

DEVELOPING SAFETY AND HEALTH
ASSESSMENT MODEL AS BENCHMARK
STRATEGY TO EVALUATE AND MEASURE
THE PERFORMANCE OF CONTRACTOR IN
JKR CONSTRUCTION PROJECT

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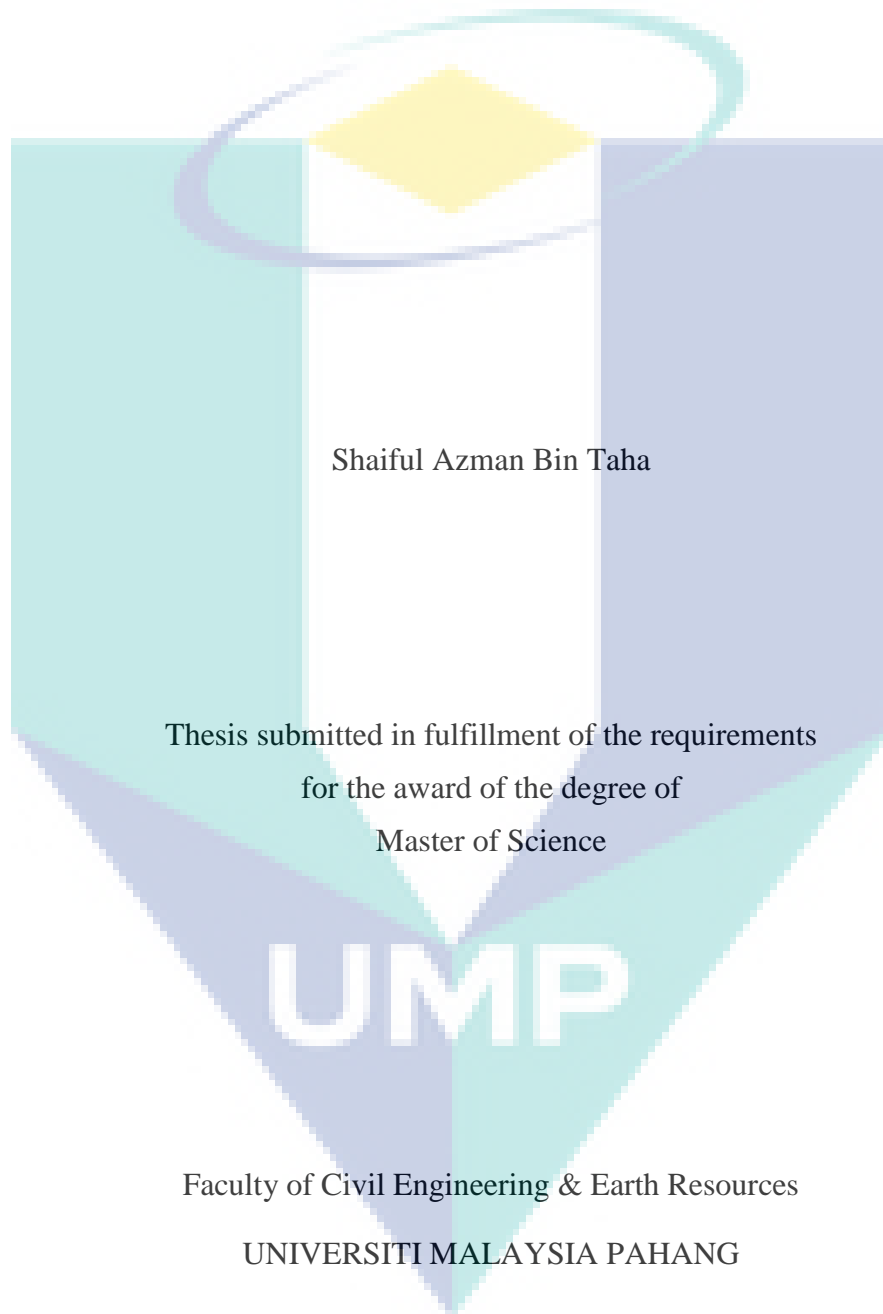
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Date : 19 January 2018



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Developing Safety and Health Assessment Model as Benchmark Strategy to Evaluate
and Measure the Performance of Contractor in JKR Construction Project



Shaiful Azman Bin Taha

Thesis submitted in fulfillment of the requirements
for the award of the degree of
Master of Science

U.M.P.

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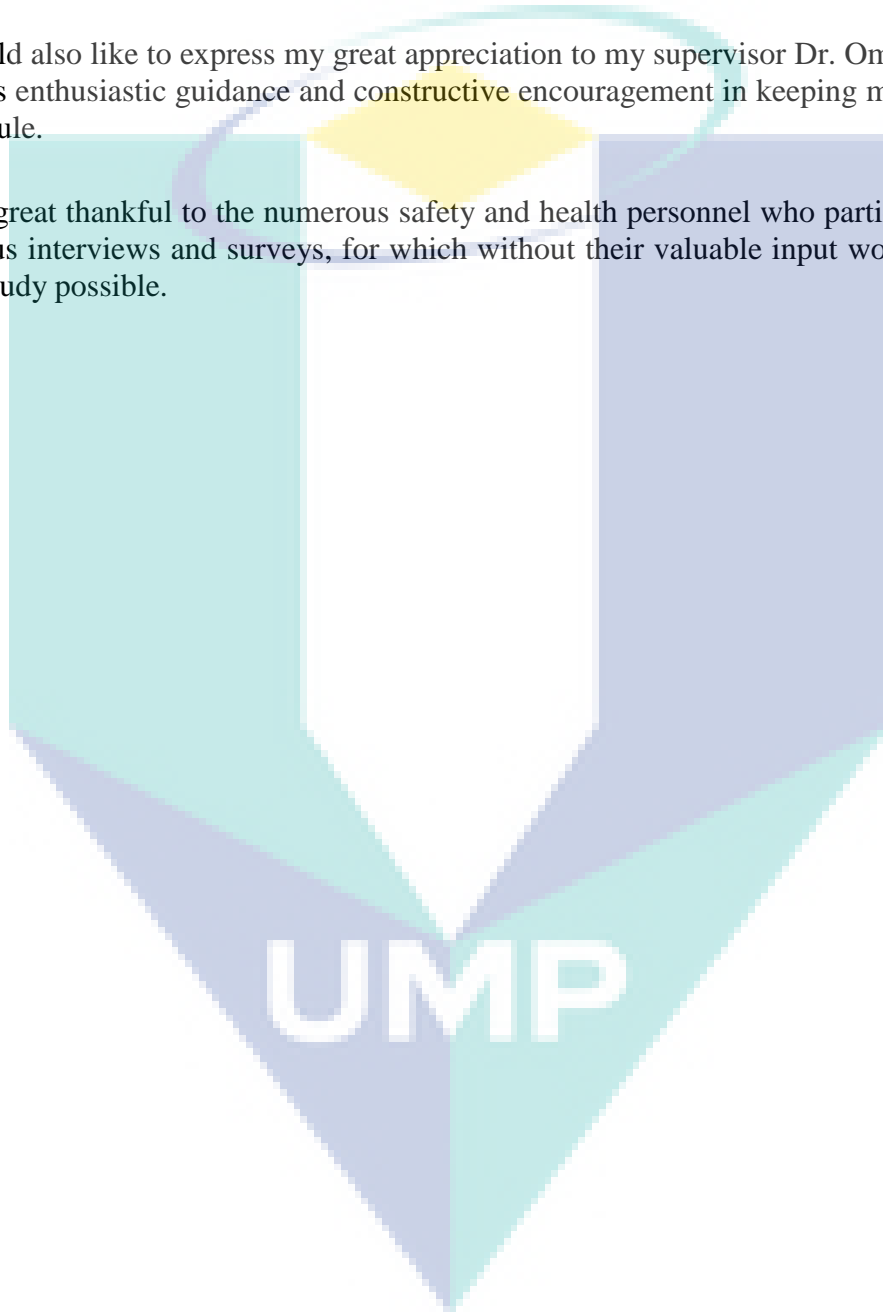
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ACKNOWLEDGEMENTS

In the beginning, I am thankful to almighty Allah S.W.T for giving me to courage for my studies. I will use this opportunity to say thanks to all my friend faculty, JKR management, JKR staff and students of UMP who were particularly instrumental in the success of this research.

I would also like to express my great appreciation to my supervisor Dr. Omar Jamaludin for his enthusiastic guidance and constructive encouragement in keeping my progress in schedule.

Also great thankful to the numerous safety and health personnel who participated in the various interviews and surveys, for which without their valuable input would not make this study possible.



ABSTRAK

Penilaian prestasi Keselamatan dan Kesihatan projek-projek pembinaan telah lama menjadi isu kerana kerumitan setiap projek. Tiada kriteria standard yang boleh digunakan sebagai penanda aras untuk menilai prestasi keselamatan sebuah syarikat pembinaan untuk projek pembinaan. Untuk projek-projek pembinaan di bawah Jabatan Kerja Raya (JKR) bernilai lebih RM20 juta, dua dokumen wajib untuk penyerahan adalah Pelan Keselamatan dan Kesihatan sebelum permulaan projek dan Laporan Keselamatan dan Kesihatan bulanan sepanjang pelaksanaan projek. Secara teorinya, menggunakan dua dokumen ini sebagai garis dasar, alat tanda aras yang standard boleh dirumuskan untuk menilai projek-projek akan datang. Rangka kerja teoritikal dibangunkan daripada kajian literatur untuk menampung semua pemboleh ubah penting dalam Pelan Keselamatan dan Kesihatan Pekerjaan (dan seterusnya, SH Laporan bulanan). Pemboleh ubah ini kemudiannya dibentuk menjadi satu kaji-selidik di mana 193 responden yang terdiri daripada personel dalam bidang keselamatan dan kesihatan telah mengambil bahagian untuk menentukan daya maju pemboleh ubah tersebut. Kedua-dua pemboleh ubah dan hasil kajian itu kemudiannya dikaji oleh panel pakar untuk dianalisis dan ditapis. Berdasarkan maklum balas, alat penanda aras telah ditubuhkan. Ia kemudiannya digunakan untuk tiga projek yang dipilih secara rawak daripada pelbagai peringkat durasi untuk menilai keberkesannya dalam menentukan prestasi aspek keselamatan dan kesihatan dari segi Pelan SH. Projek yang sama juga dinilai menggunakan kriteria prestasi sedia ada JKR dan skor yang diperolehi dari kedua-dua cara dibandingkan. Kajian ini menyimpulkan bahawa alat tanda aras yang digubal dan pemboleh ubah yang dipilih adalah konsisten dalam menentukan tahap keselamatan dan kesihatan daripada projek yang dipilih dan diperbaiki lagi boleh dibuat dari segi penggunaannya di tapak pembinaan. Ia juga menyatakan bahawa semua projek dinilai mempunyai tahap yang tidak boleh diterima prestasi keselamatan tanpa mengira jaringan awal yang diterima untuk penggubalan Pelan SH. Adalah dicadangkan bahawa pemantauan dan pelarasan berterusan dibuat supaya ubah penanda aras boleh dipertingkatkan lagi. Dalam hal ini, sistem dalam talian boleh dibangunkan untuk membolehkan penyepaduan taksiran di lokasi dan analisis luar tapak daripada hasil yang dijana, membolehkan perkongsian dan perbincangan di kalangan pakar-pakar keselamatan dan kesihatan.

ABSTRACT

Safety and Health Performance evaluation of construction projects have long been an issue due to the complexity of each project. There are no standard criteria that can be used as a benchmark to evaluate the safety performance of a construction company for a particular construction project. For construction projects under Jabatan Kerja Raya (JKR) valuing over RM20 million, two mandatory documents for submission are Safety and Health Plan before start of the project and monthly Safety and Health Report throughout the execution of the project. Theoretically, using these two documents as baselines, a standard benchmarking tool can be formulated to apply for future projects. A theoretical framework was developed from literature review to cover all important variables in crafting a Safety and Health Plan (and subsequently, the monthly SH Report). These variables were then formed into a survey in which 193 respondents consisting of personnel in safety and health field participated in order to determine their viability. Both the variables and results of the survey were then reviewed by a panel of experts to be analysed and refined. Based on their input, a benchmarking tool was formed. It was then applied to three randomly selected projects of various completion stages to evaluate its effectiveness in determining the performance of safety and health aspect in terms of their SH Plan. The same three projects are also evaluated using existing benchmark tool and the scores compared. The study concluded that the formulated benchmarking tool and its selected variables were consistent in determining the level of safety and health performance of the selected projects and that further refinement can be made in terms of its application on-site. It is also noted that all the projects evaluated had unacceptable level of safety performance regardless of the initial scoring received for SH Plan formulation. It is suggested that continuous monitoring and adjustment be made so that the benchmark variable can be further improved. In this regard, an online system can be developed to enable seamless integration of on-site assessment and off-site analysis of the generated results, enabling sharing and discussion among safety and health peers.

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LIST OF ABBREVIATIONS

CIDB	Construction Industry Development Board
CIMP	Construction Industry Master Plan 2006-2015
SH	Safety and Health
OSHA	Occupational Safety and Health Act
SOCISO	Social Security Organization
JKR	Jabatan Kerja Raya
CQI	Continuous Quality Improvement
NCR	Non-Conformance Report
UNDP	United Nations Development Programme
UNRWA	United Nations Relief and Works Agency
IEM	The Institution of Engineers, Malaysia
CCOHS	Canadian Centre for Occupational Health and Safety
PPE	Personal Protective Equipment
HIRADC	Hazard Identification, Risk Assessment and Determining Control
SIRIM	Scientific and Industrial Research Institute of Malaysia
DOSH	Department of Occupational Safety and Health
ERP	Emergency Response Plan
EAP	Emergency Action Plan
ERT	Emergency Response Team
PIC	Person-In-Charge
MSDS	Material Safety Data Sheet
CSDS	Chemical Safety Data Sheet
SOP	Standard Operating Procedure

CHAPTER 1

INTRODUCTION

1.1 Introduction

With the rise of concern for sustainable and progressive construction, the focus towards safety and health issue is a major trend in the Malaysian construction industry. The launching of the Construction Industry Master Plan 2006-2015 (CIMP) spearheaded by the Construction Industry Development Board (CIDB) Malaysia aims to prepare the construction industry towards globalisation and competitiveness. Among the seven strategic thrusts contained within the CIMP, the third strategic thrust focuses on striving for the highest standard of quality, occupational safety and health, and environmental practices.

In order to keep abreast with development, particularly in relation to the issue of occupational safety and health, major players in the construction industry should play their roles in consolidating the industry to reach greater expectation. Safety in construction must be a priority among the construction fraternity during pre-construction, construction and post construction. A holistic approach of safety that can be systematically measured and analysed as a benchmarking framework must be introduced to the construction industry as a strategic way for construction stakeholders to move up to the greater standard in future.

This research is carried out to investigate and evaluate the effectiveness of the existing method in measuring and monitoring safety and health performance, adhering the safety practices as planned in the Safety and Health Plan (SH Plan) and Safety and Health Report (SH Report), before and during construction process until its completion. The findings will be analysed and discussed so that a new approach or strategy framework or assessment system can be developed and used as rating criteria or benchmark tool that will be able to measure and reflect the actual integrated capabilities and competencies of the contractor to deliver the construction works while adhering to

safety and health requirements and criteria complying with the acts, policies and regulations. The outcome of this research may be used by the Jabatan Kerja Raya (JKR) and other related government agencies as an interactive tool to select and identify credible contractor to be awarded future projects.

1.2 Background of the Study

JKR, acting as either the client or an agent, have the responsibility to evaluate the Health & Safety Specification (Plan) proposed by the contractor for any awarded construction project before initiating construction work, according to Construction Regulation 4(1)(a) of the Occupational Health and Safety Act, 1993. The Client's further duties are as described in The Act and the Regulations. The Contractor shall be responsible for the Health & Safety Policy for the site in terms of Section 7 of the Act and in line with Construction Regulation 5 as well as the Health and Safety Plan for the project.

This Health and Safety Specification (Plan) document is governed by the Occupational Health and Safety Act, 1993, referred to as 'The Act'. It should be noted that no single Act or its set of Regulations can be interpreted or taken by itself. Despite the fact that the definition of Health and Safety Plan itself is a documented specification of all health and safety requirements concerning any activity done on a construction site to ensure safety of workers, the entire scope of the Labour legislation, including the Basic Conditions of Employment Act must also be a part of the drafted system and made to comply with. Taking the entire mentioned factor into account, the safety document is required to deal with all health, safety and environmental issue relating to the construction site in question. Environmental management should also be taken into account despite its minor mention.

The health and safety plan must be drafted by the contractor with consideration of the construction site in mind. This is due to the fact that for every construction activity and site, the combination of many variables will present different kind of challenges and issues that require due attention. The fluidity of a construction project and site will require foresight and planning in order to ensure any possible issues are taken into account and control measures put in place. A Risk Assessment Program can be initiated to identify and determine the scope and details of any risk associated with

any hazard at the construction site, in order to identify the steps needed to be taken to remove, reduce or control such hazard. The results of the program can be a starting point or basis for drafting of the Health and Safety Plan. The Health and Safety Plan shall include documented Methods of Statement detailing the key activities to be performed in order to reduce as far as practicable, the hazards identified in the Risk Assessment.

Every effort have been made to ensure that this specification document is accurate and adequate in all respects. However, any errors or omissions are not be considered as grounds for claims under the contract for additional reimbursement or extension of time, or relieve the Contractor from his responsibilities and accountability in respect of the project to which this specification document pertains. Any such inaccuracies, inconsistencies and/or inadequacies must immediately be brought to the attention of the Agent and/or Client. Therefore, a proper method or assessment to inspect and then assess the submitted SH Plan is greatly needed.

In all, in the context of JKR project above RM20 million budget, SH Plan is a mandatory document to be prepared by the contractor prior the initiation of construction works. The contractor must also appoint a Safety and Health Officer for the project as part of the requirement noted by the Occupational Safety and Health (OSHA) Act 1994. The SH Plan is evaluated by JKR safety division for approval before commencement of any construction works. Detail of the SH Plan will be discussed in the methodology part. The designated committee of JKR safety division will review and give some suggestion or feedback towards the proposal and upon complying with all of the requirements, the SH Plan will be approved. At all time during the construction works, it is the responsibility of the contractor to follow and implement the safety and health practices according to what have been planned in the SH Plan, by adhering to all of the of safety and health policies, requirements and guidelines

Upon initiation of the project, the contractors are required to submit monthly Safety and Health Report (SH Report) to JKR to outline the applications of safety and health practices that have been implemented as construction progresses. In addition to that, the internal audit and external audit will be conducted when necessary or on ad-hoc basis at construction site not only as a check-up mechanism of the SH Report but also to monitor the application of safety and health are fully adhered in all aspects and are

carried out according to the approved SH Plan. If accidents occur, depending on the degree of the accident, all construction works may be stopped immediately allowing for all of the existing safety and health implementations and practices to be carefully reviewed and examined thoroughly. After all of the complicated issues regarding safety and health is resolved, JKR will give approval for the construction work to continue. This is a standard practice to monitor the implementation of safety and health practices and procedures are fully adhered on construction site throughout its progress.

1.3 Problem Statement

The practise of monitoring the safety and health practices for a construction project are conducted regularly adopting the methodology as describe in the background of study. In this perspective, two mandatory documents submitted are SH Plan and monthly SH Report. However, due to the flexibilities of the SH Plan and SH Report and the complexity of each awarded project, there is no standard criteria that can be used as benchmark to evaluate the credible contractor in terms of the management of safety and health aspect. Many contractors completes the awarded project but depending on the complexities of the project, the success of managing the safety and health practices is not carefully evaluated and reviewed upon project completion. This create a gap between the management of projects resources and safety and health issues, in which the current practice segregating the evaluation method to measure the success factor of the overall projects by neglecting the direct impact that safety and health management have on the construction process throughout until its completion.

For example, a project can be completed regardless of any accidents occurring or not but there is currently no comprehensive method to examine the success of the management of safety and health aspect, and how these integrated management are affected by each other, and to promote the continuous awareness, responsibilities, accountabilities on safety and health agenda in construction projects. A holistic assessment needs to be carried out and this research will address this issue and try to propose realistic recommendation. Thus, it is necessary to redevelop more standardized assessment criteria so that the credibility or performance of the contractor can be recognised in the aspect of safety and health. This assessment methodology and criteria can be continuously evaluated, reviewed and measured and later used as guideline, CQI

or benchmark to award future projects. Pilot projects have been done in 2016 within the JKR projects and below are the findings that are related to safety and health concerns:

1. There is no standardized method to evaluate the effectiveness of safety and health practice for JKR construction projects valuing more than RM20 million
2. There is no standardized method to evaluate the documentation for continuous monitoring system of the safety and health practices at construction site
3. There is no standardized mechanism to benchmark the implementation of safety and health practices of a particular project
4. Due to non-standardised criteria, variables and flexibilities, most of the SH Plan and SH Report are not systematically prepared and difficult to be evaluated

All these findings have been addressed by JKR as a red spot issue thus needs to be resolved in a matter of urgency in order to ensure all future projects can be managed effectively and successfully within the zero-accident motivation.

Apart from that, it is also found that a holistic approach must take into consideration human values, safety and responsibility concerns. The management and workers are mutually accountable for safety and health issues on the construction site. Much work is needed to ensure the successful implementation of safety prevention at a construction site. Indeed, safety at a construction site requires the involvement of all construction parties. Research has also pointed out that the most effective techniques of preventing hazards are pre-planning for safety, safety orientation, safety training and a written safety policy. To prevent accidents from recurring, there is also the need to establish a systematic evaluation strategy and benchmarking in addition to post-investigation of the causes. Obviously, the pre-planning of safety is a more systematic framework needed to ensure the effectiveness of the safety programme being carried out. It is also suggested that more time be devoted to a site's safety problems by the contractor and workers. Thus, an effective control method of assessment needs to be developed.

In addition to that, without systematic approach on the evaluation methodology, enforcement and punitive actions against offending contractors and workers are carried out continuously without a proper measure of success on the method. Based on the pilot study, it was found that in order to prevent the workers from repeating their offences,

they should be penalised. However, some respondents had surmised that this practice does not promote good safety culture. In actual fact, any lapse in the enforcement level for offences can result in the offenders continuing their bad habit and be hard to rectify in the future. As a regulatory body, the government have the right to take action against the errant contractor or worker. Despite this, the issue of poor evaluation on safety concerns is continuously debated and argued. While the authorities promise to put recalcitrant contractors out of business, serious enforcement and inspection have to be made especially for high-profile large-scale projects. In terms of moral value, safety cannot be enforced by legislation alone but requires the cooperation of the contractors as well as workers to ensure the goal of safety and health is achieved. Positive reinforcement in terms of higher chance of contract award based on safety performance can contribute to improve safety and health on-site. Therefore a more effective benchmarking strategy need to be develop as an effective tools to gauge the most reliable contractors and will be the criteria in selecting potential credible and reliable contractor before awarding for future projects.

1.4 Research Question

1. How to measure and benchmark the Safety and Health documentations on construction project, what are the criteria, variables and indicators and who are the designated personnel
2. What are the variables that can be analysed in a systematic approach or framework to recognise the credibility of contractor practicing best practices on safety and health issue without neglecting the environment act, policies and regulation
3. What strategy model can be used to promote awareness, concern, responsibility and accountability in safety and health aspect

1.5 Objective of the Research

1. To review the assessment criteria and strategy of the safety and health practices documented for JKR projects.
2. To develop systematic methodology to evaluate the level of safety and health practices based on documentations submitted for JKR projects.

3. To propose a benchmarking strategy model to evaluate credible contractors based on safety and health documentations submitted within the JKR projects.

1.6 Scope of the Research

This research will critically examine the assessment criteria of safety and health practices within the SH Plan for JKR project of more than RM20 million due to the requirement of SHO and Safety Plan submission.

1.7 Significance of the Research

The outcome of the research will assist the local government and JKR in drafting a systematic model for benchmarking strategy as a tool to measure and promote best practices concerning documentations of safety and health issues on construction projects. The benchmarking tool can be applied to JKR projects for evaluation of contractors based on their safety and health performance. The outcome also can be a value added system to identify credible contractors for future projects with the strong determination and commitment to apply effective safety and health plan.

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UIMP

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, all of the major factors in implementation of safety and health in a construction project are reviewed. The factors are then included in a theoretical framework in order to form the basis of a benchmarking tool, with the purpose of assessing safety and health performance of construction projects. It is observed that various aspects in safety performance of the construction industry have been improving since safety and health has been recognized as a crucial part in evaluating the performance of business (Myers, 2003; Wilson & Koehn, 2000). Due to this, the common factors causing construction site accidents have been addressed by several researchers, which mainly are poor planning, insufficient training, lax legislation enforcement, inadequate equipment, hazardous working environment, immature safety attitude, and isolated, sudden deviation from prescribed behavior (Toole, 2002). Although safety and health performance as a evaluation metric is considered an important subject in determining overall business overall performance, no proper tool of assessment or systematic evaluation that is able to measure the effectiveness of safety and health planning currently exists and need to be derived as a matter of urgency (Myers, 2003).

2.2 Performance of Construction Sector in Malaysia

The construction sector in Malaysia has seen a very consistent trend in terms of demands despite economic fluctuations or recessions. Due to the nature of the construction sector itself, which is volatile in terms of returns due to long development period, companies might have to cope with increased costs of materials of manpower. Therefore, having another avenue in terms of preventing additional costs due to health

and safety related incidents would provide a more stable way of increasing profit margins. Figure 2.1 shows the growth at which the Malaysian's construction sector has gone through, causally implying a higher demand for improved safety performance.

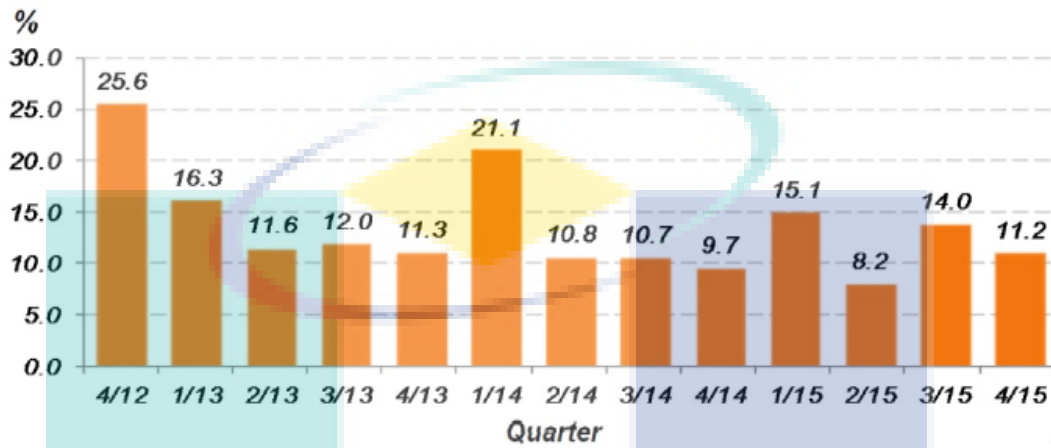


Figure 2.1 Malaysia's Construction Sector Annual Percentage Change, Q4 2012 to Q4 2015, Source : DOSM (2016).

Despite the spike in special trades for construction sector as shown in Figure 2.2, the growth for each type of activity has been largely consistent with no particular trade having a clear majority of shares over the others.

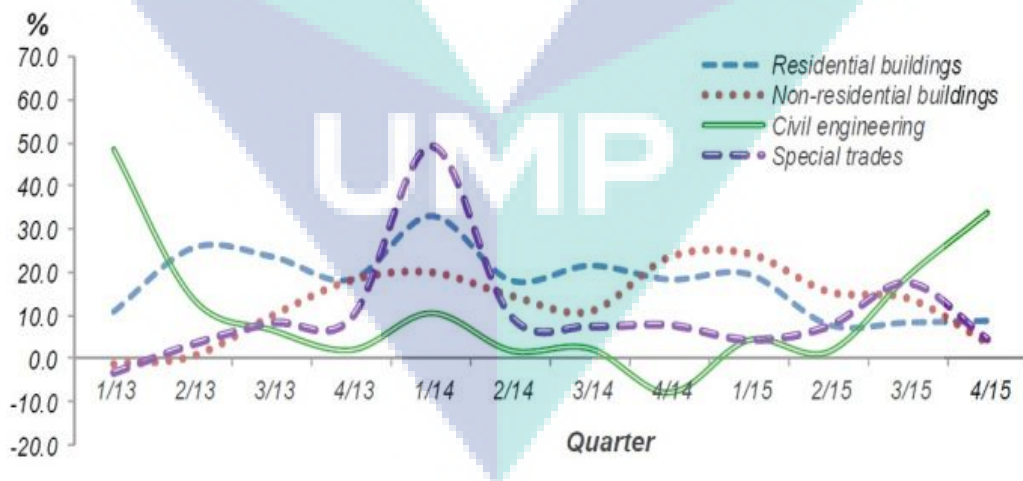


Figure 2.2 Malaysia's Construction Sector Annual Percentage Change by Type of Activity, Q4 2012 - Q4 2015, Source: DOSM (2016).

In terms of location, three states in Malaysia have shown significant difference in value of construction work done. Johor led the way due to the works done with the Iskandar Malaysia development region and Pengerang Integrated Petroleum Complex. As shown by Figure 2.3, the other two states are Selangor and Wilayah Persekutuan, with the other states showing various levels of investment value in terms of construction works.

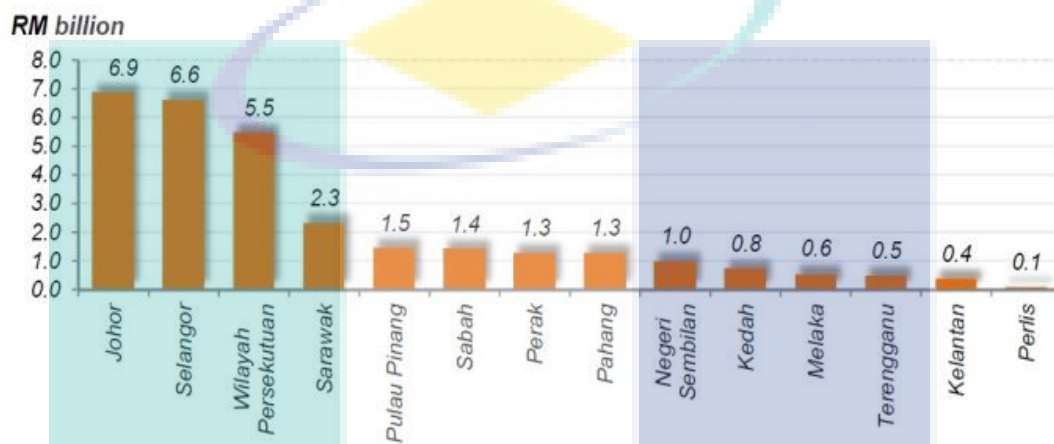


Figure 2.3 Value of Construction Work done by location, Q4 2015, Source: DOSM (2016).

In terms of construction work done by project owner, the private sector invested more in terms of value, as shown in Figure 2.4. Despite that, both the private and public sector showed consistent growth from Q4 2012 to Q4 2015.



Figure 2.4 Value of Construction Work done by project owner, Q4 2012 - Q4 2015, Source: DOSM (2016).

2.3 Safety and Health Plan and Monthly Report

In a typical construction project, there are two documents that is usually prepared in terms of safety and health, Safety and Health Plan and Monthly Report. An SH Plan is a written document establishing the details of implementing any safety and health programs for the duration of the project. The details typically include possible hazards during work along with all company policies, controls and work practices selected to either eliminate or minimize those hazards. In its simplest form, SH plan should describe the process for identifying the physical and health hazards that can cause injury to workers, the steps and procedures prepared to avoid the injury and to handle them should any occur. The safety and health monthly report is typically drafted with relevant details from the SH plan to illustrate the ongoing effort of maintaining proper safety and health performance throughout the construction project. It typically contains statistics regarding safety and health-related matters such as incident or accident and injuries on-site. These statistics are a way to measure how the site is progressing and performing from a safety and health point of view. The SH report is prepared and submitted monthly to the relevant parties.

2.4 Current Practice of Safety Performance Review for JKR Projects

In Malaysia, JKR requires any project costing more than RM20 million to submit a Safety and Health (SH) Plan prior to start of construction. Another requirement

for such a project, stated under the Occupational Safety and Health (OSHA) Act 1994, is the appointment of a Safety and Health Officer (SHO). SH plan in terms of JKR project will include all details of safety and health-related matters pertaining to the project. After the SH plan is approved and construction begins, a monthly SH report that outlines the details of any SH related issues on site is required. The report itself is submitted to outline the on-site compliance of safety measures detailed in the SH plan. If any of the measures are not followed on-site, the consultant appointed by JKR issues an NCR for the contractor to comply with. Any safety-related NCR will be logged and recorded in the SH report to be rectified by the contractor (JKR, 2011).

Safety performance of a project under JKR supervision is usually measured based upon the amount of NCR (Non-Conformance Report) submitted and closed by the contractor at the end of project, provided no other serious issue presented itself, such as fatal accidents. At the end of the project, the list of NCRs submitted and closed by the contractor forms a timeline on which the performance of the contractor can be evaluated. A safety audit, both internal and external, may also be made according to JKR requirements for selected projects and site to allow a more thorough evaluation of a project's safety performance. The accepted process for the safety performance review of a construction project is shown in Figure 2.5. The primary focus is in the way a project is evaluated during construction, focusing on a loop of non-conformance and rectifying actions made by the contractor until completion. In its current form, the method to measure the safety performance of a project, especially under JKR supervision, does not have any standard baseline as reference. The report produced at the end of the project denoting how a company performed, safety-wise, does not have any bearing upon which they will be considered for future projects. In terms of the documents themselves, the SH Plan and monthly SH report are sufficiently adequate in terms of evaluating a construction project's safety performance. However, a method in which to evaluate how the documents are prepared and maintained is insufficient in its current form (Abu Bakar, 2002).

CARTA ALIRAN PROSES KERJA SPKKP

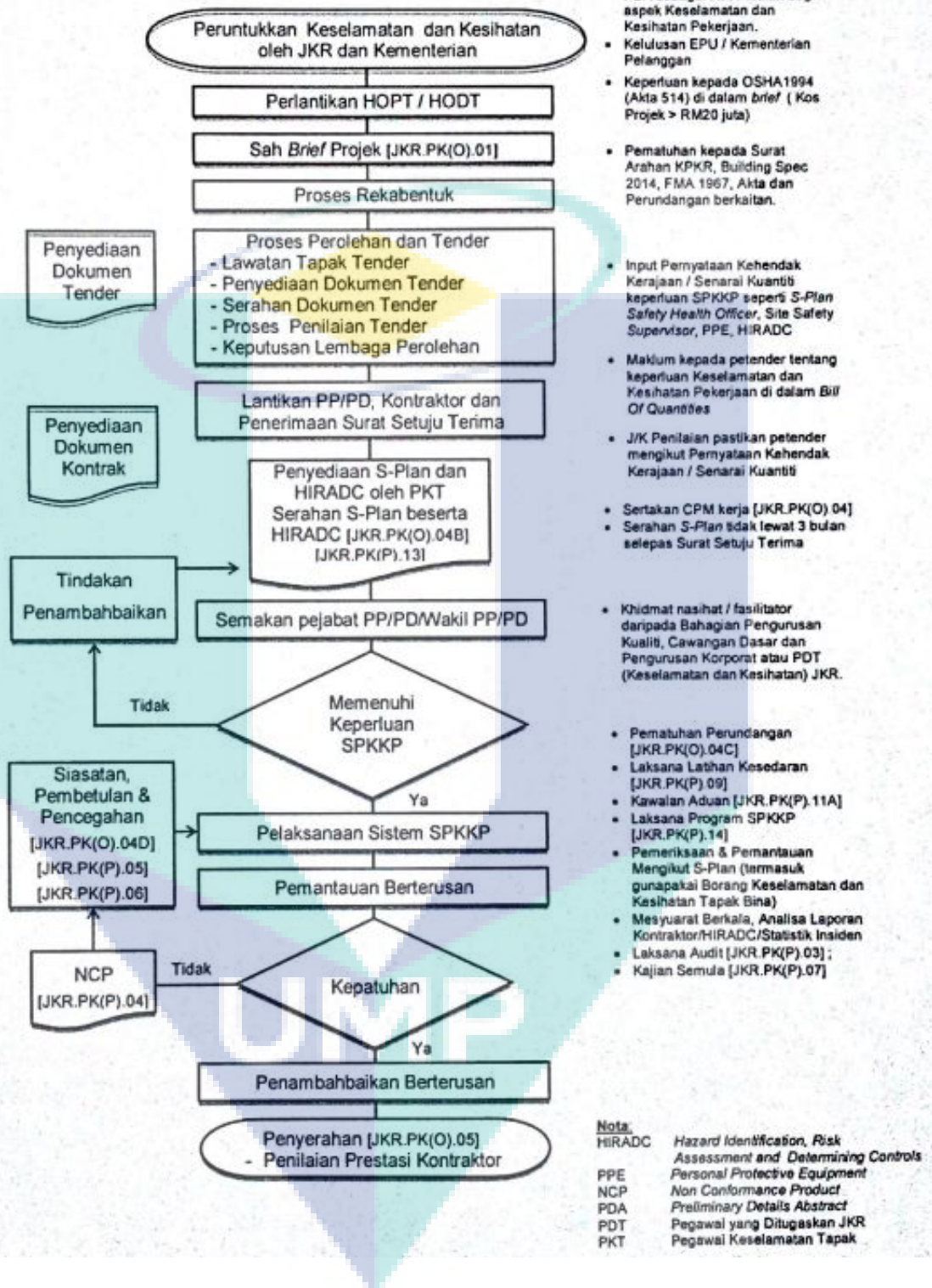


Figure 2.5 Flowchart for safety performance review method of JKR projects, Source : JKR (2016).

Despite the presence of a safety guideline stated in the OSHA 1994 Act drafted using worldwide safety standards as used by countries such as UK and Australia, evaluating the level of compliance to these guidelines is still an issue. Without a proper standard evaluation method for the actual safety and health performance of the JKR project, it is difficult to take into consideration the level of performance from one project to a possible future award for the same contractor. Therefore, by establishing a standard benchmark tool, all of the accumulated record and data can be better utilized for future JKR project tendering.

2.5 Legislation Enforcement

Local authorities can be an important factor in how safety and health performance is improved for construction projects (Wu, T. C. et. al., 2008). The Occupational Safety and Health Act 1994 are enforced by government officers by conducting inspection at the relevant sites. This is to ensure that the corresponding company comply with the imposed rules and regulations therefore increasing workplace safety. The most common type of inspection conducted includes a surprise visit, a follow-up inspection and an annual formal inspection. A more specialised inspection can be conducted such as health inspection, plant audit and assigning a certificate of fitness for equipment used in the plant itself. A more reactionary form of inspection may be involved depending on accident or incidents occurring on-site, and any complaints made towards the site or company itself. Depending upon the results obtained during various inspections, improvement and prohibition notice or stop work order may be issued to the relevant parties. Enforcement of the legislation can be escalated by taking legal action on the company itself or prosecuting them accordingly in a court of law (Wong, C. H. et. al., 2000).

The government needs to develop more effective regulations and Standard Code of Practice for any enforcement effort of the corresponding legislation to be fruitful. It is in the interest of the government to foster higher standards of safety and general welfare in the workplace, as this will benefit both the employees and employers (Shaw & Sealre, 1995). Government regulations can affect the way health and safety hazards are handled on-site positively by working in tandem with the workers involved and key players in the industry itself. Previous research implied that the steps taken after

inspection such as improvement and prohibition notices issued made companies more likely to comply with safety and health legislations. Level of compliance however depended upon the effectiveness of the inspections made in recognizing serious infractions and frequency of notice issuance. The notices must carry adequate sanctions towards the company for failing to comply (Shaw & Sealre, 1995). Failure to enforce and prosecute according to the legislations can be attributed to the lax enforcement of government officials and the legislation itself. A direct correlation between the level of government regulations enforcement and implementation of safety and health procedures on site is assumed for the purpose of this study (Gunningham, 1984).

Contractors in Singapore believed that site accidents are the result of inadequate company policies and its enforcement (Evelyn, Florence, Adrian, 2005). Generally, in the drafting of health and safety policy statement, they should contain immeasurable aim, and measurable objectives of the organization or company. This is due to the fact that aims are usually static between policy revisions, whereas objectives are more fluid and can be reviewed according to current conditions or requirement. Figure 2.6 shows the key elements on how health safety policy and how they correlate with one another. The health and policy statement should be easily understandable which can be achieved by using clear and simple language (Phi Hughes et.al, 2001). The following points can be used as a baseline for what is required in drafting a health and safety policy statement:

- i. The aims should cover health and safety, welfare and relevant environmental issues.
- ii. The position of the senior person in the organization or company who is responsible for health and safety.
- iii. The names of the health and safety adviser and any safety representatives.
- iv. A commitment to the basic requirements of the health and safety at work Act (access egress, risk assessments, safe plant and systems of work, use handling, transport and handing of articles and substances, information, training and supervision).
- v. Using a safety committee or plant council.
- vi. Specific policies of the organization (staff welfare).

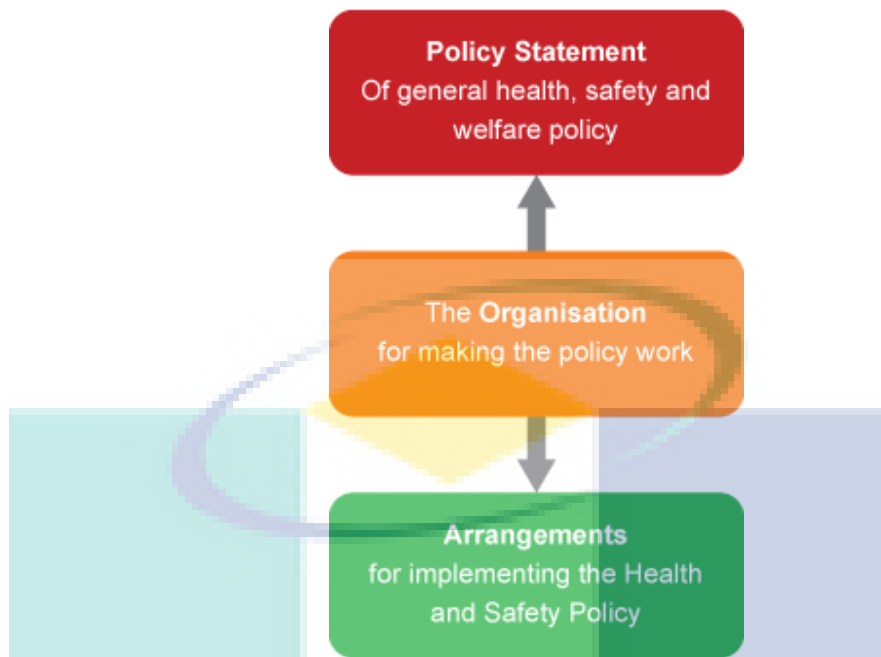


Figure 2.6 Key elements of Health and Safety Policy,
Source: Phi Hughes et.al, (2001).

Studies conducted in Kuwait, Gaza Strip and China found out that the majority of the respondents from surveys conducted agreed that accidents can be reduced with sufficient safety regulation in the construction site (Kartam, 2000; Tam, et al., 2004; Hassouna, 2005). One of the study also found that 75% respondents, from a total of 83 respondents had accidents in their construction projects during the last five years; 10% of the respondents had death cases, while 14% of them had injuries that caused permanent inability and more than 40% of them had temporary injuries as the majority of contractors had a very high number of light injuries. This study also found that 92% of consultants and 75% of owners believed that safety is not confined only to those working in the field, but it extends to any party who could affect the safety performance in sites such as government. The consensus from the study is that high accident rates in construction stems from improper safety culture among workers and that among those involved in the construction, consultants have the most influence in affecting the overall trend of safety on-site (Hassouna, 2005).

On the role of designers, 49% of the respondents agreed and 40% of them strongly agreed that designers should be responsible for constructability and safe working conditions and conduct regular site visits to ensure safe construction as specified and record mistakes and notes which could be avoided in future designs.

Furthermore, the majority of consultants and owners agreed to stop the contractors in preceding the work when safety violations are discovered. 63% of the respondents believed that the current regulations are inadequate while the other 37% considered them impractical and could not be applied in construction industry. On the role of insurance companies and ministry of labor, it is found that the insurance companies are more invested in following safety issues in the construction sites than the ministry of labor. 30% of the respondents agreed that the insurance companies arrange safety site visits and 14% of them only agreed that the ministry of labor arrange such visits. The majority of respondents agreed that the implementation of total quality management in the construction industry can reduce accidents (Hassouna, 2005).

For the contract made by owners on safety conditions, the study found that 53% of respondents believed that few owners' institutions care more in safety conditions for its own contracts, such as UNDP and UNRWA, which includes strong provisions and sometimes a penalty against contractors who have made safety violations. On the penalties against contractors, 25% of the respondents found that stopping work when an injury or safety violation occurs was considered as a penalty because stopping the execution causes loss of overhead, productivity and may delay the project. On safety and using safety tools the study found that the majority of the respondents mentioned using hard hats as the most important safety procedure, followed by having the first aid bag with score, emergency telephone number, and safety footwear are in the next degree (Hassouna, 2005).

2.6 Risk Analysis for Construction Projects

Accident prevention in construction can be achieved by implementing the proper steps according to safety and health regulations and being aware of several major factors. These factors which are considered risks consists of actual physical and environmental hazards, human factors, and subpar safety standards, communication breakdown within a single trade or between two or more trades. These risks can be identified and analysed by implementing a Risk Analysis system. Risk Analysis is a systematic use of available information to determine how often specified events may occur and what is the magnitude of their consequences. In order to improve site safety, any and all accidents or potential accidents must be investigated, analysed and the

resulting report be taken as a step in preventing any future occurrence of that particular accident (Reese et. al., 1999).

In Malaysia, preventive measures are still lacking in their application for accident reduction in construction sites. This can be seen in comparison to other construction companies worldwide that implements various preventive measures based on their corresponding legislation enforced by the government (Singh, A et. al., 1999). The detailed analysis of an accident requires knowledge of many factors such as type, time, location, cost of accident, victim, nature of the injury, personal and environmental factors. The analysis can be standardised by using a report form. A complete study of accident trends can be made to formulate relevant hazard controls based on causes, type of work done, occupation of victim, level of expertise, location and time of accident. The data obtained can be used to evaluate hazards, prepare job safety guides, formulate new policies, redesign equipment, modify operating procedures, assessment and develop training programs (Viner, 1991).

2.7 Safety and Health Training

Any organization can effectively be represented by their employees. The implementation of safety and health on-site within an organization can be affected by employees' concern and demands. It is found that by encouraging workers' participation in the implementation of safety and health matters can lower the rate of on-site injury (Reilly et al., 1995). Employees may express their concerns and demands by giving suggestions, sending in complaints, usage of safety equipment supplied and their cooperation when safety and health programs are held (McIntosh & Gurdon, 1986).

The key in utilizing the inherent fact that employees can be made to engage in safety and health programs lies in ensuring that the management is receptive to the needs and demands of the workers, ensuring a mutual cooperation (Codrington & Henley et al., 1981). However, a solid cooperation effort can only be treated as a foundation upon which the final responsibility lies on the employees in term of safety and health compliance once all provisions are met. It can be generally assumed for this study that the implementation of safety and health programs on-site is affected by employees' concerns and demands.

2.8 Safety and Health Programmes

In terms of large-scale construction projects, it has generally been a trend to hire multiple contractors depending on the current needs of the project in order to save cost compared to having a static workforce. Any implementation of safety & health program involving separate contractors needs a more streamlined and thorough approach compared to a more static workforce. As contractors are usually hired based on specialized works, a general approach to safety and health would be insufficient in handling possible incidents due to the complexity of said works. Extra care must be taken to ensure safety would always be a priority in their work practices and that adequate monitoring is made (Akass, 1994).

In the context of this study, the implementation of OSH in the organization is those that encourage workers' participation in OSH matters to reduce the workplace injury or illness rate. These can be categorized into three main areas; the policies, organizational structures and arrangements. Policies refer to the main mission of the company towards safety especially the OSH policy. The policies will be followed by the organizational structures of the company towards safety especially the OSH policy. These structures embody the designation of OSH officer, committee, manager and even the setup of one Department. The arrangements or implementation of OSH are included the delegation of authority and responsibility (Hopkins, 1993).

The implementation of OSH can be further shown from the management commitment such as treating OSH problems as other operational problem in the managerial meetings, following up of any OSH problems, involving extensively in any OSH programs, and creating a safety culture environment. These are also included in the investigations report of accidents, incidents and complaints pertaining to the safety and health matters (Bottomley, 1994).

Furthermore, the management's commitment towards the implementation of OSH at workplaces can be seen through the measures taken on the injury preventions such as proper housekeeping, machines safety, safe handling of materials and the program of wearing personal protective equipment. Nevertheless, measures must be taken to prevent occupational illnesses pertaining to health hazards such as ergonomics,

illumination, and assessment of health hazards, adequate first aid facilities and noise monitoring program (Bottomley, 1994).

2.9 Safety Training On-Site

A good safety management system will include safety training as one of its most important component. Training employees with the knowledge, skills and attitude, at all levels which would enable them to perform their duties in a safe and efficient manner is the objective of a safety training program. Employees at all levels including managers, supervisors, safety personnel, contractors and general workers should participate in safety training (Heberle, 1998).

Statistics recorded by SOCSO, which divides reports of industrial accidents according to different sectors and type of work, shows that the construction industry accounts for 5% of total accidents recorded. Severe accidents and fatalities are also more prominent in the construction industry (Inforeach, 2002; Socso Report, 2003). Despite the inherent dangers associated with the construction industry, the frequency of severe accidents can also be attributed to insufficient safety training, substandard safety equipment and inadequate supervision during the accidents. All of these issues can be traced back to the main root of the issue, which is the lack of management's commitment to safety issues. Generally, it can be implied that the top management does not care about safety and health if they refuse to invest in providing training, proper safety equipment and hold safety and health programs. (Inforeach, 2002). The employer must be aware and committed to the implementation of safety and health in order to protect the workers and provide a safe working environment.

An effective safety program can include proper safety equipment, consistent involvement of management on safety briefings, safety and health booklets for information and having a trained safety representative for the construction site. (Sawacha et al., 1999; Aksorn, 2009). A survey was made to determine the nature of safety programs in the largest 100 construction firms in the USA, and concluded that larger firms had more formal safety programs. They also had the safest performance. Lower injury rates were in companies that provided workers with formal safety orientation; companies that gave incentives to workers and foremen and companies that employed full time safety representatives. Higher safety performance was noted when

safety representatives were hired and trained by safety directors (Hassanein et al., 2007).

The most critical elements that should be included in safety programs to ensure their effectiveness consist of safety policy, safety committees, safety training and inductions, and safety inspections. It is found that the safety performance for sites that included these elements were higher (Tam et al., 1998; Aksorn, 2009; Poon et al., 2000). Another study concluded that specialty contractors' safety performance was consistently influenced in part by a number of factors. The factors shown to improve safety performance include: minimizing worker turnover; implementing employee drug testing and training of workers (Hinze & Gambatese, 2003; Hassanein, 2007). In terms of safety programs, for any projects consisting of many contractors, it is a requirement that anyone working on site should receive at least eight hours of safety training or for refresher safety training (Huang & Fang, 2003).

The critical factors that influence the attitudes of construction workers towards safe behavior on construction sites were identified such as training of operative and safety supervisors, most of which is important to safety awareness and improved performance (Langford et al., 2000). The importance of safety training to improve the safety performance in the construction industry has been addressed by many researchers (Huang et al., 2003; Aksonrn et al., 2008). Effective training of construction workers can be one of the best ways in improving site safety performance. Chinese construction industry had received limited education about safety issues despite the workers identifying training as a necessary element of safety performance (Zeng et al., 2008).

A survey in Gaza Strip found that 24% of the respondents were receiving training courses and all of them achieved a good benefit from it, the main course which included the first aid courses, causes of accidents, ways to prevent accidents, the safe technique of scaffolding, and safety tools usage. It was also found that part of respondents received safety training abroad such as in Saudi Arabia and the United Arab Emirates (UAE) and other part received training courses in the Syndicate of engineering and in the contractor union (Hassouna, 2005). For organized safety training courses for managers, engineer, and labors found 10% of the respondents, from a total of 83 respondents, have training on how to use equipment and how to perform the

danger activity safety, but the other respondents 90% did not have any training for their workers, engineers and labors (Ahmed et. al, 2005).

2.10 Occupational Safety and Health

Occupational safety and health is a very intricate topic today, covering many facets in society in terms of not just economy, but affecting legislations and moral stance. Globalization has also posed a challenge for companies to maintain their profitability and competitiveness. Based on accidents and incident statistics, maintaining a high level of safety and health performance is more than just good business practice but a way to ensure their survival in a cutthroat environment (Hopkins, 1995).

The accident statistics shown in the Social Security Organization (SOCSO) 2015 reports shows how dire the construction industry is. The current rate of workplace accidents for the year 2015 is 99 per 10,000 workers per year, amounting to 1% from the average number of workers. There were 62,837 cases of occupational accidents and 1,192 occupational deaths reported for that particular year. However, in the construction industry, the same report shows 6,301 cases accidents reported, consisting of 10% from the total of accidents reported, with the total death cases for construction industry of 142 cases, which is 11.91 % of the total death percentage of all the industry collated. It is important to consider that the SOCSO report only concerns Malaysian workers and does not include foreign workers, which are still the majority employed in construction sites compared to local workers (SOCSO, 2015).

Figure 2.7 below shows the risk of working in the construction industry. While the rate of fatality for workers in other industries are declining each year, fatalities for workers in the construction industry remains consistent due to the inherent danger.

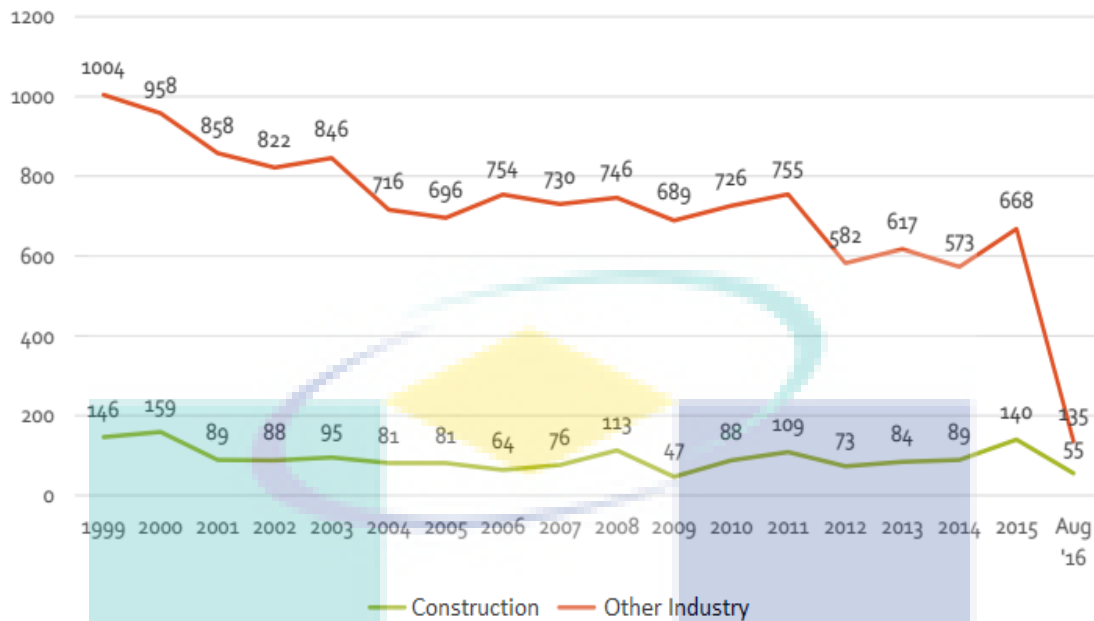


Figure 2.7 Fatal Injuries to Workers in Malaysia 1999-2016, Source: DOSM (2016).

Occupational Safety and Health Act (OSHA) was placed into effect in the year 1994 due to the increasing seriousness of safety and health matters to the workforce. It was introduced alongside the Factories and Machinery Act 1967, together requiring any workplace to be aware of safety and health risk posed by their occupation and controlling them, while covering all economic activities. From early on, legislation has made it a requirement for employees to be providing a safe working environment and not be placed into any dangerous situation due to their occupation. Employer's focus on productivity and profit has made a challenge to safety and health, due to their short-sighted views of not realizing that accidents and incidents in the workplace will result in loss of efficiency, productivity and therefore profit (Wong, C. H. et. al., 2000).

2.11 Safety and Health as Business Performance Metric

Occupational safety and health programs are dependent upon the commitment of the upper management in terms of execution, due to the fact that the company's primary objective is to turn a profit from the project. The contract price of any construction project can be affected by several elements, two of which is the level of quality and safety measures put in place. Balancing these two elements is important due to how they correlate with one another and their effect on the bottom line of the company. Studies found that most accidents occurring on-site are usually the result of insufficient safety

precautions or lax enforcement of safety programs due to lack of allocated budget for safety and health (Singh, A et al., 1999).

Financial losses can be minimized by creating a safe working environment since it can improve productivity by reducing delays due to lost work time and avoids injury claims. Companies should realize that in order to improve efficiency of the working environment and therefore increasing profits due to additional working capacity gained, losses from safety and health issues must be addressed. The advantage of focusing on safety matters is that not only the company can profit directly from increased productivity, the workforce would be more inclined to stay, therefore reducing rate of turnover for the company (Frein, 1980). It has been common believe for companies that once the project is properly insured, any safety issues arising will not impact them financially (Levitt & Samelson, 1993).

Safety and health incidents can impose losses to the company in the form of working time loss due to delays, decreasing productivity, equipment damages, insurance costs, medical costs and legal fines. There need to be a balance between the losses due to safety and health incidents and the cost of implementing safety and health precautions on-site. Establishing a safety and health management system based on safety and health plan drafted at the start of the project can be costly to the management but can be justified by the savings made by avoiding losses from safety and health incidents. The main issue is that the perceived cost of accidents cannot be interpreted directly from the accounting records due to the inherent volatile nature of accidents. Current practice of using the value of insurance premiums for construction projects as a guideline on the safety of performance of the company is flawed since insurance costs are only a small margin from the overall total safety and health implementation costs (Levitt & Samelson, 1993).

The Business Roundtable conducted studies in which is discovered that from the total project costs, safety and health incidents costs an average of 6.9% from the total, compared to 0.9% from total costs of implementing a proper safety and health programs. The 0.9% safety costs can be broken down to safety and health personnel salaries', safety equipments such as PPE, safety briefings, meeting and training. Therefore, the benefits and costing of implementing a safety and health program far outweighs the costs of accidents (Hislop, 1999).

Previous studies showed that after a construction project was completed, the costs of accidents can be anywhere from 7.9% to 15% from the total costs of the finished project (Everett & Frank, 1996; Hassanein, 2007). For example, in China, a study found that for the construction industry, 8.5% of the total project costs was from accidents (Godwin et al., 2011). In Kuwait, the costs of implementing safety and health programs are not included in the total contract price during bidding process as they consider it to be a substantial increase in costs without merit. The only safety-related cost that is usually included is the insurance premium which is mandatory due to legislation. The severity of the problem can be seen from the survey made as the construction managers gave an estimate of around 0.25% to 2% of the total project costs to be directed to safety and health implementations for a construction project in Kuwait (Kartam et al., 2000; Hassouna, 2005).

Project performance can be increased from implementing a proper safety and health management system. By providing a safe working environment for the workers, morale can be maintained and productivity can be increased due to higher efficiency achieved from the workers. Factors that reduce productivity due to accidents such as loss of working time due to equipment damage, injuries, near misses or work stoppages can be minimized with proper safety and health program on-site. Cutting down possible delays that can be caused from safety and health accidents is another way profit can be maximised indirectly. Accidents can also hamper the management in terms of litigation and the resulting process required from such accidents such as proper investigations and claims (Bottomley, 1994). Overall, despite the difficulty of obtaining actual financial losses due to safety and health incidents, they can be mitigated by implementing adequate control in the form of safety and health management system (Godwin, 2011).

2.12 Safety and Health Responsibilities

Companies must have a greater sense of responsibility in terms of safety and health implementation. Construction company or facility owners, their representatives, project manager, and supervisors legally can be held responsible for injuries or fatalities resulting from safety and health accidents on-site, provided that it is proven that they were caused by unsafe site conditions, work practices or both. Due to the nature of subcontractor use in large projects, this move will not absolve the main contractor out of their responsibility of implementing adequate safety and health program even if the

accident is focused primarily on the employees of subcontractor working on the project (Koehn & Regmi, 1991). This is due to the fact that the main responsibility of safety of site falls upon the main contractor. In turn, it is also their responsibility to ensure that the various parties involved in the project to contribute towards a safer working environment. Starting from the commissioning of the project itself, the client must be made aware of the safety requirements and selection of the contractor must also take into account their safety performance in previous projects. After construction has started, safety and health programs must be implemented throughout the entire lifespan of the project to ensure no incidents occur for both the benefit of the client and also the contractor (Hislop, 1999).

Clients or owners are the first step towards ensuring that the project possesses a proper safety and health management system. They can include provisions for safety programs in the bidding process for the project and provide safety criteria's that must be fulfilled by contractors wishing to work on the project. Past safety performance of the contractors involved in the bidding phase can also be taken into consideration. The concern for safety and health did not start with legislations of OSHA but in fact has been well documented since the 1970s (Smith, 1976). Since the total project costs will be paid for by the client, it is in their best interest that safety and health is integrated from the start of the project until handover. When safety and health procedures are made from the beginning of the project, workers will be more invested and confident in the upper management to also follow the safety procedures themselves. The presence of safety supervisors on-site to continuously monitor and implement safety precautions can help bridge the gap between upper management and the workers (Hammer & Price, 2001).

The appointment of a qualified safety supervisor can ensure that from the start of the project, safety and health aspects are integrated into every facet of work done on-site. Subcontractors hired to perform general or specialized work can also be required to either follow the established safety program or draft one of their own based on the needs of the work being done. Contract requirements can be drafted in place to ensure that the liabilities of the project and work being done and their safety requirements are outlined clearly. The implementation and monitoring of safety and health programs falls upon the main contractor and its appointed safety personnel (Hammer & Price, 2001).

2.13 Safety and Health Commitment

Employer, whether it is the client or main contractor, must show a certain level of commitment to safety and health in order to achieve a high level of safety performance for their projects. The most common method to measure the level of commitment shown is by the amount of financial support and consideration given to safety and health programs. There are various ways for companies to invest in safety and health, one of which is to have certified safety personnel from either new employments or the training of current employees to obtain competency in safety and health. Safety and health culture can be further nurtured by the top level management by including safety and health issues and discussing them in top management meetings. They can also be directly involved with safety and health issues or delegate them to qualified safety personnel available (Abudayyeh, 2006).

2.14 Hazards Identification and Control

Employees should be more integrated in the safety and health program on-site due to their proximity to hazards and hence higher awareness towards danger compared to the employer or management. Including the involvement of employees early on in safety programs can ensure the employees will be more invested in the success of the program (Lin and Mills, 2001). Creating a safety and health committee that consists of representatives of the client, main contractor, subcontractor and also worker can further foster trust and communication between parties involved in the project. Site inspections made by safety officer and also the upper managers can further improve the level of site safety performance (Lin & Mills, 2001). Safety and health problems on-site can be resolved and accident prevention can be improved with continuous monitoring and frequent safety meetings (Herberle, 1998). The safety committee can be involved in planning of task for the construction site, utilizing the method of Job Safety Analysis and Pre-Task Planning (PTP). The tools mentioned can be used to study and analyze the inherent hazards and preventive measures that can be put in place to ensure the task can be carried out efficiently and safely (Hammer & Price, 2001).

2.15 Management of Safety and Health

Safety and health management is crucial in determining the safety performance of a construction site. "Failing to plan is planning to fail" is a mantra that should be adopted by the management since accidents should be considered as an unplanned event. Starting from the bidding and estimation phase of the project until the handover of the project, safety must always be a primary concern and applied thoroughly. Everyone involved in the construction project holds a certain level of responsibility for safety, either of themselves or others. A study in Australia showed that "safety is the responsibility of both management and the worker together" is a well-held belief among construction workers on-site (Williamson, et.al 1997; Hassouna, 2005). A study concluded that to maintain a high level of safety performance, owners must be responsible in ensuring safety is emphasized throughout the design phase. They should consider the implementation of safety and health part of the contractual and bidding process (Kartam, et.al, 2000).

Construction safety performance in China is plagued with poor awareness of safety and health matters. The upper management does not provide and pay proper attention to safety assessment and awareness (Tam, et. al, 2004; Hassouna, 2005). The study also showed that inadequate monitoring system, lack of awareness from management, insufficient safety training, financial restraints in terms of safety spending and lax safety regulation enforcement were the major causes of accidents for construction projects in China (Tam et al., 2004; Abdul Rahim, 2008).

Safety matters being discussed in coordination meetings and also included certified safety personnel had a positive effect on the rate of accident and injuries on construction sites (Hinze & Raboud, 1988). Safety information can be disseminated more effectively by arranging frequent and consistent safety meetings involving all parties on-site. However, the survey also showed that despite this, 87% of respondents from sites surveyed noted lack of participation from upper management for these safety meetings with only 36% respondents noted frequent safety meetings that discussed relevant safety issues (Tam et al., 2004; Hassouna, 2005).

2.16 Role of Clients in Safety and Health

One major issues in the implementation of safety and health programs for construction projects is that the assumption that the client or owner is not responsible for safety once the project is commissioned. The rationale is that the contractor must carry out safety and health requirements after the project has started. Protecting the workers and also anyone associated with the project falls upon the contractor and it is their responsibility to provide hazard controls and safety precautions. Fact of the matter is that if there are any issues arising due to safety incidents on-site, the construction process itself will be affected as a whole and directly hinders the ability of the contractor to complete the project. This in turn will delay the project and affect the client's future plan and profits potential (Akass, 1994).

To remedy this issue, clients must possess a basic level of understanding for safety and health issues and at the very least appoint certified safety personnel to manage the required safety and health system. This move can ensure that there is sufficient level of expertise and deliberation in terms of safety management systems in affect when potential contractors are shortlisted for the project. Choosing a contractor based on their safety performance can instil a certain level of confidence that the contractor in question will be aware of proper safety and health systems and can manage it properly (Adams, 1976).

2.17 Site Working Condition

The work area temperature, the amount and quality of light and the levels of noise are common working condition factors found in all workplaces. These conditions can affect safety and health in factory premises where mechanization and automation have brought about changes. If inappropriate or excessive, these factors can strongly influence how a task is performed and affect productivity. There are important safety and health factors. For example hot, humid condition adds to fatigue and cause potential health risks and noise makes hearing of warnings impossible, causes misunderstanding and lead to permanent loss of hearing (IEM, 1974).

Modernization of the construction industry has also increased the complexity and therefore the number of possible hazards on-site. Newer, more mechanical

construction methods are being utilized instead of raw, manual labor. As the complexity of current construction project grows, these methods also increase in demand. Contractors have to fulfil the requirements of more complex specifications, tighter construction schedule by increasing efficiency, newly developed construction materials and at the same time still maintain the level of safety performance required by legislations. Despite the high initial costs for mechanization of construction projects, the long-term profits that stand to be gained have proved lucrative enough due to the shortened construction time required, therefore saving costs and increasing profits (Godwin, 2011).

Mechanization of the construction project also introduces more variables and therefore more hazards for the workers in terms of equipment usage. Studies and surveys have shown that danger is inherent to the construction industry due to the high rate of injuries and fatalities (Kartam, 1997). Statistics showed that the rates of accident and injury prevailing in construction works are significant compared to other industries for most countries. For example, 22% of all occupational fatalities in the United States of America were recorded from the construction industry despite employing less than 7% of their entire workforce (Loushine et al., 2003). In Britain, the construction industry that employs over 2.2 million workers, which makes it one of its largest industry, had a record of around 2,800 deaths from injuries received at work in the last 25 years (HSE, 2009).

Studies made in developing countries have also shown that the rate of accident and injuries suffered in construction projects are significantly higher compared to European countries such as Nigeria (Idoro 2007), Thailand, and Tanzania (International Labour organization, 2005). Due to the nature of financial allocation in developing countries, safety and health implementation is kept to a minimum in order to maximize profit (Mbuya & Lema, 2000). Surveys showed that the safety of workers is not prioritised during construction work and that they are considered expendable. Despite the existence of safety legislations, the enforcement is far too lax and authorities are lacking in commitment to punish employers in the case of infractions (Lee & Halpin, 2003). The normal practice for construction projects in these countries is that employees are often compensated in cash in the case of injuries and no formal reports are made (Koehn et al., 2003). The high rate of accidents and injuries in construction

industry of Nigeria can be traced to several factors such as lack of safety and health legislation, no proper accident reporting system, and lack of commitment from clients and contractors in terms of safety (Godwin, 2011).

2.18 Hazardous Environment

Advancement in construction technology has increased productivity and thus profit, although having the side effect of increasing complexity of projects and therefore hazardous environment for workers (Farooqui et al., 2007). Statistics from research has shown that construction workers have 1 in 300 chance of suffering fatal injuries while working. Ignoring fatalities, the likelihood of suffering temporary or permanent disability is also higher than average compared to other industrial fields (Ho et al., 2000; Farooqui 2008).

Studies made in Egypt and China shows that falling from height, slip and fall, and being struck by an object were the most prevalent cause of injuries for workers in construction sites (Hassouna, 2005; Zeng et al., 2008). In China, it was revealed by a study made in 2000 that the fatality rate for construction industry was on average 3,000 workers per year, mainly from accidents on-site. In Hong Kong, 275 reportable accidents per 1,000 workers per year were recorded in 1994; this figure stood at around 150 in 2000 (Rowlinson, 2003; Farooqui 2008). In comparison, 10 construction workers in every 1,000 suffer an injury in a year in Japan, and the figure is around 50 for the United Kingdom. Contractor's previous safety performance did not affect the insurance premiums for constructions site in Egypt, due to the informal nature of safety programs operated there (Farooqui et.al, 2008).

Due to the abundant supply of workers in developing countries such as Pakistan and India, construction projects tend to focus on manual working method, utilizing 2.5-10 times as many workers per activity compared to other developed countries (Koehn & Regmi, 1991; Farooqui 2008). The nature of the workers employed in this project makes it difficult to enforce the most basic of safety measures since they are typically unskilled. The variance in terms of their language, culture and also factions tends to complicate safety matter.

A huge gap exists between small and large contractors in Pakistan. Despite the presence of a safety policy for most large contractors, it is considered only a formality

and most employees are not informed of it. Despite that fact, various safety programs have been implemented for several major construction projects with safety controls in place. Workers are properly trained and the presence of safety officers on site to implement the safety controls made (Farooqui, 2008). Profit margins are the primary objective for majority of contractors, leading to unsafe conditions on-sites, due to cost-cutting measures taken especially for safety procedures. Orientation and training for new and existing workers on-site is considered a waste of resources due to abundance of manpower supply. There is no safety meetings held and no safety equipment provided for the employees and substandard working condition is considered the norm (Koehn & Regmi, 1991).

Due to the lack of training, accidents occur when the workers does not have the proper understanding to complete the work safely or use proper equipment. When accidents do happen, they are unreported and any injuries sustained are only treated with basic first aid. Specialized treatment or compensation are not an option. Only fatalities are usually reported due to potential litigation issues and financial impact that may result from it (Aksorn et al., 2009).

Breakdown of equipment is usually the result of neglect on part of the management that ignores maintenance and inspection schedules. The downtime due to repair works required leads to loss of work time and subsequently project delay. Breakdown of equipments such as backhoes, concrete mixers, forklift, water pumps, and tractors are common. Use of uncertified electrical equipment or installation by unqualified technician may also induce electrocution hazard. Personal protective equipments are not supplied and usually ignored even when available on-site due to lack of training for the workers. Rampant abuse of substance such as drugs and alcohol is also an issue, leading to lapse of concentration and focus, causing accidents. There are usually no procedure in place for drugs and alcohol test on-site (Hassanein, 2007).

Corruption is also a major factor hindering the development of a proper safety and health program in Pakistan. Low-level management staffs such as the supervisor are usually used as a scapegoat for when accidents happen on-site. Depending on the location of the site, relatives or friends of the victims may take matter into their own hands and metes out their own form of punishment towards the supervisor in charge. Any litigation effort will also be directed towards the perceived scapegoat, though it is

usually resolved with cash compensation instead of criminal prosecution in court. Workers are not aware of their rights in the event of an accident, leaving a gap to be exploited by the management and also local bureaucracy (Farooqui, 2008). The most common type of injuries faced by workers on-site were falling from height, struck by falling objects and raw materials, heatstroke, head injuries, eye injuries, and lastly burns cases (Farooqui, 2008).

2.19 Accident Investigations

Larger firms being responsible for large building construction projects have been shown in a study to display better safety records compared to smaller firms. Proper record-keeping of safety issues, including accidents is important due to their ability to provide valuable insights that can be utilized to control or eliminate future possible hazards (Hinze & Wilson, 2000, Hassouna 2005). It was a consensus among respondents in a survey made in the USA that improved safety performance can be achieved by conducting proper accident investigations. Another study in Hong Kong found that a major factor in lowering rate of site accident is the execution of accident reporting and investigation program. Similar accidents can be prevented by proper investigation on the nature of the accident and its underlying cause on-site. Results from the investigation can also be utilized to create preventive measures and checklists to ensure it does not occur again (Poon et al., 2000). In Kuwait, most contractors do not possess proper safety records owing to inadequate safety monitoring system and assessment procedure (Kartam, et al., 2000; Hassouna, 2005).

2.20 Relevant Items in Safety and Health Plan

For the Malaysian construction industry, especially for projects under the supervision of JKR, there is a rough guideline on what is required in a safety and health plan for submission. This guideline exists to enable a more streamlined evaluation of the submitted documents since it is a mandatory part of any awarded contract under JKR with a budget of more than RM20 million (JKR, 2011).

2.20.1 Background on Safety and Health Plan.

It must include the details of the company and current project where the S-Plan and S-Report is currently representing for (JKR, 2011).

2.20.2 Scope of Occupational Safety and Health

The contractor's commitment to provide a safety and health plan must be reiterated and ensure that proper enactment is lined out in the scope of occupational safety and health (Bohle, 1993).

2.20.3 Legislation, Procedures and Regulation

The contractor must identify the list of acts and regulations related to safety and health in Malaysia that is pertinent to the execution of the project during the drafting of the safety and health plan. A program on how the acts and regulations will be enforced and updated on site to both the administration and workers should also be lined out to ensure proper adherence. Breaking down the activities regarding safety and health done on site and what acts or regulations it falls under, the relevant parties and also method of enforcing will be a boon in determining the level of safety performance for the project (Bottomley, 1994).

The relevant acts and regulations for safety and health in Malaysia may include, Occupational Safety and Health Act 1994, Factory and Machinery Act 1967 (Act 139), The Factory and Machinery (Building Operations and Works of Engineering Construction)(Safety) Regulation 1986, BOMBA Act, The Radiation Protection (Basic Safety Standards) Regulation 1987 (JKR, 2011).

2.20.4 Occupational Safety and Health Policy

A construction company must have a sound safety and health compliance policy to ensure that it can enforced on all stages of the project. In that regard, the policy must reflect the commitment of the management and also workers to safety and health. It must also state what the company hopes to achieve and what their responsibilities are, in terms of safety and health. Management is responsible for providing and maintaining a safe working environment and systems of work. This include hazard control, injury-risk

mitigation and promoting safety and health aspects on site for anyone relevant, workers and visitors included. Facilities for all workers, including welfare, information, training and instruction to ensure works can be done safely must also be provided by the management. In turn, the workers must also comply with the instruction lined out in the safety plan (Shaw & Sealre, 1995).

2.20.5 Safety and Health Objectives

Objective of the safety and health implementation at construction sites that can be measured to comply with the requirements of relevant legislation and regulations. The main objective of any safety and health plan first and foremost is to ensure the safety of the workers on site while work is being done. This can be achieved by analysing the risks involved, possible hazards and implementing ways to control the hazards identified. Objective should be short term with a set duration and assigned to specific parties such as clients, management and workers. (Shaw & Sealre, 1995).

2.20.6 Job and Responsibilities

A proper organisational chart of the project safety and health team must be displayed. All of the responsibilities lined out for each of the roles defined. For example, some of the roles of the managing director in terms of safety is to direct, oversee and control operational activities, to reach targets (in terms of costing) and ensure compliance of policy and objective of company. In terms of a Project Manager, their role can consist of being committed in encouraging continual improvements in all aspects of safety and health, fulfil need of clients and also policy regarding safety and health and also any regulations relevant to the works done by the contractor, plan and prepare work procedures, safety organisation and health programs before commencement of work according to contract, including involvement of sub-contractors and suppliers based on needs, and determine potential for hazard or process before commencement of work and inform workers on site accordingly (Blewett, 1994).

2.20.7 Communication and Involvement

Method of internal communication and involvement in safety and health related matters must be outlined to ensure implementation on site is being done properly. The

management is responsible for the establishment of proper procedure of communication, in terms of documentation. This can be achieved by using memorandums, forms, signboards, bulletin boards, safety briefings, emails and also meetings. Holding a meeting would be the most common form of communication method between several different parties, especially in a construction environment where there would be the client or their representatives, the main contractor, any sub-contractor involved and also the local authorities. Types of meetings most commonly held are start-ups meeting, progress meeting, coordination meeting, safety committee meeting and client meeting (CCOHS, 1986).

For external communication and arbitration, all information on safety and health should be equally distributed among the project director, project manager and safety and health officer for easy access. This allows a system where issues brought forward by any external parties can be handled and negotiated by all levels of management (Candeias, 1991).

2.20.8 Prohibition of Dangerous Behaviour and Usage of Substance

Any behaviour deemed unsavory on the construction site can be a catalyst for unwanted safety and health incidents. This include the abuse of drugs, alcohol and any controlled substance. Procedures can be enforced in place to control these behaviors, from possession, usage and ultimately disciplinary actions for offenders. Early method of controls can include signage around the site and list of prohibited behaviour, drugs, alcohol and controlled substance along with actions that will be taken upon offenders in safety briefings and site induction (Johnstone, 1993).

2.20.9 Personal Protective Equipment (PPE)

The objective of personal protective equipment, or PPE, is to protect workers from risk of injury by minimizing exposure to hazards in by way of wearing protective equipments. PPE should not be considered the be-all and end-all of safety and health measure on-site but used alongside proper engineering and management controls to establish an adequate safety and health system for workers. Personal protective equipment (PPE) should be provided for the workers engaging in works identified to pose risk of injury, depending on the results of hazard identification, risk analysis and

determining control (HIRADC) forms. The provision of general PPE is not limited to workers, but also any visitors on-site. The usage of PPE must be monitored unless where it is not required, such as in the office or rest area (Akass, 1994).

All PPE used on-site should also be approved by the appropriate governing body such as SIRIM or DOSH. It falls upon the wearer to inspect the equipments used daily with supervision from management. The most common form of PPE used on site would be safety helmet, steel-toe boots, safety goggles and safety harness (Barnes, 1993).

2.20.10 Safety and Health Meetings

The safety and health committee on-site should strive to hold consistent meetings to discuss matters relating to safety and health for a project. Generally, these meetings are held at least once every 3 months, depending on any situation that may occur on site. Attendees must be made aware of the meetings beforehand so that any concerns that the workers or management might have can be tallied and addressed at the meetings. Proper record of the meetings in the form of Minutes of Meetings should be made available to management so that any decision or agreement made can be implemented accordingly. Special meetings may be held in the event of any accident arising on site, focusing on accident investigations, causes and suggested corrective measures (Toole, 2002).

2.20.11 Safety and Health Training/Induction

It is required for any worker to undergo an induction course before entering the work site. Despite the limited amount of material that are taught in the courses, it is still the best to convey any important information that will be relevant to safety and health on-site. Any workers does include the sub-contractors or indeed any specialist that might be starting work on-site. In terms of any construction projects done in Malaysia, the CIDB Green Card issued after attending the relevant course is mandatory for all workers and must be valid at all times for the duration of the project. Furthermore, extra training on safety can be held by the management according to the works that are being done for the project. This can include impromptu training course on-site or even any external programs that are held by certified organizations such as CIDB (Heberle, 1998).

2.20.12 Hazard, Risk and Control (HIRADC)

Hazard Identification, Risk Assessment and Determining Control (HIRADC) has been crucial tool in formulating a safety and health plan for construction projects since its inception. For all activities involved in the project, HIRADC will be carried out and the results will be enforced for all workers including sub-contractors working for the project. The HIRADC analysis for all activities required in order to complete the project will be done and included in the safety and health plan submitted. The activity, hazards involved, possible risks and control method shall be fleshed out in detail and continuous monitoring and improvement shall be made throughout the duration of the project (Wourinen, 1987).

2.20.13 Fire Prevention and Protection Plan

Fire prevention and protection plan should be part of the HIRADC analysis outcome and detailed out in the form of an Emergency Response Plan (ERP). The plan should be made with several context of emergency level identification, complete with Emergency Action Plan, Emergency Evacuation plan and Emergency Response Standard Procedure. All of these plans should be included in the training programmes scheduled by the safety committee, preferably to all the workers. An Emergency Response Team (ERT) complete with competent Person-In-Charge (PIC) and properly equipped with fire-fighting equipment should be assigned beforehand with their roles and responsibilities (Shaw & Sealre, 1995).

2.20.14 Reporting and Investigation on Accident/Incident

If any accident or incident should occur on-site, the procedure lined out previously should be initiated and the ERT put into action if required. Depending on the severity of the situation, preliminary reports should be made by the Safety and Health Officer in charge of the site within 24 hours of the incident. Should the incident in question involves fatality or any serious injury, the proper authorities such as the police must be notified and the corresponding forms submitted to Department of Safety and Health. Regardless of the nature of said incident and whether all works are stopped or not, the area where it happened should be vacated immediately. This ensure evidences are not disturbed and an investigation can be launched (Keyserling, 1988).

Any and all incidents involving safety and health on-site must be recorded and statistics produced in the relevant reports. This record shall be maintained throughout the duration of the project and reviewed in order to find any corresponding trend and improvements that can be executed on-site. A proper report form should be prepared for this intent (Keyserling, 1988).

2.20.15 Publicity Program for Safety and Health

Safety and health programmes held on site should be properly publicised through posters and signage. Both the project manager and Safety Officer can collaborate in developing the programmes as a way to achieve the safety and health objectives. Programmes such as safety meetings, safety audits, safety training/inductions, safety briefings, PPE inspection, housekeeping, site inspection and vector control must be conducted according to schedule and monitored constantly. Sub-contractors involved with the project should also be required to attend all of the programmes on-site. A special area can be designated and equipped with first aid kits with selected workers undergoing basic first aid training. Their contact number can be displayed around the special area for easy contact should any incident occur (Pasmore & Friedlander, 1982).

2.20.16 Handling of Material Used On-Site

Due to the various materials used on site, there is a possibility of accident occurring due to mishandling of certain materials. Material Safety Data Sheet (MSDS) and Chemical Safety Data Sheet (CSDS) are available for any kind of materials and chemicals used and they outline the hazards involved in handling them and also the proper way of handling them during the particular work activity (Lin & Mills, 2001; Ringen & Seegal 1995).

2.20.17 Employee Health Inspection

One of the main objectives of a proper safety and health program is to preserve the health of the workers. This should start even before the workers enter the site through proper health screening with medical checkups to ensure there are no pre-existing condition that might hamper their ability to complete a task safely. Continuous

inspection of the workers' health condition should be made in accordance to work activities completed to ensure proper PPE usage are being practiced. (Johnstone, 1993) The results of these inspections and also the health monitoring must be kept in records and reviewed on a regular basis for any possibility of improvements towards the safety culture (Mcintosh & Gurdon, 1986).

2.21 Theoretical Framework for Safety and Health Plan

After all of the relevant information have been compiled from the various sources, a theoretical framework consisting all of the variables that were chosen for inclusion in the drafting of a safety and health plan is formed. The framework consists of all the important items that should be present in a safety and health plan that is submitted for review under JKR project. The theoretical framework for safety and health plan is shown below in Table 2.1 and further simplified as shown in Table 4.1.



UMP

Table 2.1 Theoretical Framework For Safety And Health Plan

CATEGORY		REQUIREMENT	DESCRIPTION/INPUT VARIABLE	REFERENCES	
POLICY	P1	SAFETY AND HEALTH SCOPE	a	Description of Project within the context of safety and health management system	Project Requirements in terms of Safety and Health Phi Hughes et.al, 2001 Akass, 1994 Owen, 1996
			b	manifest the statement of Commitment on Safety and Health	Commitment in ensuring site is accident-free and workers/visitors are protected at all times Phi Hughes et.al, 2001 Akass, 1994 Owen, 1996
			c	Brief Description on the scope, limitation and execution of the overall Safety and Health Plan within the context of safety and health management	Scope of Safety and Health Plan Committed to executing Safety Plan Phi Hughes et.al, 2001 Akass, 1994 Quinlan & Bohle, 1991
			d	List of Achievements in Safety and Health	Prior Project Safety and Health Management System Barnes, 1993 Quinlan & Bohle, 1991
	P2	OBJECTIVE SAFETY AND HEALTH	a	describe commitment to comply with safety and health legislation, act, rules and regulation.	List of Legislation List of Acts List of Rules and Regulation Ir. Abu Bakar, Inforeach, 2002 Barnes, 1993 Quinlan & Bohle, 1991
			b	describe initiative to promoting consistence and productive safety and health environment	List of Initiative by Company Director Ir. Abu Bakar, Inforeach, 2002 Barnes, 1993 Jones, 1985
			c	outline the strategy to encourage healthy working culture and procedure	Implementation Strategy through promotion/training Ir. Abu Bakar, Inforeach, 2002 Barnes, 1993 Minter, 1991

Table 2.1 Continued

	P3	SAFETY AND HEALTH POLICY	d	describe continual improvement in safety and health management	Meeting to discuss effectiveness of management and ways to improve	Ir. Abu Bakar, Inforeach, 2002 Barnes, 1993 Minter, 1991
			a	Outline and describe General Policy Statement that manifest commitment to manage safety and health with specific aim and objectives	General Policy Statement	Singh, A et al., 1999 Phi Hughes et.al, 2001 Wilkinson et al., 1992
			b	detail out the actions, function, roles and responsibilities of the Safety Management Team on specific activities within the context of overall safety management structure	Organization Chart with roles and their responsibilities	Heberle, 1998 Wilkinson et al., 1992 Linkow, 1989
			c	Outline the overall Safety and Health Management system that can proclaim to deliver towards the achievement of the aim and objectives of the policy	Safety and Health Management System	Heberle, 1998 Linkow, 1989 Lindsay, 1992
LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Provide enforcement management related to construction works at all stages related to safety and health	Schedule for inspection Person in charge (pic) for inspection	Wu, T. C. et. al., 2008 Wong, C. H. et. al., 2000 JKR, 2011
			b	outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health	List of Act, Rules and Regulation that requires compliance	Wu, T. C. et. al., 2008 Wong, C. H. et. al., 2000 JKR, 2011

Table 2.1 Continued

LEGISLATION			c	presented compliance to local government/authorities requirement for specific construction works at all stages related to safety and health	List of Act, Rules and Regulation linked accordingly to work done on site and compliance procedure	Farooqui et.al, 2008 Clap & Phillis, 1988 Blewett, 1994
			d	attachment of documentation of obtaining consent/approval/ permission/from related local government/authorities to initiate construction works pertaining to safety and health requirement	Proper Documentation and Forms in HQ and Site Office for inspection	Farooqui et.al, 2008 Blewett, 1994 Owen & Rankin, 1996
			e	provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer	Yellow Book Certificate or equivalent for Safety Officer	Hinze & Raboud, 1988 Farooqui et.al, 2008 Owen & Rankin, 1996
			f	outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation throughout the construction stages.	Schedule for Inspection Schedule for Assessment Audits	Shaw & Sealre, 1995 Tam, et al., 2004 Boden et al., 1984
			g	describe resource planning related to enforcement requirement with specific compliance to legislation act, rules and regulation throughout the construction stages	Person in Charge (PIC) for compliance monitoring Inspection Schedule coordinated with relevant authorities	Gunningham, 1984 Mansfield, 1994 Quinlan & Bohle, 1991
	L2	PROBIHITED SUBSTANCE	a	describe in detail the enforcement management strategies to prohibit the use of Drugs at construction site at all time	Drug Testing Schedule Warning Signage	Hinze & Gambatese, 2003 Resta, 1994 Phillis, 1988

Table 2.1 Continued

MANAGEMENT			b	describe in detail the enforcement management strategies to prohibit the consumption of alcoholic drinks/substances at construction site at all time	Alcohol Testing Schedule Warning Signage	Hassanein, 2007 Resta, 1994 Barnes, 1993	
			c	describe in detail the enforcement management strategies to prohibit the use of restricted medicine at construction site at all time	Fines and Suspensions Further Action for repeat-offenders	Farooqui et.al, 2008 Quinlan & Bohle, 1991 Gardner & Palmer, 1992	
			d	Describe in detail management of Prohibited Substance records	Health Records List of Offenders	Farooqui et.al, 2008 Resta, 1994	
		M1	ROLES AND RESPONSIBILITIES	a	outline the roles and responsibilities on safety and health management of each parties involved across all management level	List of Roles Involved: Managing Director, Project Manager, Site Manager, Safety Officer	Williamson, et.al 1997 Beaumont et al., 1982 Wilson & Koehn, 2000
				b	prescribes in detail the duties of each designated post related to safety and health management team; managing director, project manager, safety site supervisor, site engineer, site supervisor, management team, designer and sub-contractor involvement	Duties of Project Manager related to safety and health: ensure all subcontractor fulfills their responsibility in accordance to legislation, acts, contractual agreement while complying with all safety and health procedures laid in place	Hassouna, 2005 Jannadi et al., 1998 Coyle & Leopold, 1981

Table 2.1 Continued

			c	outline Organisational Chart exhibiting all level of safety and health management and the competent Person In-Charged (PIC)	Organizational Chart arranged according to their hierachy in safety and health for the project	Hinze & Raboud, 1988 Coyle & Leopold, 1981
			d	provide valid documentation to support evidence of appointment and competent person qualification	Compilation of Resume for Competent Person with relevant certificates/qualification	Hinze & Raboud, 1988 Coyle & Leopold, 1981
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases	SOP for Excavation Works: Weekly Inspection of Excavation Works done by competent person, Proper PPE used according to specification, Excavating Equipment is in stable position	Reese & Eidson, 2006 CCOHS, 1986 Bottomley, 1994
			b	analyse the implications SOP has on the evaluation of HIRADC for each specific construction works/activities at all stages/phase	Determine SOP for specific activity i.e excavation and how it would affect safe working conditions	Reese & Eidson, 2006 CCOHS, 1986 Phillis, 1990
			c	Describe the SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation within the specific construction works/activities at all stages/phase	List of expected works/activities for all stage of construction and proper SOP adhering to legislation, Act, rules and regulation	Reese & Eidson, 2006 JKR, 2011 Motzko, 1989

Table 2.1 Continued

		d	outline and describe the Frequency of Assessment/monitoring /supervision and enforcement of SOP at specific construction works/activities at all stages/phase	SOP Assessment every 2 weeks	Toole, 2002 Hislop, 1999 JKR, 2011
		e	Outline and describe the SOP for inspection, maintenance, management and requirement of PPE and related equipment	PPE Inspection PPE maintenance schedule	Toole, 2002 Hislop, 1999 JKR, 2011
		f	Describe the SOP for obtaining Competent Person requirement and responsibilities	Relevant Certificates	Toole, 2002 Hislop, 1999 JKR, 2011
		g	describe the SOP for Documentation and audit	All works done are recorded properly Records kept for any activity	Toole, 2002 Hislop, 1999
		h	describe the SOP for House Keeping and maintenance at specific construction works/activities at all stages/phase	Objective of Housekeeping Housekeeping method	Toole, 2002 Hislop, 1999 JKR, 2011
		i	describe the SOP for Specialist Involvement at any specific construction works/activities at all stages/phase as required	Certificate for Specialist Requirement/SOP for Specialist works	Toole, 2002 Hislop, 1999 Reese & Eidson, 2006
M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	describe the schedule of induction training programmes and the application of relevant safety pass for specific construction works complete with the outline of procedure of delivery and attendance record management system.	Schedule for induction of workers into site List of forms and safety passes assigned on-site Attendance Records	Huang and Fang, 2003 OHSA, 1994 Peterson, 1988

Table 2.1 Continued

			b	provide the valid documentation of Green Card holders, and describe the management of its implementation and procedure for application requirement.	List of workers and copy of valid CIDB Green Card List of CIDB Green Card expiry dates and renewal procedures for workers	Abu Bakar, InfoReach, 2002 JKR, 2011 Quinlan & Bohle, 1991
			c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion throughout construction phases complete with task force setting up as strategy to encourage its implementation, discussion, meeting and CQI orientated	Schedule of Safety Training and On-Site Briefings Safety Campaigns and Promotion on-site Safety Task Force for Safety Programmes on-site	Toole, 2002 JKR, 2011 Quinlan & Bohle, 1991
			d	describe the management of documentation and assessment to maintain the quality of training programmes incorporating validity of competent instructional person and relevant legislation, act, rules and legislation wherever relevant to comply suitable with specific construction works/activities	List of Documentations required List of PIC for Documentation Accessibility to Documentation for reference List of Documentation for Compliance	Ahmed et. al., 2005 JKR, 2011 Quinlan & Bohle, 1991
			e	provide valid documentation of certified competent person (with compliance to specific local agencies/government requirement) to manage training and outline the resource capabilities to conduct skill training to fit the need and purpose of specific construction works through all phases wherever required	Certificates of Safety Officer/PIC for safety training/programmes Resume of Safety Officer/PIC including Yellow Book	Langford et al., 2000 JKR, 2011 Reese & Eidson, 2006

Table 2.1 Continued

	M4	EMPLOYEE HEALTH INSPECTION	a	outline scheduled Health Campaign programme	Schedule of Health Campaign On-site	McIntosh & Gurdon, 1986 Johnstone, 1993
			b	describe Scheduled health check up	Schedule of Medical Check-up for workers	Johnstone, 1993 Abudayyeh, 2006
			c	describe health monitoring programme	Based on Medical Check-ups of workers and inspection on-site	Johnstone, 1993 Abudayyeh, 2006
			d	describe environmental assessment on site	Site Condition Working Condition for workers	Petersen, 1988 Abudayyeh, 2006
	M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a	outline the list of compulsory involvement/participation of the sub-contractor on specific safety programme	List of Compulsory Attendees (all workers and sub-contractor)	Heberle, 1998 OHSA, 1994 JKR, 2011
			b	describe the schedule coordination meeting involving sub-contractor on safety and health	Frequency of Coordination Meeting: Every 2 weeks	Heberle, 1998 JKR, 2011 Tyler, 1992
			c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement	CIDB Certificate Green Book for Workers Scaffolding Certificate	JKR, 2011 Heberle, 1998 Linkow, 1989
	M6	TRAFFIC MANAGEMENT	a	provide traffic management plan	Traffic Management Plan	Hislop, 1999 Minter, 1991
			b	outline proposal of conflict handling of traffic management in case of emergency	List of involved Parties and their responsibilities Specific Zone Designation for Management	Hislop, 1999 Minter, 1991 Akass, 1994

Table 2.1 Continued

		c	design traffic plan for emergency evacuation	Layout of Traffic during Emergency	Sawacha et al., 1999 Akass, 1994	
		d	describe and propose signage management and procedure	List of Signage placed on site	Sawacha et al., 1999 OHSA, 1994	
		e	describe temporary traffic management outfit/tool	List of PPE for traffic controllers	Sawacha et al., 1999 OHSA, 1994	
		f	Describe PPE function for traffic management	List of PPE for traffic controllers	Sawacha et al., 1999 OHSA, 1994	
	M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	outline the Purpose and objective of PPE related to construction activities/stages/phases	Objective of PPE: To protect workers from hazard	Toole, 2002 Hammer & Price, 2001 CCOHS, 1986
			b	outline scheduled Briefing on PPE and its training programmes	PPE Briefing Schedule PPE Training Schedule	Abu Bakar, InfoReach, 2002 CCOHS, 1986 Beers, 1990
			c	provide technical data and documentation of specification, compliance and/or certification according to specific construction works/activities/stages/phases	List of PPE and technical data, specification according to compliance to regulations and safety and health practices	Abu Bakar, InfoReach, 2002 CCOHS, 1986 Hammer & Price, 2001
			d	provide enforcement management system for inspection, assessment, monitoring and supervision maintaining the fitness of all PPE in standard working condition at all time.	PPE Inspection Schedule Checklist for PPE Inspection	Farooqui et al., 2008 CCOHS, 1986 Hammer & Price, 2001

Table 2.1 Continued

			e	describe in detail the Functions and allocation of each PPE designated to specific construction works/activities/stages/phases	List of PPE according to type of work List of PPE according to work area	Farooqui et al., 2008 CCOHS, 1986 Hammer & Price, 2001
ANALYTICAL ASSESSMENT	A1	HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)	a	prescribe specific scope of construction works/activities within the context of hazard identification of its type, effect and control strategy	HIRADC for all expected works on-site	Hislop, 1999 Lauriski & Guymon, 1989 Akass, 1994
			b	analyse and determine the level risks (1-25) upon specific scope of construction works/activities within the influential context of likelihood (1-5) and severity (1-5) implications	Risk Level Classifications Likelihood of Incidents Implication of Risk Level and Incidents	Hammer & Price, 2001 Akass, 1994 Legge, 1989
			c	provide risk control management compliance with the related legislation, act, rules and regulation	Risk Control Management Plan (according to HIRADC)	Hammer & Price, 2001 Akass, 1994 Lindsay, 1992
			d	provide competent Person-In-Charged (PIC) to deliver the management of HIRADC with proven certification and/or industrial experience related to safety and health	Person-In-Charge (PIC) Appointment and Record (Certificates, Experiences)	Lindsay, 1992 Hammer & Price, 2001 Mansfield, 1994

Table 2.1 Continued

ANALYTICAL ASSESSMENT	A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	describe and detail out the Emergency Classification in response to HIRADC analysis within the influential context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency	Emergency Level Identification Emergency Escape Priority Plan List of Potential causes of Emergency	Hammer & Price, 2001 Akass, 1994 Hislop, 1999
			b	prescribed in depth the Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure complete with scheduled training programmes, awareness initiatives, briefing programmes, instructions management, notice communication strategies and practical demonstration	Emergency Action Plan Emergency Evacuation Plan Emergency Response Standard Procedure Monitoring/Inspection Schedule	Phi Hughes et al., 2001 Pitblado et al., 1990 Denton, 1982
			c	prescribed in depth the Emergency Response Plan (ERP) complete with the management of the Emergency Escape Routes, alarm, notification and information systems, signage, instructions, Recovery Plan, Contingency Plan, sources of fire fighting equipment, sources of Personal Protection Equipment, sources of First Aid facilities, Emergency Contact number and linkage intercommunication facilities/strategies with the local emergency services agencies such as Fire department and police.	Emergency Response Plan (with all relevant details included as stated in (c))	Sawacha et al., 1999 Aksorn, 2009 Pitblado et al., 1990

Table 2.1 Continued

ANALYTICAL ASSESSMENT			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC) describing their roles and responsibilities within the overall Emergency Management System.	Emergency Response Team Assignment Person In Charge (PIC)	Sawacha et al., 1999 Aksorn, 2009 Lin & Mills, 2001
			e	outline the management of potential hazardous material including liquid and gases including the zoning strategies, compartmentalisation strategies (storage and enclosure protection), procedure and scheduled frequencies of inspection, supervision, maintenance and waste disposal	Hazardous Material Management Plan	Aksorn, 2009 Lin & Mills, 2001 Reese & Eidson, 2006
			f	describe the scheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system (including all of its appliances) with the voltage usage, design requirement, code of practice and standard, cabling requirement, and competent Person-In-Charged (PIC)	Infrastructure Inspection and Monitoring Approved Design Specifications according to requirement of standard and code of practice	Aksorn, 2009 Lin & Mills, 2001 Reese & Eidson, 2006
			g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintenance programmes.	List of Fire Fighting Equipment Maintenance Schedule Maintenance Record	Aksorn, 2009 Lin & Mills, 2001 Reese & Eidson, 2006

Table 2.1 Continued

ANALYTICAL ASSESSMENT	A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	describe the procedure for accident report and investigation	Protocols to Initiate on-site Person in Charge (PIC) Personnel to Contact	Kartam et al., 2000 Petterson & Roberts, 1990 Ferry, 1998
			b	provide the flow chart on accident/incident management	Flow Chart on Accident/Incident management	Kartam et al., 2000 Petterson & Roberts, 1990 Ferry, 1998
			c	presented format of report documentation	Safety Report	Hassouna, 2005 JKR, 2011 OHSA, 1994
			d	describe in detail the Role of responsibilities of parties involved, including ERT and ERP	Role and Responsibilities for all Safety Team (ERT, ERP)	Hassouna, 2005 JKR, 2011 OHSA, 1994
			e	describe the methodology to analyse the source of accident/incident	Based on Incident Investigation	Hassouna, 2005 JKR, 2011 OHSA, 1994
			f	describe the analysis of CQI and its management		Hassouna, 2005 Bottomley, 1994 Barnes, 1993
	A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based	Type of Accident Fatalities/Injuries sustained Scope of Area for Incident	Poon et al, 2000 Curtain et al. , 1992 Ferry, 1998
			b	describe the format of presenting and evaluating causes of accident, injuries and illness	Report on Incident (JKKP6 Form)	JKR, 2011 Hinze & Wilson, 2000 OHSA, 1993
			c	describe the format of presenting and evaluating total accumulative of reported cases	Statistic in Safety Report	OHSA, 1993 Hinze & Wilson, 2000 Lees, 1980

Table 2.1 Continued

FACILITIES AND INFRASTRUCTURE			d	describe the format of presenting and evaluating statistical data on site	Evaluation in Coordination/Safety Meeting	Hinze & Wilson, 2000 Sanders & McCormick, 1993 Pardy, 1991	
			e	outline the process and procedure of documentation of information and forwarding for meeting	Preparation of Incident Report and Safety Report for relevant meetings	Hinze & Wilson, 2000 Sanders & McCormick, 1993 Pardy, 1991	
			f	describe the methodology to analyse findings of the statistical result for CQI	CQI Analysis Chart	Coyle & Leopold, 1981 Hinze & Wilson, 2000 Colling, 1990	
		F1	TEMPORARY ELECTRICAL SUPPLY	a	provide installation procedure, drawing and documentation approved by competent person	Installation Procedure Drawing Documentation	IEM Malaysia, 1974 Fisher, 1991 JKR, 2011
				b	outline the guideline and code of practice, related Legislation, Act, rules and regulations for construction works, connection and installation	List of guideline, code of practice, legislation, Act and rules	IEM Malaysia, 1974 Fisher, 1991 JKR, 2011
				c	outline material specification and design requirement approved by competent person	Approved Design Material Specifications	Farooqui et al., 2008 Smith et al., 1976 Denton, 1982
				d	provide valid documentation of certified competent person for electrical works	Certificate of Competency for Workers/Installer	Farooqui et al., 2008 Smith et al., 1976 Denton, 1982
	F2	SANITARY FACILITIES	a	provide waste management system approved by competent person	Briefing for waste management Specification for waste management	Wood, 1981 Sawacha et al., 1999 Smith & Larson, 1991	

Table 2.1 Continued

		b	provide installation procedure, drawing and documentation as approved by competent person	Installation Procedure Layout Drawings Documentation	Wood, 1981 Sawacha et al., 1999 Smith & Larson, 1991	
		c	comply with guideline and code of practice, related Legislation, Act, rules and regulation	List of guideline, code of practice, legislation, Act and rules	Aksorn, 2009 JKR, 2011 Smith & Larson, 1991	
		d	outline the specification and design requirement as approved by competent designer, local authorities/government	Facilities Specification Approved Drawings	Sawacha et al., 1999 JKR, 2011 Smith & Larson, 1991	
		e	provide valid documentation of certified competent person	Certificate of Competency for Workers/Installer	Sawacha et al., 1999 JKR, 2011 Smith & Larson, 1991	
	F3	OTHER FACILITIES	a	design to meet the requirement of the employee. Provide evidence of survey and employee responses/feedbacks	Feedback Forms Inclusion in Meetings for improvement	Sawacha et al., 1999 Sass & Crook, 1981 Boden et al., 1984
			b	outline and describe in detail the installation procedure, drawing and documentation as approved by competent person	Installation according to requirements	Prior, 1985 Sawacha et al., 1999 Sass & Crook, 1981
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	List of guideline, code of practice, legislation, Act and rules	JKR, 2011 Sawacha et al., 1999 Sass & Crook, 1981
			d	describe the specification and design requirement that comply with all designated requirement	Facilities Specification Approved Drawings	Aksorn, 2009 Sawacha et al., 1999 Sass & Crook, 1981

Table 2.1 Continued

			e	provide valid documentation of certified competent person	Certificate of Competency for Workers/Installer	Aksorn, 2009 Sawacha et al., 1999 Sass & Crook, 1981
COMMUNICATION ADMINISTRATION	C1	COMMUNICATION INVOLVEMENT	a	outline methodology of delivering safety and health information	Coordination Meeting Safety Briefing Safety Training Announcement On-Site	Sawacha, 1999 Aksorn, 2009 Barnes, 1993
			b	provide the management of documentation of safety and health related information	Person in Charge (PIC) List of Documentation Accessibility to Documentation	Beaumont et al., 1982 Sawacha, 1999 Aksorn, 2009
			c	outline schedule of safety meeting; initial, development, co-ordination, head department, site safety committee and client meeting	Schedule and Frequency for each meeting, including provisions for emergencies	Lin and Mills, 2001 Heberle, 1998 Leopold & Beaumont, 1982
			d	outline CQI for safety information management system	CQI for Safety Information System	Lin and Mills, 2001 Heberle, 1998 Leopold & Beaumont, 1982
	C2	PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels	Signage Bulletin Boards	Ahmed et. al., 2005 Lindsay, 1992
			b	outline schedule of safety programmes in weekly basis	Schedule of Safety Programmes	Ahmed et. al., 2005 Lindsay, 1992 Lindsay, 1992
			c	outline frequency of safety programmes according to the specific requirement	Based on Schedule of Safety Programmes	Ahmed et. al., 2005 Lindsay, 1992 Lindsay, 1992

Table 2.1 Continued

			d	describe in detail each categories of safety programme including induction, safety meeting, surveillance, health campaign, training and audio visual demonstration.	Site Safety Induction Safety Meetings Site Inspection Safety Campaign On-site Specialized Training (for certain works)	Ahmed et. al., 2005 Lindsay, 1992 Wilkinson et al., 1992
C3	SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members	Startup Meeting, Progress Meeting, Coordination Meeting, Safety Committee Meeting, Client Meeting	Reese et al., 1999 Leopold & Beaumont, 1982 Lowery & Thomas, 1988	
		b	outline schedule and frequencies of each meeting	Schedule of Meetings	Reese et al., 1999 Krause & Finley, 1993 Jones, 1985	
		c	prescribe the management of information and documentation of each meeting in relation to the progress of construction works	Appointed Minute Keeper Record of Meetings	Reese et al., 1999 Leopold & Beaumont, 1982 Krause & Finley, 1993	
		d	provide the means of CQI after meeting and its management	CQI for Meeting Management	Reese et al., 1999 OHSA, 1994 Curtain et al., 1992	
I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards (health, fire, reactivity and environmental) on material	List of Materials used on site, List of MSDS required for display	Ringen & Seegal, 1995 OHSA, 1994 Lauriski & Guymon, 1989	

Table 2.1 Continued

INFORMATION			b	provide information on the use, storage, handling and emergency procedures all related to the hazards of the material.	Handling Procedures with Proper signage	Lin & Mills, 2001 Ringen & Seegal, 1995 Lauriski & Guymon, 1989
			c	describe the recognition of overexposure symptoms and what to do if such incidents occur	Warning Labels Proper Signage First Aid Kit	Lin & Mills, 2001 Hopkins, 1993 Lauriski & Guymon, 1989
			d	describe the management and accessibility of documentation	Proper record keeping	Lin & Mills, 2001 Hopkins, 1993 Lauriski & Guymon, 1989
			e	provide valid documentation of competent Person-In-Charged (PIC)	PIC Certificate/Resume in Record	Lin & Mills, 2001 Ringen & Seegal, 1995 Lauriski & Guymon, 1989
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	provide information on chemicals, describing the hazards the chemical presents	List of Chemicals used on site, List of CSDS required for display	Ringen & Seegal, 1995 OHSA, 1994 Lauriski & Guymon, 1989
			b	provide information on handling, storage and emergency measures in case of an accident	Handling Procedures with Proper signage	Lin & Mills, 2001 Ringen & Seegal, 1995 Lauriski & Guymon, 1989
			c	provide information on safe handling, in the form of exposure scenarios	Signage and CSDS displayed on-site	Lin & Mills, 2001 Hopkins, 1993 Lauriski & Guymon, 1989
			d	describe advice on risk management measures given in the exposure scenario, where provided.	Signage and CSDS displayed on-site	Lin & Mills, 2001 Hopkins, 1993 Lauriski & Guymon, 1989
			e	outline the management and accessibility of documentation	Briefings for workers involved Signage and CSDS near storage and work area	Lin & Mills, 2001 Hopkins, 1993 Lauriski & Guymon, 1989

Table 2.1 Continued

I3	MACHINERY EQUIPMENT LIST	f	provide valid documentation of competent Person-In-Charge (PIC)	PIC Certificate/Resume in Record	Lin & Mills, 2001 Ringen & Seegal, 1995 Lauriski & Guymon, 1989
		a	provide technical list of all machineries, contract vehicle (rental) for construction works; including technical information such as type of machinery, model, engine capacity, engine number, chassis number and valid roadtax and permit	Types of machineries used List of Machineries on-site Registration info	Farooqui et al., 2008 DeReamer, 1980 Colling, 1990
		b	provide the management of inspection, service manual and maintenance schedule	Maintenance Record Service Record Inspection Checklist	Farooqui et al., 2008 DeReamer, 1980 Minter, 1991
		c	provide valid record of drivers with competent driving license	Driver Records and List Copy of Driving License	Farooqui et al., 2008 Mansfield, 1994 Minter, 1991
		d	provide related vehicle permit and taxes documentation	Vehicle Roadtax records	Farooqui et al., 2008 JKR, 2011 Dawson et al., 1987
		e	provide valid documentation of certified competent person	Name and List of Person-in-Charge (PIC)	Prior, 1985 Farooqui et al., 2008 JKR, 2011

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the general view of research method used in this study. The data collected for this study will be analysed and results interpreted in the following chapters. Both qualitative and quantitative approaches are used to separately evaluate the effectiveness of the variables used to assess the SH plan and also the performance of the sites selected for comparison of assessment methods. An overall performance average obtained from the assessment was tallied against past statistics to verify the accuracy of the data collected.

The research methodology consists of the following steps:

- i. Determine variables relevant to developing a SH benchmarking tool
- ii. Research design to develop a SH Performance Assessment Model to elicit information about construction safety performance at different work sites.
- iii. Conducting survey and interviews to establish viable benchmark criteria for SH Performance Assessment model.
- iv. Research analysis, assessment of the survey findings to diagnose the SH Performance Assessment Tool and develop conclusions and recommendations.

3.2 Research Technique

This section discusses the research techniques used in this study such as literature review, semi-structured interview sessions, questionnaires, content analysis for qualitative data and Relative Importance Index (RII) method for analysing data collected from the questionnaire.

3.2.1 Theoretical Framework Establishment

In order to establish a baseline on the scenario of construction safety performance in Malaysia compared to a global scale, a review of relevant literature including previous reports and researches was made. By gathering all factors related to safety and health implementation from a documentation point of view for construction projects all over the world, this enabled a collection of base knowledge that is used to generate safety variables for the site assessment survey. The relevancy and effectiveness of the factors discussed is also taken into consideration to narrow down the list of variables selected. The review serves as benchmark for analysis of the survey made in order to confirm the relevancy of the variables selected to the current scenario of construction safety climate.

A theoretical framework is then formed from the variables in order to better illustrate the importance of each factors selected and placed into their own categories. This allowed a better transition into the second stage of the research that is to perform a gap analysis and also to prepare the framework for the interview and survey phase.

3.2.2 Research Strategy

In order to fulfill the research objectives, both qualitative and quantitative methods are used in order supplement each other. After the theoretical framework has been established, semi-structured interview with an expert panel selected among JKR certified Safety Officers to review and validate the factors before being placed in a survey. The interviews with each expert panels were performed separately and confidentially according to industry preference. Questionnaire is distributed among safety and health personnel related to JKR projects. By using both these methods, the quality of the data collected can be quantified and evaluated objectively.

3.2.3 Questionnaire Design

The questions for the survey are done in two parts. The first part contains questions regarding the qualification of the personnel answering the survey in terms of safety and health such as their age and working experience. The second part of the questionnaire for the survey are designed by assigning the Likert scale of 1 to 5 according to level of importance for each of the variables presented, with 1 being least

important to 5 being the most important. Result for the questionnaire is analysed to establish impact factor to the overall survey result. The result is also analyzed as 100% towards total compliance of the theoretical framework. Feedback from the interview is then absorbed into the results of the survey to design the full assessment benchmark.

3.2.4 Data Collection

The process to determine the set of variables relevant to be included in the proposed benchmarking system is performed in two stages. A theoretical framework is presented to an expert panel consisting of various safety and health officers to determine the relevancy of the variables selected. Data from the interviews was then analysed and the framework for the benchmark system was then established to be taken into stage two, in which it is presented in a survey with chosen safety and health personnel to fine-tune the variables selected and provide a more complete overview of the system.

Variables selected from the literature review are evaluated by Safety and Health officers certified by JKR, acting as an expert panel. The same variables are also presented to relevant Safety and Health personnel chosen from various companies to provide an independent review. The results of the survey are then collected and then tallied to provide an overview on the variables deemed relevant by the expert panel from both JKR and contractors involved. A finalized framework for the benchmarking system is then established by analysing the data obtained from the survey.

3.2.5 Data Analysis

After the two stage data collection is completed, content analysis is performed to identify the patterns obtained from both the surveys and interviews conducted. It was imperative that the outcomes related to how safety and health performance can be quantified are determined. For both the method used, quantitative data analysis which includes checking, editing, coding, handling and processing the surveys, rating and filtering data, can be performed upon. The Relative Importance Index (RII) method was implemented to analyze the data collected:

$$RII = \frac{\sum W}{A*N} \text{ where } 0 < RII < 1$$

From the formula, W is the weight of each factor given by the panels ranging from 1 to 5, A is the highest weight (=5), N is the number of respondent participating in

the survey. The requirement for when a variable can be considered is when $RII \sim 1$. Likert scale is used to analyze the answers of the survey. The way Likert Scale is applied is by assigning level of importance from 1 to 5 for each of the variables listed in the framework. The respondents will then be asked to assign a value for all of the variables in terms of their importance for safety and health performance of JKR projects. All of the response received from the survey is then pooled and calculated based on the Relative Importance Index (RII) method in order to determine their weightage in safety and health plan evaluation.

3.3 Sampling Selection for Survey and Interview

Sampling is the process of selecting a chosen group of people to represent a certain party in order to conduct a study. In the case of this research, sampling is done in order to form a panel of expert for interviews and also a pool of respondents to participate in a survey. Both the quality and quantity of the group of people chosen are reflected below.

3.3.1 Sampling Qualitative Approach

For the purpose of the survey and also the interview, the respondents selected varied from personnel of JKR and also construction companies in order to satisfy a certain level of quality requirement in terms of data collected. The qualifications and also years of experience being involved in safety and health are the main selection criteria for these respondents. The surveys were held on the 30th of May 2016 during a safety conference held by JKR and attended by Safety and Health officers certified by JKR from all over the country.

3.3.2 Sampling Quantitative Approach

The survey was conducted by distributing the survey forms to the expert panels selected from a pool of qualified safety and health personnel. The survey forms consisted of 2 separate sections. The first section requires detail on the safety and health organization that the respondent are currently involved with to establish their credentials. Section 2 consists of the variables that have been chosen based on the literature review made.

Formula to determine the minimum sample size required for the study to be reliable:

$$N = \left(\frac{Z_{\alpha/2} * \delta}{E} \right)^2$$

where N is the minimum sample size

$Z_{\alpha/2}=1.96$ from Z table where $(\alpha) = 0.05$ with accuracy of 99%

δ is the allowable standard deviation and E is the allowed error

$$N = \left(\frac{1.96 * 136}{20} \right)^2 = 177.6$$

Hence, the minimum sample size required by the survey must not be less than 178. Due to the fact that 193 respondents were accepted, the sample size is considered reliable. Further refinement were made to the sample pool by removing any respondents below the age of 25 and have less than 1 year working experience related to safety and health.

3.4 Validity and Reliability

The panel selection for the interview section in determining the reliability of the variables produced is based upon their qualifications and also degree of work experience. The expert panels were selected from among JKR certified safety officers with more than 10 years' experience in safety and health implementation, either in the public or private sector, or both. These experts are interviewed 1-on-1 to ascertain their inputs regarding the proposed benchmarking tool. The panels were given the theoretical framework in advance and then all of their inputs were discussed in separate interviews in a three week period, between June and July of 2016. After review from the expert panels, the conceptual framework has been simplified for the next stage of data collection through questionnaire. The questionnaire was designed by inserting Likert scale. The result obtained from the survey will be analysed to study the individual impact weightage towards 100% evaluation. Upon establishing the overall assessment plan, the final framework will be further discussed with expert panel for their validation and expert opinion.

Following the safety variables, a SH Performance Assessment was developed to provide insight on construction safety performance for different sites. The panel suggested adding a variable for Introduction of the SH Plan in accordance to JKR

requirement. The way compliance levels are evaluated can be dependent on the variable itself and may warrant future revision. In the end, all the marks are summed up to produce a total score of the evaluated SH Plan.

For the scope of this research, the assessment takes into account the SH documentation submitted for the assessed project. The scoring from the project reflects on how well the current SH team conforms to the requirement set by JKR for submissions of SH Plan. SH Performance Assessment surveys were conducted for three construction sites. The criteria for selecting the project for assessment simulation were as below:

- i. JKR project costing over RM20 million
- ii. Certified Safety and Health Officer assigned for project
- iii. Safety and Health Plan submitted to JKR
- iv. Project duration not more than two years

Three projects were then selected by the expert panel for assessment and comparison of the benchmarking tool. The assessment marks the level of safety and health implementation in terms of documentation which the scale defined the level of safety performance on related site. Basing the requirements for JKR projects, most of the selected sites are roadwork, infrastructure and construction of government buildings.

In the final step, findings based on the assessment were then used to analyze the overall site SH performance of the local construction industry. The assessments and all relevant data were broken down to ensure the validity of the variables used to determine the scoring. Several assessment results are picked and analyzed in-depth in relation to the variable used. Some conclusions and recommendations were drawn based on the analysis of the data.

RESEARCH METHODOLOGY FLOWCHART

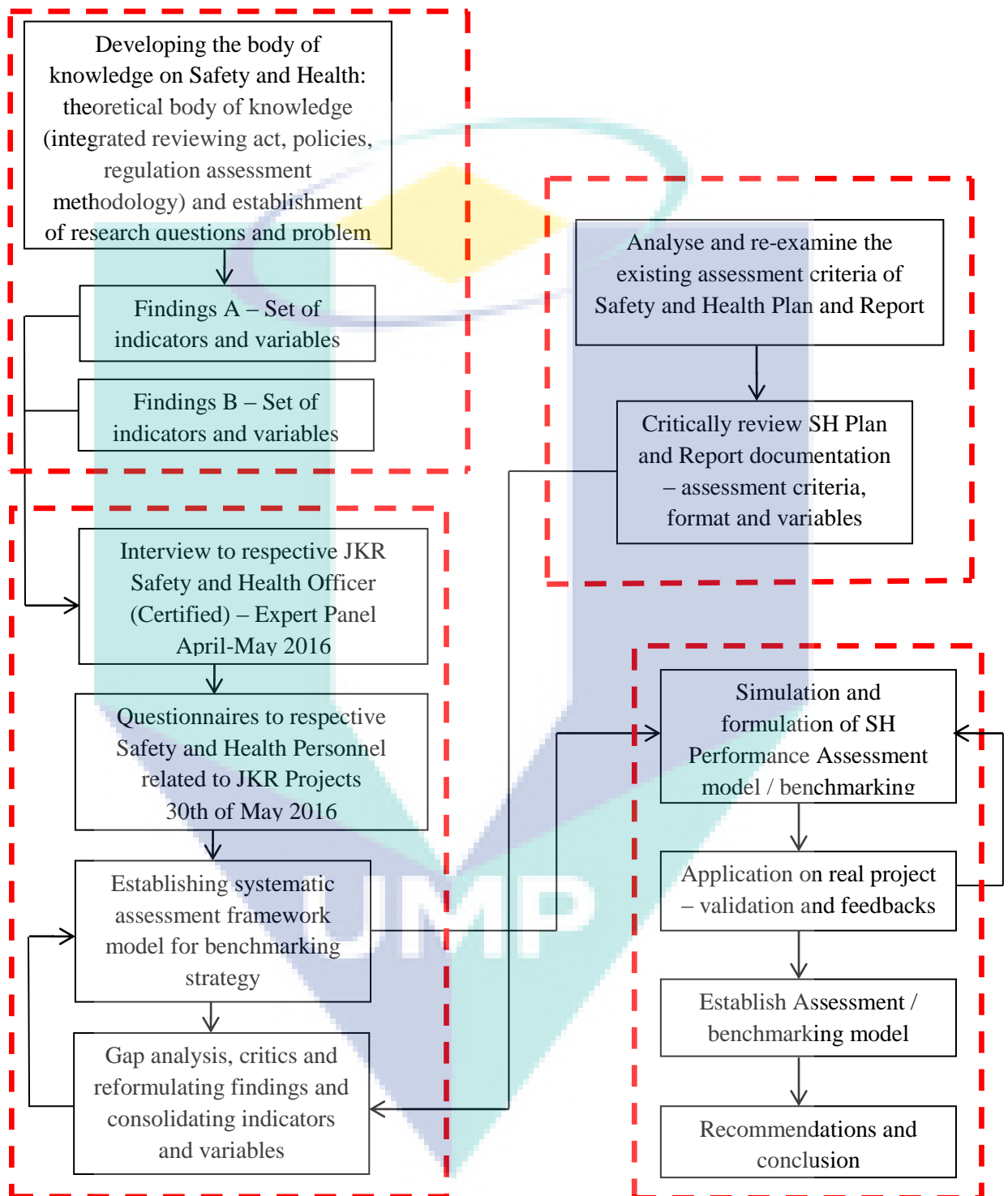


Figure 3.1 Flowchart for Research Methodology, Source: JKR 2015

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the results and findings from the survey and also the interview done. After the gap analysis was made to determine the suitable factors that should be taken into consideration in terms of safety performance, all of the factors are outlined into several variables that can be effectively scored and subsequently made into a benchmark tool. After the variables for the benchmarking process is finalised, a comparison will be made with existing assessment tool used by JKR for their projects and the scores obtained from both tool discussed.

In the interview phase, all of the variables intended for the benchmark tool were presented to an expert panel. After that, all of the variables narrowed down from the interview were formulated into a survey that is distributed among safety and health personnel at safety and health conferences and events. The responses received from the survey were then tabulated and the results calculated based on weightage. After removing the results from personnel below 25 years of age and worked less than 1 year in safety and health-related field, a total of 193 responses were acquired. Table 4.1 shows the results after the interview phase in which an expert panel was presented with the variables compiled following the literature review. Any variables with two or more approval from the panel were selected for inclusion in the next stage of the research. Table 4.2 shows the results from the survey done among safety and health personnel related to JKR projects, with any variables obtaining a score of 0.7 or more selected for inclusion in the next stage of the research. Results from the two tables are compared for validation and to confirm their reliability in forming a benchmark tool for safety and health performance of SH Plan in construction projects.

Table 4.1 Result from Interview with Expert Panel

CATEGORY			REQUIREMENT	Expert A	Expert B	Expert C		
POLICY	P1	SAFETY AND HEALTH SCOPE	a	Description safety and health management	✓	✓	✓	
			b	Commitment on Safety and Health	✓	✓	✓	
			c	Brief Description on overall Safety and Health Plan management	✓	✓		
	P2	OBJECTIVE SAFETY AND HEALTH	a	comply with regulation	✓	✓	✓	
			b	promoting consistence and productive	✓	✓	✓	
			c	outline strategy		✓	✓	
			d	continual improvement		✓	✓	
	P3	SAFETY AND HEALTH POLICY	a	Policy Statement	✓	✓	✓	
			b	overall management structure	✓		✓	
			c	aim and objectives of policy	✓	✓	✓	
	LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Enforcement management	✓	✓	✓
				b	compliance of Act, Rules & Regulation	✓	✓	✓
c				compliance to local government/authorities	✓	✓		
d				documentation of safety and health requirement		✓	✓	
e				documentation of Competent Person		✓	✓	
f				schedule of enforcement	✓	✓	✓	
g				resource planning enforcement	✓	✓	✓	
L2		PROBIHITED SUBSTANCE	a	enforcement strategies of Drugs	✓	✓	✓	
			b	enforcement strategies of alcohols	✓		✓	
			c	enforcement strategies of restricted medicine	✓	✓		
MANAGEMENT		M1	ROLES AND RESPONSIBILITIES	a	management of each parties	✓	✓	✓
				b	prescribe duties of designated post	✓		✓
				c	outline Organisational Chart	✓	✓	✓
	d			valid documentation of competent person	✓		✓	
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Standard working Procedure	✓	✓	✓	
			b	implications of SOP on HIRADC	✓	✓	✓	
			c	SOP in relation to guideline and legislation	✓	✓	✓	
			d	Frequency of Assessment	✓	✓	✓	
			e	SOP for inspection	✓	✓	✓	

Table 4.1 Continued

ANALYTICAL ASSESSMENT		f	SOP for Competent Person requirement	✓		✓		
		g	SOP for audit	✓	✓	✓		
		h	SOP for House Keeping		✓	✓		
		i	SOP for Specialist Involvement		✓	✓		
	M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	schedule of training programmes	✓	✓	✓	
			b	documentation of Green Card and procedure	✓	✓	✓	
			c	frequencies of Safety Training, campaign and promotion	✓	✓	✓	
			d	management of assessment	✓	✓		
			e	documentation of competent person		✓	✓	
	M4	EMPLOYEE HEALTH INSPECTION	a	scheduled Health Campaign	✓	✓	✓	
			b	Scheduled health check up		✓	✓	
			c	health monitoring programme	✓		✓	
			d	environmental assessment	✓	✓	✓	
	M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a	outline specific safety programme	✓	✓	✓	
			b	describe schedule coordination	✓		✓	
			c	certification program as competent person	✓	✓		
	M6	TRAFFIC MANAGEMENT	a	traffic management plan	✓	✓	✓	
			b	traffic management of emergency	✓	✓	✓	
			c	emergency evacuation	✓	✓	✓	
			d	signage management	✓	✓	✓	
			e	temporary traffic management	✓	✓	✓	
	M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	objective of PPE	✓	✓	✓	
			b	scheduled Briefing	✓	✓	✓	
			c	documentation of compliance	✓	✓		
			d	enforcement and supervision of fitness	✓	✓	✓	
			e	Functions of PPE	✓		✓	
	A1	HAZARD IDENTIFICATION, RISK ASSESSMENT	a	hazard identification	✓	✓	✓	
b			analyse level risks	✓	✓	✓		
c			risk control management	✓	✓	✓		
DETERMINING CONTROL (HIRADC)		d	competent Person-In-Charge (PIC)	✓	✓	✓		
		A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY	a	Emergency Classification Priority Plan	✓	✓	✓
				b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure	✓	✓	✓

Table 4.1 Continued

FACILITIES AND INFRASTRUCTURE	RESPONSE PLAN	c	prescribed Emergency Response Plan (ERP)	✓	✓	✓	
		d	Emergency Response Team (ERT)	✓	✓	✓	
		e	management of potential hazardous material	✓	✓	✓	
		f	scheduled inspection, supervision and monitoring enforcement	✓	✓	✓	
		g	management of Fire Fighting Equipment	✓	✓	✓	
	A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	procedure for report and investigation	✓	✓	✓
			b	flow chart on accident/incident management	✓	✓	✓
			c	format of report documentation	✓	✓	✓
			d	Role of parties involved	✓		✓
			e	methodology to analyse accident/incident	✓	✓	✓
			f	analysis of CQI		✓	✓
	A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	methodology and format to classify type of accident	✓	✓	✓
			b	format of evaluating causes of accident	✓	✓	✓
			c	format of evaluating accumulative of reported cases	✓	✓	✓
			d	format of evaluating statistical data	✓	✓	
			e	procedure of documentation	✓	✓	✓
			f	analyse result for CQI		✓	✓
	F1	TEMPORARY ELECTRICAL SUPPLY	a	procedure and documentation by competent person	✓	✓	✓
			b	guideline and code of practice	✓	✓	✓
			c	material specification and design requirement	✓	✓	✓
d			documentation of certified competent person	✓	✓	✓	
F2		SANITARY FACILITIES	a	waste management system	✓	✓	✓
			b	installation procedure	✓		✓
			c	comply with guideline and code of practice	✓	✓	
			d	specification and design requirement	✓	✓	✓
			e	documentation of certified competent person	✓	✓	✓
F3		OTHER FACILITIES	a	evidence of survey and employee responses		✓	✓
			b	outline installation procedure	✓	✓	

Table 4.1 Continued

COMMUNICATION ADMINISTRATION			c	comply to guideline and code of practice	✓	✓	✓
			d	specification and design requirement		✓	✓
			e	documentation of certified competent person	✓	✓	
	C1	COMMUNICATION INVOLVEMENT	a	methodology of delivering information	✓	✓	✓
			b	management of documentation and information	✓	✓	✓
			c	schedule of meeting co-ordination	✓	✓	✓
			d	CQI for safety information		✓	✓
	C2	PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	methodology of Publicity	✓	✓	✓
			b	schedule of programmes	✓	✓	✓
			c	frequency of programmes with specific requirement	✓	✓	✓
			d	detail each categories of safety programme	✓	✓	✓
	C3	SAFETY AND HEALTH MEETING	a	list out type of meeting	✓	✓	✓
			b	outline schedule of meeting	✓		✓
c			management of information and documentation	✓	✓		
d			CQI after meeting		✓	✓	
INFORMATION	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	documentation of potential hazards	✓	✓	✓
			b	handling and emergency procedures	✓	✓	✓
			c	safe handling of exposure scenarios	✓	✓	✓
			d	accessibility of documentation	✓	✓	
			e	documentation of competent Person-In-Charge (PIC)	✓	✓	✓
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	information on hazards	✓	✓	✓
			b	handling, storage and emergency measures	✓	✓	✓
			c	safe handling of exposure scenarios	✓	✓	✓
			d	describe risk management		✓	✓
			e	accessibility of documentation	✓	✓	✓
			f	documentation of competent Person-In-Charge (PIC)	✓	✓	✓
	I3	MACHINERY EQUIPMENT LIST	a	list of all machineries including technical information	✓	✓	
			b	management of inspection and maintenance schedule	✓	✓	✓
			c	valid record of drivers with competent driving license	✓	✓	✓

Table 4.1 Continued

		d	vehicle permit and taxes documentation	✓	✓	✓
		e	documentation of competent person	✓	✓	✓

Based on the interview result, all of the factors that obtained two or more approval from the expert panel in the theoretical framework have been included for the next phase of the research. The theoretical framework is then turned into a questionnaire and presented to relevant safety personnel based on criteria discussed in previous chapter. A more thorough breakdown on the relative importance of factors chosen can be reliably measured through the analysis of the survey results.

Table 4.2 Demographic Breakdown of Respondent for Questionnaire

Age	No Respond	Years of Experience	No Respond	Representative	No Respond
Below 25	N/A	1 year	N/A	Main Contractor	71
25-30	70	1-3 years	76	Sub-Contractor	75
31-40	80	3-5 years	77	Developer	35
41-50	42	5-10 years	44	Government	12
Above 50	1	More than 10 years	1	Others	0

Table 4.2 shows the demographic breakdown of respondents for the questionnaire. All of the respondents are personnel related to JKR project concerning safety and health, regardless of their position. This is to ensure opinions from every level in the management hierarchy are taken into account. 320 forms were distributed among the safety personnel and 220 forms were returned, indicating a response rate of 69%. Any respondent aged below 25 years old or possess less than 1 year of experience in safety and health work-related position are excluded from the results, leaving only 193 forms considered reliable for further analysis. The results of the questionnaire are

included in the appendix, with the weightage values obtained for each category presented in table 4.3.

Table 4.3 Weightage Percentage Based on Category

Category	Weightage Percentage
Management	28.7%
Analytical Assessment	18.8%
Information	13.1%
Facilities and Infrastructure	11.5%
Communication Administration	9.9%
Policy	9.9%
Legislation	8.1%

Table 4.3 shows the weightage percentage of the major categories for variables presented in the theoretical framework based on the questionnaire survey results. The categories are ranked based on the relative importance in safety and health planning, according to participants of the survey. Based on input from the expert panel, for each of the variables included in the benchmarking tool, a score of 0 to 3 is assigned, 0 being no compliance or not included, 1 for minimal compliance, 2 for adequate compliance to 3 for full compliance.

Table 4.4 Weightage Percentage Based on Category

Score	Compliance Level
0	No Compliance/Item not included in Safety Plan
1	Minimal Compliance/Item included with basic details
2	Adequate Compliance/Item Included with detailed explanations
3	Full Compliance/Item included with detailed explanations and supporting documents

The scoring method can be refined depending on the variable being scored and items required for that category. The justification is that if the company had included the item within the submitted SH Plan, provisions for said item would have been made, regardless of its level of implementation on-site. Category with more items may be broken down to ensure their importance is not overlooked in the final scoring.

Table 4.5 shows a sample of the weightage system in the benchmark tool being applied to one of the projects assigned by the expert panel for evaluations. The weightage value for each requirement in the benchmark tool is obtained by analyzing the survey results and calculating the total score obtained by said requirement. The raw weightage value for the survey results are used directly in the tool and may be refined in a future study. After the total score of the safety plan being evaluated is obtained, it is then directly converted into percentage based on the full score that can be obtained in the tool. The table reflects the usage of said tool in a spreadsheet program and can be altered depending on requirement and usage environment.

All of the three projects chosen for assessment are scored using the same method and the results outlined and compared with scores given by the expert panel for the same projects. Due to the confidential nature of the assessment method used by JKR for their projects, the expert panel could not include a full overview of the method they used to calculate the scores and only the results obtained by the sample projects being used is included for comparison.

Table 4.5 Assessment of Scoring for sample JKR Project

				COMPLIANCE LEVEL				SCORE WEIGHTAGE	TOTAL SCORE	
CATEGORY		REQUIREMENT		0	1	2	3			
POLICY	P1	INTRODUCTION	a	Project Description and its durations		1			0.861	0.861
			b	Company Detail with experiences related to safety and health in construction		1			0.864	0.864
	P2	SAFETY AND HEALTH SCOPE	a	Description of Project		1			0.844	0.844
			b	statement of Commitment on Safety and Health		1			0.867	0.867
			c	Brief Description on the scope Safety and Health Plan	0				0.861	0.000
	P3	OBJECTIVE SAFETY AND HEALTH	a	Commitment to comply with safety and health legislation, act, rules and regulation.		1			0.845	0.845
			b	initiative to promoting consistence and productive safety and health environment		1			0.827	0.827
			c	strategy to encourage healthy working culture and procedure	0				0.845	0.000
			d	describe continual improvement in safety and health management	0				0.868	0.000
	P4	SAFETY AND HEALTH POLICY	a	General Policy Statement manifesting commitment manage safety and health	1				0.850	0.850
			b	function, roles and responsibilities of Safety Management Team		1			0.848	0.848
			c	overall Safety and Health Management system to achieve aim and objectives of the policy	0				0.855	0.000

Table 4.5 Continued

LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Enforcement management related to construction works at all stages	1			0.815	0.815
			b	outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health	1			0.841	0.841
			c	presented compliance to local government/authorities requirement	1			0.846	0.846
			d	attachment of documentation of obtaining consent/approval/permission from related local government/authorities	1			0.849	0.849
			e	provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer	1			0.836	0.836
			f	outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation	1			0.834	0.834
			g	describe resource planning for enforcement requirement with specific compliance to legislation act, rules and regulation	1			0.851	0.851
	L2	PROHIBITED SUBSTANCE	a	enforcement strategies to prohibit use of Drugs	1			0.847	0.847
			b	enforcement management strategies to prohibit the consumption of alcoholic drinks/substances	1			0.823	0.823

Table 4.5 Continued

MANAGEMENT			c	enforcement management strategies to prohibit the use of restricted medicine	0				0.828	0.000
	M1	ROLES AND RESPONSIBILITIES	a	roles and responsibilities on safety and health management of each parties involved		1			0.845	0.845
			b	detail of duties for each designated post in safety and health management team		1			0.863	0.863
			c	Organisational Chart of safety and health management		1			0.844	0.844
			d	valid documentation for evidence of appointment and competent person		1			0.832	0.832
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases		1			0.851	0.851
			b	implications of SOP on evaluation of HIRADC		1			0.870	0.870
			c	SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation		1			0.858	0.858
			d	outline Frequency of Assessment/monitoring /supervision and enforcement of SOP		1			0.866	0.866
			e	SOP for inspection, maintenance, management and requirement of PPE and related equipment		1			0.858	0.858
f			SOP for obtaining Competent Person requirement and responsibilities		1			0.838	0.838	

Table 4.5 Continued

		g	SOP for Documentation and audit		1			0.873	0.873
		h	SOP for House Keeping and maintenance at specific construction works/activities		1			0.854	0.854
		i	SOP for Specialist Involvement at any specific construction works/activities		1			0.855	0.855
M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	describe schedule of induction training programmes and the application of relevant safety pass		1			0.853	0.853
		b	valid documentation of Green Card holders and management of its implementation		1			0.839	0.839
		c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion		1			0.846	0.846
		d	management of documentation and assessment to maintain quality of training programmes		1			0.822	0.822
		e	valid documentation of certified competent person to manage training and resource capabilities to conduct skill training		1			0.840	0.840
M4	EMPLOYEE HEALTH INSPECTION	a	outline scheduled Health Campaign programme	0				0.855	0.000
		b	describe Scheduled health check up	0				0.829	0.000
		c	describe health monitoring programme	0				0.846	0.000
		d	describe environmental assessment on site	0				0.818	0.000
M5	SAFETY PROGRAM FOR SUB-	a	list of compulsory involvement/participation of the sub-contractor on specific safety		1			0.859	0.859

Table 4.5 Continued

	CONTRACTOR	programme								
		b	schedule coordination meeting involving sub-contractor on safety and health		1			0.850	0.850	
		c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement		1			0.824	0.824	
	M6	TRAFFIC MANAGEMENT	a	provide traffic management plan		1			0.860	0.860
			b	outline proposal of conflict handling of traffic management in case of emergency		1			0.837	0.837
			c	design traffic plan for emergency evacuation		1			0.831	0.831
			d	describe and propose signage management and procedure		1			0.846	0.846
			e	describe temporary traffic management outfit/tool		1			0.838	0.838
	M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	outline the Purpose and objective of PPE related to construction activities/stages/phases		1			0.839	0.839
			b	outline scheduled Briefing on PPE and its training programmes	0				0.846	0.000
c			technical data and documentation of specification, compliance and/or certification according to specific construction works	0				0.833	0.000	
d			provide enforcement management system for inspection, assessment, monitoring and supervision maintaining the fitness of all PPE	0				0.830	0.000	

Table 4.5 Continued

ANALYTICAL ASSESSMENT			e	describe Functions and allocation of each PPE designated		1			0.847	0.847
	A1	HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)	a	prescribe scope of construction works/activities within the context of hazard identification of its type, effect and control strategy		1			0.830	0.830
			b	analyse and determine the level risks (1-25) within the influential context of likelihood (1-5) and severity (1-5) implications		1			0.831	0.831
			c	provide risk control management compliance with related legislation, act, rules and regulation		1			0.841	0.841
			d	competent Person-In-Charged (PIC) for management of HIRADC		1			0.830	0.830
	A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	detail out the Emergency Classification in response to HIRADC analysis within the context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency		1			0.832	0.832
			b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure		1			0.846	0.846
			c	prescribed in depth the Emergency Response Plan (ERP)		1			0.867	0.867
			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC)		1			0.851	0.851

Table 4.5 Continued

		e	outline the management of potential hazardous material		1			0.845	0.845
		f	describe the scheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system		1			0.858	0.858
		g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintenance programmes.		1			0.838	0.838
A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	procedure for accident report and investigation	0				0.836	0.000
		b	flow chart on accident/incident management		1			0.867	0.867
		c	presented format of report documentation		1			0.841	0.841
		d	Role of responsibilities of parties involved, including ERT and ERP	0				0.849	0.000
		e	describe the methodology to analyse the source of accident/incident	0				0.847	0.000
		f	describe the analysis of CQI and its management	0				0.828	0.000
A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based		1			0.838	0.838
		b	describe the format of presenting and evaluating causes of accident, injuries and illness		1			0.865	0.865
		c	describe the format of presenting and evaluating total accumulative of		1			0.816	0.816

Table 4.5 Continued

FACILITIES AND INFRASTRUCTURE			reported cases					
			d describe the format of presenting and evaluating statistical data on site	1			0.837	0.837
			e process and procedure of documentation of information and forwarding for meeting	1			0.862	0.862
			f describe the methodology to analyse findings of the statistical result for CQI	1			0.836	0.836
	F1	TEMPORARY ELECTRICAL SUPPLY	a provide installation procedure, drawing and documentation approved by competent person	1			0.825	0.825
			b guideline and code of practice, related Legislation, Act, rules and regulations	1			0.854	0.854
			c material specification and design requirement approved by competent person	1			0.836	0.836
			d provide valid documentation of certified competent person for electrical works	1			0.836	0.836
	F2	SANITARY FACILITIES	a provide waste management system approved by competent person	1			0.825	0.825
			b provide installation procedure, drawing and documentation as approved by competent person	1			0.844	0.844
			c comply with guideline and code of practice, related Legislation, Act, rules and regulation	1			0.838	0.838
		d specification and design requirement as approved by competent designer	1			0.858	0.858	

Table 4.5 Continued

COMMUNICATION ADMINISTRATION	F3	OTHER FACILITIES	e	provide valid documentation of certified competent person	1			0.844	0.844
			a	design to meet the requirement of employees based on responses/feedbacks	1			0.854	0.854
			b	details of installation procedure, drawing and documentation as approved by competent person	1			0.834	0.834
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	1			0.846	0.846
			d	describe the specification and design requirement that comply with all designated requirement	1			0.863	0.863
			e	provide valid documentation of certified competent person	1			0.851	0.851
	C1	COMMUNICATIO N INVOLVEMENT	a	outline methodology of delivering safety and health information	1			0.841	0.841
			b	provide the management of documentation of safety and health related information	1			0.852	0.852
			c	schedule of safety meeting; initial, development, co-ordination, head department, site safety committee and client meeting	1			0.862	0.862
			d	outline CQI for safety information management system	1			0.866	0.866
	C2	PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels	1			0.849	0.849
b			outline schedule of safety programmes in weekly basis	1			0.846	0.846	

Table 4.5 Continued

INFORMATION		c	outline frequency of safety programmes according to the specific requirement		1			0.846	0.846	
		d	describe in detail each categories of safety programme		1			0.840	0.840	
	C3	SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members		1			0.841	0.841
			b	outline schedule and frequencies of each meeting		1			0.848	0.848
			c	prescribe the management of information and documentation of each meeting		1			0.830	0.830
			d	provide means of CQI after meeting and its management		1			0.868	0.868
	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards	0				0.861	0.000
			b	provide information on the use, storage, handling and emergency procedures	0				0.849	0.000
			c	recognition of overexposure symptoms and what to do if such incidents occur	0				0.854	0.000
			d	describe the management and accessibility of documentation	0				0.841	0.000
e			provide valid documentation of competent Person-In-Charged (PIC)	0				0.864	0.000	
I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	information on chemicals, describing the hazards the chemical presents	0				0.854	0.000	
		b	information on handling, storage and emergency measures in case of an accident	0				0.830	0.000	

Table 4.5	Continued	c	information on safe handling, in the form of exposure scenarios	0				0.846	0.000	
		d	advice on risk management measures given in the exposure scenario	0				0.829	0.000	
		e	outline the management and accessibility of documentation	0				0.832	0.000	
		f	valid documentation of competent Person-In-Charge (PIC)	0				0.820	0.000	
	I3	MACHINERY EQUIPMENT LIST	a	provide technical list of all machineries, contract vehicle (rental) such as type of machinery, model, engine capacity		1			0.830	0.830
			b	management of inspection, service manual and maintenance schedule		1			0.837	0.837
			c	valid record of drivers with competent license		1			0.835	0.835
			d	vehicle permit and taxes documentation		1			0.839	0.839
			e	valid documentation of certified competent person		1			0.854	0.854
								Total Score	80.31 26%	

4.2 Breakdown and Analysis of Assessment Results

Table below shows the scoring breakdown for the three selected for the comparison of scores obtained using the two different assessment methods. Project 1 obtained a SH Plan score of 52% under the JKR assessment method while it obtained 47% using the theoretical framework. Project 2 obtained a SH Plan score of 41% under the JKR assessment method while it obtained 37% using the theoretical framework. Project 3 obtained a SH Plan score of 28% under the JKR assessment method while it obtained 26% using the theoretical framework.

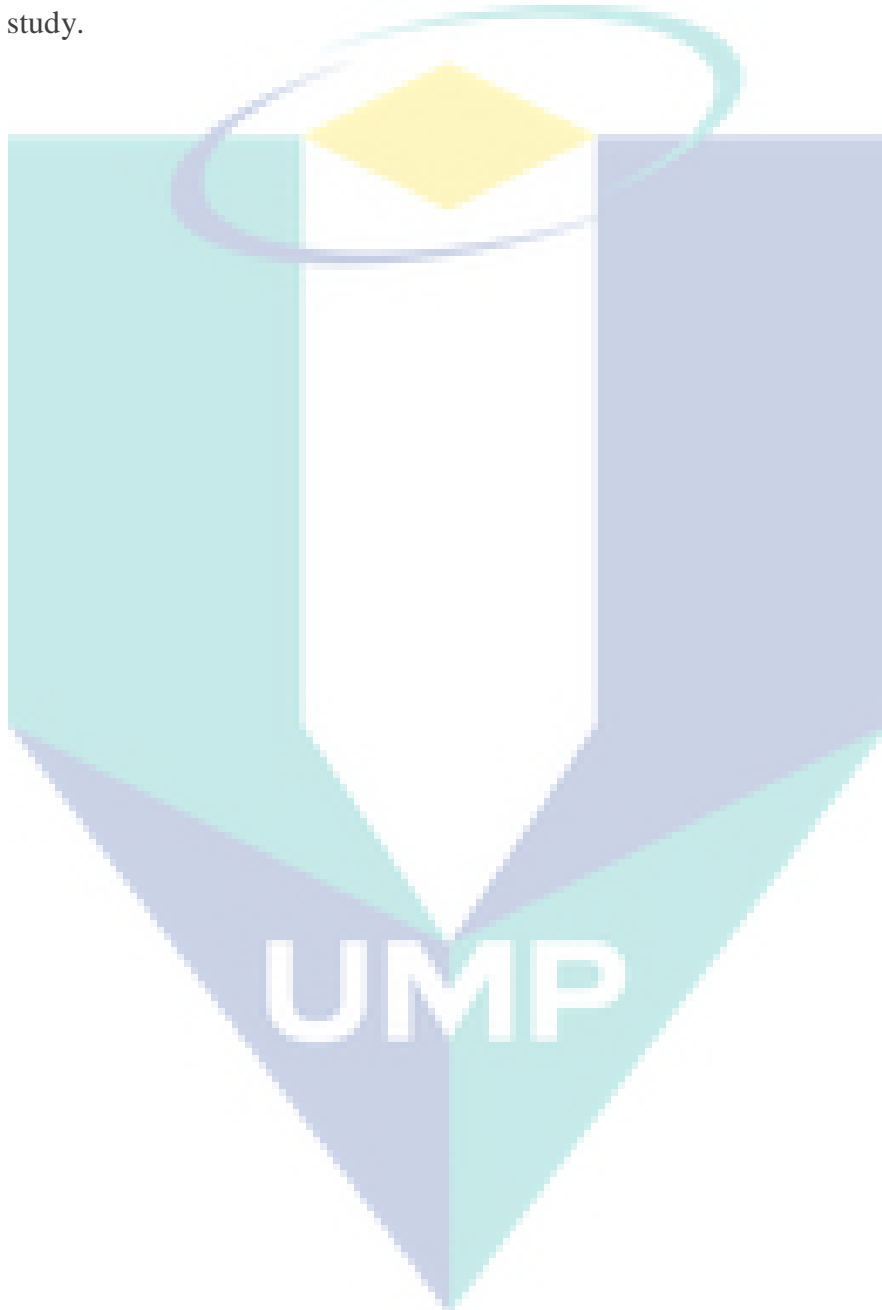
Table 4.6 Result of SH Plan Scoring

Items	Existing Jkr Assessment Method Scoring	Theoretical Framework Assessment Tool Scoring
Project 1 (Roadworks Upgrading)	52%	47%
Project 2 (Roadworks - Highway)	41%	37%
Project 3 (Construction - Public Library)	28%	26%

From the results of the assessment made, it can be seen that all of the SH plan scored lower across the board using the theoretical framework devised in this study as opposed to the existing JKR assessment method. This is presumed to be due to the higher level of details required for the theoretical framework from a safety plan in order to properly gauge the quality and hence the safety performance of the SH Plan submitted.

The overall summary of the results shows that the projects selected does not fulfil an exemplary level of safety performance in terms of their SH Plan using both assessment method, with most opting to submit the minimum requirement for JKR projects. This shows a lack of attention to safety concerns of the construction project; despite the fact projects costing over RM20 million would require the appointment of a certified safety and health officer (SHO). In the process of making the assessment, it is

noted that the variables used to evaluate the project, while suitable, may require a more detailed method of scoring breakdown for each of the items listed. Another notable issue would be setting a baseline score upon which the evaluated safety and health plan being submitted is said to pass or fail the evaluation. A gradual scoring system can also be used to further separate the scores obtained and this may be further explored in a future study.



CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

At the start of the research, several questions were raised on the effectiveness of current existing method of measuring and monitoring safety and health performance in a construction project. This includes the drafting of the Safety and Health Plan (SH Plan), submissions of Safety and Health Report (SH Report) and their implementations throughout the entire project. Based on these questions, a literature review was made in order to establish the global scenario of safety and health in construction in relation to its implementation in Malaysia. Objectives of the research were then derived as below:

1. To review the assessment criteria and strategy of the safety and health practices for JKR projects.
2. To develop systematic methodology to evaluated the level of safety and health practices for JKR projects.
3. To proposed a benchmarking strategy model to evaluate credible contractors based on safety and health aspect within the JKR projects.

Based on the literature review, several variables were formulated as criteria in assessing the safety performance of a construction project. The common denominators for safety and health issues on-site discussed in previous researches were chosen. These variables were then placed in a survey taken by 193 respondents consisting of personnel involved in safety and health field for construction projects. Taking into account how the global scenario on health and safety can be applied in context with Malaysian's

construction industry, an assessment method was formed. The assessment method was then presented to a panel of experts with wide-ranging experience in the construction industry. After implementing all of the provided inputs, a final benchmarking tool was produced. This was then applied to three construction projects selected based on costing and also duration of completion. The assessment method was filled according to submissions of documentation for implementation of SH Plan of the selected projects. The final scoring was then compared against scores obtained from using existing JKR assessment tool to compare the effectiveness of both methods to in evaluating the SH plan performance. The assessment method produced drew lower scores compared to the existing JKR tool due to the more demanding requirements for a SH plan.

5.2 Conclusion of the study

The primary objective of the research is to design a benchmarking strategy model to assess potential contractors based on the performance of safety and health of their previous projects. In theory, this will allow a more transparent selection process for JKR and also the contractors involved. Placing emphasis on how well the contractors have performed in terms of safety and health implementations will also push for a more direct focus on safety instead of being an afterthought for project requirement.

After a literature review was made in chapter two, several variables were obtained and then formed into a survey in which respondents from safety and health field participated. After the variables were then formed into a benchmarking strategy based upon the inputs from a panel of experts, it was then applied to three sample projects to evaluate its relevancy. Based on the data obtained, it is shown that the assessments were sufficient in allowing a more thorough view of the projects' performance in terms of safety and health implementation. The scoring obtained also reflected the lack of awareness in implementing a proper SH strategy in terms of SH Plan and monthly SH report documentation. However, a complete benchmark of the project's safety and health performance is not achieved, due to lack of actual on-site data for comparison.

5.3 Research limitation

The current study is limited to the performance of safety and health implementations in terms of the projects' documentations and submissions. A more thorough assessment should be made to compare the submissions to the actual on-site implementation using similar variables. Breaking down company performance into tiers also introduced the problem of establishing a cut-off point for the tiers. A more complete report should be made to justify the scoring of a certain project and how it affects the company's standing in terms of award of future projects.

A few assumptions were made during the start of the research, namely in terms of how the global safety climate relates to the current situation in Malaysia's construction industry. After establishing the benchmark, it should be refined to better suit Malaysia's health and safety climate depending on future data that might be available.

5.4 Recommendation

The variables used in the benchmark model proposed in this research accounts for implementation of documentation for safety and health performance. The same variables being applied to actual on-site evaluation might require adjustment, which can be made in future research. On-site evaluation can be made every 3 months at random.

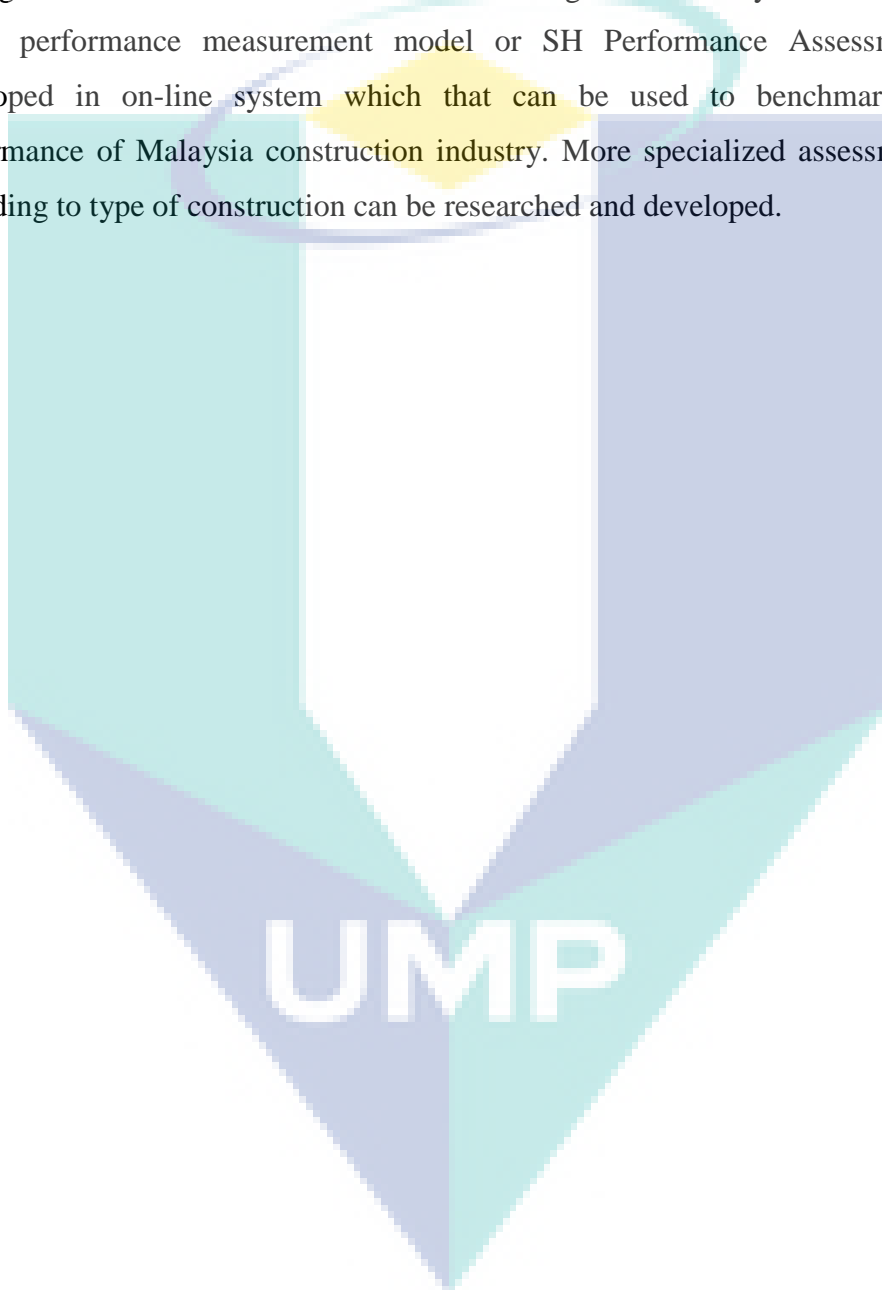
Application of said benchmark can also affect the safety climate of construction firms, changing the way in which the companies approach their safety and health implementation. A separate research on how the companies react to their safety performance score can be conducted.

Continuous and stringent monitoring of the benchmark application can allow modification of the variables to better represent current safety performance. As more research is made on the topic, more variables can be obtained to better improve the benchmarking tool.

An online system for the benchmark can be designed to allow on-the-fly assessments of projects and ease of archiving. This can also allow collaborations to be made among officials and construction companies, depending on the amount of access

that will be allowed into the database itself. A cloud-based system will allow wider dissemination of the data for future researchers to refer to and also devise further improvement to the system itself.

A future research might investigate the safety climate of construction firms, the findings of which can be connected to the findings of this study and a comprehensive safety performance measurement model or SH Performance Assessment can be developed in on-line system which that can be used to benchmark the safety performance of Malaysia construction industry. More specialized assessment variable according to type of construction can be researched and developed.



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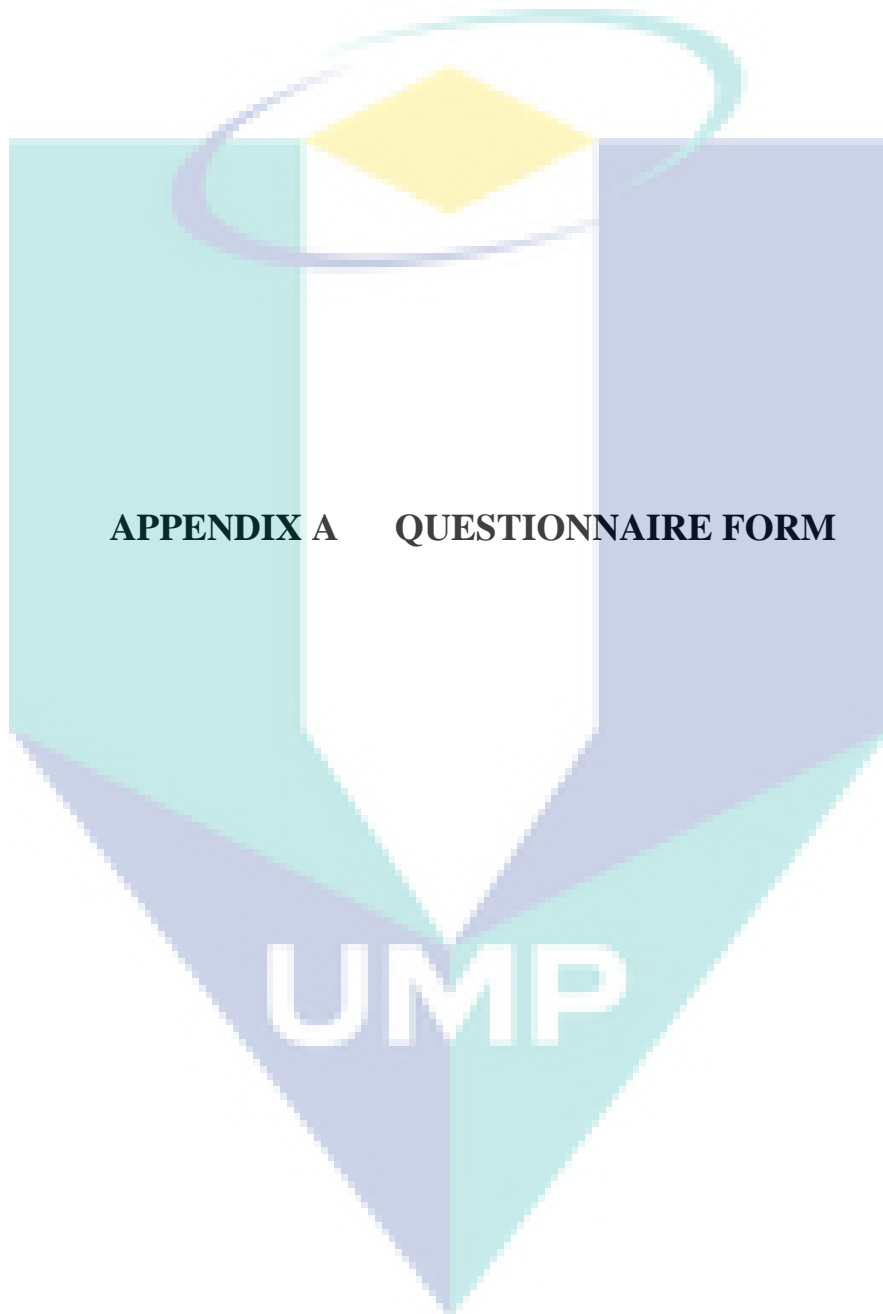
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APPENDIX A : QUESTIONNAIRE FORM

SECTUON 1

PERSONAL INFORMATION		PLEASE CIRCLE YOUR ANSWER				
1	what is your age group	below 25	25-30	30-40	40-50	above 50
2	how many years of experience you have working in construction industry	1	1 to 3 yrs	3-5yrs	5-10yrs	more 10yrs
3	currently you are working for which company?	main con	sub con	developer	gov	other

SECTION 2

TABLE 3.1: QUESTIONNAIRES DESIGN

CATEGORY			REQUIREMENT	LEVEL OF IMPORTANT (PLEASE TICK)					
				1	2	3	4	5	
POLICY	P1	INTRODUCTION	a	outline in breif the Project Description and its durations					
			b	Outline Company Detail and provide its incorporation documentation and experiences related to safety and health management in constrction environment					
	P2	SAFETY AND HEALTH SCOPE	a	Description of Project within the context of safety and health management system					
			b	manifest the statement of Commitment on Safety and Health					
			c	Brief Description on the scope, limitation and execution of the overall Safety and Health Plan within the context of safety and health management					
	P3	OBJECTIVE SAFETY AND HEALTH	a	describe commitment to comply with safety and health legislation, act, rules and regulation.					
			b	describe initiative to promoting consistence and productive safety and heath environment					
			c	outline the startegy to encourage healty working culture and proceedure					
			d	describe continual improvement in safety and health management					
	P4	SAFETY AND HEALTH POLICY	a	Outline and describe General Policy Statement that manifest commitment to manage safety and health with specific aim and objectives					
			b	detail out the actions, function, roles and responsibilities of the Safety Management Team on specific activities within the context of overall safety management structure					
			c	Outline the overall Safety and Health Management system that can proclaim to deliver towards the achievement of the aim and objectives of the policy					
LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	provide Enforcement management related to construction works at all stages related to safety and health					
			b	outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health					
			c	presented compliance to local government/authorities requirement for specific construction works at all stages related to safety and health					
			d	attachment of documentation of obtaining consent/approval/ permission/from related local government/authorities to initiate construction works pertaining to safety and health requirement					
			e	provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer					
			f	outline frequencies and schedule of inspection, monitoring, survailence, assessment and audit of enforcement requirement related to legislation act, rules and regulation throughout the construction stages					
			g	describe resourse planning related to enforcement requirement with specific compliance to legislation act, rules and regulation throughout the construction stages					
	L2	PROBIHITED SUBSTANCE	a	describe in detail the enforcement management strategies to prohibit the use of Drugs at construction site at all time					
			b	describe in detail the enforcement management strategies to prohibit the consume of alcoholic drinks/substance s at construction site at all time					
			c	describe in detail the enforcement management strategies to prohibit the use of restricted medicine at construction site at all time					

TABLE 3.1: QUESTIONNAIRES DESIGN (CONTINUE...)

CATEGORY		REQUIREMENT	LEVEL OF IMPORTANT							
			1	2	3	4	5			
MANAGEMENT	M1	ROLES AND RESPONSIBILITIES	a							
			b							
			c							
			d							
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a							
			b							
			c							
			d							
			e							
			f							
			g							
			h							
			i							
	M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a							
			b							
			c							
			d							
			e							
	M4	EMPLOYEE HEALTH INSPECTION	a							
			b							
			c							
			d							
	M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a							
			b							
			c							
	M6	TRAFFIC MANAGEMENT	a							
			b							
			c							
d										
e										
M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a								
		b								
		c								
		d								
		e								

TABLE 3.1: QUESTIONNAIRES DESIGN (CONTINUE...)

CATEGORY		REQUIREMENT	LEVEL OF IMPORTANT					
			1	2	3	4	5	
ANALYTICAL ASSESSMENT	A1 HAZARD IDENTIFICATION, RISK ASSESMENT DETERMINING CONTROL (HIRADC)	a	prescribe specific scope of construction works/activities within the context of hazard identification of its type, effect and control strategy					
		b	analyse and determine the level risks (1-25) upon specific scope of construction works/activities within the influential context of likelihood (1-5) and severity (1-5) implications					
		c	provide risk control management complianced with the related legislation, act, rules and regulation					
		d	provide competent Person-In-Charged (PIC) to deliver the management of HIRADC with proven certification and/or industrial experience related to safety and health					
	A2 FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	describe and detail out the Emergency Classification in response to HIRADC analysis within the influential context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency					
		b	prescribed in depth the Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure complete with scheduled training programmes, awareness initiatives, briefing programmes, instructions management, notice communication strategies and practical demonstration					
		c	prescribed in depth the Emergency Response Plan (ERP) complete with the management of the Emergency Escape Routes, alarm, notification and information systems, signage, instructions, Recovery Plan, Contingency Plan, sources of fire fighting equipment, sources of Personal Protection Equipment, sources of First Aid facilities, Emergency Contact number and linkage intercommunication facilities/strategies with the local emergency services agencies such as Fire department and police.					
		d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competant Person-In-Charged (PIC) dercibing their roles and responsibilities within the overall Emergency Management System.					
		e	outline the management of potential hazardous material including liquid and gases including the zoning strategies, compartmentalisation strategies (storage and					
		f	describe the sheduled inspection, supervision and monitoring enforcement, and complianced of the electrical infra system (including all of its appliances) with the voltan usage, design requirement, code of practice and standard, cabling requirement, and competant Person-In-Charged (PIC)					
		g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintainance programmes.					
	A3 REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	describe the proceeedure for accident report and investigation					
		b	provide the flow chart on accident / insident management					
		c	presented format of report documentation					
		d	describe in detail the Role of responsibilities of parties involved, including ERT and ERP					
		e	describe the methodology to analyse the source of accident / incident					
		f	describe the analysis of CQI and its management					
	A4 STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor the type of accident, injuries and illness in time based					
		b	describe the format of presenting and evaluating causes of accident, injuries and illness					
		c	describe the format of presenting and evaluating total accumulative of reported cases					
		d	cescribe the format of presenting and evaluating statistical data on site					
		e	outline the process and proceeedure of documentation of information and forwarding for meeting					
		f	describe the methodology to analyse finding of the satstistical result for CQI					

TABLE 3.1: QUESTIONNAIRES DESIGN (CONTINUE...)

CATEGORY			REQUIREMENT	LEVEL OF IMPORTANT					
				1	2	3	4	5	
FACILITIES AND INFRASTRUCTURE	F1	TEMPORARAY ELECTRICAL SUPPLY	a	provide installation proceedure, drawing and documentation approved by competent person					
			b	outline the guideline and code of practice, related Legislation, Act, rules and regulations for construction works, connection and installation					
			c	outline material specification and design requirement approved by competent person					
			d	provide valid documentatinn of certified competant person for electrical works					
	F2	SANITARY FACILITIES	a	provide waste management system approved by competent person					
			b	provide installation proceedure, drawing and documentation as approved by competent person					
			c	comply with guideline and code of practice, related Legislation, Act, rules and regulation					
			d	outline the specification and design requirement as approved by compentent designer,local authorities/government					
			e	provide valid documentation of certified competent person					
	F3	OTHER FACILITIES	a	design to meet the requirement of the employee. Provide evidence of survey and employee responses/feedbacks					
			b	outline and describe in detail the installation proceedure, drawing and documentation as appropve by competent person					
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation					
			d	describe the specification and design requirement that comply with all designated requirement					
			e	provide valid documentation of certified competant person					
	COMMUNICATION ADMINISTRATION	C1	COMMUNICATION INVOLVEMENT	a	outline methodology of delivering safety and health information				
b				provide the management of documentataion of safety and health related information					
c				outline schedule of safety meeting; initial, development, co-ordination, head department, site safety committee and client meeting					
d				outline CQI for safety information management system					
C2		PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels					
			b	outline schedule of safety programmes in weekly basis					
			c	outline frequency of safety programmes according to the specific requirement					
			d	describe inn detail each categories of safety programme including induction, safety meeting, survailence, health campaign, training and audio visual demonstration.					
C3		SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members					
			b	outline schedule and frequencies of each meeting					
			c	prescribe the management of information and documentation of each meeting in relation to the progress of construction works					
			d	provide the means of CQI after meeting and its management					
INFORMATION	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards (health, fire, reactivity and environmental) on material					
			b	provide information on the use, storage, handling and emergency procedures all related to the hazards of the material.					
			c	describe the recognition of overexposure syptoms and what to do if such incidents occur.					
			d	describe the management and accessibility of documentation					
			e	provide valid documentation of competent Person-In-Charged (PIC)					
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	provide information on chemicals, describing the hazards the chemical presents					
			b	provide information on handling, storage and emergency measures in case of an accident					
			c	provide information on safe handling, in the form of exposure scenarios					
			d	describe advice on risk management measures given in the exposure scenario, where provided.					
			e	outline the management and accessibility of documentation					
			f	provide valid documentation of competent Person-In-Charged (PIC)					
	I3	MACHINERY EQUIPMENT LIST	a	provide technical list of all machineries, contract vehicle (rental) for construction works; including technical information such as type of mechnery, model, engine capacity, engine number, casis number and valid roadtax and permit					
			b	provide the management of inspection, service manual and maintenance shedule					
			c	provide valid record of drivers with competent driving licence					
			d	provode related vehicle permit and taxes documentation					
e			provide valid documentataon of certified competant person						



APPENDIX B: SCORING FOR PROJECT 1

CATEGORY			REQUIREMENT	Compliance Level				Score Weightage	Total Score	
				0	1	2	3			
POLICY	P1	INTRODUCTION	a	Project Description and its durations			2		0.861	1.722
			b	Company Detail with experiences related to safety and health in construction			2		0.864	1.728
	P2	SAFETY AND HEALTH SCOPE	a	Description of Project			2		0.844	1.687
			b	statement of Commitment on Safety and Health			2		0.867	1.735
			c	Brief Description on the scope Safety and Health Plan			2		0.861	1.722
	P3	OBJECTIVE SAFETY AND HEALTH	a	commitment to comply with safety and health legislation, act, rules and regulation.			2		0.845	1.689
			b	initiative to promoting consistence and productive safety and heath environment			2		0.827	1.654
			c	strategy to encourage healthy working culture and procedure			2		0.845	1.689
			d	describe continual improvement in safety and health management			2		0.868	1.737
	P4	SAFETY AND HEALTH POLICY	a	General Policy Statement manifesting commitment manage safety and health			2		0.850	1.699
			b	function, roles and responsibilities of Safety Management Team			2		0.848	1.695
			c	overall Safety and Health Management system to achieve aim and objectives of the policy			2		0.855	1.710
	LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Enforcement management related to construction works at all stages			2		0.815
b				outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health			2		0.841	1.683
c				presented compliance to local government/authorities requirement			2		0.846	1.691
d				attachment of documentation of obtaining consent/approval/ permission/from related local government/authorities			2		0.849	1.697
e				provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer			2		0.836	1.673
f				outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation			2		0.834	1.668
g				describe resource planning for enforcement requirement with specific compliance to legislation act, rules and regulation			2		0.851	1.702
L2		PROBIHITED SUBSTANCE	a	enforcement strategies to prohibit use of Drugs			2		0.847	1.693
			b	enforcement management strategies to prohibit the consumption of alcoholic drinks/substances			2		0.823	1.646
			c	enforcement management strategies to prohibit the use of restricted medicine			2		0.828	1.656

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MANAGEMENT	M1	ROLES AND RESPONSIBILITIES	a	roles and responsibilities on safety and health management of each parties involved			2		0.845	1.689
			b	detail of duties for each designated post in safety and health management team			2		0.863	1.726
			c	Organisational Chart of safety and health management			2		0.844	1.687
			d	valid documentation for evidence of appointment and competent person			2		0.832	1.664
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases			1		0.851	0.851
			b	implications of SOP on evaluation of HIRADC			1		0.870	0.870
			c	SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation			1		0.858	0.858
			d	outline Frequency of Assessment/monitoring /supervision and enforcement of SOP			1		0.866	0.866
			e	SOP for inspection, maintenance, management and requirement of PPE and related equipment			1		0.858	0.858
			f	SOP for obtaining Competent Person requirement and responsibilities			1		0.838	0.838
			g	SOP for Documentation and audit			1		0.873	0.873
			h	SOP for House Keeping and maintenance at specific construction works/activities			1		0.854	0.854
			i	SOP for Specialist Involvement at any specific construction works/activities			1		0.855	0.855
	M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	describe schedule of induction training programmes and the application of relevant safety pass			1		0.853	0.853
			b	valid documentation of Green Card holders and management of its implementation			1		0.839	0.839
			c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion			1		0.846	0.846
			d	describe management of documentation and assessment to maintain quality of training programmes			1		0.822	0.822
			e	valid documentation of certified competent person to manage training and resource capabilities to conduct skill training			1		0.840	0.840
	M4	EMPLOYEE HEALTH INSPECTION	a	outline scheduled Health Campaign programme			1		0.855	0.855
			b	describe Scheduled health check up			1		0.829	0.829
			c	describe health monitoring programme			1		0.846	0.846
			d	describe environmental assessment on site			1		0.818	0.818



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M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a	list of compulsory involvement/participation of the sub-contractor on specific safety programme		1			0.859	0.859
		b	schedule coordination meeting involving sub-contractor on safety and health		1			0.850	0.850
		c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement		1			0.824	0.824
M6	TRAFFIC MANAGEMENT	a	provide traffic management plan			2		0.860	1.720
		b	outline proposal of conflict handling of traffic management in case of emergency			2		0.837	1.675
		c	design traffic plan for emergency evacuation			2		0.831	1.662
		d	describe and propose signage management and procedure			2		0.846	1.691
		e	describe temporary traffic management outfit/tool			2		0.838	1.677
M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	outline the Purpose and objective of PPE related to construction activities/stages/phases			2		0.839	1.679
		b	outline scheduled Briefing on PPE and its training programmes			2		0.846	1.691
		c	provide technical data and documentation of specification, compliance and/or certification according to specific construction works/activities/stages/phases			2		0.833	1.666
		d	provide enforcement management system for inspection, assessment, monitoring and supervision maintaining the fitness of all PPE in standard working condition at all time			2		0.830	1.660
		e	describe in detail the Functions and allocation of each PPE designated to specific construction works/activities/stages/phases			2		0.847	1.693

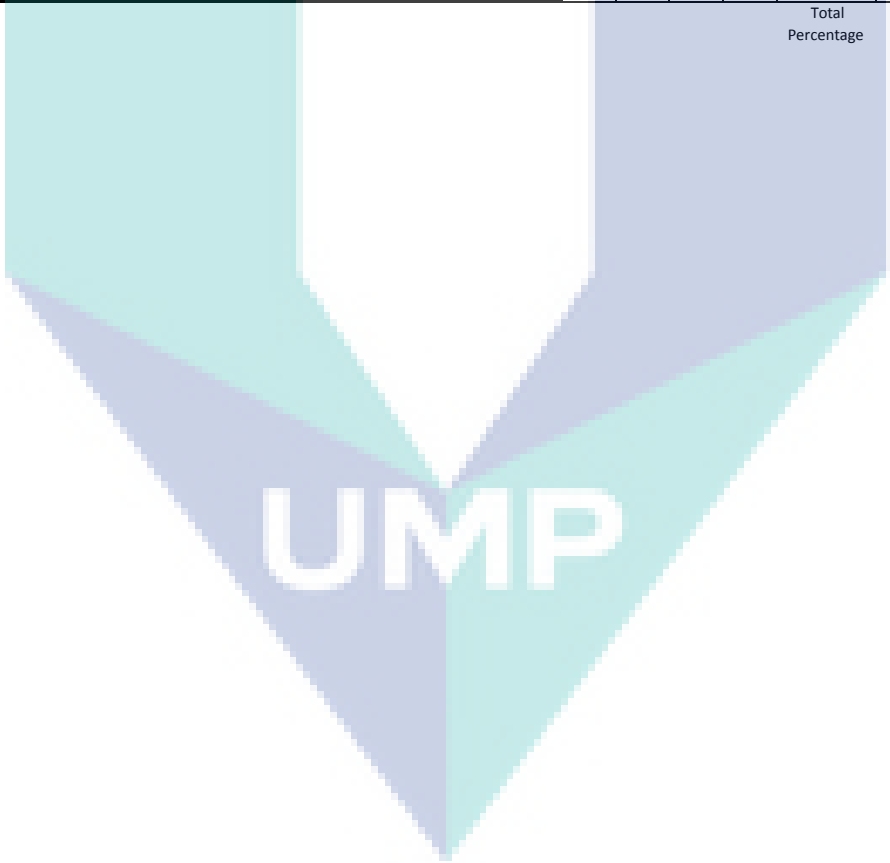


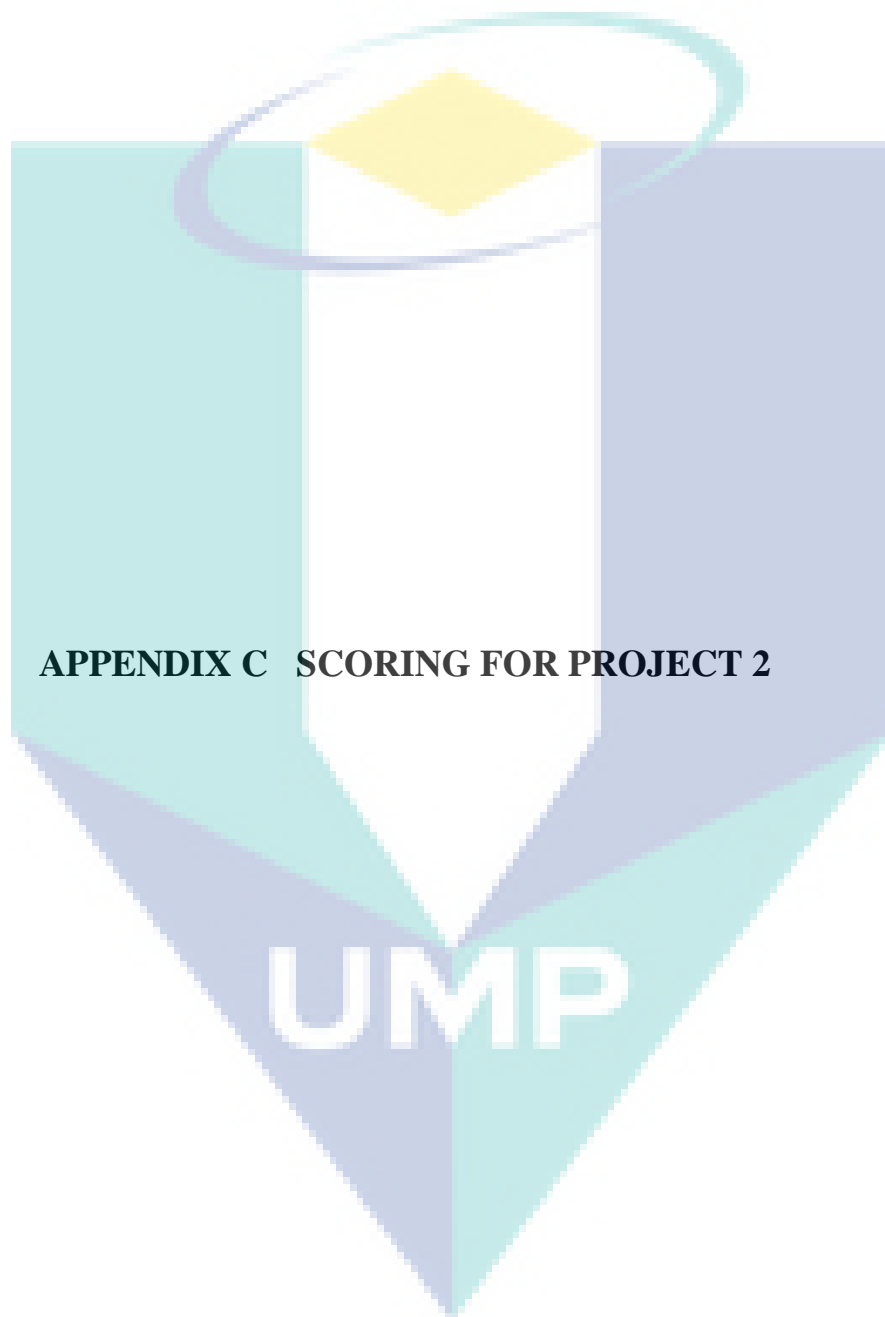
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ANALYTICAL ASSESSMENT	A1	HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)	a	prescribe specific scope of construction works/activities within the context of hazard identification of its type, effect and control strategy	1			0.830	0.830
			b	analyse and determine the level risks (1-25) within the influential context of likelihood (1-5) and severity (1-5) implications	1			0.831	0.831
			c	provide risk control management compliance with the related legislation, act, rules and regulation	1			0.841	0.841
			d	competent Person-In-Charged (PIC) to deliver the management of HIRADC with certification and/or industrial experience	1			0.830	0.830
	A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	detail out the Emergency Classification in response to HIRADC analysis within the context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency	1			0.832	0.832
			b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure	1			0.846	0.846
			c	prescribed in depth the Emergency Response Plan (ERP)	1			0.867	0.867
			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC)	1			0.851	0.851
			e	outline the management of potential hazardous material	1			0.845	0.845
			f	describe the sheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system	1			0.858	0.858
			g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintainance programmes.	1			0.838	0.838
	A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	procedure for accident report and investigation		2		0.836	1.673
			b	flow chart on accident/incident management		2		0.867	1.735
			c	presented format of report documentation		2		0.841	1.683
			d	Role of responsibilities of parties involved, including ERT and ERP		2		0.849	1.697
			e	describe the methodology to analyse the source of accident/incident		2		0.847	1.693
			f	describe the analysis of CQI and its management		2		0.828	1.656
	A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based		2		0.838	1.677
			b	describe the format of presenting and evaluating causes of accident, injuries and illness		2		0.865	1.731
			c	describe the format of presenting and evaluating total accumulative of reported cases		2		0.816	1.631
			d	describe the format of presenting and evaluating statistical data on site		2		0.837	1.675
			e	outline the process and procedure of documentation of information and forwarding for meeting		2		0.862	1.724
			f	describe the methodology to analyse findings of the statistical result for CQI		2		0.836	1.673

FACILITIES AND INFRASTRUCTURE	F1	TEMPORARY ELECTRICAL SUPPLY	a	provide installation procedure, drawing and documentation approved by competent person	0				0.825	0.000
			b	outline the guideline and code of practice, related Legislation, Act, rules and regulations for construction works, connection and installation	0				0.854	0.000
			c	outline material specification and design requirement approved by competent person	0				0.836	0.000
			d	provide valid documentation of certified competent person for electrical works	0				0.836	0.000
	F2	SANITARY FACILITIES	a	provide waste management system approved by competent person	0				0.825	0.000
			b	provide installation procedure, drawing and documentation as approved by competent person	0				0.844	0.000
			c	comply with guideline and code of practice, related Legislation, Act, rules and regulation	0				0.838	0.000
			d	outline the specification and design requirement as approved by competent designer, local authorities/government	0				0.858	0.000
			e	provide valid documentation of certified competent person	0				0.844	0.000
	F3	OTHER FACILITIES	a	design to meet the requirement of the employee. Provide evidence of survey and employee responses/feedbacks	0				0.854	0.000
			b	details of installation procedure, drawing and documentation as approved by competent person	0				0.834	0.000
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	0				0.846	0.000
			d	describe the specification and design requirement that comply with all designated requirement	0				0.863	0.000
			e	provide valid documentation of certified competent person	0				0.851	0.000
	COMMUNICATION ADMINISTRATION	C1	COMMUNICATION INVOLVEMENT	a	outline methodology of delivering safety and health information			2		0.841
b				provide the management of documentation of safety and health related information			2		0.852	1.704
c				outline schedule of safety meeting; initial, development, coordination, head department, site safety committee and client meeting			2		0.862	1.724
d				outline CQI for safety information management system			2		0.866	1.733
C2		PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels			2		0.849	1.697
			b	outline schedule of safety programmes in weekly basis			2		0.846	1.691
			c	outline frequency of safety programmes according to the specific requirement			2		0.846	1.691
			d	describe in detail each categories of safety programme			2		0.840	1.681
C3		SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members			2		0.841	1.683
			b	outline schedule and frequencies of each meeting			2		0.848	1.695
			c	prescribe the management of information and documentation of each meeting			2		0.830	1.660
			d	provide means of CQI after meeting and its management			2		0.868	1.737

INFORMATION	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards		1			0.861	0.861
			b	provide information on the use, storage, handling and emergency procedures		1			0.849	0.849
			c	recognition of overexposure symptoms and what to do if such incidents occur		1			0.854	0.854
			d	describe the management and accessibility of documentation		1			0.841	0.841
			e	provide valid documentation of competent Person-In-Charged (PIC)		1			0.864	0.864
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	information on chemicals, describing the hazards the chemical presents		1			0.854	0.854
			b	information on handling, storage and emergency measures in case of an accident		1			0.830	0.830
			c	information on safe handling, in the form of exposure scenarios		1			0.846	0.846
			d	advice on risk management measures given in the exposure scenario		1			0.829	0.829
			e	outline the management and accessibility of documentation		1			0.832	0.832
			f	valid documentation of competent Person-In-Charge (PIC)		1			0.820	0.820
	I3	MACHINERY EQUIPMENT LIST	a	provide technical list of all machineries, contract vehicle (rental) such as type of machinery, model, engine capacity			2		0.830	1.660
			b	management of inspection, service manual and maintenance shedule			2		0.837	1.675
			c	valid record of drivers with competent licence			2		0.835	1.670
			d	vehicle permit and taxes documentation			2		0.839	1.679
e			valid documentation of certified competent person			2		0.854	1.708	
Total									146.158	
Percentage									47%	





APPENDIX C SCORING FOR PROJECT 2

APPENDIX C: SCORING FOR PROJECT 2

CATEGORY		REQUIREMENT	Compliance Level				Score Weightage	Total Score		
			0	1	2	3				
POLICY	P1	INTRODUCTION	a	Project Description and its durations			2		0.861	1.722
		b	Company Detail with experiences related to safety and health in construction			2		0.864	1.728	
	P2	SAFETY AND HEALTH SCOPE	a	Description of Project			2		0.844	1.687
			b	statement of Commitment on Safety and Health		1			0.867	0.867
			c	Brief Description on the scope Safety and Health Plan		1			0.861	0.861
	P3	OBJECTIVE SAFETY AND HEALTH	a	commitment to comply with safety and health legislation, act, rules and regulation.		1			0.845	0.845
			b	initiative to promoting consistence and productive safety and heath environment		1			0.827	0.827
			c	strategy to encourage healthy working culture and procedure		1			0.845	0.845
			d	describe continual improvement in safety and health management		1			0.868	0.868
	P4	SAFETY AND HEALTH POLICY	a	General Policy Statement manifesting commitment manage safety and health		1			0.850	0.850
			b	function, roles and responsibilities of Safety Management Team			2		0.848	1.695
			c	overall Safety and Health Management system to achieve aim and objectives of the policy			2		0.855	1.710
	LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Enforcement management related to construction works at all stages		1			0.815
b				outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health		1			0.841	0.841
c				presented compliance to local government/authorities requirement		1			0.846	0.846
d				attachment of documentation of obtaining consent/approval/ permission/from related local government/authorities		1			0.849	0.849
e				provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer		1			0.836	0.836
f				outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation		1			0.834	0.834
g				describe resource planning for enforcement requirement with specific compliance to legislation act, rules and regulation		1			0.851	0.851
L2		PROHIBITED SUBSTANCE	a	enforcement strategies to prohibit use of Drugs		1			0.847	0.847
			b	enforcement management strategies to prohibit the consumption of alcoholic drinks/substances		1			0.823	0.823
			c	enforcement management strategies to prohibit the use of restricted medicine		1			0.828	0.828

UMP

MANAGEMENT	M1	ROLES AND RESPONSIBILITIES	a	roles and responsibilities on safety and health management of each parties involved	1			0.845	0.845
			b	detail of duties for each designated post in safety and health management team	1			0.863	0.863
			c	Organisational Chart of safety and health management	1			0.844	0.844
			d	valid documentation for evidence of appointment and competent person	1			0.832	0.832
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases	1			0.851	0.851
			b	implications of SOP on evaluation of HIRADC	1			0.870	0.870
			c	SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation	1			0.858	0.858
			d	outline Frequency of Assessment/monitoring /supervision and enforcement of SOP	1			0.866	0.866
			e	SOP for inspection, maintenance, management and requirement of PPE and related equipment	1			0.858	0.858
			f	SOP for obtaining Competent Person requirement and responsibilities	1			0.838	0.838
			g	SOP for Documentation and audit	1			0.873	0.873
			h	SOP for House Keeping and maintenance at specific construction works/activities	1			0.854	0.854
			i	SOP for Specialist Involvement at any specific construction works/activities	1			0.855	0.855
	M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	describe schedule of induction training programmes and the application of relevant safety pass	1			0.853	0.853
			b	valid documentation of Green Card holders and management of its implementation	1			0.839	0.839
			c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion	1			0.846	0.846
			d	describe management of documentation and assessment to maintain quality of training programmes	1			0.822	0.822
			e	valid documentation of certified competent person to manage training and resource capabilities to conduct skill training	1			0.840	0.840
	M4	EMPLOYEE HEALTH INSPECTION	a	outline scheduled Health Campaign programme	1			0.855	0.855
			b	describe Scheduled health check up	1			0.829	0.829
c			describe health monitoring programme	1			0.846	0.846	
d			describe environmental assessment on site	1			0.818	0.818	



UMP

M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a	list of compulsory involvement/participation of the sub-contractor on specific safety programme		1			0.859	0.859
		b	schedule coordination meeting involving sub-contractor on safety and health		1			0.850	0.850
		c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement		1			0.824	0.824
M6	TRAFFIC MANAGEMENT	a	provide traffic management plan			2		0.860	1.720
		b	outline proposal of conflict handling of traffic management in case of emergency			2		0.837	1.675
		c	design traffic plan for emergency evacuation			2		0.831	1.662
		d	describe and propose signage management and procedure			2		0.846	1.691
		e	describe temporary traffic management outfit/tool			2		0.838	1.677
M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	outline the Purpose and objective of PPE related to construction activities/stages/phases			2		0.839	1.679
		b	outline scheduled Briefing on PPE and its training programmes			2		0.846	1.691
		c	provide technical data and documentation of specification, compliance and/or certification according to specific construction works/activities/stages/phases		1			0.833	0.833
		d	provide enforcement management system for inspection, assessment, monitoring and supervision maintaining the fitness of all PPE in standard working condition at all time		1			0.830	0.830
		e	describe in detail the Functions and allocation of each PPE designated to specific construction works/activities/stages/phases		1			0.847	0.847

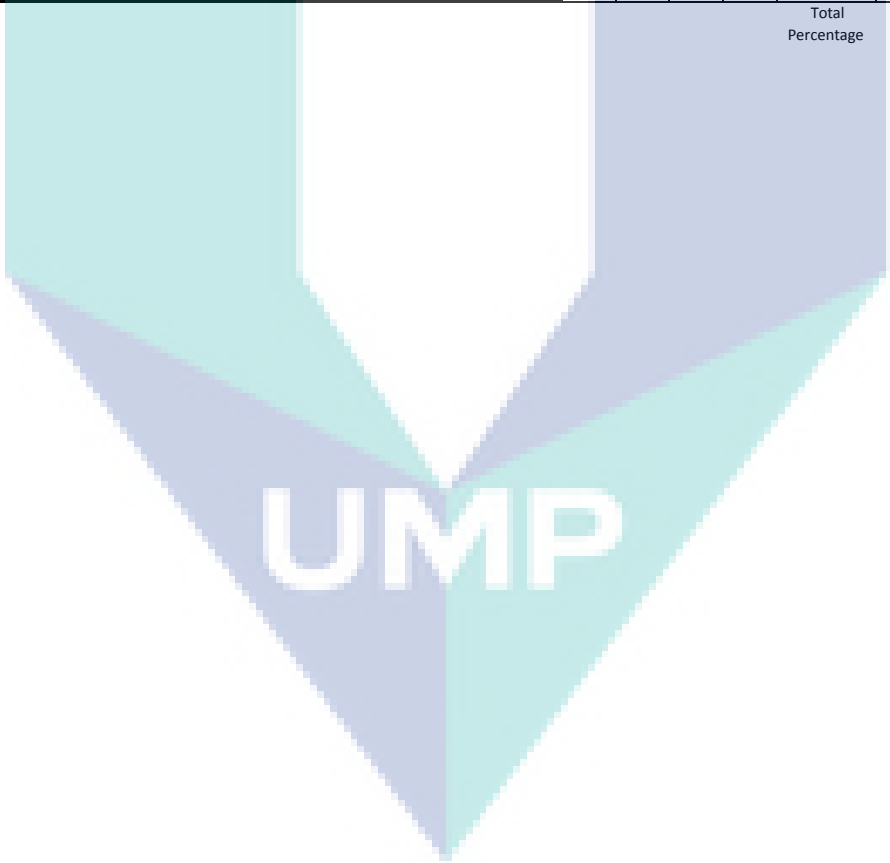


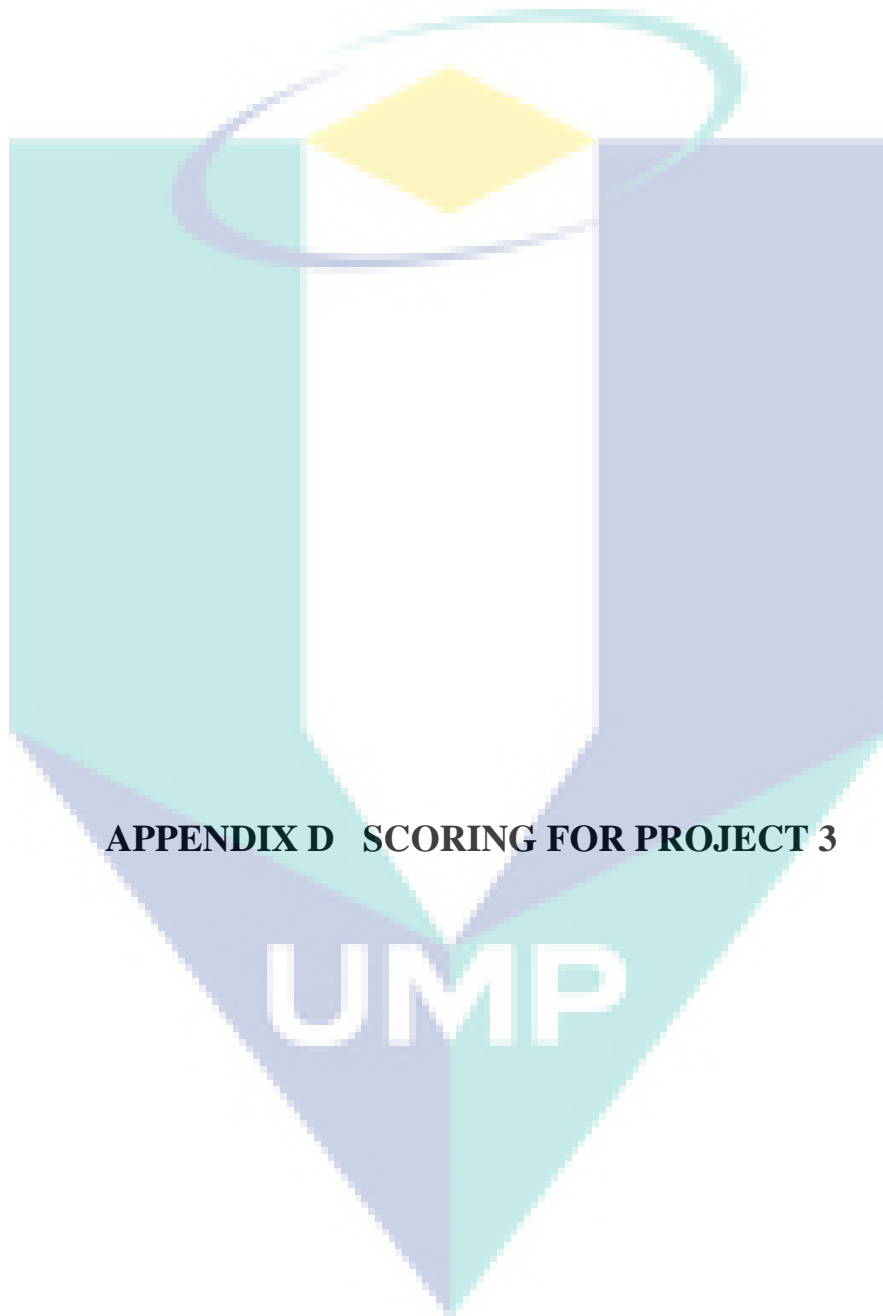
UMP

ANALYTICAL ASSESSMENT	A1	HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)	a	prescribe specific scope of construction works/activities within the context of hazard identification of its type, effect and control strategy	1			0.830	0.830
			b	analyse and determine the level risks (1-25) within the influential context of likelihood (1-5) and severity (1-5) implications	1			0.831	0.831
			c	provide risk control management compliance with the related legislation, act, rules and regulation	1			0.841	0.841
			d	competent Person-In-Charged (PIC) to deliver the management of HIRADC with certification and/or industrial experience	1			0.830	0.830
	A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	detail out the Emergency Classification in response to HIRADC analysis within the context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency	1			0.832	0.832
			b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure	1			0.846	0.846
			c	prescribed in depth the Emergency Response Plan (ERP)	1			0.867	0.867
			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC)	1			0.851	0.851
			e	outline the management of potential hazardous material	1			0.845	0.845
			f	describe the sheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system	1			0.858	0.858
			g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintainance programmes.	1			0.838	0.838
	A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	procedure for accident report and investigation	1			0.836	0.836
			b	flow chart on accident/incident management	1			0.867	0.867
			c	presented format of report documentation	1			0.841	0.841
			d	Role of responsibilities of parties involved, including ERT and ERP	1			0.849	0.849
			e	describe the methodology to analyse the source of accident/incident	1			0.847	0.847
			f	describe the analysis of CQI and its management	1			0.828	0.828
	A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based	1			0.838	0.838
			b	describe the format of presenting and evaluating causes of accident, injuries and illness	1			0.865	0.865
			c	describe the format of presenting and evaluating total accumulative of reported cases	1			0.816	0.816
			d	describe the format of presenting and evaluating statistical data on site	1			0.837	0.837
			e	outline the process and procedure of documentation of information and forwarding for meeting	1			0.862	0.862
			f	describe the methodology to analyse findings of the statistical result for CQI	1			0.836	0.836

FACILITIES AND INFRASTRUCTURE	F1	TEMPORARY ELECTRICAL SUPPLY	a	provide installation procedure, drawing and documentation approved by competent person	1			0.825	0.825
			b	outline the guideline and code of practice, related Legislation, Act, rules and regulations for construction works, connection and installation	1			0.854	0.854
			c	outline material specification and design requirement approved by competent person	1			0.836	0.836
			d	provide valid documentation of certified competent person for electrical works	1			0.836	0.836
	F2	SANITARY FACILITIES	a	provide waste management system approved by competent person	1			0.825	0.825
			b	provide installation procedure, drawing and documentation as approved by competent person	1			0.844	0.844
			c	comply with guideline and code of practice, related Legislation, Act, rules and regulation	1			0.838	0.838
			d	outline the specification and design requirement as approved by competent designer, local authorities/government	1			0.858	0.858
			e	provide valid documentation of certified competent person	1			0.844	0.844
	F3	OTHER FACILITIES	a	design to meet the requirement of the employee. Provide evidence of survey and employee responses/feedbacks	0			0.854	0.000
			b	details of installation procedure, drawing and documentation as approved by competent person	0			0.834	0.000
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	0			0.846	0.000
			d	describe the specification and design requirement that comply with all designated requirement	0			0.863	0.000
			e	provide valid documentation of certified competent person	0			0.851	0.000
	COMMUNICATION ADMINISTRATION	C1	COMMUNICATION INVOLVEMENT	a	outline methodology of delivering safety and health information	1			0.841
b				provide the management of documentation of safety and health related information	1			0.852	0.852
c				outline schedule of safety meeting; initial, development, coordination, head department, site safety committee and client meeting	1			0.862	0.862
d				outline CQI for safety information management system	1			0.866	0.866
C2		PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels	1			0.849	0.849
			b	outline schedule of safety programmes in weekly basis	1			0.846	0.846
			c	outline frequency of safety programmes according to the specific requirement	1			0.846	0.846
			d	describe in detail each categories of safety programme	1			0.840	0.840
C3		SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members	1			0.841	0.841
			b	outline schedule and frequencies of each meeting	1			0.848	0.848
			c	prescribe the management of information and documentation of each meeting	1			0.830	0.830
			d	provide means of CQI after meeting and its management	1			0.868	0.868

INFORMATION	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards		1			0.861	0.861
			b	provide information on the use, storage, handling and emergency procedures		1			0.849	0.849
			c	recognition of overexposure symptoms and what to do if such incidents occur		1			0.854	0.854
			d	describe the management and accessibility of documentation		1			0.841	0.841
			e	provide valid documentation of competent Person-In-Charged (PIC)		1			0.864	0.864
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	information on chemicals, describing the hazards the chemical presents		1			0.854	0.854
			b	information on handling, storage and emergency measures in case of an accident		1			0.830	0.830
			c	information on safe handling, in the form of exposure scenarios		1			0.846	0.846
			d	advice on risk management measures given in the exposure scenario		1			0.829	0.829
			e	outline the management and accessibility of documentation		1			0.832	0.832
			f	valid documentation of competent Person-In-Charge (PIC)		1			0.820	0.820
	I3	MACHINERY EQUIPMENT LIST	a	provide technical list of all machineries, contract vehicle (rental) such as type of machinery, model, engine capacity			2		0.830	1.660
			b	management of inspection, service manual and maintenance shedule			2		0.837	1.675
			c	valid record of drivers with competent licence			2		0.835	1.670
			d	vehicle permit and taxes documentation			2		0.839	1.679
e			valid documentation of certified competent person			2		0.854	1.708	
Total									113.179	
Percentage									37%	





APPENDIX D: SCORING FOR PROJECT 3

CATEGORY		REQUIREMENT	Compliance Level				Score Weightage	Total Score		
			0	1	2	3				
POLICY	P1	INTRODUCTION	a	Project Description and its durations		1			0.861	0.861
			b	Company Detail with experiences related to safety and health in construction		1			0.864	0.864
	P2	SAFETY AND HEALTH SCOPE	a	Description of Project		1			0.844	0.844
			b	statement of Commitment on Safety and Health		1			0.867	0.867
	P3	OBJECTIVE SAFETY AND HEALTH	c	Brief Description on the scope Safety and Health Plan	0				0.861	0.000
			a	commitment to comply with safety and health legislation, act, rules and regulation.		1			0.845	0.845
			b	initiative to promoting consistence and productive safety and heath environment		1			0.827	0.827
			c	strategy to encourage healthy working culture and procedure	0				0.845	0.000
	P4	SAFETY AND HEALTH POLICY	d	describe continual improvement in safety and health management	0				0.868	0.000
			a	General Policy Statement manifesting commitment manage safety and health	1				0.850	0.850
			b	function, roles and responsibilities of Safety Management Team		1			0.848	0.848
			c	overall Safety and Health Management system to achieve aim and objectives of the policy	0				0.855	0.000
	LEGISLATION	L1	LEGISLATION, RULES AND REGULATION	a	Enforcement management related to construction works at all stages		1			0.815
b				outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health		1			0.841	0.841
c				presented compliance to local government/authorities requirement		1			0.846	0.846
d				attachment of documentation of obtaining consent/approval/ permission/from related local government/authorities		1			0.849	0.849
e				provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer		1			0.836	0.836
f				outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation		1			0.834	0.834
g				describe resource planning for enforcement requirement with specific compliance to legislation act, rules and regulation		1			0.851	0.851
L2		PROHIBITED SUBSTANCE	a	enforcement strategies to prohibit use of Drugs		1			0.847	0.847
			b	enforcement management strategies to prohibit the consumption of alcoholic drinks/substances		1			0.823	0.823
			c	enforcement management strategies to prohibit the use of restricted medicine	0				0.828	0.000

UMP

MANAGEMENT	M1	ROLES AND RESPONSIBILITIES	a	roles and responsibilities on safety and health management of each parties involved	1			0.845	0.845
			b	detail of duties for each designated post in safety and health management team	1			0.863	0.863
			c	Organisational Chart of safety and health management	1			0.844	0.844
			d	valid documentation for evidence of appointment and competent person	1			0.832	0.832
	M2	SAFETY AND HEALTH STANDARD PROCEDURE (SOP)	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases	1			0.851	0.851
			b	implications of SOP on evaluation of HIRADC	1			0.870	0.870
			c	SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation	1			0.858	0.858
			d	outline Frequency of Assessment/monitoring /supervision and enforcement of SOP	1			0.866	0.866
			e	SOP for inspection, maintenance, management and requirement of PPE and related equipment	1			0.858	0.858
			f	SOP for obtaining Competent Person requirement and responsibilities	1			0.838	0.838
			g	SOP for Documentation and audit	1			0.873	0.873
			h	SOP for House Keeping and maintenance at specific construction works/activities	1			0.854	0.854
			i	SOP for Specialist Involvement at any specific construction works/activities	1			0.855	0.855
	M3	INDUCTION TRAINING MANAGEMENT ON SAFETY AND HEALTH	a	describe schedule of induction training programmes and the application of relevant safety pass	1			0.853	0.853
			b	valid documentation of Green Card holders and management of its implementation	1			0.839	0.839
			c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion	1			0.846	0.846
			d	management of documentation and assessment to maintain quality of training programmes	1			0.822	0.822
			e	valid documentation of certified competent person to manage training and resource capabilities to conduct skill training	1			0.840	0.840
	M4	EMPLOYEE HEALTH INSPECTION	a	outline scheduled Health Campaign programme	0			0.855	0.000
			b	describe Scheduled health check up	0			0.829	0.000
c			describe health monitoring programme	0			0.846	0.000	
d			describe environmental assessment on site	0			0.818	0.000	



UMP

M5	SAFETY PROGRAM FOR SUB-CONTRACTOR	a	list of compulsory involvement/participation of the sub-contractor on specific safety programme	1			0.859	0.859
		b	schedule coordination meeting involving sub-contractor on safety and health	1			0.850	0.850
		c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement	1			0.824	0.824
M6	TRAFFIC MANAGEMENT	a	provide traffic management plan	1			0.860	0.860
		b	outline proposal of conflict handling of traffic management in case of emergency	1			0.837	0.837
		c	design traffic plan for emergency evacuation	1			0.831	0.831
		d	describe and propose signage management and procedure	1			0.846	0.846
		e	describe temporary traffic management outfit/tool	1			0.838	0.838
M7	PERSONAL PROTECTION EQUIPMENT (PPE)	a	outline the Purpose and objective of PPE related to construction activities/stages/phases	1			0.839	0.839
		b	outline scheduled Briefing on PPE and its training programmes	0			0.846	0.000
		c	technical data and documentation of specification, compliance and/or certification according to specific construction works	0			0.833	0.000
		d	provide enforcement management system for inspection, assessment, monitoring and supervision maintaining the fitness of all PPE	0			0.830	0.000
		e	describe Functions and allocation of each PPE designated	1			0.847	0.847



UMP

ANALYTICAL ASSESSMENT	A1	HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)	a	prescribe scope of construction works/activities within the context of hazard identification of its type, effect and control strategy	1			0.830	0.830
			b	analyse and determine the level risks (1-25) within the influential context of likelihood (1-5) and severity (1-5) implications	1			0.831	0.831
			c	provide risk control management compliance with related legislation, act, rules and regulation	1			0.841	0.841
			d	competent Person-In-Charged (PIC) for management of HIRADC	1			0.830	0.830
	A2	FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN	a	detail out the Emergency Classification in response to HIRADC analysis within the context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency	1			0.832	0.832
			b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure	1			0.846	0.846
			c	prescribed in depth the Emergency Response Plan (ERP)	1			0.867	0.867
			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC)	1			0.851	0.851
			e	outline the management of potential hazardous material	1			0.845	0.845
			f	describe the scheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system	1			0.858	0.858
			g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintenance programmes.	1			0.838	0.838
	A3	REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT	a	procedure for accident report and investigation	0			0.836	0.000
			b	flow chart on accident/incident management	1			0.867	0.867
			c	presented format of report documentation	1			0.841	0.841
			d	Role of responsibilities of parties involved, including ERT and ERP	0			0.849	0.000
			e	describe the methodology to analyse the source of accident/incident	0			0.847	0.000
			f	describe the analysis of CQI and its management	0			0.828	0.000
	A4	STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based	1			0.838	0.838
			b	describe the format of presenting and evaluating causes of accident, injuries and illness	1			0.865	0.865
			c	describe the format of presenting and evaluating total accumulative of reported cases	1			0.816	0.816
			d	describe the format of presenting and evaluating statistical data on site	1			0.837	0.837
			e	process and procedure of documentation of information and forwarding for meeting	1			0.862	0.862
			f	describe the methodology to analyse findings of the statistical result for CQI	1			0.836	0.836

FACILITIES AND INFRASTRUCTURE	F1	TEMPORARY ELECTRICAL SUPPLY	a	provide installation procedure, drawing and documentation approved by competent person	1			0.825	0.825
			b	guideline and code of practice, related Legislation, Act, rules and regulations	1			0.854	0.854
			c	material specification and design requirement approved by competent person	1			0.836	0.836
			d	provide valid documentation of certified competent person for electrical works	1			0.836	0.836
	F2	SANITARY FACILITIES	a	provide waste management system approved by competent person	1			0.825	0.825
			b	provide installation procedure, drawing and documentation as approved by competent person	1			0.844	0.844
			c	comply with guideline and code of practice, related Legislation, Act, rules and regulation	1			0.838	0.838
			d	specification and design requirement as approved by competent designer	1			0.858	0.858
			e	provide valid documentation of certified competent person	1			0.844	0.844
	F3	OTHER FACILITIES	a	design to meet the requirement of employees based on responses/feedbacks	1			0.854	0.854
			b	details of installation procedure, drawing and documentation as approved by competent person	1			0.834	0.834
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	1			0.846	0.846
			d	describe the specification and design requirement that comply with all designated requirement	1			0.863	0.863
			e	provide valid documentation of certified competent person	1			0.851	0.851
	COMMUNICATION ADMINISTRATION	C1	COMMUNICATION INVOLVEMENT	a	outline methodology of delivering safety and health information	1			0.841
b				provide the management of documentation of safety and health related information	1			0.852	0.852
c				schedule of safety meeting; initial, development, coordination, head department, site safety committee and client meeting	1			0.862	0.862
d				outline CQI for safety information management system	1			0.866	0.866
C2		PUBLICITY ON SAFETY AND HEALTH PROGRAM	a	describe the methodology of Publicity medium and channels	1			0.849	0.849
			b	outline schedule of safety programmes in weekly basis	1			0.846	0.846
			c	outline frequency of safety programmes according to the specific requirement	1			0.846	0.846
			d	describe in detail each categories of safety programme	1			0.840	0.840
C3		SAFETY AND HEALTH MEETING	a	list out and describe all type of safety and health meeting and its objective/purpose and members	1			0.841	0.841
			b	outline schedule and frequencies of each meeting	1			0.848	0.848
			c	prescribe the management of information and documentation of each meeting	1			0.830	0.830
			d	provide means of CQI after meeting and its management	1			0.868	0.868

INFORMATION	I1	MATERIAL SAFETY DATA SHEET (MSDS)	a	provide documentation of the information on the potential hazards	0				0.861	0.000
			b	provide information on the use, storage, handling and emergency procedures	0				0.849	0.000
			c	recognition of overexposure symptoms and what to do if such incidents occur	0				0.854	0.000
			d	describe the management and accessibility of documentation	0				0.841	0.000
			e	provide valid documentation of competent Person-In-Charged (PIC)	0				0.864	0.000
	I2	CHEMICAL SAFETY DATA SHEET (MSDS)	a	information on chemicals, describing the hazards the chemical presents	0				0.854	0.000
			b	information on handling, storage and emergency measures in case of an accident	0				0.830	0.000
			c	information on safe handling, in the form of exposure scenarios	0				0.846	0.000
			d	advice on risk management measures given in the exposure scenario	0				0.829	0.000
			e	outline the management and accessibility of documentation	0				0.832	0.000
			f	valid documentation of competent Person-In-Charge (PIC)	0				0.820	0.000
	I3	MACHINERY EQUIPMENT LIST	a	provide technical list of all machineries, contract vehicle (rental) such as type of machinery, model, engine capacity		1			0.830	0.830
			b	management of inspection, service manual and maintenance shedule		1			0.837	0.837
			c	valid record of drivers with competent licence		1			0.835	0.835
			d	vehicle permit and taxes documentation		1			0.839	0.839
			e	valid documentation of certified competent person		1			0.854	0.854
	Total									80.310
Percentage									26%	



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