

# Safety and Health Cost Components for Scaffolding Works in Construction Projects

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## ABSTRACT

Construction industry are known as one of the hazardous industries, compares to other industries' accidents, fall from height also consistently have the highest rates of construction accidents such as slipping, tripping and falling incidents. In working with height, a temporary platform is needed, such as the scaffolding which has been used as a technology in construction for centuries. Scaffolding is a temporary or movable structure made of wooden planks and metal poles, used by workmen while building, repairing, or cleaning the building, bridges and all other manmade structures. Among the factors listed as the causes of the accidents were due to inexistence or insufficient barrier, unsafe act by workers such as not wearing personal protective equipment (PPE), failure to conduct risk analysis on dismantling phase of the scaffold, incompetent erector, insufficient maintenance, training, and unsafe workplace condition. The objectives of this paper are to identify the safety and health planning and implementation for scaffolding installation and handling in construction and to identify the safety planning and implementation cost for scaffolding works in construction. The scope of this paper is focusing on the building construction projects that uses on scaffolding. To attain the objectives, interview conducted among the competent construction personnel for low rise and mid-rise building projects that located in Kota Kinabalu, Sabah, Malaysia. Data were analysed by using the content analysis method. The finding from this study reveals that the safety and health planning and implementation for scaffolding installation, all of the projects comply to the procedures and safety regulations based on Occupational Safety and Health Act (OSHA) which provides the legislative framework to secure the safety and health among workforce and to protect against risks especially during work on height, every projects have the similarities on managing the safety and health prior to the scaffold work. The planning and implementation cost for scaffolding works deemed to its projects size, the allocation of each element discussed are distributed based on their priority.

**Keywords:** cost, implementation, planning, safety and health, scaffolding, construction

## INTRODUCTION

Construction industry are known as one of the hazardous industries, compares to other industries' accidents, fall from height also consistently have the highest rates of construction accidents such as slipping, tripping and falling incidents. Workplace injuries are common and can lead to high rate of fatalities and permanent disabilities (Nadhim et al., 2016). In working with height, a temporary platform is needed, such as the scaffolding which has been used as a technology in construction for centuries. Despites on the advanced technologies and onsite safety, scaffolding remains the most appropriate and efficient way of providing access

to conduct various type works, including construction works, repairs and maintenance.

However, inadequacies in delivering of the professional service may also lead to inefficiencies of the outcomes. Health and safety management plays a vital role in construction industry, the workers are sometimes not typically aware such dangerous occasions, therefore one of the main elements that should be introduced in construction industry is the occupational safety and health (OSH) program and their safety management systems. The safety and health regulations not only enforced to the clients, as well as the contractors and site labours. It is important for the contractor to 5 appropriately organise with the works to achieve the objective of ensuring that the danger is legitimately regulated and should adhere to the obligations under the OSH provision (Abd Latib et al., 2016).

According to Shamsuddin et al., (2015), safety issues are still considered as the minor and less important issue in construction. Many employers have not implemented complete plans for accidents prevention, but instead focus on optimising benefit. They do not focus solely on the safety, this is because the real cost of accidents is unknown until the accident occurs. In order to maintain healthy working environment, costs for safety should be incurred, to the planning and implementation of the safety regulation to prevent accidents and improve the safety especially in scaffolding works in construction (Adetunji et al., 2024).

The objectives for this paper is to identify the safety and health planning and implementation for scaffolding installation and handling in construction and to identify the safety planning and implementation cost for scaffolding works in construction.

## LITERATURE REVIEW

There were about 20 fatal accidents involving scaffolding in Malaysia reported to Department of Safety and Health, Malaysia (DOSH), from 2010 until March 2020. 95% were accounted for fall from height, whereas 1 (5%) case was due to collapse of scaffolding. Among the factors listed as the causes of the accidents were due to inexistence or insufficient barrier, unsafe act by workers such as not wearing PPE (safety harness), failure to conduct risk analysis on dismantling phase of the scaffold, incompetent erector, insufficient maintenance, training, and unsafe workplace condition. 'No safe working procedure' were mostly mentioned, in which 5 cases were reported (Abas et al., 2020).

According to Berita Harian Online dated 18th of May 2016, there are construction including tall buildings were found not using the standard size of 6 scaffolding based on the specification, rusted scaffolding, bent, broken and does not follow the design code, this is due to cost savings. The contractor will be able to save up to 20% of costs including maintenance fees. DOSH WPKL found that 24 construction sites involved used defected scaffolding, thus will carry the risk of collapsing and accidents. DOSH WPKL found that some of the scaffolding were unprofessionally inspected. Scaffolding inspection must be inspected by those who are competent and certified by DOSH.

Accidents have considerable negative effects on project execution, the consequences of these effects include damage to materials and equipment, labour injuries, works delays, decreased productivity, wastage to resources and increased costs of construction. The effects of construction accidents cause a huge cost to the employer for the reorganization of works, replacements or reimbursements for equipment, workers, facilities and legal fees (Yusof and Misnan, 2019a). Also stated the rise in insurance premiums, cost for emergency operations and supplies, medical bills, payments for settlements of injury or death cases, legal fees for protection against claims, insurance costs for workers' compensation and higher insurance costs are the effects of construction accidents (Zaini et al., 2020).

According to William et al., (2019) occupational safety and health (OSH) is described as the science of anticipating, recognising, evaluating, and controlling hazards that may develop in or from the workplace and

jeopardise workers' health and well-being. while also taking into account the potential influence on neighbouring communities and the wider environment. Occupational safety and health (OSH) is a multidisciplinary field that ensures the safety, health, and well-being of persons who work or are employed. The mental and physical health refers to the well-being of all persons at work, including employees, contractors, and visitors, as well as their protection from harm in the form of injury or disease (Khan et al., 2014). An integrated approach that combines planning and review, management organisational structures, consultation arrangements, and specialised programme features to improve health and safety performance. (Ammad et. al, 2021a).

### **Safety and Health Act Provisions**

According to Yoon (2020), by "setting standards on occupational safety and health" and "clearly addressing the responsibility," the Occupational Safety and Health Act intends to "keep and promote the safety and health of individuals who supply labour." The law is founded on the employer's and government's responsibilities, as well as the rights and responsibilities of workers. The law normally outlines the minimal requirement, and the user should go beyond the legal definition of protection. The Occupational Safety and Health Act is a legislation passed by a congress in 1970 to ensure better working practises in the United States. The legislation of 1970 of Occupational Safety and Health Administration gave the authority to implement industry specific guidelines. However, the Act also provided for a "general duty" provision, which stipulates that the employer must have a safe environment that does not jeopardise the safety and well-being of employees. This Act applies to both private and public employers.

### **Safety and Health Act 1994**

The Occupational Safety and Health Act of 1994, or OSHA for short, expresses Malaysian workers' attitudes regarding the significance of workplace safety and health (Ismail and Sum, 2000). The Occupational Safety and Health Act of 1994 (OSHA) underwent significant changes from year to year and was fully implemented in Malaysia in February 1994. OSHA's principal job and goal is to encourage employers and employees to implement effective workplace safety and health measures. OSHA is significant in the construction sector because it establishes a safety and health policy that must be defined and accepted by both employers and employees (Awang and Kamil, 2014). Under the OSHA 1994 law, employers have a responsibility to provide a safe workplace. This is a short summary of key employer responsibilities: Provide a workplace free from serious recognized hazards and comply with standards, rules and regulations issued under the OSH Act (Yusof and Misnan, 2019a).

Over the years, as a result of the construction work, the Department of Safety and Health (DOSH) has made a significant effort to minimise the number of workers killed, injured, or suffering from health issue. However, their effort alone is inadequate within the increasing of construction industry to improve safety and health practices. The working platform of a scaffolding is the most frequently seen structure at any construction site, but it is also one of the industry's most legally abused working regulations. Aided with current statistics that the majority fatal accidents are caused on scaffolding unsafe act and condition (Ammad et. al., 2021b).

It is also called 'staging' or 'scaffold'. Scaffolds are widely used on construction site to get access to heights and areas that would be otherwise difficult to get to or to reach. Scaffolding, also called scaffold or staging, is a temporary structure used to support a work crew and materials to aid in the construction, maintenance and repair of buildings, bridges and all other manmade structures. Scaffolding is also used in adapted forms for formwork and shoring, grandstand seating, concert stages, access/viewing towers, exhibition stands, ski ramps, half-pipes and art projects. The scaffold has to fulfil a diverse set of requirements: - the creation of safe and productive working areas providing access to working areas at higher levels - carrying area and/or point loads. Scaffolding work is erecting, altering or dismantling a temporary structure erected to support a platform and from which a person or object could fall more than 4 meters from the platform or the structure.

Scaffolding work must be undertaken by a person holding the appropriate class of high-risk work license. This definition applies whenever the term ‘scaffolding work’ is used in construction works project (Adhikari et. al, 2019).

## **Scaffolding Work**

Scaffolding is an important trade in the construction of structures because it provides platforms that allow workers to operate at a higher level (Kumar et al., 2019). Scaffolding is a temporary framework that changes shape and placement as the project advances. Because scaffolding is used and shared by multiple trades, its interaction with various construction activities frequently results in difficulties and issues that are only identified after the work has started (Yin and Caldas, 2020). Scaffolding is used to support workers and materials while building or repairing buildings and other large structures, particularly while working at heights above ground level. For all work that cannot be done safely from the ground, a section of the building, or other available means of support, an appropriate and sufficient scaffold must be supplied (Desai et al., 2014).

Scaffolding will vary depending on the sort of construction work being done. Scaffolding should be well-constructed, robust, and stable in order to support employees and other construction materials. Scaffolding can be composed of either steel or wood. The top scaffolding types and how they are being used at the construction sites to support the workforce.

## **Steel Scaffolding**

Scaffolding is comprised of steel tubes joined by couplers and is easy to assemble and remove. However, it imposes stricter construction safety regulations. The structure is strong, long-lasting, and fire-resistant. Despite its high cost, it is quickly becoming one of the most preferred scaffolding choices because to its numerous advantages. Scaffolding made of steel is typically used for larger projects and outdoor construction (Singh et al., 2019). Figure 1 shows the sample structure of the steel scaffolding.



Figure 1 Steel Scaffolding

## **Patented Scaffolding**

This type of scaffolding is similarly made of steel, comes prefabricated, and has its own set of connections and frames. Scaffolding of this type is widely accessible on the market and is ready to use as soon as it is purchased. The working platform is placed on the brackets when using Patented Scaffolding; these brackets can be adjusted to the proper level when using Patented Scaffolding (Singh et al., 2019). Figure 2 shows the example of patented scaffolding.

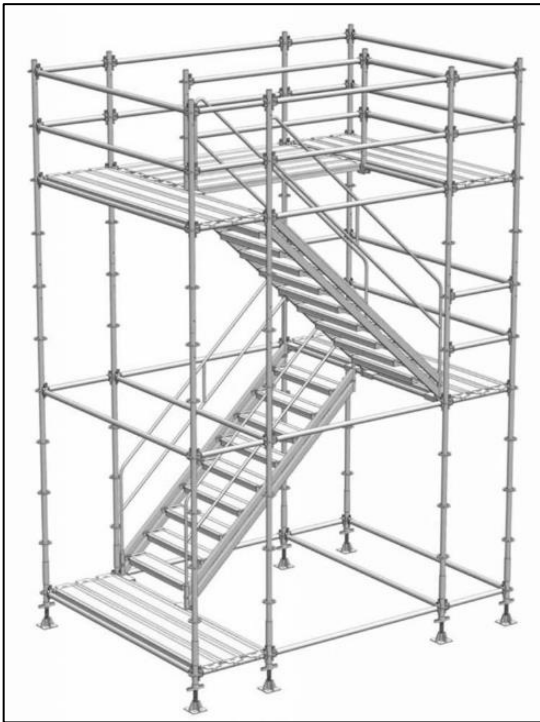


Figure 2 Patented Scaffolding

## **SAFETY AND HEALTH PLANNING AND IMPLEMENTATION FOR SCAFFOLDING INSTALLATION AND HANDLING CONSTRUCTION**

The safety and health planning and implementation for scaffolding works in a company is a necessity, is not only to provides framework for taking a preventive measure against illness and injury, it also will help in future improvement on the matters. This includes advice on how to integrate preventive at all hierarchical and organisational levels, as well as the use of appropriate approaches, tools, and improvement activities (Duran, Miranda and Patino, 2018).

### **Competent Person and Their Obligations**

According to Hrica and Eiter (2020), A competent individual is someone who possesses the skills and experience required to completely qualify him for the task at hand. The competent person should be able to recognise threats and undesirable situations that the operator is aware of in a work area or that an industry expert can predict, according to the 2015 MSHA programme policy letter.

### **Safety and Health Officer**

The safety officer is in charge of ensuring that workplace safety is implemented effectively, from planning to implementation to reporting and follow-up. In order to achieve zero accidents, the safety officer's job and responsibilities are crucial. As a result, several safety programmes are developed, such as safety briefing and safety patrol, with the purpose of enhancing OSH (Widajati, Ernawati and Martiana, 2017).

### **Safety Site Supervisor**

The supervisor's role in assuring the effectiveness of work accident prevention initiatives has long seen as crucial. Several such characteristics were discovered, including the fact that most of these organisations' supervisors were involved in teaching employees for safe work procedures and met with employees on a regular basis to discuss safety issues (Yusof and Misnan, 2019b). Construction site supervisors are also

responsible for supervising and executing fundamental construction project activities, as well as conveying project goals and objectives to on-site workers, and acting as a liaison between the site manager and workers on site. As a result, supervisors with the relevant skills and competences are required to provide site safety induction training for workers, as well as to ensure that health and safety standards are observed on construction sites (Okorie and Musondo, 2018).

## **Documentation**

Documentation is a ground-breaking book in the subject of library studies, going beyond Otlet's emphasis on the book as a metaphor and cornerstone for documentation. It provides a vision that extends beyond libraries and books, viewing documentation as an infinite horizon of physical forms and aesthetic formats for documents, as well as an unlimited horizon of techniques and technologies in service of a varied variety of cultures (Awang & Kamil, 2014).

## **Safety and Health Policy and Manual**

Policies and programmes promoting health and safety can be effective if they are well implemented. Multiple approaches are usually necessary for complex and sophisticated planning and implementation tasks. It also makes advantage of interdisciplinary contributions and operates on multiple levels over a long period of time (Welander, Svanstrom and Ekman, 2004).

## **Safety and Health Committee**

A health and safety committee can be an effective instrument for improving working condition. Employees and management can collaborate to tackle health and safety issues through the committee. A functional committee can aid in the prevention of workplace accidents and illnesses by promoting awareness of health and safety issues among employees, supervisors, and managers, as well as proposing measures to keep the workplace safe and healthy (Yusof and Misnan, 2019a). According to Taylor (2005), the system's groups are in charge of supervising the overall safety and health system of the organisation.

## **Meeting**

The meeting's purpose is for one member to provide a brief update on the status of his or her assignment. Meetings must never be cancelled or postponed for any reason. Meetings should occur on the same day of the month, at the same time, and in the same location every month. Members will be far more likely to recall and plan other events around meetings if they are scheduled in this manner (Taylor, 2015).

## **Safety Handbook**

The handbook provides a framework for frontline management teams to address many aspects of site safety, but it does not replace adherence to statutory requirements and standards. There is some discussion of good industrial practise and several approaches for dealing with the same problem in various contexts (Mohammad Ali et al., 2024).

## **Training**

According to Freitas and Silva (2017), safety training is essential for workplace safety and is a component of many safety management systems, hazard reduction programmes, and preventive programmes. It is a component of many safety management systems, hazard control systems, and preventive programmes. It is regarded as one of the most important safety management approaches for lowering accident rates (Zhou, et al., 2015).

## **Inspection and Investigation**

When employers evaluate and review the information in their records, they can identify and correct hazardous working problems on their own. Employees who are aware of workplace injuries and diseases are more mindful of the dangers they confront. As a result, they are more likely to follow safe work practises and alert their employers to potential hazards on the job (Opeyemi Williams et al., 2018).

## **Safety Audit and Inspection**

A safety audit is a thorough analysis and evaluation of all system components to ensure that they meet the required requirements. A safety audit includes inspections, document inspections, and interviews. Smallwood (2015) claims that, health and safety practitioners, hazard identification and risk assessment, and procedures that result in a "healthy" health and safety culture and climate. During auditing, management commitment, oversight, and worker participation should all be emphasised.

## **Accident and Incident Investigation**

Accident investigations can take a variety of forms, from administrative data analysis to months-long examinations into specific accidents. Understanding the human skills and limits that contributed to the accident is often the key to understanding causality, regardless of the type or severity of the event (Dempsey, 2006).

## **Design of Scaffolding**

Scaffolding manufacturers and designers must adhere to certain guidelines. This product has a high durability, however, it comes at a high price point to begin with. Designers and technicians with advanced training are required for the design. (Singh et al., 2019).

## **Scaffolding Designer**

Designer responsibilities include doing an analysis, testing, or review, as well as providing accurate plant information. The information must be passed on from the designer to the manufacturer and supplier, and ultimately to the end user, as far as is reasonably practicable (Singh et al., 2019).

## **Design and Approved by Professional Engineer (PEPC)**

Only Professional Engineers with a practising certificate and engineering consultation practise may submit designs, drawings, and specifications (BEM, n.d.). Registered engineers who design and manage temporary works in construction must become familiar with the Act and Code of Practice in order to ensure compliance with the laws and design requirements.

## **Scaffolding Works**

Scaffolding is utilised in a variety of ways in the construction sector by a variety of trades. It provides a temporary and stable aboveground platform for employees, their tools, and materials, allowing building tasks to be completed safely and efficiently. As a tradesperson on a construction site, they may be necessary to erect and remove restricted height scaffolding in order to complete some scaffolding work operations

## **Safety Appliance**

Workers employ safety equipment to protect themselves from injuries, fatalities, and life-threatening circumstances. Depending on the job and setting, a single worker may require multiple pieces of appliances especially working on height. Additional safety appliance such as ladder, lighting, and barricade.

## **Fall Protection System**

DOSH (2007) emphasized that, any site where an employee is at risk of falling more than 2 metres requires the installation and operation of fall prevention equipment. The employer can choose the fall prevention solutions that are best suited to the job at hand. Guardrails, safety nets, and personal fall arrest systems are some of the methods used to provide fall protection.

## **Personal Protective Equipment (PPE)**

Personal protective equipment (PPE) is a tool used to protect workers from workplace hazards at the construction site. On construction sites, personal protection equipment (PPE) such as safety gear, protective clothing, impact-resistant clothing, full body protective clothing, personal protective cover, and clean room suit are widely utilised (Ammad et al., 2020).

## **Signage, Tools and Equipment**

Providing the appropriate signage, tools and equipment to the building site is critical to delivering timely and high-quality outcomes. There is an ideal combination of tools, equipment, and labour for any type of building project.

## **First Aid Box**

According to DOSH (2014), "First-aid" refers to the assessment and interventions that during an emergency, the first responder can function with minimal equipment until qualified medical personnel arrive. The life of a worker or a member of the public in the immediate area of the workplace may depend on effective first-aid being delivered within the first few minutes of an accident or illness.

## **Housekeeping**

According to Shazwan et al., (2017), the safety of both the site's working staff and the surrounding environment can be ensured by appropriate site management and adequate housekeeping planning.

## **SAFETY AND HEALTH PLANNING AND IMPLEMENTATION COST FOR SCAFFOLDING WORKS IN CONSTRUCTION**

In order to ensure a healthy working atmosphere, safety costs are incurred to comply with the regulatory requirements relating to the prevention of accidents, the introduction of accident prevention measures during construction work and the improvement of health and safety standards in all areas of the work performed.

### **Cost of Safety Planning**

The processing of the construction costs begins at the planning stage and begins with the cost estimate for all building objects and the operation of the building packages. The projected cost of the structural and technical components of the 32 construction shall be used to estimate the cost of the project and engineering works. the cost of the establishment of the site and other additional costs of unforeseen works or, ultimately, for others, which shall be calculated at a rate of percent on the relevant basis (Ellingeorva, 2011).

### **Cost of Safety Implementation**

Implementation costs are the total amount of price financing that must be paid to initiate and implement project operations related to safety and health at the construction site. The total amount of financing necessary to begin and execute operations for the project (Sharifah et al., 2007).



## RESEARCH METHODOLOGY

Data collection is the systematic acquisition and evaluation of information on variables of interest that enables researchers to respond to research questions, test hypotheses, and evaluate results. While the methodologies vary per discipline, the emphasis on accurate and truthful data collection remains constant. The goal of any data collection is to obtain high-quality evidence that can be turned into a detailed data analysis and used to build a convincing argument and a convincing response to the questionnaires provided

For this research, the method for data collection is using a qualitative data collection, which is also including interview. In impact evaluation, qualitative data collection approaches are important because they provide data that can be used to gain a better understanding of processes that can produce observable results and analyse changes in people's well-being perspectives..

The qualitative method was adopted by using semi-structured interviews to gather information regarding the cost for safety planning and implementation for scaffolding works in construction. Next is a review of the literature which is used as a reference for further study. The third is data collection which is very important for obtaining the data needed to meet the objectives research. Fourth, data analysis of which the interview form analyzed using content analysis method and lastly is the conclusion.

Hence, a set of questions as a guideline and framework interview was carried out for collecting the data in this study in order to know the cost for safety planning and implementation for scaffolding works in construction.

## RESULTS AND DISCUSSION

Three projects that were selected for this paper involve in the scaffolding works in building construction. All project explaining the safety and health briefly the planning and implementation of scaffolding works used during their project. Although the cost of planning and implementation be borne are higher for large project, thus, safety and health requirements is very essential in every project and compulsory to be complied to meet the rules and regulations for a safety workplace environment.

### Safety Planning and Implementation Cost for Scaffolding Works in Construction Projects

This section discussed the cost for safety planning and implementation for scaffolding works in construction of building projects in all three projects. To develop the site safety plan, monetary is one of the essential element that help to assist the construction team to set out the safety arrangements.

#### Planning Cost

This section discussed the cost for safety planning and implementation for scaffolding works in construction of building projects in all three projects. To develop the site safety plan, monetary is one of the essential element that help to assist the construction team to set out the safety arrangements on scaffolding works. Safety planning sets out on how the project team identify, assess and manage the risks associated to the scaffolding work that they will undertake, all three projects had given the cost figure for the safety planning. The allocation for planning cost in three projects is shown in Table 1.

Table 1: Cost of Safety Planning for Scaffolding Works in Projects

No	Project	Type of Project	Planning Cost for Scaffolding Works (RM)	Allocation Cost for Safety Planning for Scaffolding Works (%)
1	A	Hospital	716,000.00	0.708
2	B	Housing	29,500.00	0.22
3	C	Mix Development	10,000.00	0.027

As shown in Table 1, the percentage of safety planning allocation all the three projects need to pay from the overall construction cost. Project A, B, and C are considered large project, therefore the allocation for scaffolding safety planning did not exceed one percent, optimal allocation for scaffolding safety planning is to allow other allocation for safety planning in the project.

However, the safety planning allocation in all the projects are distributed fairly based on the project’s planning components and other safety aspects, the project distinguished the allocation on each element in the safety planning according to their scaffold works requirements. Each of the projects set the cost to its necessities on safety planning, this is to indicate that the project recognized the elements that need to be extra focused on so that the planning for safety reached the optimum performance.

### Implementation Cost

Implementation of the safety planning elements take place afterwards. Implementation of the scaffold works plan involves the project to establish an active safety workplace in accordance with the rules and regulations set by the law. The safety representative of the project plays the vital roles to make sure that every personnel is adhering to the safety rules. Thus, the budget allocated for safety implementation are given in order to safety and health planning is properly implemented. Thus, Table 2 shows the allocation for safety implementation in three projects.

Table 2: Cost of Safety Implementation for Scaffolding Works in Projects

No	Project	Type of Project	Implementation Cost for Scaffolding Works (RM)	Allocation for Safety Cost Implementation for Scaffolding Works (%)
1	A	Hospital	142,820.00	0.059
2	B	Housing	19,730.00	0.148
3	C	Mix Development	56,800.00	0.125

As shown in Table 2, the allocation and percentage for the safety implementation cost of each projects from their overall construction cost. Project A, B, C cost for scaffolding safety implementation is less than one percent from the overall construction cost.

Hence, the allocation for safety implementation, based on the project's implementation components and other safety aspects, projects cost was divided appropriately, the project allocated the resources to each part of the safety implementation based on the scaffolding needs. Each project determined the cost of implementing safety measures according on its requirements, the intentions is to allow the project identified the elements that needed to be prioritised in order for the safety implementation to perform optimally. Thus, Table 3 shows the allocation for safety planning and implementation in three projects.

Table 3: Safety Planning and Implementation Cost for Scaffolding Works in Projects

Project	A	B	C
Planning Cost (RM)	716,000.00	29,500.00	10,000.00
Implementation Cost (RM)	142,820.00	19,730.00	56,800.00
Total Cost [n] (RM)	<b>858,820.00</b>	<b>49,230.00</b>	<b>66,800.00</b>
Construction Cost (RM)	92,646,200.00	129,995,400.00	44,000,000.00
% from $\sum$ Construction Cost [n/total construction cost x 100]	0.93	0.04	0.15

As shown in Table 3, there are three projects that has been analysed. Based on the analysis of the interview session that has been carried out, safety and health requirement is very crucial for scaffolding works in every construction project, as the employees are working at height. Overall, these three projects had provided the allocation for safety and health for the scaffold works. Conclude that the analysis for overall cost for safety planning and implementation is significantly focuses on the safety implementation which is the safety appliances.

The highest cost for safety planning and implementation for scaffolding works in construction is Project A, which is RM858,820.00, due to the structure and size of the project, whereas the high cost for scaffolding safety of this project was contributed mostly in the planning cost, which the designer's fee and revision for the errors of the design, which cost over half of a million, the rate is higher because it is inclusive with the professional fee and for errors and to revised designs. For Project B, the total cost for safety planning and implementation is RM49,230, and for Project C is RM66,800.00, both of Project B and C, and the highest cost contribution is from the safety implementation section, which both projects focusing more on safety appliances and falling protection system, as the purpose of the project is to minimize the risk of falling objects, thus preventing workers or public from being injured by falling objects on construction sites. While Project A prioritize on the scaffold design which the provide scaffold design in details, the details for scaffold structure includes the design for the safety appliances on how it should be done properly, and the designer have the ability to make decisions that considerably reduce risk to safety and health during construction, as well as for future use and maintenance, therefore, the allocation for implementation of safety appliances for Project A can be reduced.

Nonetheless, the cost ratio for all the projects is considered distributed equally based on the size of the project and the needs of the scaffolding safety requirement. However, every organisations that implements safety and health, assess their allocation according to their own method.

## CONCLUSION

Throughout this study, the objectives of this research have been stated, in with three representatives of the project were completed. Every projects have the similarities on managing the safety and health prior to the scaffold work, they still adopt to their own way of safety approach towards the project's activities, to ensure that optimal safety planning is achieved, through the analysis results, each project does provide the allocation in accordance to the safety elements for the scaffolding works. In conclusion, planning and implementation costs are very important for the needs of safety and health activity for scaffolding works with the aim that safety requirements can be achieved and safety risk can be reduced. The safety planning and implementation is necessary to help in minimize the safety risk during installation and handling of the scaffolding in construction. The budget allocated for safety planning and implementation is necessary in order to assure that all the safety elements can be covered.

It can be concluded that the safety planning for each project differ based on the type and sizes of construction, nature of the project, expertise, location of the project, and duration of the project, as well same goes to the implementation of safety, which safety implementation also based on the type and sizes of project that needed expert guidance and advice. Nonetheless, that every projects have the similarities on managing the safety and health prior to the scaffold work, they still adopt to their own way of safety approach towards the project's activities, to ensure that optimal safety planning is achieved.

The planning and implementation cost for all three projects is deemed to its projects size, the allocation of each element discussed are distributed based on their priority. Nonetheless, the ratios of the cost for planning and implementation of each project can be considered roughly even, since the type of constructions are different. As a result, each project does provide the allocation in accordance with the safety elements for the scaffolding works. The planning and implementation costs are very important for the needs of safety and

health activity for scaffolding works with the aim that safety requirements can be achieved, and safety risk can be reduced

## RECOMMENDATIONS

Research study on construction safety on site are extensive, yet most of the safety for scaffolding work studies are moderately conduct. Therefore, some suggestions can be extended on the future as:

- i. To identify the significant safety issues on scaffolding works in different type and sizes of constructions.
- ii. To study the implementation of safety based on OSCHIM towards scaffolding works in construction company.

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