

**ADHERENCE TO HEALTH AND SAFETY PRACTICES IN ROOF
CONSTRUCTION IN GHANA**

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DECLARATION

This research or any portion of it has not ever been submitted in any way to KNUST, any other institution or organization whether for purposes of assessing, publishing or for any others. Excluding all expressions, acknowledgements and cited works, I confirm that the academic content of this work is the result of my time-consuming but frank effort and no other person(s).

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DEDICATION

This research is dedicated to the Almighty God (Jehovah Nissi) and my lovely family.

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I express my profound appreciation to my Creator who initiated this process and gave me the strength and resources for this endeavour.

Secondly to my supervisor Mr. Ayeribi Danso who has been very influential to this course. I must say I have learnt a lot from his guidance.

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ABSTRACT

Adherence is the state of being or the ability to become attached to something. Therefore being attached to something depends on some conditions available for cooperation by all stakeholders involved. The aim of this study was to identify factors for adherence of health and safety practice in roof construction. The objective was to identify factors that influence workmen to adhere to health and safety and the relative impact these factors have on the roofing companies in Ghana. Literature though scanty, discovered three major categories of factors that influenced adherence of health and safety practices. The review served as the bases for collecting Quantitative data which was used to design the questionnaire for the research. Data collected was analysed using mean score to find the relative importance. The study revealed that the identified adherence factors highly influence health and safety, with provision of safety incentives, client require safety compliance on their site and care for personal safety ranked highly among all three categories irrespectively and also has significant impact in the roofing companies. The response rate towards certain factors highlighted gaps in roof work practices.

The study recommended that roofing companies should implement these factors to their advantage so as to reduce casualties or fatalities, improve on work performance and for customer satisfaction and feedback. In addition, appropriate state institution should be empowered to enforce adherence to health and safety or if possible make it a prerequisite for establishing a roofing contracting business.

In conclusion, roofing companies in Ghana should set up necessary procedures within their organization based on the results from respondents irrespective of the financial commitment to also help gain international recognition.

Key words: Health and safety, Adherence, Roof construction, operatives

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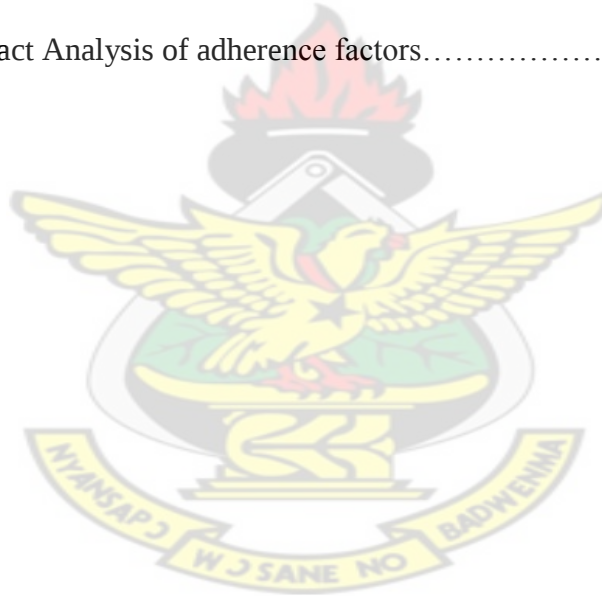
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LIST OF ABBREVIATIONS AND ACRONYMS

HSE Health and Safety Executive

HSA Health and Safety Authority

BLS Bureau of Labour Statistics

HESAPRO Health and Safety professionals

OSHA Occupational Safety and Health Agency

NIOSH National Institute for Occupational Safety and Health

EANPC European Association of National Productivity Centres

ILO International labour Organization

NSW New South Wales

WSH Workplace safety and Health



LIST OF ACTS

Uganda's Factories Act Cap 198 (1964)

Ghana Labour Act, 2003 (Act 651)

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CHAPTER ONE

GENERAL INTRODUCTION TO THE STUDY

1.1 BACKGROUND

According to Hawkins (2012) the roof is the most vital component of a building to maintain but the most disregarded. The roof serves as a shelter for all life and properties and hence a building is not complete without a roof. It also provides the principal line of defence against all elements while its design significantly affects its overall appearance. Against this backdrop, roof cannot under any circumstance be ignored in any construction work or research work due to its significant importance. Mattison (2011) supported this notion by stating that about fifteen (15) per cent of all newly constructed roofs fail during the first six years of usage. These statistics is a proof to the industry's majority of inferior materials, careless installation and overlooked maintenance.

Fall from height is the most severe hazard associated with roof work (HSE, 2012). Fatal occupational injuries to the average construction worker cannot be compared to the roofer who is six times more at risk (BLS, 2004). The total productivity of a construction project can be impaired by injuries. This phenomenon when it occurs affects the whole company and may run it to a halt. There would be idle time, work may not be completed on schedule and company may be unstaffed due to absence of a gang member, subsequently, impacting on overall productivity (Hinze, 1997).

Over the year many researchers have written about safety in the construction industry as far as the roofing industry is concern. Hence, it was appropriate to look at the driving force or what will make site operatives adhere to health and safety to achieve high safety standards in the roofing industry of Ghana. This notion alone cannot be

conclusive because other factors will also seek to address non-adherence issues when put in place and that is what this research sought to explore or identify.

The environmental appearance and life-cycle costs of metal products fabricated into different forms truly have some benefits to the users, hence being advertised by most of the roofing companies in construction industry. Most government project in Ghana have metal roofing specification in document which has help it gain popularity in the ordinary market but unsurprisingly failures ensue due to wrong installation works or the view that metal is magic and can be used for whole lot. According to Haddock (2004) using metal roofing systems entails a good deal of science, thus making ignorant design decisions about materials and systems can be very detrimental. Therefore all stakeholders in the roofing industry must have adequate knowledge and understanding in roof design, material choice, and installation to improve the chances of a successful roofing project and satisfy clients or customers for several years to come.

HSE (2008) states that roof construction can be very risky due to the height involved. About 24 per cent of roofers account for most deaths and severe injuries in construction than any other field, the largest group of employee by far persons who die in all falls from height. This statistics is not good and brings to fore how employers and employees have neglected the practice of proper health and safety procedures. There is a high probability of serious injury to be incurred from every fall from a roof. Risks are significant; it does not matter how short or long the duration of work. Hence, the need to adhere to health and safety will go a long way into minimizing or eliminating all the risk involved in undertaking a roof work,

either when constructing the wood carcass, metal trusses and installation of roof material.

Adhering to health and safety would certainly depend on some factors that stem from all stakeholders involved and this is what the researcher sought to unveil.

1.2 PROBLEM STATEMENT

Metal Long span roofing came into existence in Ghana some few decades ago overshadowing our ancient traditional standard roof, to this effect a lot of individuals and institutions have accepted the idea of roofing their buildings with metal long span roofing sheets. The roof appearance after installation brings an outstanding beauty to the building. . Invention of different roofing materials has inspired a lot of client to adopt different roof style or shapes increasing the risk involved in working on such projects.

Modernization of roof materials means workmen approach towards working on the roofs must change. The roof industry employs services of both semi-literates and illiterates and this to some extent has some growing challenges towards health and safety as a whole. There are barely recognized institutions that give training to workmen in the roofing industry, hence in depth knowledge on job requirement is a big issue.

How some roofing companies perceive or handle safety matters with respect to their workmen is to some extent questionable.

Customer consent about mode or method of roofing their building is on the low side, hence how well equipped (safety) does not always play a major role in choice of a roofing contractor. However, over the years various customers complain about how their roofs have performed with respect to workmanship or installation. It is to this

effect that the researcher found out factors that will influence work men adhere to health and safety practices and what impact these adherence factors had on the roofing companies.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim

The main aim of this research is to identify factors to the adherence of health and safety practice in the construction of roofs.

1.3.2 OBJECTIVES

To endeavour to accomplish the above stated aim, the following precise objectives were established:

1. To identify factors that influence roof workmen to adhere to health and safety practices in roof construction.
2. To identify the impact adherence factors will have on the Roofing companies.

1.4 RESEARCH QUESTIONS

1. What are some of the factor that influence worker to adhere to health and safety?
2. What impact does adherence factors have in the roofing Industry?

1.5 SCOPE OF THE STUDY

The extent of this research was concentrated on selected roofing companies in Kumasi and Greater Accra Metropolis. These two cities are the largest in Ghana, and the preponderance of roofing companies is located in these two cities. The focus of

this research was on companies that do production or fabrication of roof material and conduct installation services for their clients. Companies' that treat site workmen as part of them and deduct retention from installation charges. This study tackled roofs that were made with wood and metal trusses. It also focused on companies that had been in existence for five years and above. Companies that were part of Association of Ghana Industries (AGI) were considered and some selected companies outside the association.

1.6 RESEARCH METHODOLOGY

The study adopted different steps including field work in order to have precise and up to date information. A critical literature review was conducted to unearth the factors that influence adherence to health and safety practices and methods as well as its impact on the roofing companies. This was to facilitate the exploration of critical adherence factors influencing health and safety practices that can be adopted by roofing companies in the Ghanaian construction industry. Reliable and scientific data from the existing literature through journals, articles and books was sourced.

Interviews were carried out prior to the questionnaire survey to examine the relevance of the identified factors in the Ghanaian context. Project managers and Installers of Roofing construction organizations registered with the Registrar general Department were targeted. The roofing companies are classified under building section of the register. Interviews were conducted with some executive directors the roofing companies operating in Kumasi and Accra.

The next step was to draw sample frame from roofing companies operating within the catchment zones of Greater- Accra and Ashanti Region by using purposive sampling technique. The enquiry was largely dependent on survey questionnaires to

assemble empirical data from the field. The questions were close-ended and ranked on a Likert scale rating to allow easy categorization and synthesis.

The Statistical Packages for Social Sciences (SPSS version 16) and Microsoft Excel was used for the analysis of the raw data. Statistical tools that was considered for the analysis was Relative Importance Index

1.7 SIGNIFICANCE OF THE STUDY

The finding of this study is to address factors available to the adherence of health and safety in the roofing companies and its effects during and after project delivery in the Ghanaian Roofing Industry as a whole. The findings would lead to viable and practically applicable suggestions which would serve as a guide to educate and also the key role players in the Ghanaian Roofing material Industry who are not well informed about the relevance and the need to enforce health and safety practices. It will also identify the major factors that will influence workmen adhere to safety issues and reduce the number of fatalities on site as well as necessary policies that need to be established to involve all stakeholders. It seeked to identify the appropriate method of conducting installation works on site to bring about customer satisfaction and worth of money in the long term in literature review. Educate prospective clients on the need to consider safety in their choice of a roofing contractor. The analysis and recommendations derived from this research would serve as points of reference in further studies on this subject matter.

1.8 ORGANIZATION OF THESIS

The structure of the thesis (report) was divided into five (5) interdependent chapters, and conformed to the following outline. Chapter 1, labelled “General Introduction to the Research”, presents the background to the study and states the problem meriting research efforts. The research aim, objectives, research questions, and scope are all contained in this chapter. Chapter 2 contained the detailed literature review. The review provided and extended coverage on previous works. Chapter 3 also focused on the research methodology. It explored the philosophical dimensions of the research and situates it within its appropriate philosophical tradition methodological jurisdiction. Detailed discussions were provided by the data collection analytical tool that was employed. Chapter 4 presented the empirical analysis of data from the field survey that responded to all the research objectives and questions. Chapter 5 which was labelled “Conclusions and Recommendations” wrapped up the entire research endeavour by reviewing the main contributions of the research to knowledge. Policy recommendations and limitations of the study were also outlined. Pointers as to where future research attempts should be directed were also clearly defined.

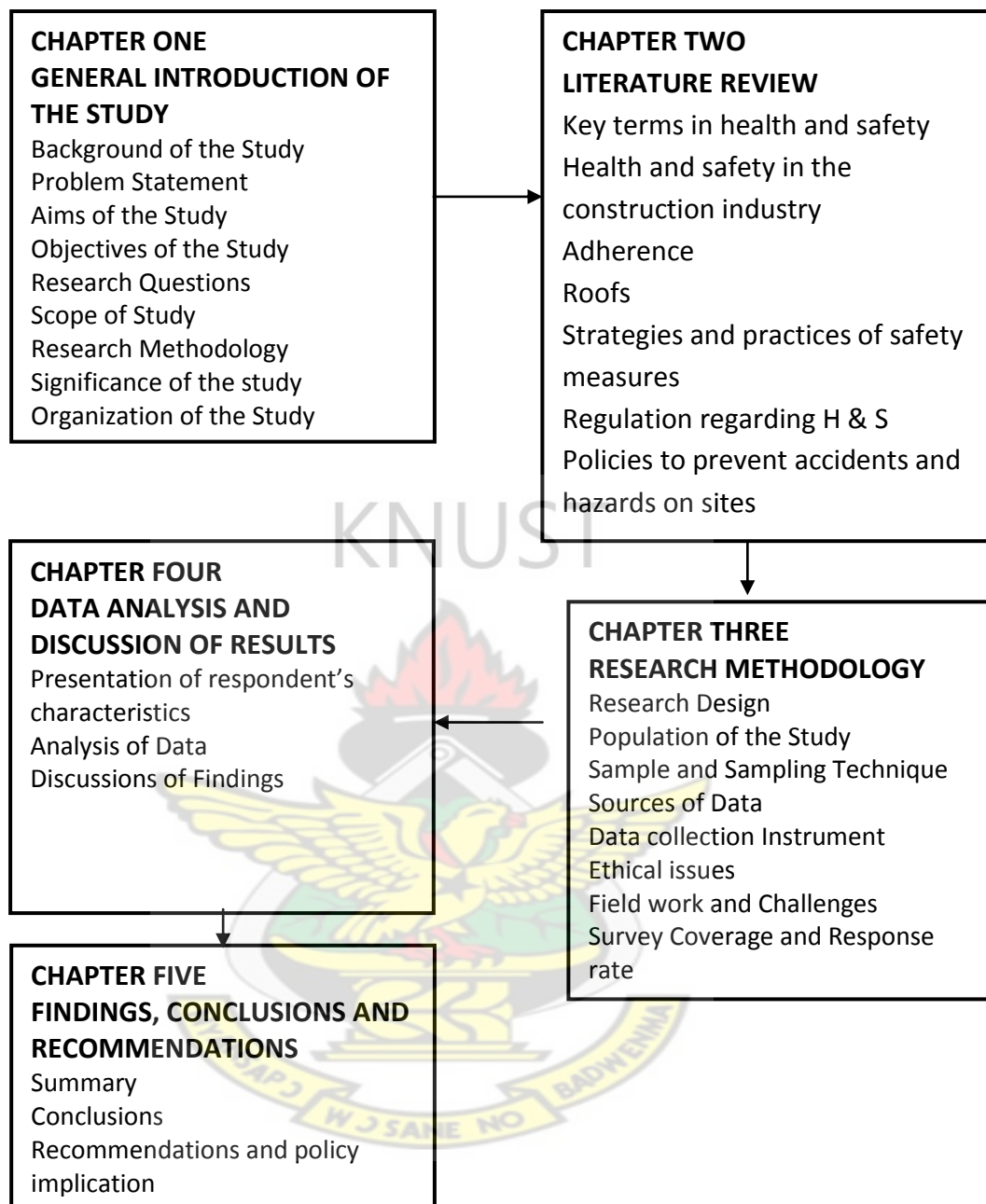


Figure 1.1: Conceptual Framework for the Study

1.9 CHAPTER SUMMARY

As indicated in the preceding section, this chapter has discussed the general introduction to the research. In addition, the background of the study and the problem statement of this research were presented. This chapter also presented the research aim, objectives, research questions, and the scope of the research. In other to achieve the aim of the study, the research objectives were established and a summary of the methodology adopted for the study was presented in the chapter.

In conclusion, chapter one discussed the justification of the study and the organization of the research.



CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Generally roofs are known to serve as the first line of defence against all weather conditions and protect life and properties as such very important component of the building. The building project is not complete without a decent roof. Basically, roofs can be classified into three major categories: flat, sloppy and arc or curve roofs. Various researches has been conducted on health and safety in the construction industry (Leopold and Leonard, 1987; Enshassi and Mayer, 2002; Kaplinski, 2002; Rowlinson, 2004; Gibb, 2005; International Labour Organization, 2005) sounding the need for governments, health and safety professionals and stakeholders participation to create a better environment at work. The welfare of operatives when prioritized will go a long way to boost the reputation of their respective companies and minimize wastage as well as improving roof performance. This measure if up held will in long-term profit all parties involved. As part to delivering project worth the cost to the client, factors such as: proper installation of roof frame work and sheets, higher safety standards as far as avoidance of accidents is concerned and adequate roof performance over a lengthy period are the responsibility of all stakeholders involved.

Stakeholders involved in this context are:

- a. The manufacturers of roof products and related equipment
- b. The project manager which may involve the owner of the company supervising the quality of roof work
- c. The installers on-site fixing the wood or metal members and sheet
- d. The client who will be using the finished product

Adhering to health and safety on site is tailored towards encouraging and maintaining of the highest level of the physical, mental and social welfare of workers in all occupations, avoiding high labour turnover owing to health complications caused by working environments, protecting workers from risks ensuing from factors adverse to health and creating favourable working conditions for worker (HESAPRO, 2013).

Safety concerns in the construction industry of which the roofing industry is no exception are always essential as it can make or break a construction firm. Universally, construction industry is still regarded as one of the most dangerous industries (Hinze, 2008). The physical nature of roof work makes it prone to health and safety hazards. Hence, investing in health and safety offers strong dividend on individual projects. There are relatively low cost to implementing health and safety practices, and the benefits that comes with it help drives most companies to greater investment returns in their safety programs especially smaller ones (Hill, 2013).

According to OSHI (2006), Jordanian reports published by their Ministry of labor from 1995 to 2005 showed that the spate of accidents within most industries continue to rise at an alarming rate claiming life's and properties as a result of poor safety performance. This report stated that though construction employees' accounts for about 7.1% of the labor force, Occupational Safety and Health Institute in Jordan reports that accidents in the construction industry contributed to about 10.5% of all cases. This explains that a safe working environment helps secure skilled employees on the job and projects on schedule by reducing accidents, the occurrence of injuries and schedule delays, while also reducing the risks of dispute and regulatory action (Cesarini et al., 2013).

A study by Laryea and Mensah (2010) showed that Ghanaian society does not hold health and safety of construction employees on site in high esteem. Labor Department report in 2000 stated that 56 out of 902 occupational accidents that occurred in construction in that year were fatal (Kheni, 2008). In advanced countries, health and safety practices are well regulated in the construction industry therefore creating sanity in that field. In Ghana, the roofing industry is porous as employers and workers bend the regulations governing roof work in OSHA, hence the need to look at adherence issues which when addressed can improve health and safety.

2.2 ADHERENCE

According to Oxford Advanced learner's dictionary "*adherence is the state of being or the ability to become attached to something. Being attached to something depends on some conditions available*".

2.3 FACTORS FOR ADHERENCE

Adhesion of health and safety in construction sites can be linked to top management commitment to worker safety, safety training and orientation for site operatives, safety audit by safety committees, good site conditions, safety incentives, supervisor involvement, taking into consideration health and safety matters during the design phase of a facility, accident investigation and record keeping, responsibility/accountability and safety budget and alcohol/substance abuse programs (Kheni , 2008; Liska et al., 1993; Aksorn and Hadikusumo, 2008). These factors can be categorized into three main headings namely; management factors, external and manpower factors.

A study by Teo et al. (2005) supported the previous researchers that site accidents has high tendency to ensue when company policies are inadequate, poor worker attitude, perilous work practices, poor safety knowledge, low management commitment and worker training.

2.4 MANAGEMENT FACTORS

Adhesion of health and safety in construction sites can be linked to top management commitment to worker safety. Management commitment to delivering a good safety policy, better management-worker relationship, safety representative, frequent toolbox talks on safety among others can help adherence of health and safety (McDonald, 2001; Kheni , 2008; Liska et al., 1993; Aksorn and Hadikusumo, 2008). This notion is true because employers own the business and their level of commitment to health and safety will determine how the ordinary man or professional adhere. According to HSE (2003), a committed management will stop all activities to attend to safety matters irrespective of the cost involved.

2.4.1 PROVISION OF COMPANY SAFETY POLICY

A safety policy is aimed at instituting transparency, consistency, targeting, proportionality, accountability and investigation (HSE, 2009). It will be a guide in which every issue relating to health and safety would be referred to. Policies are sets of principles that serve as a guide to companies in making right decisions to arrive at expected outcomes. According to Teo et al. (2005), inadequate company policy can have serious consequences on health and safety. These policies cover the entirety of companies' works and as such health and safety is accommodated in such. The extent of health and safety observations and practices depends on the provisions in

the policies i.e. while some companies may be very extensive in exploring health and safety, others may just do it on ad hoc bases. The extent of practice also depends on the type, nature and complexity of works that a company engages in. Roof companies' works may vary from just simple roof to highly complicated storey roofs which arouse quite different practices. However, the nature and complexity of company works should reflect the health and safety policy used to address all risk involved. The employees should be able to completely commit themselves to works by adhering to the health and safety provisions in policies.

The most common health and safety policies adopted worldwide for construction work include the Occupational Safety and Health Act which is imposed by the Occupational Safety and Health Agency (OSHA) in the United States. Workplace health and safety regulations are provided by OSHA through the Act. These regulations include employee safety procedures, access to information and requirements for the use of PPE's. These guidelines offer a means and guide for companies to customize their policies to the mutual benefit of companies and their employees. Management is at the helm of implementing safety policies and championing adherence by site operative. Budgetary provisions are prepared to sustain the policies and keep it running. OSHA agents as important as they are might not be available in the Ghanaian Roofing industry, as well as employers difficulty in providing PPE for site operatives.

2.4.2 PROVISION OF SAFETY INCENTIVES

One area in construction firms that is controversial in adhering to safety practices by employees is provision of safety incentives (Bizell, 2008). Incentives like bonuses paid to operatives can lead to attaining greater production through conducting work

safely at site. Jobs where workers are paid hazard money are mostly those that come with higher risk of accidents (Lund and Aaro, 2004). Due to the nature of roof work and the risk involved, it will not be out of place to set up safety bonus for workers; for example, when they have conducted their site work the whole year without recording any accidents. This in turn sparks interest in operatives to conduct duties safely and prompt co-workers. Safety bonus must be encouraged at the expense of productivity bonus. Choudhry and Fang (2008) opined that when productivity bonuses are encouraged, it achieves high production at the detriment of safety. Lee (2003) in similar research stated that issues concerning bonus payment creates problem for management therefore paying safety bonuses rather than productivity bonuses relatively impact positively on productivity and safety performance as a whole.

Furthermore, bonuses for workers help as one of the many ways used to inspire the observation and practice of health and safety on construction sites. The award is granted to the workers to show their stern following of health and safety procedures at the work place periodically to motivate them to sustain such practices even if more. They are also awarded to workmen who obtain exceptional safety and health performance and can augment particular safe behaviours, promote good construction site culture and participating in safety initiatives. It is imperative to communicate the reward scheme to all the workmen who are covered by such arrangements so that the companies can benefit from the competition. That is to say, what it takes to be able to win the awards should be clearly delineated unto all the workers so that there is no such bias entertained. One of the easiest and most cost effective means to provide a safety incentive for the workers is to recognize them in some way for undertaking their work tasks safely (Choudhry and Fang, 2008). It is also advisable not to award

the lack of insecure behaviours but rather the focus should be on rewarding noticeable safe behaviours. The awards could be in terms of either individual performance or group performance; however, the award based on individual performance is more important. Daily site work routine should be incorporated into the reward scheme in order to boost mass participation of all the workers. Safety engineers and job superintendents can have safety incentives tied into a bonus that they will receive if projects they supervise ends successfully (Gillen et al., 2004).

The outcomes of the reward schemes could be published in newsletter, posters and stickers, could also be communicated through team meetings and site briefings. Some of the workers may however not want their details to be published and so empathy should be given them as such. The type of reward should also put into consideration the differences in terms of religion, gender, cultural background, age, etc. From the opinions elaborated above, safety incentives are very essential in the construction industry given the level of knowledge or educational background of operatives on site.

2.4.3 EFFECTIVE COMMUNICATION BY MANAGEMENT

According to HSE (2003), a good communication relationship between employer and employee provides good updates on current matters day to day and in formal safety meetings, listening and feedback. The health and safety practice in the construction industry has to be well communicated amongst all the workers who have direct involvement in the construction process. Whenever health and safety policies are produced or revised, the members forming part of the companies must come to the knowledge in order to diligently observe them. This can only be appropriated when there is a sustained flow of safety and health related information amongst all

concerned workers. It has been noticed in various hazardous incidences on sites that workers are often not aware of safety practices and equipment at their disposal in times when they are needed. It therefore becomes the prime duty of the management team to ensure that whatever level of health and safety commitment and practices that the company is operating at, the workers are aware and ready to engage them. Communicating vital health and safety information to workers effectively can help address critical health and safety matters (Tutt et. al., 2011). If the roofing companies management can make health and safety communication an integral part of their operations this will reduce accident drastically. The mode of the communication would have to be set properly so that the workers would benefit fully. The language used will have to be understood by every worker to generate interest to both literate and semi-literates.

According to HSE (1997), effective communication about health and safety relies on information coming into the organization, flowing within the organization and going out from the organization. All these information flow can be properly addressed if management is committed. For example, if a roof client should sound the need for safety to be adhered to on their site prior to given the contract to the company, this message flows through the companies down to the operatives on site. Effective communication between employers, roof foremen, and the work force can inspire duty of care.

2.4.3.1 PRE-WORK MEETINGS

Pre-work safety meetings are work site practices that may encourage safety performance (Irizarry and Abraham, 2006). Pre-work meetings address daily activities and hazards workers may be exposed to at the beginning of each day

throughout the cycle of the project (Nighswonger, 2001). A pre-work meeting helps heighten workers' safety awareness and it is a constant reminder to operatives that their companies care about their safety (Bizzell, 2008).

In the case of roof work where most sites may be remote, trained work foremen may assume the role giving pre-work address. The job superintendent has to weigh the level of knowledge and what is required of each member in the team. If there is a knowledge gap in the work process, it is the duty of foreman to ensure that adequate training or support is provided and sustained. Special attention should be given to new or inexperienced operatives since they are more at risk on the work site. Periodic safety training sessions should be conducted (OSHA et. al, 2007). In our Ghanaian set up (roofing industry) where most operatives/workmen are illiterates or semi-literates pre-work meeting are essential to the adherence of health and safety.

2.4.3.2 TOOLBOX TALKS

Toolbox talks are conducted once a week or every two weeks by the safety engineer or the job superintendent (Nighswonger, 2001). Issues to be discussed at the meeting are predetermined by management and may not be necessarily related to job site activities to be performed at the time, but meant for general overview of adhering to health and safety on site (Bizzell, 2008). Toolbox talks are mostly held by companies to identify new threats and review current hazards, discuss/review accident, develop/review hazard controls, and incident records, worker participation, encourage discussion by soliciting input from workers, develop/review work processes and short training sessions. Many companies have a standard toolbox talk outline, and cover different hazards on the jobsite each week. As long as the subject

covered relates to the work that will be taking place, it helps make the workers aware of the dangers that they could face that day (Bizzell, 2008).

2.4.4 ACCIDENT INVESTIGATION

Effective accident investigation is a valuable means of learning from failure (HSE, 2003). Updates on incidents and accidents which may include injury, near-misses, fatalities among other should be communicated to the entire work force for awareness likewise fatal accident occurrence in other companies to reinforce the need need to work safely and points out best practices to help avoid a similar fate (Nighswonger, 2001). Roof workers awareness of management interest in investigating accidents and finding solutions to it can create adhesion to health and safety because they would not want to be vilified for their negligence when found culpable.

2.4.4.1 DRUG TESTING

According to Rountree (2001) before a worker is recruited and after an accident had occurred, drug test should be carried out whilst also looking out for abnormal behaviors. Drug-testing system is another efficient way for construction companies to be proactive about safety on their jobsites (Bizzell, 2008). A survey conducted in Alberta, Canada on 459 job place deaths showed that 40 workers who tested positive for alcohol, and 10 who tested positive for cannabis. Approximately fifty tested positive for both prescription and non-prescription drugs. Also in the assessment of deaths in New Mexico proved that almost 530 Of 613 occupational deaths recorded found the presence of alcohol or drugs. The success of each test depends on the type of drug testing required by the company. Most companies that have a drug-testing

program require a drug test to be conducted prior to beginning their employment with the company. This is really important to ensure that workers that are hired are drug-free on the first day of employment. To increase the effectiveness of these drug tests, follow up drug tests should be implemented. These tests can be administered upon suspicion, at random, or after an accident (Bizzell, 2008). In the case of construction of roofs where mostly project duration is short, trained project superintendent can take up the role of drug testing at the beginning of each project or intermittently on their site visit. Consistent practice of drug testing can prove influential for worker to desist from various drug attitudes that can put their life at risk.

2.4.4.2 THE RELATIONSHIP BETWEEN DRUGS AND SAFETY AT WORK

Biggs et al., 2012 stated that no identified study has scientifically established the relationship between the use of drugs and safety effects in construction, as well as restriction on adoption of nationally coordinated strategies. It also has been supported by employers and employees to make it socially unacceptable to arrive at a construction workplace with impaired judgment from alcohol and drugs. It was supported by Rowntree (2004) that common sense alone will tell anyone that drug abuse intensify the risk of accident at workplace.

2.4.5 SAFETY PERSONNEL

The employment of safety personnel or an independent safety consultation agency may be a common practice with large construction companies, but with small to medium-sized construction firms, the safety budget may not be possible to implement. However, the project managers who focus mainly on the scheduling and

paperwork aspects of construction provide assistance in the field can be empowered to enforce safety (Bizell, 2008). Safety workers are individuals who work for a construction company, and their singular responsibility is to track safety information for good recordkeeping purposes and oversee the company's safety program. The safety employee may be involved with pre-job planning, toolbox talks, new worker orientation, and employee training. The project manager meets with the job superintendent (roof foremen) on the site and walks through the jobsite to look at the safety aspects of the roof work. These inspections usually are performed weekly, and range from one to two hours in length. A checklist is commonly used to conduct the inspection. The jobsite safety inspections should not be scheduled, in order to keep the workers unaware of when the inspection will be. If the time is random, then the workers will need to make sure that they are working safely at all times (Hinze 1997). Although these safety inspections allow project managers to become familiar with the jobsite and the safety procedures being used, there have been no indications that these safety inspections reduce accidents (Hinze and Gambatese, 2003). Given the depth of knowledge express on safety personnel it will be very prudent to employ services of safety personnel in the roofing industry in Ghana to promote safe working methods and this process will help model workmen to adhere to safety or minimize accidents.

2.4.6 INSURANCE POLICIES

Generally insurance are known to be a medium in which unexpected event can be prevented or the risk involved reduced. Hence insurance policies are very important in the life of every roofer considering the risk that is associated with their work. Insurance policies premiums are calculated according to the risks or uncertainties

surrounding the work or nature of task and these policies have some basic requirement that need to be fulfilled before a person can be covered by the policy. According to HSE (2002) many worker are off the opinion that health and safety regulations does not cover self-employed workers. In Ghana here most of the labor force in roofing companies are in the semi-literate range, their perception about adhering to safety laws are very absurd and the fact that most of them are also sub-contractors which makes it even worse. From literature, provision of insurance policies can help roof operatives to adhere to health and safety practices.

2.4.7 SUPERVISION BY MANAGEMENT

Supervision can be defined as co-ordination by someone taking responsibility for the work of others (Mintzberg, 1979). According to HSE (2003), supervision when properly conducted can eliminate some site accidents. Management can institute a proper supervision system in the roofing companies' right from the period materials are delivered on site, throughout the project duration and after completion. It will go a long way to create adhesion to health and safety with workers knowing very well management is concerned about their site activities. Constant supervision will bring to light all the peculiar challenges roofers face so as to mitigate risk, identify areas operative need training and improve site conditions through the design stage.

2.4.8 FORMATION OF PROJECT TEAMS

The construction industry is a complex industry where no two jobsites are the same. Projects have different completion dates, cost and quality requirement. To this effect, hazards change daily on the jobsite, and when many subcontractors of different potential are combined working in the same working areas, the chance for fatalities

will escalate. Most designers do not factor the construction methods, the way in which the equipment are used and the means to achieving the construction methods. But according to HSE (2002) designers play a vital role to minimize the risks that arise from construction works and its subsequent maintenance and demolition work. In the case of roof work designer could help building owner to choose roof designs that are nice but appropriate and comes with moderate risk.

The project team will have to encourage every team member to work together to improve the planning and management of projects from the beginning to the end, early risk identification, focus effort where health and safety can be improved to minimise risk and discourage unnecessary bureaucracy (HSE, 2007). HSA (2009) emphasize the identification of hazards ensuing from the design/technical, organisational, planning, or time related aspects of the job, taking into account the general principle of prevention so as to eliminate or minimize the risk involved. Preparation of specific written health and safety plan for projects with longer duration or at least 30 working days will have to be delivered to the client prior to tender (HSA, 2009). Formation of teams which includes all stakeholders within the organization from above discussion help identify all possible problem that might be associated to roof work from the drawing stage to the laying of roof material.

2.4.9 SAFETY TRAINING AND ORIENTATION FOR SITE OPERATIVES

According to Bratton and Gold (2007), training and human resource development plays a critical part in promoting health and safety awareness among employees. Training given to new operatives especially is vital due to the potential of high casualty levels during the early stages of the job. As Roof workers form greater percentage of operatives who are prone to injuries on site, it will be prudent to train

operatives to that effect. Training of workers has been proven to be a very effective way of ensuring that workers have the ability to complete their duties in a safe way (Bizzell, 2008). Over the years experienced workers may feel that since they have completed most of their tasks successfully on multiple projects without injury means that they are being safe. This phenomenon may not be true as training is not the same as experience. Those who see themselves as experienced workers may at certain times ignore some procedures, let down their guard, and subsequently be involved in accidents. Statistics data available shows that new workers to a company are at greater risk while long-term employees with the same company are at a higher risk when they move from one project to another (Broderick and Murphy, 2001). This shows that worker training is important for new and seasoned workers alike and the training must have direct relationship with the hazards found on jobsites. Frequent training for roofing operatives would be necessary to keep them abreast with the changing nature of constructing roofs and material to reduce fatalities.

2.4.10 TRAINING ON EQUIPMENTS

Training operatives on the use of protective wear and equipment is significant for adhering to health and safety in their jobs (Choudhry and Fang, 2008). In Swacha et al. (1999) study, they found out that ladders and scaffold are a great source of accidents in the construction industry. Their analysis showed that eighty-four percent of the workers believed that some criteria such as training, good technical skill, and experience should be considered as highly important to certify those who handle ladders and scaffolding. McDonald and Hrymak (2001) confirmed this showing that good technical abilities result in fewer accidents. Operating and use of mechanical plant and equipment are also a major cause of accidents on site.

Navon and Kolton (2006) states that roof workers require the adequate knowledge, skills, training and experience to work safely, or should be under the supervision of someone else who has the know-how. They are required to recognise the risks, know the proper systems of work and be competent in the skills to undertake them. Training on ladder use, edge protection installation, operating a movable equipment work platform(MEWP), manually handling materials, tower scaffolds erection, and wearing safety harness systems must be given where necessary (HSE, 2008). Training and experience to achieve these competencies are needed by operatives. Health and safety inputs provided during the site induction process are crucial, and yet there is a high level of variability in terms of how this is delivered and its effectiveness as a route to ensuring safer working (Tutt et. al., 2011).

2.4.10.1 WORKING ON ROOF

Fall from roofs does not take into consideration the numbers of years or experience an operative have acquired as one moment of negligence can cause anyone death or serious injury. Occupational injuries triggered by falls remains undoubtedly a severe public health problem all over the United States. Data gathered by the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries stated that falls are one of the foremost causes of traumatic injury death on construction site, accounting for 13.7% of such deaths (808 of 5,900) in 2001. Statistics that year showed that, 23 employees died in falls through skylights, 11 died in falls through existing roof openings, and 24 died in falls through existing floor openings (BLS, 2002).

Falls from roofs do occur from the edges, through gaps or holes, a through fragile roof materials and roof lights (HSE, 2008). Consequently, several people have incurred serious injuries by way of material falling or thrown from roofs. Site

operatives are exposed to all forms of risks from falls during construction, operation, maintenance, and demolition of buildings (NIOSH, 2004). Given labor statistics on occupational injuries in the United States and research conducted by Laryea and Mensah (2010), there is emphasis that every height work is dangerous and construction of roof is no exception no matter the project duration.

2.4.10.2 HOW TO PLAN ROOF WORK

Planning of roof work is essential right from the requisition of measurement from the client to the construction of roof structure and installation of roofing material. All site workers must be provided with a copy of and trained in the procedures of planning roof work. This includes the modes of hoisting, sequence of erection, bracing and connection details, material loading limitations and installation of sheets, wood and metal truss. Potential hazards duly discussed and communicated to workers, trained to control the risks in order to complete their task safely and must be trained and competent in fall protection. Supervisors in charge of the work must also constantly consider measures that safeguard all operatives at risk and ensure that work is undertaken only when weather conditions do not threaten the health and safety of workers (HSE, 2008).

2.4.10.3 MATERIALS HANDLING IN ROOF WORK

Material handling is summarized as an activity that uses the right procedure to provide the correct quantity of the right material at the right place in the right position (Tompkins et al., 2003). Manual handling of material include a wide range of activities that require a worker to use their body to execute the work. These may involve the use of force for lifting, lowering, pushing, pulling, carrying, moving,

holding or restraining any person, animal or item. Most roofs jobs involve some level of manual handling and not all handlings may be dangerous. Nevertheless, almost half of all site fatalities occur because of manual handling (NSW, 2006).

Handling of roofing materials carelessly or inappropriately can lead to serious injury on site. The roof worker must appreciate the dangers in working with the roofing materials and follow the manufacturer's instruction carefully in relation to transport of material from delivery point to the designated position (HSE, 2008). The layout of the site does have affect material handling process. Findings have shown that a well laid out site eliminate double handling of materials. It is also recommended the roofing sheets must not be handled during strong winds (HSE, 2008).

2.4.10.4 ACCESS TO AND FROM THE ROOF

According to WSH (2012), safe entry to the roof must be cautiously planned in order to choose the most appropriate method and equipment. Everyone must be responsible for preventing fall from roof the like employers, estimators, installers and the client. Accessing roof to and from is a high risk (Singh, 2000). A safe means of getting on the roof and exiting is essential. The New Zealand Department of Labour studies into construction falls from height showed that almost 70% of falls are from ladders and roofs. Cost of falls from height in construction has been estimated at \$24 million annually and relative financial and human cost is simply very high.

A properly secured ladder is the minimum requirement for all roof works (HSE, 2008). In roof work where any worker can fall, the first line of defense against fall is to provide adequate edge protection. Edge protection may comprise or be equal to main guard rail which is mounted at least 950 mm above the edge, a toe board and brick guard where there is risk of falling objects from edge of the platform and a

suitable number of intermediate guard rails or suitable alternatives positioned so that there is no gap more than 470 mm (HSE, 2008). In most installation of roofing sheets where ladder is used to access or exit a roof, work foremen must ensure that it is of a suitable type and mounted in a safe manner. Parapet roof may seem to provide equivalent protection, however there periods extra protection will be required. Providing an adequate and secured working platform is always necessary to which work will be carried out. Accidents on site can also be triggered by falling materials (Tycho et al., 2005). Procedures to prevent this include keeping a tidy site, stop material which could fall from accumulating and avoid hurling anything from a roof or scaffold (HSE, 2008).

2.4.10.5 STEEP AND LOW SLOPES

The main difference between residential building roofs and industrial & commercial building roofs is the slope (Current, 2009). The later has a lower slope than the former.

Operatives involved in roof work on low-slope roofs with unprotected edges i.e. without parapet wall at the edge must protect themselves with all safety systems available (OSHA, 1998). This is rightly so because underestimation of any low slope could cause some consequences especially when most clients are changing from the traditional style of roofing. Roof slopes of buildings are changing from lower to steeper slope due to the side effect the former poses which may include leakages, debris collection on roofs, poor rain water drainage etc.

As stated in OSHA (1998), any roof work that is conducted 6ft above ground level appropriate fall protection system must be adhered to. In case of re-roofing stringent measures should be adopted to prevent any kind of fall, every operatives on site must

be adequately protected. The design team must design roofs with respect to the type of roof material to be used taken into consideration all safety requirements.

2.4.11 LABOUR CHARGES (PROJECT COMPLEXITY/SAFETY FACTOR)

According to Hanna et al. (2005), labour cost in construction industry is estimated to be about 33%- 50% of the entire project cost. In the case of roofing in Ghana, labour charges are between 10%- 15%. The cost of labour charged on construction project only takes into account the work content and skills of the workers without making other provisions for the health and safety implications. Workers knowledge on this doesn't encourage them to adhere to health and safety procedures even if required. It is therefore necessary to add special amounts to the labour costs varying relatively with the health and safety implications and provisions. Some roof workers may come with their own health and safety equipment and so should be given substantial tool allowances as a means of recognition of their efforts in ensuring that health and safety prevails on construction sites. The differences in labour costs due to the possession of health and safety equipment and the observance of procedures and practices would encourage other workers to do the same.

2.4.12 SAFETY AUDITING

A study by Aksorn and Hadikusumo (2008) show that safety auditing when properly managed with all seriousness can be a catalyst for health and safety adherence as worker would be aware that any mistake on their part would be audited and that could be the bases to rate them in terms of competence. Safety audit and assessment are very important component of good management (Esposito, 2009). It is undertaken to identify the companies' weakness and strength for ranking purposes in

health and safety which is instrumental to the continual growth and success of the company. Safety audit takes a holistic look at the company's activities to check whether all parties involved in spearheading health and safety are really functioning. It seeks to check adherence to laid down regulations, employee's compliance or difficulties to the use of safety equipment, analyze the impact training programs, etc.

2.4.12.1 RISK ASSESSMENT

A well-documented risk assessment should be carried out for all roof work before the work commences. The appropriate equipment and necessary measures and systems of work should be provided and implemented, and workers should have required training. All roof work no matter project duration needs careful planning to minimize the risks to operatives (UT, 2009).

For simple jobs where the necessary risk measures are straightforward and can be easily repeated the company can prepare safety procedure statements. It must be specific and practical to the job in hand and clearly describe the precautions and system of work identified during risk assessment (HSE, 2008). Iannacchione et al. (2007) stated that risk-assessment and management methods for the mining industry are more prevalent in countries with safety standards that emphasize duty-of-care. American miners (Newmont) in Ghana enforce health and safety regulations in all construction of roofs both for residential or commercial and underground mine work and this practice improves adherence in the industry.

2.4.12.2 LEADING INDICATORS

Leading indicator are some of the strategies adopted for use in developing safety procedures in a company (Bizzell, 2008). This indicator in construction safety can be

ascribed to measures that involve practices, behaviors, attitudes, or performance conditions that effect safety. It defines how hazardous construction site is by looking at areas where past injuries occurred. New safety techniques can be developed and implemented after analysing past occurrences. The disadvantage of this indicator is that it only looks at the past. According to Bizzell (2008) new trend for a company's health and safety procedures to be termed successful includes initiating preventative measures which look for leading indicators on the jobsite. This is defining the problem before there is an actual injury and coming up with a plan to prevent it (Mohamed, 2002). Absence of an awareness of leading indicators a person's focus while planning and executing a particularly risky task may have physical and financial consequences of an accident occur (Ng et al., 2012). This indicator can be influential in accident investigation there knowing which individual or team of roofers that record high number of injuries.

2.5 EXTERNAL FACTORS

2.5.1 REGULATORY BODY

The establishments of health and safety legislation forms part of the process by which the roof work can be controlled to ensure the safety at work, employee's well-being and all individuals that come in contact with the roof work. Baldock et al. (2005) also added that membership of trade/business association and regulatory bodies can help adhere to health and safety practices. Health and safety management is a challenge to governments as well as owners of businesses of which Ghana is no exception (Kheni, 2008). Ghana lacks a policy that defines the responsibilities of all stakeholders' i.e. government, employers and employees. Stakeholder participation in managing health and safety will create a better work environment that can have

effect on the informal sector where temporary labour is often used. According to Uganda's Factories Act Cap 198 (1964), their government makes provision for all employees in the factories, building operations and engineering construction with respect to health and safety.

If government is to create effective system of monitoring safety practices in companies, accidents will be reduced and employers as well as employees will have no choice but to adhere to laid down regulation.

2.5.2 CLIENT INVOLVEMENT

Safety and health on site is the fundamental obligation of the contracting company. However, the clients also have some secondary duties to perform to the intent of ensuring safe and health practices. According to HSA (2009), clients' involvements in how work processes are conducted play a key role to creating adherence to health and safety practices on construction projects. Similar research by HSE (2002) stated that experience has shown that high standards are realized in projects where clients are devoted to health and safety. The clients' involvement, being very necessary, come to cooperate with that of the companies in dealing with health and safety in the roofing industry. First of all, it is the clients who make the choice of the contractors to work with and so can greatly influence health and safety performance. The clients may go in for only contractors who are willing to adhere to health and safety procedures as much as the contracts still hold valid. These roles to be played by the clients can be enforced through the clauses inserted in the contracts, which may result in a certain legal punishment upon breach by the relevant contractors and subcontractors. This will in turn cause the contractors to be up and doing in the delivery of the projects whilst giving deliberation to health and safety procedures.

The clients should always have representatives on sites to ensure that the workers performing various jobs on site are adhering to the health and safety practices and procedures. In the absence of the clients or their representatives, the contractors and the workers often tend to skip health and safety procedures in order to finish earlier or avoid extra costs which they may deem “unnecessary”. Fatalities show up often in this situation and therefore the clients’ involvement at the various phases of the projects has been encouraged in the industry.

2.5.2.1 WORK ENVIRONMENT

A well tidy and planned policy has a high probability of providing high level of safety performance (Neal and Griffin, 2006). In roof work where most of the work is done on site, the client has a responsibility to provide a safe working environment as a properly cleared site and appropriate location for material storage. Even though people and other resources are been utilised in ensuring health and safety in roof construction industry, the work environments also equally ought to be attended to. The type and nature of the work environment will actually dictate the type and level of health and safety arrangements that should be provided for the works irrespective of the cost involvement. It is partly the duty of the clients to ensure that the sites for the projects are safe enough for the workers to work in and if possible provide other safety mechanisms to overshadow the flaws. The clients cooperating with the contractors should ensure that the site is accessible especially when danger at work occurs. The clients making provision for these will somewhat ensure that the workers work in the best of environment and therefore safety is guaranteed.

2.5.3 LABOUR UNIONS

Evaluation of the true extent of the union protective effect was conducted in 1995 on UK unions. It revealed that in organizations that unions and joint management-union safety team are recognized, fatal accidents recorded were minimal compared to organization without this set ups (ILO, 2002). If roofing companies can recognize their work force and allow operatives to form unions or association not only will good health and safety standards be adhered to but remain cost effective in minimizing absence due to accident or illness.

Furthermore, the existence of labour unions in roofing companies will pave way for worker to address issues confronting their labour charges. Labour unions can also be a platform for to channel their grievances and bring to fore employers whom default in safety practices, outline a proper system of apprenticeship, undertake reviews of installation works or device new ways of roof construction in a safe manner.

2.6 MANPOWER FACTORS

Aside the general responsibility of the company in providing supervisors to ensure health and safety, the individual workers equally bear the responsibility of observing same. According to HSE (2007), there are about 240 human factors that influence construction health and safety. This shows that human factors cannot be ruled out when employees have to adhere to health and safety. A study by Razuri et al. (2007) showed that worker involvement play a major role in adhesion to health and safety. In case of roof work where some site workers think their years of experience play a factor for adherence, Gellor (2000) refutes this idea as the probability of accident cannot be determined by age and experience. Being aware of safety requirement and complying are two different stages. Geller (2000) explained that, experience has its

own risks like formation of rigid routines. In a well organised work force, workers responsibilities are well spelt out and adhered to whilst the less organised work force may not recognise it at all. The workers often don't see the relevance of personal responsibility for their health and safety except when being supervised by superior authority. It has to be affirmed that no matter how much time the supervisors utilise on roof work force to ensure health and safe, the aspect the individual workers are supposed to play must not be compromised. The supervisor might only be at the bottom of the building, and watching and giving instructions but it is still the responsibility of the workers up there to make full use of the laid down procedures. Therefore, according to HSE (2003), workforce competency level is relevant to addressing health and safety matters. Hence, the need to institute a program to certify roofers before given leadership role on their respective sites. Most roofing firms in Ghana do not have a well-structured apprenticeship system whereby gang members rise to master level. This phenomenon has serious implication on the roofing industry in terms of safety and proper control of the whole system.

According to Ghana Labour Act, 2003 (Act 651), provision of health and safety and environment of workplaces are part of the duties of the employer, hence it will not be out of place for workmen to champion this course for their own safety. Workmen can maintain these equipment provided by the company when there is a level of safety factor included in labor charge. Most of these operatives complain that wearing personal protective gears slows down their work hence safety factor included in their charge be it woodwork, metal truss or installation of sheets could go a long way to curb non-adherence to health and safety.

2.7 ROLES ADHERENCE FACTOR PLAYS IN THE COMPANYS GROWTH

This section reviews the literature on roles adherence safety factors play in growth of the company. From literature four main roles were identified and are discussed below.

2.7.1 PRODUCTIVITY

It can be expressed as how efficiently and effectively goods and services are being produced. Hence, its key characteristics can be expressed in physical or economic units (quantities or values) with respect to measurements made at different levels factoring the level of company, its equipment and that of individuals (EANPC, 2005). The level of productivity actually describes the totality of the companies' effort in every section or department. Health and safety is often key to productivity and so cannot be downplayed at all.

Companies that offer a robust and visible commitment to safety also have a relatively direct influence on the health and safety of operatives. Though empirical evidence may be lacking, research suggest workers attitude, job satisfaction, and employee's health and safety are linked to work performance as well as productivity (Lundstrom et al., 2002). A well-organized and coordinated safety program will improve productivity among roof workers. This will ensure that before the operative climb the building to start work all risk issues are properly addressed.

Findings by Mthlane et al. (2008) showed that 40% of the causes of site accidents are as a result of fall by people due to their negligence or not practicing health and safety regulations. This menace affect standard of living and decline in productivity represent the highest economic impacts on the affected families and construction companies respectively.

2.7.2 SAFETY

The work of Choi (2006) proved that safety is achieved when all health and safety guidelines are adhered to. Safety performance is very critical to the success of projects as it puts the workers in the right condition to deliver the utmost. The safety performance involves the roles played by the external individuals and organization in making sure that the regulations and governmental policies regarding health and safety are adhered to, the role of the company also in providing all the relevant health and safety policies and equipment as well as the adequate supervision of the workers on site, and then finally the personal responsibility that the workers assume to practice and observe the health and safety procedures even under limited supervision. The workers carry out the jobs in pure minds, having at hand the best equipment and tools and also receiving the best of instruction from the supervisors whilst at the top. Even if the workers fall from heights, they are assured that there is safety landing and therefore are willing to meet the deliverables that the jobs require. The willingness of the workers is determined by the confidence that they have in the procedures they are to work with. Value is achieved in safety performance when the accidents or casualties experienced across a period of time on roof works is minimized within the means of the company. However, other casualties that may arise outside the controls of the companies such as the act of God cannot be guaranteed here since they are either unpredictable or though they are known, they cannot be prevented or controlled. Nevertheless, the best of efforts of companies should be directed towards ensuring that best health and safety is achieved as it partly contributes to productivity in general.

2.7.3 QUALITY

A study by Choi (2006) found that quality is achieved when health and safety practices are adhered to. Quality of a work is very much important in a construction work as it is a determinant factor a company can maintain its customers. Abnormality in the process will mean losing one's client to another company. In the context of roofing, quality work starts from the negotiation stage to completion. According to ISO 9000 standards, achieving quality stems on both external and internal factors. It has been ascertained that the best quality works are attained through good health and safety atmosphere. The quality of the work produced impacts on the long term benefit to be derived from the building as well as minimizing the life cycle cost (LCC) to be incurred by the clients. The outputs will be devoid of these benefits if the clients don't put in their best whiles working on the roofs through poor health and safety procedures.

The clients of roof companies are not interested in how much work or experience that the companies have at their disposal, but the quality that they've showcased in all their efforts in the industry. While the internal members of the companies may be interested in just the outputs in terms of numbers or quantities leading to profits, the customers are rather interested in the values they can derive from the works. Just as in any other business atmosphere, the customers desire supersedes that of the companies' and so customers' values should be on the radar of the roof companies.

2.7.4 COST

The implementation of health and safety policies and the practice thereof has an initial high financial commitment but in the long run tend to lower the overall financial commitment of the company. There is always the high cost of forming a

committee to draft health and safety policies making a lot of enquiries from external sources and organizations; then investing money into purchasing health and safety equipment such as harnesses, cranes, better scaffoldings, tools etc.; then organizing adequate training for the workers their responsibilities concerning their claims in times of danger, the use of the equipment and all other procedures; and then finally putting in the right supervision techniques and people to make sure that the workers adhere to the requirements of the policies.

There is cost attached to the time taken for injured worker to be restored on site, supervisors who also equally stop in order to attend to the casualties, cost of first-aid materials, time and attendants, damage caused to materials, properties, equipment and tools, cost of idle plants, cost of interference with production, cost due to the consequent lost in efficiency of injured workers, and the cost that the owners of the companies will incur through fulfilling policies under the benefits and welfare systems in the midst of others (Heinrich,1941). It can be inferred from the list above that the extra cost born by companies for not adhering to the best health and safety measures and practices is dreadful past that required to establish the policies. In the best interest of roof companies, health and safety should be promoted so they can benefit in the long run.

2.7.5 SCHEDULE

In Choi's (2006) study, time plays a major role in a construction project as it can be a determinant for clients in assessing the capabilities of a contractor. As duration in roof work is mostly short, prolonging a client work would be bad practice. The adhesion to health and safety practices could prove instrumental in completion time. The use of protective equipment and clothing would ensure that accident or injury

are avoided therefore no interruption in project schedule. It should be known that time has direct implication on cost and therefore unnecessary extension in work time will add additional cost to the clients' financial commitment.

As stated earlier, various delays in work schedules occur through casualties which results in reduction in productivity. The measure of the performance of companies depends on their ability to work within the scheduled whiles not undermining quality and cost. This is the very reason why best health and safety cannot be downplayed in the quest to meet the time schedule of production.

2.8 CONCLUSION/SUMMARY OF CHAPTER

This chapter explored the various dimensions that influence health and safety practices in the construction of roofs. Factors for adherence to safety practices were also reviewed. Literature on the roles these adherence factors play in the growth of the roofing companies were also reviewed and presented. From the review of literature seven main factors were found that influenced adherence to health and safety by roof workers.

In conclusion, every safety practices in the construction industry as important as it might be roofing is more delicate considering statistics of fatalities recorded by various researchers. Hence, roof workers will have to appreciate the need to protect themselves at all times and also considering all stakeholders involved.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

A study by Cooper and Schindler (2003) indicated that the subsequent step in the research process after literature study, management dilemma findings and identifying research questions is crucial in most methodology approach. This chapter three seeks to look at the approach adopted for the research. It deliberates the strategies and procedure used in the study which involves areas like the design and creation of questionnaires, flawless definition of the population, determining sampling techniques and the sample size as well as research ethics.

The following researchers (Fellows and Liu 2003; Naoum1998; Saunders et. al., 2003) stated that the outcome of any research is directly connected to the methodology used and subsequently the success and originality of the research critically relies on the right selection and application of the research method. Naoum (1998) explain that once the purpose of a study has been determined and a thorough literature has been completed, the researcher should be able to design the research in full detail.

The methodology brings forth, how the research was undertaken and planned in order to obtain data. This methodology is centred on survey questionnaires and involves the various stakeholders responsible for the adherence of health and safety practice in the construction of roofs in Ghana. It provides the characteristics of the research adopted, explains the survey method used to acquire information from the various stakeholders, explains how the data was collected and analysed; detail how

respondents were selected and approached and finally how data received was analysed.

3.2 PHILOSOPHICAL POINT OF THE RESEARCH

A study from literature has shown that philosophical queries of existence, value and knowledge have significant impacts on the research design (Christou, *et al.*, 2008; Koetting, 1996). Subsequently, such philosophical matters of epistemology, ontology, and axiology methodology assumptions must be addressed extensively since they characterize the choice of research instruments (Christou, *et al.*, 2008). Streubert and Carpenter (1999) stated that epistemology is the subdivision of philosophy which relates to how individuals determine what is right; interpretivism and positivism. This research is based on positivists approach to knowledge. For the positivists, through the accrual of verified facts, scientific knowledge is proven (Osei-Hwedie, 2010; Bryman, 1992). The research was of the opinion that the identification and analysis to adherence of health and safety practice in the construction of roofs in Ghana must be carried out in an unbiased way which can be replicated.

Research was objectivism at the ontological level. Ontology can be explained as enquiring the existence of a 'real' world that is sovereign of our knowledge; it is a theory of living being (Marsh & Stoker, 2002). This is because the health and safety practice in the construction of roof in Ghana exist as external facts that are beyond the reach and influence of the researcher. These health and safety adherences are objective realities and not constructions of the researcher. Thus, in answering the research question; what are the factors that influence the adherence of health and safety practices in the construction industry? The ontological objectivism position was followed.

3.3 RESEARCH PURPOSE

Saunders et al., (2003) stated that the most frequently used classification of purpose of research is; descriptive, exploratory, and explanatory. They argue that exploratory research looks like “the activities of a traveller without a set itinerary” in that it is adaptable during the course of the process.

According to Torsten and Wiedersheim-Paul (2001) descriptive research involves identifying and mapping by signifying, registering and documenting centred on the researchers choice of perspectives, level of depth and definitions. Explanatory study aims to institute casual relationships between variables (Saunders et al. 2003).

This research study is primarily descriptive as data was gathered in order to describe a specific subject.

3.4 RESEARCH APPROACH

The theory behind this research will be clear enough to serve as a guide to one of two research approaches; qualitative or quantitative. Yin (1994) recommended that the appropriate research method to use for a study is determined by the research purpose and the related research questions. He defined quantitative approach as the pursuit for knowledge that will describe, measure, and elucidate the phenomena of our reality. This process is typically well structured and formalized. Quantitative research tries to measure the data and characteristically apply some form of statistical analysis (Malhotra, 2007). A quantitative approach is a research technique in which scientific, real and projectable numerical data are statistically analysed. It is also an approach that collects statistical data in order to explain, describe, forecast and or

regulate phenomena of interest. This method may offer a more valid data taking into account the scope of study.

According to Ghauri and Gronhaug(2002) qualitative methods are more flexible and could be used to exploit in depth different areas of research question. It is research that seek to find information that is meant to interpret, examine, and understand the phenomena by means of an inside perspective. Qualitative research offers insights and understanding of the problem setting (Malhotra, 2007). It is mostly used in case studies, where the aim is to collect detailed information and thereby obtain an in-depth understanding of the research problem. Qualitative research is very effective when seeking to know people's attitude and may be conducted 'open ended' through focus groups or in-depth interviews.

This study was founded on quantitative research as O'Leary (2004) describes quantitative research as producing quantitative data that can be represented through numbers and analysed using statistics.

3.5 RESEARCH STRATEGY

Research strategy is an overall design of how to respond the research questions that have been set (Saunders et al. 2007). They determine these strategies as follow:

Survey: According to Malhotra and Peterson (2006) a structured questionnaire given to a sample of a population and designed to draw specific information from respondents. This strategy is commonly used in business research which sanctions the collection of a large volume of data from an ample population in a highly cost-effective way.

Experiment: This is a standard form of research that emphasises much to the natural sciences and also social sciences, mostly psychology. Malhotra and Peterson

(2006) classified it under causal research and define it as the method of controlling one or more independent variables and determining their effect on one or more dependent variables, whereas controlling for the unnecessary variables, all variables other than the independent variables.

Case study: This study place more prominence on a full contextual analysis of few events or circumstances and how they interrelate (Cooper and Schindler, 2003). The situation that give case studies a distinctive advantage occur, when a “how” or “why” question is being asked about a modern set of events over which the researcher has slight or no control (Yin, 1994).

Grounded theory: According to Miller and Fredericks (1999) it is discovered, developed, and provisionally tested through systematic information collection and analysis of data pertaining to that phenomenon. The stress on induction or deduction during this process varies due to different viewpoints of its founders, Glaser and Strauss (1967).

According to Oppenheim (2003) survey research offers consistency of observations and improves repetition due to its inherent standardized measurement and sampling techniques and that was what this research was based on.

3.6 RESEARCH PROCEDURE

Research procedure addresses the sampling method, data collection instruments, and procedures. This involves explanations to each of the methods employed and the methods adopted to answer the aims, objectives, and research questions.

3.7 DATA COLLECTIONS AND INSTRUMENTATION

3.7.1 SOURCES OF DATA

This part of the research method addresses data collection methods, instruments, and procedures. It provides comprehensive explanations to each of the methods used in addressing the aims, objectives, and research questions. Data collecting is key in research, as the data contributes to a better understanding of a theoretical background (Bernard, 2002). Hence, imperative that selecting the way of attaining data and from whom the data will be acquired must be done with sound judgment, particularly since no amount of analysis can replace inadequately collected data (Bernard *et al.*, 1986; Tongco, 2007).

Data collected was done using both secondary and primary sources. The primary data dealt with the gathering of the practical data through case survey questionnaires. Literature review has been conducted thoroughly and the study positioned within a theoretical context, hence a case study questionnaire was adopted for the study. Secondary data (literature review) was extracted from published and unpublished materials were used. The data extracted from literature formed the theoretical framework for the research. Both direct and indirect sources provided the data. These sources yielded rich knowledge in adhering to health and safety practices. Roofing companies which are in existence for five years and above were targeted. The respondents were supposed to be safety manager but these were not available in most of the firms. In the event that a firm does not have a safety manager, the director, estimators, installers or a top manager was contacted for the research.

3.8 DATA COLLECTION TOOL

The key tool used for the research study was questionnaire. A well-structured questionnaire was designed to collect info from the relevant stakeholders in the roofing industry. The respondents read the questions, interpret what is expected and then and write down the answer. In the case of roof operatives who couldn't read or write the researcher read it to them and filled the form subsequently. The content of the questionnaire was simple and easy to understand. The layout made it easy to read and at the same time pleasant to the eye with a carefully designed sequence that made it easier to follow. The content of the questionnaire was mainly closed ended with spaces for respondents to indicate their preferred choice by ticking the spaces provided that matches the choice against the item being measured.

3.8.1 QUESTIONNAIRE DESIGN

Closed ended questionnaire which has advantages of easy to ask and quick to answer, require no writing by the respondent, and their straight forward analysis was used (Naoum, 1998). The adherence to health and safety practices in roofing industry contracting companies in Ghana was explained through a comprehensive literature review. The adherence factors were then converted into questions of easy form, definite, and void of technical terms to reduce potential errors from respondents. Questions from related topics were adopted from previous research and grouped into categories to build the main areas of the draft questionnaire. A pilot study was undertaken which added very vital questions, simplify some questions and modify the contents of others. Questionnaire was divided into three main sections: the first was the respondents background and the second was factors that influence adherence of health and safety practices in roof construction and last section was impact these

factors play in the companies. The last two sections of the survey questionnaire addressed the two main specific objectives.

The questionnaires were designed to comprise only scaled-response questions. Likert five point scale of 1-5 was employed to measure the strength or intensity of respondent's opinion.

3.8.2 QUESTIONNAIRE FORMAT

Literature suggests that the optimum length of questionnaire ranges from one side of a4 paper to eight pages of a4 paper (Naoum, 1998; Oppenheim 2000; Saunders *et. al.*, 2000; Polgar and Thomas, 2005; fellows and Liu, 2003). This research however designed a questionnaire covering five pages as provided in the appendix.

3.8.3 QUESTIONNAIRE CONTENT

Donkor, (2011) stated that the quality of the answers and response rate is generally affected by the type of questions and the manner in which questions are enunciated and presented. Against this backdrop, it was therefore imperative to ensure that the right questions are asked, well understood and asked in the right manner.

Section A-background questions (profession, years in the industry, length of existence of the company, types of projects undertaken) was to institute the level of experience of the respondent and alertness of adherence factors.

Section B was to identify the factors that influence adherence to health and safety practices in roof construction and general issues peculiar to the roofing industry.

Section C was to identify the impact these adherence factors play in improving the growth of the company. This was relevant as the literature review found advantages as to when health and safety practices are adhered to.

The questions followed a uniform format and order. It guaranteed that each question was asked the same manner in each questionnaire and also simple to administer and relatively easy to analyse and gather. Therefore, the frame of the reference is specified for response and this raises the chance for obtaining responses which are significant to the research.

3.9 SAMPLING TECHNIQUE AND SAMPLE SIZE DETERMINATION

This aspect of the methodology discussed the sampling technique that was adopted for choosing the sample as well as the justification for its suitability for the study. Significance of sampling stems on the fact that it delivers a practical way of supporting the data gathering and processing of components of the research to be undertaken whilst making sure that the sample provides a worthy representation of the population (Yankah, 2013).

According to Webster (1985) the term “sample” refers to a finite portion of a statistical population whose properties are considered to gain information about the entire populace. When the sample has to deal with persons, then it can be defined as a set of respondents (persons) nominated from a larger population for the purpose of a study (Mugo, 2002). Hence, sampling is a method of choosing a quota of the population to signify the whole population (Polit and Hungler, 1999) and typically used in large-scale survey research for the sake of economy and accuracy (Weisberg and Bowen, 1977). Furthermore, the term “population” is a group of persons, individuals, items or objects from which samples are selected for measurement for example a population of Engineers or labourer’s, books or students (Mugo, 2002). Population is the overall group of subjects that meet a selected set of criteria. Polit and Hungler (1999) differentiate between the accessible population and target

population. The target population comprises all the cases about which the researcher would like to make generalizations. Accessible population also involves all cases that fit in to the chosen criteria and are accessible to the researcher as a group of subject for a study.

Purposive sampling technique is a method that involves the selection of persons who denotes the preferred population was used for the purpose of this study. The purposive sampling technique is a non-probability sampling mode which comprises the conscious selection of certain subjects to be contained in the research (Polit and Hungler, 1999). Purposive sampling technique was used in identifying the key respondents namely Top Manager, Project managers and site operatives/installers in the roofing industry. This was because the researcher required certain categories of respondents who had been involved in a lot of roofing projects and therefore had encountered some amount of health and safety practices experience, to answer the questionnaires. Using the purposive sampling resulted in selecting project managers and other respondents from well-known and reputable roofing companies within the Greater Accra and Ashanti regions since the researcher believed that they were representative to the population of interest and could give practical and resounding answers to the questions asked.

Nevertheless, Non-probability sampling designs are suitable in situations where the number of elements within the population is either anonymous or cannot be individually identified (Kumar, 1996). This study was specifically targeted at all roofing companies that have been in existence for five years because they will have enough resources to implement health and safety procedures. In addition to the purposive sampling technique, the researcher use snowball sampling to identify the respondents. However, Kumar (1999) describes the snowball sampling technique as

a process of selecting a sample by using network. Atkinson and Flint (2001) also stated that snowball sampling is a technique for discovering research subject. Henning (2004) emphasize that snowball sampling and purposive sampling are interconnected and have one common denominator: “the people most suitable to wander with on the research journey are selected at the time they are required”. A study by De Vos *et al.*, (2002), reveals that snowball sampling is valued in research as it is focused at entities that are difficult to find. Snowballing approach helps the researcher collect data on the few members of the target population he can find and then seeks information from those individuals that aid him to locate the other members of that population. Consequently, this strategy according to Mensah (2013) is seen as a response to overcome the difficulties associated with concealed or hard-to-reach populations. Burns and Grove (2003) added that these sampling methods allow the researcher to choose specific subjects who will provide the most extensive information about the phenomenon being studied. By adopting this approach, a few firms that were known and easily assessable were contacted and questionnaire administered to them. The known companies were then asked to identify the other firms and those identified by these firms also become a part of the sample. These new companies were also asked to identify other firms and in turn those identified also became the basis for further data collection. This process continued until the saturation point when the total accessible number of roofing contracting companies operating in the Ashanti and Greater Accra was reached.

The usefulness of this sampling technique for the research stems on the way construction firms do their business. It is extremely difficult to get any information about either the firms or their activities. Fellows and Liu (2008) emphasize that the snowball sampling involves data which are difficult to assess, perhaps because the

individual sources of data cannot be identified readily. Under such situation, Fellows and Liu (2008) adds that the researcher may find a very small number of sources (respondents) and, after gathering data from each one, requests that source to identify further sources thus progressively building an adequate sample. This was the approach that was adopted as indicated.

3.10 DATA PREPARATION AND STATISTICAL CONSIDERATION

3.10.1 DATA PRESENTATION

Two stages would be completed; first, the raw data is collected and processed to place it into a form appropriate for analysis and next; a test methodology is well-defined for the statistical tool to be engaged and the use of the data. After the data have been collected, they were packaged into a suitable format for analysis using Standard Package for Social Science (16.0) and Microsoft excel.

3.11 STATISTICAL CONSIDERATIONS

The following statistical methods will be used in this report:

Descriptive Statistics with frequencies (Questions as indicated on the survey questionnaires);

Relative Important Index (RII)

From questions one to five, no scoring was used since these consisted of general information related to the respondents companies.

3.12 CHAPTER SUMMARY

This chapter addressed the research methodology of this study, explained how sample was collected, defined the process used in designing the tool and collecting the data, and provided clarification of the statistical procedures used to analyse the data.

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CHAPTER FOUR

DATA ANALYSIS

4.1 INTRODUCTION

This part of the study work deals with analysis and discussion of results. The first part deals with the background information of the respondents which consists of job status, years of experience and kind of projects undertaken in the construction industry. The analysis consists of cross tabulation and ranking of identified variables or factors which have been widely used in the presentation of results. This technique allows for a good analysis of the data collected. The percentage of the variables will also be employed in the analysis and discussion.

4.2 BACKGROUND INFORMATION

	Frequency	Percent	Valid Percent	Cumulative Percent
MANAGING DIRECTOR	10	20.0	20.0	20.0
PROJECT MANAGER	20	40.0	40.0	60.0
OPERATIVE/INSTALLER	20	40.0	40.0	100.0
Total	50	100.0	100.0	

Table 4.1 indicates that 20% of the respondents were managing directors, 40% were project managers and 40% of the respondents were operatives/installers.

Fig 4.1 Respondent's Position in the Company

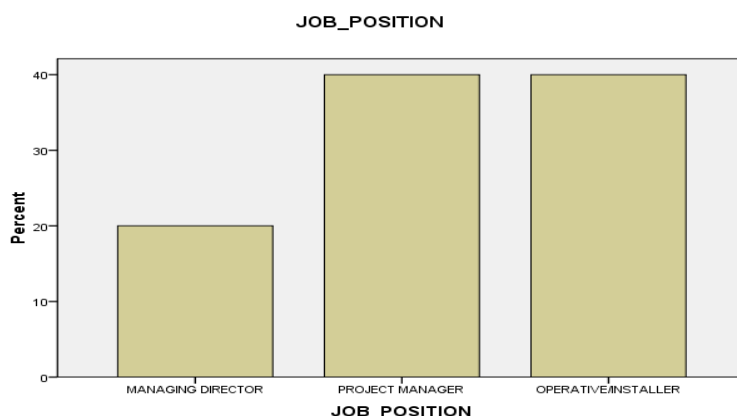


Table 4.2 YEARS_OF_EXPERIENCE				
	Frequency	Valid Percent	Valid Percent	Cumulative Percent
LESS THAN 6 YEARS	8	16.0	16.0	16.0
6-10 YEARS	31	62.0	62.0	78.0
11-15 YEARS	9	18.0	18.0	96.0
16-20 YEARS	2	4.0	4.0	100.0
Total	50	100.0	100.0	

According to Table 4.2, 16% of the respondents had worked less than 6 years, 62% of the respondents had worked from 6-10 years, 18% of the respondents had worked between 11-15 years and the remaining 4% had worked between 16-20 years.

Fig 4.2 Respondent's years of experience

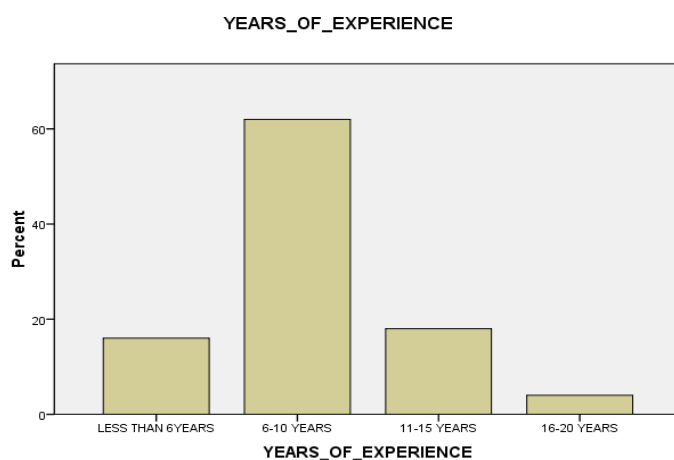


Table 4.3 YEARS_OF_COMPANY_EXISTENCE					
		Frequency	Percent	Valid Percent	Cumulative Percent
	5-10 YEARS	15	30.0	30.0	30.0
	11-15 YEARS	23	46.0	46.0	76.0
	16-20 YEARS	12	24.0	24.0	100.0
	Total	50	100.0	100.0	

From Table 4.3, 30% of the respondents were from companies that had been in existence for 5-10 years, 46% from companies that had been in existence from 11-15 years and the remaining 24% from companies that had been in existence for 16-20 years.

Fig 4.3 How long Company has been in existence

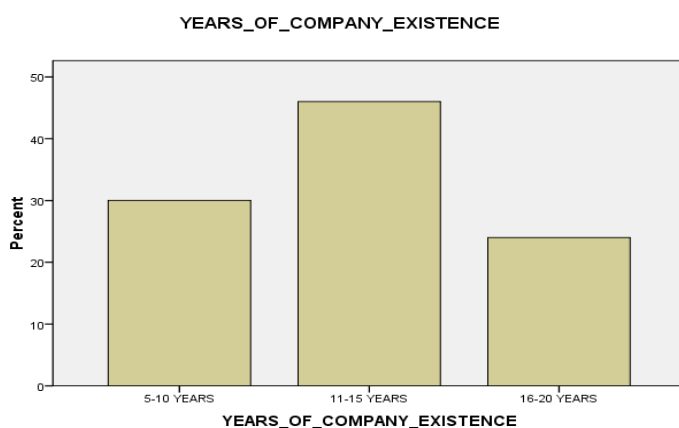


Table 4.4 PROJECTS_UNDERTAKEN					
		Frequency	Percent	Valid Percent	Cumulative Percent
	INDUSTRIAL/COMMERCIAL	47	94.0	94.0	94.0
	AND RESIDENTIAL				
	RESIDENTIAL ONLY	3	6.0	6.0	6.0
	Total	50	100.0	100.0	

From Table 4.4, majority of the respondents forming 94% undertook industrial/commercial projects while the remaining 6% undertook residential projects.

Fig 4.4 Project's undertaken by respondent

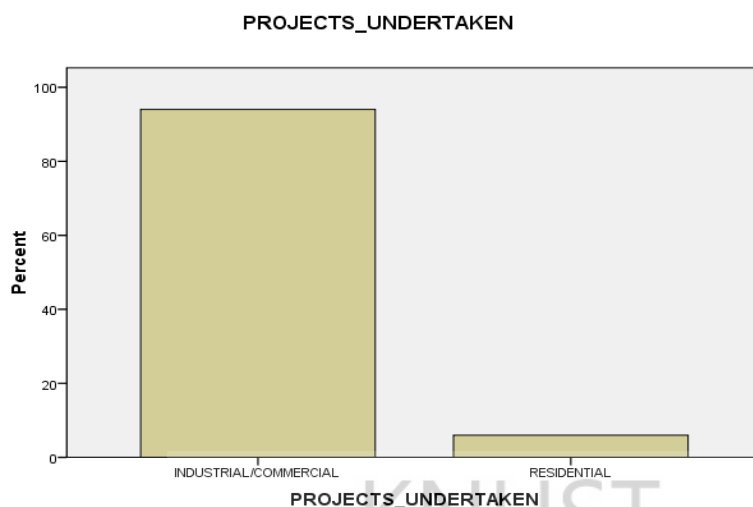
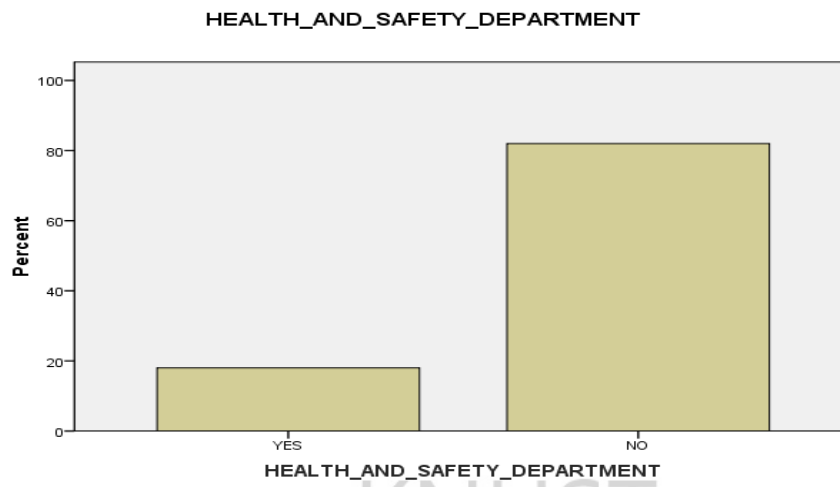


Table 4.5 HEALTH_AND_SAFETY_DEPARTMENT					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	YES	9	18.0	18.0	18.0
	NO	41	82.0	82.0	100.0
	Total	50	100.0	100.0	

From Table 4.5, 18% of the respondents responded in the affirmative that their companies had health and safety department while the remaining 82% of respondents responded in the negative.

Fig 4.5 Existence of Health and safety Department



4.3 FACTORS THAT INFLUENCE WORKERS ADHERENCE TO HEALTH AND SAFETY

4.3.1 MANAGERIAL FACTORS

Table 4.6 Table of Managerial factors					
	N	Minimum	Maximum	Mean	RANKING
COMPANY SAFETY POLICY	50	1	3	1.76	7
PROVISION OF SAFETY INCENTIVES	50	1	2	1.16	1
EFFECTIVE SAFETY COMMUNICATION	50	1	2	1.20	2
ACCIDENT INVESTIGATION	50	1	5	2.82	10
SAFETY PERSONNEL	50	1	4	1.94	8
INSURANCE POLICIES	50	1	5	2.36	9
EFFECTIVE PROJECT SUPERVISION/INSPECTION	50	1	3	1.58	5
FORMATION OF PROJECT TEAMS	50	2	5	3.08	12
SAFETY TRAINING AND ORIENTATION FOR SITE OPERATIVES	50	1	2	1.36	4
TRAINING ON SAFETY EQUIPMENT	50	1	3	1.66	6
LABOUR CHARGE (PROJECT COMPLEXITY)	50	1	2	1.30	3
SAFETY AUDITING	50	1	5	3.06	11
GRAND MEAN				1.94	

According to Table 4.6, the 12 managerial factors that influenced adherence to health and safety were; company safety policy, provision of safety incentives,, effective safety communication, formation of project teams, safety personnel, insurance policies, effective project supervision/inspection, accident investigation, training on use of safety equipment, provision of safety equipment, labour charge (project complexity) and safety auditing. Of the 12 factors, respondents ranked provision of safety incentives as the most important factor since it recorded the least mean score,

which is 1.16. A mean score of 1.16 which is approximately 1 on the Likert scale means that respondents strongly agreed that provision of safety incentives greatly influenced adherence to health and safety. Effective safety communication ranked second with a mean score of 1.20 meaning that respondents strongly agreed that it influenced adherence to health and safety. Labour charge (project complexity) ranked third with a mean score of 1.30. Safety training and orientation of site operatives ranked fourth with a mean score of 1.36. The fifth ranked managerial factor was effective project supervision/inspection with a mean score of 1.58. Training on safety equipment was ranked sixth with a mean score of 1.66. A mean score from 1.5 to 2.0 indicated that respondents agreed that a factor had an influence on the adherence to health and safety. Company safety policy was ranked seventh with a mean score of 1.76. Safety personnel ranked eighth with a mean score of 1.94. The ninth ranked factor was insurance policies with a mean score of 2.36. Accident investigation, safety audit and formation of project teams all had approximate means of 3.0 which implies that respondents were neutral about the influence of these three factors. A grand mean of 1.94, approximately 2.0 implies that the managerial factors influence the adherence to health and safety in the construction of roofs. From results provision of safety incentives by management ranking first means though other factors are relevant yet still this factor stands out.

4.3.2 EXTERNAL FACTORS

Table 4.7 Table of External Factors					
	N	Minimum	Maximum	Mean	RANKING
CLIENT REQUIRE SAFETY COMPLIANCE ON THEIR SITE	50	1	2	1.18	1
IMPLEMENTATION OF GOVERNMENT LAWS	50	1	2	1.58	2
REGULATORY BODY (OSHA REPRESENTATIVE)	50	1	4	2.56	5
FORMATION OF LABOUR UNION	50	1	3	1.72	3
PLANNED AND ORGANIZED SITE BY CLIENT	50	1	4	2.42	4
GRAND MEAN				1.90	

From Table 4.7, five external factors that influenced adherence to health and safety were outlined as follows; formation of labour union, client require safety compliance on their site, planned and organized site by client, implementation of government laws and regulatory body (OSHA representative). A mean score from 1-1.4 implies that respondents strongly agree that a factor influences adherence to health and

safety, a mean score of 1.5-2.4 implies that respondents just agree that a factor influences adherence to health and safety. A mean score of 2.5-3.4 implies that respondents were neutral to the influence of a factor to the adherence of health and safety. A mean score from 3.5-4.4 implies that respondents disagreed that a factor influences adherence to health and safety and a mean score of 4.5-5 implies that respondents strongly disagree that a factor influences adherence to health and safety. From Table 4.7, clients require safety compliance on their site first with a mean score of 1.18 showing strong agreement to the fact that it influences adherence to health and safety. Implementation of government laws ranked second with a mean score of 1.58. Formation of labour union ranked third with a mean score of 1.72. Planned and organized site by client ranked fourth with a mean score of 2.42. Regulatory body (OSHA representative) ranked fifth with a mean score of 2.56 implying that respondents remained neutral about the influence of Regulatory body (OSHA representative). A grand mean of 1.90, approximately 2.0 implies that the external factors outlined influence adherence to health and safety in the construction of roofs. From results safety requirement by client ranked high above all external factors meaning of the client take the first step to request the companies will have no option but to comply.

4.3.3 MANPOWER FACTORS

Table 4.8 Table of manpower factors				
	N	Minimum	Maximum	Mean
EXPERIENCE	50	2	5	3.40
CARE FOR PERSONAL SAFETY	50	1	2	1.56
LABOUR COMPETENCY ANALYSIS	50	1	3	1.78
SAFETY CERTIFICATION FOR ROOF FOREMAN	50	1	5	2.94
GRAND MEAN				2.42

From Table 4.8, the manpower factors that influenced adherence to health and safety were care for personal safety and labour competency analysis with mean scores of 1.56 and 1.78 respectively. Experience and safety certification for roof foreman according to the results did not greatly influence adherence to health and safety. A grand mean of 2.42, approximately 2.0 implies that manpower factors have an influence on the adherence to health and safety in the construction of roofs. From result personal care for safety ranked highly and this could mean irrespective of one's experience, competency or certification the worker owes it to his/herself to stay alive or not be maimed for life.

4.4 IMPACT OF ADHERENCE FACTORS IN HEALTH AND SAFETY

Table 4.9 Table of impact of adherence factors				
	N	Minimum	Maximum	Mean
IMPACT OF ADHERENCE FACTORS ON PRODUCTIVITY	50	1	5	3.72
IMPACT OF ADHERENCE FACTORS ON QUALITY	50	3	5	3.98
IMPACT OF ADHERENCE FACTORS ON SAFETY	50	4	5	4.26
IMPACT OF ADHERENCE FACTORS ON TIME	50	1	4	2.76
IMPACT OF ADHERENCE FACTORS ON COST	50	3	4	3.46
GRAND MEAN				3.6

From Table 4.9, it is observed that the least mean score was 2.76, approximately 3.0 which imply that the factors that influence adherence to health and safety have a great impact on productivity, quality, safety, time and cost. A grand mean of 3.6, approximately 4.0 implies that the adherence factors have a high impact on productivity, quality, safety, time and cost. This results show that adherence factors identified in objective one play significant role when companies adopt health and safety practices and implement it irrespective of initial challenges that may be encountered.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The aim of this research has been to identify factors that influence adherence of health and safety practices in roof construction.

Two objectives were stated for this study. To identify factors that influence workmen to adhere to health and safety practices and to identify the impact of the adherence factors on the roofing companies. The findings from the research concerning the objectives are discussed below.

Objective 1:

The factors that influence adherence to health and safety in the construction of roofs were grouped into three categories namely; managerial factors, external factors and manpower factors.

Under managerial factors, 12 factors were outlined. company safety policy, provision of safety incentives,, effective safety communication, formation of project teams, safety personnel, insurance policies, effective project supervision/inspection, accident investigation, training on use of safety equipment, safety training and orientation for site operatives, labour charge (project complexity) and safety auditing. According to results from the study, almost all the factors significantly influenced adherence to health and safety. A grand mean of 1.98, approximately 2.0 indicated that the managerial factors influence the adherence to health and safety in the construction of roofs. Provision of safety incentives ranking first shows that if companies are to adopt this method for adherence it will inspire workmen to adhere to health and safety practices but not neglecting others factors raised.

Under external factors, formation of labour union, client require safety compliance on their site, planned and organized site by client, implementation of government laws and regulatory body (OSHA representative) were the factors discussed. Results from the study yielded a grand mean of 1.90, approximately 2.0 which implied that the external factors outlined influence adherence to health and safety in the construction of roofs. Clients require safety compliance on their site from results will prove a high authority for business owners and workers to adhere to health and safety. An entity could be side-lined for non-adherence; such measure could help bring sanity in the practice.

Under manpower factors, 4 factors were outlined. Experience, care for personal safety, labour competency analysis and safety certification for roof foreman. The study resulted in a grand mean of 2.42, approximately 2.0 implying that manpower factors have an influence on the adherence to health and safety in the construction of roofs. Results from the ranking revealed that care for personal safety was prime to most of the respondents. Irrespective of all other factors at stake the worker owes it to himself to value his life.

Objective 2:

The impact of the adherence factors on productivity, quality, safety, time and cost were discussed. Results showed that, the factors significantly affected or had an impact on productivity, quality, safety, time and cost. This is seen in Table 4.9. . A grand mean of 3.6, approximately 4.0 indicated that the adherence factors have a high impact on productivity, quality, safety, time and cost.

Obviously from results any company that invest in health and safety will certainly reap its benefits in the long term despite initial cost involved. The impact of

adherence factors on the company can also widen customer base therefore adding some unique recognition and customer satisfaction.

5.1.1 RECOMMENDATIONS

Based on the outcome of this study companies need to adopt or strengthen these factors identified from literature and affirmed by respondents to foster serene atmosphere in the roofing industry in the Ghanaian setup. Owner of companies must not take provision of safety incentives for granted cause larger population of these operatives' semi-literates and their understanding about safety is entirely different. Teams that have undertaken installation works without any casualties over a period of six months should be some bonus or recognition. Labour charges should include some safety component for workmen so as to take care of time duration spent on project and foster adherence. Clients should only award roofing contracts to only companies that are capable of adhering to health and safety practices to create competition among these firms. Roofing companies should have a proper and formalised apprenticeship structure for training new workmen over a particular duration before given teams to manage. Roofing companies must be required to register with Ministry of works and housing and safety personnel's should part of such requirement before dim eligible to operate. Implementation of government policies could start when roof contracts are awarded within government projects like schools, dormitories, recreational centres and health and safety requirements are basic requirement for award.

5.1.2 FUTURE RESEARCH

This research was only tailored to identify adherence factors that will influence health and safety practices positively and its impact of the roofing companies if implemented. Hence there will be the need to research into certain areas such as:

1. Funding of health and safety in the roofing industry.
2. Factors that affect apprenticeship in the roofing Industry.
3. Factors that affect retention deduction in the Roofing Industry.



REFERENCES

- Aksorn, T. and Hadikusumo, B. H. W.** (2008), Measuring effectiveness of safety programmes in the Thai construction industry. *Construction Management and Economics* **26**, 409-421. Construction industry
- Atkinson, R., and Flint, J.** (2001), Accessing hidden and hard-to-reach populations: Snowball research strategies. *University of Surrey Social Research Update*, 33. Available at [<http://sru.soc.surrey.ac.uk/SRU33.html>.] Accessed on [04/04/2013]
- Baldock, R., Vickers, I., Smallbone, D., and James, P.** (2005), Health and safety in small firms: what are the main influences on the adoption of improvement measures? MUBS Discussion papers.
- Bernard, H.R., Pelto, P.J., Werner, O., Boster, J., Romney, A.K., Johnson, A., Ember C.R. and Kasakoff, A.** (1986), The construction of primary data in cultural anthropology. *Current Anthropology*, Vol. 27, pp. 382-396.
- Bernard, H.R.,** (2002), *Research Methods in Anthropology: Qualitative and quantitative methods*. 3rd ed. California: AltaMira Press, Walnut Creek.
- Bizzell S.G** (2008), Safety practices of small to medium-sized construction firms, University of florida.
- Bratton J. and Gold J.** (2007), Human Resource Management: theory and practice.
<http://www.palgrave.com/>
- Broderick, T. and Murphy, D.** (2001), "Construction Safety: A Cruel Oxymoron?" *Occupational Health and Safety*, ASCE 70(10), 68-70.
- Bryman, A.** (1992), Quantitative and Qualitative Research: Further Reflections on Their Integration, In Brannen, J.(ed.) *Mixing methods: Qualitative Research*, Aldershot, UK: Avebury. pp. 57-78

- Bureau of Labour Statistics** (2002), Fatal occupational injuries by event or exposure and major private industry division, all United States, 2001. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics
[www.bls.gov/iif/oshwc/foi/cftb0153.pdf].
- Bureau of Labor Statistics**(2004), Construction and Non-Farm Labor Productivity Index.Fall <<http://www.bls.gov>>.
- Burns, N. and Grove, S. K.** (1987), the practice of nursing research, W.B. Saunders Company, Philadelphia.
- Cesarini G., Hall G., and Kupiec M.** (2013), Building a proactive Safety culture in the construction industry:12 steps to a safer job site. ACE Construction. Philadelphi,PA 19106,US.
- Cooper, D. and Schindler, P.** (2003), Business research methods, 8th Edition, Boston: McGraw-Hill.
- Cooper, M.D., and Phillips, R.A.** (2004), Exploratory analysis of the safety climate and safety behavior relationships. Journal of Safety Research 35, 497–512.
- Choi, S. D.** (2006), A survey of the Safety roles and costs of injuries in the roofing contracting industry. The Journal of SH &E research. American Society of Safety Engineers. Vol. #3 num 1
- Choudhry, R. M. and Fang, D. P.** (2008), Why operatives Engage in unsafe work behavior: Investigating factors on construction sites. Safety science, science Direct, 46 (4), 565-584, April 2008
- Christou, E., Valachis, I., and Anastasiadou, C.** (2008), Research Methodology in Hospitality Industry: The role of the Inquiry Paradigm. Available on:
<http://www.ul.edu.lb/fthm/papers/3rd%20Axis/Methodology%20greece.doc>
Assessed on [04/04/2013]
- Current J.** (2009), Development of a Pull out test method for Adhesion Applied

roofing systems. A Master thesis presented to the University of Ottawa.
Ottawa, Ontario, Canada.

De Vos, AS, Fouche, CB, Poggenpoel, M, Shrurik, E and Schurink, W. (2002).

Research at grassroots level: Second Edition. Pretoria: Van Schaik
Publishers.

Donkor, F.(2011), Assessment of learner acceptance and satisfaction with video-
based instructional materials for teaching practical skills at a distance. Int.
Rev. Res. Open Dis. Learn.,12(5): 74-92.

Enshassi, A. and Mayer, P. E.(2002), Analysis of construction site injuries in
Palestine. In: *Proceedings of Triennial Conference CIB W099
Implementation of Safety and Health on Construction Sites* (edited by
Rowlinson, S.). Department of Real Estate and Construction, the University
of Hong Kong, Hong Kong, 29-34.

Esposito, P.A. (2009), Best Practices: Safety Audits.USA

European Association of National Productivity Centres (2005), “Productivity: the
high road to wealth,” Brussels.

Fellows, R. and Liu, A.,(2003), Research Methods for Construction. 2nd ed. Oxford:
Malden.

Fellows, R. and Liu, A. (2008), Research methods for construction, Blackwell Ltd,
UK.

Geller E.S. (2000) “The ten myths of behavior based safety,” ISHN.
<http://www.ishn.com/articles>.

Ghuri, P. and Gronhaug, K. (2002), Research methods in business studies: A
practical guide, 2nd Edition, Harlow, England: Prentice Hall.

Glaser, B. and Strauss, A. (1967), The Discovery of Grounded Theory. Chicago, IL,

Aldine.

Gibb, A.G.F. (2005), Health and safety management practices of small sub-contractor. 21st Annual ARCOM Conference, 7-9 September 2005, SOAS, University of London. Association of Researchers in Construction Management, Vol. 1, 105-14.

Gillen, M., Kools, S., McCall, C., Sum, J., and Moulden, K. (2004), "Construction Managers' Perception of Construction Safety in Small and Large Firms: A Qualitative Investigation." *Work*, ASCE, 23(3), 233-43.

Haddock R. (2004), Metal Roofing from A to Z. History and materials (Part 1)

Hanna, A. S., Taylor, C. S., and Sullivan, K. T. (2005), "Impact of extended overtime on construction labour productivity." *ASCE Journal of Construction Engineering Management*, 131(6), 734-740.

Hawkins D. M. (2012), AIA, LEED AP of Preservation Design Partnership, LLC in Philadelphia, PA. (*City of New Orleans HDLC – Guidelines for Roofing*).

Health and Safety Executive (1997), Successful health and safety management. ISBN 978 0 7176 1276 5

Health and Safety Executive (2002), Revitalising Health and safety in Construction: Discussion document

Health and Safety Executive (2003), Causal Factors in Construction Accidents, Contract Research Report 156/2003, UK.

Health and Safety Executive (2003), Falls from height – Prevention and risk control effectiveness, Research Report 116/2003, UK. ISBN 0 7176 2221 5

Health and Safety Executive (2006), Enforcement Policy Statement

Health and Safety Executive (2007), Development of a working model of how

human factors, safety management systems and wider organizational issues fit together: Research Report.

Health and Safety Executive (2008), Working on Roof, NDG284(rev1) ISBN 978 0 7176 6288 3.

Health and Safety Executive (2008), Health and safety in roof work HSG33 (Third edition) ISBN 978 0 7176 6250 0

Health and Safety Authority (2009), Client in Construction: Best Practice Guidance

Health and Safety Executive (2012), Best practices guidelines for working on roofs: Ministry of business, Innovation and Employment, ISBN 978-0-478-36095-0

Heinrich, H. (1941), *Industrial Accident Prevention* (2nd Ed.). McGraw-Hill, NY.

Henning, E., Van Rensburg, & Smit, B. (2004), Finding your way in qualitative research. Pretoria: Van Schaik.

Hesapro (2013), The link between productivity and health and safety at work: Research Paper

Hill G. (2013), Safety Management in the construction Industry: Identifying risk and reducing accidents to improving site productivity and project ROI. McGraw Hill Construction Smart market report.

Hinze, J., Gambatese, J., and Hass, C. (1997). "Tool to Design for Construction worker Safety." *Journal of Architectural Engineering*, ASCE, 3(1), 32-42.

Hinze, J. (2002), Safety incentives: do they reduce injuries? Practice Periodical on Structural Design and Construction, 7(2), 81–4.

Hinze, Jimmie, and Gambatese, John (2003), "Factors That Influence Safety Performance of Specialty Contractors." *Journal of Construction Engineering and Management*, ASCE, 129(2), 159-64.

Iannacchione A., Prosser L., Esterhuizen G. and Bajpayee T. (2007), Methods

for determining roof fall risk in underground mines Pittsburgh Research Laboratory, Pittsburgh, PA.

International Labour Organization (2002), Health and safety at work: A trade union priority.

International Labour Organization (2005), Global estimates of fatal work related diseases and occupational accidents, World Bank Regions. International Labour Organisation, Geneva. Programme on Safety and Health at Work and Environment (SafeWork). Accessed on 10th May 2007 from; http://www.ilo.org/public/english/protection/safework/accidis/globest_2005/index.htm

Irizarry, J. and Abraham, D.M. (2006), Assessment of Risk Perception of Ironworkers. *Journal of Construction Research*. 7 (1&2), pp. 111-132.

Kaplinski, O. (2002), Accident rate on building sites as a quality data in a simulation model of production. In: *Proceedings of the Triennial Conference CIB W099 Implementation of Safety and Health on Construction Sites* (edited by Rowlinson, S.). Department of Real Estate, University of Kong Kong, Hong Kong, 251-261.

Kheni, N.A., Dainty, A.R.J. and Gibb, A.G.F. (2008), Health and safety management in developing countries: a study of construction SMEs in Ghana, *Construction Management and Economics*, 26(11), 1159-1169.

Kheni, A. N. (2008), Impact Of Health And Safety Management On Safety Performance Of Small And Medium-Sized Construction Businesses In Ghana, Submitted To Loughborough's Institutional Repository, Accessed On 30th November 2009.

Koetting, R. J. (1996), Philosophy, research, and education, In Jonassen, D.H. (ed.)

Handbook of research for educational communications and technology.

New York: Macmillan, pp. 1137-1147.

Kumar, R. (1999), *Research methodology: A step-by-step guide for beginners*. Sage, London, England.

Labour Department (2000), *Annual Report*, Labour Department, Accra, Ghana
labour Department.

Laryea, S. and Mensah, S. (2010), Health and Safety on Construction Sites in Ghana. The Construction Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors (COBRA), 2-3 September 2010 Paris. London: RICS.

Lee, S., and Halpin, D.W. (2003), Predictive tool for estimating accident risk.
Journal of Construction Engineering and Management 129 (4), 431–436.

Leopold, E. and Leonard, S. (1987), Cost of construction accidents to employers.
Journal of Occupational Accidents 8(4), 273-294.

Liska, R. W., Goodloe, D. and Sen, R. (1993), Zero accident techniques.
Construction Industry Institute, University of Texas, Austin, Texas.

Lund, J. and Aaro, L. (2004), Accident prevention: presentation of a model placing emphasis on human, structural, and cultural factors. *Safety Science*, 42, 271–324.

Lundstrom T., Pugliese G., Bartley J., Cox J., and Guither C.(2002),
Organizational and environmental factors that affect worker health and safety and patient outcomes, *AIJC: American Journal of Infection Control*. Vol. 30 No. 2 USA.

Malhotra, N.K., Naresh and Peterson M. (2006), *Basic Marketing Research*, Prentice Hall, ISBN 0131548654

Malhotra, N.K. (2007), *Marketing Research: An Applied Orientation*, Fifth Edition:
Prentice Hall, India.

Marsh D. and Stoker G. (eds.) (2002), *Theories and Methods in Political Science*.

2nd ed. Houndmills, UK: Palgrave, Macmillan.

Mattison K. (2011), *The Cost of Cheap by, PE Benchmark Roof and Pavement*
consultants Inc, Vol69b, pp2.

McDonald, N.,and Hrymak, V. (2001), *Safety behaviour in the construction*
industry. Report to the Health and Safety Authority, the Health and Safety
Executive, Northern Ireland.

Miller S.I. and Fredericks M. (1999), *How Does Grounded Theory Explain?*

Qualitative Health Research, vol. 9 (4), pp. 538-551.

Mintzberg, H. (1979), *The Structuring of Organization*. Prentice-Hall, Englewood
Cliffs NJ.

Ministry of Labor (1995-2005), *Annual reports*. Amman, Jordan.

Mensah, J.K. (2013), *Exploring Innovative Financing Mechanisms for Delivering*
Sanitation Infrastructure in Ghana. Unpublished thesis. Kwame Nkrumah
University of Science and Technology.

Mohamed, S. (2002), *Safety climate in construction site environments*. *Journal of*
Construction Engineering and Management 128 (5), 375–384.

Mugo F.W.(2002),*Sampling in Research*.

https://profiles.uonbi.ac.ke/fridah_mugo/files/mugo02sampling.pdf. *Eastern*
and Southern Africa.

Mthalande, D., Othman, A. A. E., & Pearl R. G. (2008), *The economic and social*

impact of site accidents on the South African society, *5th Post Graduate Conference on Construction Industry Development*, Bloemfontein, South Africa, 16 - 18 March 2008.

National Institute for Occupational Safety and Health (2004), Preventing falls of workers through skylights and roof and floor openings. Workplace safety and health. Publication No.2004-156 August 2004. www.cdc.gov/niosh.

Naoum, Dr. S. G. (1998), Dissertation Research and Writing for Construction Students, Butterworth-Heinemann, Oxford.

Navon R. and Kolton O. (2006), "Model for Automated Monitoring of Fall Hazards in Building Construction." *Journal of Construction Engineering and Management*, July 2006, 733-740.

Neal, A., Griffin, M.A. (2002), Safety climate and safety behavior. *Australian Journal of Management*, Vol. 27 Special Issue, 67-75.

Neal, A. and Griffin, M.A., (2006), Study of the Lagged Relationships among Safety Climate.

New South Wales (2006), Safe working at Height. Work cover. Guide 2006. www.workcover.nsw.gov.au.

Ng K., Lurlund A., Howell G., and Lancos G. (2012), lean safety: using leading indicators of safety Incidents to improve construction safety.

Nighswonger, T. (2001), Occupational Hazards, *Construction a Successful Message*, The traveller.com.

Occupational Safety and Health Administration (1998), Fall Protection in Construction. U.S. Department of Labor

Occupational Safety and Health Institute (2006), Number of work accidents in several industries in Jordan. Amman, Jordan.

O'Leary, Z. (2004), *Essential Guide to Doing Research*. Sage Publications Inc. e-Book. . Chapter Three. Developing Your Research Question.

Oppenheim, A. N. (2003), *Questionnaire Design, Interviewing and Attitude Measurement*. New ed. London: Continuum International Publishing Group.

Osei-Hwedie, M. (2010), *Strategic Issues of Innovative Financing of Infrastructure Project Delivery*. Unpublished Thesis (MSc), Kwame Nkrumah University of Science and Technology, Kumasi- Ghana.

Polgar, S. and Thomas, S.A. (2005), *Introduction to research in the Health Sciences*. New York: Churchill Livingstone Elsevier.

Polit, D.F and Hungler, B.P. (1999), *Nursing Research: Principles and Methods*. 6th ed.(Revised). London: Lippincott Williams & Wilkins.

Razuri et al. (2007), Evaluating the effectiveness of safety Management practices and strategies in Construction projects. Catholic University of Chile, Santiago, Chile.

Rountree P. (2001), Drug testing and workplace Accidents: AMA Survey: Medical Testing. American Management Association Safety Motivation, Safety Behavior, and Accidents at the Individual and Group Levels, *Journal of Applied Psychology*, 91(4): 946–953.

Rowlinson, S. (2004), *Construction Safety Management Systems*. Spon Press, London.

Rowntree J. (2004), *Drug testing in the workplace: The report of the Independent Inquiry into drug testing at work*. UK.

Saunders, M., Lewis, P. and Thornhill, A. (2000), *Research Methods for Business Students*. 2nd ed. London: Pearson Education Limited.

Saunders M., Lewis P.,and Thornhill, A.(2003), *Research Methods for Business*

Students (3rd edn), Rotolito Lombarda, Italy.

Saunders, M., Lewis, P. and Thornhill, A. (2007), *Research Methods for Business Students*. 6th Edition. Pearson Education Limited.

Sawacha, E., Naoum, S. and Fong, D. (1999), Factors affecting safety performance on construction sites. *International Journal of Project Management* 17 (5), 309-315.

Singh, A. (2000), "Innovative fall protection for construction workers on low-rise roofs." *Construction Safety and health management* , Prentice-Hall, Upper Saddle River, N.J. 87-114.

Streubert, H.J. and Carpenter, R.D. (1999), *Qualitative Research in Nursing: Advancing the Humanistic Imperative*. 2nd ed. Philadelphia: Lippincott Williams & Williams.

Teo E. A. L., Ling F.Y. Y. and Chong A. F. W. (2005), Framework for project managers to manage construction safety. *International Journal of Project Management*. 23 (4), 329-341.

Tompkins, J.A., White, J.A., Bozer Y.A., and Tanchoco, J.M.A., (2003). *Facilities planning*. 3rd edition. USA: John Wiley & Sons, Inc

Tongoco, D.C. (2007) Purposive sampling as a tool for informant selection. *Enthobotany Research & Applications*, 5. pp.147-158. Available at [<http://hdl.handle.net/10125/227>] Accessed on [04/04/2013]

Torsten, E. L. & Wiedersheim-Paul, F. (2001), *Attutreda forska och rapportera*, Malmo: Liber.

Tutt, D., Dainty, A., Gibb, A. & Pink, S. (2011), *Migrant construction workers and health & safety communication*: Department of Civil & Building Engineering Sciences, Loughborough University.

Tycho K. F., Osama A., Choi S. D., Wiersma M., and Charles M.(2005),

“Occupational Injuries and Fatalities in the Roofing Contracting Industry.”

Journal of Construction Engineering and Management, November 2005,

1233-1240.

University of Toronto (2009), *Working on roofs* .working at elevated places.

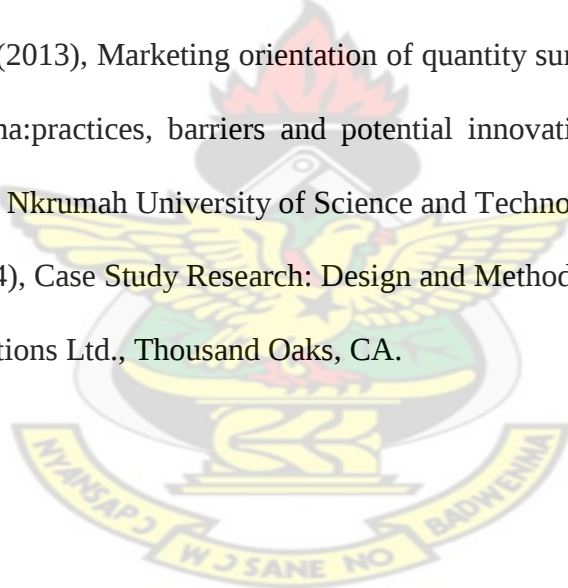
Webster, M. (1985), Webster`s nith new collegiate dictionary. Meriam - Webster Inc.

Weisberg, H.F. and Bowen, B.D. (1997), *An Introduction to Survey Research and Data Analysis*. London: W.H. Freeman and Company.

Workplace Safety and Health (2012), Working safely on roofs. Workplace safety and health council. www.wshc.sg

Yankah, J. E. (2013), Marketing orientation of quantity surveying consultancy firms in Ghana: practices, barriers and potential innovations. Unpublished thesis. Kwame Nkrumah University of Science and Technology. Ghana.

Yin, R.K. (1994), *Case Study Research: Design and Methods*, Second Edition: Sage Publications Ltd., Thousand Oaks, CA.



APPENDIX A

SURVEY QUESTIONNAIRE

ADHERENCE OF HEALTH AND SAFETY PRACTICES IN ROOF CONSTRUCTION IN GHANA

The researcher is a post-graduate student at the Kwame Nkrumah University of Science and Technology studying for a Master of Science degree in Construction Management. The researcher is conducting a research into adherence of health and safety in the construction of roofs in Ghana.

The aim is to identify major factors to the adherence of health and safety practice in the roofing industry.

With this background, kindly answer the questions in this questionnaire as accurately as you possibly can. Your response to this research will be confidential and will be used exclusively for academic purposes. The questionnaire is divided into three main sections.

SECTION A: BACKGROUND INFORMATION

1. What is your job position in the company?

☐ Managing Director/Top Manager ☐ Project Manager ☐ Operative/Installer

☐ others (specify).....

2. How many years' experience do you have in the industry?

☐ Less than 6 ☐ 6-10 years ☐ 11-15 year's ☐ 16-20years

☐ More than 20years

3. How long has your company been in existence?

☐ 5-10years

☐ 11-15 year's

☐ 16-20years

☐ More than 20years

4. What kind of projects do you do? Please tick as many as apply.

☐ Industrial/Commercial

☐ Residential

☐ other please specify.....

5. Does your company have a Health and Safety Department? Yes ☐ No ☐

**SECTION B: FACTORS THAT INFLUENCE WORKERS ADHERENCE OF
HEALTH AND SAFETY**

6. How will the following factors influence adhesion of health and safety on your roofing construction site? Please rank on scale of 1-5 with;

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly disagree

Factors		1	2	3	4	5
	Managerial Factors					
1	Company Safety policy					
2	Provision of Safety Incentives					
3	Effective safety communication					
4	Formation of project teams					
5	Safety personnel					
6	Insurance policies					
7	Effective project supervision/inspection					
8	Accident investigation					
9	Training on use of safety equipment's					
10	Provision of safety equipment					
11	Labour charge (project complexity)					
12	Safety Auditing					
	Others please specify					
	External Factors					
13	Formation of labour union					
14	Client require safety compliance on their site					
15	Planned and organized site by client					
16	Implementation of government laws.					
17	Regulatory body (OSHA representative)					
	Others please specify					
	Manpower factor					
18	Experience					
19	Care for personal safety					
20	labour competency analysis					
21	Safety certification for roof foreman					
	Other please specify					

SECTION C: WHAT IMPACT DOES ADHERENCE FACTORS HAVE ON ROOFING COMPANIES

7. How will the following adherence factors impact health and safety in your roofing company? Please rank on scale of 1-5 with;

1	2	3	4	5
No Impact	Less impact	Moderately impact	High impact	Very high Impact

		1	2	3	4	5
1	Does adherence factor impact on Productivity					
2	Does adherence factor impact on Quality					
3	Does adherence factor impact on Safety					
4	Does adherence factor impact on Time					
5	Does adherence factor impact on Cost					
	Others please specify					

Please do you have any recommendation for adherence of health and safety in roof construction? Kindly indicate

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.....

.....

THANK YOU VERY MUCH FOR YOUR TIME!!!



APPENDIX B



UNSAFE SHEET INSTALLATION 1



UNSAFE SHEET INSTALLATION 2



UNSAFE MATERIAL HANDLING 1



UNSAFE WOODWORK 1



WRONG ACCESS ON ROOF 1



WRONG MATERIAL STORAGE 1



SAFE WAY OF ROOF INSTALLATION 1



SAFE ACCES TO ROOF 1