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Exploring the safety climate and performance of roof construction in Ghana.

By

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MASTER OF SCIENCE

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DECLARATION

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

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ABSTRACT

Roof construction is the most vital component of a building since the roof serves as a shelter for all life and properties. Workers in roof construction are prone to many accidents mainly due to the height involved. This study aimed at exploring the safety climate and performance of roof construction in Ghana. The objectives of the study are; to explore the safety precautions for workers in the roof construction industry, to identify the factors that affect the quality of workers safety in roof construction and to identify effective safety climate practices in the roof construction industry were set to achieve the aim of the study. Purposive sampling was used in sampling the respondents. A structured questionnaire was used to collect primary data from the respondents for the analysis. The analysis was done using the relative importance index, one sample-test and mean score ranking. Mean score ranking was used in the analysis of safety precautions for workers to rank them from the most to the least important. A one sample t-test analysis was conducted to affirm that these precautions were indeed safety precautions being used by roof construction workers. The use of mean score ranking and relative importance index was used to rank the factors that affect the quality of workers safety from the highest to the lowest. The factors that ranked as the first five are lack of training, lack of personal protective equipment, lack of management commitment to safety, lack of inspection procedures on site and lack of skilled labour. To distinguish compelling wellbeing atmosphere hones in the rooftop development industry, the gathered information from the respondents were dissected utilizing the mean score positioning and the one example t-test. The analysis revealed the most important practice as the provision of personal protective equipment. The research recommends that, practitioners make sure employees abide with the safety rules and regulations when executing their daily works and the fact that safety officers should also educate workers on the importance of abiding with safety precautions on site for safe working environment.

Keywords: Safety, Climate, Performance, Roof construction, Ghana.

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DEDICATION

I dedicate this work to the Almighty God for the life, strength, wisdom and understanding granted to me that has brought this work to a successful end and to my supervisor, Dr. Barbara Simons, for her support, guidance and supervision. I further dedicate this work to my parents, my wife and children.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND

Safety climate in an organization may be viewed as a set of underlying values, beliefs, and principles that employees perceive as held within the organization (Barbaranelli et al., 2015). Safety compliant behaviours may be described as the core safety activities that employees need to carry out to ensure workplace safety, whereas safety participation behaviours can be considered as behaviours that may not directly contribute to workplace safety but help to develop a working environment that supports safety (Amponsah-Tawaih and Adu, 2016). Organizational safety climate has been defined by Zohar (1980) as "a unified set of cognitions [held by workers] regarding the safety aspects of their organization". Safety climate has also been described as a set of perceptions shared by the employees about safety policies, procedures, and practices and may be considered as a multidimensional factor that can have a positive effect on safety in the firm (Vinodkumar and Bhasi, 2010).

A positive safety climate is one of the most important issues at the workplace Safety climate has an impact on worker's belief and behaviour at workplaces (Kath et al., 2010). Safety climate is composed of several factors that is directly involved in relationship with each other. According to the Health and Safety Executive (2012), these factors include management commitment; safety training; safety communications; pressure for production; safety improvements; employee involvement in safety; work permit system; safety rules; encouraging raising safety issues; safety committees and safety rule breaking (Jafari et al., 2015). Prior research indicates that safety climate in the construction industry is not only affected by individual elements, but can also be dependent on internal organizational attributes (Mohamed and Chinda, 2011), such as

leadership style (Chinda and Mohamed, 2008), group cohesion and orientation (Burt et al., 2008), and the safety response of supervisors (Lingard et al., 2010). Glendon and Litherland (2001) suggested that measuring employee attitudes towards safety could be useful form of safety measurement, arguing that the more mature the safety attitudes of employees, the more likely they would search for safer environments – hence unsafe behaviour would decrease. Safety climate overcomes many of the limitations of traditional safety measures, such as reporting biases and after the fact measurement. Safety performance should be measured on multiple levels, one of them being safety attitudes, in order to determine the real safety level of an organisation (ibid).

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 likewise gives the chief line of resistance against all components while its plan fundamentally influences its general appearance (Hawkins, 2012). Against this backdrop, roof cannot under any circumstance be ignored in any construction work or research work due to its significant importance. Tumble from stature is the most extreme risk related with rooftop work (Health and Safety Executive, 2012). Fatal occupational injuries to the average construction worker cannot be compared to the roofer who is six times more at risk (Bureau of Labor Statistics, 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. (Hinze et al., 1997). There would be idle time, work may not be completed on schedule and company may be understaffed due to absence of a gang member, subsequently, impacting on overall productivity (ibid). Health and Safety Executive (2008) states that roof

construction can be very risky due to the height involved. About 24 percent of roof workers account for the most deaths and severe injuries in the construction industry than any other field. This statistic 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 (Sakyi, 2014).

1.2 PROBLEM STATEMENT

Construction industries have high accident rates due to the nature of the work, management system, equipment used in the process, techniques used to perform the tasks, speed of the work and other relevant factors (Zhang and Fang, 2013). In spite of improvements in safety conditions in this industry, effective reduction in accident rates in some countries have not been significant (Jafari et al., 2015). Safety issues have always been put forward as one of the major problems and primary concerns in construction industries in many countries (Jafari et al., 2015). Fatal accident investigation reports indicated that safety culture or climate play an importance role in the occurrence of accidents (López et al., 2008). Although there are extensive empirical studies on safety climate measurement and validation in the construction industry, there is limited research on the conceptual or theoretical framework of safety climate in the context of construction industry (Niu et al., 2016).

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 (Sakyi, 2014). 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. Thus, roof construction workers in Ghana

are not well equipped when it comes to safety (ibid). The researcher therefore seeks to assess the safety climate and performance of roof construction workers in Ghana.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim

The aim of the research is to explore the safety climate and performance of roof construction in Ghana.

1.3.2 Objectives

The following objectives are set to effectively achieve the aforementioned aim;

1. To identify safety precautions for workers in the roof construction industry.
2. To identify the factors that affect the quality of workers safety in roof construction.
3. To identify safety practices in the roof construction industry.

1.4 RESEARCH QUESTIONS

1. What are the safety precautions for the construction of roofs in Ghana?
2. What are the factors that affect the quality of safety workers safety in roof construction?
3. What are some of the measures that can be put in place to achieve effective safety climate?

1.5 SCOPE OF THE STUDIES

The work will contextually look at roof construction and narrow it down to safety climate and performance in roof construction. The factors of safety climate will be examined so as the measures for effective safety performance in roof construction.

Geographically, the research will be limited to the Ashanti region of the country. Some of the roof construction companies in the region will be sampled for the study. Their workers will be the population from which some will be sampled for the research.

1.6 RESEARCH JUSTIFICATION

The construction industry has been accident-prone and long criticized for its relatively poor safety performance (Jannadi and Bu-Khamsin, 2002). Despite the focus on individual behaviours that directly contribute to accidents (Fleming and Lardner, 2002), many scholars, such as Griffin and Neal (2000), advocate attaching an equal value to inherent, safety-related organizational factors. As a leading indicator of organizational safety (Hon et al., 2013), safety climate continues to be the focus of many studies because of its positive and significant influence on occupational safety behaviour (Fang et al., 2006; Probst et al., 2008) and accident prevention (Siu et al., 2004; He et al., 2016). Safety climate as a key element largely affects workers' performance. Assessing the workers' performance provides a method by which organizations can examine the safety perception of their employees. Accident rates and compensation costs could be suitable measures to evaluate the safety performance of workers (Evans et al., 2007). It against this backdrop that it becomes apparent for this research to look into the safety climate and performance of roof construction workers in Ghana.

1.7 RESEARCH METHODOLOGY

The research methodology outlines the various approaches and methods that will be used to gather and analyse the data. These approaches include the research design, the research population and sample size, the research sampling technique, the source of data, the data collection instrument and the ethical consideration of the study. The quantitative

approach will be adopted for the research. The research population for this research will be Workers of Roof Construction Companies in the Ashanti Region of the Country. A sample will be chosen using the purposive and snowballing techniques. Primary data will be collected using questionnaires that focuses on the research objectives, while the secondary source of information such as journals, articles and publications from the internet on the relevant topics for the research will also be used. All gathered data from the participants and organizations will be coded and amended correctly, so as to alter any mistake made by the participants. Data will however, be analyse through the Statistical Package of Social Science (SPSS) and the Microsoft excel.

1.8 ORGANIZATION OF THE RESEARCH

The study will be structured into five main chapters. The first chapter is the introduction and it comprise of the background of the study, the research problem, the research objectives and question, the significance of the study, the scope and limitation and organization of the thesis. Chapter two is the literature review and this comprise of both theoretical reviews and empirical findings. Chapter three is the research methodology and this comprise of the various approaches and methods that will be used to gather and analyse the data. These approaches include the research design, the research population and sample size, the research sampling technique, the source of data, the data collection instrument and the ethical consideration of the study. Chapter four is the discussion of data and analysis. This chapter analyse all data drawn from the research studies. Chapter five is the summary of findings, conclusions and recommendations. This chapter outline the studies into their respective findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter captures a general overview on the subject matter, safety climate and performance in roof construction. It presents literature on issues relating to safety in the roof construction industry towards performance. It highlights the nature of construction safety and presents the safety precautions in roof construction and the factors that affect the quality of workers' safety. Measures to achieve effective safety precaution in line with the subject matter is captured.

2.2 THE GHANAIAN CONSTRUCTION INDUSTRY

According to Anaman et al (2007) cited in Amarh (2014), the construction or development industry, is characterized as a gather of firms with closely related exercises included within the development of genuine estates, building, private and open infrastructure. Adu-Boateng (2014) added that the construction industry includes all organized activities concerned with construction, including, demolition, buildings, landscaping, maintenance, civil engineering works, process engineering work, heavy engineering works and mining. The construction industry in Ghana are involved with activities like construction and renovation of buildings as well as engineering works which includes roads, bridges dams, ports and railways. (Danso, 2010).

With regards to the definition of the industry and the activities involved, Amarh (2014) states that, the industry can be divided into two sections namely Building Construction and Civil Engineering works. Danso (2010) confirms Amarh's statement and describes the categories as Building Construction Firms (BCF) and Civil Engineering firms. He goes ahead to explain that both categories play important roles in Ghana, where projects

like the construction of health facilities, educational institutions, residential buildings, offices are done by Building Construction companies while Civil Engineering companies are involved with the design and construction of works such as roads, dams, pipelines, bridges and railways. Loushine et al. (2007) clearly points out that in every construction industry, there are three main contributors namely; the contractor, the designer or engineer and the client (owner). He adds that, in construction, before the start of a project, the client decides and chooses an architect to take care of the design aspect of the project and then places a bid on the project for contractors and the contractors then execute the construction work. Edmonds et al. (1984) in their study explains that building construction companies in Ghana consists of a number of enterprises from large to small which are registered and characterised as D1K1, D2K2, D3K3 and D4K4 by the Ministry of Works and Housing. The D1K1 class of contractors are labelled as larger companies since this class is mainly involved with distributing construction and industrial machines while D2K2 construction companies are medium and D3K3 and D4K4 are termed as small construction companies. In the opinion of Danso (2010), the Ministry of Works and Housing in Ghana register the larger companies as financial class 1 which simply means they have the ability to execute projects at any cost. However, Financial class 2, that is the medium companies, are able to execute construction projects up to US$500,000 or GH¢750,000.00, whereas the D3K3 and D4K4 companies are registered as financial class 3 and 4 and are also able to undertake projects up to US$200,000 or GH¢ 300,000.00 and projects up to US$75,000 or GH¢112,500.00 respectively. The Ghanaian industry contribute massively to the economic growth of the country since it creates jobs for most people in the country, either literates or illiterates. Enshassi (2003) points out that the construction industry is one of the most hazardous industries thus, health and safety in the construction industry should be given full attention.

2.3 OVERVIEW OF CONSTRUCTION SAFETY

Adu-Boateng (2014), in his study, briefly defined safety as the protection of people from physical injury. Safety was also described from a different angle by Promfret (1997) adopted from Enshassi (2003) as an economic and humanitarian concern that requires proper management control. He pointed out the benefits of safety and health in a construction industry which included: reduction in property damage and injuries, reduced down time and cost, higher productivity well as develop industrial relations and improve quality.

Construction is widely recognized as an accident-prone industry in Ghana. Generally, Hughes and Ferret (2005) contribute to the fact that indeed, the construction industry is a very accident- prone industry. Pointing in the same direction, Takala (1999) cited Kheni et al (2008) reported that construction is a hazardous industry whether in a developed or developing country and contributes to significant numbers of occupational accidents and ill health globally. Odeyinka et al (2005) believe that construction workers are more likely to be killed than any other workers. The construction industry is hazardous and disposed to safety and health dangers because of the materials, work operations, heavy machinery and equipment involved in construction; as well as the nature of the construction site and the complex nature and characteristics of the construction project. (Laryea, 2010; Adu-Boateng, 2014). According to Article 5 Section 24 (1) of the 1992 Constitution of the Republic of Ghana states that "Every person has the right to work under satisfactory, safe and healthy conditions." The National Building Regulation of 1996 stipulates the need to ensure safety precaution measures at the construction site. Hence, health and safety are important and part of employment duties. Center for Disease Control and Prevention, (2009), added that, construction workers build our roads, houses, workplaces, repair and maintain our nation's physical infrastructure, these works include

many hazardous tasks and conditions such as work at height, excavations, noise, dust, power tools and equipment, confined spaces and electricity. According to ILO Enclyopaedia of occupational health and hazards in construction industry (2011), Construction projects, especially large ones, are complex and dynamic thus the need for good safety measures. Hinze and Wilson, (2000) quoted in Amarh, (2014) saying that it is indeed necessary to acknowledge or accept that the importance of safety in a construction industry is the standard way to reduce injuries or accidents. They believe that if safety is recognised at the workplace, the occurrence of accidents and injuries are likely to reduce, on the other hand, increase if safety is not recognised.

Kheni et al (2008) suggests that, implementation of health and safety regulations in Ghana is a challenge caused by inadequate resources accessible to the government institutions accountable for the administration of occupational health and safety. As, Clarke (2005) points out, that inadequate resources offered to enforcement agencies is the key factor contributing to poor health and safety conditions at the construction sites. Construction industries in Ghana accounts for the highest rate of occupational deaths when compared to other industrial sectors. Out of 902 occupational accidents that resulted from construction in the year 2000, 56 were fatal with a fatality rate of 77.6 per 100 000 workers and 846 were non-fatal. Thus, for the effective and efficient management of health and safety in the construction industry, the following points should be carefully addressed.

2.3.1 Safety Management in Construction

Accidents and unsafe conditions on construction sites is an indication that the top management in the industry are not taking health and safety seriously. There is the need for every construction company to draw a safety management plan to avoid and reduce

injuries on site. Walter (2011) cited in Adu-Boateng (2014) explains that a plan for managing safety in construction is a necessity for any contractor or professional engaged in business and construction projects. He goes ahead to explain that most municipalities and cities almost always demand that any company involved in construction must present a safety management plan before any authorisations from the government are given out for the legitimate start of the construction projects. Peterson (1979) adds that, Indeed, health and safety in the construction industry should be equally managed as other parts of the industry. Al-Kilani (2011) adopted from Amarh (2014) suggests that safety planning and management is one way to avoid unforeseen circumstances. Meanwhile accidents on construction sites are also unforeseen. Therefore, an effective safety management can be used to avoid or reduce these accidents or injuries. For safety management to be successful, it must be in detail and applied to every work operation, from the start of the project to the finish.

2.3.2 Safety Programme

Carrying out an effective safety programme at a construction site can avoid or reduce most injuries or accidents. (Enshassi, 2003). According to Amarh (2014), a construction company's safety program forms part of a contractor's work. Basically, every safety plan of a construction company should be able to identify precise hazards that are likely to happen on the site and should educate the workers on how to avoid or reduce injuries or accident when working. To add to this, Fales (1990) in his study established that, the best strategy for avoiding or reducing injuries or accident is for every company to possess a safety program. He addresses the objective of a company's safety program which helps workers to carry out their activities over a long period of time without any accident or injury. Another important objective of a safety program is that it helps workers to develop

good safety behaviours and safety welfare of the public. Thus, workers must be stimulated to adhere the rules and regulations relating to their own safety as well as the safety welfare of the public when working with equipment, tools or machines.

As stated by Peyton and Rubio (1991), the Occupational Safety and Health Administration of United States listed about twelve key features of a good safety program. They include; the scope of the business;; definite safety responsibilities**;** management commitment to safety; sufficient funds planned for safety programs; effective communication between top management and employees; implementation of safety programs by top management;; identification of hazard and analysis of the hazard through inspections; workers' participation; safety management plan from the start of the project to the finish; disciplinary programs for the workers; safety education and training and review of the safety performance occasionally which involves reports of accidents as well as the results of health and safety inspections.

2.3.3 Site Responsibilities on Safety

According to Agnew and Snyder (2008), Everyone on site, whether employer or employee, has responsibilities for health and safety, only the level of responsibility varies, example it is the obligation of building contractors to make available a healthy and safe construction site environment, plus responsibility geared towards their sub-contractors. Magid et al. (1998) agree with Agnew and Snyder (2008) on the issue about who is responsible when it comes to safety in construction. Magid et al (1998) elaborates that employees at all levels are involved in accident prevention, but the main responsibilities rest with the directors and management who alone have the authority to issue orders and direct work. They point out that, the management is responsible for safe and healthy conditions in the work places as well as preventing unsafe working practices

by the employees. The degree of the responsibility ought to be stated in the Occupational health safety (OHS) plan with the purpose of all individuals knowing what is anticipated of them (Geller, 2000).

2.3.4 Safety Policy

Development of safety policies and process plays a significant role of minimizing the risk of injuries and deaths in the workplace. Most organizations use different replicas to develop an all-inclusive safety policy manual. One of the ways to ensure that all workers in the construction industry work together is to develop an all-inclusive safety policy manual. (Bianca, 2011).

A company's safety approach statement summaries the company's values on health and safety and encourages the top management to commit to safety. The safety approach must be a straightforward and brief statement with allocated general responsibilities for health and safety in all branches of the industry and must be accurate and practicable. To communicate the company's commitment to a safer workplace, this policy must be signed by any highest top management professional (Peyton et al, 1991).

Davies and Tomasin (1999) cited in Yankah (2012) put forward that the safety policy of a company drafted by the employers should be clearly understood by their employees. The statements in the safety policy must show how the company is structured regarding the health and safety duties of the management, and should clearly state the top management's commitment to providing information relating safety training and advice to employees.

According to Hughes et al., (2008), the wellbeing and security approach explanation ought to incorporate the goals which are not quantifiable, and the goals which are quantifiable of the company. Some of the objectives will likely stay unaltered amid policy reviews, while others will be re-examined annually.

As to what is to be included in the safety policy of the construction company, Amarh (2014) suggests that these facts must be incorporated when a safety and health policy is being drawn; The objectives ought to cover the wellbeing and safety involved with all work operations as well as safety relating to the site environment, The work positions of the top management in the company in charge of health and safety, The names of the wellbeing and safety or security consultant and agents, A commitment to the health and safety requirement at the work place which includes the safe use of plant or machines, safety training and education, safe work operations, supervision, transport of materials and safe access and egress and using a safety committee and precise safety plans of the company.

2.3.5 Safety Training

Training is the planned and systematic sequence of instruction, under competent supervision, designed to develop or improve the predetermined skills, knowledge and abilities required by an individual to perform a task to a particular situation McCollum (1995). It is therefore very important that whenever employees first arrive on the site, the management must organize a safety training program for the newbies focusing on the safety policies of the company, safety guidelines, personal protective equipment (PPEs), site safety orientation and Organisational Health and Safety Education and Training required.

Educating and Training construction workers on health and safety training is necessary to their safety on a construction site. The provision of safety education and training regarding the safety at the workplace is the duty of the contractor (Wendy, 2014). Thus, effective safety training on site results in higher safety performance by workers.

Amarh (2014) in his study made mention of some advantages of applying safety on a construction site. These merits are listed below: Safety on construction sites bring about financial benefits: Direct costs (worker's payment claims and protection cost) are reduced and indirect costs (reduced productivity) are also minimized, Safety leads to fewer schedule interruptions which minimizes cost and maximize performance and productivity, Safe work environment boosts employee morale, Safety on construction site increases productivity, efficiency and profit margins and An effective safety program protects a company's reputation.

2.4 SAFETY CLIMATE AND PERFORMANCE IN CONSTRUCTION

Scholars at the Centre for Construction Research and Training (Gillen et al., 2014) defines safety climate as observations of safety policies and procedures by fellows of an organisations at a certain time, mainly concerning the capability of health and safety as well as the regularity between actual conditions related to adopted safety policies and procedures. In the context of construction, they defined safety climate as observations of occupational safety and health on a particular construction project at a specified time. It involves several safety climates from the various organizations engaged in the construction project including the owner, construction manager or contractor, and subcontractors. Construction safety climate of a project can be greatly affected circumstances such as the delivery method of a construction project, the agenda, planning and motivations. Similarly, Zohar (1980) defines safety climate as the 'overall

observations or insight shared by workers on safety issues at the site. Ever since then, others have observed the effectiveness and precision of assessing safety or security climate and whether it can be utilized to comprehend and foresee safety and health execution at the construction site in various industries. Also, AIHA (2017) clearly defines that the safety climate of a job site determines whether or not workers feel empowered to raise safety concerns. From the findings it was discovered that the common definition of safety climate was that it reflected worker's observations of safety within the work environment (Schwatka et al., 2016). With respect to the definitions of safety climate explained above, it is evident that the scholars generally defined safety climate based on observations made.

For the aims of safety climate, Gillen et al., (2014) points out that, scholars or researchers have recognized safety climate as the main strategy to reduce or avoid accidents, injuries, illnesses and death on active construction sites. Schwatka et al., (2016) agrees with Gillen et al., (2014) on the fact that, safety climate measurements can be used to proactively assess an organization's effectiveness in identifying and remediating work-related hazards, thereby reducing or preventing work-related ill health and injury. Thus, safety climate at construction sites should be considered and paid attention to in order to reduce or injuries or accident at the workplace resulting in higher performance by workers.

2.4.1 Factors or Indicators of Safety Climate and Performance

On the other hand, some researchers used a different approach in defining safety climate. For instance, instead of a clear definition, researchers like Cigularov et al., (2010) depicted the exact factors of safety or security climate, focusing on safety communication and error management climate. Most building contractors are trying to develop these factors in order to achieve a construction site free from injuries, accidents or damages.

Analysts and scholars at the Centre for Construction Research and Training (Gillen et al., 2014) during their study were questioned to share their views on the key factors they believed had an impact on safety climate in construction. These leading factors and their characteristics are outlined below:

Communication: they branded communication as one key factor or leading indicator and found out that, mutual communication between employers and employees, active commitment, no fear of punishment, no filtering, multilingual, safety guidelines noticeable and shared with every individual at the workplace in a hierarchical manner, were the characteristics of communication that can result in a positive safety climate if present. (Gillen et al., 2014).

Management Commitment: According to Gillen et al. (2014) management commitment contributes to a higher productivity, quality and safety at the construction site. Management Commitment has been commonly viewed as contributing to positive safety climate (Flin et al., 2000). Cohen (1997) cited in Glendon and Litherland (2001) agrees with the other researchers on the view that management commitment to safety has been a consistent factor in successful safety programs.

Employee involvement: Employee empowerment or involvement should involve effective safety committees, cooperative environment, looking out for each other and preparedness to work together effectively. Also, when the involvement of the employees is backed up by a policy and associated with planning and hazard evaluation, a positive safety climate will be achieved. (Gillen et al., 2014)

Training/Education at all levels: Gillen et al., (2014) elaborates that, training contributes to safety climate as well as the performance of the workers on the site. Providing education or training to the employees, a good training environment, frequent

certification of training, ensuring that training is conversed to all employees and accurate assessment of training by both the superiors and employees are all the components that would be measured supervisors. Owner/Client involvement: Positive or negative safety climate at the construction site affects the performance of the workers. Hence, for a positive safety climate and higher performance by workers, the owner has to set expectations for safety, include safety in bid specifications, provide sufficient funds and an adequate program to support safety and support a safety design to prevent or reduce injuries at the site (Gillen et al., 2014).

According to Schwatka et al., (2016), some companies use safety climate investigation as a learning tool. He stated that, Gittleman et al. (2010) in his study, included safety climate factors associated with management commitment in safety assessment when several site workers lost their lives on a construction site within a short period of time. Actually, this turned out to be one of the effective use of wellbeing and security climate. Without a doubt, this method gave the workers a chance to voice out their opinions, and also provided the top management team in the company with a feedback on how to improve health and safety of workers. Gillen et al., (2014) argues that, safety climate investigations are the main technique for gathering data to measure safety climate, these investigations may not be appropriate for learning where an alteration is needed to develop safety climate and to observe if it progresses after an alteration is made. Thus, the higher the safe performance the lower the accident rate resulting in increased performance of workers.

2.5 ROOF CONSTRUCTION IN GHANA

Roofs are elements of a building related to the notion about shelter. A person with no home is generally called someone lacking a “roof over his or her head”. It is a structure

forming the upper covering of a building which covers the outside dividers of the building at their most elevated level and since its portion of the structure, it must achieve the abilities required of them and also serving to protect the inhabitants of the building from rain, snow, wind, extreme temperature and sunlight thus making them feel safe (Afram, 2008).

According to Hawkins (2012), the roof is the most vital element of a building to maintain but the most ignored. He added that, the roof serves as a shelter for all life and properties, and henceforth, a building is not complete without a roof. Afram (2008), added that the same way a good foundation is important in building construction so is the provision of a good and suitable roof. A good building foundation provides stability to the building but most importantly protects the building from damage beneath the foundation and a good and appropriate roof avoids any defect from the upper part of the building. With respect to the types of roofs, Sakyi (2014) asserts that roofs can basically be categorised into three main types namely the flat roofs, curved roofs and sloppy roofs.

The design of the particular type of roof for a structure must be constructed after considering its structural function of spanning the space and helping to control the climate conditions within it. This is because certain types of roofs might not be practical if the widths are large. (Schrenkenbach, 1981; Foster and Greeno, 2007).

2.5.1 Types of roofs constructed in Ghana

Roofs comes in different types. They can be level, pitched or arched. On the other hand, there are other types of roofs, some of which are as a result of the combination of two or three types of roofs. Flat roofs are the kinds of roofs which have their slope not more than an angle of 10° whilst a pitch roof has a slope more than 10° (Afram, 2008). Emmit

and Gorse (2006) state that a roof can be characterised as flat or level when its plane is inclined at 1° to 5° to the level. However, Chudley and Greeno (2005) also describes a pitch roof as a type of roof which has an angle between 10° and 70°, and a roof below 70° is referred to as a flat or level roof and the type of roof above 70° is called a wall; whereas the pitch is generally determined by the roof covering, which is run by the load and width.

In Ghana, Afram (2008) elaborates that pitched roofs are types of roof that are usually used in building construction in Ghana, specifically the parts of the country that experience greater rainfall.

2.5.2 Functional Requirements of Roofs

Afram (2008) in his study briefly outlined some functional requirements of a roof. However, he points out that, these requirements differ with respect to the nature of the building structure and the roof. These necessities are as follows; *ability to provide* s*hade to the external walls:* This requirement can be accomplished with wide overhangs in addition to sun-shading strategies for walls facing east and west. Also, if the roof is properly done it would contribute to keeping the inside of the building cool. *Insulate against solar heat penetration:* Insulation against the sun into the building through the roof can be minimised or avoided through this method; using a hanged ceiling with a gap for free movement of air between the two, using a protective material between the roof and the covering and then painting with paints that can reflect light. *Shed rainwater quickly and effectively:* Roofs should be constructed in a way to avoid rain water from remaining too long on it since it may cause the water to move into the building, as a result of flooding of the roof gutters and the side laps of the roofing sheets.

Ability to withstand superimposed loads like wind pressure, rain water, weight of snow etc.: This is one of the most important requirements. It will be a disaster if the roof is not able to achieve this functional requirement. This is because if the roof is unable to withstand the loads, it may lead to the collapse or fail of the roof structure which may result in the loss of properties and damages of properties. *Durability and freedom from maintenance:* the durability of the roof is also essential when designing a roof. This is because roofs cannot be changed frequently due to weakening or fail. Thus, it must be designed and constructed to last as long as the building is in good shape supported with maintenance work when necessary. Moreover, it is impossible for a building to be free from maintenance because all building materials including the roof have a life span and needs to be maintained occasionally. *Aesthetics:* A well-constructed building might perhaps not be valued in case the roof looks inappropriate with the building. Thus, a well-designed roof contributes a lot to the beauty of buildings because the roofs are the most visible part of the building after the external walls.

2.5.3 Stakeholders Involved in Roof Construction

According to Sakyi (2014), as part to executing a roof project work worth the client's cost, factors such as: properly installing roof frames and sheets, higher safety standards as far as avoidance of injuries or accidents is concerned and acceptable roof performance over a long period are the responsibility of the stakeholders involved in roof construction. Stakeholders involved in roof construction are as follows; The producers of roof materials and equipment or machines involved in roof construction, the personnel in charge of the project or the owner of the company responsible for the supervision of the roof work, the individuals involved with the installation of wood or metal members and sheet on site and the client to use the product.

2.5.4 Safety Relating to Roof Construction

Safety issues in the construction industry which involves the roofing sector are necessary at all times because it cause a construction firm to succeed or fail. According to Hill (2013), the physical nature of roof work makes it prone to health and safety hazards. Henceforth, involving health and safety in activities gives higher bonus on different projects. There is somewhat low cost to employing health and safety procedures, and the profits that comes with it help drives most companies to greater investment returns in their safety programs.

HSE (2008) added that roof construction is very dangerous because of the height involved. About twenty-four percent (24%) of roof workers are involved in most deaths and end up with serious injuries in construction works since most of them die as a result of falls from height, thus, falls from height is the greatest hazard connected with roof work. Research from BLS (2004) also shows that fata occupational injuries to the average construction worker cannot be compared to the roofer who is six times more at risk.

OSHI (2006) cited in Sakyi (2014) states that, Jordanian reports published by their Ministry of labour from 1995 to 2005 revealed 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 further stated that even if construction employees contribute to about 7.1% of the labour force, OSHI Occupational Safety and Health Institute in the reports of Jordan clearly stated that injuries or accidents rising in the construction industry was about 10.5% of all cases. Cesarini et al. (2013) clarifies that a good and safe working environment helps in keeping the skilled employees at the work place and projects on program by minimizing accidents, the existence of injuries and project delays which intends reduces the disputes and risks of regulatory action.

2.6 SAFETY PRECAUTIONS IN ROOF CONSTRUCTION

Roof workers face a lot dangers when working on the site, some of these dangers include falling from heights and from ladders, electrical hazards, hazardous substances, falling materials, noise exposure, and injuries from the use of faulty or old tools and equipment as well as hazards from extreme weather conditions. If these hazards are controlled by the project manager or supervisor, roof workers can avoid severe injuries and death at the work place. In order to protect workers involved in roofing jobs, the top management must identify the dangers present and act to assess them (OSHA, 2015). This section briefly outlines safety practices to avoid or reduce falls, other physical injuries, accidents, hazardous substance exposures and ailments that are connected to the surrounding environment.

According to the Ministry of Business Innovation and Employment (MBIE), 2012; OSHA (2015) and The Health and Safety Code of practices for safety in roof work, the subsequent points are some of the safety precautions to be considered in roof construction:

2.6.1 Begin work on site with a toolbox talk:

A toolbox talk must be conducted for about 5-10 minutes with all workers before commencing work on a rooftop. Discussion about the plan, common hazards present, assess the condition of the work area, control measures and encourage the team to verbalize the safety tips to follow can be undertaken at toolbox talks. Using a pre-start toolbox talk template can help with the communication and training of workers towards the hazards associated with roof construction which includes falling from a height.

2.6.2 Work only during good weather conditions and avoid extreme heat/cold

Not only does extreme weather cause slips and falls, it can also hinder proper execution of roofing work (roof shingles not sealing down). A wet roof is also a huge risk for slips and falls. Better side with caution and always wait for ideal weather before you begin roofing work. There are some key factors to consider when working on roof during extreme weather conditions. These factors include; the state of the roof surface (good or bad conditions), the wind speed, how moist the roof is (as a result of rain or snow) and radiation from the sun.

2.6.3 Ladders should be stable and properly secured or tied off:

Always make sure that the right type of ladders is used. All ladders at the site must be in good condition and safeguarded well to prevent it from moving when working on it. Check your ladders for safety as some of them may need repair or replacement to prevent fatal accidents or injuries.

2.6.4 Wear proper PPE

The top management at the workplace in charge of health and safety should make sure that all workers are trained properly on the right use of every personal protective equipment; as well as the caring and maintenance of the PPEs. Wearing proper PPE such as helmets, shoes with traction, and fall protection harnesses can help save workers when slips and falls occur. Employers must perform regular PPE checks to ensure your team is properly equipped.

2.6.5 Signage should be visible in your work area

People around the work area should always be made aware of roofing work in the vicinity by using visible warning signs to prevent injury or accidents with staff working on site or from falling debris.

2.6.6 Safety in erecting scaffolding

Again, to ensure that the site is free from injuries or accidents from falls, the supervisors must make sure that only skilled and trained workers work with the scaffold in terms of the movement, disassembling, erection and altering of the scaffolds. Effective supervision from an experienced person is necessary during scaffolding activities. Hence, caution must be taken not to overstrain the scaffolding with roof materials. The roof materials should only be loaded on the scaffold in the required amounts and avoid attacking them on one side of the scaffold rather, it should be should be evenly spread on the scaffolding or the roofs for an even balance.

2.6.7 Fall Arrest System

Fall arrest systems saves workers from falling on the ground when working on roofs. It provides support to the workers by holding them with wires. Every fall arrest systems on the site must be installed and maintained properly by an experienced person. This system should only be used when the other fall protective systems like handrails are deemed to be useless or unworkable. The gears of the fall arrest system have to be suitable for the individual and the worker must be trained to use them appropriately. Also, for a successful fall arrest, there must be enough space below the work position.

2.6.8 Use guardrails whenever possible

Guardrails serve as a visual and physical barrier which protect workers from falls. It reduces the risk of injury and death from working on roofs. In roof construction, guardrails should be spaced at roughly 500 mm centre to centre and the top guardrail also placed at minimum spacing of 900 mm above where roof pitch line meets.

2.6.9 Sweep the roof before and after work and make sure it is clear of dirt and debris

One random nail can cause slips while snow or leaves can hide areas of the roof that should be visible to workers. Always keep the roof clean and free of items that can cause accidents or materials that can hinder visibility of the roof.

2.6.10 Safety mesh and nets

Working on roof areas without the roofs would require a safety mesh. This safety mesh should be set up as soon as the roof is removed. Although it is not safe to walk through or work on a safety mesh, in the event of a fall it can lessen the damage with a free fall. The fixing and strength of a safety mesh mush be checked before use. Safety nets are similar to the safety mesh and they also protect workers from falls however, the advantage the safety nets have over the mesh is its lightweight and easiness to use or handle it.

2.6.11 Protection against noise

When workers on a construction site are exposed to loud noise from the machines or equipment they are using, it can result in a permanent hearing loss and may perhaps be accompanied by tinnitus which is a responsiveness of noise or ringing in the ears. Roofers

might be exposed to noise from roof construction as well as the background noise of other work operations on the site. Appropriate hearing protection ought to be worn by roofers unprotected from excessive loud noise for long periods of time. This hearing protection should be suitable for the nature and extent of the noise and should also be friendly with other personal protective equipment.

2.6.12 Relocation of electricity lines over roofs

Every electrical tool used in roof work should be installed and maintained appropriately. However, if during roof work there happen to be electric lines above ground crossing the site, or close to the site, there could be a threat especially if there is contact between some of the roof materials like metal roof sheets, scaffolds or ladders, which could result in an unintended electric discharge. Building designers must advise the client to organize the repositioning of the electric lines to avoid the danger through contact in the course of construction and maintenance or alert the top management and put into writing an application for the electric lines to be diverted during a construction phase. Also, if it's impossible to divert the electric lines, then the electricity must be put off for all work operations to avoid the risk of contact.

2.6.13 Protecting the public

The general public can be in danger from falling items during roof work. Safety measures should be taken at all times to avoid materials from falling from the roof since it can cause danger to anybody especially when members of the public walk through the site or pass close or below an ongoing roof work. Some control measures include; getting rid of movable materials from the roof top or tying down materials or items that could be easily blown away by the wind, using birdcage scaffolds and debris netting to retain falling

materials and using brick guards to prevent stacked materials on a scaffold platform from falling on top of workers beneath the roof or the members of the public.

2.6.14 Reduction or Elimination of Chemical Hazards

Most chemicals used in roof construction affects the health of the workers due to its harmful nature. The risk involved in the usage of these chemicals can be minimized if the chemicals are eliminated completely or replaced. However, if elimination and substitution of these chemicals is not likely appropriate personal protective equipment (PPE) like coveralls, protective gauntlets, and footwear and eye protection can be used. Other actions to avoid chemical hazards include, the application of brush instead of spraying of chemicals, air circulation to take out fumes, the use of a nose mask to avoid the inhalation of chemicals and hand gloves to prevent contact between the skin and chemicals.

2.6.15 Carrying out Risk Assessments

Assessment of risks at the construction site plays an important role in controlling health hazards or risks. Every risk assessment must feature the suggested control measures that must be implemented before work starts. The assessment must recognize the ways of entering and exiting the work place which will minimise movement on the roof, the different materials or items used in the installation of the roof and identify if the materials are delicate or not as well as the ways to control or reduce falls from heights. When assessing risk, the lifespan of the roof as well as the maintenance of the roof elements and make provisions for changes in the future.

2.7 FACTORS AFFECTING THE QUALITY OF WORKERS SAFETY

Many factors have been acknowledged to affect the quality of worker's safety and their performance. Some of the factors gathered from different authors and researchers are briefly discussed below.

2.7.1 Lack of Training

Accidents and injuries at the work place happen because of inadequate training and supervision of workers, negligence, carelessness, and lack of knowledge on safety, laziness, inadequate means to execute a task safely. Additionally, an unsafe working environment and the complex nature of the industry have an influence on health and safety in the industry (Sawacha et al., 1999).

2.7.2 Lack of personal protective equipment

Construction work is always accompanied with accidents or injuries. These accidents or injuries happen often and it is most of the time caused by the lack of personal protective equipment on site or the failure to use the equipment. Personal Protective Equipment protect workers against hazards or injuries on the job. If workers lack PPEs, workers will be exposed to hazards resulting in poor performance (Jannadi, 1996).

2.7.3 Lack of management commitment to safety

Whether the management team of the company is committed to health and safety at the workplace or not, it does have an effect on the industry either in a positive or negative way. The top management must make it a point to be involved and engaged in the health and safety procedures of the company (Peyton et al., 1991).

2.7.4 Lack of safe construction site environment

According to Sawacha et al. (1999), if the site environment is not safe, the workforces are exposed to serious injuries and accidents resulting in low productivity.

2.7.5 Poor Legislation of codes and standards

One key factor that affect the quality of workers' safety in a construction field is when there is poor legislation of codes and standards on the site. (Tam et al., 2004).

2.7.6 Lack of inspection procedures on site

Site inspections are mostly conducted by safety officers or supervisors. Failure to conduct a daily or weekly site inspection, may lead to site workers not abiding to the safe working practices imparted in them (Amarh, 2014).

2.7.7 Ineffectiveness of current safety policies

The safety policies and safety management of the company coordinated with the laws related to health and safety has a positive impact on the safety performance at the work place. Hence, without effective safety policies, safety of workers' is not assured (Ng, Cheng and Skitmore, 2005).

2.7.8 Lack of skilled labour

It is necessary to nurture the skill, participation and commitment of workers towards a positive construction safety climate and performance. Support from the management as well as adequate skilled labour influence construction safety performance (Jannadi, 1996).

2.7.9 Poor safety awareness among top management

When the top management are not aware of safety precautions, rules or regulation in the construction site; the site is exposed to accidents and injuries of workers and even the public. Further, Abdul-Rashid, Bassoni and Bawazeer, (2007) identified that one of the factors affecting construction safety performance of large contractors in Egypt is safety consciousness among management of the company.

2.7.10 Insufficient safety budget

Yankah (2012) states that companies with good safety efforts allocated safety budget at the corporate level and assess accident costs at the project level has a positive impact on workers' safety and performance.

2.7.11 Poor accident record keeping and reporting system

According to Kartam et al., (2000)**,** one of the issues affecting the quality of employees' safety is poor accident record keeping and reporting systems which led to the lack of safety awareness among contractors and owners on the relevance of health and safety at the work place.

2.7.12 Poor equipment

Construction work involves the use of equipment and machinery. Hence if these equipment and machines are faulty or not in good conditions, they might cause accidents and injuries to the workers (Ng, Cheng and Skitmore, 2005).

2.7.13 Low educated workers

Durdyev et al. (2017), in their study explains that in Cambodia, construction workers generally come from poor provinces, and are unskilled, uneducated and untrained. Therefore, it is evident that this factor causes poor construction safety performance.

2.7.14 Reckless operations

The most influential safety item within a workforce cluster was ‘reckless operations’, the main causes of reckless are economic conditions (low wages) low level of education and skills pressure to work overtime (also the cause of workers’ physical fatigue) and lack of safety training (Pinto, Nunes and Ribeiro, 2011).

2.8 EFFECTIVE SAFETY CLIMATE PRACTICES

The following are some of the effective safety climate practices in the construction industry, the following suggestive measures from various authors and scholars are outlined below.

2.8.1 Provision of personal protective equipment

Management must ensure that personal protective equipment is available onsite, as the simple use of this equipment can protect laborers from the short- and long-term effects of construction worksite hazards (Durdyen et al., 2017).

2.8.2 Effective Management Commitment

The project managers, owners, supervisors etc. should participate and commit to the health and safety practices employed at the workplace and make sure that the workers abide by the rules and regulation governing health and safety in the company. The

management are obligated to making health and safety of the workers a priority just as the quality of work done and output is a priority to them. Safety performance without the commitment and participation of the management will negatively affect safety. (Amarh, 2014).

2.8.3 Regular Toolbox talks

Construction work on site should always include some few minutes of toolbox talks where workers are briefed on safety before work starts to prepare them with respect to safety consciousness thus improving safety on sites. (MBIE, 2012).

2.8.4 Effective Safety Training

Consistent education and training on safety for all workers in the industry will help minimize the number of injuries, accidents or deaths that happen on sites. (Peyton and Rubio, 1991).

2.8.5 Provision of safety incentives

According to Yankah (2012), Employers must provide incentives to motivate staff to work harder, therefore it is expected that employees are provided with incentives in various forms to assist in the operation of health and safety management systems.

2.8.6 Provision of experience and skilled workforce

Management involved in construction projects play a significant role in providing the required resources at an appropriate level, including an experienced and skilled workforce at various levels and sufficient financial support (money), facilities and machines (Rollenhagen and Kahlbom, 2001)

2.8.7 Frequent Keeping of records of accidents on construction sites

One valued safety tool that every company should have is a scheduled assessment of the project's safety record. The safety record should include elements like the reports of accidents and injuries, the outcome of safety inspections and accident data over the past years, months or weeks. A good review allows the management to identify the specific causes and solution of an accident (Yankah, 2012).

2.8.8 Effective Safety Policies

Peyton et al. (1991) states that all top management in construction companies ought to have on paper the safety policy which is specific and easily understood. An effective safety policy must summarize the company's objectives and aims towards safety and how relevant it is on the site. Therefore, government authorities have a central responsibility not only for improving current safety policies, but also for increasing their effectiveness (Thomas, 2012).

2.8.9 Set effective safety guidelines

Yankah (2012) recommends that the management and administration should make sure that setting safety rules or guidelines into a project contract creates safety awareness at the workplace.

2.8.10 Accident Investigations

According to Leigh (2010) when a workplace accident occurs, a safety officer must investigate to determine why the accident happened. He adds that investigating an accident is a very necessary module of health and safety which leads to an effective safety culture at the workplace.

2.8.11 The role the government and engineering societies in ensuring safety

The government should make health and safety a priority in construction industries by introducing safety officers and other societies involved in construction to conduct site inspections and visits regularly to improve safety on construction sites. (Amarh, 2014).

2.8.12 Regular safety inspection by safety officers and supervisors

Conducting a regular site inspection by supervisors makes the workers vigilant and encourages them to stand by safety practices introduced to them at the work place. Hence, the supervisors and safety officers responsible must try to visit the site regularly.

2.8.13 Imposing fines on construction companies

Adu-Boateng (2014) believes that if the ministry of works and housing in union with various local authorities such as the District Assemblies should impose fines on construction companies who flout the Health and safety law, an effective safety precaution will be achieved.

2.8.14 Effective safety program

Designing an effective program helps to reduce injuries on construction site (Durdyen et al., 2017).

2.8.15 Implementation of effective health and safety management system

Carrying out an effective Health and Safety Management System is a positive approach to averting accidents, injuries and illnesses. Although there is no assurance that accidents or injuries will never happen on a construction site, an operational safety management structure will help reduce the rate at which workers die or are injured at the site (Yankah, 2012).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Keeping in mind the end goal to help in accomplishing the examination points and destinations, this part looks at explore strategies with the viewpoint of finding the best strategy to answer the exploration questions raised. Collis and Hussey (2003) contended that examination strategy is the general way to deal with the outline procedure from the theoretical establishments to the gathering of information and investigation adjusted for an examination.

Strategy is then a route by which we gain learning about the world, endeavoring to find how we can approach the undertaking of discovering what we accept to be valid (Christou et al., 2008). Hence, this chapter provides a detailed description and evaluation of the methodological approach to the study. This chapter also details the Research strategy, design and procedure which explains the sample and sampling techniques used, administering of questionnaires, respondents selected for the research and instruments used for the research.

3.2 RESEARCH STRATEGY

The clarification to the course of the specialist towards the lead of research is of foremost substance (Bryman, 1998; Baiden, 2006). Naoum (1998) characterizes look into methodology as the enquiry of research targets. Therefore, Baiden (2006) attested that, the three principle kinds of research procedures are quantitative, subjective, and triangulation. Be that as it may, the decision to adjust a specific procedure relies upon the motivation behind the investigation, the sort, and additionally accessibility of data for the examination (Naoum, 1998; c.f Baiden, 2006). Henceforth, this examination

adjusts a quantitative technique, as the fundamental information accumulation systems utilized in this exploration was polls.

3.3 RESEARCH APPROACH

A research approach can also be classified in terms of whether it is deductive or inductive. The deductive approach known as testing a hypothesis is the point at which the specialist builds up a hypothesis or speculations and plans an examination technique to test the planned hypothesis. In clarifying deductive research, Perry (2001) included it is an examination in which a reasonable and hypothetical structure is produced which is then tried by exact perception; along these lines, specific occasions are deducted from general impacts. Deductive research is an investigation in which hypothesis is tried by experimental perception. The deductive strategy is alluded to as moving from the general to the specific and it frequently requires extensive information (Hussey and Hussey, 1997).

The inductive approach which is known as building a hypothesis, includes the specialist gathering information trying to build up a hypothesis (Saunders et al, 2009). Hussey and Hussey (1997) included that inductive research is an investigation in which hypothesis is, “developed from the observation of empirical reality; thus, general inferences are induced from particular instances, which is the reverse of the deductive method since it involves moving from individual observation to statements of general patterns or laws,”. This examination is molded utilizing the deductive research plan as it tends to utilize impressive information which would thusly support the utilization of quantitative techniques to dissect (Travers, 2001) and draws on the deductive reasoning which operates from a general to specific perspectives drawing conclusions based on facts (Burney, 2008).

3.4 RESEARCH PROCEDURE

This part of the examination strategies tends to the inspecting technique, information accumulation instruments, and methodology. It involves clarifications to every one of the techniques utilized and the strategies embraced to address the points, targets, and research questions.

3.4.1 The Study Area

The research work will be limited to roof construction workers in the Ashanti Region of the country. Furthermore, the reason for the selection of the geographical area is to have a wide range outcome in the Ghana to blend ideas. Again, the reason is the infrastructure projects located in this region and their head offices located in the Ashanti region., this will reduce the problems that the researchers will face in terms of data collection, making it easier and faster to retrieve the questionnaires.

3.4.2 Sources of Data

This part of the exploration system tends to information gathering instruments, strategies, and methods. It gives comprehensive clarifications to every one of the strategies utilized in tending to the points, goals, and research questions. Information gathering is urgent in investigate, as the information adds to a superior comprehension of a hypothetical foundation (Bernard, 2002). Data is actually the bases to any research. The data we gathered for our research included both writing audit (optional information) also, field study (essential information).

3.4.3 Questionnaire Development

It was fundamental to build up the data to accumulate for significant inquiries to be requested (Oppenheim, 1996). The questionnaire designed includes; close-ended questions and scaled response questions which focused on the subject matter and aimed to cover the objectives of the research. The Likert reaction scale was utilized, which estimates the quality or force of respondent's sentiment.

Regardless, the inquiries have additionally been organized in such a way, to the point that the appropriate responses got would help accomplish the exploration point. Subsequently, the inquiries center around satisfying the necessities of this examination. Measures were additionally set up to keep the inquiries in the survey in basic dialect, invalid and drained of specialized terms with a specific end goal to limit potential mistakes from respondents.

3.4.4 Questionnaire Design and Distribution

Structured questionnaires were designed and self-administered to the various institutions and firms (shown in the appendices). The questionnaire used mainly closed ended questions that focused mainly on the subject matter of the literature review. The rating scale was the scale adapted in the preparation of the questionnaire.

These questionnaires were mainly administered face to face to various institutions and professionals in the construction industry depending on the organizational structure of the organization and the responsibility of the various personnel in the firm. The surveys were circulated and recovered face to face. This guaranteed the proposed beneficiaries, keeping in mind the end goal to help enhance the reaction rate, finished the surveys. All these were done to ensure that the objectives of our study could be achieved.

3.5 SAMPLING TECHNIQUE AND SAMPLE SIZE DETERMINATION

Soanes and Stevenson (2008) defined Sample in as a small part intended to show what the whole is like". Thus, sampling refers to the process of selecting a quota of the population to characterize the entire population. A sample, then, consists of a subject of the units that constitute the population (Polit & Hungler, 1992). This is on account of utilizing an example is more pragmatic and less exorbitant than gathering information from the whole populace. There are two types of sampling, namely probability and non-probability sampling. In this study non-probability sampling is used.

The research work was limited to roof construction workers in the Ashanti Region of the country which was the target population of the study. Fifty roof construction workers were sampled for the work with three top management also interviewed.

3.5.1 Purposive sampling

Purposive inspecting alludes to techniques in which the analyst practices his or her judgment about who will give the best point of view on the marvel of intrigue, and afterward deliberately welcomes those particular viewpoints into the investigation. The examining procedure for this work in light of its motivation, plan, and commonsense ramifications of the examination theme is purposive inspecting. Basically, the specialist chooses what should be known and embarks to discover individuals who can and will give the data by goodness of learning or experience (Bernard, 2002; Lewis and Sheppard, 2006).

3.6 ANALYSIS OF DATA

The information was analysed using SPSS and Excel software program. Excel was mainly used for the analysis of all tables with the rating scale. The questions were mainly closed ended questions and so the SPSS was mainly used for all that kind of questions. These two tools made analysis very simple and easy because they converted the information from the questionnaire to numerical data and charts. Again, relative importance index will also be used to analyse some of the data by computing to deduce their rankings.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The chapter four looks at the analyses of the various objectives and the discussion of the results. Using a purposive sampling approach, the number of questionnaires received for analysis were fifty. The questionnaire used a five-point Likert scale to rate the various factors from one to five, with five being the highest and one as the lowest. The respondents were required to rate these variables from one to five of their opinions on the specific variables as explained. The analysis used is the mean score ranking, relative importance index and one sample t-test. The objectives are analysed and discussed below.

4.2 RESPONDENTS CHARACTERISTICS

The characteristics of the respondents were elicited through the asking of pertinent questions concerning their qualifications. This was needed to have a firm and reliable data to work with as well as a valid data. Questions like their educational background, their working experience as well as their professional background were enquired about. The respondents were also asked whether they had a health and safety department in their various work places. The table below shows the results of the analysed characteristics which is also discussed further.

Table 4.1: Characteristics of the respondents

		Frequency	Percent
Educational Level	Diploma/Professional Certificate	16	32.0
	Bachelor's Degree	16	32.0
	Masters / Postgraduate Degree	14	28.0
	PhD	4	8.0
Working Experience	1 – 5 years	13	26.0
	6 - 10 years	14	28.0
	11 – 15 years	13	26.0
	16 years and above	10	20.0
Professional Background	Managing Director	19	38.0
	Project Manager	17	34.0
	Operative/ Installer	14	28.0
Does your company have a H &S department	Yes	37	74.0
	No	13	26.0
Total		50	100.0

Source: Author's Survey (2018)

To ascertain the educational level of the respondents, the data was analysed using simple descriptive statistics like percentages and frequencies. Respondents with a diploma/professional certificate were sixteen which represents a percentage of 32.0. Sixteen of the respondents had a bachelor's degree also representing 32.0. Fourteen of the respondents had a qualification in masters/postgraduate degree representing 28.0 percent. The respondents with a PhD were four making a percentage of 8.0. the work experience of the workers was also important to identify the qualification of that respondent to give adequate information on the topic. Thirteen people had one to five years of experience representing a percentage of 26.0. Fourteen of the respondents also had an experience ranging from six to ten years constituting 28.0 percent. The respondents with eleven to fifteen years of experience were thirteen having a percentage of 26.0. Ten people had fifteen years and above experience in the industry representing 20.0 percent. Nineteen managing directors answered the questions with a percentage of 38.0. The project managers were seventeen also representing 34.0 percent. The

operatives/installer were fourteen with a percentage of 28.0. the respondents were further asked if they had a health and safety department in their various companies. It was realised that, most of the respondents that is thirty-seven of them had health and safety departments but thirteen of them did not have the health and safety department which represented 74.0 and 26.0 percent respectively. The results from the analysis of the respondent characteristics are encouraging and safe enough to say that the respondents were qualified to give credible and reliable data for the research.

4.3 SAFETY PRECAUTIONS FOR WORKERS

This section of the questionnaire was to explore the safety precautions for workers in the roof construction industry. Literature was first reviewed to ascertain the fifteen safety precautions for workers in the roof construction industry. The identified precautions were then formulated into a questionnaire using the Likert scale with a range from one to five having strongly agree as five and strongly disagree as one. To achieve the research objective, the mean score ranking was used in the analysis of the precautions to rank them from the most to the least important. A further one sample t-test analysis was conducted to affirm that these precautions were indeed safety precautions being used by roof construction workers. The analysis is shown in the tables below with a further discussion of the precautions.

Table 4.2: Mean ranking of safety precautions for workers

Safety precautions	N	Mean	Std. Deviation	Std. Error Mean	Rank
Safety in erecting scaffolding	50	4.60	0.535	0.076	**1**
Wear proper PPE	50	4.58	0.499	0.071	**2**
Signage should be visible in your work area	50	4.42	0.642	0.091	**3**
Carrying out Risk Assessments	50	4.24	0.657	0.093	**4**
Safety mesh and nets	50	4.22	0.582	0.082	**5**
Ladders should be stable and properly secured or tied off	50	4.20	0.639	0.090	**6**
Relocation of electricity lines over roofs	50	4.16	0.681	0.096	**7**
Fall Arrest System	50	4.12	0.521	0.074	**8**
Protecting the public	50	4.06	0.586	0.083	**9**
Begin work on site with a toolbox talk	50	4.02	0.654	0.093	**10**
Use guardrails whenever possible	50	4.00	0.452	0.064	**11**
Reduction or Elimination of Chemical Hazards	50	3.94	0.652	0.092	**12**
Protection against noise	50	3.74	0.876	0.124	**13**
Sweep the roof before and after work and make sure it is clear of dirt and debris	50	3.28	1.031	0.146	**14**
Work only during good weather conditions and avoid extreme heat/cold	50	2.98	1.220	0.173	**15**

Source: Author's Survey (2018)

The table above shows the mean and standard deviation of the various precautions that have been ranked from the highest to the lowest. With the fifteen identified precautions, safety in erecting scaffolding emerged first with a 4.60 as its mean value and a standard deviation of 0.535. The precaution which emerged second was wear proper PPE with a mean value of 4.58 and a standard deviation of 0.499. Signage should be visible in your work area emerged third with a mean value of 4.42 and a standard deviation of 0.642.

Carrying out risk assessments emerged forth with a mean value of 4.24 and a standard deviation of 0.657. Safety mesh and nets emerged fifth with a mean value of 4.22 and a standard deviation of 0.582. Ladders should be stable and properly secured or tied off emerged sixth with a mean value of 4.20 and a standard deviation of 0.639. Relocation of electricity lines over roofs emerged seventh with a mean value of 4.16 and a standard deviation of 0.681. Fall arrest system emerged eighth with a mean value of 4.12 and a standard deviation of 0.521. Protecting the public emerged ninth with a mean value of 4.06 and a value of 0.586 as the standard deviation. Begin work on site with a toolbox talk emerged tenth with a mean value of 4.02 and a value of 0.654 as the standard deviation. Use guardrails whenever possible emerged eleventh with a mean value of 4.00 and a value of 0.452 as the standard deviation. Reduction or elimination of chemical hazards emerged twelfth with a mean value of 3.94 and a value of 0.652 as the standard deviation. Protection against noise emerged thirteenth with a mean value of 3.74 and a value of 0.876 as the standard deviation. Sweep the roof before and after work and make sure it is clear of dirt and debris emerged fourteenth with a mean value of 3.28 and a value of 1.031 as the standard deviation. Work only during good weather conditions and avoid extreme heat/cold emerged last with a mean value of 2.98 and a value of 1.220 as the standard deviation. The results of the mean show that, safety in erecting scaffolding, wear proper PPE, signage should be visible in your work area, carrying out risk assessments and the use of safety mesh and nets are very important as they were ranked as the first five precautions to take when working. The results of the further one sample t-test performed is shown below.

Table 4.3: One-Sample Test of safety precautions for workers

Significant Stakeholders	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Diff.	95% Confidence Interval of the Difference	
					Lower	Upper
Begin work on site with a toolbox talk	11.02	49	0.000*	1.020	0.834	1.206
Work only during good weather conditions and avoid extreme heat/cold	-0.12	49	0.908	-0.020	-0.367	0.327
Ladders should be stable and properly secured or tied off	13.28	49	0.000*	1.200	1.018	1.382
Wear proper PPE	22.41	49	0.000*	1.580	1.438	1.722
Signage should be visible in your work area	15.65	49	0.000*	1.420	1.238	1.602
Safety in erecting scaffolding	21.17	49	0.000*	1.600	1.448	1.752
Fall Arrest System	15.21	49	0.000*	1.120	0.972	1.268
Use guardrails whenever possible	15.65	49	0.000*	1.000	0.872	1.128
Sweep the roof before and after work and make sure it is clear of dirt and debris	1.92	49	0.061	0.280	-0.013	0.573
Safety mesh and nets	14.83	49	0.000*	1.220	1.055	1.385
Protection against noise	5.97	49	0.000*	0.740	0.491	0.989
Relocation of electricity lines over roofs	12.05	49	0.000*	1.160	0.967	1.354
Protecting the public	12.79	49	0.000*	1.060	0.894	1.227
Reduction or Elimination of Chemical Hazards	10.20	49	0.000*	0.940	0.755	1.125
Carrying out Risk Assessments	13.36	49	0.000*	1.240	1.053	1.427

*Significant

Source: Author's Survey (2018)

The significance of the precautions was confirmed using the one sample t-test. Because of the Likert scale used, that is, to a scale of five. The test value chosen was three with a significance level of 95 percent. It also meant that, the precautions with a p value less than the value 0.05 were classified as significant and those which had a value greater than 0.05 classified as not significant. From the test conducted (table 4.3) it clearly shows that two of the precautions that is, work only during good weather conditions and avoid extreme heat/cold and sweep the roof before and after work and make sure it is clear of dirt and debris had a p value of 0.908 and 0.061 respectively. This means that, these two precautions were not being undertaken in roof construction and that to the best of their knowledge these two were not an issue in the roof construction industry. The rest of the precautions were all significant.

The study goes with the assertion made by OSHA (2015) that, supervisors must make sure that only skilled and trained workers work with the scaffold in terms of the movement, disassembling, erection and altering of the scaffolds. Effective supervision from an experienced person is necessary during scaffolding activities. Hence, caution must be taken not to overstrain the scaffolding with roof materials. The roof materials should only be loaded on the scaffold in the required amounts and avoid attacking them on one side of the scaffold rather, it should be should be evenly spread on the scaffolding or the roofs for an even balance. The top management at the workplace in charge of health and safety should make sure that all workers are trained properly on the right use of every personal protective equipment; as well as the caring and maintenance of the PPEs. Wearing proper PPE such as helmets, shoes with traction, and fall protection harnesses can help save workers when slips and falls occur. Employers must perform regular PPE checks to ensure your team is properly equipped (OSHA, 2015).

4.4 FACTORS THAT AFFECT THE QUALITY OF WORKERS SAFETY

A literature review of the factors that affect the quality of workers safety in roof construction was identified from several sources. These factors were developed into a questionnaire. The respondents were required to rate these factors from one to five with the former being the least and the latter being the highest. The use of mean score ranking and relative importance index was necessary to rank the factors from the highest to the lowest. The results of the ranking are shown in the table below.

Table 4.4: Factors that affect the quality of workers safety

No	Factors	(ΣW)	Mean	RII= ΣW/(5*N)	Rank
1	Lack of Training	223	4.460	0.892	**1**
2	Lack of personal protective equipment	222	4.440	0.888	**2**
3	Lack of management commitment to safety	215	4.300	0.860	**3**
4	Lack of inspection procedures on site	209	4.180	0.836	**4**
5	Lack of skilled labour	208	4.160	0.832	**5**
6	Poor safety awareness among top management	205	4.100	0.820	**6**
7	Reckless operations	204	4.080	0.816	**7**
8	Lack of safe construction site environment	202	4.040	0.808	**8**
9	Poor accident record keeping and reporting system	201	4.020	0.804	**9**
10	Low educated workers	200	4.000	0.800	**10**
11	Ineffectiveness of current safety policies	197	3.940	0.788	**11**
12	Insufficient safety budget	194	3.880	0.776	**12**
13	Poor equipment	191	3.820	0.764	**13**
14	Poor Legislation of codes and standards	187	3.740	0.748	**14**

Source: Author's Survey (2018)

The fourteen factors affecting the quality of workers safety were ranked using the relative importance index and mean which is shown in the table above. The factor that came in first is lack of training with a value of 4.460 as the mean and a value of 0.892 as the relative importance index. The factor that came in second is lack of personal protective equipment with a value of 4.440 as the mean and a value of 0.888 as the relative importance index. The factor that came in third is lack of management commitment to safety with a value of 4.300 as the mean and a value of 0.860 as the relative importance index. The fourth ranked factor is lack of inspection procedures on site with a value of 4.180 as the mean and a value of 0.836 as the relative importance index. The fifth ranked factor is lack of skilled labour with a value of 4.160 as the mean and a value of 0.832 as the relative importance index. The sixth ranked factor is poor safety awareness among top management with a value of 4.100 as the mean and a value of 0.820 as the relative importance index. The seventh ranked factor is reckless operations with a value of 4.080 as the mean and a value of 0.816 as the relative importance index. The eighth ranked factor is lack of safe construction site environment with a value of 4.040 as the mean and a value of 0.808 as the relative importance index. The ninth ranked factor is poor accident record keeping and reporting system with a value of 4.020 as the mean and a value of 0.804 as the relative importance index. The tenth ranked factor is low educated workers with a value of 4.000 as the mean and a value of 0.800 as the relative importance index. The eleventh ranked factor is ineffectiveness of current safety policies with a value of 3.940 as the mean and a value of 0.788 as the relative importance index. The twelfth ranked factor is insufficient safety budget with a value of 3.880 as the mean and a value of 0.776 as the relative importance index. The thirteenth ranked factor is poor equipment with a value of 3.820 as the mean and a value of 0.764 as the relative importance index. The fourteenth ranked factor is poor legislation of codes and standards with a value of

3.740 as the mean and a value of 0.748 as the relative importance index. The factors that ranked as the first five are lack of training, lack of personal protective equipment, lack of management commitment to safety, lack of inspection procedures on site and lack of skilled labour.

Accidents and injuries at the work place happen because of inadequate training and supervision of workers, negligence, carelessness, and lack of knowledge on safety, laziness, inadequate means to execute a task safely. Additionally, an unsafe working environment and the complex nature of the industry have an influence on health and safety in the industry (Sawacha et al., 1999). Construction work is always accompanied with accidents or injuries. These accidents or injuries happen often and it is most of the time caused by the lack of personal protective equipment on site or the failure to use the equipment. Personal Protective Equipment protect workers against hazards or injuries on the job. If workers lack PPEs, workers will be exposed to hazards resulting in poor performance (Jannadi, 1996). Whether the management team of the company is committed to health and safety at the workplace or not, it does have an effect on the industry either in a positive or negative way. The top management must make it a point to be involved and engaged in the health and safety procedures of the company (Peyton et al., 1991). Site inspections are mostly conducted by safety officers or supervisors. Failure to conduct a daily or weekly site inspection, may lead to site workers not abiding to the safe working practices imparted in them (Amarh, 2014).

4.5 EFFECTIVE SAFETY CLIMATE PRACTICES IN THE ROOF CONSTRUCTION

A literature review of the effective safety climate practices in the roof construction industry were identified and developed into a questionnaire to gather information from the respondents. The same rating system was used, that is, a Likert scale from one to five showing strongly disagree and strongly agree respectively. The collected data from the respondents were analysed using the mean score ranking and the one sample t-test. The ranking of the practices is illustrated in the table below. The discussion of the various practices is also explained below.

Table 4.5: Mean ranking of effective safety climate practices

Significant Stakeholders	N	Mean	Std. Deviation	Std. Error Mean	Rank
Provision of personal protective equipment	50	4.64	0.693	0.098	**1**
Effective Safety Training	50	4.50	0.678	0.096	**2**
Implementation of effective health and safety management system	50	4.47	0.504	0.072	**3**
Provision of experience and skilled workforce	50	4.46	0.676	0.096	**4**
Accident Investigations	50	4.44	0.644	0.091	**5**
Frequent Keeping of records of accidents on construction sites	50	4.38	0.602	0.085	**6**
Effective Management Commitment	50	4.36	0.663	0.094	**7**
Regular safety inspection by safety officers and supervisors	50	4.32	0.621	0.088	**8**
Effective Safety Policies	50	4.30	0.614	0.087	**9**
Provision of safety incentives	50	4.28	0.701	0.099	**10**
Effective safety program	50	4.26	0.600	0.085	**11**
Regular Toolbox talks	50	4.24	0.591	0.084	**12**
Set effective safety guidelines	50	4.20	0.606	0.086	**13**
The role the government and engineering societies in ensuring safety	50	4.10	0.735	0.104	**14**
Imposing fines on construction companies	50	3.86	0.606	0.086	**15**

Source: Author's Survey (2018)

The table above displays the results of the analysis of the effective safety climate practices in the roof construction industry. The practices are ranked from the first to the fifteenth. The first ranked practice with a mean value of 4.64 and a standard deviation of 0.693 is provision of personal protective equipment. The second ranked practice with a mean value of 4.50 and a standard deviation of 0.678 is effective safety training. The third ranked practice with a mean value of 4.47 and a standard deviation of 0.504 is implementation of effective health and safety management system. The fourth ranked practice with a mean value of 4.46 and a standard deviation of 0.676 is provision of experience and skilled workforce. The fifth ranked practice with a mean value of 4.44 and a standard deviation of 0.644 is accident investigations. The sixth ranked practice with a mean value of 4.38 and a standard deviation of 0.602 is frequent keeping of records of accidents on construction sites. The seventh ranked practice with a mean value of 4.36 and a standard deviation of 0.663 is effective management commitment. The eighth ranked practice with a mean value of 4.32 and a standard deviation of 0.621 is regular safety inspection by safety officers and supervisors. The ninth ranked practice with a mean value of 4.30 and a standard deviation of 0.614 is effective safety policies. The tenth ranked practice with a mean value of 4.28 and a standard deviation of 0.701 is provision of safety incentives . The eleventh ranked practice with a mean value of 4.26 and a standard deviation of 0.600 is effective safety program. The twelfth ranked practice with a mean value of 4.24 and a standard deviation of 0.591 is regular toolbox talks. The thirteenth ranked practice with a mean value of 4.20 and a standard deviation of 0.606 is set effective safety guidelines. The fourteenth ranked practice with a mean value of 4.10 and a standard deviation of 0.735 is the role the government and engineering societies in ensuring safety. The fifteenth ranked practice with a mean value of 3.86 and a standard deviation of 0.606 is imposing fines on construction companies. The analysis revealed

the five most important practices as the provision of personal protective equipment, effective safety training, implementation of effective health and safety management system, provision of experience and skilled workforce and accident investigations. One sample t-test is further used to test the significance of the practices as shown below.

Table 4.6: One-Sample Test of effective safety climate practices

Significant Stakeholders	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Diff.	95% Confidence Interval of the Difference	
					Lower	Upper
Provision of personal protective equipment	16.74	49	0.000	1.640	1.443	1.837
Effective Management Commitment	14.51	49	0.000	1.360	1.172	1.548
Regular Toolbox talks	14.83	49	0.000	1.240	1.072	1.408
Effective Safety Training	15.65	49	0.000	1.500	1.307	1.693
Provision of safety incentives	12.91	49	0.000	1.280	1.081	1.479
Provision of experience and skilled workforce	15.26	49	0.000	1.460	1.268	1.652
Frequent Keeping of records of accidents on construction sites	16.20	49	0.000	1.380	1.209	1.551
Effective Safety Policies	14.96	49	0.000	1.300	1.125	1.475
Set effective safety guidelines	14.00	49	0.000	1.200	1.028	1.372
Accident Investigations	15.81	49	0.000	1.440	1.257	1.623
The role the government and engineering societies in ensuring safety	10.58	49	0.000	1.100	0.891	1.309
Regular safety inspection by safety officers and supervisors	15.04	49	0.000	1.320	1.144	1.496
Imposing fines on construction companies	10.03	49	0.000	0.860	0.688	1.032
Effective safety program	14.86	49	0.000	1.260	1.090	1.430
Implementation of effective health and safety management system	20.40	49	0.000	1.469	1.325	1.614

**Significant

Source: Author's Survey (2018)

The significance of the effective safety climate practices was confirmed using the one sample t-test. The test value chosen was three with a significance level of 95% because of the five-point Likert scale chosen for the questionnaire design. It also meant that, the safety practices with a p value less than the value 0.05 were classified as significant and those which had a value greater than 0.05 classified as not significant. From the test conducted in the table above it clearly illustrates the significance of all the practices as they all achieved a p value less than 0.05. this proves the necessity of roof construction workers to work in a safe environment and practice safe operations.

Management must ensure that personal protective equipment is available onsite, as the simple use of this equipment can protect laborers from the short- and long-term effects of construction worksite hazards (Durdyen et al., 2017). Consistent education and training on safety for all workers in the industry will help minimize the number of injuries, accidents or deaths that happen on sites. (Peyton and Rubio, 1991). Carrying out an effective Health and Safety Management System is a positive approach to averting accidents, injuries and illnesses. Although there is no assurance that accidents or injuries will never happen on a construction site, an operational safety management structure will help reduce the rate at which workers die or are injured at the site (Yankah, 2012).

An interview was again conducted on three people to confirm the practices of safety in the roof construction industry. The three people interviewed are Gloria Asiedu-Ampem (Head of works, Oforikrom Municipal Assembly), Jehosheba Kali Addo (Site Supervisor) and Erica Oppong (Assistant Quantity Surveyor). These people were selected because of their experience and works with roof construction. The interviewees revealed that training is organised for the roof workers once in every six months. They also agreed that, personal protective equipment is provided to worker as well as the

management of the various companies having great commitment to safety when it comes to their workers. The further stated that there was provision of warning and safety signs, safety wears like helmet, signs on site to caution employee on dangerous areas and these were al ensure by safety officers on the sites. Gloria mentioned the use of ISO 9000 with Erica also giving the building regulations and standards as some of the legislative codes being used. Some safety awareness they all have come to realise were ensuring safe scaffolds erection, carrying out risk assessment quarterly or annually, abiding to signs and avoiding approaching danger zones, lack of inspection procedures on site, poor accident record keeping and reporting system, inadequate professionals on site and the availability of skilled labourers and professionals. Health and safety in their organisations were being funded by from the savings of the organization, loans and donations. The workers were also practising safety because safety officers made sure employees abide with the safety rules and regulations when executing their daily works and the fact that safety officers educate workers on the importance of abiding with safety precautions on site for safe working environment.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter concludes the whole research with a summary of the findings of the various objectives of the research. The researcher then gives a conclusion of the study. The recommendations made are also stated for practice and academia. The limitation of the study is also explained with directions given for future research in the same subject area.

5.2 SUMMARY OF THE RESEARCH OBJECTIVES

The aim of the research is to explore the safety climate and performance of roof construction in Ghana. The following objectives that is to explore the safety precautions for workers in the roof construction industry, to identify the factors that affect the quality of workers safety in roof construction and to identify effective safety climate practices in the roof construction industry were set to achieve the aim of the study.

5.2.1 To explore the safety precautions for workers in the roof construction industry

For this objective a questionnaire was developed to explore the safety precautions for workers in the roof construction industry. Literature was first reviewed to ascertain the fifteen safety precautions for workers in the roof construction industry. The identified precautions were then formulated into a questionnaire using the Likert scale with a range from one to five having strongly agree as five and strongly disagree as one. To achieve the research objective, the mean score ranking was used in the analysis of the precautions to rank them from the most to the least important. A further one sample t-test analysis was conducted to affirm that these precautions were indeed safety precautions being used by roof construction workers. The results of the mean show that, safety in erecting

scaffolding, wear proper PPE, signage should be visible in your work area, carrying out risk assessments and the use of safety mesh and nets are very important as they were ranked as the first five precautions to take when working. From the test conducted using the one sample t-test clearly shows that two of the precautions that is, work only during good weather conditions and avoid extreme heat/cold and sweep the roof before and after work and make sure it is clear of dirt and debris had a p value of 0.908 and 0.061 respectively.

5.2.2 To identify the factors that affect the quality of workers safety in roof construction

A literature review of the factors that affect the quality of workers safety in roof construction was identified from several sources. These factors were developed into a questionnaire. The respondents were required to rate these factors from one to five with the former being the least and the latter being the highest. The use of mean score ranking and relative importance index was necessary to rank the factors from the highest to the lowest. The factors that ranked as the first five are lack of training, lack of personal protective equipment, lack of management commitment to safety, lack of inspection procedures on site and lack of skilled labour.

5.2.3 To identify effective safety climate practices in the roof construction industry

A literature review of the effective safety climate practices in the roof construction industry were identified and developed into a questionnaire to gather information from the respondents. The same rating system was used, that is, a Likert scale from one to five showing strongly disagree and strongly agree respectively. The gathered information from the respondents were examined utilizing the mean score positioning and the one

example t-test. The analysis revealed the five most important practices as the provision of personal protective equipment, effective safety training, implementation of effective health and safety management system, provision of experience and skilled workforce and accident investigations. From the test conducted using one sample t-test it clearly illustrates the significance of all the practices as they all achieved a p value less than 0.05. this proves the necessity of roof construction workers to work in a safe environment and practice safe operations.

5.3 CONCLUSION

Safety climate in an organization may be viewed as a set of underlying values, beliefs, and principles that employees perceive as held within the organization. There are scarcely perceived foundations that offer preparing to laborers in the material business, henceforth top to bottom learning on work prerequisite is a major issue. How some material organizations see or handle security matters regarding their laborers is to some degree sketchy. The aim of the study was therefore to explore the safety climate and performance of roof construction in Ghana. Using a purposive sampling technique, the respondents were tailored to only roof construction workers. The analysis used was the relative importance index, one sample-test and mean score ranking. The results of the mean for the first objective shows safety in erecting scaffolding, wear proper PPE, signage should be visible in your work area, carrying out risk assessments and the use of safety mesh and nets as very important precautions as they were ranked as the first five precautions to take when working. The factors that ranked as the first five for objective two are lack of training, lack of personal protective equipment, lack of management commitment to safety, lack of inspection procedures on site and lack of skilled labour. The analysis for the last objective revealed the five most important practices as provision of personal

protective equipment, effective safety training, implementation of effective health and safety management system, provision of experience and skilled workforce and accident investigations.

5.4 RECOMMENDATION

The research recommends that, practitioners make sure employees abide with the safety rules and regulations when executing their daily works and the fact that safety officers should also educate workers on the importance of abiding with safety precautions on site for safe working environment. It also recommended that management train workers as well as being committed to health and safety of roof worker. The study also provides a source of information for academia and new literature for researchers.

5.5 LIMITATION

The limitation of the study is the fact that, many respondents were not willing to help in the answering of the questionnaires.

5.6 DIRECTION FOR FUTURE RESEARCH

It is recommended that; other areas of health and safety can be tackled henceforth. Other areas of the country can also be accessed for the same research to be able to generalise the findings to the whole nation.

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APPENDIX I

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND BUILT ENVIRONMENT

FACULTY OF BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

RESEARCH QUESTIONNAIRE

Exploring the safety climate and performance of roof construction in Ghana

Dear Sir/Madam,

These set of questions are intended for the research work on exploring the safety climate and performance of roof construction in Ghana. The aim of the study is to explore the safety climate and performance of roof construction in Ghana. The work will be submitted to the Department of Building Technology, Kwame Nkrumah University of Science and Technology, in partial fulfillment for the award of Master's Degree in Construction Management. All information will be solely used for academic purposes and would be treated as confidential.

Yours sincerely,

Charles Cudjoe
Tel. 0244992043
Email: cudjoecharlesejma@yahoo.com

SECTION A: RESPONDENTS CHARACTERISTICS

Please **tick [√]** where appropriate and provide brief answers where necessary.

1. What is your educational level?

   Diploma / Professional Certificate [ ] Bachelor's Degree [ ]

   Masters / Postgraduate Degree [ ] PhD [ ]

2. How many years of working experience do you have in roof construction?

   1 – 5 years [ ] 6 - 10 years [ ]

   10 – 15 years [ ] 15 years and above [ ]

3. What is your professional background?

   Managing Director [ ] Project Manager [ ]

   Operative/ Installer [ ] [ ] Other, please specify ……..

4. Does your company have a health and safety department?

   Yes [ ] No [ ]

SECTION B: SAFETY PRECAUTIONS FOR WORKERS IN THE ROOF CONSTRUCTION INDUSTRY

5. Rate the statements below; **strongly disagree-1, disagree-2, neutral-3, Agree-4, strongly agree-5**.

Safety precautions						
Please tick [√] under your choice of rating		1	2	3	4	5
1	Begin work on site with a toolbox talk					
2	Work only during good weather conditions and avoid extreme heat/cold					
3	Ladders should be stable and properly secured or tied off					
4	Wear proper PPE					
5	Signage should be visible in your work area					
6	Safety in erecting scaffolding					
7	Fall Arrest System					
8	Use guardrails whenever possible					
9	Sweep the roof before and after work and make sure it is clear of dirt and debris					
10	Safety mesh and nets					
11	Protection against noise					
12	Relocation of electricity lines over roofs					
13	Protecting the public					
14	Reduction or Elimination of Chemical Hazards					
15	Carrying out Risk Assessments					
Other, please specify						
16						
17						
18						

SECTION C: FACTORS THAT AFFECT THE QUALITY OF WORKERS SAFETY IN ROOF CONSTRUCTION

6. Rate the statements below; **strongly disagree-1, disagree-2, neutral-3, Agree-4, strongly agree-5**.

Factors						
Please tick [√] under your choice of rating		1	2	3	4	5
1	Lack of Training					
2	Lack of personal protective equipment					
3	Lack of management commitment to safety					
4	Lack of safe construction site environment					
5	Poor Legislation of codes and standards					
6	Lack of inspection procedures on site					
7	Ineffectiveness of current safety policies					
8	Lack of skilled labour					
9	Poor safety awareness among top management					
10	Insufficient safety budget					
11	Poor accident record keeping and reporting system					
12	Poor equipment					
13	Low educated workers					
14	Reckless operations					
Others, please specify						
15						
16						
17						

SECTION D: EFFECTIVE SAFETY CLIMATE PRACTICES IN THE ROOF CONSTRUCTION

7. Rate the statements below; **strongly disagree-1, disagree-2, neutral-3, Agree-4, strongly agree-5.**

Measures						
Please tick [√] under your choice of rating		1	2	3	4	5
1	Provision of personal protective equipment					
2	Effective Management Commitment					
3	Regular Toolbox talks					
4	Effective Safety Training					
5	Provision of safety incentives					
6	Provision of experience and skilled workforce					
7	Frequent Keeping of records of accidents on construction sites					
8	Effective Safety Policies					
9	Set effective safety guidelines					
10	Accident Investigations					
11	The role the government and engineering societies in ensuring safety					
12	Regular safety inspection by safety officers and supervisors					
13	Imposing fines on construction companies					
14	Effective safety program					
15	Implementation of effective health and safety management system					
Others, please specify						
16						
17						
18						

THANK YOU

APPENDIX II

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI

FACULTY OF BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

INTERVIEW GUIDE

(These set of questions are intended for the research work on exploring the safety climate and performance of roof construction in Ghana. The aim of the study is to explore the safety climate and performance of roof construction in Ghana. The work will be submitted to the Department of Building Technology, Kwame Nkrumah University of Science and Technology, in partial fulfillment for the award of Master's Degree in Construction Management. All information will be solely used for academic purposes and would be treated as confidential).

Research Topic:

EXPLORING THE SAFETY CLIMATE AND PERFORMANCE OF ROOF CONSTRUCTION IN GHANA

By:

Charles Cudjoe

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INTERVIEW GUIDE FOR TOP MANAGEMENT

This semi-structured interview guide consists of detailed but not restricted to the following questions that will be discussed during the interviews with targeted respondents aimed at exploring the safety climate and performance of roof construction in Ghana.

Part A: Background Information

Name of interviewee: …….

Position in the Organisation: ……

Date and time of interview: ……...

Part B: Interview Guide on factors that affect the quality of workers safety in roof construction

1. Does the organisation provide training for its roof construction workers?

   ……

   ……

2. Does the organisation provide personal protective equipment?

   ……

   ……

3. Is management of the organisation committed to safety of its employees?

   ……

   ……

4. What are some of the measures the organisation has put in place to provide safe construction site environment?

   ……

   ……

5. What are some of the Legislation codes and standards in the organisation?

   ……

   ……

6. Do you have knowledge of roof construction safety awareness?

   ……

   ……

7. If yes, what are some of the safety awareness issues?

   ……

   ……

8. How does the organisation fund its health and safety needs?

   ……

   ……

9. What are some of the ways the organisation uses in recording and keeping accident occurrences?

   ……

   ……

10. Are the workers in the organisation abreast with safety rules and regulations in roof construction and how did they get know?

    ……

    ……