

**CASE STUDY OF SAFETY MANAGEMENT
IN CONSTRUCTION INDUSTRY**

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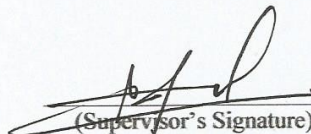
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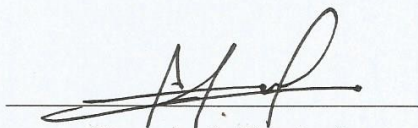
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Thesis submitted in fulfillment of the requirements
for the award of the
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ABSTRAK

Kadar kemalangan yang tinggi dalam pembinaan adalah masalah yang perlu ditangani oleh semua pihak yang terlibat (Poon et al. 2008). Walaupun peraturan dalam keselamatan dan kesihatan pekerjaan di Malaysia agak komprehensif dan dengan pemeriksaan keselamatan yang ketat oleh Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia (DOSH) secara berkala, kemalangan dan kematian masih dalam jumlah yang tinggi. Industri pembinaan menghadapi cabaran dalam keselamatan yang kurang baik yang boleh menyebabkan kecederaan dan kematian disebabkan oleh sikap tidak beretika dan faktor tingkah laku. Objektif kajian ini adalah untuk mengkaji isu-isu keselamatan yang berlaku dalam industri pembinaan, untuk mengenal pasti punca utama isu keselamatan yang berlaku dalam industri pembinaan dan untuk menganalisis penyelesaian untuk mengatasi isu-isu dalam pengurusan keselamatan. Kajian ini dijalankan melalui tinjauan literatur dan kajian soal selidik untuk mencapai objektif kajian. Maklumat yang berkaitan dengan pengurusan keselamatan dalam industri pembinaan telah diambil dari jurnal, internet dan buku terbitan. Soal selidik telah diedarkan kepada seramai seratus orang responden yang terlibat secara aktif dalam industri pembinaan di seluruh Malaysia. Melalui kajian ini, dapat dikenal pasti bahawa tiga isu utama dalam pembinaan adalah latihan dan pendidikan keselamatan yang tidak mencukupi, tidak semua orang mengetahui secara terperinci kandungan dasar keselamatan dan keadaan di tapak pembinaan tidak dikemas dengan rapi. Untuk meminimumkan masalah ini, pengurusan atasan harus mewajibkan latihan keselamatan kepada pekerja yang bekerja di tapak pembinaan dan pegawai keselamatan harus memberikan nasihat tentang tindakan yang perlu diambil untuk memastikan persekitaran kerja yang lebih selamat.

ABSTRACT

High accident rate in construction is a universal problem which needs to be tackled by all parties concerned (Poon et al. 2008). Although regulation in occupational safety and health in Malaysia are quite comprehensive and reinforced with strict safety inspection and audit by Department of Occupational Safety and Health Malaysia (DOSH) at regular of time, the accident and fatality still at unacceptable figure. The construction industry in confront with a poor level of safety performance and dangerous safety issues that may cause injuries and death due to the major cause of unethical attitude and behaviour factors which leads to other problems occur in occupational safety and health. Objective of this study is to study the safety issues that happen in construction industry, to identify the major cause of safety issue that happen in construction industry and to analyse solution to overcome the issues in safety management. This study was carried out by literature review and questionnaire survey to achieve the objectives. The information related to the safety management in construction industry has been collected from journal, internet and published book. The questionnaire had been distributed to a total of one hundred respondents that are actively involved in construction industry all over Malaysia. Through this study, it can be identified that the Top three common issue in construction is insufficient proper training and education, not everyone aware of the contents of safety policy and site does not kept neat and tidy. In order to minimize the problem, top management must establish safety training and orientation for site operatives and safety officer's should provide advice on actions to be taken in order to ensure a safer working environment.

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LIST OF ABBREVIATIONS

AI	Average Index
DOSH	Department of Occupational Safety and Health
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment

CHAPTER 1

INTRODUCTION

1.1 Introduction

The construction industry is a dynamic and innovative industry that delivers buildings and infrastructure for all aspects of commercial and domestic activity. It is a global industry that facilitates the development and maintenance of buildings, transport links and energy supplies. It is an industry that continues to deliver many incredible things, from ever taller sky scrapers to expansive bridges, impressive stadia and structures that rise out of land reclaimed from the sea.

This dynamic and innovative industry is faced with safety challenges on a project-by-project and day-by-day basis. The need to systematically plan and organise for effective health and safety management practice is regularly underlined as no justification can be, or is, given to construction projects, work activities, environments or business organisations that place the safety or health of people at risk.

Many hazards exist on all construction sites: sharp edges, falling objects, openings in floors, chemical, noise and a myriad of other potentially dangerous situation. Mitigation measures are required to minimize the potential for injury and continued training is needed to ensure the entire work force maintains a work safely attitude.

Most construction projects are unique and executed in varied work environments. Construction workers, therefore, are constantly expected to familiarize themselves with new situations that potentially may be hazardous. In addition, the composition of construction project teams varies from project to project, and many craft worker may work for different employers leading to a lack of conformity and continuity. Craft workers may only work on a project site during certain phases of the work and then move to another project site. The continuing change in the composition of the work force on a

project presents significant leadership challenges to the project manager, superintendent and field supervisors.

Another major safety challenge for construction site supervisors is the increased employment of workers for whom English is a second language. Not only do these workers have difficulty reading and understanding safety signage, but they may be unwilling to report unsafe job site conditions or working practices. It is critical that the supervisors be able to enforce good safety practices among all individuals working on a job site. This may require that safety signage be posted in multiple languages and that safety orientations can be conducted in multiple languages.

As a construction projects are being executed, there is a continuous series of situations in which construction workers and/or general public may be exposed to risk of injury. It is extremely important for construction leaders to recognize these situations and take action to control or mitigate these job site hazards. Many construction operation occur in excavations below the surface ground or in the air above the ground. In many cases, construction activity is exposed to natural elements such as rain, wind or other climatic conditions. Implementing measures to protect workers and the public is the best way to minimize the potential for injury.

Construction work has been increasing in developing and undeveloped countries over the past few years. With an increase in this type of work occupational fatalities have increased. Occupational fatalities are individuals who die while on the job or performing work related tasks. Within the field of construction, it is important to have safe construction sites.

Creating a safe work site is a function of the physical conditions of the working environment and the behaviour or working attitude of the individuals working on the site. Safety planning must begin during the initial planning for a construction project along with the development of a cost estimate and project schedule. The initial safety plan needs to outline how safety will be managed on the project, including roles and responsibilities of project participants, resources available, anticipated hazards and mitigation measures, training requirements and safety equipment needs. Requiring everyone on the project site to wear appropriate PPE may impact worker productivity and the purchase of appropriate safety equipment may impact project cost.

1.2 Problem Statement

Although regulation in occupational safety and health in Malaysia are quite comprehensive and reinforced with strict safety inspection and audit by Department of Occupational Safety and Health Malaysia (DOSH) at regular of time, the accident and fatality still at unacceptable figure. The number of accidents in construction industry reported from 2012-2016 as shown in Figure 1.1. There's an increase of accident in 2016. However, there might be some accidents that might not be reported due to near miss. In addition to that there is no indicator established to measure the level of safety culture in construction sector in Malaysia. Although the construction sector in Malaysia is growing very fast, however workers at many construction sites, operate in unsafe working environment, hence there is a need to make construction sites safe in order to ensure the safety of the workers, if the construction sector is to have a sustainable growth and develop.

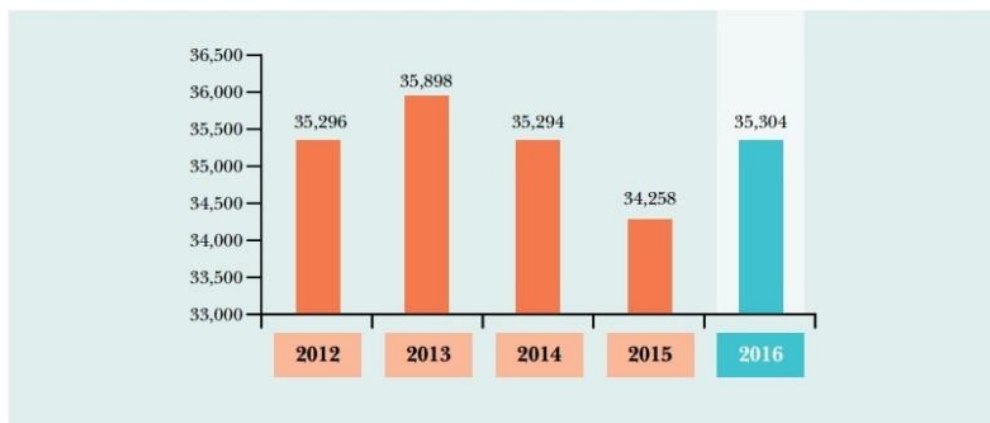


Figure 1.1 Industrial Accidents Reported from 2012-2016

Source : (SOCSO Annual Report,2016)

The understanding of the construction site's management on safety is in contrast to the regulation of occupational safety and health. Although cases were reported to related departments, yet information on the safety and health management in construction sites is still far lacking. The issue has to be fundamentally understood and comprehended. Awareness on safety and health is important and crucial for construction sector. The Occupational Safety and Health Act 1994 (OSHA) is a self-regulation statute. (Gunningham, 2011) defined self-regulation as the controlling of a process or activity by the people or organization that are involved in it rather than by an outside organization

such as government. It means that the government will not prescribe how the safety and health at a workplace should be managed. The Act requires a joint effort from the employers and employees on how to administer the safety and health at their respective workplace.

Construction safety has undergone a substantial evolution in the past century as illustrated in Figure 1.2. In the early 1900s, safety was virtually non-existent. There were no workers' compensation laws, thus typically construction organisations did not need to pay anything when an accident happened. Without any compelling financial incentive, there was no encouragement for the industry to implement or consider safety. An infamous tragic accident showing the lack of interest towards safety happened in 1911 in New York when a fire broke out in the Triangle Waist Company building killing 146 employees, mostly women. It is believed that the exit doors were deliberately locked, the fire escape was dysfunctional, and the fire-fighting equipment was insufficient, further demonstrating the lack of safety concerns during this period (Cornell University, 2004). This is the beginning of the evolution as shown in Figure 1.2 below.;

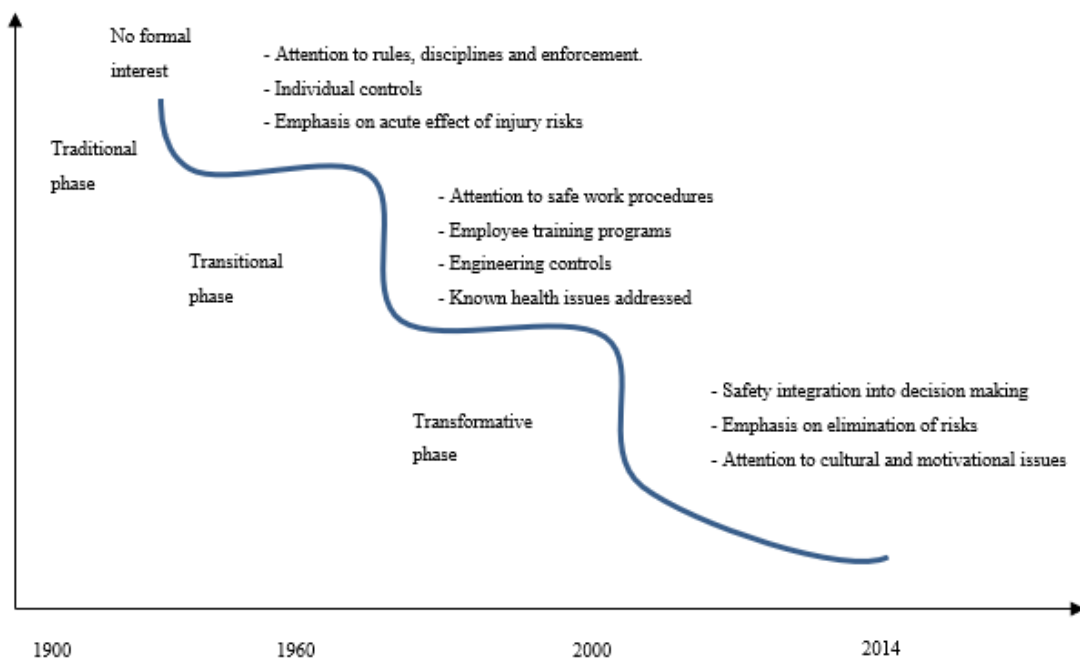


Figure 1.2 The evolution of safety management
Source: (Adapted from p.18 in Finneran and Gibb, 2013)

This evolution of safety has significantly improved safety performance in the construction industry. However, in recent years, it appears that this improvement has plateaued and the industry is facing difficulties in achieving further improvements, while injuries and fatalities still occur in regular basis. Despite having an important role in the global and national economies, the construction industry has a notorious reputation as being one of the most dangerous industrial sectors (Health and Safety Executive, 2013; Lingard and Rowlinson, 2005; Murie, 2007; Safe Work Australia,2013).

The construction industry in confront with a poor level of safety performance and dangerous safety issues that may cause injuries and death due to the major cause of unethical attitude and behaviour factors which leads to other problems occur in occupational safety and health. Construction workers are exposed to various hazard and treat at the workplace.

Potential hazards for workers in construction include:

- Falls (from heights);
- Trench collapse;
- Scaffold collapse;
- Electric shock and arc flash/arc blast;
- Failure to use proper personal protective equipment; and
- Repetitive motion injuries.

Workers awareness and perception towards safety, health and their working environment are important aspects in enhancing the building construction to the better condition of the workers themselves (Che Hassan, Basha and Wan Hanafi, 2017). Ensuring safety on a construction site is a difficult challenge. Effective safety management on project sites is the most importance due to the nature of the construction industry. However, it is usually not at the top priority in a market-driven society where the main focus is completing projects at the specific quality with minimum time and cost. Thus, safety issues are considered only after an accident occurs at a construction site. Therefore, proper effective safety management in construction is of utmost importance.

1.3 Objective of Study

The objectives of the study are;

- i. To study the safety issues that happen in construction industry;
- ii. To identify the major cause of safety issue that happen in construction industry;
- iii. To analyse solution to overcome the issues in safety management.

1.4 Scope of Study

The scope of my dissertation focused on the safety management of construction sector that covers basically in all over Malaysia.

This study was carried out by conducting questionnaire survey and distributed to those who are involved in construction activities for example project manager, site engineer and construction worker who will be chosen randomly from different construction site.

1.5 Significance of Study

Due to high rates of accidents and injuries in the construction sector, much effort has been taken through research and better work practices to improve safety management. The intended outcome of this case study will be to;

- Improve safety awareness on the importance of safety management in work places, in this case the construction site.
- Understand the various issues regarding to safety management that happen in Malaysia nowadays.
- Serve as reliable material source to help companies to improve the safety at construction site.

1.6 The Organization of Study

This study was divided into five-chapter, reference and appendices. It is summarized of the entire chapter in this project report. It includes as the following below;

- **Chapter 1**

This chapter presented an introduction of the study which includes; problem statements, objective, scope and significance of the study.

- **Chapter 2**

It presented literature review which includes safety practices and the importance of safe practices. Further, it includes the studies which have been made to identify the problems of safety management in construction industry and strategies to reduce the problems.

- **Chapter 3**

Discusses the study of methodology which includes; information of the study design, respondent, questionnaire design, statistical technique, data analysis and research methodology.

- **Chapter 4**

This chapter presented and discussed about result and discussion. The statistical analysis of the result obtained from the questionnaire surveys, and the table and graphics deduced from statistical analysis and statistical result.

- **Chapter 5**

It summarized the result and objectives of the study, to present the conclusions, recommendations of this study and proposal for future works

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

It is essential that construction site hazards be clearly identified so as to ensure the management and achievement of a safe working environment. Undertaking the site hazards involves the systematic recognition of the aspects of a project which have a potential to cause harm to any person.

The systematic identification and management of construction hazards begins long before site activity commences. Indeed, architects and design team work to eliminate, remove or minimise hazards through the deployment of a design that thoroughly considers materials, buildability and maintenance. Hazards remaining within a design which are not removed or fully mitigated at the design stage are commonly termed 'residual' hazards. In order to enable effective safety management, it is essential that the information regarding these hazards is communicated to project constructors as early as possible. As such it is a good practice for project clients and design teams to provide pre-construction information to those bidding for or planning the work. This pre-construction information should include detail regarding the existing environment and serves to enable contractors to develop a safe construction phase plan that takes into account hazards and risks.

It is essential that construction contractors ensure safety hazards are identified in order to fully address the effective management of the construction site. Once hazards have been identified it is necessary to undertake evaluation of the risk posed by the hazard and to control significant hazards and reduce risk by the use of control and protective measures.

It is the legal and moral duty of employers and employees to ensure that the workplace is a safe environment. Workplace hazards that pose a significant risk to the health and safety of people need to be identified and appropriately managed.

There are two major aspects of project site safety:

1. Safety of persons working on the site
2. Safety of the general public of who may be near the project site.

Both aspects must be addressed when developing project-scientific safety management or plans. These plans identify all hazards to be faced by construction workers and general public during the various phases of construction and measures to be taken to minimize the risk of injury to workers or the public. Examples of construction worker safety measures are requiring the wearing of personal protective equipment (PPE) and placement of barricades around floor openings. Examples of public safety measures are perimeter fences and warning signs to prevent entry into the project site by unauthorized individuals.

(Holt, 2005; Reese & Eidson, 2006), highlight the need to continue improving safety performance in construction.

The primary causes of construction job site injuries are:

- Falling from an elevation
- Being struck by something
- Trenching and excavation cave in
- Being caught between two objects
- Electrical shock

Many hazards exist on all construction site: sharp edges, falling objects, openings in floors, chemicals, noise and a myriad of other potentially dangerous situations. Mitigation measures are required to minimize the potential for injury and continued training is needed to ensure the entire work force maintains a work safely attitude.

2.2 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.

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 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 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.

2.3 Importance of Safety Practices

The primary factors that motivate safe practices on construction sites are:

- Humanitarian concern for workers and the public
- Economic cost of accidents
- Regulatory requirement for work site safety

A disabling injury or a fatal accident on a construction project will have a significant negative impact on the execution of construction operations. Accidents cost money, have an adverse impact on worker morale and productivity, and lead to adverse publicity about the project, the construction company, and the project owner. It is the construction company's responsibility to provide a safe working environment for all construction workers on the project site, including those employees by subcontractors

and to protect the public from harm. This is a significant concern when major construction activity occurs within a facility, such as a hospital, that is in operation.

It is a normally accepted principle that an individual should not be injured while working for an employer. A lot of people are killed in workplace accidents or suffer major injuries due to occupational illness. Beside this, there are still a number of uncountable people who suffer from long term health problems due to their work. The economic costs are considered later but it is clear that this scale of human suffering should be acceptable in an advanced, civilized society. Fortunately, the picture is improving, partly due to gradual raising of health and safety standards. However, the contraction of the country's manufacturing and industrial base has also played a part.

In addition to the humanitarian concern, there is a significant adverse economic impact if an accident occurs. Accidents are costly, and often result in un-compensable delays in the completion of the construction projects. The financial costs of accidents serve as the second reason of the implementation of effective management of health and safety. Some of these costs are potentially measurable whilst others are hidden. Measurable costs refer to the compensation paid to employees in the form of damages and are sometimes the related legal and administrative costs. Although these payments paid are made by the insurance company, in the long run the insurance premium paid will inevitably reflect the claims history of the employer. So, senior managers or safety specialists may be unaware of the size of the premium being paid. While the hidden costs of accidents are either impossible to quantify or their quantification would be totally impracticable. However, the hidden costs are usually far greater than the measurable costs, especially when the large numbers of minor injuries and non-injury accidents are taken into account.

Congress passed the Occupational Safety and Health Act (the OSH Act) in 1970 establishing mandatory workplace safety and health procedures. The act created the Occupational Safety and Health Administration (OSHA) within the Department of Labour to administer the act. OSHA regional and area offices employ inspectors whose duties include visits to construction projects to ensure compliance with mandated safety and health procedures and to assess significant fines for failure to comply with the required procedures. Job safety and health requirements generally consist of rules for

avoiding hazards that have been proven by research and experience to be harmful to personal safety and health.

The act authorized individual states to establish their own occupational health and safety requirements as long as the state requirements are at least as effective as the federal requirements. Several states have enacted their own occupational safety and health statutes and employ inspectors to ensure compliance on construction project sites within the state. Failure to comply with statute requirements usually results in significant citations and fines.

Most successful construction companies have recognized the importance of safety management and have developed effective company safety programs that include:

- New employee orientation
- Safety training
- Project-specific accident prevention plans
- Job site surveillance

Good safety practices reduce cost of doing business because they lead to reduced premiums for workers' compensation and liability insurance and minimize the costs that result from accidents and injuries on a job site. Construction companies, depending upon the type of craft labour that they employ, often pay 10 to 20 percent of their direct labour costs for workers' compensation insurance premiums, which is a significant cost of doing business.

The effectiveness of a construction company's safety program often is a key factor in the ability of the company to become prequalified and allowed to submit a proposal on a project. Project owners do not want unsafe contractors working on their projects, because the owners do not want the negative publicity associated with construction accidents. Unsafe project sites also often lead to citations and resulting fines from state or federal occupational safety and health inspections.

2.4 Safety Organization

The organization of safety on the construction site will be determined by the size of the work site, the system of employment and the way in which the project is being organized. Safety and health records should be kept which facilitate the identification and resolution of safety and health problems on the site.

In construction projects where subcontractors are used, the contract should set out the responsibilities, duties and safety measures that are expected of the subcontractor's workforce. These measures may include the provision and use of specific safety equipment, methods of carrying out specific tasks safely, and the inspection and appropriate use of tools. The person in charge of the site should also assure that materials, equipment and tools brought on to the site meet minimum safety standards.

Training should be conducted at all levels, including managers, supervisors and workers. Subcontractors and their workers may also need to be trained in site safety procedures, because teams of specialist workers may mutually affect each other's safety.

There should also be a system so that site management has information quickly about unsafe practices and defective equipment. Safety and health duties should be specifically assigned to certain persons. Some examples of duties which should be listed are:

- Provision, construction and maintenance of safety facilities such as access roadways, pedestrian routes, barricades and overhead protection;
- Construction and installation of safety signs;
- Safety provisions peculiar to each trade;
- Testing of lifting machinery such as cranes and goods hoists, and lifting gear such as ropes and shackles;
- Inspection and rectification of access facilities such as scaffolds and ladders;
- Inspection and cleaning of welfare facilities such as toilets, clothing accommodation and canteens;
- Transmission of the relevant parts of the safety plan to each work group;
- Emergency and evacuation plans.

2.4.1 Role of Construction Personnel in Safety and Health

Every construction company of any size should appoint a properly qualified person (or persons) whose special and main responsibility is the promotion of safety and health. Whoever is appointed should have direct access to an executive director of the company. His or her duties should include:

- the organization of information to be passed from management to workers, including those of subcontractors;
- the organization and conduct of safety training programmes, including induction training for all workers on the site;
- the investigation and review of the circumstances and causes of accidents and occupational diseases so as to advise on preventive measures;
- acting as consultant and technical adviser to the safety committee;
- participation in pre-site planning.

To carry out these functions the safety officer should have experience of the industry and should be properly trained and qualified and, where such exists, should be a member of a recognized professional safety and health body.

2.4.2 Role of Supervisor

Good planning and organization at each work site and the assignment of clear responsibility to supervisors are fundamental to safety in construction. “Supervisor” here means the first level of supervision, which on site is variously termed as “foreman”, “chargehand”, “ganger”, and so on.

Each supervisor requires the direct support of site management and should seek to assure within his or her field of competence that:

- working conditions and equipment are safe;
- workplace safety is regularly inspected;
- workers have been adequately trained for the job they are expected to do;
- workplace safety measures are implemented;
- the best solutions are adopted using available resources and skills;
- necessary personal protective equipment is available and used.

Making the work site safe will require regular inspection and provision of the means for taking remedial measures. The training of workers enables them to recognize the risks involved and how they can overcome them. Workers should be shown the safe way of getting a job done.

2.4.3 Role of Workers

Every worker is under a moral, and often also a legal, duty to take the maximum care for his or her own safety and that of fellow workers.

It should be the duty of every employee or workers while at work;

- to wear or use at all time any protective personal equipment or clothing provided by the employer for the purpose of preventing risks to his safety and health;
- to comply with any instruction or measure on occupational safety and health instituted by his employer or any other person;
- workers should take reasonable care for the safety of himself and other persons who may be affected by his act or omissions at work.

There are various ways of involving workers directly in site conditions, such as:

- “tool-box briefing” (figure 2.1), a five- to ten-minute session with the supervisor just prior to starting a task gives the workers and the supervisor a chance to talk about safety problems likely to be encountered and potential solutions to those problems. This activity is simple to implement and it may prevent a serious accident;
- “safety check”; a check by workers that the environment is safe before starting an operation may allow them to take remedial action to correct an unsafe situation that could later endanger them or another worker;

According to Act 514, Occupational Safety and Health Act 1994, a person who contravenes the duty of employee shall be guilty of an offence and will be convicted liable to a fine not-exceeding one thousand ringgit or to imprisonment for a term not exceeding three months or both.

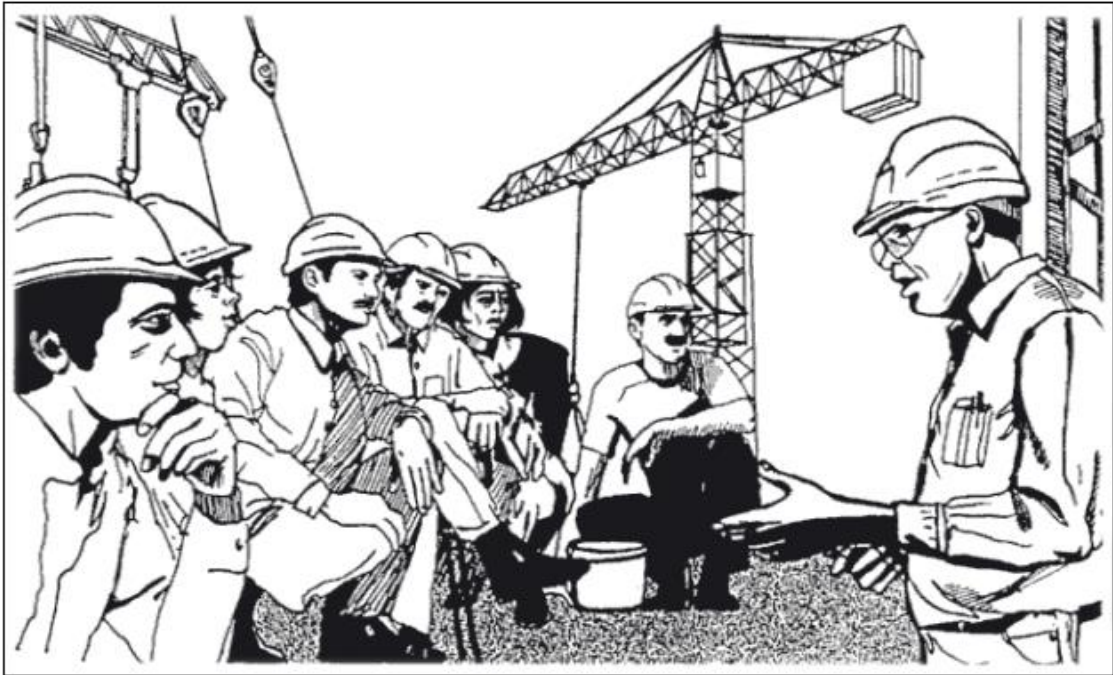


Figure 2.1 “Tool-Box briefing” should be carried out regularly

2.5 Problems of Safety Management in Construction Industry

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 Khaiolden 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 Khaiolden 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 labourers toward safety. He reported that the local labourers 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 favourable 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 play 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. 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.

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.

2.6 Strategies to Reduce the Problems in Construction Industry

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 culture 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.

2.7 OSH Management System in Construction

Health and safety risks are needed to identify, assess, and take certain action to eliminate or minimize the probability of occurrence. In order to reduce the accident or incident level and subsequently cut losses, it is important to ensure that safe working practice is being observed. Safe operation and accident prevention form a good business

practice. OSH management system (OSHMS) in the context of construction is the discipline of preserving the health of those who build, operate, maintain and demolish engineering works and of others affected by those works. It is also primarily designed to protect the health and safety of individual workers or members of the public. Traditionally, the responsibility of safety falls on the individual.

The implementation of OSHMS by the main parties involved in the construction process (owners, designers, supervising companies, contractors) must also require adaptations. We need to take the perspective and the contribution of each of these parties to the OSH into account. The implementation of the OSHMS must be applicable to all levels of organizations.

It must conform to the existing laws and regulations related with safety and health at the workplace. Managing safety essentially involves four levels: the company policy level, project management level, site management level, and individual level. Failure at each level is the reason for the occurrence of accidents. Failure at the first level will increase the probability of failures at the second level and so on. Improper OSH management leads to poor safety records. It is hard to achieve the aim of 'zero accident' due to the rough and tough nature of the industry. Overall, OSHMS mainly rely on continual monitoring of indicators of performance of the relevant processes, and continuous improvements in these processes.

In the industrialized nations of the world, accidents now cause more deaths than all infects diseases and more than any single illness except those related to heart disease and cancer (Biggs et al, 2005). Safety should be a major concern in any industry. In the construction industry, the need for such concern may be greater than in most other industries. This is caused by the disproportionately high number of industrial injuries incurred by construction workers.

2.8 Causes of Accidents

Accident don't just happen, they are caused. According to Ridley 99 per cent of the accident are caused by either unsafe acts or unsafe conditions or both (Ridley, 1986). As such, accidents could be prevented. The unsafe act is a violation of an accepted safe procedure which could permit the occurrence of an accident. The unsafe condition is a hazardous physical condition or circumstances which could directly permit the

occurrence of an accident. Most accident results from a combination of contributing causes and one or more unsafe acts and unsafe condition. Accident theories and models discussed in the previous section have evolved from merely blaming workers, conditions, machineries into management roles and responsibilities. Nowadays, accident models are being used to better explain the causes of accident so that appropriate actions could be taken to make improvement. However, in order to effect permanent improvement, we must deal with the root causes of accident.

A review of the literature indicates that finding the factors and causes that influence construction accidents has been the passion of many researchers. Kartam and Bouz (1998) did a study in Kuwaiti construction and noted that the causes of accidents were due to worker turnover and false acts; inadequate safety performance; improper cleaning and unusable materials; destiny; low tool maintenance; supervisory fault; and misplacing objects. Abdelhamid and Everett (2000) conducted a more comprehensive study in the USA and classified the causes into human and physical factors. Human factors were due failed to secure and warn; Failed to wear personal protective equipment (PPE); horseplay; operating equipment without authority; operating at unsafe speed; personal factor; remove safety device; serviced moving and energized equipment; took unsafe position or posture; used defective tool or equipment; and other unsafe action. While, physical factors were due to; unsafe act of another person(s); disregard known prescribed procedures; defects of accident source; dress or apparel hazard; environmental hazard; fire hazard; hazardous arrangement; hazardous method; housekeeping hazard; improper assignment of personnel; inadequately guarded; public hazard; and other unsafe conditions.

Lubega et al (2000) did a study in Uganda and concluded the causes of accidents were mainly due to lack of awareness of safety regulations; lack of enforcement of safety regulations; poor regard for safety by people involved in construction projects; engaging incompetent personnel; non-vibrant professionalism; mechanical failure of construction machinery/equipment; physical and emotional stress; and chemical impairment. Pipitsupaphol and Watanabe (2000) did a study in Thailand construction sites and classified the causes into the most influential factors i.e. unique nature of the industry; job site conditions; unsafe equipment; unsafe methods; human elements; and management factors. They further concluded that major immediate causes were due to

failure to use personal protective equipment; improper loading or placement of equipment or supplies; failure to warn co-workers or to secure equipment; and improper use of equipment.

Toole (2002) also did a study in the USA and suggested that the causes of accidents were due to lack of proper training; deficient enforcement of safety; safety equipment not provided; unsafe methods or sequencing; unsafe site conditions; not using provided safety equipment; poor attitude toward safety; and isolated and sudden deviation from prescribed behavior. Tam et al (2004) did a study in China and noticed that the causes of accidents were due poor safety awareness from top leaders; lack of training; poor safety awareness of project managers; reluctance to input resources for safety; reckless operation; lack of certified skill labor; poor equipment; lack of first aid measures; lack of rigorous enforcement of safety regulation; lack of organizational commitment; low education level of workers; poor safety conscientiousness of workers; lack of personal protective equipment (PPE); ineffective operation of safety regulation; lack of technical guidance; lack of strict operational procedures; lack of experienced project managers; shortfall of safety regulations; lack of protection in material transportation; lack of protection in material storage; lack of teamwork spirits; excessive overtime work for labor; shortage of safety management manual; lack of innovative technology; and poor information flow.

2.9 Core Elements of Practices for Safety and Health Programs in Construction

2.9.1 Management Leadership

- Top management demonstrates its commitment to eliminating hazards and to continuously improving workplace safety and health, communicates that commitment to workers, and sets program expectations and responsibilities.
- Managers at all levels make safety and health a core organizational value, establish safety and health goals and objectives, provide adequate resources and support for the program, and set a good example.

2.9.2 Worker Participation

- Workers and their representatives are involved in all aspects of the program — including setting goals, identifying and reporting hazards, investigating incidents, and tracking progress.
- All workers, including contractors and temporary workers, understand their roles and responsibilities under the program and what they need to do to effectively carry them out.
- Workers are encouraged and have means to communicate openly with management and to report safety and health concerns or suggest improvements, without fear of retaliation.
- Any potential barriers or obstacles to worker participation in the program (for example, language, lack of information, or disincentives) are removed or addressed.

2.9.3 Hazard Identification and Assessment

- Procedures are put in place to continually identify workplace hazards and evaluate risks.
- Safety and health hazards from routine, non-routine, and emergency situations are identified and assessed.
- An initial assessment of existing hazards, exposures, and control measures is followed by periodic inspections and reassessments, to identify new hazards.
- Any incidents are investigated with the goal of identifying the root causes.
- Identified hazards are prioritized for control.

2.9.4 Hazard Prevention and Control

- Employers and workers cooperate to identify and select methods for eliminating, preventing, or controlling workplace hazards.
- Controls are selected according to a hierarchy that uses engineering solutions first, followed by safe work practices, administrative controls, and finally personal protective equipment (PPE).

- A plan is developed that ensures controls are implemented, interim protection is provided, progress is tracked, and the effectiveness of controls is verified.

2.9.5 Education and Training

- All workers are trained to understand how the program works and how to carry out the responsibilities assigned to them under the program.
- Employers, managers, and supervisors receive training on safety concepts and their responsibility for protecting workers' rights and responding to workers' reports and concerns.
- All workers are trained to recognize workplace hazards and to understand the control measures that have been implemented.

2.9.6 Program Evaluation and Improvement

- Control measures are periodically evaluated for effectiveness.
- Processes are established to monitor program performance, verify program implementation, and identify program shortcomings and opportunities for improvement.
- Necessary actions are taken to improve the program and overall safety and health performance.

2.9.7 Communication and Coordination for Employers on Multiemployer Worksites

- General contractors, contractors, and staffing agencies commit to providing the same level of safety and health protection to all employees.
- General contractors, contractors, subcontractors, and staffing agencies communicate the hazards present at the worksite and the hazards that work of contract workers may create on site.
- General contractors establish specifications and qualifications for contractors and staffing agencies.
- Prior to beginning work, general contractors, contractors, and staffing agencies coordinate on work planning and scheduling to identify and resolve any conflicts that could impact safety or health.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, it will explain detail on the overall flow of the project from the procedure and data collection method. This methodology also acts as a guideline and direction to ensure a smooth flow of the project. Chapter 3 contains a discussion of the study problem, research method, research design, appropriateness of design, research and interview objective, pilot test, sample population, participant rights, and data collection and analysis.

There are numerous ways to understand the concept of safety management in construction industry. This chapter explains how to conduct this study using methodology. In order to achieve the objective of this study, data played an important role in this research. there are three objectives of this study that needed to be fulfil in this study.

The first objective is to study the safety issues that happen in construction industry. The second objective is to identify the major cause of safety issue that happen in construction industry and lastly the third objective is to analyse solution to overcome the issues in safety management.

This study was carried out by literature review and questionnaire survey to achieve the objectives. The information related to the safety management in construction industry has been collected from journal, internet and published book. There is needed to understand the actual circumstances which had been practiced in construction industry for the aim to relate the theory and practical in reality.

3.2 Respondent

The questionnaire had been distributed to a total of 100 respondents that are actively involved in construction industry all over Malaysia.

3.3 Questionnaire

The question is designed based on information gathered from literature review. Data were gathered through a questionnaire and was designed based on the objectives of this study. The questionnaire was divided into 4 parts:

- 1) Demographic Information of the respondent
- 2) Perspective of Safety Management
- 3) Issue of Safety Management at Construction Industry
- 4) Solution to overcome Issue in Safety Management.

3.4 Questionnaire Structured

The questionnaire was divided into 4 parts and hand out was shown in the Appendix. The questionnaire was designed to have the level of agreement from the respondents as its measurement was in ordinal scale numbering from 1 to 5. The respondents may choose one of the ordinal scales according to their level of agreement for each question.

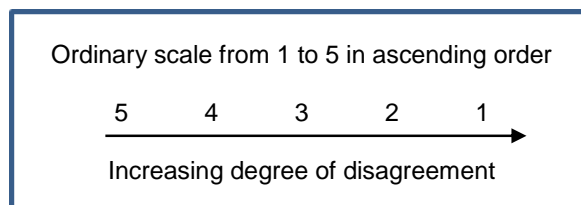


Figure 3.1 Likert's Scale

Various kinds of rating scales have been developed to measure attitudes directly (i.e. the person knows their attitude is being studied). The most widely used is the Likert Scale.

Likert (1932) developed the principle of measuring attitudes by asking people to respond to a series of statements about a topic, in terms of the extent to which they agree with them, and so tapping into the cognitive and affective components of attitudes.

Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions (Bowling, 1997; Burns, & Grove, 1997). These ordinal scales measure levels of agreement/disagreement.

A Likert-type scale assumes that the strength/intensity of experience is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured.

Each scale represents the following rating:

1 = Very low degree of agreement

2 = Low degree of agreement

3 = Natural degree of agreement

4 = High degree of agreement

5 = Very high degree of agreement

3.5 Data Analysis

In general, the data collected from questionnaire survey was analysed using the average index method. The equation used for the average index analysis is as follow (Al-Hammad, A. Mohsen and Assaf,1996). AI method was calculated using the following formula:

$$Average\ Index = \frac{\sum a_i \times X_i}{\sum X_i}$$

Where,

a_i is a constant expressing weight given to i

X_i is the variable that expressing the frequency of respondent

To identify the level of each objective, the rating of five levels is important in order to achieve the objective of this study. It was classified into five levels which were very low, low, moderate, high and very high. For level very low, an average index was between 1.0 to 1.5. for the low level, average index was within 1.5 to 2.5, for moderately, AI is between 2.5 to 3.5 and high-level shows on 3.5 to 4.5 of average index. And for the very high level, the average index is classified in the range within 4.5 to 5.0.

3.6 Research Methodology Flow Chart

This chapter discussed about data collection and data analysis of the study. The steps taken in order to conduct this study are presented in a flow chart. The methodology of this study was as follows:

- i) Study of literature related on safety and health
- ii) Preparation of questionnaire
- iii) Questionnaire survey
- iv) Analysing the questionnaire
- v) Qualitative analysing data obtained from respondent
- vi) Present data to be recorded for future reference
- vii) Conclusion and recommendation

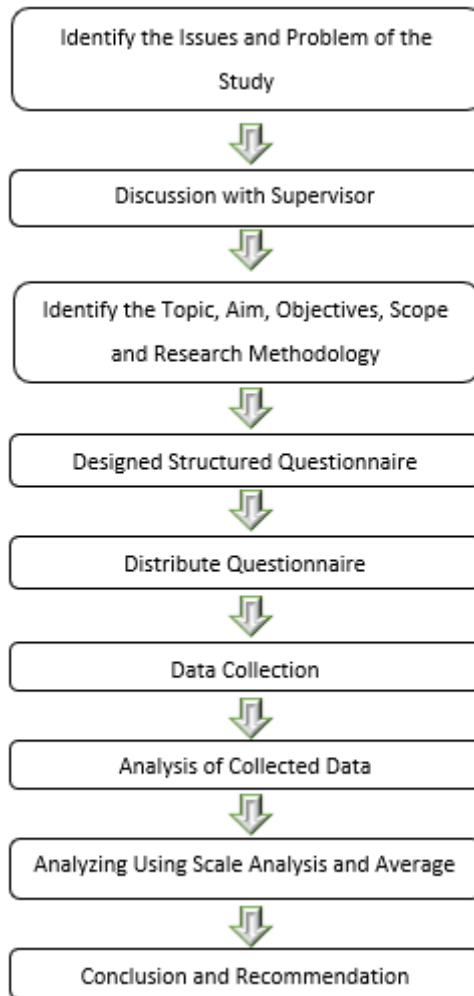


Figure 3.1 Methodology Flow Chart

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter will analyse and discussed about the data that had been collected from the respondents. In order to achieve the objective of this study, the data had been collected through structured questionnaire. Each of the section in structured questionnaire will be analysed and discussed respectively.

4.2 Data Collected

The structured questionnaire was designed based on previous chapter. There are 100 sets of questionnaire survey that have been distributed to a respondent that are actively involved in construction industry all over Malaysia.

Table 4.1 Tabulation of Respondent

Categories	Number of Respondent	Percentage (%)
Project Manager	5	5
Site Engineer	23	23
Safety Engineer	3	3
Assistant Engineer	28	28
Supervisor	21	21
Others	20	20

4.3 Data Analysis and Findings

The question is designed based on information gathered from literature review. Data were gathered through a questionnaire and was designed based on the objectives of this study. The questionnaire was divided into 4 parts:

- 1) Demographic Information of the respondent
- 2) Perspective of Safety Management
- 3) Issue of Safety Management at Construction Industry
- 4) Solution to overcome Issue in Safety Management.

4.3.1 Demographic Information of the respondent

The information about respondent include age, company sector the respondent is currently working with, location of the company, type of company, duration of the company and experience the respondent have towards construction project.

Figure 4.1 shows that the majority of the respondent were in the age of 30 to 40 years and 87 % of the respondent work in private sector as shown in Figure 4.2.

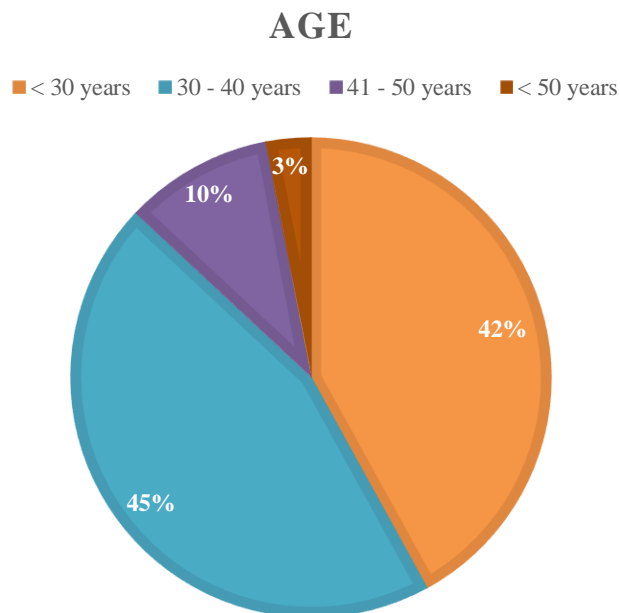


Figure 4.1 Age of the respondent

COMPANY SECTOR

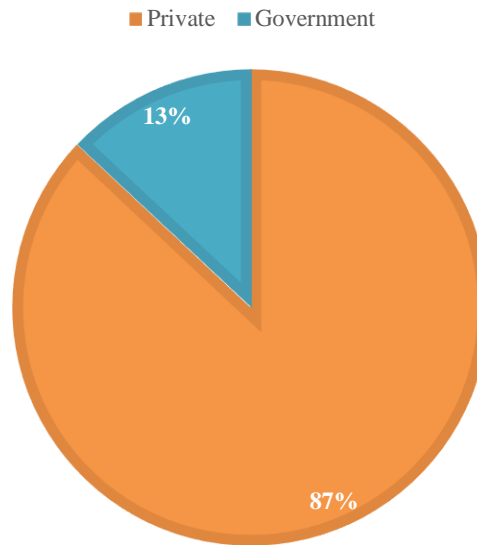


Figure 4.2 Company Sector

From Figure 4.3, the respondent has 5 to 10 years of experience in construction project. Only few that has more than 10 years of experience answer this questionnaire.

EXPERIENCE

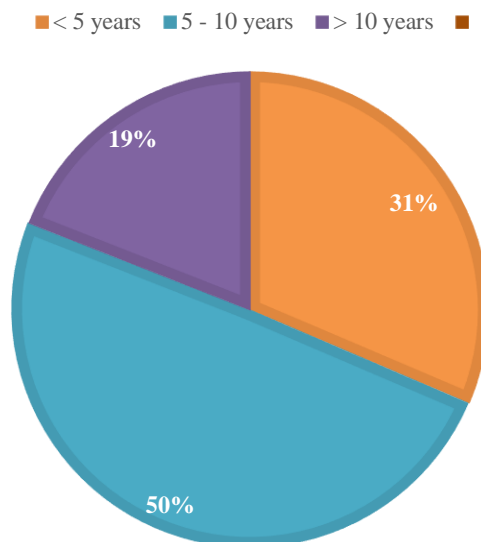


Figure 4.3 Experience in Construction Project

From Figure 4.4, most of the respondent company is from West Malaysia with the majority of Consultant Firm of type of company as shown in Figure 4.5. most of the company have a duration of less than 10 years.

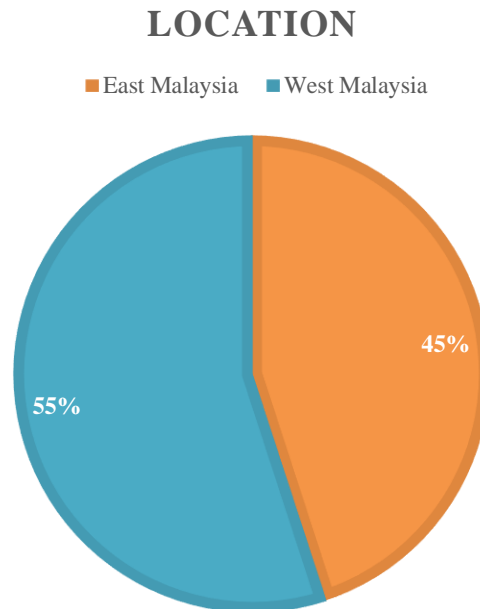


Figure 4.4 **Location of the company**

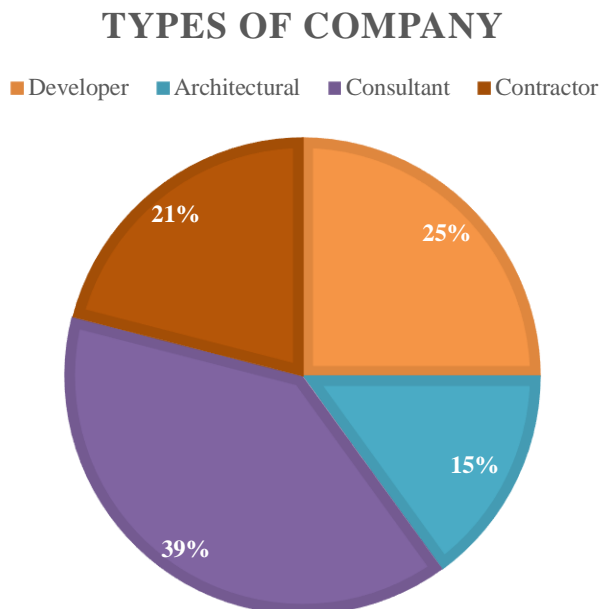


Figure 4.5 **Types of the Company**

DURATION OF THE COMPANY

■ < 10 years
 ■ 11 - 20 years
 ■ > 20 years
 ■

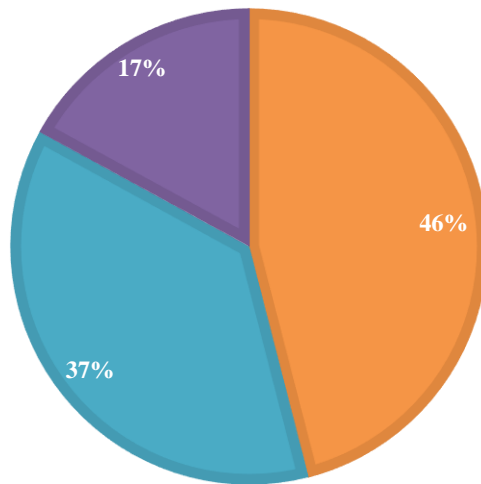


Figure 4.6 Duration of the Company

4.3.2 Issue of Safety Management in Construction Industry

Table 4.2 Issue of Safety Management in Construction Industry

Issue of Safety Management in Construction Industry	Statistics		Rank
	N	Mean	
Insufficient proper training and education.	100	4.59	1
Not everyone aware of the contents of safety policy.	100	4.52	2
Site not kept neat and tidy.	100	4.45	3
Tool box talks not regularly conducted.	100	4.31	4
Availability or access to safety equipment is insufficient.	100	4.12	5
Inadequate lighting provided for work areas and passages.	100	3.93	6
Workers not using suitable PPE as per hazards.	100	3.73	7
Workers not aware of emergency procedures.	100	3.7	8
Insufficient on inspecting hazardous conditions.	100	3.57	9
No safety programs or policy in place.	100	3.49	10
Access roads not suitable for movement plants and vehicles.	100	3	11
No site organisation chart displayed on board that indicating the responsible safety officer for every section of project.	100	2.6	12

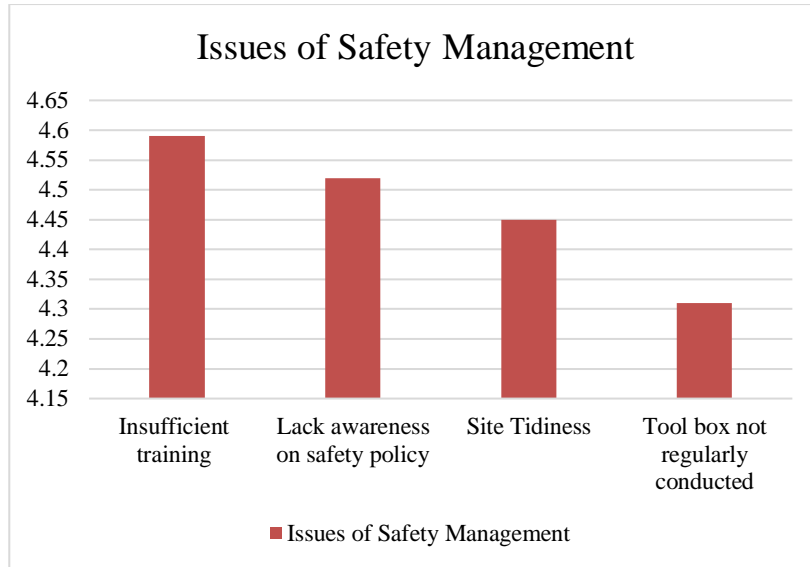


Figure 4.7 Issue of Safety Management by Rank

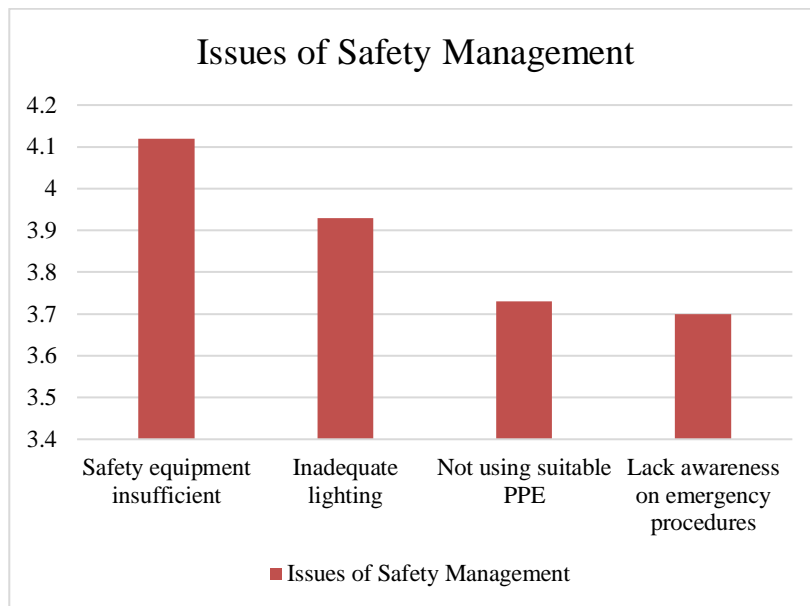


Figure 4.8 Issue of Safety Management by Rank



Figure 4.9 Issue of Safety Management by Rank

Based on the Average Index, Table 4.2, Graph 4.7, 4.8 and 4.9, the respondents rank the first as the Issue on Safety Management in Construction Industry is “Insufficient Proper Safety Training and Education” with an average index of 4.59.

Though most of a construction worker’s skills can be gained on the job, safety is one skill set that is best learned before works enter the construction site. The Occupational Safety and Health Administration (OSHA) and other organizations publish some resources to help businesses train their new laborers on standard safety and security practices, including pamphlets, worksheets, training videos, and even on-site training opportunities. Experienced workers should be expected to refresh their knowledge of standard safety by attending regular training sessions throughout the year. These training sessions can go over simple things such as fall protection and proper use of ladders, but the goal is to make sure everyone is adequately trained. Leaving these training sessions, workers should know what safety measure to do in the case of an incident.

Although workers are expected to attend regular safety training sessions about construction safety throughout the year, being able to practice safety training skills on-site would help construction workers enforce the safety rules. Practicing construction site safety training skills on-site will force workers to practice these skills in an environment where safety is essential and will make sure they are trained. Without the proper training, construction workers can be easily injured or even killed. In such an environment where

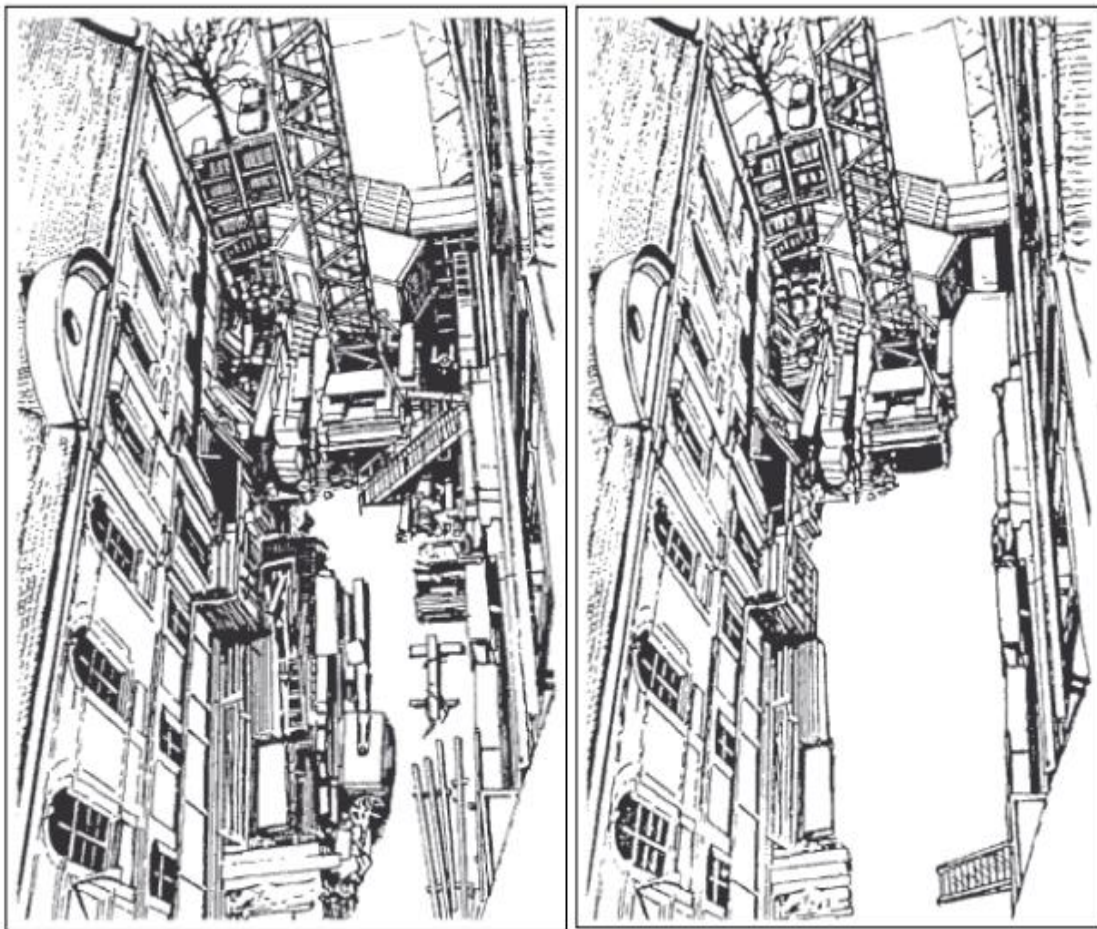
injuries and fatalities are highly likely, training is necessary and will prevent things like workplace injuries that will hurt you ethically and economically.

Lack of awareness on safety policy lies in second rank. Before any worker — no matter his or her role or experience level — can set foot on a construction site, he or she must be fully aware of the possible hazards. Ignorant workers are perhaps the biggest dangers in any industry, as their unknowing mistakes put everyone else at risk. Understanding of perils at hand and sustaining a perpetual state of alertness is perhaps the number-one best way to prevent accidents. To become aware of such risks and how to avoid them, see OSHA Safety Check Lists. Every single person that steps foot onto a construction site should be aware of the risks associated with the job and how to prevent them with their knowledge of construction site safety.

It is the construction managers job to make sure that every worker is aware of the dangers that come with working on a construction site and they must protect workers from these dangers. Any manager that fails to tell their crew and staff about how to avoid getting hurt and how to ensure safety is failing as a manager. Ensuring the safety of the construction workers and everyone on the site should be the number one priority of any construction manager. If the workers have no concept of construction site safety, they shouldn't be allowed on the construction site.

Workers are often best positioned to identify safety and health concerns and program shortcomings, such as emerging job site hazards, unsafe conditions, close calls/near misses, and actual incidents. By encouraging reporting and following up promptly on all reports, employers can address issues before someone gets hurt or becomes ill. This can be accomplished by establish a simple process for workers to report injuries, illnesses, close calls/near misses, hazards, and other safety and health concerns, and respond to reports promptly. Include an option for anonymous reporting to reduce fear of reprisal. Besides, the management report back to workers routinely and frequently about action taken in response to their concerns and suggestions. Worker's should also be emphasized that management will use reported information only to improve job site safety and health, and that no worker will experience retaliation for bringing such information to management's attention

Untidy site also one of the major issues at construction industry with an AI of 4.45. A badly planned and untidy site is the underlying cause of many accidents resulting from falls of material and collisions between workers and plant or equipment Figures 4.10. Space constraints, particularly in urban work sites, are nearly always the biggest limiting factor and a layout which caters best for the safety and health of workers may appear to be difficult to reconcile with productivity. Proper planning by management is an essential part of preparation and budgeting for the safe and efficient running of a construction operation.



Bad Layout

Good Layout

Figure 4.10 Bad site layout and lack of space prevent safe movement of workers and vehicles can cause accidents

Before work even begins on site, thought needs to be given to:

- the sequence or order in which work will be done and to any especially hazardous operations or processes;
- access for workers on and around the site. Routes should be free from obstruction and from exposure to hazards such as falling materials, materials-handling equipment and vehicles. Suitable warning notices should be posted. Routes to and from welfare facilities need equal consideration. Edge protection will be required at the edge of floor openings and stairs, and wherever there is a drop of 2 m or more as in Figure 4.11.
- routes for vehicular traffic. These should be “one way” as far as practicable. Traffic congestion prejudices the safety of workers, especially when impatient drivers unload goods hurriedly;
- storage areas for materials and equipment. Materials need to be stored as close as possible to the appropriate workstation, e.g. sand and gravel close to the cement batching plant, and timber close to the joinery shop. If this is not practicable, it is important to schedule the arrival of materials;
- the location of construction machinery. This is usually dependent on operational requirements so that tower cranes are subject to constraints such as their radius of operation, and pick-up and unloading points. The objective should be to avoid the need to slew the load over workers;
- the location of trade workshops – these are not usually moved after they are built;
- the location of medical and welfare facilities. On large sites sanitary facilities for both sexes should be provided at several locations;
- artificial lighting at places where work continues or workers pass after dark; – site security. The site should be fenced in to keep out unauthorized persons, children in particular, and to protect the public from site hazards. The type of fencing will depend on the location of the site, but in populated areas it should be at least 2 m high and without gaps or holes. Overhead protection will be necessary if tower crane loads pass over public thoroughfares;

- arrangements to keep the site tidy and for the collection and removal of waste;
- the need for low-voltage electric power supplies for temporary lighting, portable tools and equipment;
- training needs of both workers and supervisors.



Figure 4.11 Edge Protection; Guard-rails and Toe Boards

In Table 4.2 and Figure 4.8, the workers' not using suitable PPE as per hazards also become an issue at construction industry. To create a culture centred around construction site safety, workers need to have a proper equipment and adequate work area for the job at hand. Without the proper equipment, you can't have construction site safety because there will always be an opportunity to get injured using the wrong equipment. Construction workers equipped with improper gear are bound to make fatal errors. Not only should each piece of equipment on the job site be ideally suited to the task at hand, but construction firms have to make sure that all machinery and material are well maintained.

Construction companies must also consider equipment that doesn't directly contribute to the construction project. Workers should have plenty of water available on-site as well as a shady place to prevent dehydration and exposure-related illnesses. Longer construction projects may even benefit from fabric structures to store equipment and cover incomplete sites. Such simple things can be easily overlooked, and if they are, they increase the chance of on-site injury. Proper construction equipment ensures that there is at least some level of construction site safety within the construction firm.

Personal Protective Equipment (PPE) refers to protective clothing, helmets, goggles or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities. "Protective clothing" is applied to traditional categories of clothing, and "protective gear" applies to items such as pads, guards, shields, or masks, and others.

The purpose of personal protective equipment is to reduce employee exposure to hazards when engineering controls and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present. PPE has the serious limitation that it does not eliminate the hazard at the source and may result in employees being exposed to the hazard if the equipment fails.

Any item of PPE imposes a barrier between the wearer/user and the working environment. This can create additional strains on the wearer; impair their ability to carry out their work and create significant levels of discomfort. Any of these can discourage wearers from using PPE correctly, therefore placing them at risk of injury, ill-health or, under extreme circumstances, death. Good ergonomic design can help to minimise these barriers and can therefore help to ensure safe and healthy working conditions through the correct use of PPE.

Practices of occupational safety and health can use hazard controls and interventions to mitigate workplace hazards, which pose a threat to the safety and quality of life of workers. The hierarchy of hazard controls provides a policy framework which ranks the types of hazard controls in terms of absolute risk reduction. At the top of the

hierarchy are elimination and substitution, which remove the hazard entirely or replace the hazard with a safer alternative. If elimination or substitution measures cannot apply, engineering controls and administrative controls, which seek to design safer mechanisms and coach safer human behaviour, are implemented. Personal protective equipment ranks last on the hierarchy of controls, as the workers are regularly exposed to the hazard, with a barrier of protection. The hierarchy of controls is important in acknowledging that, while personal protective equipment has tremendous utility, it is not the desired mechanism of control in terms of worker safety.

4.3.3 Solution to Overcome Issue in Safety Management

The data analyse in this section investigates various ways that management can take in order to make their site safer and have more effective safety management. If the issue can be overcome by being monitored closely, safety cases at construction industry can be minimize.

There are two divided sections in Analysed Solution to Overcome the Issue in Safety Management. The two divided section is related to Company's Management and Safety Officers related.

After the analysis of data from the questionnaire, based on the Average Index, Table 4.3 and Figure 4.12, the respondents rank the Analysed Solution that can help overcome the Issue in Safety Management under the Company's Management related is "Establishing safety training and orientation for site operatives" as first rank with an average index of 5. 100 out of 100 respondents want it to be implemented in every construction industry. It indicates that safety training plays a very important role in safety management which may lead to accident when the person involved in construction have lack training.

Based on Table 4.4 and Figure 4.13, the solution that rank first under the Safety Officer's related is to "Provide Advice on Action to be Taken in Order to Ensure a Safer Working Environment". Then, Safety Officers must do safety auditing regularly to ensure site safety and review the effectiveness safety management.

Table 4.3 Proposed Solution; Company’s Management Related

Proposed Solution to Overcome the Issue in Safety Management in Construction Industry	Statistics		Rank
	N	Mean	
Establishing safety training and orientation for site operatives	100	5	1
Provides Personal Protective Equipment (PPE) and other resources to project management team	100	4.94	2
Raises the awareness of safety and health and provides information and instruction to employees on relevant legislation and good work practices	100	4.93	3

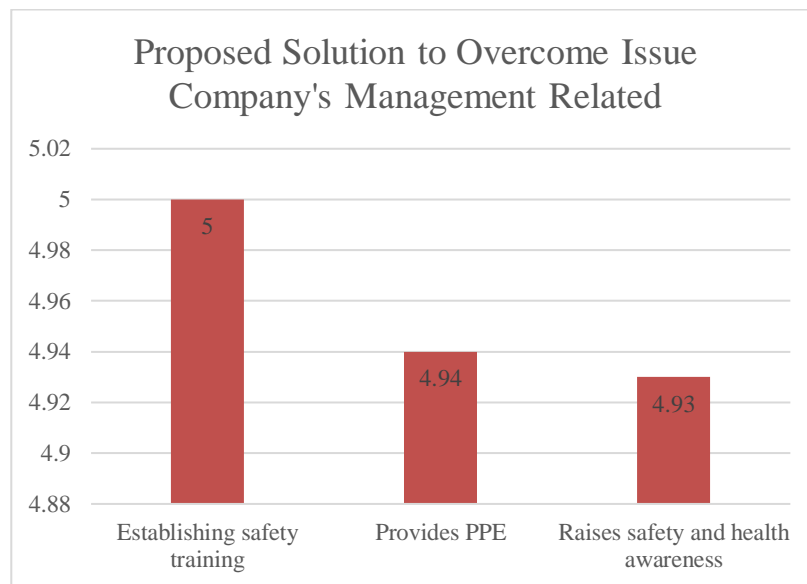


Figure 4.12 Proposed Solution; Company’s Management Related

From Table and Figure above, the best solution to be chosen was establishing safety training and orientation for site operatives. Education and Training are important tools for informing workers and managers about hazards and controls so they can work more safely and be more productive. Another role of education and training, however, is to provide workers and managers with a greater understanding of the safety and health program itself, so that they can contribute to its development and implementation.

It provides employers (owners and executives), managers, supervisors, and workers with:, knowledge and skills needed to do their work safely and avoid creating

hazards that could place themselves or others at risk. Awareness and understanding of hazards and how to identify, report, and control them. And specialized training, when their work involves unique hazards.

Additional training may be needed depending on the roles assigned to employers or individual managers, supervisors, and workers. For example, employers, managers, and supervisors may need specific training to ensure that they can fulfil their roles in providing leadership, direction, and resources for the safety and health program. Workers assigned specific roles in the program (e.g., incident investigation team members) may need training to ensure their full participation in those functions.

Effective training and education can be provided outside a formal classroom setting. Peer-to-peer training, on-the-job training, daily toolbox talks, and worksite demonstrations can be effective in conveying safety concepts, ensuring understanding of hazards and their controls, and promoting good work practices.

Provide training to all managers; supervisors; workers; and contractor, subcontractor, and temporary agency workers on:

- Safety and health policies, goals, and procedures
- Functions of the safety and health program
- Whom to contact with questions or concerns about the program (including contact information)
- How to report hazards, injuries, illnesses, and close calls/near misses
- What to do in an emergency
- The employer's responsibilities under the program
- Workers' rights under the OSH Act

Information on the safety and health hazards of the job site and the controls for those hazards are provided. Ensure that training is provided in the language(s) and at a literacy level that all workers can understand.

Table 4.4 Proposed Solution; Safety Officer’s Related

Proposed Solution to Overcome the Issue in Safety Management in Construction Industry	Statistics		Rank
	N	Mean	
Provide advice on actions to be taken in order to ensure a safer working environment	100	4.94	1
Safety officers must do safety auditing regularly	100	4.91	2

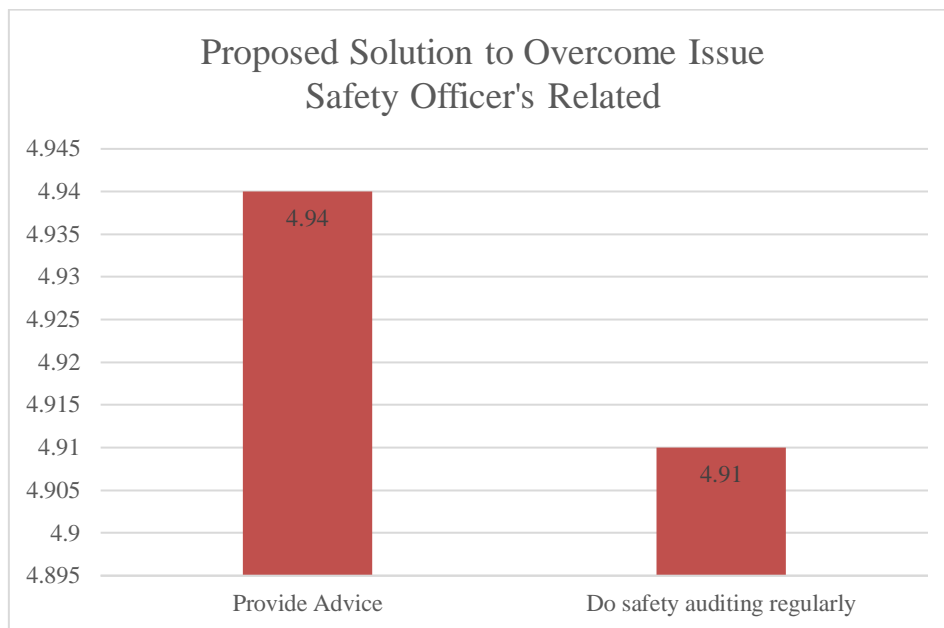


Figure 4.13 Proposed Solution; Safety Officer’s Related

The safety officer is in charge of inspecting site conditions to determine if hazards are present and to establish procedures and policies to overcome those hazardous situations. The safety officer looks for broken equipment, defective tools, and other potential hazards, focusing on worker safety. The safety officer determines what type of personal protective equipment (PPE) is needed and makes sure that workers know how to operate and use tools and equipment.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter concludes all the findings that lead to the achievement of the objective of the study. The result is based on the analysis from average index analysis. In this chapter, each of the objectives will be discussed in order to indicate a clear insight for the achievement of each objective.

5.2 Valuation of Objectives

In this study, the questionnaire structured was divided into 4 parts to achieve the objectives of this study. The objective will be discussed more comprehensively as below;

5.2.1 Demographic Information

All of the respondent involved in this study are both from west and east Malaysia that actively involved in construction activities. The respondent has working experience majority of 10 to 20 years with the percentage in service of 50%.

5.2.2 Objective (i) and (ii)

The first objective of this study was to study the safety issues that happen in construction industry. There are 12 elements on the safety issues which is: Insufficient proper training and education, not everyone aware of the contents of safety policy, site not kept neat and tidy, Tool box talks not regularly conducted, availability or access to safety equipment is insufficient, inadequate lighting provided for work areas and passages, workers not using suitable PPE as per hazards, workers not aware of emergency procedures, Insufficient on inspecting hazardous conditions, No safety programs or policy in place, access roads not suitable for movement plants and vehicles, no site

organisation chart displayed on board that indicating the responsible safety officer for every section of project.

And thus, for the second objective which is to identified the major cause of safety issue in construction industry are identified through the questionnaire. Which is, due to the insufficient proper training and education.

5.2.3 Objective (iii)

The third objective of this study is to analyse solution to overcome the safety management. There are two divided sections in Analysed Solution to Overcome the Issue in Safety Management. The two divided section is related to Company's Management and Safety Officers related.

After the analysis of data from the questionnaire, based on the Average Index, under the Company's Management related is "Establishing safety training and orientation for site operatives" rank first with an average index of 5. 100 out of 100 respondents want it to be implemented in every construction industry. It indicates that safety training plays a very important role in safety management which may lead to accident when the person involved in construction have lack training.

The solution that rank first under the Safety Officer's related is to "Provide Advice on Action to be Taken in Order to Ensure a Safer Working Environment". Then, Safety Officers must do safety auditing regularly to ensure site safety and review the effectiveness safety management.

5.3 Recommendation for Future Research

There are some recommendations for those who are interested to do further study on safety and health practices in the future:

- The number of respondents must be increase in order to compare how difference is the safety issues from the past and the present.
- The result obtained must be validated by the safety expert like safety officers to reconfirm the findings.

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APPENDIX A
QUESTIONNAIRE APPENDIX 1

SAFETY MANAGEMENT IN CONSTRUCTION INDUSTRY

* Required

Section A - Personal and Organization Background

1. Age

Mark only one oval.

- Less than 30 years
- 30 - 40 years
- 41 - 50 years
- More than 50 years

2. Company Sector *

Mark only one oval.

- Government
- Private

3. Designation (Position)

Mark only one oval.

- Project Manager
- Site Engineer
- Safety Engineer
- Assistant Site Engineer
- Supervisor
- Other: _____

4. Location of company

Mark only one oval.

- East Malaysia
- West Malaysia

5. Type of Company / Organization *

Mark only one oval.

- Developer
- Contractor
- Architectural Firm
- Consultant Firm

6. Duration of the Company / Organization had served *

Mark only one oval.

- Less than 10 years
- 10 - 20 years
- More than 20 years

7. Experience in construction project *

Mark only one oval.

- Less than 5 years
- 5 - 10 years
- More than 10 years

Section B - Perspective of Safety Management

Section B consists of 5 sets of questions.

8. 1. Does your company have a safety program or policy in place? *

Mark only one oval.

- Yes
- No
- Maybe

9. 2. Does a competent safety professional available at site? *

Mark only one oval.

- Yes
- No
- Maybe

10. 3. Does employees given safety orientation? *

Mark only one oval.

- Yes
- No
- Maybe

11. 4. Does the company have a hazard and incident reporting system in place? *

Mark only one oval.

- Yes
- No
- Maybe

12. 5. Does the company have an incident emergency response plan? *

Mark only one oval.

- Yes
- No
- Maybe

Section C - Issue of safety management at site

Please indicate in your degree of agreement or disagreement in each statement by tick/circle for each question based on 5-point Likert scale

(1= strongly disagree , 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

Section C consists of 12 sets of questions.

13. Availability or access to safety equipment is insufficient *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. Workers not using suitable PPE as per hazards *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Insufficient proper training and education *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. Tool box talks not regularly conducted *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Not everyone aware of the contents of safety policy *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Inadequate lighting provided for work areas and passages *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. **No site organisation chart displayed on board that indicating the responsible safety officer for every section of project ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. **Site not kept neat and tidy ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. **Access roads not suitable for movement plants and vehicles ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22. **No safety programs or policy in place ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23. **Insufficient on inspecting hazardous conditions ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. **Workers not aware of emergency procedures ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section D - Solution to overcome Issue in Safety Management

Please indicate in your degree of agreement or disagreement in each statement by tick/circle for each question based on 5-point Likert scale

(1= strongly disagree , 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

Section D consists of 5 sets of questions.

Company's Management

25. **1. Establishing safety training and orientation for site operatives. ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26. **2. Provides Personal Protective Equipment (PPE) and other resources to project management team. ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

27. **3. Raises the awareness of safety and health and provides information and instruction to employees on relevant legislation and good work practices. ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Safety Officers

28. **1. Provide advice on actions to be taken in order to ensure a safer working environment.**

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. **2. Safety officers must do safety auditing regularly.**

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>