CRITICAL FACTORS FOR THE EFFECTIVE SAFETY MANAGEMENT SYSTEM OF CONSTRUCTION PROJECT SITES IN PERAK

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by

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I hereby declare that all corrections and comments made by the supervisor(s)and examiner have been taken into consideration and rectified accordingly.

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Date : 29th July 2021

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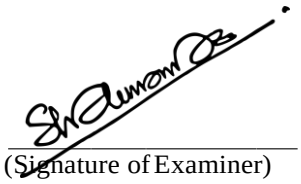

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ABSTRAK

Industri pembinaan adalah salah satu sektor penting dalam ekonomi di Malaysia yang mempunyai sumbangan mereka sendiri dari segi pembangunan tetapi ia juga diklasifikasikan sebagai salah satu industri yang berisiko tinggi di dunia. Walau bagaimanapun, terdapat penurunan yang ketara dalam jumlah dan kadar kemalangan dan kematian selama 20 tahun terakhir sehingga kini. Namun demikian, menurut rekod, industri pembinaan tetap menjadi salah satu industri yang berisiko tinggi di Malaysia. Tujuan kajian ini adalah untuk mengkaji sistem pengurusan keselamatan dalam industri pembinaan di Malaysia, dan juga untuk mengetengahkan faktor kritikal yang mempengaruhi keberkesanan sistem pengurusan keselamatan terutama di tapak pembinaan. Industri ini telah memberi sumbangan besar kepada pertumbuhan ekonomi negara. Namun, apabila sistem pengurusan keselamatan pembinaan tidak dilaksanakan secara sistematik, kemalangan tetap akan berlaku, dan ini boleh menjejaskan reputasi industri ini serta pertumbuhan ekonomi negara. Penyelidikan ini akan tertumpu pada sebarang projek pembinaan di Perak, Malaysia. Data akan dikumpulkan dengan melakukan tinjauan soal selidik dan kaedah kajian kes. Sementara itu, keutamaan penting bagi setiap faktor dalam sistem pengurusan keselamatan dicadangkan dari sesi temu ramah dan data adalah dari perspektif pasukan kontraktor pada projek pembinaan sebenar. Kemudian, analisis melalui data yang diperoleh akan dilakukan dengan menggunakan perbandingan berpasangan AHP dalam perisian Expert Choice dan ia akan menghasilkan hierarki kepentingan utama di antara semua faktor kritikal. Penyelidikan ini mampu menyumbang untuk mengenal pasti faktor-faktor kritikal yang berkaitan dengan keberkesanan sistem pengurusan keselamatan di tapak pembinaan di Perak, Malaysia.

ABSTRACT

Construction industry is one of the important sectors in the Malaysian economy that have their own contribution in terms of development but can be classified as one of the risky industries in the world. However, there have been significant reductions in the number and the rate of accident and fatality over the last 20 years or more. Nevertheless, according to the record, the construction industry remains as the one of the high-risk industries in Malaysia. The purpose of this study is to examine safety management system in the Malaysian construction industry, as well as to highlight the critical factor that influenced the effectiveness of safety management systems especially at construction sites. This industry has contributed significantly to the economic growth of the country. However, when construction safety management systems are not implemented systematically, accidents will happen, and this can affect this industry's reputation and economy growth. The research focuses on construction projects in Perak, Malaysia. The data was collected by doing a questionnaire survey and a case study method. The priority important of each factor in safety management system is suggested from the interview session and the data is from the perspective of contractor team at the real construction project. Then, data analysis was performed by using the Analytical Hierarchy Process Pairwise comparison in Expert Choice software and the result produced the hierarchy of priority importance among all the critical factors. This research contributes to identifying the critical factors related to the effectiveness of safety management system at construction sites in Perak, Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

The construction industry is one of the important sectors of the Malaysian economy that have their own contribution in terms of development and improvement of facilities in this country (Khan *et al.*, 2014). Rapid growth and a strong performance by the construction sector automatically turn this sector to be classified as the top three major economic sectors in Malaysia. In addition, the number of employees for the construction sector is increasing rapidly and the number of employees was recorded more than 1,000,000 since 2010 and the record still increasing year by year (Ibrahim *et al.*, 2010). Basically, the growth of the construction sector among Malaysian is related to strong stability and influences of socio-economic policies during that time (Khan *et al.*, 2014). Although the construction industry contributes to many successful advanced developments, the ethical dilemma about the safety aspect among employees has always been a public concern until today.

The safety aspect is very essential and synonymous for any occupational sector due to the risk and effect when this issue is not taken seriously. Safety issue should be prioritized first rather than other aspects to make sure the process and progress of the construction can be completed without any problem. Accidents or fatality are very close to being related to the high-risk job industry, not only in Malaysia but also involve other developed countries (Bhattacharjee *et al.*, 2011). In fact, it can cause a very serious and negative impression on the public's eye toward the construction industry when any accidents happen. People's perception of the construction industry is always dangerous and high risk when it is related to the number of recorded accidents and fatality occurred over the years. Despite there being so many technologies equipment and improvement

such as Building Information Modelling (BIM) has been invented to solve safety problems at construction sites but it still not effective and also make it become harder (Fox and Morton, 2013).

In fact, safety management system for any construction project sites in Malaysia are basically being established by several responsible authorities such as Department Safety and Health (DOSH) and Construction Industry Development Board (CIDB). This kind of legislation and regulation are applicable to any construction project sites from all over this country including this research specific area which is in Perak state. For instance, to ensure safety management system can be successfully implemented at sites, CIDB has enforced and required for every worker to be equipped with a CIDB green card to make sure all of them are well known about the importance of safety aspect in construction industry. Through this study, the effectiveness of safety management system can be validated by referring to the number of accident and fatality rates occurred at construction sites from certain years to years. Effective safety management system can be achieved when several critical safety aspects being emphasized by the top management and successfully practiced by construction industry worker at any time. In conjunction to this research are which is in Perak, the effectiveness of safety management system is being investigate directly from several construction project involves building construction project that being done by the contractor with the CIDB construction grade of G7 from each district in Perak state.

1.2 Problem Statement

Despite being one of the highest Malaysian's job employment with the statistic of 9.1% of total employment in 2017, the construction sector is also known and considered as a high-risk sector because it has frequently recorded as the highest number of accidents and fatality rates that occurred specifically at construction sites compared to other industries (Hamid *et al.*, 2019). In addition, according to Statistics from the Social Security Organization (SOCSO), there are about 7,338 accidents reported in the construction industry in 2016. By comparing the recorded accidents in 2011 with 4,330 cases, a dramatic increase of 69.47% fatality rates occurred between 2011 until 2019 (Hamid *et al.*, 2019).

Table 1.1 Recorded Accident and Fatality Occurred at Construction Site.

Sources: Department Safety and Health (2020)

Years	NP	PD	Death	Total
2015	138	11	88	237
2016	126	5	91	222
2017	110	4	63	177
2018	106	8	118	232
2019	227	15	84	326
2020	160	4	58	222

Legend:

NP: Non-Permanent Disability

PD: Permanent Disability

Based on the data in Table 1.1, this statistic has been obtained from the International Policy and Research Development Division, Department of Occupational Safety and Health Malaysia. Through this statistic, the recorded number of accidents and fatalities including Non-Permanent Disability and Permanent Disability cases that occurred at construction sites from 2015 until 2020 is showing negative impression with less improvement in term of successful achievement even though the number of cases in certain years has decreased, but it started to increase back on the next year (DOSH, 2020). From this statement, it seems that an investigation about the effectiveness due to the implementation of safety management systems at construction sites is required.

In addition, according to Director-General of the Department of Occupational Safety and Health (DOSH) Malaysia, the fatality rates that occurred at construction sites are identified as three times higher than overall industries and workplaces in Malaysia (DOSH, 2019). This statement clearly shows that the construction industry is one of the high-risk industries that really need a very strong emphasis on ensuring the safety of the employees involved.

In conjunction with this study which is specifically in Perak, Department of Occupational Safety and Health (DOSH) Perak branch has stated that there are 23 fatal cases at construction sites reported in Perak just only from January to July in that year. In addition, 27 construction sites had been inspected during the site inspection and from that DOSH Perak has issued about 179 prohibition notices. Then, two construction sites in Batu Gajah and Taiping had been sealed due to non-compliance of safety aspect at construction sites. In addition, there are about 42 notices for required repairs and 87 directives were issued for various offences due to not providing adequate protection and safety measures taken at open sidewalks involving high-rise work, scaffoldings, work platforms and access to unsafe workplaces (DOSH, 2019).

From this statement, it clearly shows that there are many companies that still do not implement the proper safety management system at the construction site. Weak application and implementation of safety management will result in a high number of accident and facility cases among construction workers at construction sites (Yousif, 2017). In fact, time delays during the construction phase and unnecessary cost expenses can be controlled if safety management systems being implemented and applied in the correct ways (Ahbab and Çelik, 2012). Thus, a specific investigation on the critical factors that influence the effectiveness of safety management systems that is applied at construction sites, especially in Perak state, need to be done to check whether this approach manages to assist, reduce, or prevent any accidents from occurring at construction sites.

1.3 Objectives

The objectives of this study are listed below:

I. To identify the current safety practices applied at the construction sites in Perak.

II. To investigate the critical safety factors that influenced the implementation of safety management at the construction sites in Malaysia.

III. To determine the priority importance factor related to the effectiveness of Safety Management System at construction sites in Perak.

1.4 Scope of the Work

This study is focusing on the critical factors that influence the effectiveness of safety management systems at construction sites. The scope and limitation of this study are limit only for any building construction project in Perak state. In fact, Perak state is one of the top five of the highest number of accidents that happen at construction sites in Malaysia with Sarawak state becoming the first (Ayob *et al.*, 2018). Thus, current safety practices that are already being implemented will be investigated to relate back with the safety factor. The data for the analysis process will be obtained from the perspectives of contractor team that are directly involved with any type of work or job at the construction sites and it has been limit about 10 different contractor company from different district in Perak will be the sources of data collection. From this, it can ensure the accuracy of data can be controlled according to the real-construction situation. In addition, a comparison between the obtained data from real situation experienced with the data from literature review is required to check the gap of data accuracy and consistency.

1.5 Significant of Study

The significance of this study is it can benefit multiple parties, such as employees and others related to the construction industry. Finalizing critical factors that influence the effectiveness of the safety management system will be a key technique for achieving the goals and target related to the safety management system and at the same time, reducing the risk of accidents and fatality at construction sites (Ai Lin Teo and Yean Yng Ling, 2006). In addition, implementing a proper safety management system at construction sites can increase construction productivity (Rahim Abdul Hamid *et al.*, 2018). It is because productivity, work organization and tolerance of construction workers are likely related and affected by the safety management system that has been

applied at the construction site. Next, a lot of complications or injuries will arise if the safety of the employee is neglected or being overlooked by the employer. So, this study can be an informative guide and reference to evaluate which critical factor has the largest impact on the effectiveness of the safety management system from the statistical analysis. This research may also indicate the level of safety awareness among construction workers. At last, this study hopes the readers, especially those in the construction industry can improve and enhance their safety awareness to be the priority among the other aspects.

1.6 Chapter Outline

This study report consists of five chapters. Chapter 1, an introduction about the overview of the overall study includes general background, problem statements, objectives, the scope of study and significance of the study. In Chapter 2, the literature review which means all the information related to this study title is obtained to gain more idea and understanding including the theory, methodology and analysis equipment by searching from the journal, article, and other related resources. Chapter 3 is focused on the suitable and relevant methodology to be used in this study. It consists of systematic procedure and flows on how data is obtained to be used in the analysis stage. Chapter 4 is the data analysis phase. The data obtained from the related methodology will be analysed to produce an informative result according to specification and category. Data presentation will be produced for further discussion purposes. Chapter 5 is the last chapter that concludes the result of the entire study. The conclusion in this chapter is used to identify whether the objectives of the study are achieved or otherwise. Recommendation for future research is provided to improve this related study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Safety issues in the construction industry have evolved from a long time ago due to the construction industry and that why it can be considered as one of the high-risk occupations in Malaysia. It also can be classified as the most dangerous job in the world due to the higher number of injuries and accidents recorded among construction workers (Chong and Low, 2014). In this chapter, a review from all kinds of literature sources related to the safety management system to investigate the level of its effectiveness at construction sites. This review is going deeper to gain more information and ideas on the critical factors that influence the effectiveness of safety management systems at construction sites, based on the statistics and information obtained from the Department of Safety and Health (DOSH) and other previous research and studies. In addition, related issues, and topics regarding safety aspects such as current safety measures at construction are included in this review to enhance more understanding of how safety management systems are being implemented at construction sites.

2.2 Importance of Safety Management Systems at Construction Sites.

Relationships between safety issues with the construction industry are often associated with each other. Safety aspects among the employees is a very serious matter and essential due to the high percentage of negative impact will be faced if this issue is neglected. Death or fatality is the highest impact that has a high possibility to occur at construction sites if the safety aspect is not being implemented properly according to the standards and guideline. When it affects human life or life loss, this matter should be taken seriously without any compromise (Hui-Nee, 2014).

The safety aspect also affected the cost and time consumed. Accidents and other related safety problems not only cause disruptions in the operation and completion of the project but they also, directly and indirectly affect the cost (Keng and Razak, 2014) . Time delays and cost overrun can be some of the reasons why safety management should be implemented properly to avoid or reduce this issue from occurring. For example, according to Keng and Razak (2014), if any accident happens that causes injuries or death, the progress of work needs to be paused or stopped until a certain time. It is because the authorities or specialized parties such as DOSH will conduct a case investigation to find the proof and evidence due to the cases. Thus, any progress of work cannot be proceeding until the evidence is found which this event will affect a lot of time consumed.

In addition, unnecessary cost expenses or cost overrun also can be reduced by implementing proper safety management at construction sites (Ahbab and Çelik, 2012). For example, once any kind of machinery, working equipment or materials are broken, it will cause the overhead for this project to rise. The company needs to spend additional costs to repair or repurchase those machineries and material that are broken due to the accident that happens at construction sites. In the other case, total operation cost can be increased if any injured employees have a desire to claim their workers' compensation due to injuries or accidents caused by the company's fault. According to a study, the worker's compensation in the construction industry in the United States is four-time higher than other industries average record (Liao and Chiang, 2015). Thus, ensuring the safety management system being applied correctly at construction sites can make the working environment safe and at the same time, it helps to reduce this kind of vulnerability so that the project can be finished on schedule and on the budget without or less problematic issues (Ravindra, 2020).

2.3 Enforcement Bodies and Personnel Responsible for Safety Management System of Construction Sites in Malaysia

In the construction industry, cooperation among each other is required to complete the project. Thus, several agencies and parties must work together, and they have their own responsibility toward the implementation of safety management systems at construction sites. They are also required to make sure the effectiveness of safety management systems can benefit all the workers. Basically, it involves varies parties such as Government agencies, project owner or employer, consultant, project contractor, and the construction worker itself, who are the major participants to ensure safety aspects at construction being implemented. It is essential to carry out their roles and duties in ensuring that the application, supervision, and regulation of safety is carried out more efficiently so that any accidents and other related safety problems can be reduced or avoided.

2.3.1 Department of Safety and Health (DOSH)

This department is placed under the responsibility of the Ministry of Human Resources of Malaysia. DOSH is the body that is responsible for ensuring the safety, health, and welfare of all personnel in any organization that is related to any occupational sector is maintained. In other words, this department is responsible for securing anyone from any kind of safety and health risks and hazards resulting from the operations of the different industries including the construction sector. Their goal of being the nation's leading agency in developing a secure and safe working environment which mostly can help in boosting the quality and productivity of the worker at the workplace. In addition, the roles of the department also cover the following (DOSH, 2021):

1. To study and review the policies and legislations of occupational safety and health.
2. To conduct research and technical analysis on issues related to occupational safety and health at the workplace.
3. Helping to promote and organize supportive programs to employers, staff, and the public to improve and raise their understanding about occupational safety and health.
4. To become a secretariat for the National Council regarding occupational safety and health.

In addition, the Department of Safety and Health also has the responsibility on enforcing some of the legislation in Malaysia which involves act and policy at the workplace. This type of policy being enforced is only to make sure the progress and progress of any occupational sector are secure and safe for the worker. In conjunction with their new objectives which is to reduce any industrial or occupational accidents and fatality rates into 4.36/100,000 workers in 2020 (DOSH, 2020). There are several act and registration being under the supervision of DOSH such as the Occupational Safety and Health Act 1994, Factories and Machinery Act 1967 and Part of Petroleum Act 1984 (Safety Measures).

To fulfil their specific duties and roles, this Department needs to carry out three essential job scope involving the establishment of guidelines, enforcement of the law, endorsement of any project and organize any public interaction programmed to enhance the safety awareness among the public. These initiatives are required to improve the public perception and knowledge about safety management systems at any workplace including construction sites. The scope of the roles and responsibilities for this department is quite changing following the improvement made by the Government. At

first, it is only focusing on the formulation of the guidelines, authorization, accreditation, and data processing but nowadays this department only relies more on the enforcement of acts and laws, site and workplace inspections, safety assessments, legal proceedings, and accident investigations.

2.3.2 National Institute of Occupational Safety and Health (NIOSH)

NIOSH is responsible to provide training, advisory services, data sharing, research and development to any parties involved either directly or indirectly in any sector regarding occupational safety and health. Dissemination of knowledge is one of the essential priorities of NIOSH in which has been the industry's request. As stated in the Memorandum and Articles of Association, the goal of NIOSH is to:

1. Contribute to improving occupational safety and health (OSH) by developing and offering national curriculum and training support for staff members, managers, and others responsible for enforcing OSH at the worksite.
2. Facilitate those responsible for OSH with the latest knowledge from the research in the scope of OSH in Malaysia and from internationally.
3. Construct short-term and long-term research in OSH-related fields that will advantage and make a positive contribution to the country. This department is a resource source in providing the data from any field study in the field of OSH.
4. Organize and be involved in any exhibitions, workshops, and conferences to deliver information, advice, and support to industries to succeed in their safety and health campaigns.

2.3.3 Construction Industry Development Board (CIDB)

The Malaysian Construction Industry Development Board (CIDB) or known as the Pembangunan Industri Pembinaan Malaysia has been formed under the Malaysian Construction Industry Development Act (Act 520) since 1994 and has been in operation until now. It is also a legislative body that is under the authority of the Ministry of Works that is responsible for improving the capacity of the construction industry by optimizing efficiency and productivity, concentrating strong perspective on professionalism, creativity, and information in strategies to improve the lives (CIDB, 2021).

CIDB has the authorized power as they can immediately stop any construction work to carry out site inspections if any cases occurred. However, all the cost expenses during site inspection are under the contractor itself. Next, they also have the rights from the authority to order any execution of specified construction works and to destroy any defective building and structural or any faulty part of the building. All these rights lay under the amendment of Act 520 for CIDB. Next, CIDB also has their own major roles regarding safety management systems which is Safety and Health Assessment System in Construction (SHASSIC) (Yakubu *et al.*, 2012). SHASSIC is a method or tool that is used for analysing, assessing, and evaluating the level of safety and health performance by contractors and other related parties in any construction project. Three methods and components are used by SHASSIC to evaluate the safety and health performance in construction sites such as document check, worksite inspection and employee interview. According to CIDB CIS 10:2008, each component would have its specific weightage in order to check the level of safety and health for any construction project with 40% for document project, 40% for worksite inspection and 20% for employee interview (Yakubu *et al.*, 2012).

In the meanwhile, among its duties related to construction safety is to approve and credential qualified construction workers and construction supervisors. With this function, the Board is authorized to establish the 'Safety and Health Induction Course for Construction Workers (SICW). Upon successful completion of the said course, The Board will certify all the accredited construction workers and construction site supervisors that finished and complete all the requirements by authorizing them with 'CIDB Green Cards'. CIDB Green Cards is used to allow, enable, and qualify the owner to enter and work at construction sites. In addition, Takaful insurance will be entitled to CIDB Green Cards' holder which is only applied at construction sites or any work according to terms and conditions (CIDB, 2021).

2.3.4 Project Owner/Client

In the construction industry, the project owner or known as a client is the highest hierarchy of the top management for the construction project (Wu *et al.,* 2015). The client or owner of the project is also responsible to appoint and select the best contractor based on several ways of tendering process for completing the construction work. Then, the owner also required to ensure that the selected contractors that have been appointed are managed to provide and submit for approval a complete safety plan and implementation statement as set out in this document accordance with OSH and other safety measures before any construction work on-site starts (Wu *et al.,* 2015).

According to CIDB (2021), project owners are required to provide safety-related training for all the staff and construction workers according to OSHA 1994 and the workers are completing the CIDB safety courses to obtain a CIDB Green card. The leadership of project owners is very important to make sure safety management systems are being applied and at the same time, it can reduce any accident and improve the quality

and productivity of work (Wu *et al.*, 2015). Project owners need to play their important roles by communication among the medium management to make sure that any instruction and order is followed by all the workers especially in term of safety aspect to have smooth progress of the project. In the end, the project can be completed according to the time plan and unnecessary cost expensed can be (Keng and Razak, 2014).

2.3.5 Contractor and Sub-contractor

Contractors are the ones who is assigned by the project owner through several ways of selection such as open tendering selection that are responsible to carry out the actual and physical work at construction sites (Health and Safety Executive, 2015). Normally, all requirements and contract agreements are between contractors with the client directly such as payment and instruction. While the subcontractor is the collection or combination of several types of contractors that are appointed by the main contractor itself (Hesham *et al.*, 2019). It is because all the management related agreement is between contractors and subcontractors only without the interference of project owner or client. A subcontractor is the one who is assigned with a specific and expertise job scope that is required to be done in that project.

In terms of their roles for safety management systems, both parties are classified to be among the most critical groups that are actively exposed directly to construction hazard and risks because they will conduct the actual on-site construction work. Thus, it is their responsibility to make sure that all safety aspects are functioned and operated properly by following the guideline and regulation made by the authorities (Hesham *et al.*, 2019)

2.3.6 Safety and Health Officer

According to the Department of Safety and Health (2021), a Safety and Health Officer (SHO) is a position that has a major responsibility to ensure and enforce compliance of the safety management systems being applied correctly at any workplace or working sites by referring to the guidelines stated by DOSH. Basically, this position is established under the Occupational Safety and Health (Safety and Health Officer) Regulation 1997 and their job scope has been discussed in detail under Part V with the title of Duties of Safety and Health Officers. This chapter clearly discusses the roles and responsibilities of Safety and Health Officers (SHO) to be done at the workplace especially at construction sites. For examples, to make sure the safety management system can be implemented correctly, a proper and proactive SHO should be able to advise and recommend his employer about safety issues and solutions toward any safety problem so that his objectives to protect and secure the worker from any risk and hazard at the workplace can be achieved.

In addition, any inspection at the workplace which is used to evaluate whether there is any equipment, machinery, supplies, material and working operation, or any type of manual labour used in the workplace that has possibilities to cause any physical harm to any person involved in the workplace is laid under SHO responsibility. SHO is also an important person that is involved in any site investigation when accident or safety-related cases occur which they are required to find the cause of the accident. The finding from site investigation is very essential because it can be a preventive reference for safety management systems that can benefit to avoid that accident from occurring again in the future. Next, any inspection to check the effectiveness of safety management systems whether it followed the regulation at the workplace made by safety and health

committees can be assisted by Safety and Health Officer due to their expertise in specific knowledge and information regarding safety management systems (DOSH, 2021).

Also based on the Department of Safety and Health (2021), a specific report on safety evaluation finding at any workplace including construction sites was designed and created specifically for Safety and Health Officers which are known as SHO Performance Indicators. This type of reporting task was established to assist and be a guide for SHO and their employer to make sure their roles and responsibilities under the related safety act and policy are being followed and achieved. This performance indicator focuses on several parts such as employers and worker's involvement, regulatory enforcement, and effectiveness regarding the implementation of control measures at work. In addition, this indicator has been designed based on legal requirements and SHO required to complete this report every month to make sure this report is up to date for any DOSH monitoring session. At last, this indicator report would benefit the employer to improve their method to monitor any risks that could affect his or her employees. This report also used to prove that the SHO has done their roles to comply with the legislation.

2.4 Act, Law and Regulations

Regarding safety management system related law and regulation, several governmental agencies such as Department of Safety and Health (DOSH) already established the specific requirement need to be followed especially at high risk working environments including construction sites. This kind of policy normally aims to protect and secure the safety and health issues among the workers.

2.4.1 Occupational Safety and Health Act 1994 (OSHA 1994)

According to Hui-Nee (2014), Occupational Safety and Health Act (OSHA 1994) also known as Act 514 was formulated majorly by referring to the 1970 British Occupational Safety and Health Act. It basically contains specific responsibilities for employees and other specific guidelines about safety and health issues for any occupational sector. Before the OSHA 1994 formed, our country had only followed the guidelines from The Factories and Machinery Act (FMA) 1967 that only regulated occupational safety and health in the sectors of mining, quarrying, manufacturing, and construction sector whereas the other industries were not covered. Thus, OSHA 1994 was formed to improve and update safety and health-related issues for any occupational sector including the Governmental and private sector. Basically, OSHA 1994 contains about 15 parts, 67 sections and 3 schedules which all of this used to ensure the workers are safe enough from any risk and hazard based on their workplace (Of and Resources, 2006).

OSHA 1994 developed an independent sector with self-management and extended responsibilities to team decisions. The protection and health framework are based around the concept of identifying and handling risks sensibly by allowing workers to concentrate their attention more on major hazards and risks that can cause real harm to them (DOSH, 2021). The three major principles of this act are self-regulation, tri-party consultation and cooperation between employers and workers. These first principles are to ensure that safety awareness among employees is strengthened by taking their own obligation to recognize those who generate the risk and even those who work with the risk. Employers need to have very effective instruction regarding safety and health issues toward the worker. Next, the second principle is a consultation where employers, staff and the authorities need to discuss concerns and issues linked to occupational safety and

health at the workplace. Lastly, the third concept is cooperation, where employers and staff must work collaboratively to take care, maintain, and improve the quality of occupational safety and health at the workplace. Without collaboration between employers and workers, none of the occupational safety and health policies introduced will be effective (DOSH, 2021).

2.4.2 Factories and Machinery Act 1867 (FMA 1967)

This act was established first in 1967 and was revised up to 1974. It consists of 6 parts with 59 sections and this act being the nation guideline until The Occupational Safety and Health Act 514 was formed in 1994. The main purpose of this regulation is to monitor the operation of factories or workplace with regard to some aspects such as safety, health and welfare of the related person such as employees and staff by carrying out the registration and inspection of machinery and equipment (Of and Resources, 2006). For example, part II section 15 already discusses the dangerous parts of machinery at factories and any workplace (DOSH, 2021). This guideline was already inserted with the high possibility of risks and hazards that were predicted to occur. Until now, this content of this guideline is still valid to be used but due to lack of content which is its only regulated occupational safety and health in the sectors of mining, quarrying, manufacturing, and construction make it outdated.

2.4.3 Law of Malaysia Act 520

According to this act, Lembaga Pembangunan Industri Pembinaan Malaysia, also known as the Malaysian Construction Industry Development Board (CIDB) was formed. In fact, it contains about 10 parts with 41 sections focus on the formation of this agency.

Basically, their main target and goals are divided into three main areas which are improving the quality of the construction industry through the registration of construction workers as well as the qualification of skills and competencies, ensuring the quality of construction materials and supply is met and in compliance with requirements provided and enforcing safety at construction sites during or after the construction work under the responsibility of the contractor, site manager or employer (Of and Resources, 2006).

In addition, this amended Act 520 requires all construction industry personnel which involve employer, employees, site supervisor and others to be licensed with the CIDB. By enforcing this requirement, CIDB can gather adequate and reliable data on the number of construction employees available, the level of skill development of the worker and this agency can keep track of the standards of construction practices. Next, CIDB can certify the raw materials available on the market and another requirement related to construction raw material set out in the Fourth Schedule of the Act to make sure low qualities materials in Malaysia can be minimized. This effort also can prevent other countries from exporting low cost and poor-quality building materials. Thus, the productivity and quality of the construction industry can be improved in terms of the material used at construction sites. Act 520 also obliges that all the contractors or employers need to make sure the safety of the building and construction worker is guaranteed whether it during or after construction work. This policy is applicable to all contractors whether licensed with the CIDB or not (CIDB, 2021).

2.5 Common Safety Practices for Construction Activities on Sites.

In the full development phase, there are various stages of construction before any complete structural fully finished. Thus, a review of current construction practices in construction sites that have a high probability for any safety-related issues to occur will

be discussed. In fact, these selected current construction practices already have numerous accidents and injuries due to improper implementation of safety management systems at their workplace.

2.5.1 High Workplace

In the construction sector, working in a high workplace and environment is undeniable anymore. It is because people nowadays are exposed to high-rise buildings whether it is for living and for any office or workplace. For instance, nowadays there will be a lot of high-rise construction such as apartments, condominiums and towers being built due to the demand from the public. Working in high places is referring to any work or job that needs to be done in a place that has a height more or equal than 3 meters. It includes any work that from a ladder, high building, roof phase, scaffolding and other elevated working areas which it impacts occurs when the worker falls directly on the ground (Smita, 2016). In 2011, there were 4,937 reported injuries in the construction industry and obviously, it became the second-largest reported incident in all sectors in Malaysia. In the same year, there were a total of 9,057 cases of serious injuries due to workers falling from a high workplace and 4,689 cases of accidents involving worker injuries due to falling objects from high places (Goh *et al.*, 2016). From this statistic, it is proven that working in high places has the higher possibilities for any accident and injuries to occur if safety management systems are not being applied properly.

In fact, unsafe working conditions which are caused by improper housekeeping can cause employees to slip and fall from heights. In addition, it also causes staff to be struck by fallen working tools due to carelessness and attitude from the worker itself (Goh *et al.*, 2016). For instance, all the workers should play their roles and responsibilities to handle their tools and other things by managing them properly. Any

unused or excessive material and object such as nail and screw should be placed or disposed of at the designated areas without letting it be left in that working area. This is because poor housekeeping and management will impact the safety of the worker such as if any tiny object and material that is left being trampled by workers, it can make their body balance be uncontrolled and then possibilities of an accident and injuries can happen. Another issue due to the high workplace is the insufficiency of safety equipment such as Personal Protective Equipment (PPE) and low safety awareness among the worker (Goh *et al.*, 2016). Next, it also can be caused by the unsafe working surface. For instance, any spills of liquid on the surface which make the surface wet or sandy and dusty would affect the balance of the worker if stepped on it. The worst becomes when the worker also does not wear a suitable and clean boot (Smita, 2016).

The usage of scaffolding in construction sites is also one of the key points related to falling from high workplace issues. Scaffolding is a temporary structure or platform made by a combination of steel that is used to lift and support the users and material to perform any construction work such as bricklaying, cleaning, and plastering at high places. Basically, there are still contractors that appointed unskilled workers to construct the scaffolding for high-rise buildings which is this event is too risky and very dangerous due to this scaffolding may fail and it would lead to any injuries and even death to workers. It is because any constructed scaffolding in construction sites are required to meet the standards (Yakubu *et al.*, 2012). According to the Guidelines of OSHA 1994, any scaffolding that is being constructed is required to be provided with a tieback with safety belts as personal protective equipment for all the workers that are using the scaffold (DOSH, 2006). The setting of scaffolding is very essential due to the impact when the proper requirement is being neglected and it has also been identified as one of the causes for fall accidents among the workers (Guo *et al.*, 2013). According to Keng

and Razak (2014), all scaffolds need to be inspected first by safety personnel with different tags such as yellow tag for inspection are still ongoing, red for the prohibited scaffold to be used and green that indicates it is safe and ready to be used. So, by applying this approach, it may reduce any potential for accidents to occur. Besides, an employer or project manager should inspect the location and design of the scaffolding safe enough to be used by the worker before any work starts which by this approach, the safety measure can be improved (Guo *et al.*, 2013).

According to DOSH (2021), there are several safety practices that should be applied if any task or work needs to be done in high places. This safety suggestion is consisting of using extensible equipment at ground level to minimize the need to climb the ladder, installation of cables at ground level, using mobile elevation work (MEWPs) such as scissor lifts, applied with safety nets and soft-landing system and ensure the worker is using the appropriate tools such as the good condition ladder for any climb work. Employers are also responsible to provide SKE to the worker with adequate training before any job being instructed. Working conditions such as current weather and height of the workplace are suitable or not to be done at that time which has a high possibility to affect the safety among the workers.

2.5.2 Lifting Work

Lifting material and objects at construction sites normally have two different approaches which are by using any lifting equipment such as crane lifting if the object is from the ground and needs to be lifted until at certain heights or by a manual approach which is by using human efforts. According to previous studies, accidents that happen due to lifting operation are attributes that cause the top three among the types of accidents and injuries at construction sites with a percentage of 31% from 116 responses (Hamid

et al., 2008). However, lifting operations in the construction sector cannot be avoided because this is the basic operation for any construction work to supply the objects or material to a certain place, especially in high-rise building construction. In addition, DOSH Officers are required to inspect and check the lifting crane every 15 months interval and manufacturers need to appoint any competent person (OYB) to do so based on their recommendation. In fact, all of this is the employer's responsibility to provide a safer working environment by implementing a proper operating system for the lifting process. There are several key points in the operating system such as:

1. Planning process consists of the preparation of working sites and crane services.
2. Selection process for the most suitable equipment for lifting and arrangement of signalling purpose during operational.
3. Appointment of competent and adequate worker including crane operator and signalman.
4. Supervision of lifting process by the authority.
5. Proper maintenance and inspection of related lifting equipment.
6. Prevention of unauthorized and unnecessary usage of a crane or other lifting equipment.
7. Identification of related important factored load such as maximum lifted load, load chart, load radius and lift capacity.

According to the DOSH (2021), a systematic safety practice has been suggested and is provided to the employer on how to handle lifting operation issues at construction sites. First, employers need to ensure that any worker that has overseen any lifting operations at construction sites should at least have basic theoretical knowledge and sufficient practical experience before any lifting process being started. Next, any lifting work should be prepared with a process plan which includes the identified risk based on