ANAL` ON SITE

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ABSTRACT

Construction industry is one of the largest economy industries that contributed to the development and prosperous of Malaysia. Besides compared with the many other industries, the construction industry is subject to more risks due to unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structure. This study are purpose to recognize the risk that always occur on construction site. This study also circumstances the application of the solution to prevent or reduce the risk on construction site. The questionnaire has been prepared and distributed to the site participant either directly or indirectly which is involved in variation level on construction site. Result of the study found that the time management problem is major types of risk in resources management and falling during work at height is a major risk in construction site activities. The result shows that management should well planning the process of a project before start to achieves target reduce risk on construction site.

ABSTRAK

Industri pembinaan adalah salah sebuah industri yang banyak menyumbang ke arah kemajuan dan pembangunan Malaysia. Selain itu berbanding dengan industry-industri lain industri pembinaan berisiko lebih tinggi kerana cirri-ciri unik aktiviti pembinaan seperti tempoh yang panjang, proses yang rumit, persekitaran yang pesat, keamatan kewangan dan struktur organisasi yang dinamik. Kajian yang dijalankan adalah bertujuan untuk mengenalpasti risiko yang sering berlaku di tapak bina. Kajian ini juga merangkumi kaedah-kaedah penyelesaian untuk mengatasi dan mengurangkan risiko di tapak bina. Borang soal selidik telah disediakan dan diedarkan kepada syarikat-syarikat pembinaan yang berfokuskan kepada pihak-pihak yang terlibat secara lansung atau tidak lansung dalam pelbagai tahap di tapak bina. Hasil kajian mendapati bahawa masalah pengurusan masa adalah risiko utama didalam pengurusan sumber dan jatuh ketika melakukan kerja di tempat tinggi adalah risiko utama dalam aktiviti tapak bina. Keputusan menunjukkan pihak pengurusan perlulah merancang proses sesebuah projek dari mula dengan baik untuk mencapai matlamat mengurangkan risiko di tapak bina.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Risk is defined as the probability of obstacle that may lead to the failure of a project. While risk cannot be eliminated from projects, it can be reduced by risk management. Robert Charette pointed out that "risk management does not deal with future decision, but the future of present decisions" (Jurutera, Jun 2011).

As engineers, it is compulsory to be concerned about any possible risks that may occur during the project period. Therefore, it is a significant concern to most engineers that their engineering project completed within the estimated cost and duration without any fatality.

The risk management process begins by identifying the risk before the start of any work or project. Identifying the risk in the early stages will help reduces losses and prepare us to face the consequences of the problems. Inspect of workplace and identify the possible hazards before analyzing the risks. Then, evaluate each risk and classify the level of the risk accordingly. The risk response planning addresses the various ways to deal with the identified risk such as transferring the risk, and prepare a contingency plan. Finally, implement the developed management plan to continuously monitor the risk and prepare the documentation of the risk management plan.

Risk management principles always start with creating a risk management plan. Assigning a risk engineer who is responsible for forecasting potential project problems is a good solution. The budget and schedule should include a calculated risk reserve to

avoid over cost overruns and delay in project completion. After implementing the risk management plan, the risk must be continuously monitored. Furthermore, all parties need to establish an efficient communication channel at the workplace by adhering to specific procedures and comprehensive documentation.

1.2 PROBLEM STATEMENT

Construction industry in Malaysia is always exposed to the risk that occurred either on site or not. The common risk that always occur are in the form of finance, materials and manpower resources, hazards related to the safety human beings and the scheduling of project completion (Jurutera, Jun 2011).

From the previous research and statistic obtained from Occupational Safety and Health Administration (OSHA), it has reported that the hazards related to the safety human beings is the common risk that always occur on construction site. The top six (6) construction site hazards identified by OSHA are electrical, excavation and trenching, falls, stairways and ladder, scaffolding and heavy construction equipment.

As reported in the Berita Harian, construction industry is the main contributor of the highest death cases compared to the other sectors. According to the Department of Occupational Safety and Health Malaysia (DOSH), there were sixty six (66) cases reported on 2010 and until May of this year there are thirty (30) cases have recorded as shown in Figure 1.1 and Figure 1.2 (Berita Harian, 2011).

DOSH also stated that risk management can help to avoid or lessen the impact of issues that threaten the success of a project. At the construction site, sensitivity should be developed to expect unexpected events in order to be well prepared to deal with any eventuality.

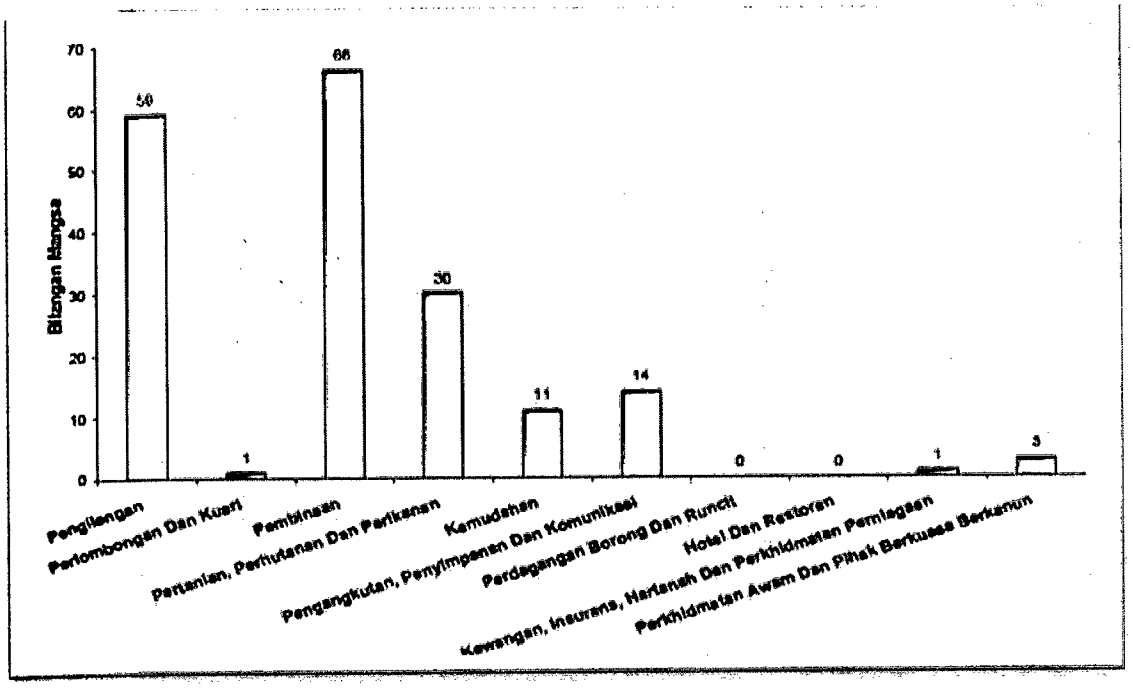

Figure 1.1: Statistic of the Workers Accident According To Sector for the Category of Death in Year 2010

Source: Department of Occupational Safety and Health Malaysia (DOSH)

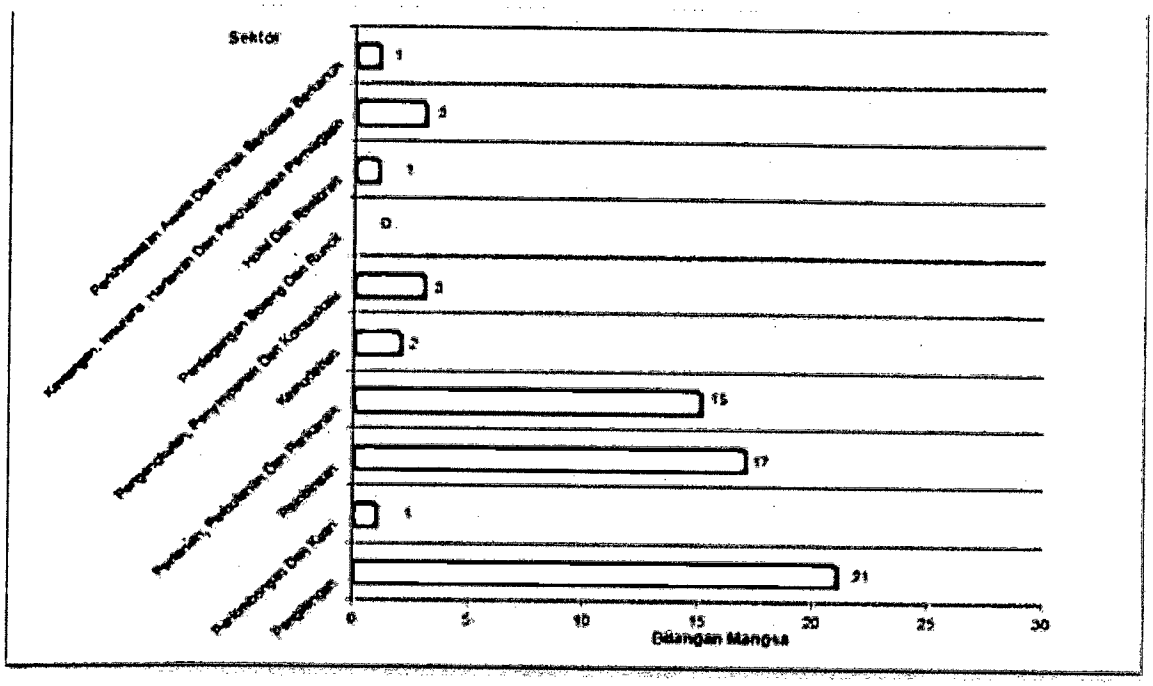

Figure 1.2: Statistic of the Workers Accident According To Sector for the Category of Death until May 2011

Source: Department of Occupational Safety and Health Malaysia (DOSH)

1.3 OBJECTIVES OF STUDY

The objective of this study have been discussed and decided to make sure this study will be done in a right path. There are three (3) objectives to be achieved for this study, which are:

(i) To identify types of risk on construction site.

(ii) To identify factors that contributes to the risk on construction site.

(iii) To determine solutions on how to prevent risk on construction site.

1.4 SCOPE OF STUDY

For the scope of study, the limitation has been done in order to focus and narrow down the topic to the specific area and subject of study. The selection of the case study

area is depends on the frequency of risk that occur on construction site that lead to the failure of a project.

The area of the case study is focusing on construction site at east coast region which is Terengganu, Kelantan and Pahang. The reason of choosing this area is due to rapid development in construction within this region. Then it is also focus on the types of risk and the factors that contributes to the risk on construction site. Lastly the respondents of this study has been focused on the person that involve in the construction site such as consultant, site engineer, site supervisor, site manager, project coordinator, safety officer, workers and also publics.

1.5 SIGNIFICANCE OF STUDY

The significance of this study is divided into two (2) parts which are to the industry and individual. For the industry, this study identifies all the opportunities in the construction industry. This study also review the process or steps that enable improvement in decision making to decrease the risk on construction site and in the same time avoiding or minimizing losses. Besides, it is also provide a logical and systematic approach to the industry in managing risk on construction site.

For the individual significance, this study exposed to individual especially workers about all the risk during working at construction site while reducing the number of accident occur.

1.6 RESEARCH METHODOLOGY

In achieving these objectives, a research methodology is required. Figure 1.3 shows the research methodology of this study.

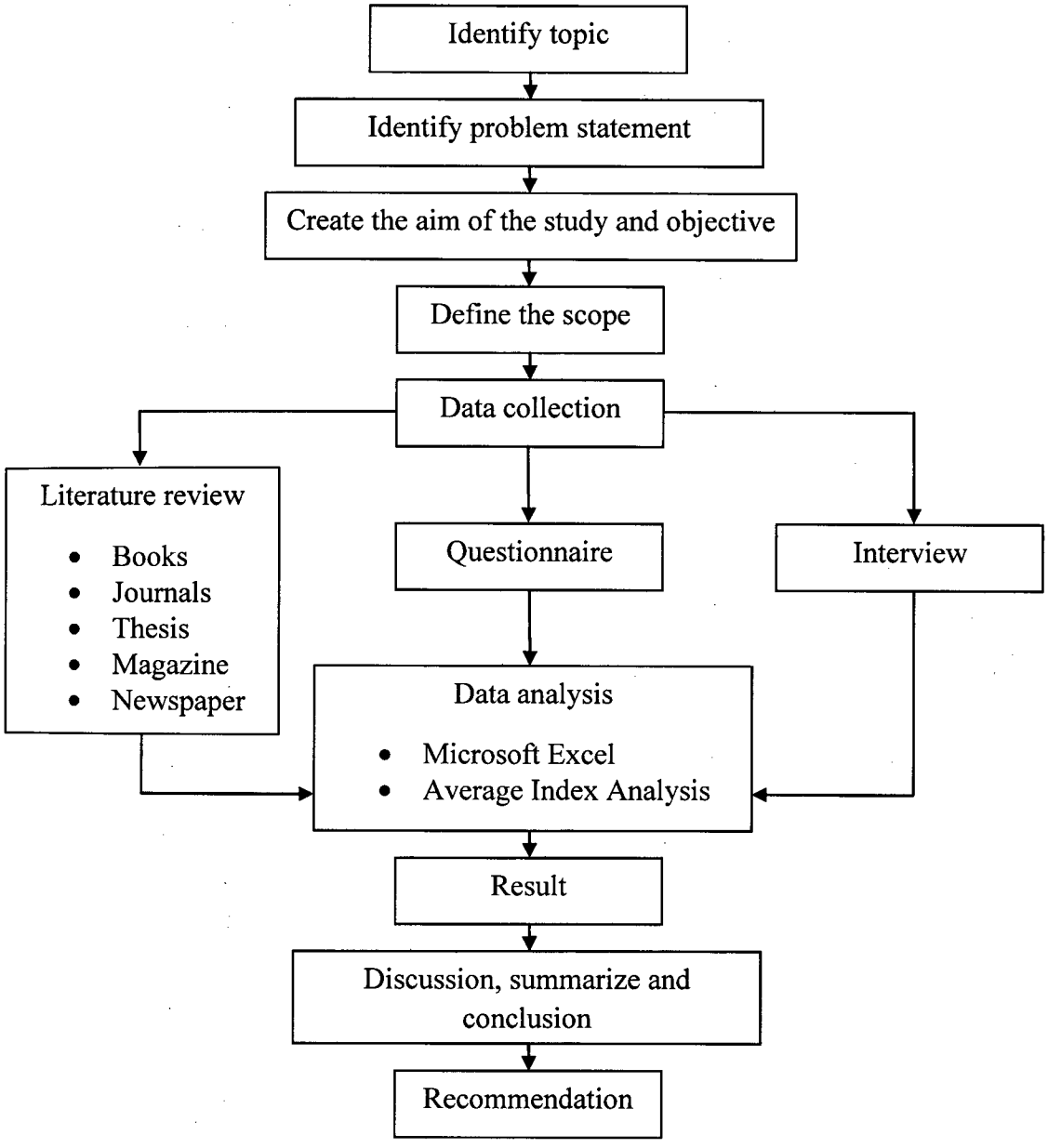

Figure 1.3: Methodology of the study

This research will be adopted field survey methodology to uncover types and factors of risk on construction site. To identify the risk types and factors in construction market, a comprehensive literature review was conducted as to identify the essential information such as the major types and factors of risk on construction site. This useful information will be included in the preparation of the main survey questionnaire.

After that, main survey questionnaires are prepared. The designed questionnaire will be distributed to the person that involved in the construction site. Upon the completion of the data analysis, discussion of these findings, conclusions and recommendations will be presented.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Literature review is an important process of conducting research in which it provides to propagate the formulation of the research problems in addition to review the critical point of current knowledge on a particular topic. Its ultimate goal is to bring the reader up to date with current literature and forms a basic for expanding the knowledge within the topic. The subject of risks and its effect has been discussed by several researchers in the past decades. Risks, however, were still being reported among construction projects.

Managing risk in construction projects has been recognized as very important management process in order to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability. An effective risk management method can help to understand not only what kinds of risk faced, but also how to manage these risks in different phases of a project. Owing to its increasing importance, risk management has been recognized as a necessity in most industries today, and a set of techniques have been developed to control the influences brought by potential risks (Schuyler, 2001; Baker and Reid, 2005).

Compared with the many other industries, the construction industry is subject to more risks due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures (Flanagan and Norman, 1993; Akintoye and MacLeod, 1997; Smith, 2003). Hence, taking effective risk management techniques to manage risks

associated with variable construction activities has never been more important for the successful delivery of a project.

2.2 DEFINITION

Any risks that occur on construction site can be reduced if the awareness of the person related is high. It is because every risk can affect the profit and lose especially to company, family, and employer. It also affects the country productivity generally. The definition of risk, risk management, hazard and accident are shown as below.

2.2.1 Risk

Risk is defined as the uncertain event or condition that results from the network form of work, having an impact that contradicts expectations. An event is at least partially related to other actors in a network (Artto and Kähkönen, 2005).

2.2.2 Risk Management

Risk management is a systematic process of accessing and then dealing with risk. This is described in more detail in the following diagram. The process entails consideration of the context, followed by identification, analysis, evaluation, and treatment of risks. It is an iterative process that also involves monitoring and review, and can usefully encompass a dialogue with stakeholders along the way (AusAid, November 2005).

2.2.3 Hazard

A hazard is the potential for harm. In practical terms, a hazard often is associated with a condition or activity that, if left uncontrolled, can result in an injury or illness (OSHA, 2009)

2.2.4 Accident

Accident is defined by health and safety regulation as any unplanned event that result in injury or ill-health of people or damaged or loss to property, plant, material or the environment or a loss of business opportunity it is also called as an unplanned event. The terms undesirable, unexpected, and non-controlled have also been used to describe such events. More formally, the accident is an undesired event, which result in physical harm and/or property damaged, usually resulting from contact with a source of energy the ability of the body or structure to withstand it (Dave Heberle, 2003).

2.3 TYPES AND FACTORS OF RISK IN RESOURCES MANAGEMENT

Risk management is one of the most critical project management practices to ensure a project is successfully completed. Royer (2000) stated that experience has shown that risk management must be of critical concern to project managers, as unmanaged or unmitigated risks are one of the primary causes of project failure.

Any risk in resource management can lead to the breach of contract by either contractors or project clients and project fail. The common risks that always occur in resources management are in the form of finance, materials, manpower resources, machines and time.

2.3.1 Finance

One of the myriads of problems facing domestic contractors is financial problem to run their projects. This major problem spread almost all over the domestic contractors has critically affected performances of construction projects against time, cost and quality. Construction planning problem such as time and resource planning, cost estimation problem, financial management problem and overstretching of contractors beyond their capacity are the major factors. Moreover, there are external factors that aggravate the financial problem of domestic contractors contributed by different stake holders in the industry. Delay in payments, lack of alternative source of finance, lack of

cost administration system, unfavorable regulations for different financial requirements, are among the external factors.

2.3.2 Materials

Materials management is an important element in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs presents important opportunities for reducing costs. Poor materials management will risk to the large and avoidable costs during construction. First, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of materials. Even worse, materials may deteriorate during storage or be stolen unless special care is taken. For example, electrical equipment often must be stored in waterproof locations. Second, delays and extra expenses may be incurred if materials required for particular activities are not available. So that, there are many factors to consider in managing risk of material such as consideration of the lead time like purchasing process, transportation and delivery time of the material, consideration for availability of finance and import process of material considerations.

2.3.3 Manpower Resources

Most of the construction organization are tend hire foreign worker. Opinions about foreign workers were divergent. All realized the problem that the construction industry will be facing a severe shortage of labour in a few years and foreign workers are necessary to fill this gap. Problems occur, when language skills are poor, professional qualifications unclear and quality viewpoints different. On the other hand, most foreigners are extremely motivated and hard working but the risk is the investment that is needed to bring their skills to the level required professionally, linguistically and cultural.

2.3.4 Machines and Equipments

The selection of the appropriate type and size of construction machinery or equipment often affects the required amount of time and effort and thus the job-site

productivity of a project. It is therefore important for site managers and construction planners to be familiar with the characteristics of the major types of machinery and equipment most commonly used in construction. There are many factors of risk that come out from the machinery and equipment which is because of its source either it is owned, leased or rented, or purchased. Besides, the machines equipment hourly productivity, the availability of equipment and also the construction method that use.

2.3.5 Time

In construction, all projects are time bound. The project time objective specifies the project completion time. Time is the essence of all construction contracts. A plan, prepared well before the commencement of construction in a project, can be instrumental in formulating directions, coordinating functions, setting targets, forecasting resources, budgeting costs, controlling performance and motivating people. It is for these reasons that the construction planning starts with time planning as the first step. The time planning process involves the following three stages which is Project work breakdown, Modeling and analyzing networks and Scheduling work program.

Time overrun caused by contractors will not only affect the contractor financially but will also affect the contractor's reputation. Any kind of delay whether in the change of design and construction method, technical, environmental or government caused delays is main reason for time overrun. Most of the factors like risk changes that contribute to time overrun can be avoided even at early stage. The Employer plays an important role as well in ensuring that the project is completed within a stipulated time and cost.

2.4 TYPES AND FACTORS OF RISK IN CONSTRUCTION SITE ACTIVITIES

The construction industry is a high risk industry because there is a high risk of accident occurrence. Reasons are time, cost and quality that are always the main factors considered ahead of safety. The statistics of accidents occurred in the construction industry indicate that the accident rate in Malaysian construction industry is still high

and it give a picture that construction industry is one of the critical sectors that need a huge and fast overhaul from the current site safety practices. Listed below are the top five (5) construction site risky activities identified by the Occupational Safety and Health Administration (OSHA).

2.4.1 Work at Height

Falling from scaffolding while work at height over six feet or a fixed ladder over twenty feet is the most dangerous and common construction site hazard. Falling from high places such as a ladder, scaffolding and roofs account for more than fifty percent of the accidents that happen at the workplace. The usual factors of this incident is slipping, tripping and using unstable ladders. The high level works including removal and replacement of the suspended ceiling, removal and replacement of high level mechanical and electrical services, structural steel alterations and installation the fall protection and debris netting for the main roof work.

2.4.2 Excavation and Trenching

OSHA has recognized excavation and trenching as the most hazardous construction site operation. OSHA requires that workers in trenches and excavations be protected, and that safety and health programs address the variety of hazards they face. The hazards cause the most trenching and excavation injuries are no protective system, failure to inspect trench and protective systems and also unsafe spoil-pile placement.

2.4.3 Electrical

Electricity is one of the greatest hazards to people either at home or at work. Power line workers, electricians and electrical engineers work continuously with electricity and can face exposure to this hazard on a daily basis. Usually, accidents happen due to faulty electrical installation such as cables, plugs or equipment. Besides, workers that ignored safety by doing electrical work in wet condition can cause electric shock.

2.4.4 Lifting Material

During lifting any material on the site, they are many risks that need to be considered. Accidents may be happens because of lifting equipment is not inspected or not maintained regularly. If the lifting equipment such as chains that was use are dirty or corrode, it risk to fail and causing heavy load to fall. Besides, the sloped or slippery walking surfaces that use to lift material also can be as a risk to accident occurs.

2.4.5 Heavy Construction Equipment

Approximately one hundred (100) construction site workers die each year due to heavy construction equipment. The main factors of such accidents includes ground workers struck when a vehicle is backing up or changing direction equipment, rollovers that injure the operator, mechanics run over when brakes are not properly set and ground workers crushed by falling equipment from backhoes, buckets, and other moving construction vehicles.

2.5 METHOD PRACTICES TO PREVENT THE RISK ON CONSTRUCTION SITE

As we know, risks can be reduced if they cannot be eliminated. Each construction project is different. Therefore work practices and solutions to problems must be matched to the particular situation by carrying out an assessment of the risks in construction project concerned.

Safety risks on construction site are unavoidable. However, these can be prevented if workers are instructed on how to identify the hazards that might be present at the work-site. The employer must establish proper safety standards that meet the maximum requirements of the Occupational Safety and Health Administration. This will ensure that workers will have a safe working environment during normal operation.

2.5.1 Work at Height

There are thousands of reasons for fall hazards and to eliminate such risks, employers must have a fall protection program as part of any overall workplace safety and health program. Workers should be trained to identify and evaluate fall hazards and be fully aware of how to control exposure to such risks as well as know how to use fall protection equipment properly. The proposed solution to the health and safety risks was to provide fully decked, moveable platform over all live production areas, for use by all trades involved in the project. The platforms were rail mounted on an extensive scaffolding system that was be designed and erected around existing plant and machinery.

2.5.2 Excavation and Trenching

Both employer and employee must follow safety standards and use protective equipment to minimize hazards while trenching and excavating. Providing proper training and organizing risk management workshop would help increase risk management awareness among staff members or workers. Besides implementing safe work practices by providing Personal Protective Equipment (PPE) to workers, safety rules and regulations must be enforced at the workplace.

2.5.3 Electrical

At the construction site, the best way to prevent this kind of hazard is for the power line workers to be a safe working distance away from the power lines. Other precautionary measures include guarding and insulating of the vehicle from which they might work. The most important is workers must wear Personal Protective Equipment (PPE) during working to help prevent electrical hazards from injuring them.