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Strategies for Curbing Ineffective Management of Safety on Construction Sites: A Case Study in the Greater Accra Region

by

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MASTER OF SCIENCE

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science Degree in Construction Management and that to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgment has been made in the text.

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ABSTRACT

The construction industry is inherently risky, with a substantial number of accidents. Moreover, most construction firms aims at completing projects on time, especially with different projects at hand thereby neglecting the safety aspect of the workers. In most Ghanaian construction companies, adequate concentration is not allocated to the areas of health and safety and this has been a great problem over the years in which Accra Metropolis is no exception. To support in addressing this issue, this work planned with the aim to recommend strategies for curbing ineffective management of safety on construction sites. In order to achieve the said aim, the objectives set up include; to identify the possible causes of accident as a result of infective management of safety, to determine the level of accidents caused by ineffective management of safety at the construction sites and to identify strategies to curb ineffective management of safety at the construction sites. Survey questionnaires were administrated to five (5) major construction companies in the Greater Accra Region in which the data collected was also analyzed with the Statistical Package for Social Science (SPSS) and the Relative Importance Index (RII) was also used in ranking. It was therefore revealed from the findings that poor planning at site, unsafe working conditions with others are some of the major causes of accident at site. In addition, falling victims was identified as the most serious level of accident on site. Construction companies should consider the need for special training for workers and also to create a group of internal health and safety monitory experts were some of the recommendations made.

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DEDICATION

I dedicate this work to my dad Mr. Lawrence Ahenkora Boamah whose love and support turned all fears into desires to succeed.

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My outermost thanks goes to the Lord God Almighty. Whose grace and mercies has brought me this far.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

The construction sector is regarded as one of the most accident prone sectors because of its poor safety conditions, (Haslam *et al*. 2005). Construction project sites involve risk, and prone to health and safety risk because of construction nature and working environment, methods, type of equipment used.

Hughes (2007) stated that the protection of the body and mind from illness resulting from work is health, whiles the defense of people from physical injury is safety. For over twenty-five (25) years, Health and Safety Executive (HSE), also stated that 2800 workers and over die in UK as a result from injuries sustained from construction (HSE, 2009). Cole (2002) stated that safety hazards are some dimension of the environment at work which have the possibility of creating danger to an employee.

Worldwide the construction industry has a greater role in the economy's growth. Research proves that construction brings on board between 5 and 10 percent of (GDP) Gross Domestic Product in all countries and utilize equal to 10 percent of the people that works. (Ofori, 2012.). In order to boost the economy of the country Ghana, the government of Ghana came out with laws and regulation on activities within the construction industry to help solve problems associated with accidents on construction sites. The laws included, Worksmans Compensation law 1987 (Labour Act 2007) and Labour Act on health and Safety, offices and shops Act 1979 (Act 328).

Most major issues which have much impact on the construction industry have been centered only on the industrialized countries. It is believed that, such matters are not

needed by the developing countries. (Ofori, 2012). This research will intend address one of the greater challenges in the industry which is health and safety.

Casio (1996) stated that it is very easy to bypass the safe way to work but often the precursor to an accident. The construction industry will be safe to generate and boost the economy of every country if attention is paid to health and safety regulations.

As recommended by construction researchers and policy makers, employees should be able to carry out their normal work duties in a safe environment, free from accidents and harm. According to the International Labour Organization, (2005), it is estimated that about 6,000 workers die each day as a result of illness and accidents relating to work.

1.2 PROBLEM STATEMENT

According to Sengupta and Guha (1999), the rate of accident occurrence in the construction sector is more dangerous than that of the manufacturing sector. Majority of employees do not take into consideration much about safety precautions at the work place due to lack of safety regulations and measures in the organization (Ferret and Huges, 2007). Kheni *et al*. (2006) also stated that Ghana has a higher accident rate than most economic areas. Cotton *et al.* (2005) adds that, this could be due to deficiency in proficient health and safety management techniques. Moreover, most construction workforce are hired on time-based and casual grounds and hence the working conditions are inappropriately definite (Mitullah and Wachira, 2003), and this creates minute protection on workers' health and safety.

In developing economies, local contractors encounter diverse obstructions that often prevent the effective management of health and safety (Kheni *et al.,* 2005). Gibb and

Bust (2006) determined some variables that could affect health and safety management of construction sites in developing economies. Among such variables were; poor infrastructure, challenges in vocal communication because of high illiteracy level, uncontrolled activities on construction sites as well as corruption. As revealed by Koehn *et al.* (2000), problems in preparation as a result of illiteracy amounts to the ineffective safety management in countries that are developing.

Most firms in construction, focus on getting the project done especially when there are different projects at hand thereby neglecting the health aspects of the workers. The forgoing difficulties in construction may be deliberated to have adverse influence on the management of health and safety outcomes in deprived health and safety performance of construction sites in developing economies (Kheni *et al.*, 2005). Accra Metropolis is no exception to this. According to Armstrong (2007), pp 829, accidents from work related can have many serious direct and indirect effects on the life of the worker and family. Before health and safety can improve, it is the responsibility of the law enforcers within the metropolis to enforce this law and pay regular site visit. Strategic Forum (2005) suggests that, effective health and safety management practices fosters increased productivity, and cost savings in construction businesses.

1.3 RESEARCH QUESTIONS

1. What are the possible causes of accident as a results of ineffective management of safety at the construction sites?
2. What is the level of accidents caused by ineffective management of safety at the construction sites?
3. What are the strategies needed to curb ineffective management of safety at the construction sites?

1.4 THE AIM OF THE STUDY

The aim of this study is to identify strategies for curbing ineffective management of safety on the construction sites.

1.5 OBJECTIVES OF THE STUDY

1. To identify the possible causes of accident as a results of ineffective management of safety at the construction sites;
2. To determine the level of accidents caused by ineffective management of safety at the construction sites; and
3. To identify strategies to curb ineffective management of safety on the construction sites.

1.6 JUSTIFICATION OF THE STUDY

In past years, health and safety have been an issue of concern due to high rate of accidents on construction sites. Much is not given to the implication added on to the organization, therefore the findings and recommendations of this study will help increase the awareness of health and safety and implications on project within the construction sector, also to ensure adequate protective tools and equipment are provided to workers on site.

1.7 THE SCOPE OF THE STUDY

The construction industry consists of two major sectors, the road construction and the building construction sector. The road sector consists of three major agencies which are: Ghana Highway Authority, Department of Urban Roads and the Department of

Feeder Roads (mrh.gov.gh). Whiles on the other hand, the building construction sector also has three major agencies, which are: Water sector agencies, Work sector agencies and Housing sector agencies (mwrp.org).

This research focused on construction sites with registered contractors classified under D3, K3 and above who are in good standing within Greater Accra Region.

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1.8 METHODOLOGY OF STUDY

To achieve the set aim and objectives, these methods will be used:

- Textbooks, internet, journals, construction magazines will also be used.
- Visits to the sites and offices for the arrangement of the interview for the study.
- Design and distribution of questionnaires to personnel whose duties are to be more concentrated on health and safety within the industry.

This study will also be organized into chapters:

Chapter one: This will consist of the introduction/ background study, statement problem, research questions, aims and objectives, justification, methods to be used in the research and the scope of study.

Chapter two: Literature review, which brings on board different ideas from various sources especially in the building and civil works sector. Also brings into light the types and various health and safety products to be provided on site and the cost implementation.

Chapter three: This will deal with the methods used for the research. The details of the questionnaires and sample size gathered will also be reviewed in this chapter.

Chapter four: This chapter also will focus on the data collected and analyzed, ranked using bar and pie chart.

Chapter five: This portion states the introduction, achievements of research objectives, findings, conclusions and the recommendations made for further studies.

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CHAPTER TWO

LITERATURE REVIEW

2.1 THE CONSTRUCTION INDUSTRY

According to Anaman *et al.* (2007), the construction sector is defined as an entity of institution with closely connected actions which are involved in the construction of real estate, private, building and public infrastructure. Construction works includes all aspects of executing the project from the start to finish. This also includes site clearance, investigation, demolition and removal, commissioning, maintenance of services like electricity and telephone.

All these processes involve health and safety of workers and management. According to Anaman and Osei-Amponsah (2007), the industry of Ghana has a potency to drive the growth of the economy, even though the commitment of the government is low in the improving of productivity. It further stated that another means of enhancing the quality of the Ghanaian construction industry is by making the safety performance better. It was stated by Egmond *et al*, (2007), that the construction industry in Ghana is made mainly with more workers that are not able to write and read. Also the Ghana Investment Promotion Centre GIPC (2006), states that the degree of accomplishment of anybody hired by the sector, usually 67.2 percent are unskilled, semi-skilled are 24.8 percent and highly skilled are 8 percent. These percentages are much concerned when it comes to issues of health and safety in the construction sector.

Like other developing countries, the construction industry in Ghana depends on labor methods. Some development projects like road construction, hospital projects, and classroom are constructed using labor. European Commission, (1994).

According to the Confederation of Construction Clients (CCC), (Construction Procurement Guidance, No.10, OGC, 2001), in the commitment to work together to

improve performance on construction sites in relation to health and safety, quality and productivity, has also set a reference to cut down the:

- Occurrence ratio of happenings in relation to work unhealthiness by 40 percent in 2004/2005 and 66 percent by 2009/2010,
- Occurrence of death and higher injuries by a percentage of 40 by 2004/2005 and 66percent by 2009/2010,
- Number of days lost during working hours per 100,000 workers relating to work hard and ill health by 20 percent as of 2004/2005 and 50 percent as of 2009/2010.

The construction industry consists of two major sectors, the road and the building construction sectors. There are two major government ministries that are responsible for the activities and implementation of the policies within the construction industry. The Roads and Highways ministry (MRH) is accountable for the road section and has three major agencies under, which are the Ghana Highway Authority (GHA), Urban Roads Department (DUR) and the Feeder Roads Department (DFR). (mrh.gov.gh). On the other hand, The Water Resources, Works and Housing ministry (MWRWH) is in charge for the execution of policy within, water supply, works, housing, hydrology and sanitation and all activities of building contractors who are certified and classified. This ministry has agencies as, Water sector agencies, works sector agencies and Housing sector agencies (mwrwh.gov.gh).

The Health Ministry (MOH), and through the unit of occupational health of this ministry is in charge for the issues concerning occupational health.

2.2 HEALTH AND SAFETY

World Health Organisation, (1999) describes health as a way of mental, physical and social well-being and not only in relation to sickness or disease. As a result, health and safety is the preventing and protecting of people from any form of hazards and risk that can arise as a result of harm, injury, unhealthy working environment in the working place. According to Anaman and Osei Amponsah (2007), they stated that the law of health and safety defines a way by which the working environment can strengthen to secure the safety and health of people who are likely to be affected by the working environment.

Also the International Labour Organisation. (1996) describes these as a study with a wide area regarding different special areas and also aims at the following:

- Keeping and preserving to the highest position of physical, mental and social well-being of workers in all areas of working environments
- Protect workers in their places from risks as a result of adverse to health
- Maintaining and placing workers in an environment that adapt mental and physical needs.

World Health Organisation, (1999) also states, workplace that is a place in which managers and workers coordinate together to use a frequent progress in development to protect and boost the health and safety of workers by considering the following, supported on needs that are known:

- Personal health resources in the workplace
- Safety interest in the working environment which include the administration of work and culture at the workplace.

- Concerns of safety in the working environment

In order to achieve the objectives of health and safety, all groups involved at the workplace like, workers, management and officials in the various unions must be committed to the programs of health and safety.

Caldwell (1999) stated that in early 1960's the number of workers killed in the industry was around 275. By 1970, it reduced to about 200, and decreased again around 135.

2.3 APPLICABLE HEALTH AND SAFETY LAWS TO CONSTRUCTION

There are no formulated laws in relation to health and safety to the construction sector in Ghana. Looking at the greater danger that is in involved in this sector, it has severely affected the accomplishment of the standards of health and safety at site. With respect to civil engineering and building construction works, the major health and safety law that applies in this sector is the Factories, Offices and Shop Act 1970 (Act 328).

There are also some specific laws for health and safety that are applicable to the industry, these laws are: Labour Act (2003), the Workmen's Compensation Law (1987) and the Environmental Protection Agency Act (Act 490).

2.3.1 Factories, Offices and Shops Act (2003)

The Factories, Offices, and Shops Act 1970, this Acts provides towards, offices, ports, construction and shops. This Acts also supports the manpower, development and labour minister to engage in rules with respect to works in construction and address issues of danger. The 57th section of the Act connects to work under civil engineering and building. There are different sections as clearly stated in section 57(1) of the Act which are also important to works related to building and civil engineering. Under this, construction companies are mandated to register their sites (sections 6-8) and to give

an account of any accidents and harmful activities that happen at the workplace to the Factory Inspectorate Department. It is also required under section 19, 20, 25, 26, 27 and 31 to provide toilet facilities, potable drinking water, protective equipment's, and also take measures to control and prevent specific hazards on site respectively.

Under (section 33-35), the Act also demands medical management in reference to the health of workers, this also a requirement to put in place with respect to access to site and all construction design must be in conformity to safety of workers and all by users of the project.

Different sections of this Act in relation to works under construction include the following:

- Sections 52-54: indicates the right of inspectors in making sure, safety and welfare of all stakeholders at project site and the functions of the court in situations like these.
- Sections 60-73: also lay out the actions to be taken and the legal steps.
- Sections 74-77 is also associated with the administration of the Act ▪ Sections 78-87 also entitles to all other matters in general.

2.3.2 The Labour Act

Part XV of this Act, 2003 (Act 651) links to the health and safety and the workplace environment. This is therefore every employer's responsibility under this Act to check that employees work under safe, healthy and satisfactory context. There are also different sections of this Act that also is in relation to health and safety. They include: broad conditions of employment, protection of wages, organization bargaining agreements.

It is expected of the employee to report any harmful condition to his/her immediate supervisor. If this due process is followed the employer has no right by law to terminate the employment of the worker. The same applies to the employers also to report any occupational accidents that occur at the workplaces to the appropriate agency. The (LA, 2003) also sees to the protective equipment to be given by the employer in accordance to the employers' activities.

2.3.3 The Workmen's Compensation Law in Health and Safety

This Act 1987 compels employer to provide expenditure to employees' helplessness as an outcome of accidents in the process of their employment. It is mandatory for the employer to pay all expenses at the hospital for the harmed worker. For instances where only treatment is needed of the harmed person, the Act states the (the injured) is still qualified to their salary even when treatment is undergoing through an accident occurred during the course of employment.

There are also exceptions to the rule: under circumstances where the injury occurred as a result of the influence of drug or liquor at the time o of accident or deliberately selfharmed. The law also applies to both the private and public sector.

2.4 INEFFECTIVE MANAGEMENT OF SAFETY ON THE CONSTRUCTION SITES

In these past years, site health and safety management has increased in significance in other areas (Boyd, 2009). According to Rawlinson and Farrell (2010), there has been a basic want to sustain the health, safety and wellbeing of workers. Available literature on health and safety management offers grounds that, there is alternating integration of health and safety regulations in small scale enterprises due to specific features they have

(Kheni *et al.,* 2008). Baldock *et al.* (2005) investigation on small firms indicated that, there are distinct changes in companies' health and safety techniques. Some of the variables obstructing contractors from adopting efficient health and safety management techniques or schemes comprise bureaucracy, employees' unconsciousness in connection to their privileges and time insistency (Koehn *et al*., 1995).

Gibb and Bust (2006) revealed that negative construction activities, adverse weather situations, and incapacitating socio-economic atmosphere have a bad impact on health and safety management of construction sites in developing economies. In Peckitt *et al.* (2002) research on health and safety, the results suggested that directors and project managers were usually oblivious of their responsibilities under the health and safety legislation was merely imposed. In developing countries such as Ghana, the proper procedure of construction is progressively outmoded by inappropriate construction (Wells, 2001).

Often clients and construction team bend regulations and proper processes to get their completed structure at a minimal fee (Kheni *et al.,* 2008). Except there is severe implementation of health and safety regulations, minute concern will be assigned to health and safety in such sector atmosphere because the principal goal of the contractor it to maximize proceeds and that small private clients which control the industry is to acquire the complete product at the most minimal cost. Nevertheless, there have been perpetual interest over the number of accidents in the construction industry (Reynolds *et al.,* 2008).

2.5 CAUSES OF POOR SAFETY IN THE CONSTRUCTION SECTOR

2.5.1 Reasons for the poor record

According to the National Institute for Occupational Safety (NIOSA), (2009) the nature of constructing work has a high status of safety incidents and this may include many

built in hazardous works and conditions. The following are the different reasons for the poor safety records in the construction industry:

A. Nature of the Site and Project

i) Conditions at site

a) ***Slope and Nature of site:*** If the nature of the site is of an uneven surface, it may have an effect the firmness of materials, workers and equipment during working times. (Ringen *et al.* 1995). Also the site with very steep slope and no precautions taken has the ability through its movement to cause accident.

b) ***Space Constraints:*** NIOSA, (2009) also stated that, sites with constrains have the attribute to cause accident and in cases of heavy materials and equipment been conveyed from one place of the site to the other and in addition to worker traffic in construction It stated further that confined spaces present hazardous working conditions.

c) ***Soil State:*** soil states / conditions differ from site to site. Poor soil conditions affect the stability of equipment, materials. Levitt and Samelson (1993). They explained further that, soil with poor conditions require an extensive site engineering activities.

d) ***Temporary duration of site:*** Levitt and Samelson, (1993), Reese and Eidson, (1999) argued that the temporal duration of work on site makes it difficult to set up an effective lasting strategy for safety on site.

ii) Project Scope

a) ***Structure Height:*** The height of the structure exhibits the risk of collapse if adequate materials are not used and brings about injuries as a result NIOSH, (2009)

b) ***Soil work and Foundation:*** NIOSH (2009) states that, there is always a risk of excavated walls caving in if adequate precautions are not taken.

c) ***Heavy materials:*** Materials for construction works are typically heavy and of large size, therefore having the tendency to cause injury to workers allocated to work with either by falling or striking. Levitt and Samelson (1993).

iii) Consideration of Design

a) ***Unclear Design:*** Rowlinson (2004) stated that unclear designs have an advance inclination to cause accidents because workers may not be acquainted with safety precautions for execution the project.

b) ***Changing Design:*** it was also stated by Rowlinson (2004) that, in the stages of construction, certain designs may require a change within short notice, therefore earlier construction site safety planning maybe not necessary to address the new design.

B. Nature of Workforce:

i) Consideration of Workers:

a) ***Trained workers***: Workers that are untrained mostly have a chance to cause or be in accidents at site. Toole (2002), depending on the nature of project, you are likely to find workers who are trained and those not.

b) ***Experienced Workers***: when one is experienced in his/ her field of work, the percentage of causing accidents on site is low while those without experience are more likely to be involved in accidents on site. (Levitt and Samelson, 1993)

c) ***Labor Consideration:*** It was argued by Weil (1992), that labour unions are known to give its members adequate training with reference to professional safety through their apprenticeship programs, went on further to explain that, union workers have been found to perform better with respects to safety at their work places. With almost a percentage of 17 from U.S construction trade workers were also noted to be part of the union which implies the usefulness and positive impact it brings on board in areas of safety. (BLS, 2016).

d) ***Unqualified Subcontractors:*** The industry patronizes the services of subcontractor's or special services. In cases where inexperienced or unqualified subcontractor are used, the accident rate is likely to increase. Some are usually not well trained in aspects of site safety. (Rowlinson, 2004).

e) ***Welfare Problems:*** Any time there is a welfare problem, it leads to unconcern behavior and resistant to work, thereby have a good chance of an outcome in hazards on safety at site. (Fang *et al*, 2006: Langford *et al*, 2000)

C. Industry Process

a) ***Competitive Tendering:*** The main aim of this tendering process is to seek the lowest responsible bidder. King and Hudson, (1985) stated that, the

smaller the bid, the lower the margin of the contractor and the possibility to factor safety into the project will be low.

2.6 ACCIDENTS IN CONSTRUCTION

Safety was defined by Ngowi (1996) as the prevention of individual injury or damage in property which may arise as a result of accident, Cox and Cox (1996) also defined safety as "a state of freedom from unacceptable risk of personal harm". A practicable definition in relation to construction site, is when an individual can work about his/ her daily duties without undue risk. Ridley and Channing, (2003) described accident as an unplanned or unexpected event that comes about as a result of causes that may result in injury or disease or damage to a property, a loss, or combination of both.

Hinze (2006) also defines accident as an unplanned event that is not always result in injury. The Advance English Dictionary (AED) also defined accident as anything which happens suddenly or by chance without a cause. Maybe the easiest and simplest way of defining accident is occurrences that are incapable of been controlled. In most instances, activities that lead to accident can be controlled and that indeed brings about safety. By the provision of safe working conditions, impressive safety training and adhering to the use of safe working procedures and working tactics are some of the aims of preventing accident.

Heinrich *el al.* (1980) describes some prominent attribute of accident occurring series:

- ***Unsafe Act****:* insecure performances of persons, like removal of safeguards, nonadequate lighting systems all results in accidents.
- ***Accident****:* occasions like, contact of person as a result of flying objects also brings about injuries and accident.

- ***Individuals fault*:** lace of knowledge on safe working practices, brings about physical or mechanical hazards.
- ***Injury**:* these are fractures as a result of direct accidents.

The great significance difference between the cause of accident and happenings of accident is the cause of accident can be prevented before the happenings.

The risk of danger faced by workers in the construction industry is very alarming due to the fact that construction site is a busy place with different activities ongoing.

2.6.1 Causes and types of Accidents on Construction project site

HSE (2004), identified some causes of accident as the effects of unsafe working conditions, Ferret and Huges (2007) also stated and attributed unsafe conditions to some major causes which are: unsafe acts of workers, management reactions and unsafe conditions. These unsafe acts, other factors and management related factors are shown in Table 2.1. The causes indicated in Table 2.1 is likely to lead to massive cost for a contractor (Lancaster *et al*. 2003). HSE (2006), gave instances that accidents negatively affect the rate of productivity, brings about rise in the cost of insurance and also likely to incur legal actions against the firm. Accidents also leads to health implications such as respiratory problems, eye problems, hearing damage, psychological stress. It went on further to state that accidents can also:

- Cause delays in progress of project
- Decrease motivation of workers
- Disrupt construction process
- Affect the reputation of the construction industry.

Table 2.1 Causes of Accidents on construction project site

Unsafe Acts	Unsafe conditions	Management related causes
Failure to wear or use PPE	Lack or missing guards	Inadequate planning
Inability to warn others of danger	Missing platform guardrails	Improper design
Placing equipment in dangerous conditions	Faulty tools and equipment	Absence of training and awareness
The use of faulty tools	Poor fire warning systems	Lack of communication
Wrong usage of equipment	Contact with electricity	Poor supervision
In position with moving machinery	Noise	Ineffective management policies
Struck by motion vehicle	Fire hazards	Non compliances
Struck by flying object	Dangerous conditions	
Manual handling	Lack of inadequate light	

Source: HSE, (2004): Ferret and Hughes, (2007)

To reduce the causes of accident it is best to proper understand the causes. When these causes are understood, the processes for prevention will have a greater impact Hinze and Russel (1995), as cited in Manase (2008).

It can be stated clearly that, when project is high, less attention is given to safety therefore resulting into casualties. The construction industry has a high death rate as a result of injury, though the construction industry represents about 6 percent of US working class, it produces 20 percent of the fatalities (El Safty *et al*., 2012) as cited by Amarh (2014).

The following were found by Kripendriff (2004), to be the types of accidents on project sites.

- ***Method of work:*** This type is made up of the techniques used to execute every activity and may include: unsafe loading practice, poor manual handling, and unprotected shoring.
- ***Poor quality tools:*** this is the case where tools to be used are of poor quality and they contribute to cases of accidents like: tinny rusty particles in the eye.
- ***Unfortunate error:*** this comes about as a result of behaviors, and includes carelessness, poor planning, human error, poor hold of tools, poor observation, and may also lead to slip or fall on wet grounds.
- ***Set up of site:*** organization of the site is very necessary and the placement of tools and equipment also contribute to accident if care is not taken.
- ***Error by plant operator:*** this may arise by actions of unguarded machinery, wrong actions taken by the operator.
- ***Plant failure:*** This includes any malfunctioning part of the tool and can cause structural failure or component jam.

2.7 STRATEGIES FOR IMPROVING CONSTRUCTION SAFETY

The Construction Industry Institute (CII), (2003) conducted investigations to identify strategies that show better safety records. The results determined by the CII research team brought out some actions to use. They are as follows:

1. ***Participation of Management in Accident Investigation:***

   They recorded that companies with its top management participating in the investigation of injuries and accidents were able to decrease the rate of accidents

in their firms. When managements are involved, the following measures are putted in place:

- Appointment of safety staff.
- Ensuring adequate training for staff
- Budgets are prepared for safety and managed accordingly.
- Ensures the adequate provision of cost and time of safety measures.

Beach (2000) and cited by Yankson (2012), it was revealed that management involvement in safety has a major influence in the success of the safety story

2. Safety Planning:

The study found out that companies that carry out specific site safety plans and programs is variable to record low accident rate. Safety planning must be done effective and applied to all areas of the job to be executed. He further added that it is important to include all parties in the planning.

3. Training and Education on Safety

Companies where all workers are introduced to formal safety education always record low incidence of accident. A company safety program is as important as the estimating of the company. The training of the company's staff must be one of an important issue to the firm and also educating the workers to conduct their work in a manner to reduce the risk of accident. The main goal of educating the workers is to develop a positive attitude to work without causing accident.

Davies and Tomasin (1996), stated that the US Occupational Safety and Health Administration has outlined some basic element for a better safety program. They are:

- Management should always be fully committed to safety above all issues.
- Safety program and education should always reflect the size of the project.
- It is better to clearly state the responsibilities of safety.
- There should be a cordial open communication between management and workers
- Adequate funds should be allocated for safety programs ▪ Leadership by example. All management needs to be involved.
- Employees also needs to participate.
- Discipline programs must also be stated clearly.
- The need to periodically review safety performances.

4. Participation and Involvement.

Safety programs such as behavior based helps to assist in correcting behaviors that are unsafe and help to improve good safety practice. It went further to add, projects which have workers in involvement were found to have lower injury rates.

5. Rewards and Acknowledgement

In companies where workers receive incentives on a frequent basis recorded lower injuries due to the fact that all workers were committed to their work.

6. Reporting and investigation of Accident

Though reporting and investing of accidents is required by law, the study didn't miss it out. Companies that do not miss any little information were also found to improve in areas of safety, where as those who do miss were found to

increasing in injuries.

7. Alcohol and Drug testing

The CII study found safer companies and stated that where companies conduct random testing on alcohol and drugs recorded low accident issues.

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2.8 CAUTIONARY MEASURES

Different cautionary measures can be taken into consideration during construction to prevent site accidents and injury in the event of occurring. These are as follows:

1) Personal Protective Equipment

Davies and Tomasin, (1996), Personal Protective Equipment (PPE) should at all times on the site be worn. Huang and Hinze (2003) also indicated that PPE could help prevent injuries and also decrees the effect of injury at site. They further explained that. Basic PPE includes, reflective jacket, helmet, safety eyewear.

2) Safety Nets

Safety nets are tools that fastens a construction worker to a point by strengthening and supporting him/her to carry their duties at height. They further added that it decreases the events of falling from heights.

3) Protective Rails

Protective rails can also be installed around work areas that are of height. This rails when installed will prevent the worker from falling off. (Reese and Eidson, 1999)

4) Signals and signs

When Signs and signals are allocated to alert workers on site safety and hazardous conditions it helps minimize the risk of injury. Davies and Tomasin, (1996) added that signal and sings informs the workers in taking extra caution to avoid injury.

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5) Disposal of waste

Reese and Eidson, (1999). indicated that in order to prevent individuals from slipping, trips and falling, it is important to clear the construction area of tools, materials, waste and debris and other accidents and injury can also be prevented through the implementation of this measure.

2.9 CONSTRUCTION PARTIES RESPONSIBILITIES IN SAFETY

Kheni (2008), stated that safety in the construction industry must at all times be the primary first ranked interest of the employers, employees, participants of the project and the government.

In addition, the groups accountable for safety in the construction industry are:

- The Client
- Main contractor ▪ All Regulatory agencies
- Employees.

The major duties of the parties involved in the construction industry are summarized in Table 2.2.

2.9.1 Safety duties of government agencies:

According to Laryea *el. al* (2010), government agencies often bring out laws and instructions that will guarantee all construction projects are safe to sue and to maintain.

They continued further that an excellent planning of safety ensures all projects are managed very well with minimal problems and cost.

2.9.2 Safety duties of employer:

Since the client always influences much of how work is done, they do not look at the safety side but always look at the end side. Where health and safety risks are minimum, little is required from the client but where there is a higher risk involved, clients are expected to do more.

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Table 2.2: Roles of construction parties in assuring site safety

Clients	Contractors	Regulatory agencies	Employees
Delegate the right people	Access on site must be safe	Guidance notes	Wearing of PPE
Make possible time	Provision of welfare facilities	Safety warning	Taking care of tools and equipment
Providing adequate message or information to the project team	Working at safety measures	Health and safety education	Defects reporting
Ensuring team communication and co operation	Safe scaffolds	Enforcement	
Ensuring suitable arrangement are in place	Safe ladder	Laws in health and safety	
Ensuring equal welfare facilities on site	Safety precaution		
Ensuring correct design of workplace	Safe excavation		
Appointment of a head contractor	Handling must be free and safe		
Provide adequate plans for safety	Loading and offloading of goods must be free from danger		
Keeping files on safety	Safe vehicles and plants		
Public protection	Safe tools and machinery		
	Managing of noise levels		
	Safe emergency procedures		
	Safe hoist and cranes		
	Safe handling, storage and disposal of substances		
	Public protection		

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HSE (2009), Lingard and Rowlinson (2005), Ringen *et al.* (1995)

2.9.3 Safety duties of the Contractor

It is the duty of the contractor to check and confirm that all subcontractors do comply with safety rules by providing PPE for all their workers.

2.9.4 Duties of employees on safety

Responsibilities of wearing PPE well, should be made aware to employees, also taking good care of all equipment's and to report any defects. Employees are also to be warned of any misuse of the PPE will result in disciplinary actions. It also needs to be noted that the equipment is provided for their protection.

There are certain questions that relating to safety issues that needs to be attended to;

- Are there any sufficient first aids on sites in Ghana?
- Are there safety officers in construction sites?
- Do regulatory bodies in Ghana ensure safety rules are compiled?

2.10 COST OF ACCIDENTS IN THE CONSTRUCTION INDUSTRY

According to HSE (2006), accidents generally affect the rate and productivity of work and also leads to a significant lost to the contractor. The detailed expenditure of accidents is described in different structure. Everett and Frank (1996), stated that there are three major types of expenditure or costs that are important to management or owners in areas where measurement of fatalities, accidents and injuries are involved, which are:

- ***Direct cost:*** this include cost of injuries and accidents that comes along with worker's compensation, property insurances.

- ***Indirect cost:*** this also includes loss in productivity, time for investigations and report, training to replace personnel's, amount paid to injury workers for all the times not working, cleaning up and repairs, claims and other equipment damages
- ***Cost of safety programs:*** this also includes salary for medical personnel's, safety meetings on sites, inspections of tools and materials, orientation for workers, inspection on site, PPE.

Waehrer, *et al.,* (2007) also suggested that the costs of occupational accidents and illnesses can be separated into three broad categories used in other areas, namely:

- ***Direct costs:*** which includes the costs involved in hospital bills, doctors, rehabilitation, home care, medical items, cost of burier, cost of insurance, police, fire, emergency transport and property damage;
- ***Indirect costs:*** this makes references to productivity lost by the victim which includes wages and cost of administration.
- ***Quality of life:*** this also refers to the quality attributed to the sufferings and pains of the victim and the family as a result of accident, injury or sickness.

Rikhardsson, *et. al* (2002) brought about the development of the Systematic Accident Cost Analysis (SACA) method. The following cost categories were used in the SACA approach.

- ***Time:*** This is the hours spent by employees and management on events related to the accident and also hours for which wages were paid without productivity and employee sick pay.
- ***Materials***: these and other elements lost as a results of the accident. E.g. Replacement of machine parts.

- ***External***: this also was described as services due to the accident such as legal support.
- ***Other costs:*** fines like rehabilitation.

Waehrer, *et al.*, (2007) further explained the three types of average cost standard

- ***Variable cost:*** they are the cost that varies with respect to the number of sick days which include sick pay and add on to salary to which the company is required to pay.
- ***Fixed cost:*** these are accidents that are not dependent on the number of days absent of the injured worker, and it includes administrative and communication cost.
- ***Disturbance cost:*** these are dependent on accident, role and attributes of the injured person and it includes time lost, production lost and fines if possible.

However, the most common used in the construction industry is the direct and indirect cost. There is different cost that are associated with construction accidents but hidden. Jallon *et al,* (2011) states that many of these costs are difficult and sometimes difficult to quantify. The basic list of indirect cost are as follows:

- Haltage in production immediately after accident
- Co-workers becomes affected
- Replacement and training cost of injured worker
- Personnel's in charge for investigating and reporting of accident
- Quality in product reduction due to accident
- Damage of plants and equipment
- Legal cost

- Transportation of injured worker

The failure in identifying and taking into consideration the above indirect cost will have a deep impact on an organization.

2.11 QUANTIFICATION OF COST

According to Health and Safety Executive HSE (2005), many elements needs to be taken into consideration when quantifying cost in relation to accident in construction. These are:

- The nature of the accident
- The degree of injury suffered

All have important impacts when it comes to cost computations. Financial loss can also be:

- Cost of treatment
- Income lost from days off work
- Physical losses

Each instances or case should be considered in the estimation of the monetary compensation. The cost of accidents is characterized by the types of accident cost, in order to create a cost type. The following should be taking into consideration:

I. Time lost:

a. First aid attendant to provide medication and filling of documents

b. Personnel accompanying the injury person to the hospital

c. Workers who stop working instantly after the accident

d. Personnel in charge of managing the accident effects

e. Injured worker who can't work for some days after the accident

II. Cost of investigation details

a. Cost of paper

b. Time for investigation

c. Follow up meeting and wages attached

III. Cost of replacement details

a. Time spent on location

b. Cost of evaluating

c. Hiring a new worker

d. Working at minimal productivity as an effect of employing new worker

IV. Cost of productivity details

a. Minimal working results during the return of the injured person after the first week of accident

b. Minimal productivity the day after the incident.

An accident cost calculator has been developed by the Health and Safety Executive.

***Table 2.3 Safety* Executive Accident Cost Calculator**

CATEGORY	EXAMPLE	TIME SPENT	COST (£)

Dealing with occurrences (instant action)	First – aid treatment Injured person been taken to the hospital Making the site safe Instant staff cut down		
Incident investigation	Consultant fees in investigation Meeting for discussing incident Time for reporting incident		
Business cost	Cost of recruiting new staff Cost of overtime Penalties in contract Cost of salary with respect to injured person		
Action to safeguard future business	Restoring confidence of customers Providing different source of supply for customers		
Penalties and sanction	Increase in insurance premium Timing of staff dealing with legal cases Legal fees and expenses Cost imposed as a results of criminal proceedings Claim payment Other		
Other	Personal examples		
TOTAL COST			

Source, Health and Safety Executive HSE (2005) **CHAPTER THREE**

RESEARCH METHODOLOGY

3.1 INTRODUCTION

MacDonald and Headlam (2009) said, without the use of research methods and adequate designs, essential information is not likely to be brought together and that creates no basis for any reviews foundation or future systematic plans.

Research methodology also as described by Goddard and Melville, (2007) is the strategy in which research is mobilized. They further explained that research methods also describe the process that is need in the study and the logic behind.

The research methodology is a significant element in the research that basically brings out the method to be used during the course of the research work. Based on the objectives and research problems, quantitative data was used for the study. This chapter explained the methodology used to conduct this research. The chapter was concerned about how the data was collected and analyzed. This chapter covered the research design, sampling procedure, data collection instrument used and procedure used in data analysis.

3.2 THE STUDY AREA

The study focused on five construction sites in Greater Accra Region but with registered contractors. The construction sites of Vanguard properties, Mikadu Construction, PSA Builders, Gibson Construction and UT Properties were considered in this study.

This field of study was concentrated on both the field workers and the management team. Base on the above category of people it can be drawn that employees will be from different cultural, social, economic and educational background with different basic ideas and orientations. It is therefore not exaggerating to assume that these employees may have diverse ideas and opinion on the subject matter.

3.3 RESEARCH DESIGN

Research design is a process that directs or guides the research project. It was identified by Naoum (1998) that there are three main strategies in research design, these are: Qualitative, quantitative and triangulation. Naoum and Coles (1997) also added that the decision to go in for any of the above strategies depends on the purpose of the study, the availability and the type of research.

This study adopted a quantitative research design. A critical literature survey research approach was adopted to determine the level or degree of accidents caused by ineffective management on health and safety at the construction sites and to develop the strategy for curbing ineffective health and safety management at the site.

3.3.1 Sampling and Sampling Techniques

The study was based on purposive sampling which is also a type of non – probability sampling technique. The main objective of a purposive sampling is to be centered on a particular population of interest which will best answer the research questions.

Erbil *et al*, (2010) also states that, purposive sampling technique allows the researcher to select people with broad ideas on the subject matter. The study also involved a population of fifty (50) experts as the sample size, ten (10) respondents from each construction site. Architects, general foremen, structural engineers, electrical engineers, quantity surveyors, plumbers, carpenters, steel benders, brick layers and labourers were therefore considered from each of the construction site stated. Ten respondents from each site were taken since the study needed précised result.

Therefore, a total number of fifty (50) questionnaires were personally sent out for the data collection.

3.4 SAMPLING AND SAMPLING SIZE

Though it is believed that purposive sampling creates a kind of bias for the researcher, this study and technique was done based on the availability, a convenient sample size, time factor, and proximity to the site. The sampling of this study involved architects, general foremen, structural engineers, electrical engineers, quantity surveyors, plumbers, carpenters, steel benders, brick layers and labourers because they directly get involve in the activities at site.

3.5 RESEARCH INSTRUMENT

Questionnaire was used in place of scheduled interview to examine the possible effects caused by ineffective management of health and safety at the construction sites and the determination of the accident levels caused by ineffective management of health and safety at the construction sites at the five construction sites in the greater Accra Region. Both primary and probing questions that are open- ended were developed and used for the survey. A critical review was therefore conducted on existed constructional strategies and frameworks on constructional health and safety. It is noted, with reference to the research objectives.

3.6 DATA COLLECTION

To achieve the objectives of this study, this focused on registered construction firms within the said region, but in detailed with field workers. This is because they directly encounter the issues of accidents in the matters of the industry.

Since all activities and information concerning constructional sites are always confidential as one of the health and safety regulations and as a right to safeguard (especially to labourers), formal registrations were made at the construction sites under study before permissions were granted for the ultimate survey at their various departments and units. Data was therefore collected as part of the answers provided to the questionnaires and literature review was conducted to support the following purposes:

3.6.1 Identifying the possible causes of accidents as a result of ineffective management of safety at the construction sites.

The possible causes of accident as a results of ineffective management of safety in construction were examined based on how construction workers consider health and safety regulations by the five construction sites (in the Greater Accra) and its implications to the study was also deeply extracted for analysis. Data was also gathered from definitions and conceptions on constructional health and safety by studying the literature review already conducted. Comparison was therefore made to know the safety awareness of the construction sites under study.

3.6.2 Determining the level of accidents caused by ineffective management of safety at the construction site.

Data was collected on the accident levels caused by ineffective management of safety at the construction sites. Answers from the questionnaire as to know the construction sites' status (readiness) to support the study were adequate instrument to determine the construction sites' ability to adopt effective management of constructional safety. Seven types were used as a study tool on the accident levels caused by ineffective management in constructional practices. This was done by seeking reviews from the various studies as some writers gave different theories. Review was also done on the

implications of the ineffective management. These were compared with what the construction sites have to enhance effective and efficient management of safety. The literature review conducted provided this study with more information on the possible effects and accident levels caused by ineffective management of safety at the construction sites which is the subject under study.

3.6.3 Identifying strategies for curbing ineffective management of safety at the construction sites

Literature review was conducted on already developed strategies, frameworks and concepts for effective management of health and safety at the construction sites by different studies. Nine theories and Kripendriff (2004), model on constructional health and safety were reviewed and converted into componential facts, which were used to develop the theoretical strategy. Critical review was therefore used to analyze the developed theoretical strategy based on the study objectives and the literature review on constructional health and safety management and concepts to identify gaps (strengths and weaknesses) with regards to the study aim. Data collected from the possible effects and accident levels caused by ineffective management of safety at the construction sites and the literature review conducted in chapter two provided theoretical strategy that was then used to form componential facts for the strategy development.

3.7 DATA ANALYSIS METHOD

The study used a statistical approach to analyze the collected data from the questionnaire. Frequency tables and charts were displayed to give a pictorial view of what was gathered on the field before analysis was made. A critical review was adopted to analyze the studied constructional health and safety management concepts found in the literature review towards a strategy development.

Different factors were organized into the questionnaire for it to be ranked by the respondent. This points of ranking were done using the Relative Importance Index (RII). Abdal-Hadi (2010) stated that the relative index technique has been used widely by different researchers in the construction sector for measuring attitudes in relation to surveyed variables. The factors for this are:

$$RII = \frac{\sum W}{A \; X \; N}$$

W = weight given to every factor by the respondent.

A = The highest obtained weight

N = is the total number of respondents.

Statistical Package for Social Scientists (SPSS) and the Microsoft Excel were used in the analysis.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1. INTRODUCTION

The chapter brings to light and detailed analysis of the obtained field data. The data was processed using Statistical Analyst and presented with tables, charts and graphs before analysis was made. Every data used in this analysis was first-hand information collected from the sample of interest. This chapter is divided into three parts based on the objectives of the study. The first part looks into the current demographic characteristics of the respondents, second part looks at the Health and Safety Practices of the construction sites at study, second part looks at possible hazards and accidents that may

occur and the last part looks at the structures to be put in place to avoid the situation from happen.

4.2. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Demographic characteristics of respondents took into account the gender of respondents, level of education and years of experience in construction works. This is to help the study get a general idea of the background of survey respondents.

4.2.1. Gender

The gender of the fifty (50) respondents was sought. From the pie chart in Fig 4.1, 85% of the respondents representing as much as 35 were males while the other 15 were females.

This is very striking as women in nowadays are known to be practicing skills that were thought for men. The study revealing more males than females presupposes that males are already in the profession and out weighing the females in constructional practices.

4.2.2. Educational Level

The educational level of the respondents was also sought. This is as shown on the column chart in Fig 4.2. Most of the respondents (22) were Advance Diploma and First Degree holders. This was followed by 4 respondents who were Master's degree holders. Three respondents had obtained diploma while 24 respondents each had obtained certificate and other professional qualifications. They are well educated to provide logical and accurate information on construction issues in the construction sites.

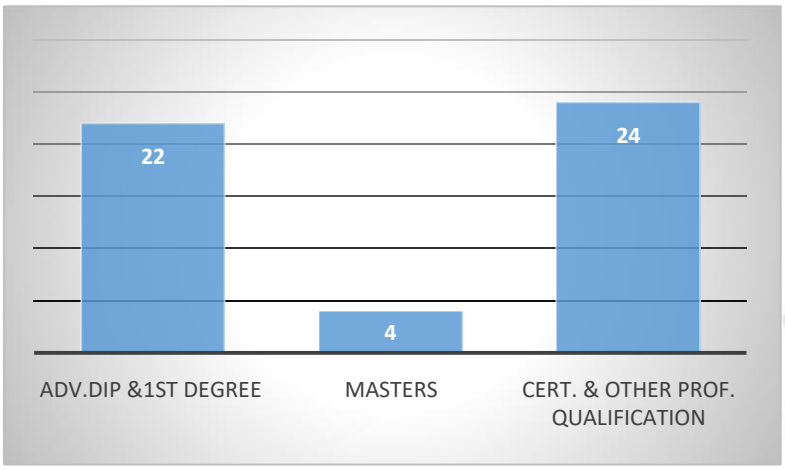

Figure 4.1. Level of education of respondents
Source: Field Data

4.2.3. Number of years of experience in constructional practices

From the figure 4.3 all workers at the five construction sites have had some years of experience in construction practices. Exactly 25 of the respondents had between five to ten years of experience in construction works. This was followed by 13 having had between three and five years' experience in the work. Only 12 of respondents had less than three years' experience in construction works. Fifteen of the total number of had more than ten years of experience in construction practice in all the five sites.

The above finding shows that more of the respondents have enough experience in construction works; therefore, issues of construction may not be as much challenging to them. This is so because experience they say is the best teacher. With their expertise, knowledge and experience in construction, they are bound to provide useful data for the study and better prepared for the solution to the health and safety with regards to Ghanaian construction sites.

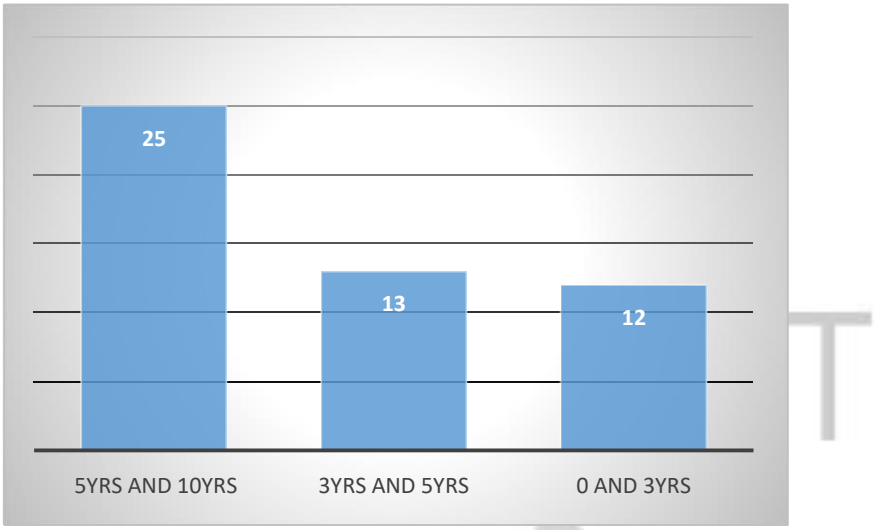

Figure 4.2. Years of experience in construction practice
Source: Field Data

4.3. CAUSES OF ACCIDENTS AT CONSTRUCTION SITES

The construction practice of the construction sites was considered important because that will give the indication of whether they would need and benefit from the results of the study. The traditional construction practices on less consideration of constructional health and safety.

In order to determine the relative ranking of the significant causes of all the respondents, (Tam *et al*, 2000 used: Relative Importance Index (RII).

CAUSES OF ACCIDENTS AT SITES

In this study, the respondents were asked to rate the causes of accident at site by using the scale of 1-4. Based on the response, ranking was done using the combination of Relative Important Index (RII) and mean score ranking. Where two (2) variables have the same RII, the one with the highest mean is ranked higher.

The results in the findings are shown in the table below.

Sector	Total	∑ W	Mean	RII	Rank
Poor planning at site	50	183	3.66	0.92	1
Falling of equipment	50	180	3.60	0.90	2
Poor usage of PPE	50	179	3.58	0.90	3
Unsafe working conditions	50	163	3.26	0.82	4
Poor handling practice	50	161	3.22	0.81	5
Lack of communication tools	50	151	3.02	0.76	6
Poor quality tool usage	50	148	2.96	0.74	7
Inadequate space at site	50	133	2.66	0.67	8
	50	84	1.68	0.42	9
Basic hygiene on site	50	74	1.48	0.37	10

Table 4.1. Causes of accidents at site Causes of Accidents in the Construction

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Nature of site

The following are the most critical causes of accidents at site

1. Poor planning at site
2. Falling of equipment
3. Poor usage of PPE
4. Unsafe working conditions
5. Poor handling practice
6. Lack of communication tools

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✓ **Poor planning at site**

Poor planning at site by the respondents was ranked as the very frequent factor that causes accident at site with RII value 0.92 and a mean of 3.66 and the results been 37 respondents rating very frequent, 11 respondents also rated frequent. It was only 2 respondents who rated not frequent and the rest of the respondents rated less frequent to confirm the validity of its happening. Due to the nature of most construction sites and more projects at site, also looking at the end product, the tendency of planning at a particular site tends to be reduced. Construction is like all other works, dangerous and hazardous in its operations. Therefore, there was the need to create concern of rampage in accident happenings.

✓ **Falling of equipment**

This was also ranked to be the second factor to be the cause of accidents at site. Falling of equipment can be in different forms, the placement of equipment at site, the usage of them, coverings of the equipment, therefore making it important to be sure all equipment are placed in good and secure position to prevent them from falling. This also came with a RII value of 0.90 and a mean of 3.60. The digest confirms the falling of equipment at the construction sites and this is an issue of concern and needs to be treated as such. It was also indicated that, employers must provide fall protection and

right equipment's for the work to be executed. It is therefore advisable to provide workers with the exact kind of materials to get the work done safely.

✓ **Poor usage of Personal Protective Equipment (PPE)**

Poor usage of Personal Protective Equipment was not so surprisingly to be ranked as the third factor to cause accident on site due to ignorance from both the workers and management to ensure its been used properly. Controlling an accident at its source is the best way to prevent it. Though poor usage of personal protective equipment had an RII value of 0.90, it is an equipment which is worn to reduce the exposure of different kinds of hazards and these includes, gloves, eye and foot protection. It was also noted that employers and employees need to understand the types of PPE, select the appropriate PPE for different circumstances.

✓ **Unsafe working conditions**

Unsafe working conditions with RII value 0.82 and a mean of 3.26 was ranked as the fourth factor to cause accidents on site. With the various sites visited, some conditions were laid down as some of the unsafe working conditions that were very common at sites. These include: walking behind, under or walking in the path of cranes or heavy equipment. When such activities are done, it exposes the worker to accident. Taking breaks and lunch should only be at a designated area.

✓ **Poor handling practice**

Poor handling practice brings about fatigues and also leads to injuries such as, neck, back, shoulders and other body parts. It was also identified that there are two major groups of injuries as a result of poor handling practice. Cuts bruises, fractures etc., due to sudden, unexpected events such as accidents. Poor handling practice by the

respondents achieved a RII value of 0.81 and a mean of 3.22. Most workers confirmed poor handling practices on tools and equipment which is very bad situation.

✓ **Lack of communication tools**

The effectiveness and efficiency of the construction process to achieve a great result mainly depends on the quality of communication. In view of the respondents, workers do not see construction communication as a major problem but however they admit it causes accident. It was also noted that, warning signs and other signage tools should be placed at vantage positions to warn pedestrians and workers on impending danger that will results in accident. Lack of communication tools by the respondents mad this be ranked as the sixth and with RII value 0.76 and a mean of 3.02.

4.4 LEVELS OF ACCIDENTS ON THE CONSTRUCTION SITE

This study also, the respondents were asked to rate the causes of accident at site by using the scale of 1-4. Based on the response, ranking was done using the combination of Relative Important Index (RII) and mean score ranking. Where two (2) variables have the same RII, the one with the highest mean is ranked higher.

The results in the findings are shown in the table below.

Table 4.2 Levels of accidents on site

Levels of Accidents	Total	∑W	Mean	RII	Rank
Falling victims	50	134	2.68	0.89	1
Incorrect use of electrical materials	50	120	2.40	0.80	2
Stepping on objects	50	119	2.38	0.79	3
Expose to extreme temperature	50	107	2.14	0.71	4
Caught in-between	50	106	2.12	0.71	5
Struck by falling object	50	105	2.10	0.70	6

✓ **Falling victims**

Falling victims by the respondents was ranked the most serious level or degree of accident on site with RII value 0.89 and a mean of 2.68. Falling victims were identified to be classified in two forms. External and internal. From the five (5) sites visited, external causes were dominant and they included: breaking of equipment while in use and resulting in balance lose and slipping as a results of wet floor**.** The internal causes include, hitting head against wall or object. Fall victims may also suffer from broken bones, internal bleeding, etc.

✓ **Incorrect use of electrical materials**

Electrocutions from high current lead to complete death. Workers under operation are cautioned to consider the correct and appropriate use of electrical materials at the construction site. Respondents ranked incorrect use of electrical materials with RII value 0.80 and a mean of 2.40**.** Electrical workers on site must pay special attention to electrical tools because if there is an exposure, it can bring about execution. Getting in physical contact with a high electricity voltage causes the flow of current to the body and this brings about electrical burns and shock. Serious injuries and most often death do occur as a result of this. Because electricity is part of our daily lives especially at site, care must be taken.

✓ **Stepping on objects**

Stepping on objects was reported by the respondents as objects been left on the floor after work or during work. It was also identified that stepping on sharp objects brings about injuries. Among the five sites, three sites were noted for accidents as a results of stepping on objects on sharp object as a results of the exposure. And this was ranked third in the levels of accident with RII value 0.79**.**

✓ **Expose to extreme temperature**

Extremely higher temperature contact to human body could lead unhealthy conditions with regards to the workers at the construction site. The findings brought out that occupational exposure to extreme temperature may increase the risk of cancer. It was also noted that extreme temperature brings about skin disease. Expose to extreme temperature was ranked based on the RII value 0.71 and a mean of 2.

✓ **Caught in-between**

Accidents do happen due to traps. The workers under operation may find themselves caught in-between objects at the construction site. Pieces of equipment which are not properly adjusted, rotating objects, also brings about caught in between. It was also known that loosed clothing and other loosed items can also cause caught in between accidents, therefore there is the need to tighten all clothes and items before use. This also had a RII value 0.71 and a mean of 2.12.

✓ **Struck by falling object**

Construction workers based on the findings are at risk of being struck by objects from above. It was also noted that, when construction materials are not properly secured above, it brings about the fall. The most common injury given by the respondents was spinal injury. Struck by falling objects had an RII value 0.70 and a mean of 2.10.

4.5 STRATEGIES FOR CURBING INEFFECTIVE SAFETY MANAGEMENT

In this study, the respondents were asked to rate the causes of accident at site by using the scale of 1-4. Based on the response, ranking was done using the combination of Relative Important Index (RII) and mean score ranking. Where two (2) variables have the same RII, the one with the highest mean is ranked higher.

The results in the findings are shown in table 4.3 .

Table 4.3 strategies for curbing ineffective safety management

Strategies for Curbing Ineffective Safety Management	Total	∑W	Mean	Standard Deviation	RII	Rank
Emergency planning	50	185	3.70	0.948	0.93	1
Effective implementation of preventive system	50	183	3.66	0.746	0.92	2
Effective monitoring on site	50	182	3.64	1.657	0.91	3
Participation of management in accident investigation	50	172	3.44	0.542	0.86	4
Safety planning	50	165	3.30	0.839	0.83	5
Training and education on health and safety	50	163	3.26	1.193	0.82	6
Alcohol and drug testing	50	159	3.18	0.818	0.80	7
Measurement of performance and assessment	50	156	3.12	1.124	0.78	8
Reward and acknowledgement	50	125	2.50	1.554	0.63	9

✓ **Emergency planning**

Asides the high benefits of rendering guidance in cases of emergency, developing the plan has other advantages. Unrecognized hazardous conditions that will aggravate emergency situations can be eliminated. The planning process also exposes short comings like lack of items that can be rectified before an accident occurs. The overall objective of emergency planning is to prevent fatalities, reduced damage to buildings, protect the environments among others. Installation of emergency alerts at the site to reduce disasters and fatal accidents were perceived. RII value 0.93, Standard Deviation 0.948 and a mean of 3.70.

✓ **Effective implementation of preventive system**

It is important to use appropriate PPE at adequate times. Management will do more good when right tools are used for the right job at the right time. A RII value 0.92, Standard Deviation 0.746 and a mean of 3.66 was obtained. It is therefore important to

employ the services of skilled and trained personnel's instead of armature ones and also accidents prone sites should be well restricted.

Provision of adequate protective clothing to workers fully under operation is essential in preventive systems also protective clothing must be available that even security personnel should be given to wear. This is because it serves as the primary security to the host. The adequate provision of the clothing will make workers look genuine and also promotes health and safe condition to the users.

✓ **Participation of management in accident investigation**

It was recorded that, when top management participates in the investigation of injuries and accidents it will be able to decrease the rate of accidents in their firms. When managements are involved, the following measures can be putted in place appointment of safety staff. Ensuring adequate training for staff, budgets are prepared for safety and managed accordingly, ensures the adequate provision of cost and time of safety measures. Based on that, respondents ranked this with a RII value 0.86, Standard Deviation 0.542 and a mean of 3.44

When managements are involved, the following measures should be structured well:

- Appointment of safety staff.
- Ensuring adequate training for staff
- Budgets are prepared for safety and managed accordingly.
- Ensures the adequate provision of cost and time of safety measures.

Peyton and Rubbio (1991), stated that the US Occupational Safety and Health Administration has outlined some basic element for a better safety program.

They are:

- Management should always be fully committed to safety above all issues.
- Safety program and education should always reflect the size of the project.
- It is better to clearly state the responsibilities of safety.
- There should be a cordial open communication between management and workers
- Adequate funds should be allocated for safety programs ▪ Leadership by example. All management needs to be involved.
- Employees also needs to participate.
- Discipline programs must also be stated clearly.

The need to periodically review safety performances

✓ **Safety planning**

The planning of safety at the site would reduce accident rates. It was induced that, when safety is critically planned, it helps reduces the rate of accident. If measures are put in place, the working environment become conducive for all. Safety planning obtained an RII value 0.83, Standard Deviation 0.839 and a mean of 3.30 and the results been 5 respondents rated not important, 5 respondents rated less important, 10 respondents rated important and 30 respondents rated

Management should encourage workers to abide by constructional safety rules and regulations. This alone could reduce the increase rate of accidents at the construction sites. Establishment of penalties could also let operators and other workers bond to it better.

Also implantation of safety indicators at working areas should be installed so as safety notices and warning lights and alarms at the construction sites under operations. This is to promote safety grounds for the workers and their management at the site.

✓ **Training and education on health and safety**

Since education is the key to success and training promotes accuracy, the study identified that educating work personnel on the hazards of the job on site and ways of preventions goes a very long way to eliminating accidents. Example, been educated on how to handle sharp tools and equipment can help prevent serious injuries. This also obtained a RII value 0.82 and a mean of 3.26

Training employees in their field of skills improve efficiency and efficacy with less accident risk. Training will not only sharpen their sense of caution but also helps in preventing conditions of workers' ignorance that will lead to accident.

In addition, there will be the need to organize periodic workshops and seminars for workers in general There must be period workshops and seminars on constructional health and safety especially for the operators of machinery and other labourers that are either skilled or even unskilled ones. Such trainings will make them regard health and safety issues in construction work.

✓ **Alcohol and drug testing**

Alcoholic beverages and drugs when taken into the human system may change behavior that may lead to accidents. On the construction site, it is of great importance to check by testing regularly for excessive alcohol and abuse of drugs on personnel before and after work to ensure safety of all. Respondents ranked this with a RII value 0.80, Standard Deviation 0.818 and a mean of 3.18**.**

✓ **Measurement of performance and assessment**

Measurement and evaluation of performance provides periodic records and digest for future references. This would also provide proper accounts on health and safety at the construction site. Respondents ranked as the very frequent factor that causes accident at site with RII value 0.78, Standard Deviation 1.124 and a mean of 3.12.

✓ **Effective monitoring on site**

Site monitoring promotes operational effectiveness and efficiency in every industry. This would also safeguard the multi-operational activities carried-out at the construction site. Respondents ranked as the very frequent factor that causes accident at site with RII value 0.91, Standard Deviation 1.657 and a mean of 3.64.

This question was an open ended and the respondents were able to express their minds. Several suggestions were given by the respondents as to help curb the situation at hand. The information provided by respondents were all in line with curbing the problem the construction sites are experiencing. Through analysis the following comments were taken from the 50 responses;

- The management should install more of safety indicators like alarms, warning lights and warning notices at working areas. Faulty machines are also to be indicated to alert operators.
- Companies are to provide adequate safety tools and equipment to carry out operations at the construction sites.
- There should be more of protective clothing to workers fully under operation and even more as surplus.
- Disposal units should take much in the act of disposing waste at construction sites to pose more poisonous chemicals to the environment.

- Sites allocated for construction must be very firm and friendly for living.
- The management must establish reward and acknowledgement to motivate workers periodically.
- Effective monitoring must be introduced to check health and safety status at the construction site.
- Regular check on alcoholism and drug abuse must be adopted on the construction workers.
- Training and education on health and safety must be organized for the construction workers periodically.

 Legal framework on health and safety with regards to construction must be enforced by law.

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CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter brings to bare the conclusions and recommendations of the study which are to address the main findings derived from all the analysis in view of the objectives of the study.

The objectives of this work was to examine the possible effects caused by ineffective management of safety at the construction sites, also to determine the level of accidents caused by ineffective management of safety at the construction sites and finally to identify and develop strategies to curb ineffective management of safety at the construction sites.

5.2 ACHIEVEMENT OF THE RESEARCH OBJECTIVES

The aim of this study was to recommend strategies for curbing ineffective management of safety on the construction site.

In order to achieve the above aim, some objectives were set which are:

1. To identify the possible causes of accident as a results of ineffective management of safety on the construction sites.
2) To determine the level of accidents caused by ineffective management of safety on the construction sites, and
3) To identify strategies to curb ineffective management of safety on the construction sites.

OBJECTIVE ONE (1): To identify the possible causes of accident as a result of ineffective management of safety at the construction sites.

In view to achieve this objective, an extensive literature review was conducted and found by other researchers, Lancaster *et al.* (2003), HSE, (2004), Ferret and Hughes, (2007), Hinze and Russel, (1995), Krripendriff (2004).

There were also some other causes identified and structured into a questionnaire to be rated by respondents. The data was later analyzed and ranked using the Relative Important Index. The causes include:

- Poor planning at site
- Unsafe working conditions
- Falling of equipment
- Inadequate space at site
- Lack of communication tools
- Poor handling practice
- Poor usage of PPE
- Basic hygiene at site
- Nature of site and
- Poor quality tool usage

OBJECTIVE TWO (2): To determine the level of accidents caused by ineffective management of safety at the construction sites

The level of accident was also achieved by ranking the seriousness in the types of accidents. Firstly, the various types of accidents were identified and structured into a

questionnaire to be rated by respondents based on the scale of Not serious, Moderate and Serious. The data was later analyzed and ranked using the Relative Important Index. This included:

- Falling victims
- Stepping on objects
- Struck by falling objects
- Expose to extreme temperature
- Caught in-between and
- Incorrect use of electrical materials

OBJECTIVE THREE (3): To identify strategies to curb ineffective management of safety at the construction sites.

The said objective was also achieved by conducting an extensive literature review by other researchers, such as; Construction Industry Institute, (2003), Beach (2000), Davies and Tomasin, (1996), Huang and Hinze, (2003), etc.

Some other strategies were also identified and structured into a questionnaire to be rated by respondents. The data was later analyzed and ranked using the Relative Important Index. The strategies include;

- Emergency planning
- Effective implementation of preventive system
- Effective monitoring on site
- Participation of management in accident investigation
- Safety planning
- Training and education on health and safety

- ❖ Alcohol and drug testing
- ❖ Measurement of performance and assessment and ❖ Reward and acknowledgement.

5.3 SUMMARY OF FINDINGS

All the five studied construction sites do conduct heavy-duty operations and construction experts with a minimum qualification, Technician Certificate. It was also known that the workers are of more experience and very competent with their roles in the management. It was noted that the construction companies are registered, tender in contracts and come out eventually as winners based on the various works to be executed.

Based on the answers given, it can be indicated that respondents have knowledge about safety issues with regards to construction works. Although, the construction sites practice safety measures, they recorded less frequency for the general information on constructional health and safety. This is as a result of inadequate managerial skills to support safety conditions at the construction sites. Workers also ignore safety indicators and do not apply them during operations. Survey invitees showed their readiness to adopt change by expressing their views as to explain how the new plan could be initiated, perceived benefits and a whole lot. The infrastructure (safety tool and equipment) available can strongly support the strategic solution as the opinion has been confirmed by the literature review. Literature survey was conducted on health and safety principles and the outcome was analyzed in the chapter four of this study. A strategy has been developed for proper management on safety adoption in the construction sites of the Greater Accra Region. The developed strategy will therefore provide guidelines for health and safety adoption and implementation. The strategy

shows all what it takes to start the process adoption by determining the organizational current status and readiness for accident and illness solutions, perceived benefits, in terms of cost and strategy implementation, required training for the construction practitioners, suitable resources for the process integration and a legal framework that will protect both the worker and the management of the construction industry.

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5.4 CONCLUSION

The results of this study have shown that construction activities by the construction sites of the Greater Accra are done but needs a touch up on health and safety procedures. Despite the years of experience of the construction experts and the experiences acquired by most workers, they are affected in cost terms and efficiency of the activities due to the disregard of the health and safety regulations governing constructional practices. There are structures and resources in place to support health and safety practices. Infrastructures were adequate and strong enough to support health and safety operations. The infrastructure that the construction sites have can support the health and safety adoption since they could be involved in the safety planning that adequacy of safety equipment could be used for the management of health and safety.

Except the integration of strategic ideas, which is not most often currently applied to the resources available to them. A coalition of studies deeply involved in the health and safety process of public and private constructions, has joined together on a set of common principles addressing the use and impact of health and safety measures in the construction works worldwide.

The related studies of this study acknowledge that the advent of health and safety, offers an unprecedented opportunity to reduce incidental costs and increase efficiency for the contractor. Such strategy, however, must be open, interoperable and approved to

safeguard the integrity of a construction worker and his immediate environment. Further, any process should not affect the legal rights and responsibilities of construction managers and contractors. This study serves to establish common parameters for all construction companies to adopt the strategy.

5.5 RECOMMENDATIONS

The work is aimed at recommending strategies for curbing ineffective management of safety at the construction site and it is revealed that although construction sites do engage in an amount of safety measures, workers ignore and fail to apply the measures needed. Therefore, various recommendations are made. Below are some outline recommendations:

a) ***Application of all-inclusive safety programs***

It was revealed from the findings that, when all stakeholders are involved in decisions of safety it helps curb ineffective management of safety. According to Fales (1990), wide-ranging safety programs such as risk assessment can be undertaken often to guarantee that the prevailing controls, trainings and precautions are still executing their preferred roles. If executed will fundamentally help achieve what was anticipated to directly result in improved efficiency and proper study of an accident (Adei and Kunfaa, 2007). Koehn *et al.* (1995) adds that, in order to beat down the economic risk, institutional support for safety programs in nations should be seen as a financial need since accidents have been revealed to be costly to the contractor.

b) Training and education on safety

It was noted in the findings that, management ignore periodic training because of the different projects that needs to be executed and complete on time.

Training employees in their field of skills improve efficiency and efficacy with less accident risk. Training will not only sharpen their sense of caution but also helps in preventing conditions of workers' ignorance that will lead to accident.

It is therefore recommended to organize periodic workshops and seminars for workers in general.

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c) Provision of updated safety records

From the findings, three out of the five companies lacked safety records and that in itself was a reason for mismanagement of safety. According to Dorji and Hadikusumo (2006), there is a prerequisite for a more active and well-organized primary data gathering base at post. This may perhaps be likely supply even data recovery forms and systems to organizations. Without proper updating of the safety records, the impact of accidents on sites cannot be examined in social and financial terms.

d) Effective monitoring on site

Since the study also revealed some causes of accident, it is recommended that management undertake effective monitoring on sites to identify and solve pertaining issues on site. Effective site monitoring promotes operational effectiveness and efficiency at site.

e) Alcohol and drug testing

It was identified in the studies that, some workers prefer going about their working duties under the influence of drugs and alcohol due to the ideology of executing more work. It is therefore of great importance to conduct and check by testing regularly for excessive alcohol and abuse of drugs on personnel before and after work to ensure safety of all.

In addition, there is the need to develop strategies to curb them and are as follows:

The developed strategy to curb the ineffective management on safety at the construction sites starts with total awareness of the problems the construction sites are facing. For the construction sites to adopt the developed strategy, they must therefore check their status and readiness for the implementation of the system. If the analysis is affirmative, they can proceed on and if not, then they have to update their system to admit the new ways of constructional proceedings. For the process to continue there should be another analysis on the perceived benefits followed by the acquisition of resources which can enhance effective operations so far as construction is concern. There should also be education for workers, operators and management team for the proper running of the proposed strategy. The strategy to be used must be well planned to save cost from other resources. The client awareness and education is also relevant because of their involvement in the project to be constructed. The strategy should be tested and assessed to know its strength and weakness. Legal framework should therefore be put on the system if the process proves right.

The building blocks used in the strategy developed was therefore taken from the analyzed collected data in this section. The answers given were very sufficient to develop the strategy to curb the situation at hand.

5.6 PROSPECTIVE RESEARCH

With the bid to sustain the progress of safety in the construction sector, the following are recommended for prospective research work.

- Establishing the cost implication of ineffective Health and Safety management.
- In-depth research on the laws allocated for safety in the construction sector.

- An investigation into the incidence of ill health within construction small scale enterprises in Ghana.
- Alcohol and drug as an instrument of accident in the construction industry.

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APPENDIX

SURVEY QUESTIONNAIRES

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF BUILDING TECHNOLOGY

STRATEGIES FOR CURBING INEFFECTIVE MANAGEMENT OF SAFETY ON CONSTRUCTION SITE

Dear Sir/Madam

This questionnaire forms part of an MSc Construction Management research project and aims to recommend strategies for curbing ineffective management of safety at construction site.

This research is expected to help improve health and safety management at site. This questionnaire will take an estimated time of about 6 minutes to complete.

I appreciate your busy schedule and will be grateful if you could make time and contribute by providing some important information to this survey. All data received is strictly for research purposely and will be treated as confidential.

Yours faithfully

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
KUMASI

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF BUILDING TECHNOLOGY

QUESTIONNAIRE

This questionnaire aims to recommend strategies for curbing ineffective management of safety at construction site. **Please kindly tick (√) the appropriate box** for each item beside the questions. **All data received is strictly for research purposely and will be treated as confidential.**

SECTION A: BACKGROUND OF RESPONDENT

1. Profession……
   ……
2. Name of Company……
3. Please tick the appropriate box to indicate the level of your Education and/or Professional qualification

   [ ] Certificate level [ ] Diploma

   [ ] Advance diploma/First degree [ ] Masters Degree

   [ ] Other Professional qualification: Please State……
4. Please indicate your years of experience in constructional practices?

   [ ] Less than 3 years [ ] between 3 and 5 years

   [ ] Between 5 and 10 years [ ] More than 10 year

   [ ] Not Applicable

SECTION B: CAUSES OF ACCIDENTS AT SITES

Using the scale of **1= Not frequent, 2= Less frequent, 3 = Frequent and 4 = Very frequent,** rate the following causes of accident in the construction industry.

	Causes of Accidents in the Construction Sector	1	2	3	4
1	Poor planning at site				
2	Unsafe working conditions				
3	Falling of equipment				
4	Inadequate space at site				

5	Lack of communication tools				
6	Poor handling practice				
7	Poor usage of PPE				
8	Basic hygiene on site				
9	Nature of site				
10	Poor quality tool usage				
11	Other (please specify):				

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SECTION C: LEVELS OF ACCIDENTS ON SITE

Using the scale of **1 = Not serious, 2 = Moderate, 3 = Serious,** indicate in your opinion the degree of seriousness of the following types of accidents on site.

	Types of Accidents	1	2	3
1	Falling victims			
2	Stepping on objects			
3	Struck by falling object			
4	Expose to extreme temperature			
5	Caught in-between			

6	Incorrect use of electrical materials			
7	Other (please specify):			

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SECTION D: STRATEGIES FOR CURBING INEFFECTIVE SAFETY MANAGEMENT

Rating on a scale of 1 - 4 please tick the appropriate cell the importance of the following strategies in curbing ineffective health and safety management.

1 = Not important, 2 = Less important, 3 = Important, 4 = Very important

	Strategies for Curbing Ineffective Safety Management	1	2	3	4
1	Participation of management in accident investigation				
2	Safety planning				
3	Training and education on health and safety				

4	Effective implementation of preventive system				
5	Alcohol and drug testing				
6	Reward and acknowledgement				
7	Emergency planning				
8	Measurement of performance and assessment				
9	Effective monitoring on site				

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