exhibit excellent safety performances as a positive reinforcement.

Finally, the interviewee reiterates that sufficient financial budget must be allocated for safety management and there must be a fix percentage to allocate the budget on safety management. It is important to have a fixed budget for safety management in order to facilitate the safety officer or safety committee to improve the safety and health culture at construction sites.

**Discussion**

Table 1 indicates the research findings on current safety practices at construction sites. From the case studies conducted, both projects have implemented safety practices. Table 1 shows that both companies have safety policy for the works on site and provide education and training for workers at construction sites.

In addition, they also carry out site safety inspection and safety auditing regularly. Furthermore, safety meetings are conducted at construction sites to discuss safety matters with workers and the management team. Other than that, safety organizations have been established by both companies in order to manage and control the safety of the construction sites.

In order to ensure safety of workers, both companies provide personal protective equipment to workers such as safety helmets, safety boots, gloves and others. In case of emergency, they provide emergency support and safety measuring devices such as first aid, medical assistance for common injury, fall protection systems such as handrails, guardrails, safety nets and catch nets.

Furthermore, both companies promote safety at construction sites to make sure the construction site is always in a safe condition. Each company has different ways of promoting safety.

Overall, most of the safety practices listed above are implemented by both contractors except for demarcating boundaries of red and green zones and pink tickets scheme. Additionally, both case studies provide other safety practices such as providing safety access, different colour tagging for scaffolding and specific places for chemical materials.

Thus, it can be concluded that the safety practices that have been implemented by both contractors at construction sites include safety policies, education and training, site safety inspection, safety auditing, safety meeting, safety organization, personal protective equipment, emergency support and safety measuring devices, fall protection systems and safety promotions which are consistent with the literatures reviewed.

Table 1: Safety Practices at Construction Sites

Safety Practices	Case Study 1	Case Study 2
Safety policy	√	√
Education and training	√	√
Site safety inspection	√	√
Safety auditing	√	√
Safety meeting	√	√
Site safety organization	√	√
Pink tickets scheme	-	-
Demarcate boundaries of red and green zones	-	-
Personal protective equipment	√	√
Emergency support and safety measuring devices	√	√
Fall protection systems	√	√
Safety promotions	√	√
Other safety practices	Safety Access	Safety Access

The problems in safety practices encountered at construction sites are:

- 1) Ignorance of workers on work procedures
- 2) Carelessness of workers in performing their tasks
- 3) Lack of financial allocation for safety management
- 4) The training for safety officer is costly
- 5) Lack of experience of workers on safety matters
- 6) Lack of awareness among workers
- 7) Language barriers between supervisors and workers
- 8) The workers use defective equipment or tools
- 9) Lack of awareness among the management team
- 10) Lack of staff for safety department
- 11) Lack of promotion on safety matters
- 12) Poor management commitment

Above all, the major problems in safety practices at construction sites are ignorance of workers on work procedures, lack of financial allocation for safety management, lack of awareness among workers, and language barrier between supervisors and workers. The problems

are faced by both contractors of case studies. These findings are consistent with literatures reviewed.

Other than that, the researcher realized that none of the case studies facing problems on improper use or wear personal protective equipment, workers using tools in a wrong way and/or for the wrong task, incompleteness of the content in the training programme, lack of enforcement by the authority, lack of safety knowledge and information among the top management, and lack of promotion on safety matters which are inconsistent with the literatures reviewed.

Table 2 shows the research findings for strategies to reduce problems in safety practices at construction sites. Both case studies suggested that to provide effective safety training, allocation of budget for safety management, full commitment from the top management, and to provide safety booklets in various languages as the strategies to reduce problems in safety practices. The suggestion cover three aspects for the implementation of safety practices, i.e. awareness of workers, commitment of top management and the allocation of resources.

Table 2: Strategies to Reduce Problems in Safety Practices at Construction Sites

No.	Safety Practices	Case Study 1	Case Study 2
1	Provide effective safety training (e.g. using photographs and videos)	√	√
2	Allocation of budget for safety management	√	√
3	Impose penalty to the workers who have offended the safety rules and regulations	-	√
4	Provide occupational safety and health campaign	√	-
5	Give rewards to the workers who exhibit excellent safety performances	-	√
6	Full commitment from the top management	√	√
7	Recruit more staff for the safety department	√	-
8	Conduct in-house safety and health training	√	-
9	Provide safety booklets in various languages	√	√
10	Provide safety and health training for free	-	-
11	Include cost for safety management in the Bills of Quantity (BQ)	-	-
12	Distribute a copy of safety policy to each of the workers (pocket size)	-	-



## Conclusion

From the research findings, it is concluded that generally the construction site has good and structured safety practices namely safety policy, education and training, site safety inspection, safety auditing, safety meeting, site safety organization, personal protective equipments, emergency support and safety measuring devices, fall protective systems, and safety promotions. Nevertheless, several major problems are encountered in the safety practices; the problems are ignorance of workers on work procedures, lack of financial allocation for safety management, lack of awareness among workers, and language barrier between supervisors and workers. Several strategies have been suggested to overcome the problems, such as to provide effective safety training, allocation of budget for safety management, full commitment from the top management, and to provide safety booklets in various languages as the strategies to reduce problems in safety practices. The suggestions cover three aspects for the implementation of safety practices, i.e. awareness of workers, commitment of top management and the allocation of resources.

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