

**SAFETY MANAGEMENT OF CONSTRUCTION PROJECTS: PRACTICES,
CONSTRAINTS AND IMPROVEMENT MEASURES**

By

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**MASTER OF SCIENCE
IN
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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgement has been made in the thesis.

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ABSTRACT

The construction industry has long been recognised as an industry with an unacceptable accident record globally, of which Ghana is no exception. However, despite efforts being made to ensure a reduction in the high injury and fatality rates in the industry, their persistence continues to frustrate the industry. Safety on a construction project is a shared responsibility amongst personnel; from the top management to the lower management. Not prioritising safety in a construction firms affect the entire success of the project, thus, the need to give it the necessary attention. This research takes a first step in aiming to identify some of the safety practices currently being observed at various construction firms. It further went on to examine constraints these firms face in implementing these safety practices. Potential improvement measures are then identified for the constraints recognised. The research methodology was carried out over three phases. The first phase provided background information on construction safety, which was gathered from literature. This helped to capture key issues that helped in developing the questionnaire in the second phase. The third phase of the research methodology focused on the analysis of the data collected using Statistical Package for Social Sciences (IBM SPSS). The findings revealed the safety practices which are being observed in the various construction firms and the constraints limiting the full effectiveness of the practices. The results also showed the potential improvement measures which needs to be given a lot of consideration. The research made recommendations on how to improve safety management practices.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The growth, accomplishment and development of the goals of a society can be attributed to the significant role the construction industry plays in the society (Fong et al., 2016). The benefits derived from this sector ranges from the houses we stay in, the various work structures we work in, the transportation set-ups we rely on to the basic social amenities like the schools and hospitals to the drainage system to guide water flow (from rain or irrigation) (Danso, 2010). According to the Ghana Statistical Service, GSS. (2019), revenue from the construction industry in Ghana increased from 3198.7593 in the third quarter of 2017 to 3587.87 million Ghana Cedis in the third quarter of 2018. The industry also provides employment to a large number of Ghana's workforce. Forbes et al. (2012) indicated that the construction industry alone employs approximately 3 million people world-wide and in Ghana alone this sector provides employment to over 23,000 people (Ministry of Education, 2010). This shows the immense impact this sector alone is making to Ghana's Gross Domestic Product (GDP). The social and economic benefits derived from this industry makes it a strong indicator for growth in the country.

However, upon all these noteworthy benefits of the construction business, it is very unfortunate that this industry has a record of poor safety profile due to its dynamic, temporary, and decentralised nature. Statistics shown by the International Labour Organisation confirms the construction industry having a disproportionately high rates of recorded accidents (Muhammad et al., 2015). The construction sector is crippled with high rates of incidents and in worst cases, accidents which may bring about negative outcomes such as worker absenteeism, decline in

productivity, fatalities, victim being incapacitated for life (Jha, 2014) plus increase in the entire cost of a project.

A study conducted by Ganson (2014) revealed that a person dies or is injured in every two working days throughout Ghana, and a lot of workers all over the world suffer either permanent or temporary disability, or in the worst case lose their lives due to insufficient provisions made for safety at the workplace.

The sources of accidents and ailment (e.g.: falls and respiratory disorders) in the construction industry have been researched upon by various experts in the field, but their recurrence in this sector continues to disturb safety and health practitioners in the construction sector. (Ranasinghe *et al.*, 2015)

According to Zekri (2014), it has been revealed that a safety culture which is constructive and practical aids in regulating and bringing construction costs to a realistic minimum level and increasing worker productivity. It is therefore prudent to have an effective safety management practice in place which must be adhered by everybody in an organisation, since safety is everybody's business to avoid any catastrophic consequences that may occur Ganson (2014).

The construction industry has underperformed in certain critical areas and has been a bother to the sector for a while now since safety is regarded as one of the key performance indicators in this industry (Abdulateef and Dorothy, 2015). The hazardous nature of this industry alongside the accident rate leading to cost repercussions, calls for safety to be strictly observed to minimise the rate of incidents.

It is saddening to recognise that a lot of factors hamper the execution of safety practices in the Ghanaian construction industry due to problems of communication as a result of low literacy

level; underestimation of potential risks; lack of employee engagement; non-availability of personal protective equipment, non-availability of funds for safety amongst the rest (Muiruri and Mulinge, 2014).

In order to tackle this problem, it requires an analysis to be made in order to identify which approach to undertake that will be an 'eye-opener' for interested parties in the industry to perceive the advantages of effective and anticipatory safety measures. It is envisaged that a clearer understanding of this analysis can provide an incentive to improve construction health and safety (Ikpe, 2007). Jha (2014) and Muhammad *et al.* (2015) stated that losses suffered by the industry, which include victim's medical overheads, loss of productivity, investigation time spent, inability to meet deadline, cost of training another individual to fill the position temporarily, disruption of the team, damage to equipment or facility and potential legal costs and penalties.

Accidents lead to loss time injury (LTI) which can also dampen the morale of colleagues of the injured which has the potential of causing mistakes to be made. This affects project schedule and budget as employers may require the services of counsellors to bring the morale back. Aside the tangible costs incurred from injuries and mortalities, the economy of any nation suffers enormous indirect cost and productivity losses from the number of workdays lost as a result of occupational hazards and fatalities (Zekri, 2014).

These expenditures put together indicate that, it will be more prudent to adhere to safety management practices than wait for the accident to occur first.

Although the execution of safety practices cannot warrant the total elimination of an accident from occurring, however, the frequency together with the severeness of the workstation

occurrences will be decreased, when rapt attention, uninterrupted concentration and extra care is demonstrated prior to the occurrence of an incident (Yankah, 2012).

Since the happening of an incident on a construction site cost most organisations quite a substantial amount of money, as well as affect the schedule of the project and also affect the reputation of the construction firm, it is more prudent to invest in safety management practices to evade or mitigate the negative impact it has on the construction project.

1.2 STATEMENT OF THE PROBLEM

Safety management is the method of identifying Health and Safety risks and putting certain measures in place to reduce the likelihood of a hazard materialising and to decrease or better still remove completely the prospective penalties of recognised Health & Safety risk (Saeed, 2017).

In a project based industry, such as the construction industry, accidents are prone to occur due to the dangerous nature of the activities involved in its operations but when proper safety management systems (SMS) are implemented and put in place, although it may not be eliminated completely, the rate at which they occur will be minimal on a more practical level.

Due to the unique and dynamic nature of projects on a construction site (Gray and Sadiqi, 2015), each project comes with its own inherent risk associated with safety, but they all have similar factors undermining their safety performance and how this affect the success of a project. The rate of occupational injury in the construction sector alone is 44.7 per 1000 persons, which is approximately double the all-industry rate (Lingard and Rowlinson, 2005). This situation, therefore shows the inexorable nature of the accident rates but fortunately, with the right safety practices and measures put in place, this can be reduced to the minimum. Some

of these accidents occur as a result of being in a rush to complete projects, trying to save cost which could have been used to train workers on safe work practices and lack of pre job safety talks to explain the risk involved in any activity to be carried out or undermining the risk of the project. Aside employing strict legal regulation to enforce these safety practises on site, contractors or project managers who are in direct contact with the various labourers on site can implement certain strategies on safety management to help curtail the incidence of these mishaps.

The reduction in the level of accident is not just going to benefit the project manager's record or portfolio in safety but will also help minimise cost which would have been used in catering for accidents and time wasted on legal charges. Ideally, the cost of safety is much less than cost of accidents after it has occurred (Smallwood, 1999). It is therefore everyone on the construction site's responsibility from the regular labourer to the contractor or the project manager to make safety their core mandate in any construction project.

According to Pareto's principle, on Accident-Cost relationship, it indicates that 80% of costs are related to 20% of injuries, hence if the 20% of injuries can be managed, 80% of the cost can be controlled. Thus, it will be much prudent to mitigate these accidents from happening to avoid the additional cost incurred.

Emphasis is mostly based on getting work done at a construction site at the peril of the safety of its workers, thus, the issue of safety is mostly neglected. An interview conducted with a construction engineer revealed that most firms in the Ghanaian construction industry do not really see the essence of safety, hence it is susceptible to exclusion from a budget should a situation occur which involves cost cutting.

The top priority of most construction firms is their survival in business, whilst safety often have less significance because of limited resources (Gray and Sadiqi, 2015), hence it comes as no surprise when the accident rates of these firms keeps escalating.

A work environment which is safe from hazards results in an efficient work being accomplished. Also the cost incurred from accidents mostly exceed the cost of investing in safety (Hefer, 2016) thus, adherence to safety yields more income than one can imagine. The survival rate of companies as well as the integrity of the persons involved is so substantial that measures need to be put in place to avert the occurrence of incidents and casualties (Besse et al., 2018). Thus, to ensure a completely successful project, much attention must be given to safety, since Jha (2014) established that the success of any project depends on the completion of the activity within the scheduled time and budgeted cost, and without any injury or accident on site.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim

The aim of the study is to examine the operational considerations of safety management of construction projects.

1.3.2 Specific objectives

The specific research objectives are:

1. To assess safety management practice of selected construction companies in Ghana;
2. To examine the constraints associated with the implementation of the safety management practices within the selected companies.

3. To establish potential measures to improve upon safety of construction projects in Ghana.

1.4 RESEARCH QUESTIONS OF THE STUDY

Some research questions have been established for this study in examining the operational considerations of safety management to the construction industry.

1. What are some safety management practices being observed amongst selected construction firms in Ghana?
2. What are the obstacles hindering the implementation of safety management in these construction firms?
3. What measures can be put in place to improve on safety management amongst the selected construction firms?

These are all essential questions that need to be addressed and answered in order to understand the perspective on safety of construction projects.

1.5 JUSTIFICATION OF STUDY

The justification of the *Safety Management of Construction Projects: Practices, Constraints and Improvement Measures* is to examine the obstacles hindering the execution of safety practices, assess the implementation of safety management practices which is currently being observed amongst construction firms in Ghana and how they can help reduce the ratio of accidents on construction sites and also improve on the entire success of the project. Lingard and Rowlinson (2005) stated in their research that, the construction industry has earned the reputation of being amongst the most hazardous industries globally to work in, hence there is

the need to pay equal attention to the safety aspect of construction as given to cost, schedule and quality.

In order to lower the risk level associated with this industry and also improve the safety performance of workers, project safety management practices needs to be improved (Hefer, 2016). The dangerous and risky nature of construction work makes the issue of safety no luxury but a necessity (Zekri, 2014). Research has revealed that the exact cost of damages on a construction site can have a significant effect on the overall success of a construction project and may lead to an increment on the entire costs of the project by as much as 15% (Hefer, 2016).

According to Smallwood (1999), Neglecting safety or not making it a priority affects the sustainability of the environment as well, and not only the customary construction project parameters which is cost, quality and scope, therefore, the study offers the need to ensure an effective implementation of safety practices in the construction industry to ensure optimal cost performance. All construction sites are susceptible to dangers either to the workers or damage of properties, but if safety is practised, productivity will be increased and accidents occurrence will decrease resulting in the cost involved in the total running of the project to be reduced. Proactive and efficient safety measures put in place can save the project manager a significant amount to run the whole project.

Safety is also an indispensable project parameter which complements completing a project as planned, within the estimated cost, to the maximum quality expected without causing any harm to the environment or sustaining any damages to ensure that the project is completed successfully (Smallwood, 1999).

The background of this study seeks to provide an insight into how safety management systems can be enhanced on construction projects. It will also look at how these systems can be put into practice to bring the number of incidents and fatalities to a minimum, as well as decrease the risk of hazards to improve employee morale and enhance productivity.

1.6 SCOPE OF THE STUDY

1.6.1 Geographical Scope

The research seeks to look at safety practices, constraints and improvement measures amongst building construction firms in the Accra Metropolis.

1.6.2 Contextual Scope

The specific areas this research seeks to cover entails a brief introduction about safety management systems which presents safety management practices, constraints associated with the implementation of these practices and how they can be improved upon.

1.6.3 Unit of Analysis

The unit of Analysis for this research are the various workers in different fields in the building construction sector located in the Accra metropolis.

1.7 SUMMARY OF METHODOLOGY

In the effort to realise the objectives of the study, the research methodology will be steered across three phases. An extensive literature review was conducted at the preliminary phase to obtain background information from subject matter experts. This will assist in capturing key issues to develop questionnaire for the research population in the second phase. The final stage

of the research methodology will focus on how data collected will be analysed with the use of statistical package for social sciences (SPSS).

The targeted population for the research include personnel in the building construction industry, specifically contractors or project managers, safety officers, site managers and other operatives in the construction site.

1.8 LIMITATIONS OF STUDY

The study is supposed to cover building construction companies in Ghana; however, a sample frame of selected companies in Accra was chosen to represent the whole population sample, due to time and financial constraints. Nevertheless, the above mentioned shortfalls will not obstruct the information contained in this research, because Accra is the capital city of the Greater Accra region as well as Ghana's capital city, thus making it an important commercial centre.

1.9 ORGANISATION OF THESIS

The research has been categorized into five main chapters as follows:

- Chapter one: Introduction: This chapter deals with the introduction covering background of the study, statement of the problem, objectives (general and specific), research questions, justification of the study, scope of study, summary of methodology, limitations of the study as well as organisation of the research.
- Chapter two: Literature Review: This chapter provides a historical review from previous studies to identify the effects of poor safety management culture and its impact on the cost of construction projects. It provides an extended coverage on earlier works.
- Chapter three: Methodology: The chapter three shows the main methodologies used in earlier works and the methodology used in this research to achieve its stated objectives.

It gives a profile of the selected area to be studied and describes the sources and methods of data to be collected to be used in the study.

- Chapter four: Data Analysis and Discussion: This chapter tackles the presentation, analysis and discussion of data gathered on the field that answered all the research objectives and questions.
- Chapter five: Conclusion and Recommendations: The last chapter which is chapter five provides a brief of the entire research, the findings and conclusion of the study as well as recommendations for the way forward.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The principal objective of most organisations, institutions or establishments is to increase productivity, maximise profit and cut down cost. The construction industry is no different when it comes to what they seek to achieve when undertaking a project. Unfortunately, this industry is crippled with the reputation of being amongst the most dangerous industries as a result of the worker to accidents ratio occurring on a daily basis. Accidents do not only cause discomfort and distress but lower output, quality, schedule and affect the environment negatively, thereby adding to the overall construction cost (Muiruri and Mulinge, 2014).

Statistics gathered from the International Labour Organisation (2011) indicates that every year, 60,000 disastrous mishaps occur on construction sites, and according to Jha (2014), one in every six work-related fatal accidents occur on a construction site. This track record of accidents in the construction sector has made it quite unpopular when compared to that of other industries (Fong et al., 2016). Considering the negative effects of accidents on the construction industry, safety is of a genuine concern to every stakeholder in the industry. Thus, there is the need to address the issue of safety and identify it as a parameter which should be used alongside the traditional parameters of cost, quality and time to rate the success of a project (Muiruri and Mulinge, 2014).

According to Muiruri and Mulinge (2014), most construction companies tend to believe that introducing and implementing measures that ensure safety in the construction sector comes with additional cost thereby reducing profitability which has become one of the most common myths that has plagued the industry over the years. This is also backed up by statements from

some interviewees stating that adhering to safety practices come as a cost burden to the project. It has however been proven that, investment in construction safety actually lead to an increase in profitability by increasing the rate of production, boosting the morale of employees and reducing attrition (Hefer, 2016; Muhammad et al., 2015).

Safety cannot be looked at in isolation from the laws guiding occupational health and safety in Ghana, to give a fair knowledge on safety in the industry. Presently, there is no existing occupational health and safety management in Ghana, as the ILO convention number 155 (1981) requires (Asumeng et al., 2015). However, the issues of occupational safety are under the Factories Offices and Shops Act 1970, the Labour Act, 2003 (ACT 651). PART XV and the Workmen's Compensation Law, 1978 (PNDC LAW 187), which have some regulations about health and safety in the work environment.

This chapter explores various literature from different authors concerning safety management systems, which has safety management practices embedded as well as safety culture of some construction firms. Constraints hindering some constructing firms from the implementation of the safety practices will be explored on the field through the distribution of questionnaire to personnel in the construction industry. Depending on the responses given, potential improvement measures will be established.

2.2 SAFETY MANAGEMENT SYSTEM

A management system is a list of administrative framework including the set policies, practices and techniques utilised by an organisation to guarantee the fulfilment of its goals and objectives (Jørgensen et al., 2017). The management system of an organisation can be classified into four major aspects, that is the “Plan, Do, Check, Act” elements. The objectives of a safety management system is no different from what any other management systems seek to achieve in their operation. Majority of accidents occurring in the construction sector can be averted by installing proper safety management systems (Ranasinghe et al., 2015).

A Health and Safety Management System includes the presentation of procedures, intended to diminish the frequency of damage and sickness in the business’ activity (Turkson, 2006). The Safety Management International Collaboration Group (SM ICG) defines a Safety Management System (SMS) as a progression of characterized, association wide processes that accommodate viable hazard based decision making identified with your day to day business. These frameworks are brought into the construction business as a formal arrangement of overseeing site wellbeing (Ai et al., 2006). Past studies have found that fruitful usage of Safety Management System on construction sites can help anticipate mishaps (Ai et al., 2006) as well as reduce the cost of the project (Muhammad et al., 2015).

Construction safety and health management systems therefore consists of activities that are taken by management at every point in an organisation to create a conducive environment where workers will be trained and encouraged to execute safe and productive work (Muiruri and Mulinge, 2014). These systems are supposed to outline roles and responsibilities and should also delineate measures for removing hazards before they become causative influences to disastrous calamities (Muiruri and Mulinge, 2014).

Some fundamental elements of a safety management system are the planning phase, the performance phase, performance assessment phase and performance improvement phase. The planning phase must always include policy statements which outlines the safety aims, objectives and commitment of the organisation. For the performance phase to be successful, there has to be an effective communication system amongst all levels of the organisation and must be monitored on a regular basis to obtain feedback on the progress being made. Good communication with the workforce will not only assist the implementation and operation of the plans but also produce continual improvement of performance.

It is therefore prudent to identify proactive safety measures which addresses hazards and unsafe behaviours, before an injury occurs (Anon, 2019).

2.3 SAFETY POLICY

It is prudent for every organisation to have a strategy for the systematic management of safety to effectively address and control safety risks. Establishing a safety management policy should be the first step in the formulation of a safety management process (Lingard and Rowlinson, 2005). The company's management should have a written statement of its commitment to protect the safety of its workers, detailing the assigned responsibilities to individuals (Yankah, 2012). The policy statement must also entail how accident investigation, hazard identification and risk assessment will take place. The objectives set to be achieved in a safety policy must be SMART (Simple, Measureable, Achievable, Realistic, Timely), that is simple to apply, measureable enough to compare set standards with the actual, achievable to get the expected results, realistic to accomplish the set targets and must be time-bound within a specified period.

An approach ought to be set up following a '*nitty gritty*' investigation of an organisation's present circumstance with respect to Occupational Health and Safety (Lingard and Rowlinson,

2005). For these policies to be active, there has to be an effective organisation set up to implement and monitor its requirements. Construction safety policy should hence be created by each site manager and operating company before the start of any job (Muiruri and Mulinge, 2014). There are generally three areas of safety policies, which include; statement of policy, responsibility and arrangement or procedure.

The policy statement must be communicated effectively to the workforce through employee induction training or refresher training sessions, or can be posted at prominent places throughout the workplace and the statement must also be a permanent item on an agenda during safety meetings. Yankah (2012) highlighted that policy statements should include how the company is composed with regards to the health and safety obligations of the management, and should further express the manager's commitment to providing safety information, training and advice to workers.

2.3.1 Top management involvement

Without top management involvement and interest in safety, it will be quite difficult for safety to be observed by an organisation. Several studies have demonstrated that management commitment and contribution to safety is the central component of any Safety Management System. Without support from senior executives, it is difficult to uphold safe practices and instill a safety culture into an organisation (Ai et al., 2006).

Research has also revealed that the decrease of mishaps would be accomplished when top management takes a dynamic consideration and is committed to safety and health improvement just as keeping up great safety and health policy (Zekri, 2014). The upper management must then show commitment to ensure the safety of its employees as the principal aim of the organisation. Such commitments must be demonstrated through the participation in consistent

safety meetings, serving on board of trustees, and giving subsidies for other safety and health programme elements (Agyekum et al., 2018). Just as leading an effective monitoring and evaluation of performance and a procedure for exploring execution and making enhancements. The management activities required to achieve good Occupational Health and Safety performance are basically equivalent to those required to make progress in any territory of business action (Lingard and Rowlinson, 2005).

It is management's obligation to control the hazardous demonstration of workers chiefly because the unsafe acts happen over the span of employment, which the management creates and directs (Magid et al., 1982), under their watch and supervision, thus employees will have no option than to operate according to instructions given to them by management.

According to Yankah (2012), senior management can increase safety mindfulness by setting aside the effort to discuss safety alongside cost, quality and schedule concerns anytime they are on site with employees and bring to their knowledge that the organisation thinks about safety and production as equivalent partners. Furthermore, employers ought to have unlimited authority over their workers and in this manner guarantee adherence to safety practises (Muiruri and Mulinge, 2014). It is very misleading to say safety is everybody's business when management do not show any support or commitment to safety.

Fong et al. (2016) emphasized in a research they conducted that 90% of all construction mishaps leading to demise could have been anticipated and prevented by 70% positive action from management. This shows the extent to which management's commitment to safety can positively impact the overall safety culture of an organisation. Hence, for any safety management practise to be successful in an industry, managers must demonstrate leadership

by setting the proper example, displaying real commitment, and developing an effective construction safety management system to be experienced.

The figure below shows the safety structure of a contracting company

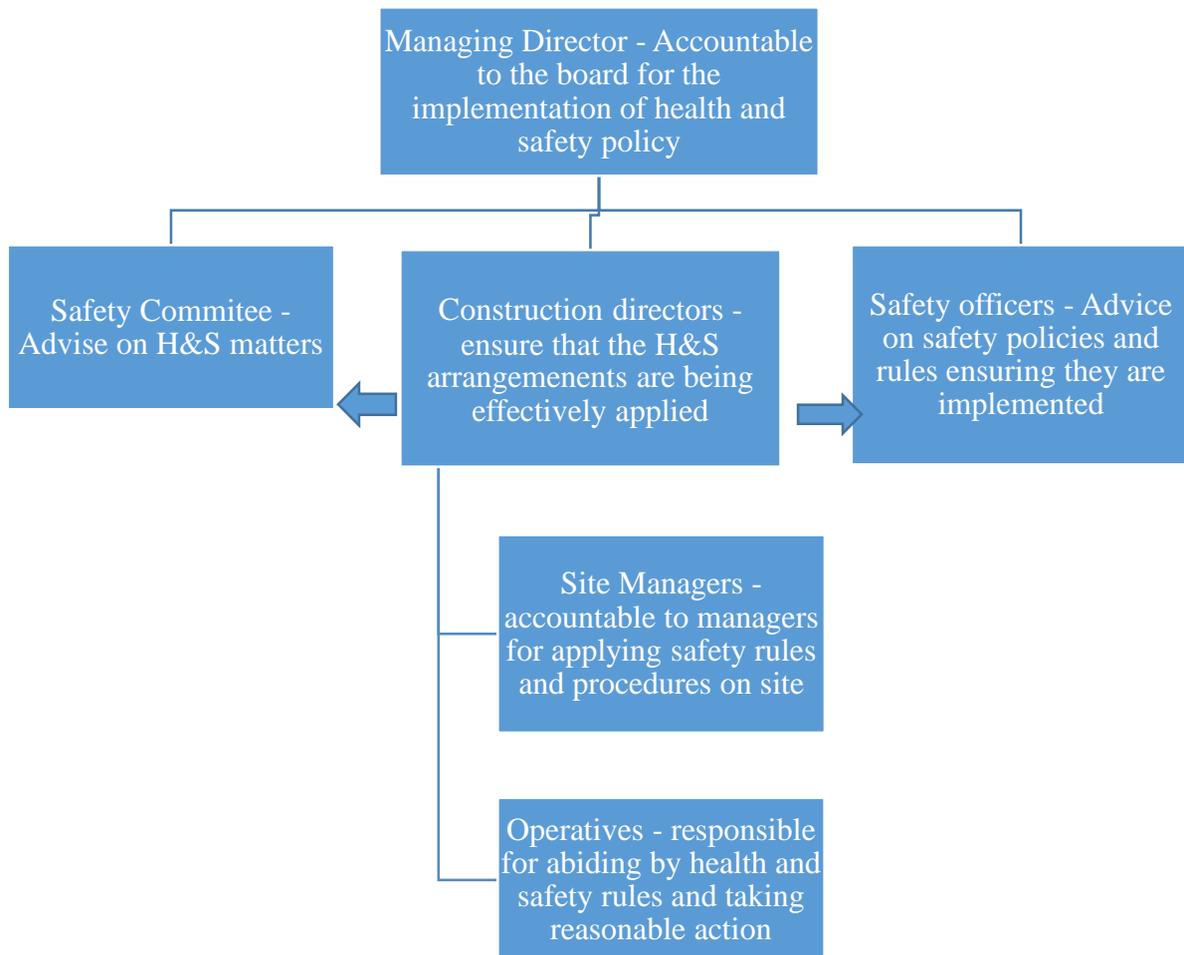


Figure 1

Source: (Muiruri and Mulinge, 2014)

The figure below shows the structure and responsibility in the area of safety of an organisation.

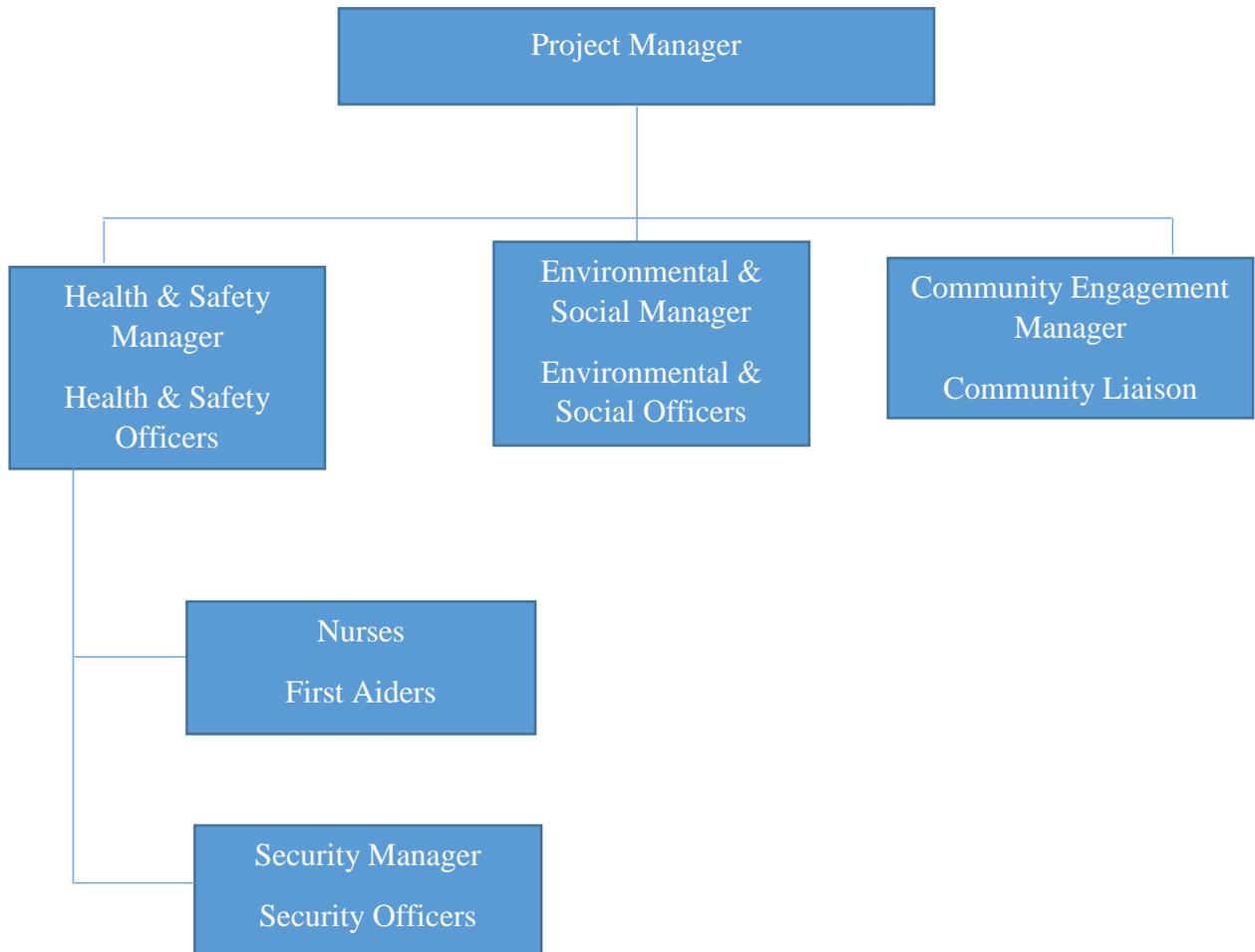


Figure 2

Source: Researcher's work

2.4 SAFETY MANAGEMENT PRACTICE

Safety management practice can be termed as the implementation of the safety management systems or the measures taken prior to the occurrence of an accident. Thus safety management practises cannot exist without a safety management system guiding its course.

Health and Safety is most frequently the principal item to face cost slicing since some contractors tend to generally accept that executing Health & Safety management systems will expand project cost (Hefer, 2016). On the contrary, Zekri (2014) established that safe work environments and employees improve efficiency joined by diminished expenses and expanded productivity.

Zekri (2014) defined safety as the state of being secured against any type of happenings (mishaps) which could be considered non-alluring by controlling risks to accomplish an adequate degree of hazard. According to Muiruri and Mulinge (2014), safety means a condition wherein no danger of a harm causing accident exists. Safety does not only protect the individual from physical harms but also prevents properties from being damaged. Jha (2014), emphasized the need for safety to be integrated into any company's procedure. This assertion was buttressed by the point Asumeng *et al.* (2015) made that pragmatic measures need to be taken to ensure that inevitable hazards are mitigated since its occurrence at the work environment can also have severe repercussion on the organisation's profile.

Therefore, the significance of safety in an organisation's policy cannot be undermined. It is a very crucial part in the operations of any company, thus it cannot be ruled out in the construction sector considering the overall incident rate (Samir et al., 2008). Zekri (2014) stressed on the fact that positive safety culture helps in regulating and decreasing the cost of construction, enhancing company's reputation, improving work performance, reducing accidents and absenteeism and increasing overall organisational performance and efficiency. Therefore, for safety to be an everyday affair of an organisation, there must be a positive safety culture which runs through the daily activities of the organisation. There has to be frequent emergency drills to keep staff reminded of what they are supposed to do in the event of an

emergency. Also, the organisation shouldn't compromise on reporting any incident that occurs in the event of working.

2.4.1 Safety Culture

HSG 65 characterizes a safety culture of an organisation as the result of individual and group standards, frames of mind, opinions, capabilities and patterns of conduct that decide the promise to, and the style and proficiency of an organisation's wellbeing and safety management. A constructive health and safety culture needs a joint commitment of the whole workforce in terms of attitudes and values just as a quality system does (Phil and Ferret, 2007). For an organisation's safety culture to be operational, there must exist effective safety leadership at all organisational levels from management's incorruptible commitment to safety, to an efficient team in charge of safety and employees' full participation (Group, 2019). Effective communication systems within the organisation, promotion of safety standards and development of training programmes will all fall under the effective safety leadership.

Since no department in an organisation can achieve safety on their own without management's support, there needs to be some form of obligation from management through the allocation of resources that is time, money and people to enhance the safety culture. Safety must be discussed regularly at management meetings and a separate committee can be set aside to provide information to any worker with regards to safety.

Safety personnel are key persons in any safety management system as they have direct contact with the workers and are the immediate management staff for the workers. Their duties are essential for the right execution and maintenance of safety management in an organisation (Ranasinghe et al., 2015). Supervisors are to exhibit guidance by providing workers the

necessary resources, training and setting good examples for the workers to follow suit (Group, 2019).

Every worker is also responsible for taking reasonable actions to protect themselves and their fellow workers from hazards. They must demonstrate this level of responsibility in doing the right thing even if they are not being supervised (Asumeng et al., 2015). They must co-operate with the trainings given to them by the Safety team for their own good.

Communication can aid in the safety culture of an organisation if it is done effectively. There are many sources of safety information which may need discussion before an accurate message can be conveyed. The sender of an information must be meticulous as to the how the message will be sent to avoid any confusion, and it is very important the recipient is urged to show his/her comprehension of the message to dodge any distortion. Several barriers exist in understanding a message from the recipient's point of view which includes language/dialect barrier, ambiguities in the message, technical language and the use of abbreviations, noise and distractions, illiteracy and lack of interest (Phil and Ferret, 2007). These barriers must be identified and taken care of in the process of communicating about safety.

The development of safety culture within an organisation requires everyone to understand the safety standards set by the organisation (Phil and Ferret, 2007). These standards must clearly identify the role of each individual with regards to safety, as to making someone accountable for safety practices. Having fixed safety standards is also essential to promote safety amongst all levels of management within the organisation. A good safety standard will reflect an increase in production, better resource allocation and decrease the occurrence of accidents.

Safety training is a crucial part of any safety culture. A safety training orientation program must be paramount when a new recruit is employed to provide them with a set of guidelines to follow should an incident occur. It also provides old workers with different approaches to acquire additional information about potential risks and their control (Muiruri and Mulinge, 2014). This training session can cover the organisation's safety policies, safety regulation, site coordination, personal protective equipment and OSHA required training (Yankah, 2012). Safety training demonstrates an important function for upgrading the employers' safety performance in the construction industry (Zekri, 2014). The target audience must be taken into account in the event of conducting a safety training (Phil and Ferret, 2007), as well as their level of literacy to be able to communicate effectively.

Averting accidents is a major significant point to improve upon the safety practices in the construction industry and this can be attained if all concerned persons are made aware of the dangers that may occur should an accident happen and pinpointing the areas of safety deficiencies in the construction sector. Identifying the factors affecting construction safety is a plus to the construction industry (Muhammad et al., 2015). This will aid them in taking indispensable measures to control these factors prior to its occurrence and be prepared for it when it actually occurs during construction.

2.4.2 Risk assessment

According to Muiruri and Mulinge (2014), risk can be defined as the probability of a substance to cause damage; and hazard is a blend of the probability of an occurrence of a dangerous incident or exposure(s) and the seriousness of injury or sick wellbeing that can be brought about by an event or exposure. Risk assessment plays a pivotal role in the planning of any safety management system, due to risky nature of the construction industry. Phil and

Ferret (2007) explained risk assessment as the techniques needed to set primacies and to set objectives for dispensing with danger and lessening risks at every possible opportunity.

The construction industry involves a lot of stakeholders in its activities alongside an interaction between organisational and technological complications and also longer working hours for most employees (Zekri, 2014) which makes the likelihood of an accidents occurring inevitable no matter how strict safety measures are put in place. Consequently, if these risks cannot be totally wiped out, they must be mitigated by assessing and managing them via an organised risk assessment procedure.

In a risk assessment procedure, the organisation must know that any mishap or sick wellbeing will bring about both direct expenses and indirect expenses and incur insured and uninsured expenses too, consequently, it is essential to consider when the full cost of an accident is being determined (Phil and Ferret, 2007).

According to Phil and Ferret (2007), risk assessment procedure follows six basic elements which includes:

- Hazard identification
- Persons at risk
- Evaluation of risk level
- Risk control (existing and additional)
- Record of risk assessment findings and
- Monitoring and review

The study went on to explain the following elements:

Hazard identification which is the initial phase in a risk assessment process was explained as conducting an assessment of accidents, incidents and poor wellbeing records to assist in the documentation and also giving significant hazards more attention than the trivial ones.

Staff who work on the construction site are most obviously exposed to risk since they come into contact with hazards often, thus, it will be judicious to check their competency to perform their tasks prior to the commencement of their work. Persons who visit the site may also be exposed to risk, thus, risk assessment must include extra provisions for them owing to their susceptibility.

Evaluating the seriousness of a specific hazard during risk assessment is made with respect to whether the hazard level is high, medium or low. It is obvious that the higher the probability and seriousness, the higher the hazard will be. The probability is dictated by elements, for example the control measures set up and the recurrence of exposure to the danger whereas the severity is influenced by the greatness of the risk (Phil and Ferret, 2007).

Once the risk has been evaluated, measures are then put in place to control them. It may be important to fortify existing systems as part of the control mechanism. For an assessment to be pertinent and appropriate, substantial hazards and conclusions should be documented (Manu et al., 2014). It ought to equally incorporate existing control techniques and their adequacy.

The written record provides excellent proof if the organisation should be involved in a law suit, and it must be made available to workers with an extra duplicate kept alongside the safety policies. It doesn't make a difference the number of employees working in the organisation, therefore, for an assessment to be 'suitable and sufficient', only the significant hazards and conclusions need to be recorded (Phil and Ferret, 2007).

Monitoring and review of the risk assessment is conducted to ascertain how effective the risk assessment programme was and making the necessary revision to areas where necessary. An incident or a near miss provides a valid reason for risk to be assessed.

Managing safety is unique in relation to overseeing other aspects of construction, therefore, there is the need to attempt a risk assessment to get some answers concerning the dangers, and to put practical measures in place to control them, and make sure they stay controlled (Muiruri and Mulinge, 2014).

2.4.3 Emergency Drills

Conducting frequent emergency drills can also assist workers on how to organise themselves in an emergency. Before the beginning of any construction project, the contractor must put into consideration the possible accidents that may arise on site (Zekri, 2014). Drills are utilised to practice foreseen crisis situations to decrease confusion and confirm the adequacy of crisis reaction exercise. The most incessant sort of drill conducted which is basically the fire drill is a technique of practicing evacuation of a structure for mainly a fire outbreak. Once a fire routine has been established and tested at regular intervals, it ensures that all staff are familiar with the actions to be taken in emergency (Phil and Ferret, 2007). Fire drills play a vital role by ensuring that employees respond quickly, calmly and in safe manner. After each drill, management and employees are to gather and evaluate the effectiveness of the exercise, by identifying the strengths and weakness and how to improve upon it.

2.4.4 Incident and Accident Investigation & Report

According to OSHA (2015), an accident investigation is a system that identifies event details and casual factors and determine corrective actions, thus the primary purpose of an accident investigation is to prevent future occurrences by identifying appropriate corrective actions

(Lingard and Rowlinson, 2005). Someone familiar with the workplace, as well as a person who has been trained in an accident investigation process should be the one to steer the investigation (Adu-boateng, 2014). Investigating and filing reports on accidents that occur on site keep managers proficient about where accidents are happening so they can dedicate responses to these problem areas (Zekri, 2014).

According to Asumeng et al. (2015), several incidents occur on site which leads to major losses but due to under reporting and unfamiliarity with existing principles, people are not normally aware of such events as well as their potential consequences. It is therefore important construction firms conduct an immediate and thorough investigation when an accident occurs on site, write a report on them and deduce the corrective actions for future purposes. A prompt examination is invaluable since the components are crisp in the minds of observers, physical conditions changes within a very short time, hence, immediate information from the victim often prove more useful. Great examination is a key component to making improvements in the execution of health and safety (Phil and Ferret, 2007).

To enhance the safety performance of the construction sector, safety specialists are the way to complete an assessment on site (Jha, 2014). Investigation is not a mechanism to apportion blames but rather gain additional valuable information and comprehension of how and why an issue emerged which prompted the accident/incident, and also identify certain loop holes in the control and management of risks in an organisation. According to Lingard and Rowlinson (2005), there are basically three methods for conducting an effective incident investigation, and this includes; observation, preparing a description of the incident and analysing the information gathered. Observation deals with taking photographs, recording damages and observing the scene the accident took place.

Information ought to be accumulated from every single accessible sources, for instance, eyewitnesses, overseers, hazard data sheets amongst the rest. A point by point description of the sequence prompting the occurrence of the incident will be beneficial. This is dependent on the observation made, eyewitnesses report and photographs taken. The information gathered is then analysed to determine the actual cause of the accident, and how it could have been prevented if some measures was put in place.

A TYPICAL ACCIDENT/INCIDENT REPORT FORM OF AN ORGANISATION

Nature of Accident / Incident:	<input type="checkbox"/> Accident	<input type="checkbox"/> Incident	<input type="checkbox"/> Near miss	<input type="checkbox"/> Property Damage
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Personnel Involved

Name(s)	Occupation(s)	Employed by	Date of Hire
Body part injured			
Witnesses Name(s)	Occupation(s)	Employed by	
Diagnosis	Work Restrictions	Return to work status and date	

Details of Accident / Incident / Property Damage

Date		Time	
Location of accident/incident/property damage:			
Description of Accident / Incident / property damage:			
Description of Injuries to Personnel:			
First aid/Name of Clinic or Hospital			
Medical Treatment Required / Administered:			

Follow up medical visits	
Description of Damage to Property / Equipment:	
Root Cause of Accident / Incident, if applicable:	
Immediate cause: what substandard action and substandard condition caused the incident	
Substandard action	Substandard condition
1. Operating without authority	1. Congested or restricted area
2. Failure to warn	2. Inadequate warning system
3. Driving at improper speed	3. fire
4. Using defective equipment	4. Poor housekeeping
5. Using equipment improperly	5. Noise exposure
6. Failing to use PPE	6. Collapse of trench
7. Horseplay	7. Trapped by machine
8. Not obeying driving /operating rules	8. failure of work equipment
Supporting Document Attachment (witness statement, photos, training records etc.)	
1.	3.
2.	4.
Corrective / Disciplinary Action Required, if applicable:	

Administrative

Report to Local Authorities Required:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If Yes, provide details of report made, to whom, when, who by			
If No, why not: Not Required			

Report to Insurance Company(ies):	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If Yes, provide details of report made, to whom, when, who by:-			
If No, why not:			
Follow-up to above mentioned reports, if applicable:-			

Distribution of report

	Consultant	Client
Date		
Time		
Person notified		
Method of notification		

Prepared by Health & Safety Lead Signature _____

Reviewed by Team Leader Signature _____

Fig 2.2

Source: Researcher’s Work

2.4.5 First Aid

It must be noted that accidents can happen whenever, in this manner, first aid provision should be accessible at all times. It is an indisputable fact that the best method to improve safety performance is to avert the occurrence of accidents and uncertainty before it actually materializes (Jha, 2014). Unfortunately that doesn’t give a full assurance that accidents will never happen on site, for that reason, it is necessary for every construction site to have suitable first aid tools in place as well as properly-trained individuals to help ensure better safety for everyone. Zekri (2014) explained first aid as the arrangement of essential consideration for an injury as it is routinely undertaken by qualified first aiders to a harmed individual until definite medical treatment can be reached if required.

The provision of emergency treatment is a lifesaving application which should not be underestimated (Muiruri and Mulinge, 2014). Even though hazards cannot be completely eliminated, fatalities will be prevented if first aid is provided which will not only facilitate

recovery but save lives as well. The minimum first aid provision on any worksite is an appropriately stocked first aid kit and a designated individual to assume responsibility for emergency treatment plans. Persons who have not been appointed to give first aid must certainly not try to administer first aid for which they are not capable, only first aiders are required to do so. As per Phil and Ferret (2007), a first aider is someone who has experienced an HSE endorsed training course in overseeing first aid at work and holds a present first aid at work credential. Safety officers on the construction site ought to be at least trained on the use of first aid and also other workers on site should be trained on basic first aid knowledge.

2.4.6 Safety training

Safety training and orientation are the essential rudiments of any operational safety management program (Yankah, 2012). An organisation which seeks to strengthen its safety management practice must inculcate it in its policy to organise safety orientation training programs for new hires which will cover safety regulations, project safety rules, site coordination, personal protective equipment and OSHA required training (Yankah, 2012). For old employees, intermittent safety training sessions can be held for them to obtain extra information about potential dangers and their control, new abilities to accept an increasingly dynamic role in executing risk control programs or to impact organisational changes that would upgrade worksite protection (Muiruri and Mulinge, 2014).

An analysis made by Heinrich led to a conclusion that 88 percent of accidents were as a result of unsafe acts, and only ten percent were caused by unsafe conditions (Lingard and Rowlinson, 2005). Thus, without knowledge on potential hazards and how to handle them, it will be very difficult to tackle it should it occur. Safety trainings give one an idea of what to expect, how to prevent it and the best way to go about it whenever it occurs. Zekri (2014) revealed that, the

most significant point in identifying safety deficiencies is by increasing the awareness of everyone on a project site. Safety trainings sessions can be organised during safety meetings with stakeholders to understand their perspective as far safety is concerned. Frequent safety meetings and tool box meetings organised daily or weekly are obligatory for imparting safety information to everyone in the organisation (Tam et al., 2004).

2.4.7 Safety inspections

Safety inspections on the construction site are one of the most effective means of recognising dangerous conditions at the work premises. When management become acquainted with the state of safety conditions on site (Zekri, 2014), they are able to mitigate them before an incident occur and destroying the company's reputation. A study conducted by Adu-boateng (2014), indicated that former records of accidents and injuries are to be considered in determining if critical areas are to receive additional attention.

A study conducted by Lingard and Rowlinson (2005), revealed that inspection is a fundamental instrument in perceiving existing and potential blunders and risks in the work environment. The study went on further to express that inspections ought to be recorded and each hazard discovered during an inspection should be traced and labelled, to provide a foundation for establishing urgencies and applying remedial actions. The highest organisational level influence towards accident is insufficient inspection (Ranasinghe et al., 2015), thus, safety inspections ought to be given much priority to help identify hazards and create awareness before injury and accident occur.

2.4.8 Emergency planning/ procedure

Due to the high-risk nature of the building sector, emergency planning is very crucial for this sector to enable people respond in an appropriate manner should an incident occur. Lingard

and Rowlinson (2005) in their literature defined an emergency management plans as a set of composed instructions that depict how individuals at a work environment ought to react in a crisis circumstance. In order for crisis planning to be effective, both old employees and new recruits, as well as guests to a construction site are supposed to be mindful of the emergency procedure before a crisis occur. According to a study conducted by Zekri (2014), probably the most factor influencing safety performance is emergency/disaster planning and readiness. It is therefore necessary for possible emergency situations to be identified in order to prepare those at the worksite for such circumstances. Should an actual emergency occur on a site, the emergency plan should recognise people with appropriate skills who will be in charge of the execution. Regular emergency drills must be conducted amongst staff to make sure they respond appropriately in an event. Likewise, emergency procedures must be shown on notice boards at conspicuous places to make it visible to everyone on site.

2.4.9 Personal protective equipment

Muiruri and Mulinge (2014) referred to Personal protective equipment (PPE) as defensive attire, helmets, goggles or other pieces of clothing or equipment intended to shield the wearer's body from damage by blunt impacts, electrical dangers, heat, chemicals and infections, for job-related occupational health and safety purposes. Zekri (2014) classified PPE into two categories; the first one which is the use of safety helmet, safety boots and suitable outfit; and the subsequent one relying upon the sort of work, like eye protection, defensive gloves, ear protection and the safety harness. The wearing of protective garment and the utilisation of safety equipment is essential in decreasing the impacts of accidents on construction sites (Yankah, 2012). An investigation directed in the United Arab Emirates (UAE) University found that around (2/3) of the medical clinic visits consisted of injuries on construction sites

because of the absence of PPE or inappropriate PPE (Zekri, 2014). In some cases, safety equipment may be provided, but employees will be unwilling to wear it since there is no corporate culture encouraging its use. This is where safety personnel must enforce the safety rules.

Aside fulfilling the moral obligation of providing PPEs for workers, it is also an avenue of satisfying the legal obligations since it is enshrined in the constitution as Act of Parliament, that is according to the Ghana Labour Act 2003, Act 651, section 2(e), employers shall supply and keep up at no expense to the employee sufficient safety equipment, suitable fire-fighting equipment, personal protective equipment, and educate the workers in the use of the appliances or equipment.

As indicated by Phil and Ferret (2007), the use of PPE shall only be suitable when it is appropriate for the dangers and the conditions of use including the period for which it is worn. The state of health of the wearer and the characteristics of the workstation must be taken into consideration. Most importantly, it should be capable of fitting the individual wearing it perfectly, by alterations if needed. The use of PPE should however be regarded as a last resort when considering control measures (Laryeah and Mensah, 2010; Attabra-Yartey, 2012).

The drive behind the use of personal protective equipment is to minimize the frequency of exposure of employees to hazards or risks that cannot be reduced to the barest minimum. The use of a particular PPE chosen must be based upon the risk assessment of the task and the existing hazards as well as the environment in which it is being used (Asumeng et al., 2015). For PPEs to be effective, it must be inspected and maintained regularly and workers must be also trained on how to use it (Adu-boateng, 2014).

2.5 CONSTRAINTS ASSOCIATED WITH SAFETY MANAGEMENT PRACTICES

The alarming injury and fatality rate of the building sector has been considered unacceptable. The organisation of the construction industry does not offer itself to the implementations of methods to reduce dangers and decrease hazards to the safety of personnel to a reasonable minimum level (Lingard and Rowlinson, 2005). Aside the fact that the irregularities of the industry escalate the risk of accidents, the organisation of work and physical condition in developing countries of which Ghana is no exception heighten safety problems (Kheni et al., 2007).

As a solution to these risks and disastrous calamities, the construction industry has been struggling for enhancement in safety performance over the years. However, the culture of the construction industry in developing countries does not support health and safety (Attabre-Yartey, 2012), thereby obstructing the success rate of safety management practices.

Attabre-Yartey (2012) observed in a study that, certain performances of the industry are a disincentive to the operational administration of safety, but these practices should never be used as a justification for the industry's ill performance because all these problems are controllable (Lingard and Rowlinson, 2005). It is therefore necessary to ascertain the critical matters that influence the success of safety performance negatively in order to improve upon them.

After a thorough literature review conducted, some of the major issues militating the improvement of safety in the Ghanaian Construction Industry negatively were found to be:

- Inadequate support from top management
- Procurement selection method
- Extensive subcontracting

- Communication barrier
- Inadequate employee engagement

2.5.1. Inadequate support from top management

Agyekum et al. (2018) revealed that, management does not demonstrate its commitment to eliminating hazards and improving workplace safety and health. Safety is a topic of interest which is discussed in site management meetings as a priority, but in reality it takes a low precedence to budget. To manage safety efficiently, it is necessary that top management devise the correct approach and perception about dangers on the construction sites (Kheni, 2008). Since top management are the formulators of safety policy in any organisation, without their commitment and unadulterated support, it becomes highly challenging for safety to be adhered in an organisation.

Resources in the form of time, materials, human and money are provided by top management, but once they become indifferent about the safety culture of the organisation, implementing safety becomes a hurdle to tackle. Most at times, senior executives misinterpret the levels of risk of their businesses and seldom include their staff in decision-making in relation to matters of safety (Kheni, 2008).

2.5.2 Procurement Selection Methods

Construction projects are mostly presented to contractors based on competitive tendering, generally to the least bidder (Lingard and Rowlinson, 2005). The practices of competitive tendering and offering of most public contracts to the least bidder in a lot of developing countries of which Ghana is no exception, propels contractors to reduce their prices low, while cutting costs, which, in turn, affects health and safety (Attabra-Yartey, 2012).

The procurement structures are such that contractors most often find themselves in compromising situations which induces them to make adjustments to health and safety in order not to lose tenders to other competitors offering a lesser bid (Smallwood et al., 1999). Competitive tendering put a great deal of pressure on tenderers in the event of an extreme competition, to keep their bids to the minimal, to expand the odds of winning a contract (Lingard and Rowlinson, 2005). This pressure tend to demoralise contractors from calculating the expense of safety into their bids. It has been proven in a study conducted by Jupp and Sawhney (2013), that injury rates will in general be higher on those projects that were competitively bid. This assertion is buttressed by the point made by Hefer (2016) that, the least-price principles in competitive bidding is mismatched with health and safety, since the basic practice is for contractors to price cut their offers just to win a tender with the allowance for health and safety often suffering.

2.5.3 Extensive subcontracting

According to Gray and Sadiqi (2015), subcontracting is only worthwhile that the foremost contractor and subcontractors work together to identify risks and decide how best to control them. Where the subcontractor employed by the main contractor do not have the needed expertise to understand or is unwilling to abide by the main contractor's safety programmes (Agyekum et al., 2018), it becomes a challenge for safety to be observed in the firm. Subcontracting can contribute to risks to both subcontractors and their workforces since they may not be acquainted with the site safety rules, emergency procedure amongst the rest (Lingard and Rowlinson, 2005).

2.5.4 Communication barrier

Phil and Ferret (2007) established that a number of problems in health and safety come about because of poor communication. Ineffective communication in an organisation creates a lot of problems when safety is being practised since employees approach towards safety is considered a root cause of accident (Jupp and Sawhney, 2013). When existing hazards at the worksite and the hazards created by contract workers are not communicated amongst workers on the site (Agyekum et al., 2018), chances are that, there can be miscommunication which can lead to serious accidents occurring sooner or later. A research conducted by Besse et al. (2018) revealed the absence of information or its ineffectiveness as one of the major constraint setting the performance of safety management aback.

Phil and Ferret (2007) deduced that the problem of communication is not just between management and employees, but can also occur similar level within an organisation, which emerges from indistinctness or unintentional misrepresentation of a message. Lingard and Rowlinson (2005) asserted that transparent and straightforward communication is not a characteristic of lots of construction firms, resulting in disagreement and hostility making co-operation on matters of safety difficult. A study conducted by Attabra-Yartey (2012), indicated that the problem of communication in construction firms in Ghana is as a result of low literacy rate of most of the workers on site.

2.5.5 Employee engagement

When employees are reluctant to take safety advice or attend safety trainings due to overconfidence of past work experience or safety records (Gray and Sadiqi, 2015), implementing safety management practices become a big impediment to overcome. Once workers are not encouraged to participate in the safety process and there is no avenue for them to express their views to senior management, they become hesitant in adhering to safety (Yankah, 2012), since their employers do not motivate them. Phil and Ferret (2007) opined in

their investigation that when workers do not feel involved and consulted in small workforces, they are more often unwilling to accept the restrictions that some precautions bring.

2.6 POTENTIAL MEASURES TO IMPROVE UPON SAFETY ON CONSTRUCTION PROJECTS

With the persistent endeavours being made to decrease the frequency of fatality in the industry, it is quite unfortunate that accidents still continue to plague this sector, therefore, consistent measures need to be practised daily to bring the rate of hazard to the barest minimum and also improve upon safety.

A single calamity can turn a slight achievement into a huge cost which may come in the form of direct and indirect costs and also incur an insured and uninsured cost (Phil and Ferret, 2007) which may be manifested through increased medical costs, insurance costs and litigations (Yankah, 2012). Since every organisation is set up to run at a profit, it will be in the best interest of the management to ensure that measures to cut down cost are not compromised with. This means investing in safety which will bring long term benefits to the firm.

Different authors have come up with innumerable measures to improve upon safety in the construction sector. Some of these measures include:

- Top management's total commitment to safety
- Provision for safety in procurement methods
- Subcontractor selection and management
- Effective communication
- Employee involvement in safety and evaluation
- Safety orientation and training

A study will be conducted in the subsequent chapters to gather first-hand information from personnel working on construction projects to throw more light on the aforementioned measures to improve on safety and how they can be effectively done to reduce the rate of incidents on a construction site.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes how the study was conducted as well as the methods and procedure adopted. It defines the choice of study approach and design that was used in undertaking the study. It also contains the target population, sources of data, sampling techniques, data analysis method and the research instruments used.

3.2 RESEARCH APPROACH

A research conducted by Leedy and Ormrod (2001) stated that a research methodology is the general approach the researcher goes through during the execution of the research project. In order to successfully meet the objectives of this research, an extensive literature review was conducted on existing works on Safety management in the Construction industry and later, a descriptive approach was used to assess the operational considerations of safety management practises of construction firms. Adu-boateng (2014), described a descriptive survey as collecting data to describe a situation and the behaviour of a sample population. The major technique employed in gathering data for this type of research consists of the questionnaire.

Well-structured close-ended questionnaire which comes with possible answers was designed to gather first-hand information from building construction sites in the Accra Metropolis on the subject matter. In addition to the questionnaire distributed, the researcher found it wise to observe some of the practises being undertaken on the project site to infer spot-on conclusions to back the questionnaire.

3.2.1 Quantitative Research

The quantitative research approach was selected for this research. This method was chosen based on the statistical procedures that was adopted to identify the data collected Rajasekar *et al.* (2013). Quantitative research focuses on gathering numerical data and generalizing it across groups of people.

3.3 SOURCES OF DATA

For the study to be effectively conducted, two set of data were identified to be of much importance. Both the primary and secondary sources of data were employed in this study to heighten the quality of the research. The motive behind this was to have an extensive range of information from other peoples' work in relation to the objectives of the study and also investigate to find out what actually exists on the field in relation to the study.

3.3.1 Primary Data

Data collected directly from first-hand experience is termed as primary data (Attabra-Yartey, 2012). This study collected primary data through the distribution of questionnaires to the selected sample population and also observed the practices being observed on some construction sites. Questionnaire was used because it is an economical way of accumulating information from the target population and offers a quick way to get results. The researcher settled on the use of close-ended questionnaire because they are more specific, thus giving a definite and concrete answer for easy analysis. Yankah (2012) also indicated that close-ended questionnaires are used to measure the respondent's ability to provide informed responses.

3.3.2 Secondary Data

Secondary data is data that has already been gathered and readily available from other sources (Attabra-Yartey, 2012). The researcher used multiple sources of secondary data to gain initial

insight into the research problem. This includes published articles, thesis and journals of other authors. The secondary data was used to raise validity and reliability of the study.

3.4 RESEARCH INSTRUMENT

According to Salvador (2018), a research instrument is a testing device for measuring a given phenomenon. The primary research instrument used for the study was a questionnaire, which was developed from the literature review based on research questions proposed for the study. The secondary research instrument used was works of other authors in relation to safety on construction projects.

3.5 RESEARCH POPULATION

Attabra-Yartey (2012) refers to a research population as an entire group that a study centres on. The target population of the study centred on project managers, civil engineers, safety officers and all other workers on site not listed were collectively put together as site operatives. The research population focused on those workers who are located in the Accra Metropolis. They are a group of individuals with some commonality, which is they working in the construction sector.

3.6 SAMPLING METHOD

The probability sampling method was used to select my sample size. This method was chosen because it assists the researcher to plan and create an accurate sample, thereby obtaining well-defined data. It is also able to represent my population adequately, thus, not biased towards one group (Attabra-Yartey, 2012). Under this method, the simple random sampling technique was chosen. Thus, efforts were made to gather a representation of workers across various job description (project managers, civil engineers, safety officers, and site operatives).

The simple random sampling technique was selected because it creates samples that are highly representative of the target population, therefore ensuring that each member in the population has an exact same possibility of being included in the sample. The respondents were made known about the purpose of the study and the questionnaire was thoroughly explained to them.

3.7 SAMPLE SIZE

A sample size is a part of a whole population drawn to reflect the entire population (Naoum, 1998). The total population for my research is 152 construction firms in Accra according to the Ghana business directory, but due to time and resources constraint, together with the help of probability sampling method, the research selected a sample of 20 construction firms. The study sampled 100 respondents from these 20 construction firms in the Greater Accra Region of Ghana. Five (5) respondents were sampled from each construction company ($20 \times 5 = 100$) making a total of 100 respondents. Thus, 100 questionnaires were distributed among the 20 construction firms selected.

3.8 DATA COLLECTION PROCEDURE

Danso (2010) described the term data collection as a process of preparing and collecting data, with the aim of obtaining information to keep on record, to make decision about critical issues and to pass information on to others. The developed questionnaires were self-administered and retrieved in person. To clear any doubts in the minds of the respondents, the purpose of the study was made known to the respondents, and this made retrieving it easier. The researcher also availed herself to the respondents to answer questions related to the study. The questionnaire was made up of four sections;

- i. Demographic information of respondents
- ii. Assessing safety practices in the organisation
- iii. Examining constraint associated with the implementation of the safety management practices
- iv. Assessing potential improvement measures to constraints associated with safety practices on site

3.9 DATA PROCESSING AND ANALYSIS

The facts retrieved from the respondents were organised and edited for analysis before being recorded. 100 questionnaire were distributed. The questionnaire were sorted and categorised according to the patterns given by the respondents. The feedback from the questionnaires was organised according to the presentation of the research questions. The results to the items on the questionnaire were analysed using descriptive statistics and the main objectives were analysed using mean score ranking with the use of Statistical Package for Social Sciences (SPSS). SPSS was selected because it is considered to be user friendly (Adu-boateng, 2014). To ensure consistency, the responses in the questionnaire were edited and coded. The responses were grouped based on common ideas that the respondents shared.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter analyses the result of the data gathered by means of the questionnaire survey. The findings from the survey are reported and discussed in this chapter. For data to have value, it must be subjected to analysis, therefore, statistical analyses were undertaken on the responses using various methods described in the research methodology. The analyses were appropriately construed for valid deductions to be made.

Based on the research objectives of the study, the questionnaire was categorised into four major sections to collect tangible information from the respondents. The four major sections are:

- i. Demographic information of respondents
- ii. Assessing safety practices in the organisation
- iii. Examining constraint associated with the implementation of the safety management practices
- iv. Assessing potential improvement measures to constraints associated with safety practices on site

The organisation of the questionnaire was done in such a way to find out the safety practices currently being observed amongst the construction firms, the challenges they encounter in executing these safety practices and potential improvement measures to these safety constraints.

4.2 RESPONSE RATE

90 responses were collected from 20 different construction firms. Out of 100 questionnaire administered, 72 of them were retrieved. 18 were considered as invalid responses, therefore it was rejected whilst 10 of them were not returned at all, thus, totalling 28 non-retrievable questionnaire. This brought the responses effectively to 72, representing a response rate of 72%.

Table 4.1 below shows the total number of questionnaires that were administered, the number of responses retrieved and the number of useable responses which can be analysed to come to a definite conclusion for the study.

Table 4.1: Response Rate

Title	Number
Number of questionnaires distributed	100
Number of respondent	90
Number of valid respondent	72
Percentage	72%

4.3 DEMOGRAPHIC DATA OF RESPONDENTS

For the purpose of this analysis, the respondents used in the study here were categorised to include project managers, civil engineers, safety officers and site operatives. Under the basic information of the respondent's questionnaire, personnel's details including position in the company, educational qualification, years of experience in the construction industry and the duration of time they spend working were recorded. Table 4.2 below shows the demographic information of the personnel.

Table 4.2: Demographic information of personnel

Respondent's information	Project manager		Civil engineer		Safety officer		Site operatives	
	Frequen cy	%	Frequen cy	%	Frequen cy	%	Frequen cy	%
Gender								
Male	5	71	6	60	9	60	30	71
Female	2	29	4	40	6	40	12	29
Total	7	100	10	100	15	100	42	100
Educational qualification								
No schooling	-	-	-	-	-	-	-	-
Basic education	-	-	-	-	-	-	9	21
Secondary education	-	-	-	-	-	-	19	45
Tertiary education	7	100	10	100	13	100	14	33
Years of experience								
0-5 years	3	43	5	50	5	38	14	33
6-10 years	2	29	3	30	3	23	17	40
11-15 years	1	14	2	20	3	23	6	14
16 years +	1	14			2	15	5	12

Working hours per day								
Less than 8 hours	-	-	-	-	-	-	-	-
8 hours	5	71	3	30	5	38	15	36
8 hours and sometimes overtime	2	29	7	70	8	62	27	64

Construction is considered amongst one of industries mostly dominated by male in the world (Yankah 2012). This can be evidently understood from the results in Table 4.2 in which males constitute 71% and females comprises of 29% of the site operatives who answered the questionnaire. A similar result was obtained from the safety officers, civil engineers and project managers who were made up of 69% males and 31% females, 60% males and 40% females and 71% males and 29% females respectively. In all, the responses from the male totalled 50% and that of the females totalled 22%.

The educational background of the respondents had 21% of site operatives having their highest education being basic education, 45% having their highest education to secondary education and 33% holding a tertiary education certificate. All the safety officers, civil engineers and project managers who filled the questionnaire had their highest education being the tertiary level. There was however no record of respondents never attending school. These results from the educational qualification paints a picture that majority of the workers on site are academically matured enough to have a bit of knowledge concerning the issue of safety. With the higher education level of respondents, the researcher believes that, it will be easier for them

to understand the research topic and give appropriate responses to the set questionnaire. This will also have an impact on their understanding on safety, since they will be able to read and comprehend the safety instructions, cautions and signs at their various places.

The number of years of experience in the construction sector from the respondents had 0 to 5 years being the highest, followed by 6 to 10 years and 11 to 15 years with 16 years + having the least number of respondents. This implies that the industry have some amount of experience though but that is not significant enough. The background of the respondents indicate that most of the workers are inexperienced when it comes to the number of years they have been working in the industry. Therefore, they will have to rely on their knowledge on safety most of the time.

The Table 4.2 also indicates the number of hours per day the workers spend at their various work stations. One can infer from the table above that most of the workers in the construction sector spend more than 8 hours working and just a handful of them work for just 8 hours, but none of the workers worked less than 8 hours. It can be seen on the average that more than 50% of the workers with the exception of the project managers spend extra time at work than those who spend only 8 hours at work. Longer duration of working hours also have an impact on the level of incident rate in the industry. This is due to fatigue from working for so long, loss of concentration and also being in a hurry to complete a particular work and close for the day.

4.4 INFORMATION GATHERED ON SAFETY PRACTICES BEING OBSERVED AT THEIR VARIOUS SITES

Under the second section, information was gathered to identify the Safety practices being observed in the various workplace of the respondents. This section made use of dichotomous questions which is generally answered ‘yes’ or ‘no’, multiple choice questions which answers the most applicable and mostly includes ‘other’ in the category since there may be other types that may be overlooked and the rating scale which measure the direction and intensity of attitudes. The data gathered from the respondents will be regrouped according to the nature of the questions; that is all the rating scale responses will be regrouped first, followed by multiple choice answers and the dichotomous question will follow afterwards.

Table 4.3: Respondents knowledge on safety

	Frequency	Percent
Poor	5	6.9
Fair	12	16.7
Good	13	18.1
Very Good	33	45.8
Excellent	9	12.5
Total	72	100.0

Data gathered from respondent concerning their level of knowledge on safety revealed that 6.9% (5) people had no idea when it comes to safety, 16.7% (12) persons had a fair knowledge in safety, and 18.1% (13) people had a good knowledge in safety. 45.8% (33) and 12.5% (9) had very good and excellent knowledge in safety respectively. The data indicated virtually that

majority of the workers have an amount of knowledge on safety. However, the smaller percentage which do not really have much knowledge on safety are prone to accidents. This calls for safety awareness to be intensified to heighten their knowledge on safety with regards to their job description.

Table 4.4: Respondents knowledge on potential incidents

	Frequency	Percent
Poor	5	6.9
Fair	9	12.5
Good	11	15.3
Very Good	35	48.6
Excellent	12	16.7
Total	72	100.0

Table 4.4 clearly shows 6.9% (5) people have a poor knowledge in potential incidents, 12.5 % (9) persons have a fair knowledge of potential incidents and 15.3% (11) people have good knowledge of potential incidents. 48.6% (35) and 16.7% (12) people have very good and excellent knowledge of potential incidents. This indicates that most workers have some amount of knowledge on potential incidents, yet, the smaller percentage which do not have enough knowledge on potential incidents have a greater chance of getting injured.

Table 4.5: Frequency of toolbox meetings in respondents' organisation

	Frequency	Percent
Never	5	6.9
Rarely	8	11.1
Sometimes	11	15.3
Often	15	20.8
Always	33	45.8
Total	72	100.0

From Table 4.5, it can clearly be seen that toolbox meetings are held a considerable number of times in most organisations. 6.9% (5) people indicated that toolbox meetings are not held in their firms. 11.1% (8) persons responded that toolbox meetings are rarely held in their organisation, whereas 15.3% (11) of the people indicated that toolbox meetings are sometimes organised at their workplace. 20.8% (15) and 45.8% (33) of the respondents pointed out that toolbox meetings are often and always conducted in their organisations respectively. Although a greater percentage of the people have safety trainings organised at their workplace, but the fact that some responded with 'Sometimes', 'Rarely' and 'Never' means there are still some firms which do not take safety as a priority, thus, some major safety issues may be overlooked.

Table 4.6: Frequency of safety trainings held at respondents' organisation

	Frequency	Percent
Never	6	8.3
Rarely	14	19.4
Sometimes	17	23.6
Often	23	31.9
Always	12	16.7
Total	72	100.0

Table 4.6 indicates that 8.3% (6) of the personnel never have safety trainings being organised at their workplace. 19.4% (14) persons rarely have safety trainings organised at their workplace and 23.6% (17) persons sometimes have safety trainings organised at their workplace. The data gathered indicated that quite a number of respondents, that is 31.9% (23) and 16.7% (12) signifies respondents whose firms conduct safety trainings 'Often' and 'Always' correspondingly. Safety trainings need to be deepened looking at the responses given from the various respondents, since there quite a number of places safety is not given much attention.

Table 4.7: Frequency of accidents and near miss reports

	Frequency	Percent
Never	4	5.6
Rarely	19	26.4
Sometimes	12	16.7
Often	17	23.6
Always	20	27.8
Total	72	100.0

Table 4.7 indicates that accidents and near misses are not reported 5.6% (4) of the time to the appropriate authorities, 26.4% (19) of the times, accidents and near misses are rarely reported and 16.7% (12) of the time they are sometimes reported. Accidents and near misses are reported 23.6% (17) and 27.8% (20) representing ‘often’ and ‘always’ correspondingly in the organisation. Although from the table one can infer that near misses and accidents are reported most of the time, this is not really impressive since the reports from accidents and near misses will assist the safety officer in being aware of the areas which need to be given much attention and find better ways to improve them. Again, near misses which are not reported to the safety officer to take proactive precautions are susceptible to occur again.

Table 4. 8: How often accidents and injuries are recorded and kept

	Frequency	Percent
Never	4	5.6
Rarely	16	22.2
Sometimes	12	16.7
Often	23	31.9
Always	17	23.6
Total	72	100.0

From Table 4.8, it can be seen that 5.6% (4) of the time, accidents and injuries are not recorded, 22.2% (16) of the time, they are recorded and 16.7% (12) of the time shows that accidents and injuries are sometimes recorded. Accidents and injuries are recorded 31.9% (23) often and 23.6% (17) always according to the respondents in their various organisations. Though from the data gathered it is recorded most of the time, there is still more to be done concerning these record keeping. Records from accidents and injuries keep managers well-informed about areas where accidents are happening most so they can offer their responsiveness to those areas (Zekri 2014). Thus, if there is no proper documentation of accidents and injuries, it will be a challenge to these authorities to be aware of the trend of particular accidents as to when, where and how often they occur.

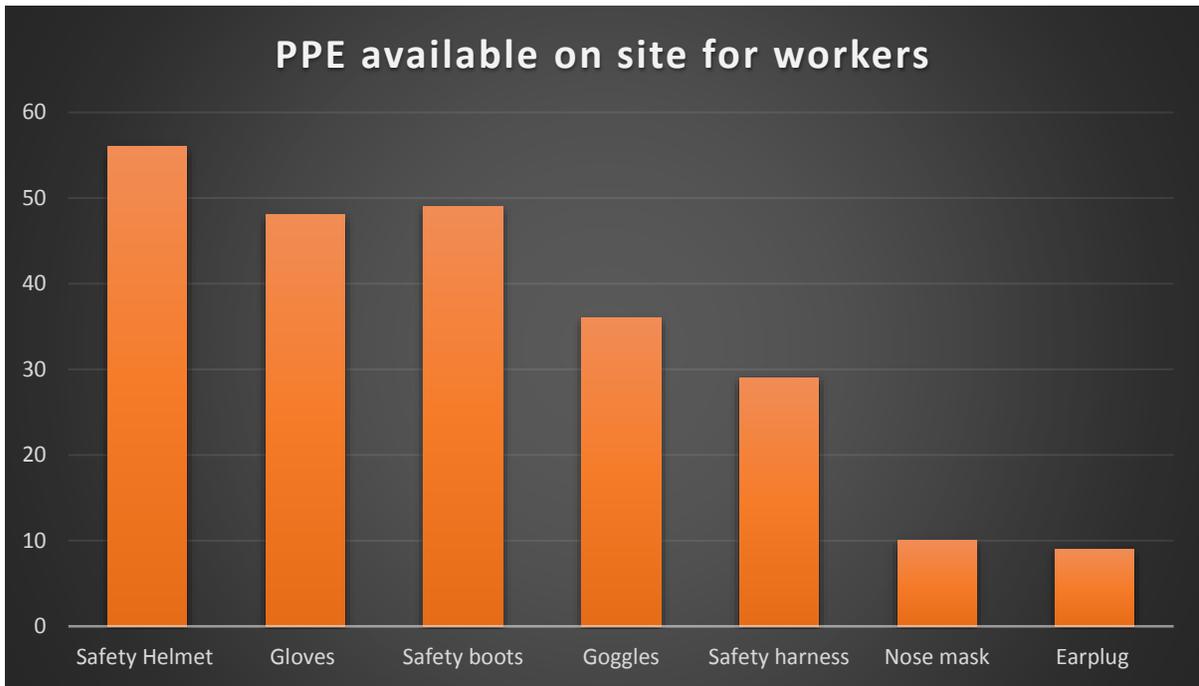


Figure 3: PPE available on site for workers

Figure 3 above clearly shows that amongst all the Personal Protective Equipment, the safety helmet is the most used PPE on a project site, since a large percentage of the respondents ticked that followed by the safety boots and gloves. Safety harness, nose mask and earplugs followed in that order indicating the most available PPE to workers. A brief discussion with some of the respondents revealed that, the nature of their job will demand specific kinds of PPEs. Therefore, if they are not working on height, there is no need for them to have a safety harness. There is also no need for nose mask when the nature of the job does not demand for it. However, safety helmet, safety boots and suitable outfit are basic requirement they are supposed to wear on site, thus the greater percentage.

Table 4.9: Accidents occurring as a result of PPE not being used

	Frequency	Percent
Never	3	4.2
Rarely	21	29.2
Sometimes	20	27.8
Often	15	20.8
Always	13	18.1
Total	72	100.0

Table 4.9 shows that 4.2% (3) of the time, accidents occurring do not have anything to do with PPE not being used, 29.2% (21) of the time, accidents rarely occur on a project site as a result of not using PPE and 27.8% (20) of accidents occurring on a project site can be sometimes attributed to PPEs not being used. 20.8% (15) of the accidents occurring on a project site are often attributed to PPEs not being used and 18.1% (13) of accidents occurring on a site are always attributed to PPEs not being used. There is a clear indication that a large percentage of accidents occurring on a project site is as a result of PPE not being used. Even though, some answered ‘rarely’ and ‘never’ for accidents occurring, it does not mean that one must do without PPEs at the workplace. This is because a considerable amount of respondents responded in the affirmative that most accidents involving workers on a project site occur as a result of PPEs not being used. The purpose of the PPE is to protect the workers from any potential incidents, thus if they are not used appropriately for the right jobs, the rate of accidents tend to increase on the project site.

Table 4.10: How often PPEs are replaced

	Frequency	Percent
Never	9	12.5
Rarely	11	15.3
Sometimes	16	22.2
Often	23	31.9
Always	13	18.1
Total	72	100.0

Table 4.10 shows that 12.5% (9) of the time, PPEs are not replaced when they get missing or in a bad shape. 15.3 (11) of the time, PPEs are rarely replaced, 22.2% (16) are sometimes replaced. 31.9% (23) of the time indicated that PPEs are replaced ‘Often’ and 18.1% (13) of the time pointed out that PPEs are ‘Always’ replaced. Table 4.10 shows that there is still more work needed to be done by management in providing safety equipment for staff to work with.

Table 4.11: How often workers wear PPE when working

	Frequency	Percent
Never	2	2.8
Rarely	10	13.9
Sometimes	15	20.8
Often	18	25.0
Always	27	37.5
Total	72	100.0

Table 4.11 revealed that upon the provision of PPEs to workers, 2.8% (2) of the time, they are not used, 13.9% (10) of the time, they are rarely used and 20.8% of the time, they are sometimes used. However, 25.0% (27) of the time, PPEs are used by these workers, and they are always used 37.5% (27) by workers provided it is available. A discussion with some of the workers revealed that they mostly refuse to wear them when they are not being supervised since it restricts their movement in their work flow.

Observing from how often PPEs are replaced really do have an influence on how often workers wear PPE when working. Some of the workers explained that since the PPEs are not replaced promptly when they get missing or damaged, they tend to work without them for quite a long time, thus become comfortable working without them. As a result, even when it provided after a while, they do not see the essence in using them. This in turn will lead to the occurrence of hazards since there will be no protective clothing to protect the workers in an event of a mishap.

This can be clearly seen from Table 4.11 above as a number of the respondents rarely or never use PPEs at all in their course of work.

Table 4.12: Presence of first aiders on site

	Frequency	Percent
Yes	38	52.8
No	34	47.2
Total	72	100.0

It can be observed from the figure above that 52.8% of workers have first aiders available on site at all times whereas 47.2% of workers do not have first aiders on site. Even though a large percentage of these firms have people trained to administer first aid on site, the percentage which do not have first aiders on site constitutes quite a number. This can lead to catastrophic incidents occurring on the project site since first aiders provide life-saving treatment to people who are injured before they seek proper medical attention. Thus, their presence on a site, is very beneficial the organisation.

Table 4.13: Safety trainings for workers and new hires

	Frequency	Percent
Yes	45	62.5
No	27	37.5
Total	72	100.0

Table 4.13 shows that 62.5% (45) of the workers have undergone safety trainings, whereas 37.5% (27) of the workers have not undergone any safety training in their organisation. This shows how much management systems are to be put in place to increase the number of workers trained concerning in safety practices.

Table 4.14: Respondents trained to identify hazards on site

	Frequency	Percent
Yes	42	58.3
No	30	41.7
Total	72	100.0

One can infer from Table 4.14 that 58.3% (42) of workers have undergone training to identify hazards on site. This will go a long way to minimise the risk level on a project site. However, 41.7% (30) of the workers have not undergone any form of training to identify hazard on a project site. This can be a contributing factor to accidents occurring on a project site.

Table 4.15: Respondents who have sustained injury in their course of work.

	Frequency	Percent
Yes	47	65.3
No	25	34.7
Total	72	100.0

Table 4.15 shows that 65.3% (47) of workers as against 34.7% (25) workers on a construction site have in one way or the other incurred injuries or impairment in their course of work. This is evident of how accidents are inevitable in the industry, thus, the need to put safety measures in place, as well as have a first aider on site to administer first aid before proper medical attention is sought.

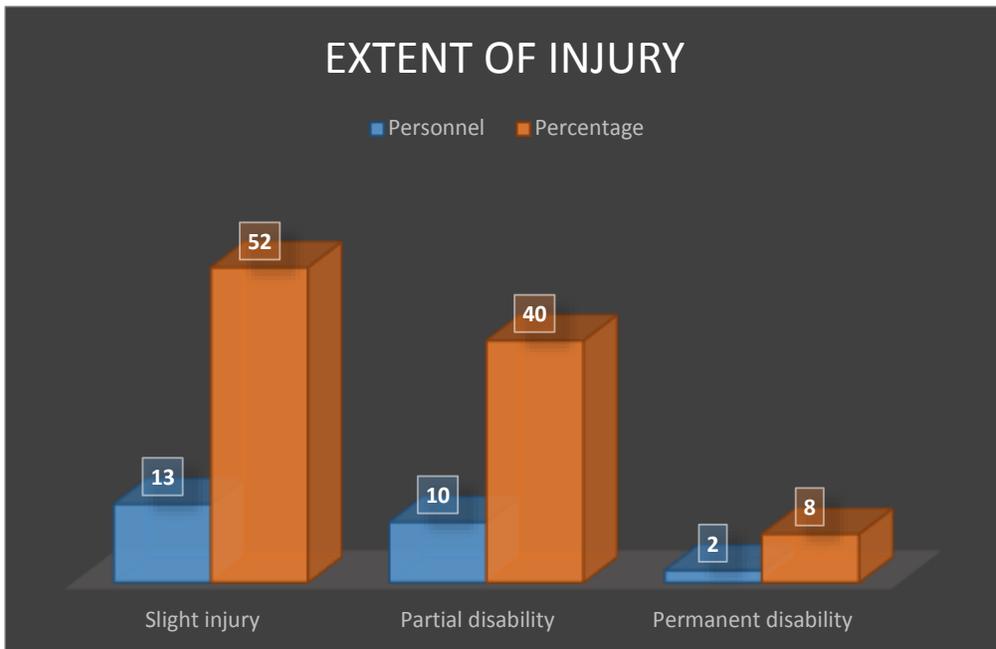


Figure 4: Extent of injury sustained

It can be inferred from the above information that only a small percentage of the workers incurred permanent disability followed by partial disability and slight injury. This shows that although slight injuries are not really seen as any major injury, when care is not taken and safety measures are not put in place, it can lead to a rise in the level of permanent disabilities occurring on site.

Table 4.16 Challenges faced in implementing safety in an organisation

Descriptive Statistics

	N	Mean	Std. Deviation	Ranking
Safety management plan of my organisation is not effective	72	3.15	1.507	1 st
Co-workers in my organisation do not ensure the safety of fellow workers.	72	2.75	1.319	2 nd
Workers refusal to report minor injuries is a challenge	72	2.61	1.400	3 rd
Workers refusal to wear PPEs in the organization is a challenge	72	2.61	1.369	4 th
Influencing workers to change their culture and behaviours towards safety is a challenge	72	2.44	1.060	5 th
Valid N (listwise)	72			

These factors were presented to the respondents to ascertain the most pressing challenges they face in their organisations with regards to safety. From the results of the data, most of the

respondents agreed to the fact that safety management of their organisation is not effective as a challenge, since a mean score of 3.15 of the respondents which is majority of the respondents agreed to the fact that safety management plan of their organisation is not effective. This is directly followed by co-workers in the organisation not ensuring the safety of their fellow workers, which has a mean of 2.75. Workers refusal to report minor injuries and workers refusal to wear PPEs in the organisation followed suit with the same mean score of 2.61. Influencing workers to change their culture and behaviour towards safety ranked the least challenge with a mean score ranking of 2.44.

4.5 INFORMATION GATHERED ON CONSTRAINTS ASSOCIATED WITH THE IMPLEMENTATION OF THE SAFETY MANAGEMENT PRACTICES

Under the third section, information was collected from respondents to assess the constraints they encounter in their various organisations in the implementation of safety management practises. The responses given were as to how applicable it is to their various organisation. The likert scale was used to determine the impact these constraints have on the various firm. This was grouped from level 1 to level 5, where 1 means very low, 2 is low, 3 is neutral, 4 is high and 5 is very high.

Table 4.17 Constraints associated with the implementation of safety management practices
Descriptive Statistics

	N	Mean	Std. Deviation	Rankings
Ineffective emergency response plan	72	4.07	1.214	1 st
Inadequate safety meetings	72	4.04	1.337	2 nd
Poor record keeping and accident analysis	72	3.90	1.189	3 rd
Underestimation of potential risks and hazards	72	3.86	1.011	4 th
Lack of employee engagement	72	3.83	1.210	5 th
Inadequate inspections at the worksite	72	3.79	1.047	6 th
Insufficient support from top management	72	3.64	1.225	7 th
Procurement selection method	72	3.51	1.256	8 th
Extensive subcontracting	72	3.44	1.060	9 th
Communication barriers	72	3.22	1.103	10 th
Valid N (listwise)	72			

From Table 4.17 above, it can clearly be seen that in order of ranking, ineffective response plan, inadequate safety meetings and poor record keeping and accident analysis ranked first three, with each scoring a mean of 4.07, 4.04 and 3.90 respectively. Underestimation of

potential risks and hazards, lack of employee engagement and inadequate inspections at the work site ranked 4th, 5th and 6th positions with mean scores of 3.86, 3.83 and 3.79 in that order. Insufficient support from top management, procurement selection methods, extensive subcontracting and communication barriers were ranked the least challenges with mean score rankings as 3.64, 3.51, 3.44 and 3.22 respectively. The rankings seemed so close to each other because majority of the answers were skewed towards them being high and very high on the rating scale.

4.6 INFORMATION GATHERED ON POTENTIAL IMPROVEMENT MEASURE TO SAFETY PRACTICES ON CONSTRUCTION PROJECTS

Under the final section, information was gathered amongst the respondents to gather some potential improvement measures to safety on construction projects. The respondents were asked to select from what they deem highly important to what they consider highly unimportant as far as improving safety in their various organisations is concerned.

Table 4.18 Information gathered on potential improvement measures to safety practices.

Descriptive Statistics

	N	Mean	Std. Deviation	Rankings
Top management commitment to safety	72	4.65	.585	1 st
Employee involvement in safety and evaluation	72	4.62	.488	2 nd
Subcontractor selection and management	72	4.49	.650	3 rd
Safety orientation and training	72	4.46	.604	4 th
Frequent work site inspection	72	4.44	.803	5 th
Good record keeping and accident analysis	72	4.38	.568	6 th
Frequent safety meetings	72	4.33	.581	7 th
Effective emergency and response planning	72	4.33	.605	8 th
Provision for safety in procurement methods	72	4.29	.879	9 th
Effective communication	72	4.08	.915	10 th
Valid N (listwise)	72			

It can be concluded from Table 4.18 that in order of ranking which shows the most important improvement measures to construction safety, top management commitment to safety, employee involvement in safety and evaluation and subcontractor selection and management were ranked the first three with mean scores of 4.65, 4.62 and 4.49 respectively. Safety orientation and training, frequent work site inspection and good record keeping and accident analysis ranked 4th, 5th and 6th positions with mean scores of 4.46, 4.44 and 4.38 in that order. Frequent safety meetings and effective emergency and response planning ranked 7th with both having the same mean score of 4.333. Provision for safety in procurement methods and effective communication ranked the least important with mean scores of 4.29 and 4.08 respectively. The mean scores had figures quite close to each other symbolizing that the responses given by the workers were skewed towards ‘important’ and ‘highly important’.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides a summary of the key findings. The conclusions which are derived from the analysis are formally documented here, as well as recommendations. The objectives of this study were to:

- To assess safety management practice of selected construction companies in Ghana;
- To examine the constraints associated with the implementation of the safety management practices within the selected companies.
- To establish potential measures to improve upon safety of construction projects in Ghana.

5.2 SUMMARY OF FINDINGS

Lots of studies have been conducted on safety issues in the construction sector. The conclusions are drawn based on each objective:

5.2.1 Safety practices being performed at the various construction sites

With respect to the findings revealed in the first objective, there are a lot of literate personnel in the construction industry, thus, understanding the concept of safety is not the main issue to deal with. Safety training, toolbox meeting, refresher courses and orientation for new personnel are fundamental elements that will assist in an effective safety management system. However, this not practiced by all construction firms in the Ghanaian construction industry. Also, reporting of

accidents and near misses to the safety officer is not practised by all these firms, thus proper records are not kept for proactive measures to be made. Most construction firms provide the basic personal protective equipment; yet, majority of workers refuse to use them since they are not enforced to do so. In conclusion, this shows that safety management practice amongst construction firms in the Ghanaian sector is in a poor state.

5.2.2 Constraints associated with safety management practices

The results from table 4.13 revealed that the major constraints that hinder safety performance in the Ghanaian construction industry includes the following starting from the most pressing:

- Ineffective emergency response plan

The table revealed that the major challenge of most of the respondents is the lack of an effective emergency response plan in their various firms. Thus, in the case of an emergency, it is difficult for them to respond appropriately to avert any incidents. This need to be given much attention since it scored the highest rank using the mean score ranking.

- Inadequate safety meetings

Inadequate safety meetings is another major constraint associated with the implementation of a safety management system. It was ranked the second most pressing constraint using the mean score ranking from Table 4.13. These meetings if conducted frequently can help increase the safety awareness of everyone on site and avert potential hazards occurring.

- Poor record keeping and accident analysis

From table 4.13, the third most ranked constraint was identified as poor record keeping and accident analysis. Most accidents and near misses occurring on a project site are could have been prevented if proper records were kept. This is because measures would have been put in place to prevent them from recurring.

- Underestimation of potential risks and hazards

When the proper risk and hazard analysis are not conducted by construction firms prior to the commencement of a project, it may result in underestimation of the potential risks and hazards occurring on site. The potential risks and hazards have a high tendency of disrupting safety management on a project. This can be attested from Table 4.13 as the fourth most ranked constraint using the mean score ranking.

- Lack of employee engagement

From the findings in Table 4.13, limited support or participation from workers is another major constraint in respect to safety in the Ghanaian construction industry. Most top management do not consult or engage workers when preparing a safety program. It was once again observed that most employees do not see the essence of working safely, therefore, they tend to work under unsafe conditions without using the right materials for working. This is demonstrated in Table 4.13 as the fifth rank constraint.

- Inadequate inspection at the worksite

Frequent inspection at the work premises is one thing which can lead to prevention of many accidents occurring on site. But in the case where there is no inspection from time to time to check if workers are complying by the safety rules, they tend

to work without any safety measures in place. Table 4.13 proves inadequate inspection at the worksite as the sixth rank constraint.

- Insufficient support from top management

When top management do not show full commitment in safety practices, it tend to affect its implementation and execution. This makes enforcing safety management practices very difficult. This is considered the seventh ranked constraint per the mean score ranking in Table 4.13.

- Procurement selection method

When there is no provision for safety in construction projects, it affects the safety management since a lot of these competitive tendering procedures award contracts to the lowest bidder, hence cost on safety is cut off most at times in order to win these contracts. It is ranked eighth from Table 4.13 using mean score ranking.

- Extensive subcontracting

In employing subcontractors to work with a firm, most contractors do not see the need to train subcontractors on safety practices, assuming that they already have sufficient knowledge on safety. Without the needed safety training for these subcontractors, accident rates tend to increase, since every project has its own inherent risk. From Table 4.13, this is ranked the ninth constraint.

- Communication barriers

Barriers in communication is another constraint that has an effect on safety management in the Ghanaian construction industry. The use of technical language and abbreviations, background noise and distraction and ambiguities in the

message are constraints associated with safety in the industry. However, this was not considered as a major constraint per Table 4.13

5.2.3 Potential Improvement Measures for safety on construction projects

The results shows that the five most significant measures to improve upon safety on a construction project are ‘top management commitment to safety’, ‘employee involvement in safety and evaluation’, ‘subcontractor selection and management’, ‘safety orientation and training’ and ‘frequent work site inspection’ respectively. Other equally important measures to improve upon safety in construction projects includes ‘good record keeping and accident analysis’, ‘frequent safety meetings’, ‘effective emergency and response planning’, ‘provision for safety in procurement selection methods’ and ‘effective communication’.

5.3 CONCLUSION

Safety is a shared responsibility of every individual on a project site. For safety management practices to be successful in a construction firm, the study revealed that it requires total commitment from the top executives at the management level in an organisation, a teamwork amongst the safety professionals and total participation from all employees.

Strong management commitment is required since they implement the policies to control the safety practices. When top management are committed to safety, the work of the safety officer becomes easy since the resources needed to ensure an effective and efficient safety management system simply become accessible to the safety officers to perform their roles without any stress.

Personnel in charge of safety must understand the nature of their work very well so they can influence and impact on the workers at site, as to how to handle their work with care to ensure the maximum safety level. Since safety personnel are more abreast with the “*nooks and cranny*” of a safety culture, they must ensure they instil that safety culture in the entire workforce functioning in the same organisation. They must also supervise all employees to find out if they are working according to the required safety standards set by the firm, and also provide them with the necessary equipment needed to ensure a safe work practice.

Employees in an organisation must also be willing to partake in safety practices to protect themselves from injury and major accidents by availing themselves for training sessions. Without their participation in the safety programme, the work of the safety officer will be meaningless as well as the commitment from the top management. But since management steer the affairs and operations of the organisation, employees will be left with no option than to abide by the guidelines set by management. Attaining a zero incident/accident rate is one of the major focus of well-established construction firms. This means no one gets hurt and everyone go home at the end of each day in the same physical condition in which they arrived or-better.

Another major element of an effective safety management system is to recognise the risks and assess the impact of hazards existing at the worksite in order to determine the appropriate controls to tackle them. Safety personnel are to focus more on proactive measures in dealing with incidents on site rather than wait till they happen.

A discussion with a safety officer in a construction firm visited revealed that there are actually two major indicators as far as safety is concerned. These indicators are

grouped as leading and lagging indicators. Again, further explanation was made on the leading indicators, which is termed as proactive measures in identifying hazards and unsafe acts prior to the occurrence of an incident. Lagging indicators on the other hand are reactive in nature, thus, they measure the effectiveness of a safety program after it has occurred. Moreover, for a safety program to be very effective, there is the need to focus more on the proactive measures in dealing with accidents than wait for the accident to occur first. Example of a leading and lagging indicators include safety trainings and incident investigation and report.

5.4 RECOMMENDATIONS

Based on the conclusions above, and the result from this study, the subsequent points can be recommended:

- Management must take a keen interest in safety by providing resources needed for an effective safety programme. They must provide a safe workplace, safe equipment and materials, safe methods of work, competent workers, adequate supervision and also put in place a reward system for staff who comply by the safety practises, as well as punitive measures for those who refuse to abide by them.
- Regular safety training, toolbox meeting, refresher courses and orientation for new personnel on safety issues are fundamental elements that should not be compromised with. This is to create safety awareness in the minds of workers.
- Records of accidents and injuries should be recorded so as to make provision for accident investigation to aid in effective accident control in future projects.

- Staff are to be made mindful of their obligation to wear PPE suitably, look out for their colleagues, take care of equipment and report any faults. They must be made aware that failure to wear or misuse any PPE could lead to disciplinary action.
- All accidents occurring on site must be reported to the appropriate authorities within the shortest possible for safety measures to be put in place.
- Main contractors must make sure they check the safety performance of subcontractors they work with; take them through the safety training of the organisation; explain the work to them before they start; and provide whatever they need in terms of protective equipment. These remedies must target at reducing accidents at the workplace.
- Employers must encourage workers to abide by safety rules. Incentives must be awarded to staff who follow safety instructions, whereas punitive measures must be meted out to workers who refuse to abide by them.
- Procurement authorities must ensure that safety guidelines are included into the requirement of a contract for a project.
- Workers at all levels in the organisation should be assigned safety responsibilities in the construction industry.
- Construction firms need to increase the quality and quantity of safety supervisors on site to conduct proper supervision whilst work is on-going.

5.5 LIMITATIONS OF STUDY

The study is supposed to cover building construction companies in Ghana; however, a sample frame of selected companies in Accra will be chosen to represent the whole population sample, due to time and financial constraints. The study focuses on the operational considerations of safety management of construction projects. Nevertheless, the above mentioned shortfalls will not obstruct the reliability of the information contained in this research.

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APPENDIX

RESEARCH QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BUILDING TECHNOLOGY

MSC PROJECT MANAGEMENT

Safety Management of Construction Projects: Practices, Constraints and Improvement Measures

This research is being conducted to collect data from construction workers on the operational considerations of safety management of construction projects. It is meant for academic purposes. Your inputs will enable the researcher achieve her aims and objectives for the research.

Completion of the questionnaire is completely voluntary and returning the completed questionnaire will be considered as your consent to participate in the survey.

All data held are purely for research purposes and will be treated with strict **confidentiality**.

Section 1

Demographic information of respondent

1. Gender:

1= Male [] 2= Female []

2. What role do you play in this firm?

.....

3. Educational level:

- a. No schooling
- b. Basic education
- c. Secondary education

- d. Tertiary education
4. How many years of experience do you have working in the construction sector?
 - a. 0 – 5
 - b. 6 – 10
 - c. 11 – 15
 - d. 16 years +
 5. How many hours do you work a day?
 - a. Less than 8 hours
 - b. 8 hours
 - c. Over 8 hours
 - d. 8 hours and sometimes overtime

Section 2

Safety Practises

6. On a scale of 1-5, what is your knowledge on safety?
 - a. 1 - Excellent
 - b. 2 - Very good
 - c. 3 - Good
 - d. 4 – Fair
 - e. 5 – Poor
7. On a scale of 1-5, what is your knowledge on potential incidents?
 - a. 1 - Excellent
 - b. 2 - Very good
 - c. 3 - Good
 - d. 4 – Fair
 - e. 5 – Poor
8. How often are tool box meetings/ safety meetings held in the organisation?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Rarely
 - e. Never

9. How frequently are safety trainings organised at your workplace?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Rarely
 - e. Never

10. How often do you report near misses and accidents that occurs to the safety officer?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Rarely
 - e. Never

11. How often are records of injury of workers on site and the causes kept?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Rarely
 - e. Never

12. Are there any safety trainings and orientation for workers and new hires?
 - a. Yes
 - b. No

13. Have you been trained to identify any hazard on site?
 - a. Yes
 - b. No

14. What are the types of PPEs available to you on site? (thick as many as available) ANY
 - a. Helmet
 - b. Gloves
 - c. Safety boots
 - d. Goggles
 - e. Safety harness
 - f. Nose mask
 - g. Earplug

h. Others (specify)

15. Have you ever sustained an injury or impairment in your course of work?)

- a. Yes
- b. No

16. If yes, what was the extent of the injury?

- a. Slight injury
- b. Partial disability
- c. Permanent disability
- d. Others (specify)

17. Are there first aiders or people trained to administer the first aid? Proof of training certificates?

- a. Yes
- b. No

Indicate on a likert scale 1 to 5, how often PPEs are used. Answer the ff questions:

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

	1	2	3	4	5
18. Accidents occurring as a result of PPE not being used					
19. How often are PPEs replaced					
20. How often do workers wear PPE when working					

21. Workers refusal to report minor injuries or near misses as a result of fear of being sacked is a challenge.

Strongly Agree [] Agree [] Disagree [] Strongly Disagree [] Neutral []

22. Workers refusal to wear personal protective equipment (PPEs) in the organization is a challenge

Strongly Agree [] Agree [] Disagree [] Strongly Disagree [] Neutral []

23. How to influence workers to change their culture and behaviours towards safety in the organization is a challenge.

Strongly Agree [] Agree [] Disagree [] Strongly Disagree [] Neutral []

24. Co-workers in my organisation ensure the safety of fellow workers.

Strongly Agree [] Agree [] Disagree [] Strongly Disagree [] Neutral []

25. Is the safety management plan of your organisation effective?

Strongly Agree [] Agree [] Disagree [] Strongly Disagree [] Neutral []

Section 3

Constraints associated with the implementation of the safety management practices

Below are challenges that hinder the implementation of occupational safety on construction sites:

26. Rank on a likert scale of 1 to 5 which challenge affects your organisation most.

1	2	3	4	5
Very low	Low	Neutral	High	Very high

Rank which is most applicable to your organisation

Constraint	1	2	3	4	5
Level of support from top management	1				
Procurement selection method					
Extensive subcontracting					
Communication barriers					
Lack of employee engagement					
Underestimation of potential risks and hazards					
Ineffective emergency response plan					
Poor record keeping and accident analysis					
Inadequate safety meetings					
No inspection at the worksite					

Section 4 – Improvement measure to constraints associated with safety practices on site

27. Rank on a scale of 1 to 5 the level of importance of each of the following measures to Improve upon safety in your organisation.

1	2	3	4	5
Highly unimportant	Unimportant	Neutral	Important	Highly important

Which one is most applicable to your organisation?

Measures	1	2	3	4	5
Top management commitment to safety					
Provision for safety in procurement methods					
Subcontractor selection and management					
Effective communication					
Employee involvement in safety and evaluation					
Safety orientation and training					
Effective emergency response planning					
Good record keeping and accident analysis					
Safety meetings					
Frequent work site inspection					

Is there anything else you will like to add concerning safety?