KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

IMPROVING SAFETY PERFORMANCE OF GHANAIAN BUILDING CONTRACTORS

BY

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DECLARATION

I declare that I have fully undertaken the research reported herein under supervision and that where other scholarly works were utilized, they have been duly acknowledged.

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DEDICATION

This dissertation is dedicated to my mother, Margaret Nortey and my father Jellister Amarh for their prayers and support.

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ABSTRACT

The Construction industry plays a major role in any economy and its activities are also vital to the achievement of the socio-economic development goals of providing shelter, infrastructure and employment. However, the construction industry is also recognised as an accident prone industry in Ghana. The interest in safety awareness among construction companies has greatly increased in the past decade. The ever-increasing cost of medical treatment and the potential for lawsuits can lead to higher insurance premiums, which in turn tend to have a negative impact on a company's profit. Safety in construction sites is a major concern in Ghana, however little research has been conducted into the subject. The study is aimed at improving safety performance of Ghanaian class D1K1 contractors. Sixty three factors affecting safety performance of large construction firms were identified from international literature and grouped into twelve major categories. A questionnaire survey was conducted on class D1K1 Ghanaian Construction firms in Accra and the collected data was analysed by using Statistical Package for Social Sciences (SPSS) to obtain the importance index and thus rank the safety performance factors. It was concluded that the most important factors affecting the safety performance of Ghanaian class D1K1 contractors in order of hierarchy are Administrative and management commitment towards safety, giving staff and site workers safety education and training, the role of Government and other Engineering societies and finally conduction of regular safety inspections by the site safety officer. The recommendations made were that, all top managers down to the line of supervisors must prioritize the safety of workers the same way they prioritize work quality and productivity and also the Government should enforce laws governing health and safety, employment, and rights of site workers and should also put punitive measures in place to deter Contractors from violating safety regulations

Keywords: Safety performance, construction industry.

Contents

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND INFORMATION

Currently, the construction industry contributes a major economic force in all parts of the world. The Construction industry plays a major role in any economy and its activities are also vital to the achievement of the socio-economic development goals of providing shelter, infrastructure and employment (Anaman and Osei Amponsah, 2007) as cited in (Danso, 2010). However, the construction industry is also recognised as an accident prone industry in Ghana. An accident is an unexpected happening that results in injury, loss or damage. Some accidents are minor, such as getting a splinter in your finger. Other accidents are serious, causing severe property damage, personal injury or even death (Fales, 1990).

The reasons the construction industry is risky and prone to Health and Safety risks are: the physical environment of work, nature of construction work operation, construction methods, construction materials, heavy equipments and physical properties of construction project itself. The annual toll of accidents in the construction industry is high, in terms of both cost and human suffering. Nevertheless, the financial consequences of accidents are an important matter to the construction industry and for an individual contractor.

Developing a proactive safety culture might take a long time and require spending of large sums of money for planning, investigating and implementation. However, it is worthy of being compared with the invaluable life and health of human beings. Once it succeeds, the relative rewards will be achieved in terms of competitive advantage, quality reliability and profitability within an organisation (Hassan et al., 2007).

To reduce the high rate of hazards, proactive construction personnel in the industry may need to take further steps to identify and eliminate the causes of accidents on job sites. Safety is a major concern in the construction industry. While the potential for accidents exist in any business, the nature of construction increases the possibility of accidents. (Fales, 1990).

The two safety issues that most concern construction workers are safe working environments and building structures that are safe for people to inhabit or use. Hinze and Wilson (2002), found that, "many construction firms have begun considering safety to be one of the main factors in reducing costs associated with work related-accidents and injuries, but by also contributing to projects being delivered within budget and on time.

The reason why effective Safety practices contributes to a "within budget" project delivery for construction companies is that, accidents have high direct and indirect costs and management can control these costs. The direct costs include medical costs and other workers' compensation insurance benefits. For most construction companies, the direct costs of accidents are not fixed. They vary depending upon each company's own accident experience. Although the costs of accidents are not highlighted by typical cost accounting systems, they come back to haunt a company in subsequent years through increased workers' compensation premiums. For construction companies with very poor safety records, these increased insurance premiums can be so expensive that they render a company sufficiently non-competitive to put it out of business.

Indirect or hidden costs are the other-and larger-part of the economic burden imposed by a poor accident record. One large part of these costs is liability claims from injured workers who sue contractors for additional payments beyond their workers claims costs. There are also many

indirect costs of accidents such as, reduced productivity, job schedule delays, added administrative time, damage to equipments and facilities, lowered worker morale, and also, less tangible but very real, costs of human suffering (Levitt and Samelson, 1993).

It is important that an emphasis on safety be recognised or even be accepted as being principle means by which injuries can be reduced. If safety is emphasized, the occurrence of injuries can be expected to be low and, conversely, if no emphasis is placed on safety, the occurrence of injuries can be expected to be high (Hinze and Wilson, 2000) as cited in (Meltz, 2009).

Even though there has been a marked reduction in the number of industrial accidents, the level of awareness and practicability of such regulations within the society of construction industries are generally lower than expected or desired. Although construction work has become safer, there is still much to be accomplished. Since there is now a strong concern for safety in the construction community, one can hope that further improvements will continue to reduce the numbers of fatalities and serious injuries in the industry.

1.2 PROBLEM STATEMENT

According to Armstrong (2006), thousands of people are killed at work every year and several hundred thousands more are injured. It is also estimated that apart from the pain and misery caused to those directly or indirectly concerned, the total cost to employers of work-related injury and illness exceed £4 billion a year. The complex nature of the construction industry in Ghana makes it vulnerable to potentially dangerous conditions that affect the safety of all personnel working on construction projects in the industry. Construction is a relatively high accident rate prone industry. Based on the world's statistics, the accident rate in the construction industry is almost three times higher than that of the manufacturing sector (Sengupta, 1999).

With continuing high work related injury and illness rates in the construction industry, the identification of safety practices, will help reverse such high rates. Such safety practices that are successful in accomplishing low injury rates will lead to increased safety performance in the construction industry.

1.3 AIM AND OBJECTIVES

The aim of the study is to improve safety performance of Ghanaian Building Contractors through practical recommendations.

The objectives are to:

1. Identify the safety performance level of Ghanaian Building Contractors.
2. To determine the underlying causes of the established performance levels.

1.4 RESEARCH QUESTIONS

This study sought answers to the following research questions:

- What are the factors influencing safety performance levels of Ghanaian Building Contractors?
- To what extent are these factors evident in influencing the safety performance levels in various organisations?

1.5 METHODOLOGY

The research employed a range of complementary research methods over three phases. In the Preliminary phase, background information on Safety in construction was gathered through literature. This helped develop a theoretical framework capturing the key issues relevant to the industry. Following this, close ended questionnaires were developed for collecting data from the fieldwork. The third phase of the research focused on analysis using, Statistical Package for Social Sciences (SPSS), which helped collate and interrogate the large volume of data collected during the research. The methodology was predominantly quantitative due to the fact that findings were expressed in figures, tables, charts, graph and the like, directed at developing a deeper understanding of the safety issues faced by Ghanaian Building Contractors.

The targeted respondents were construction managers and Health and Safety officers. A total of twenty five class D1K1 construction firms in Accra were targeted to respond to a set of close ended questionnaires and the main information sought from these respondents were on :

- How frequent accidents occur on their sites and the extent of damage such accidents caused.
- The level of importance they give to identified factors that influence safety performance

The questionnaire were distributed and retrieved in person, whiles RII was used in ranking some of the Safety issues that evolved. Relative frequency and percentages were used to determine occurrences and the magnitude of the safety issues.

1.6 SCOPE OF STUDY

The research was limited to selected class D1K1 Ghanaian Building Contractors in Accra registered with the Ghana Cocoa board. The study was further delimited to only health and safety issues and did not consider other welfare and environmental issues.

1.7 DISSERTATION STRUCTURE

The study was organised into five chapters:

- Chapter one was the general introduction of the study and it also entailed, the statement of problem, Aims and objectives of the study, and also the methodology of the study.
- Chapter two dealt with the literature reviewed on safety in the construction industry.
- Chapter three dwelled on the methodology that was used to conduct the research
- Chapter four captured the data analysis, discussions and representation of results
- The final Chapter, Chapter five covered conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 OVERVIEW OF GHANAIAN BUILDING CONSTRUCTION INDUSTRY

The construction industry, is defined as a group of firms with closely related activities involved in the construction of real estates, building, private and public infrastructure (Anaman et al., 2007). The construction industry can be broken down into two very broad categories, General Building Construction and Engineered Construction. Most construction contractors concentrate on one of these categories, or even on a specialty within one of them. A third category of contractor is the speciality trade contractor, who usually works as a sub-contractor for a general or prime contractor responsible for the construction of the entire project (Bennet, 2003).

The construction industry has traditionally consisted of three primary participants: The owner (or customer), the designer /engineer, and the contractor. The basic construction process occurs like this: the owner hires an architect / engineering firm to design the project and places the project out for bid to contractors(competitive building process) and the contractors perform the actual construction work (Loushine et al., 2007).

The construction industry also deals with all economic activities directed to the creation, renovation, repairs or extension of fixed assets in the form of buildings, land improvements of an engineering nature and other such engineering constructions such as roads, bridges, railways, ports, dams.etc.

In Ghana, Civil Engineering firms undertake some of the aforementioned projects which involves heavy Engineering characteristics such as bridges, roads, railways and dams, whiles the

Building Construction Firms (BCF) also undertake projects such as the construction of schools, hospitals, health centers, hotels, offices.etc.

The Ghanaian building construction firms comprises of a large number of enterprises of various sizes as registered and categorised by the Ministry of Water Resources, Works and Housing (MWRW&H) as D1K1, D2K2, D3K3 and D4K4. Based on factors such as annual turnover, equipment holding, personnel, the D1K1 class of contractors are termed as larger firms, whereas D2K2 construction firms are medium and D3K3 and D4K4 are small firms (Edmonds et al., 1984). The larger firms, according to MWRW&H are registered as financial class 1, capable of undertaking projects of any value, class 2 (the medium firms) are capable of undertaking projects up to US$500,000 or GH¢750,000.00, while the small firms (financial class 3) are also capable of undertaking projects up to US$200,000 or GH¢ 300,000.00 or class 4 to undertake projects up to US$75,000 or GH¢112,500.00 (Danso, 2010).

The Ghanaian construction industry also contributes a major economic force because it creates job opportunities for both literates and illiterates in our society. The diverse activities of the construction industries makes it very dependent on the use of manpower (skilled and unskilled) thus makes the issue of health and safety key.

2.2 CONSTRUCTION ACCIDENTS

The construction work site is usually a busy place with incredibly high activities on going. The accident rates closely correlate to the level of activity within the industry, indicating that when work load is high, safety tends to receive less attention. The dangers faced by construction workers are alarming. The rate of death of workers is higher in construction industry than any

other industry. Moreover, construction industry presents a high rate of death by injury. Although construction represents only 6% of US workers, it produces 20% of the fatalities (El Safty et al., 2012). Job accidents impose on the construction industry a tremendous burden of needless and avoidable expense.

2.2.1 International Construction Related Fatality Statistics.

The number of fatalities at work in the construction sector remains a matter of serious concern for the Government, employers and employees alike (Safety and Health Act, 1999). Statistics on fatalities generally places the construction sector as the second highest industry, only surpassed by the agricultural sector. Among the most common sources of fatalities in construction, falls from heights is the category that accounts for the highest proportion of deaths.

The Health Safety and Environmental Act (2001), reports that the European average fatality rate in construction was 13.3 per 100,000 workers in 1996. In contrast with that figure, the HSA (1999), has reported a rate of 8 fatalities for 100,000 workers for the Republic of Ireland in 1996. Although under the European average of fatalities, Ireland still shows a higher incidence than countries as France, the United Kingdom or Spain.

Brabazon et al. (2000) as cited in McDonald and Hrymak (2001), looked at the rate of fatalities between 1993 and 1998. For the primary building trades, the rate was 1 in 11,000 per year. This is below the HSE intolerable risk criterion of 1 in 1000 and HSE guideline of 1 in 10,000. However, scaffolding trades (1 in 5,400), roofing trades (1 in 3,800), steel erectors, bar bending and structural trades (1 in 3000) were above the HSE's guideline. Again, they noted that since the Construction Design and Maintenance Regulations were introduced in the UK in 1994, the

overall fatality rate had decreased by 10%. However the downward trend in the number of injuries on construction sites is now slowing.

Davies & Tomasin (1996) reported that 70-80% of all fatalities in the UK each year are attributed to falls. Falls from one level to another, falls on the same level and plant machinery and structures falling and striking, crushing or burying people were accounted for that percentage. On the other hand, when considering only the category "falls of people," 52% out of the 681 construction-related deaths between 1981 and 1985 were in this category.

In spite of regulatory activity and social partner initiatives, the number of fatalities related to construction in Ireland has generally increased since the 1990's (HSA, 2000). This increase has taken place against a background of rapid expansion in the construction industry. Since 1992 the numbers involved in the construction industry has more than doubled to 166,300 in 2000 (Construction Industry Review, 2001) cited in (McDonald and Hrymak, 2001).

During the period 1991-1999 a total of 125 construction related fatalities occurred across all work sectors in the Republic of Ireland (HSA, 2001). These fatalities accounted for 22.4% of the total work related fatalities across all sectors during that time period.
The most common cause of fatalities to workers in the construction sector over the past nine years were falls from heights (49.6%). Broken down, this figure reflects falls from or through roofs (17.6%), ladders (12.0%), scaffolds (11.2%), openings or stairways (4.8%), and others (4.0%).

Berg (1999) attributes falls as the leading cause of deaths in construction worldwide. Bergs states the percentage of fatalities from falls on German construction sites accounts for 50% of all fatalities in that work sector.

Cattledge et al. (1996) analysed construction fatality rates in the United States between1980 and 1989. They found that 49.6% of all occupational related fatalities due to falls occurred on construction sites. Also in America, (McVittie, 1995) compared the percentage of fatalities from falls to a different elevation on construction sites in Ontario (Canada) and the United States. In Ontario, between 1988 and 1992, 40% of all fatalities on building sites were due to falls, while that figure was of 30% for the United States for the period between 1985 and 1989.

2.2.2 Construction Related Fatality Statistics in Ghana

In 2000, the labour department reported that, the construction industry in Ghana accounted for the highest rate of occupational deaths as compared to other industrial sectors. According to the Labour Department (2000) report, 56 out of a total of 902 occupational accidents that occurred in construction were fatal and 846 were non-fatal (Laryea et al., 2010). According to Danso (2010), Kumasi (The regional capital of the Ashanti region, Ghana) alone recorded 160 construction fatalities from 1998 to 2008. In 1998, the number of construction reported accidents was 16. In 2000, it had picked up from 23 and peaked to 32 in 2003. This industry experienced a constant increase of 42 from 2004 to 2005.this remarkable consistency increased to 50 in 2006. In 2007, it had picked up again from 46 to 64 in 2008.Following the emergence of Ghana, an oil producing country, the number of accidents is likely to increase because of the number of on-going construction projects.

2.3 ACCIDENT CAUSES AND TYPES

Kripendirff (2004), found the following to be causes of accidents and the common types of accidents on Construction Sites:

Casualty error: This category includes all the actions, behaviors, omissions or misjudgments of the person who was injured in the accident. Examples in this category include: accepted poor kit, alpha sleep, carelessness, poor planning, human error, ignorance of wear limits, low self-respect, poor grip, poor observation and unsafe manual handling. Casualty error led to the following accidents slips on rough and wet grounds.

Work method: This category includes the procedures and/or techniques employed to execute the activities. Examples in this category include: mini-crane not properly fitted; poor practice – failure to use lifter; poor practice - manual handling; unsafe loading practice; unsecured shoring; and used tow-bar as a step. This led to the following accidents, cut hands whiles lifting, burn to wrist by electric flush from lose lead.

Poor quality kit: This category includes all situations in which defective and/or poorly maintained tools and/or equipment contributed to the accident. Examples in this category include: degraded cable; grinding disc in poor condition; fault with pump starter; grinder not maintained; and poor maintenance. This led to the following accidents, dust into eye and back strain when lifting.

Poor health: This category includes existing health conditions that contributed to the accident. In this category, there was only one case of arthritis that led to a back injury.

Site set up: In this category, all issues relating to how the site was set out and organised are included. There were two cases in which traffic cones were not placed in the right places and injuries occurred as a consequence.

Site conditions: This category includes the physical attributes of the site such as slope, dust and mud as well as the weather conditions such as wind and rain. The category also includes features of the site such as unprotected/unsecured temporary structures. Site conditions led to the accidents described thus:

- Fall through scaffolding ladder access gap and broke collar bone;
- Roping sprayer on back of truck - pulled rope, slipped and twisted knee;
- Walking over bank, slipped and pulled knee ligaments; and
- While lifting a manhole cover, foreign object got in eye.

Plant operator error: This category includes actions, behaviors, omissions or misjudgments of the plant operator. Examples in this category include low safety consciousness, poor judgment and unguarded machinery. Plant operator error led to the accidents described here:

- 4-inch cut from sanding disc to leg;
- Hit by dumper bruising legs;
- Operative was run over by 3.5 ton dumper, sustained serious injuries;

- Roller rolled back off low loader and broke ankle;
- Runway paving machine hit vehicle and vehicle injured foot;
- Slipped off tow-bar and broke bone while hitching up trailer; and
- Struck from behind by waste moving machine, resulting in severe bruising.

Plant failure: This category includes any type of malfunctioning of any piece of equipment/tool or any part of it. Examples in this category include structural failure and component jam. Plant failure led to the accidents described here:

- Got thermoplastic from lorry - splashed onto, and injured, arm;
- High pressure hose burst, abdomen punctured; and
- Mobile tower section fell while loading resulting in broken rib.

Packing error: This category includes mistakes made in packing and loading materials and/components before they are brought to the site. Examples in this category include load not stacked properly and components not secured well. Packing error led to accidents described here:

- Bag of cold tar fell and injured leg; and
- Injured while unlocking steel casings with crane from lorry.

2.4 FACTORS AFFECTING SAFETY PERFORMANCE

A number of factors have been identified to influence the safety performance of Building contractors. Below is a list of the some of the factors gathered from international literature:

Table 2.1 Factors affecting safety Performance in International Literature

Literature	Factors affecting Safety Performance
Jaselskis, *et al.* *(1996)*	Upper management support. Time devoted to safety issues for the company safety coordinator. Number of informal safety inspections made by the company safety coordinator. Meetings with the field safety representatives and craft workers. Length and detail of the company safety program. Safety training for new foremen and safety coordinators. Specialty contractor safety management. Company safety expenditures. Increased project manager experience level. More supportive upper management attitude towards safety. Reduced project team turnover (team stability). Increased time devoted to safety for the project safety representative. More formal meetings with supervisors and specialty contractors. More informal safety meetings with supervisors. A greater number of informal site safety inspections.
Sawacha, *et al.* *(1999)*	Increased budget allocation to safety awards. Management talks on safety. Provision of safety booklets. Provision of safety equipment. Providing safety environment.

Table 2.1 (continued)

Literature	Factors affecting Safety Performance
Hinze and Gambatese (2003)	Appointing a trained safety representative on site. Minimizing worker turnover. Implementing employee drug testing with various factors initiating the testing. Training with the assistance of contractor associations.
Fang, *et al.* (2004a)	Growth in company size. Frequency of a crew's receiving safety inspection. Frequency of a foreman's presence in safety meeting. Frequency of a foreman's reporting safety related matters to manager. Frequency of a foreman's announcing safety related matters to workers. Frequency of a foreman's correcting workers' unsafe actions. Frequency of a worker's smoking on the site. Frequency of a worker's breaking safety regulations. Hours of safety education per year a worker receives. Frequency of a worker's partners reminding him of personal safety. Frequency of a crew's receiving notices of hazard removal. Frequency of a crew's breaking safety regulations. Frequency of a crew's suffering safety penalty. Frequency of a project manager's presence in safety meeting. Frequency of a project manager's hearing safety reports. Frequency of a project manager's discussing safety matters with subcontractors. Days of safety education per year a safety officer receives. Frequency of a foreman's reminding new workers of safety regulations.
Tam, *et al.* (2004)	Safety investment on personal protective equipment. Quantity of safety supervisors. Involvement of contractor top management. Authority of safety supervisor. Safety investment. Worker compensation insurance.
Fang, *et al.* (2004b)	Factors related to the relationship between management and labor on site. Poor safety awareness of top management.

	Lack of training.
Literature	**Factors affecting Safety Performance**
	Reluctance to input resources to safety. Reckless operations.
Ng, *et al.* (2005)	Implementation of safety management system in accordance with legislation. Compliance with occupational safety and health legislation, codes and standards. Definition of safety responsibility.
Fung, *et al.* (2005)	Development of safetypolicy. Provision of safe working environment. Development of safety committee. Definition of safety responsibility to all site personnel. Effective accident reporting. High line management commitment. Active supervisor's role.
Teo, et al. (2005)	Active personal role. Understanding and implementation of safety management system. Understanding and participation in occupational health and safety management system. Understanding and implementation of permit-to-work system. Quality of subcontractors. Understanding and implementation of safety procedures. Carrying out work in a safe manner. Carrying out work in a professional manner. Type and method of construction. Management’s attitude towards safety. Supervisors and worker’s attitude towards safety. Monetary incentives. Non-monetary incentives.

Abdul Rashid et al .(2007)

Table 2.2 Major categories of factors affecting safety performance to be adopted for the study

ID	FACTOR
(a)	Administrative and management commitment
(b)	Role of Government and Engineering Societies
(c)	Project nature
(d)	Historic, Human and Psychological climate
(e)	Organisational structure
(f)	Safety inspection
(g)	Safety meetings
(h)	Safety records and reports
(i)	Incentives
(j)	Safety education and training
(k)	Economic investment
(l)	Medical facilities

Abdul Rashid et al. (2007)

2.5 SAFETY MANAGEMENT

The monitoring and control of safety and environmental impacts are major issues in all construction projects. If we think of time, cost and technical performance as objectives to be optimized, or at least balanced, then we could consider work place safety and the impact of operations on the environment as constraints on the attainment of those objectives (Bennet, 2003)

Management and planning is one way to avoid unplanned events. Since accidents are unplanned events, an effective safety management can help avoid job injuries. Safety management must be thorough, and it must be applicable to all aspects of the job, from the estimating phase of the project until the last worker has left the premise at the completion of the project. All parties to a construction project must be included in some way in the safety program every party is responsible (Al-Kilani, 2011).

Tam et al. (2004) did a study in China and noticed that the causes of accidents were due to poor safety awareness from top leaders; lack of training; poor safety awareness of managers; reluctance to input resources for safety; reckless operation; lack of certified skill labor; poor equipment; lack of first aid measures; lack of rigorous enforcement of safety regulation; lack of organizational commitment; low education level of workers; poor safety conscientiousness of workers.

2.6 SAFETY PROGRAM

A company safety program is just as much a part of a contractor's business as estimating and accounting. Fundamentally, the company safety plan must be one of identifying specific job hazards and educating the employees to conduct their work in a way that will minimize the risk of injury.

Fales (1990) found that, the best plan for accident prevention is to have a company safety program. The goal of a safety program is to achieve longer and longer periods of time without injury. One of the most important elements of a safety program is to develop a good attitude of safety among the workers. Then workers must be encouraged to follow general and specific rules concerning their personal safety while using tools and equipment. A company safety program also includes concern for the safety of the general public.

A safety program that has the most effect on site safety consist of management talks on safety, provision of safety booklets, provision of safety equipment, providing a safe environment and appointing a trained safety representative on site (Aksorn et al., 2009).

Hinze and Harrison (1981), surveyed the nature of safety programs in the largest 100 construction firms in the USA, and concluded that larger firms hadmore formal safety programs. They also had the safest performance. Lower injury rates were in companies that provided workers with formal safety orientation; companies that gave incentives to workers and foremen and companies that employed full time safety representatives. Safer performance was noted to occur when safety representatives were hired and trained by safety directors

According to Peyton and Rubio (1991), the US Occupational Safety and Health Administration has outlined twelve basic elements of an effective safety program. These are as follows:

- The safety program should reflect the size of the business;
- Management should be committed fully to safety above all else;
- Safety responsibilities should be clearly defined;
- Adequate funds should be budgeted for safety programs;
- Management should lead by example in implementing safety programs;
- Open communication should exist between management and employees;
- Hazard identification and assessment through inspections must take place;
- Active employee participation is required;
- Safety should be planned from the bid process until workers leave the job site;
- Written employee disciplinary programs must be in place;

- Safety training and orientation needs to be incorporated; and
- Periodic safety performance reviews must be undertaken (including accident statistics, reports of injuries and results of safety inspections).

2.7 SAFETY POLICY

A prime requisite for any successful accident prevention program is to leave no doubt in the mind of any employee that managers are concerned about accident prevention. The most effective means by which this can be done is for the managers at the highest levels possible to issue directives indicating their accident prevention policies and then to ensure that their lower level managers, supervisors and other employees carry them out (Hammer, 1981).

The company management safety policy statement outlines the company's philosophy on safety and sets the tone for management's commitment to the safety effort. This policy must be a simple and concise statement of the overall objectives of the company safety program. This policy should assign overall responsibilities for safety in all departments of the company and should be realistic and enforceable (Peyton and Rubio, 1991). In Hong Kong, the employer is ultimately responsible for the development of a safety policy with guidelines and then effectively enforces the company's own rules (Charles et al., 2007).

The health and safety policy statement should contain the aims which are not measurable, and objectives which are measurable of the organization or company. Aims will probably remain unchanged during policy revisions, whereas objectives will be reviewed and modified or changed each year. The statement should be written in clear and simple language so that it is easily understandable (Hughes et al., 2001).

The following points should be included or considered when a health and safety policy statement is being drafted:

• The aims should cover health and safety, welfare and relevant environmental issues.

• The position of the senior person in the organization or company who is responsible for health and safety (normally the chief executive).

• The names of the health and safety adviser and any safety representatives.

• A commitment to the basic requirements of the health and safety at work Act (access egress, risk assessments, safe plant and systems of work, use handing, transport and handing of articles and substances, information, training and supervision).

• Using a safety committee or plant council.

• Specific policies of the organization (violence to staff).

2.8 COST OF SAFETY

A Company Safety Program does, of course cost money. The fact, however, remains that safety is just a as necessary for the conduct of a construction business as is estimating or purchasing. There is however, an important distinction between safety costs and other items of company expense that must be recognized. The distinction is that, the spending of one dollar for safety can save the contractor two dollars. Although this ratio is only figurative, it has been well demonstrated that the costs of safety programs are more than compensated for by savings on accidents that do not happen (Clough, 1981).

Studies have shown that both tenders and contracts fail to consider safety costs in an adequate fashion (Charles et al., 2007). King and Hudson (1985), research suggested that the inclusion of safety costs in a tender reduces the loss time accident frequency rates from a range of 2.5-6.0 per 100,000 man hours worked to a range of 0.2-1.0 per 100,000 man hours worked on major construction projects.

2.9 SAFETY TRAINING

Safety training and orientation are necessary elements of any effective safety program. Supervisors and workers must understand the company's safety policy and procedures and the hazards associated with their work (Peyton and Rubio, 1991). When employees first arrive on site, a safety orientation training program should be provided. That training session can cover the company and project safety policies, safety regulations, site orientation, personal protective equipment, and Organisational Health and Safety Training required.

Langford et al. (2000), identified the critical factors that influence the attitudes of construction workers towards safe behavior on construction sites. According to the results of their study, training of operative and safety supervisors is important to safety awareness and improved performance .The importance of safety training to improve the safety performance in the construction industry has been addressed by many researchers.

2.10 INSURANCE COMPANIES ROLE TOWARDS SAFETY

Insurance companies play an important role in the improvement of health and safety standards. Since 1969, it has been a legal requirement for employers to insure against liability for injury or disease to their employees arising out of their employment. This is called employers' liability insurance. Certain public sector organizations are exempted from this requirement because any compensation is paid from public funds. Other forms of insurance include fire insurance and public liability insurance (to protect members of the public).

Premiums for all these types of insurance are related to levels of risk which is related to standards of health and safety. In recent years, there has been a considerable increase in the number and size of compensation claims and this has placed further pressure on insurance companies. Insurance companies are becoming effective health and safety regulators by weighing the premium offered to an organization according to its safety and/or fire precaution record (Hughes et al., 2001).

2.11 ADVANTAGES OF APPLYING SAFETY ON CONSTRUCTION SITES.

Applying safety on the construction projects has many merits, some of which are mentioned below:

Firstly, applying safety brings financial benefits to the table. Direct Costs associated with accidents, including workers compensation claims, insurance costs and legal fees are minimized in a safe working environment. Also, the indirect costs such as reduced productivity which occurs as a result of workmen turning their attention to deal with an accident are also minimized if safety is treated as key. Safety when adhered to effectively on the construction sites leads to

fewer schedule interruptions which will minimize your production cost and maximize productivity in the long run.

On the flip side, a safe work environment boosts employee morale, which, in turn, increases productivity, efficiency and profit margins. When workers know they have a good, safe working environment, they work hard and make a difference. Moreover there are fewer staff absenteeism, low staff turnover and improved quality of work.

A solid safety program can help protect a company's reputation. Clients feel safer when entrusting their jobs in the hands of such companies.

2.12 CHAPTER SUMMARY

This Chapter reviewed literature on Safety in the Ghanaian Construction industry. Firstly it defined the Construction industry as a group of firms with closely related activities involved in the construction of real estates, building, private and public infrastructure. It also looked at the various categories the industry can be broken down into and also spoke about the three primary participants of the construction industry namely, the owner, the designer and the contractor. It also went ahead to look at the various classification categories of Building contractors according to the Ministry of Water resources, Works and Housing.

The Chapter also looked at accidents in the construction industry with accident statistics from Ghana and other parts of the world. This raised a very alarming situation since literature reviewed showed that the rate of construction accidents have been increasing over the years which is the more reason research on safety has to be treated with all seriousness.

The Chapter also looked at the types of accidents and their causes as identified in the literature reviewed. Casualty error, poor quality kit, site conditions, plant operator error, plant failure, etc,

were some of the identified causes of accidents. The chapter also identified certain factors from international literature, believed to affect safety performance of Building Contractors. These factors were categorized into twelve major factors which were adopted for the study.

The chapter also looked at other issues related to safety on construction sites like the safety program, safety management, safety policy, safety training and the role insurance companies paly towards achieving a safe working environment.

Finally, the chapter looked at some of the advantages derived from ensuring a safe working environment. Some of which are minimizing worker compensation claims and insurance claims, boosting the morale of workers and increasing productivity in the long run.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the methods adopted in conducting this research. Generally, to achieve the aim of a study, one of the important areas to consider is the kind of method that is adopted (Naoum, 2001). The methods adopted were captured under the following headings: Data collection method, method of respondent's selection, the selection of the sample size and the analysis of collected data.

3.2 DATA COLLECTION METHOD

In order to achieve the aim and objectives of the study, well-structured close-ended questionnaires were designed to gather information from class D1K1 Building Contractors registered with the Ghana Cocoa Board and based in Accra. The questions were ethical and feasible. This research instrument is used to bring to light, the real safety problems and danger of injuries that occur in construction sites in Accra, to investigate safety procedures, regulations, policies, and accident prevention methods related to construction projects in Accra and also to provide methods and suggestions to improve the safety performance of Ghanaian class D1K1 Building contractors in Accra. The wordings were without bias and the questions provided multiple choice options which gave the respondents the opportunity to present their ideas by way of selecting from the options provided.

Close-ended questionnaires were used because close-ended questions are easy for respondents to answer and it also helps researchers analyze their data easily (Glasow, 2005). Fowler et al. (1995), further asserted that researchers must avoid questions that ask the respondent for data

they could not or do not have, including questions that assume the respondent knows something about the subject and more so personal questions. Objectionable statements that reflect the researcher's bias and questions that require difficult calculations should similarly be avoided in the case of wording of questionnaires.

3.2.1 QUESTIONNAIRE CONTENT

The information sought was divided into four subheadings:

Subheading (A):- Respondent's personal / company's details (e.g. designation, the educational level, working experience in the industry and number of projects executed within the last 5 years)

Subheading (B):- health and safety issues (do accidents occur during the execution of projects, If Yes are the accidents reported to management, Causes of accidents and whether there is a governmental follow up and contribution in improving safety in construction projects)

Subheading (C):- Outlines some factors that influence safety performance and the level of importance given them by the respondents,

Subheading (D):- Improving safety performance in Ghana (Whether there is a clear safety policy and if there is, whether the policy is reviewed yearly, whether contractors provide safety related items or equipment on construction sites for workers)

The questionnaire included two types of questions. These are:

• Close-ended questions, which are used in questions number 1 - 13, 16 and 17.

• Likert scale questions, which are used in parts (C) and (D) for questions 14, 15 and 18

The aim of the questionnaire used in this study is to realize the real safety problems and danger of injuries that occur in Large construction firms in Accra metropolis, and to investigate the factors that influence safety performance of such firms. It also investigates, safety procedures, regulations, policies, and accident prevention methods related to construction projects carried out by large construction firms in Accra, and to provide methods and suggestion to improve the safety performance in large construction firms.

3.3 RESPONDENTS

The technique applied for the selection of the Construction manager or the safety officer to answer the questionnaire was purposive sampling. This technique was used because, purposive sampling technique allows the researcher to select the individual who has good knowledge on the subject in discussion (Erbil et al., 2010).

Construction managers were targeted because, it has been established by fact that most construction managers have the widest exposure to construction projects, and are involved in the various project phases that is planning, design, and construction. They are most often than not responsible for setting up safety policies and programmes on sites and work closely with the main contractor and hence, their roles in safety management are explicit.

Again, site safety officers act on behalf of contractors to manage construction crew, ensuring that each worker is following safety rules and regulations. Safety officers are also chosen because they are well vested with the safety policies and procedures of the companies for which they work. In addition, safety officers know local safety statutes including the regulations of the federal Occupation Safety and Health Administration. Safety officers also conduct regular site

inspections, recording all violations, noting what remediation needs to occur to keep the project moving forward. Finally, because they are intimately acquainted with safety standards, and they have knowledge of safety deficiencies, safety officers work with management teams to develop new safety policies, refine existing policies, modify design requirements and draft construction-related specification.

3.4 SAMPLE SIZE SELECTION

Due to the constraints of time, the targeted population was Ghanaian class D1K1 Building Contractors registered with the Ghana Cocoa board and were based in Accra. In all, twenty five (25) contractors were identified to be in this category to represent the population. The entire population was used as the sample size for the study.

Therefore, 25 questionnaires were administered to 25 respondents from 25 Ghanaian class D1K1 Building Construction firms registered with the Ghana Cocoa Board.

3.5 DISTRIBUTION AND COLLECTION OF DATA

Data collection is a term used to describe the process of preparing and collecting data. The purpose of this process is to obtain information to keep on record, to make decisions about important issues, and to pass information on to others. The developed questionnaires were distributed to and retrieved from construction offices in person. This process of distribution and retrieving of the questionnaires in person was taken for two reasons as suggested by Ahadzie (2007), first, to make sure that the questionnaires gets to the intended recipients and secondly, to help improve the response rate.

3.6 DATA ANALYSIS

In order to address the research goals of this study, Descriptive statistics was used to analyze the appropriate data. The two main categories of questions asked in the questionnaire are

1. Close ended questions which require “yes” or “no” response and
2. Itemizing rating list questions.

The data collected was analyzed using statistical package for social sciences (SPSS) to obtain the importance index. The use of importance index also helped in establishing the significant importance of a list of factors identified to influence the safety performance of Ghanaian D1K1 Building contractors. The data analysis was presented in the form of texts, tables, charts and the like. The Importance index is computed as in (Adnan et al 2007) using the formula below :

$$\textbf{Importance Index (I.I)} = \frac{5n5 + 4n4 + 3n3 + 2n2 + n1}{5(n5 + n4 + n3 + n2 + n1)} \times 100$$

Where:

n5 - Number of respondents who answered “Very Important”

n4 - Number of respondents who answered “Important”

n3 - Number of respondents who answered “Neutral”

n2 - Number of respondents who answered “Not Important”

n1 - Number of respondents who answered Not “Very Important”

It is worthwhile to know that the nearer the value of importance index of the identified factor is unity (1) or 100%, the more significant it is and hence, a greater impact on the rest of the variables.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

This Chapter covers the presentation of responses and the analysis of data collected from the respondents using the Statistical Package for the Social Sciences (SPSS). The use of importance index also helped in establishing the significant importance of a list of factors identified to influence the safety performance of Ghanaian D1K1 Building contractors. The chapter presents the analysis and discussion of the results in two parts

Part (A) presents the result on the respondent's profile.

Part (B) presents results and discussion on health and safety issues.

4.2 RESPONSE RATE

Twenty five (25) questionnaires were sent out to Twenty five D1K1 Ghanaian Contractors in Accra and the response rate was 84% that is to say 21 out of the 25 contractors participated in the survey by responding to the questionnaire.

4.3 RESPONDENT'S PROFILE

4.3.1 DESIGNATION OF RESPONDENTS

The questionnaire was asked to be answered by the safety officer / supervisor if any or by the construction manager of the company. From figure 4.1 below, (71.4%) out of the 21 companies had the questionnaires been answered by construction managers and the remaining (28.6%) of

the questionnaires were answered by safety officers. This revealed that most of the companies did not have safety officers on their projects.

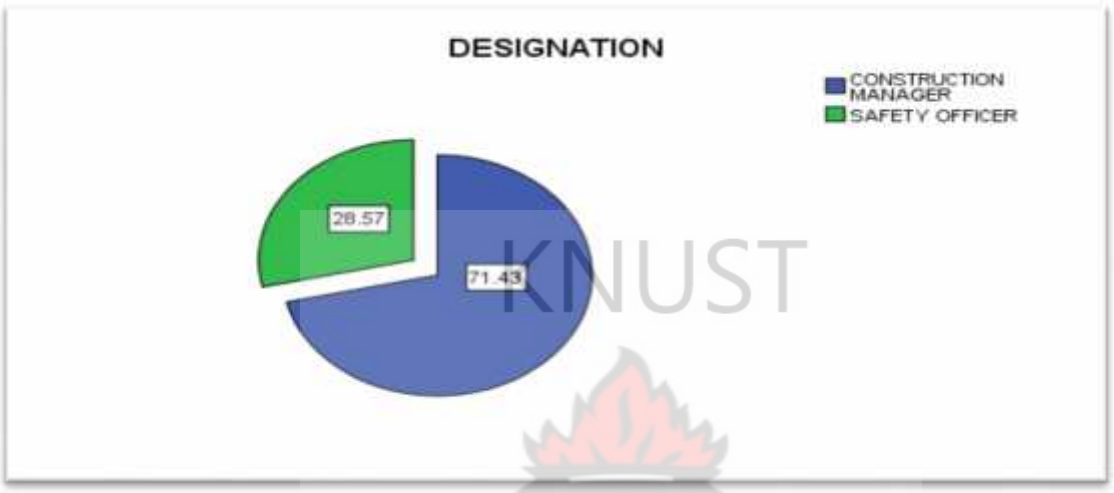

Figure 4.1 DESIGNATION OF RESPONDENTS

4.3.2 HIGHEST LEVEL OF EDUCATION

For the purpose of the study, it was necessary to find out the highest level of education of the respondents. From table 4.2, Four (4) out of the respondents were Master of Science Degree (MSc) Holders, 12 of the respondents had Bachelor of Science (BSc) Degree and 5 of the respondents were Higher National Diploma (HND) holders. There were no CTC (I ,II, and III) holders amongst the respondents. This showed that all the respondents had further or higher education from HND, through BSC and MSC in construction related courses.

TABLE 4.1 HIGHEST LEVEL OF EDUCATION OF RESPONDENTS

		Frequency	Percentage (%)	Cumulative Percentage (%)
Valid	MSC	4	19.0	19.0
	BSC	12	57.1	76.2
	HND	5	23.8	100.0
	Total	21	100.0	

4.3.3 YEARS OF EXPERIENCE

Figure 4.2, shows the work experience of the respondents and the indications are that, 8 of the respondents had between 1-5 years of experience, another 8 of the respondents had between 6-10 years of experience and 5 of them had over 10 years of experience. This background information gathered on these personnel suggests that they are competent, experienced and capable of exercising good judgment and as such the responses provided by them could be relied upon for study.

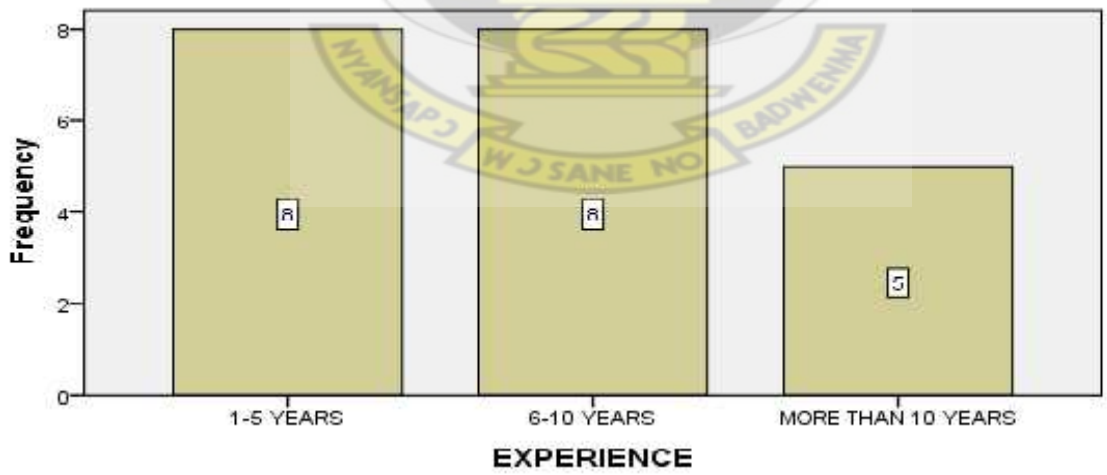

Figure 4.2 YEARS OF EXPERIENCE

4.3.4 NUMBER OF PROJECTS EXECUTED WITHIN THE LAST 5 YEARS

Figure 4.3 shows the number of projects executed by the respondents within the last 5 years. From the table, 13 of the respondents have executed less than 10 projects in the last five years whiles 8 of them have executed between 11- 20 projects within the last 5 years. This shows that all the respondents are working actively on projects and as such responses provided by them can be relied upon for the study

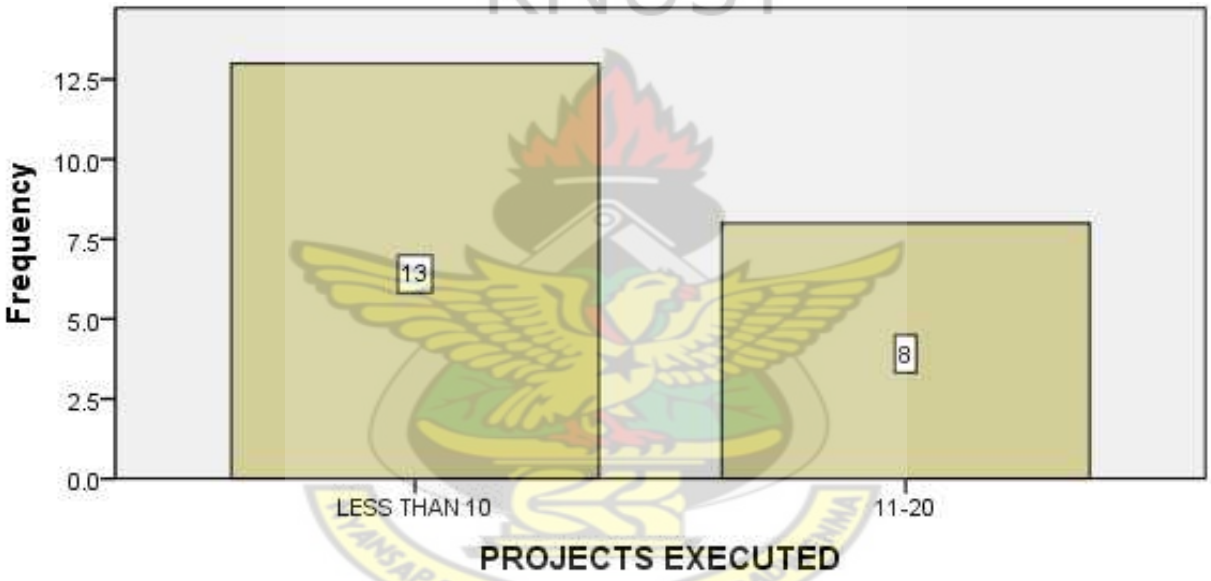

Figure 4.3 PROJECTS EXECUTED WITHIN THE LAST FIVE YEARS

4.4 HEALTH AND SAFETY ISSUES

4.4.1 OCCURRENCE OF ACCIDENTS DURING THE LAST FIVE YEARS

Figure 4.4 shows the frequency of occurrence of accidents within the last 5 years. From the figure, 19 of the respondents had accidents occurring in their companies within the last 5 years whiles 2 of the respondents did not record any accidents in their firms within the last 5 years. This indicates an alarming situation because it clearly indicates that site accidents are still rampant on our construction sites. This is not too different from a study carried out by Al Ki-Lani (2011) in Lybia which revealed that, 80% of contractors had accidents occurring on their sites within the last 5 years. The high rates of accident occurrence can partly be attributed to the enormous size and nature of projects executed without paying close attention to health and safety of the workers. The fact that there are no strict regulations and legislations to govern contractors during the execution of projects can also be mentioned as a factor resulting in the high rates of injuries recorded within Ghanaian class D1K1 firms.

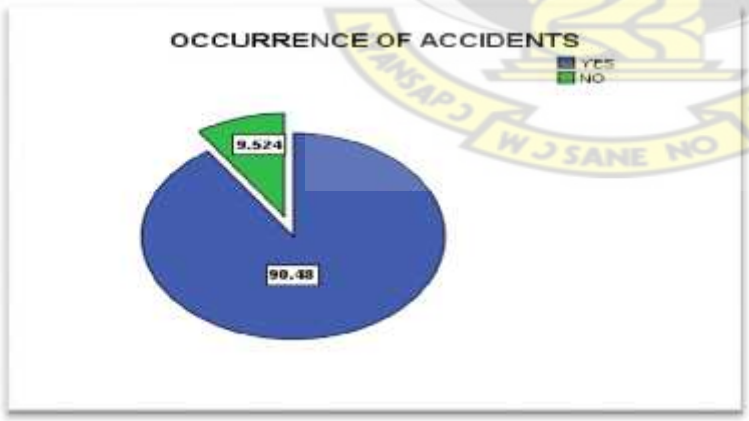

Figure 4.4 OCCURRENCE OF ACCIDENTS DURING THE LAST FIVE YEARS

4.4.2 EXTENT OF INJURY

Table 4.5 indicates the extent of injuries suffered by victims on the construction sites of the various respondents. From the figure, 6 of the companies had accidents resulting in death cases. 2 of the companies recorded accidents leading to permanent disability and 4 recorded partial disabilities. 7 of the respondents recorded accidents leading to slight injuries. 2 of the respondents did not record any accidents within the last 5 years so they did not respond to this question. A higher number of respondents had slight injuries suffered by victims on site due to the fact that most of these injuries are caused by falls from heights, slips, not using equipments and tools correctly etc.

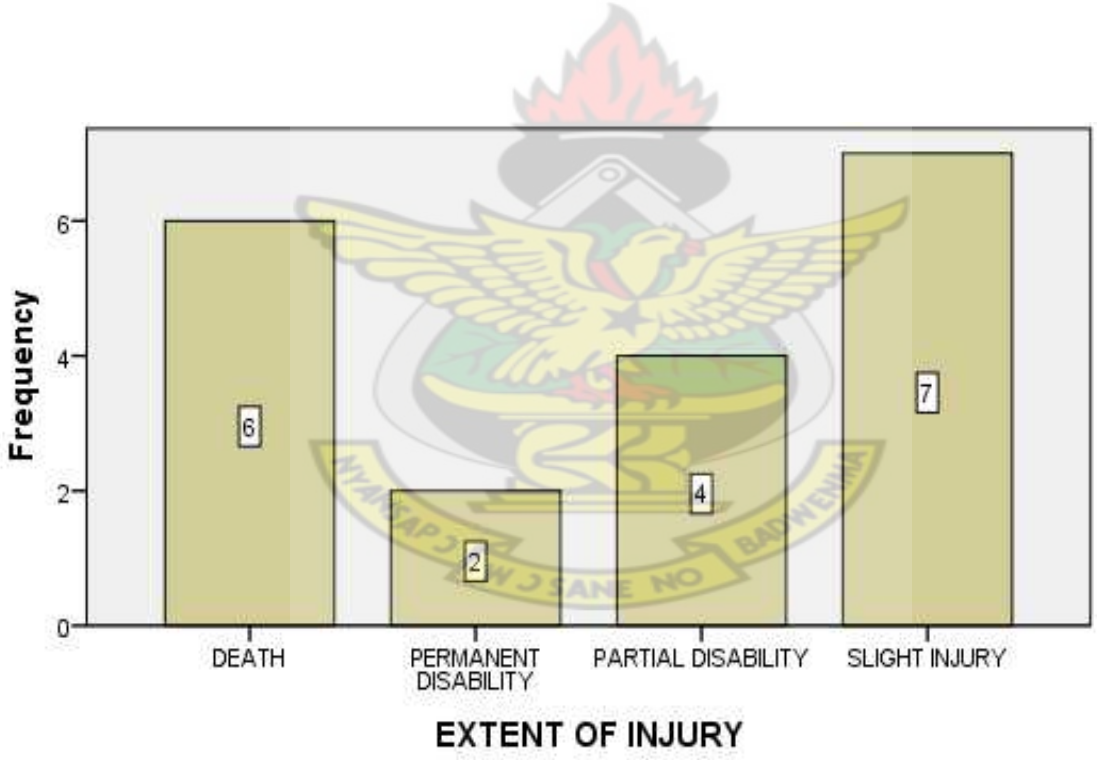

Figure 4.5 EXTENT OF INJURY SUFFERED FROM ACCIDENTS

4.4.3 RECORDING OF ACCIDENTS THAT OCCUR ON SITE.

Figure 4.6 shows respondents who record accidents. From the figure, (33.3%) of the respondents mentioned that accidents that occur on their sites are recorded while the remaining (66.7%) mentioned that accidents that occur on their sites are not recorded. This indicates that most respondents do not keep record of the cause, nature and extent of injuries caused by accidents that occur on their sites. They only in some cases keep record of the type of injury suffered only. Bad record keeping of injuries can be as a result of contractors not prioritizing safety first in their operations, also it could be that, too many accidents occur on site and the contractors feel recording them will give them a bad name. Good record keeping of accidents that occur on site will enable management look into the causes and come out with measures to help reduce or if possible eradicate the occurrence of accidents in the future.

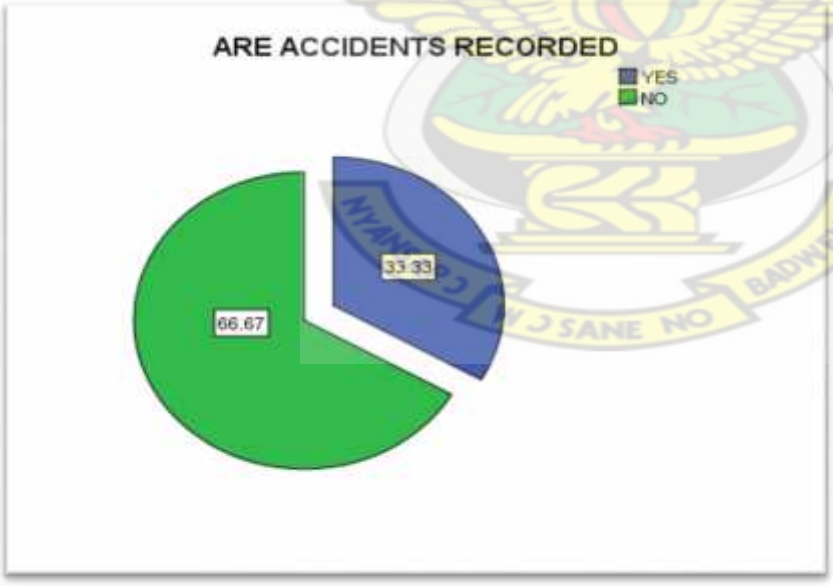

Figure 4.6 RECORDING OF ACCIDENTS THAT OCCUR ON SITE

4.4.4 CONSTRUCTION SAFETY RESPONSIBILITY

From figure 4.7, (2) of the respondents mentioned that site safety should be the responsibility of the site workers, (3) respondents also mentioned that site safety should be the responsibility of the government. Also (4) agreed that safety should be the responsibility of contractors. Another (3) agreed that site safety should be the responsibility of consultants on the various projects and finally (9) of the respondents agreed that safety should be the responsibility of all the parties (contractors, consultants, Government and Site workers) to the project. This result shown here disagrees with the general assertion that ensuring safety must be the sole responsibility of Building contractors. The result indicates that all the parties to a construction project (site workers, government, consultants and contractors) must contribute their quota to ensure a safe working environment and thus go further to improve the safety performance of Ghanaian contractors. Safety must even be incorporated from the design stage of a project through construction to completion and handing over.

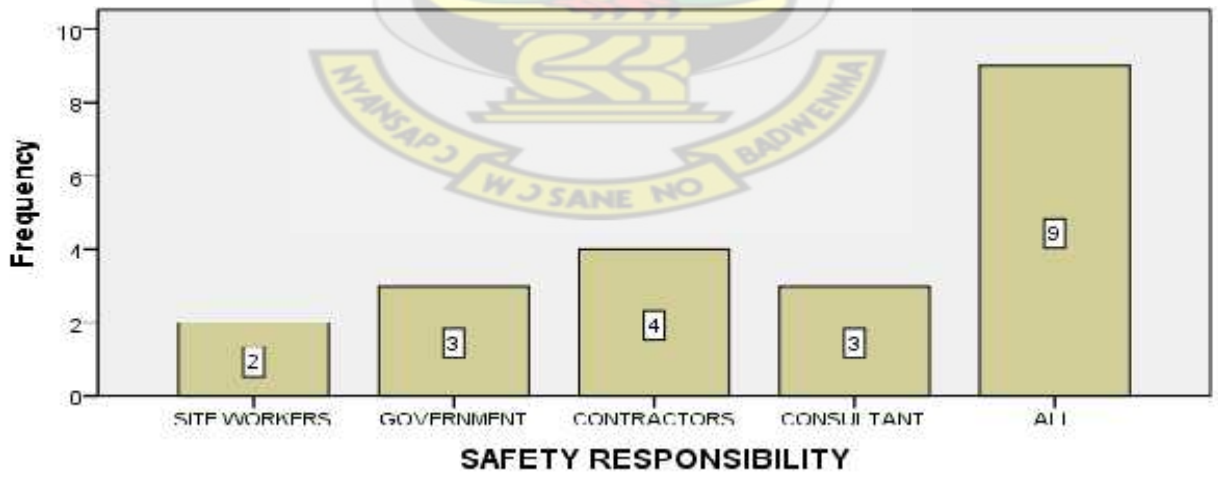

Figure 4.7 CONSTRUCTION SAFETY RESPONSIBLITY

4.4.5 THE ROLE OF GOVERNMENT INSTITUTIONS IN IMPROVING SAFETY

From figure 4.8, (23.8%) of the respondents agreed that there is a governmental institution that follows up on safety in construction, enlighten construction employees on safety rules and regulations and help in improving safety performance in construction sites in Accra. (76.2%) agreed that there is no governmental institution that follows up on safety in construction. This results that the government is not doing enough to help improve safety performance of Ghanaian contractors. This also contributed to the high rates of accidents that were identified on the sites of Ghanaian building Contractors.

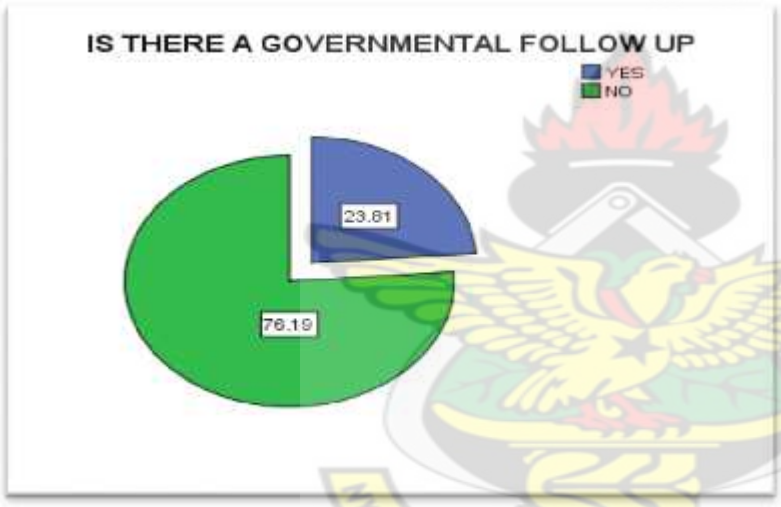

Figure 4.8 GOVERNMENTAL INSTITUTIONS FOLLOW UP ON SAFETY

4.4.6 POTENTIAL HAZARDS IDENTIFIED ON SITE

From table 4.10, (12) of the respondents identified falls as a potential hazard on their construction sites. (1) identified electric shock as the potential hazard on their site. (5) of the respondents identified inhalation of dust as a potential hazard on their sites. Finally, (3) of the respondents identifies all the hazards (falls, electric shock and dust inhalation) as potential hazards on their sites. Falls from heights and slips was identified as the commonest potential

hazard on most sites due to the fact that, items are not properly arranged on most sites and also excavations and exposed areas on site are usually not protected or properly barricaded.

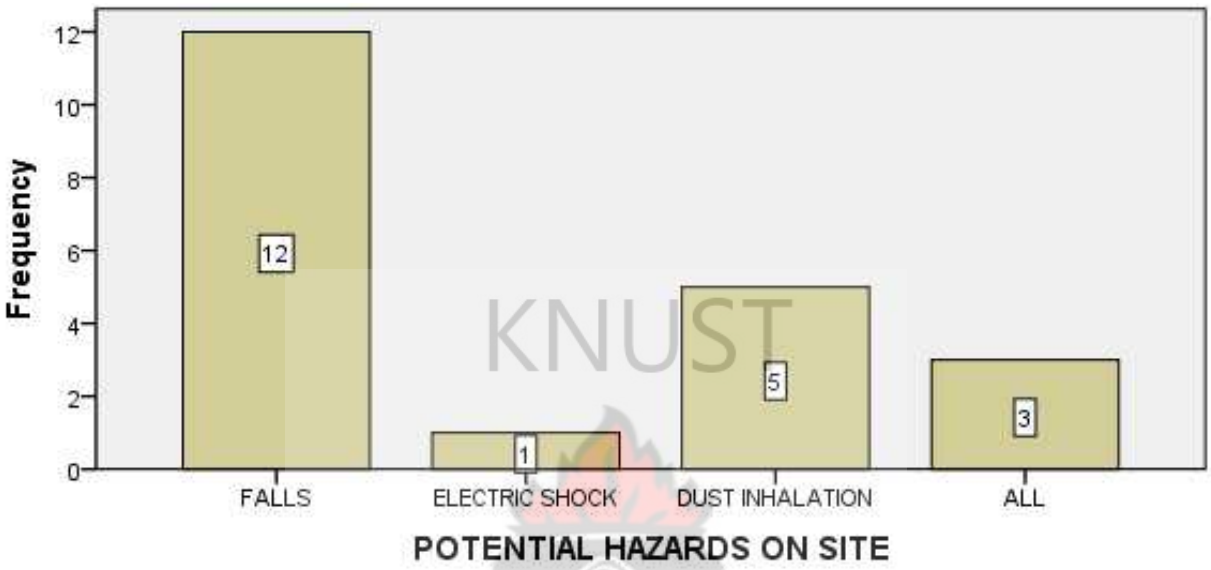

Figure 4.9 POTENTIAL HAZARDS IDENTIFIED ON SITE

4.4.7 FACTORS AFFECTING SAFETY OF GHANAIAN CONTRACTORS

Question: *Please on a scale of Very important to not very important, please rank the following factors to indicate the extent to which they are important in influencing safety performance of Ghanaian class D1K1 building contractors.*

This question is related to certain identified factors that are believed to influence safety performance of Ghanaian contractors. Here, Contractors were given these factors to rank on a scale of very important to not very important to determine how these factors influence their safety performance. Table 4.3 shows the average ratings of contractors' response whiles Table 4.4 also shows the importance index of the ranking

TABLE 4.2 Class D1K1 Ghanaian Contractors reaction to identified factors that influence their safety performance.

ID	Factors	Very Important (%)	Important (%)	Neutral (%)	Not important (%)	Not very important (%)
a.	Administrative and management commitment	81	19	0	0	0
b.	Role of government and engineering societies	52.4	38.1	9.5	0	0
c.	Project nature	42.9	52.4	0	4.80	0
d.	Historic, Human and psychological climate	23.8	52.4	19	4.8	0
e.	Organisational structure	4.8	85.7	4.8	0	4.8
f.	Safety inspections	66.7	28.6	0	0	4.80
g.	Safety meetings	57.1	33.3	0	4.8	4.8
h.	Safety records and reports	28.6	61.9	4.8	0	4.8
i.	Incentives	38.1	47.6	4.8	4.8	4.8
j.	Safety education and training	71.4	19	0	4.8	4.8
k.	Economic investment	14.3	76.2	4.8	4.8	0
l.	Medical facilities	47.6	47.6	0	0	4.8
	Average Ratings	**44.01**	**46.82**	**3.98**	**2.4**	**2.8**

TABLE 4.3 Results of importance indices showing the rank of factors influencing safety performance of Ghanaian class D1K1 Building Contractors

ID	Factors	Index	Rank
a.	Administrative and management commitment	96.1	1st
b.	Safety education and training	91.43	2nd
c.	Role of Government and Engineering societies	89.57	3rd
d.	Safety inspections	88.75	4th
e.	Medical facilities	88.57	5th
f.	Project nature	87.61	6th
g.	Safety meetings	85.71	7th
h.	Safety records and reports	82.86	8th
i.	Incentives	82.84	9th
j.	Economic investment	80	10th
k.	Historic, Human and psychological climate	79.05	11th
l.	Organisational structure	88.57	12th

- Judging from table 4.3, about 91 % (44.01% + 46.82%) of the contractors indicated that the identified factors are significant in influencing their safety performance. Whereas 4% remained neutral, only 5% (2.4% + 2.8%) of the contractors think that the identified factors are not important in influencing their safety performance
- From table 4.4, it appears that, Administrative and management commitment, Safety education and training, Role of Government and Engineering societies and safety inspections are the most important factors that influence safety performance of D1K1 contractors.

When the above factors were ranked using the importance index, it turned out that Administrative and management commitment towards safety was the overall most important factor in influencing safety performance of class D1K1 Ghanaian contractors. Safety education and training came second whiles the role of government and engineering societies placed third. Conducting of regular safety inspections came fourth.

This implies that, it is vital for Administration and management staff to increase their commitment towards ensuring safety on their sites. Management must establish and enforce safety policies and safety systems.

Question: *Please on a scale of Very evident to not evident, please rank the following factors to indicate the extent to which they are evident in influencing safety performance of Ghanaian class D1K1 building contractors.*

From table 4.5, 95% (48% + 47 %) of the respondents indicated that the identified factors are evident in influencing safety performance in their organisations whiles 5% indicated that the factors are not evident in influencing safety performance in their organisations. This shows that the identified factors are valid factors in influencing the safety performance of Ghanaian class D1K1 contractors because a greater percentage of contractors agreed to that and that close attention should be paid to the identified factors

TABLE 4.4 Ghanaian contractors' reaction to how evident the identified factors are in influencing the safety performance in their organisations.

ID	Factors	Very Evident (%)	Evident (%)	Not Evident (%)
a.	Administrative and management commitment	57.1	38.1	4.8
b.	Role of government and engineering societies	47.6	47.6	4.8
c.	Project nature	33.3	61.9	4.8
d.	Historic, Human and psychological climate	28.6	66.7	4.8
e.	Organisational structure	23.8	76.2	0
f.	Safety inspections	76.2	23.8	0
g.	Safety meetings	71.4	23.8	4.8
h.	Safety records and reports	47.6	47.6	4.8
i.	Incentives	47.6	42.9	9.5
j.	Safety education and training	71.4	28.6	0
k.	Economic investment	33.3	57.1	9.5
l.	Medical facilities	42.9	52.4	4.8
	Average ratings	**48**	**47**	**5**

4.4.8 CLEAR SAFETY POLICY

From table 4.14, (38.1%)8 of the respondents have clear and well spelt out safety policies in their organization whiles (61.9%)13 do not have safety policies in their organisations or projects that govern them in their daily work activities on site. The few firms that have safety policies also do not have effective arrangements for reviewing them annually. The company management safety policy statement outlines the company's philosophy on safety and sets the tone for

management's commitment to the safety effort. This policy must be a simple and concise statement of the overall objectives of the company safety program. This policy should assign overall responsibilities for safety in all departments of the company and should be realistic and enforceable (Peyton and Rubio, 1991).

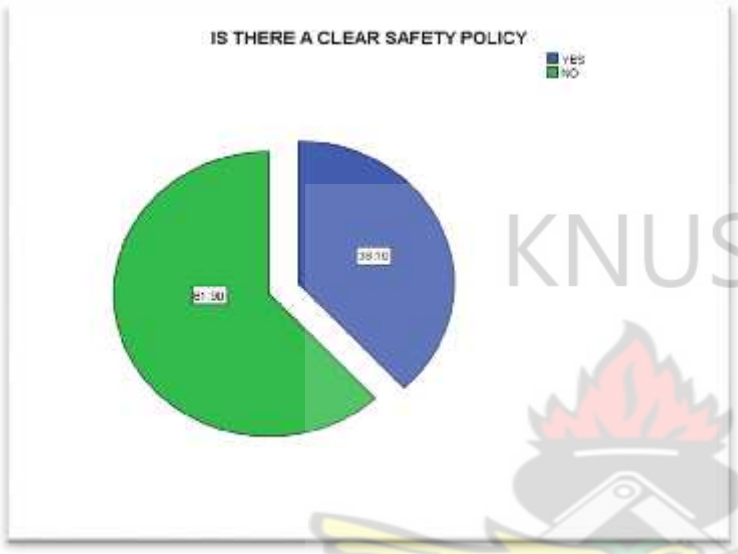

Figure 4.10 CLEAR SAFETY POLICY

4.4.9 PROVISION OF SAFETY RELATED ITEMS AND EQUIPMENTS

Question: *There is a general assertion that contractors do not provide the following safety related items or equipment on construction sites for workers. Please indicate your reaction to each statement by ticking the appropriate cell*

The above question is related to some practices of some contractors on construction sites in the context of not provision of some safety equipment to their workers. In view of this, some contractors were asked to indicate whether they agree or disagree to that assertion. Table 4.6 shows the average rate of response from contractors to the above question.

TABLE 4.5 Results of contractors response on provision of safety related items for workers

ID	Factors	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
a.	Safety Signs	33.3	28.6	9.5	14.3	14.3
b.	Hard hats or helmets	28.6	14.3	0	38.1	19
c.	Goggles and Face shield	23.8	33.3	9.5	19	14.3
d.	Safety boots	23.3	23.3	4.8	23.3	23.3
e.	Rain gear	23.8	57.1	4.8	4.8	9.5
f.	Hearing Protection	33.3	28.6	14.3	19	4.8
g.	Gloves	38.1	14.3	4.8	33.3	9.5
h.	Safety nets	47.6	14.3	19	9.5	9.5
i.	Flash lights	38.1	33.3	9.5	9.5	9.5
j.	Ladder / Scaffold platforms	33.3	33.3	0	28.6	4.8
	Average Ratings	**32**	**28**	**8**	**20**	**12**

Following the results in table 4.6, the following issues emerge:

A total of about 60% (32% + 28%) of contractors agreed to the statement that, they do not provide safety items and equipment on construction sites to workers. Whereas 8% of the contractors remained neutral, an average of about 32% (20% + 12%) of the contractors disagreed to the assertion. This indicates that contractors are not giving their best by ensuring that they provide safety equipments and materials for use by their workers. The few contractors who provide them too do not ensure the staff and site workers use them in the discharge of their duties.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

"Over the years, the construction industry has had the highest rates of reported work-related deaths and injuries," as stated by (Pollack and Chowdhury, 2001) . With the continuing high work-related deaths and injuries, the identification of safety practices may help reverse these high rates. Therefore, it was the purpose of this research to investigate the safety practices of large construction firms to identify those best practices that are successful in accomplishing low injury rates and will in turn increase the safety performance of Ghanaian Building Contractors. To achieve the purpose of the research, the following objectives were set

1. Identify the safety performance level of Ghanaian Building Contractors.
2. To determine the underlying causes of the established performance levels.

This first part of this chapter will present the conclusions from the Results discussed in Chapter four whiles, the second part of this chapter will include recommendations made towards improving the safety performance of Ghanaian contractors.

5.2 CONCLUSION

The results from the study conducted indicates clearly that, safety on construction sites of Ghanaian Building contractors is still a major issue that needs to be addressed. Almost all of the respondents had accidents occurring on their sites within the last five years which gives the indication that site accidents are still rampant.

Also, according to the respondents, there was no detailed record of the root causes of the accidents that occur on their sites, the only information available on some sites is the type of injury that was sustained.

Thirdly, there were many potential hazards identified on the construction sites of the selected respondents which can also contribute to injuries occurring on sites. Falls were the commonest potential hazard identified by the respondents.

There was also a consensus between most of the respondents that, safety and Health responsibility must be the responsibility of all the parties (client, consultant, contractor, government, site workers etc) to the contract. This implies that ensuring safety on sites should not be the sole responsibility of the contractor nor the site workers, instead all the parties should contribute their quota in creating a safe work environment.

The results collected identified four factors out of the twelve factors presented to be key factors that influence the safety performance of Ghanaian class D1K1 building Contractors. The four factors are listed in preceding order and discussed in brief below:

i) Administrative and management commitment to ensuring safety: When contractors' administration and top management staff increase their efforts in ensuring safety, it goes a long way in creating a safe and sound working environment.

ii) Giving staff and site workers safety education and training: Regular safety education and training when given to staff helps reduce the number of accidents that occur on our sites.

iii) The role the government and engineering societies play in ensuring safety :A government prioritizes ensuring safety on construction sites by encouraging the setting up engineering societies that will conduct regular site visits helps ensure a safe working environment on construction sites.

iv) Conduction regular safety inspections on site by the safety officer and supervisors: When daily or weekly site inspections are conducted by the site safety officer and supervisors, site workers will always on the alert that they should always adhere to safe working practices instilled in them.

Most of the respondents agreed there were no clear safety policies to guide them within their organisations. The few respondents who had safety policies, also confessed that no efforts are made to review such policies annually.

Finally, from the results, there was a clear indication that most of the firms do not provide the required safety materials and equipments for their workers.

5.3 RECOMMENDATION

Ghanaian policy makers and parties to a construction project should be committed to implement the following recommendations in order to improve the safety performance of Ghanaian contractors:

- Administration and management should be more committed towards ensuring safety in their firms. All top managers down to the line of supervisors must prioritize the safety of workers the same way they prioritize work quality and productivity. Without this clear commitment, safety performance will very likely be compromised.
- Contractors of the various construction firms should encourage setting up Human Resource and Safety Departments for the purpose of executing safety education campaigns and training programmes for all levels of management and site workers. The training is to deliver the content of how important these welfare facilities and safety materials are to the firms and to the health of the workers. Safety education, on the other hand, transfers the concepts of reasons workers have to work safely and the effects of not adhering to safety measures on site. Since the training involves workers, educational and training programmes will have to include the use of films or slides show pictures. This will help site workers have a better understanding of matters relating to health and safety. The establishment of safety department will also monitor the use of safety materials and this will enhance safety awareness, which in turn leads to creating a safe working environment and a successful project.

- Five to ten minutes each morning be apportioned to briefing on health and safety to all workers, especially site workers, before commencement of work, to inculcate in them safety awareness, and improving safety on construction sites.
- Contractors should ensure all job site accidents are recorded to top management in order to examine the root cause of such accidents. Results of these investigations must be communicated to all staff and workers through safety meetings in order to prevent future occurrence of such accidents.
- Contractors should ensure they provide the required safety materials and equipments for their workers and should also make sure the workers use and wear them correctly when working. Some of these safety materials are personal protective equipments (Hard hats, safety boots, nose masks, ear guards, etc) ,safety signs and flash lights.

- Safety Officers from Ghana Labour office should liaise with the Ministry of Water Resources, Works and Housing and in conjunction with Association of Civil Engineering and Building Contractors, regularly visit construction sites to ensure:

➢ The enforcement of laws governing health and safety, employment, and rights of site workers and should also put punitive measures in place to deter Contractors from violating safety regulations.

➢ The establishment of institutions such like the Department of Building Technology, KNUST, The building and road Research Institute (BRRI) and some Non-Governmental Organisations (NGOs) could be foundered to organise training programmes and workshops for the workers and management in safety

5.4 LIMITATIONS OF THE STUDY

The limitations for this study are:

- The survey used relies on human subjects, so the results are limited to the honesty of what the individuals submit. The individuals may render different numbers in order to make their company seem statistically better than they actually are
- Due to the constraints of time, the sample size used for the study was small. Larger sample sizes could have given a more representative picture.

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APPENDIX

Department Of Building Technology

Kwame Nkrumah University of Science and Technology, Kumasi.

SURVEY QUESTIONNAIRES ON IMPROVING SAFETY PERFORMANCE OF GHANAIAN BUILDING CONTRACTORS

This questionnaire forms part of an MSc. research project which aims to study ways of improving safety performance of Ghanaian Building Contractors. It is expected that this research will highlight means and measures which when put in place will lead to a drastic reduction in the numbers of accidents that occur on construction sites in Ghana. I would like to invite you to participate in the above project. Completion of the questionnaire is completely voluntary and returning the completed questionnaire will be considered as your consent to participate in the survey. The questionnaire will take you about 5 minutes to complete. I appreciate that you are already busy and that participating in this survey will be another task to add to a busy schedule, but by contributing you will be providing important information. **All data held are purely for research purposes and will be treated as strictly confidential.** If you wish to receive feedback on the research findings, please complete the slip below. In the event of questions or queries, do not hesitate to contact us

Thank you for your time and valid contribution in advance.

Yours faithfully,

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Dr. E. Adinyira

Supervisor

I wish to receive feedback on the research findings, please find my contact details below:

Name:	Email :
Tel :	Fax :
Address :	

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

IMPROVING SAFETY PERFORMANCE OF GHANIAN BUILDING CONTRACTORS

Part (A)

RESPONDENTS' PROFILE

1. Designation of Respondents:

Construction Manager ☐ Safety Officer ☐

2. Highest Level of Education.

MSc ☐ BSc ☐ HND ☐ (CTC I, II, and III) ☐

Others …….

3. Years of experience.

Less than 1 year ☐ 1- 5years ☐ 6-10 years ☐ More than 10 years ☐

4. Number of projects executed in the last five years.

Less than 10 ☐ 11 – 20 ☐ 21- 30 ☐ More than 30 ☐

Part (B)

HEALTH AND SAFETY ISSUES.

5. Did any Accident occur in your executed projects within the last five years?
   Yes ☐ No ☐

6. What was the extent of the injury?

Death ☐ Permanent disability ☐ partial disability ☐

Slight injury ☐ other……..

7. Are accidents that happen on site reported to your outfit?

Yes ☐ No ☐

8. In your opinion, who should be responsible for ensuring safety during construction on sites? Please select as many as apply.

Site Workers ☐ Government ☐ Contractors ☐ Owners ☐
Consultant ☐ All ☐

9. Is there a governmental organization follow up and contribution in improving safety in the construction projects?

Yes ☐ No ☐

10. What are some of the potential hazards easily identified on your site? Please select as many as apply.

Falls ☐ Electric shock ☐ Dust inhalation ☐ Poisonous chemicals ☐
Severe weather conditions ☐ All ☐

PART (C)

FACTORS AFFECTING SAFETY PERFORMANCE

11. Below are a list of factors that influence safety performance of Ghanaian Class D1 Contractors, in a scale of 1 to 5, please rank the following factors to indicate the extent to which they are important in influencing safety performance of Ghanaian Building contractors by ticking the appropriate cell.

Very important = 1 **Important = 2** **Neutral = 3**
Not important = 4 **Not very important = 5**

Factors	**Extent of importance**				
	1	**2**	**3**	**4**	**5**
a) Administrative and Management commitment	[ ]	[ ]	[ ]	[ ]	[ ]
b) Role of Government and engineering societies	[ ]	[ ]	[ ]	[ ]	[ ]
c) Project nature	[ ]	[ ]	[ ]	[ ]	[ ]
d) Historic, Human and psychological climate	[ ]	[ ]	[ ]	[ ]	[ ]
e) Organisational structure	[ ]	[ ]	[ ]	[ ]	[ ]
f) Safety inspections	[ ]	[ ]	[ ]	[ ]	[ ]
g) Safety meetings	[ ]	[ ]	[ ]	[ ]	[ ]
h) Safety records and reports	[ ]	[ ]	[ ]	[ ]	[ ]
i) Incentives	[ ]	[ ]	[ ]	[ ]	[ ]
j) Safety education and training	[ ]	[ ]	[ ]	[ ]	[ ]
k)Economic investment	[ ]	[ ]	[ ]	[ ]	[ ]
1) Medical facilities	[ ]	[ ]	[ ]	[ ]	[ ]

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12. Below are the above mentioned factors that influence safety performance of Ghanaian Class D1 contractors, in a scale of 1 to 3, please rank the factors to indicate the extent to which they are evident in influencing safety performance in your organization, by ticking the appropriate cell.

Very evident = 1 **Evident = 2** **Not evident = 3**

Factors	**Extent of evidence**		
	1	**2**	**3**
a) Administrative and Management commitment	[ ]	[ ]	[ ]
b) Role of Government and engineering societies	[ ]	[ ]	[ ]
c) Project nature	[ ]	[ ]	[ ]
d) Historic, Human and psychological climate	[ ]	[ ]	[ ]
e) Organisational structure	[ ]	[ ]	[ ]
f) Safety inspections	[ ]	[ ]	[ ]
g) Safety meetings	[ ]	[ ]	[ ]
h) Safety records and reports	[ ]	[ ]	[ ]
i) Incentives	[ ]	[ ]	[ ]
j) Safety education and training	[ ]	[ ]	[ ]
k)Economic investment	[ ]	[ ]	[ ]
1) Medical facilities	[ ]	[ ]	[ ]

PART (D)

IMPROVING CONSTRUCTION SAFETY PERFORMANCE IN GHANA.

13. Is there a clear safety policy for your organization on projects?

Yes ☐ No ☐

14.If yes, are there effective arrangements for reviewing the policy yearly?

Yes ☐ No ☐

15.There is the assertion that contractors **do not** provide the following safety related items or

equipment on construction sites for workers. Please indicate your reaction to each statement by ticking the appropriate cell

Strongly agree = 1 **Agree = 2** **Neutral = 3**
Disagree = 4 **Strongly disagree = 5**

Factors	**Extent of importance**				
	1	**2**	**3**	**4**	**5**
a) Safety signs	[ ]	[ ]	[ ]	[ ]	[ ]
b) Hard hats or helmets	[ ]	[ ]	[ ]	[ ]	[ ]
c) Goggles and face shield	[ ]	[ ]	[ ]	[ ]	[ ]
d) Safety boots	[ ]	[ ]	[ ]	[ ]	[ ]
e) Rain gear	[ ]	[ ]	[ ]	[ ]	[ ]
f) Hearing protection	[ ]	[ ]	[ ]	[ ]	[ ]
g) Gloves	[ ]	[ ]	[ ]	[ ]	[ ]
h) Safety nets	[ ]	[ ]	[ ]	[ ]	[ ]
i) Flash lights	[ ]	[ ]	[ ]	[ ]	[ ]
j) Ladder scaffold platforms	[ ]	[ ]	[ ]	[ ]	[ ]

THANK YOU