

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,  
KUMASI, GHANA**

**Safety Management Practices in the Construction of Road Works in the Public  
Sector-A Case Study of the Department of Urban Roads**

**by**

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A Thesis submitted to the Department of Building Technology,

College of Art and Built Environment

in partial fulfilment of the requirements for the degree of

**MASTER OF SCIENCE**

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**CERTIFICATION**

I hereby declare that this submission is my own work towards the MSc Construction Management and that, to the best of my knowledge , it contains no materials 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 the text.

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## **ABSTRACT**

The road infrastructure contributes to Ghana's pursuit of economic advancement, nonetheless despite its importance to the national growth the industry is often plagued with high accidents rates on construction sites thus being considered risky for clients, contractors and workers alike and hence the need for effective safety management practices. The purpose of this study was to evaluate the safety management practices that the department of urban roads adopts in the execution of road works in a quest to stimulate the practices that are related to safety performances in road infrastructure endeavours. A survey questionnaire was administered to a sample size of 45 professionals of the department and contractors or contractor's representative working with the department or have worked with the department in the Greater Accra Region of Ghana were involved in the research study by way of administration of survey questionnaires. A response rate of 82% of the sampling frame was obtained. The findings of the study showed that, the most employed safety management practice was the provision of adequate welfare facilities on site. The findings of the evaluation survey revealed an evaluated score of forty seven percent (47%) of safety management practice was obtained against standard safety management practice. It is therefore recommended and concluded that the department must give adequate safety training and education, induction training to contractors and or construction employees before they resume construction works and ensure that standard safety management practices are adhered to.

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## **DEDICATION**

I dedicate this work firstly to the Almighty Allah and my family members.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 BACKGROUND OF RESEARCH**

The road infrastructure is a highly expensive industry and has been a burden to most governments over the world. The story is felt most in developing countries such as Ghana where development is strongly tied to number of roads infrastructure constructed by various governments. The road infrastructure in Ghana influences the status of other players in the economy and that explains the huge investment in the sector making it very important if not critical.

Indeed according to figures released by the Ghana statistical service on industry's share of GDP for the period between 2006 to 2011, the construction sub sector which has the road construction industry forming more than 50%, has seen a growth in its share of GDP from 5.7% in 2006 to 9.3% in 2009. It however took a dip in 2010 to 2-5% but saw a significant leap in 2011 where the country recorded a GDP growth rate of 17.2%.

The sector is stand out amongst the most unsafe and is regularly records incidents of safety related issues.

Takala (1999), states that the road infrastructure industry is a perilous industry whether in established or growing countries and this gives credence to related incidents on construction sites globally. While established countries have exhibited responsibility to accomplishing reduction in the rate of incidents on construction sites, in growing countries unfortunately especially in Africa the statistics are different. The rate of construction sites incidents in growing nations are increasingly high and its feared that the incidents rate may go up in our quest for industrialisation (Hämäläinen

et al. 2006).. The road infrastructure industry is noted to have a considerable measure of occurrences relating to safety and hence the need for effective safety management practices.

The construction of road infrastructure projects in Ghana is largely sponsored by the Government of Ghana and executed by both local and foreign contractors.

Construction (road sector inclusive) is broadly viewed as a clumsy industry and it is said to be a sector with a lot of accidents and injuries taking place always (Lingard & Rowlinson, 2005).

The reasons Construction is hazardous and inclined to dangers are; 1) due to the physical environment of the work, 2) nature of the development work operations, 3) development strategies, 4) development materials, 5) substantial hardware utilized, and 6) physical properties of the development venture itself (Menzel & Gutierrez, 2010).

Safety regulations are made for the maintenance and assurance of safety of not only the worker (employee) but also the general public and the employer. In Ghana, it is covered under the Labour Act 2003 (Act 651) and the health and safety at work Act (2005), Act 1974 in the United Kingdom (UK) and other statutory regulations regulate work activities with regards to safety.

The road infrastructure industry in the country, represents the most astounding incidents rate and work related fatalities contrasted and other modern segments. As indicated by the Labour Division (2000: 22), beyond a sum of 902 work related incidents which happened in development in the year 2000, fifty-six were lethal, a casualty rate of 77.6 are recorded. International institutions like the European Union (EU) have indicated that 1.5 losses are recorded for each 1000 accidents. The

statistics for growing nations are far more detestable when it is viewed as that numerous non-deadly incidents in the construction site are unrecorded. (Colak et al. 2004). In the year 2000, the Labour Department reported that the construction industry in Ghana represented the most elevated rate of work-related deaths, in contrast to others for development safety which are the customer, primary contractual worker, administrative offices and representatives. Government managerial workplaces should approve bearings to ensure that an improvement undertaking is secured to make, safe to use, and safe to keep up and passes on incredible worth. Extraordinary safety organizing moreover ensures that an endeavour is all around directed and that, shocking costs and issues are minimised. Clients or supervisors should ensure that they give safe working environment to their workers. Labourer should in like manner be made aware of their safety and security duties.

According to the Ghana Labour Act, 2003 (Act No. 651), the public sector is summarily described as "all association which are not exclusive and worked, but rather which are built up and financed by Government for the benefit of people in general". The public sector comprises government agencies and ministries and state own agencies. The department of urban roads is an agency under the ministry of roads and highways tasked with the responsibility of the construction of roads infrastructure in the urban settings. This research is accordingly planned to distinguish how safety management practices are actualised and overseen in the development of Road works in the Public Sector using the Department of Urban Roads as a case study. This research is intended to identify current safety management practices employed and also identify challenging factors influencing safety management practices by the stake holders in the road infrastructure industry in Ghana a case study being the department



of urban roads. The aim is to evaluate the safety management practices employed by the department in the execution of road works.

## **1.2 STATEMENT OF THE PROBLEM**

The road construction industry is proclaimed to be dangerous and risky and an accident prone industry and this because of the wide range of activities that the industry is engaged in. This comprises asphalt construction, ground construction, road pavement construction and road repairs.

According to Burstyn, (2001), workers of the industry are becoming exposed to an extensive variety of possibly harmful substances. In road paving, workers regularly are exposed to bitumen smoke, which contains a little amount of benzopyrene.

According to the Ghana -Labour Act, 2003 (Act No. 651), it is the employers' obligation to guarantee that there is a protected environment to complete work and all works must be done in a sheltered way as could reasonably be expected. A construction site may oblige labourers to wear a hard cap, overalls, safety footwear, gloves, eye assurance and high perceivability vest. These must be given to all representatives.

As per Kheni, (2008), on health and safety management practices in Ghana, he uncovered that there is absence of gifted human resource (HR), deficient government support for administrative establishments and wastefulness in institutional systems in charge of health and safety practices.

There are more research on safety practices however consideration is not attracted to the execution of the street development industry as far as safety practices in Ghana. There are a lot of research on occupational health and safety but attention is not drawn

to the performance of the road construction industry in terms of safety practices in Ghana.

The industry is known to be a sector that employs a lot of workers. The safety of road construction workers is paramount as some serious construction injuries lead to fatalities and human lives are precious and must be preserved at every sphere of human endeavours and enterprise. However, information on safety management practices in the road construction industry remains a challenge and hence the need to for safety management practices adopted by the department to be evaluated in a bid to improving safety at construction sites.

### **1.3 RESEARCH QUESTIONS**

- What are the standard safety management practices adopted by the department for evaluating safety practices?
- What are the current safety management practices employed by the department.
- What are the significant factors that influences safety management practices by the department?
- What are the challenges in the implementation of safety management practices by the department?

### **1.4 AIMS AND OBJECTIVES**

The overall purpose of this study is to evaluate the safety management practices employed by the department in the execution of road works. By way of specific objectives, this study seeks:

- To identify a standardised criteria based on standard safety management practices for evaluating safety management practices.

- To identify the current safety management practices on road works.
- To identify the factors that significantly influence safety management practices on road works.
- Examine the challenges in the management of safety practices.

### **1.5 SIGNIFICANCE OF STUDY**

The road infrastructure industry is noted to be recording a number of construction related incidents and the department of urban roads as one of the roads agencies is no exception to these incidents. The study therefore seeks to evaluate the safety management practices adopted by the department and recommend other practices that could help reduce the rate of incidents on construction sites.

### **1.6 METHODOLOGY**

To achieve the objective of developing a standardised criteria based on standard safety management practices for evaluating safety management practices by the respondents, the researcher will review existing safety management practices being pursued internationally by the road construction industry. The literature review in this area will seek to create the standard based for evaluation of safety management practices.

With regards to the objective of identifying the current safety management practices used by the department, the researcher will seek to identify standard safety practices in other jurisdictions and seek to compare what is being practiced here by the department and also examine the challenges affecting the safety management practices by the department. The researcher will collect primary data for analysis. Questionnaires will be developed and sent to professionals, contractors or contractor's

representatives working for the Department of Urban roads. Other sources from the researcher's own experience will form the basis for the questionnaire.

The researcher will make use of Computer based software SPSS and Microsoft Excel for the analysis and interpretation of the data collected.

### **1.7 SCOPE/DELIMITATION**

The research is constraint because of time and resource and will focus using questionnaires to gather data without interviews and site observations. The focus will be on the department of Urban Roads as a case study, the study seeks to carry out the evaluation of construction practices relating to safety management in the department. The target group will be limited to construction professionals at the department as well as contractors or contractor's representatives.

### **1.8 STRUCTURE OF REPORT**

The study comprise five main chapters, and below are a summary of the chapters:

The chapter one contains the introduction of the study, background of the study, problem statement, research questions, aim and objectives, significance, scope and methodology and last but not the least the structure of the work.

The synopsis of the study is given as: chapter one gives the introductory of the study, related literature is reviewed in chapter two and that include safety definition, identify safety issues associated with road works in general and standard management practices. Chapter three details out the method, concept and parameters used for the study. The data collection method and instrument are explained here. Analysis, interpretation and illustrations with appropriate tables and figures are discussed in chapter four. Chapter five concludes the study with a summary of the findings, recommendations, conclusion and limitation of the study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Safety is a concern to all in the construction industry from top management to the minimal labourer on the construction project. A viable Safety Management Policy is imperative and indispensable for the smooth running of the construction industry and noteworthy commitment to country's economy. As indicated by Abdul-Rashid, Bassioni and Bawazeer, (2007) the regularly expanding expense of medicinal treatment and the potential for claims can prompt higher protection premiums, which thusly have a negative and harming effect on an organization's benefit.

The construction industry is viewed as the industry amongst the most hazardous industries in the world. Accidents and damages can convey awesome misfortunes to people, associations and social orders or the general population at large. It has been expressed that safety is a requirement that can forestall needless accidents. In a few nations, a casual worker's safety record can be considered in contractual worker capability. Abdul-Rashid et al., (2007) further expresses that, the pain as a consequence of incidents both to harmed parties and their families can't be measured in monetary terms, regardless of the possibility that the harmed parties have been satisfactorily repaid by protection.

##### **2.1.1 Situation Analysis**

The road infrastructure industry is on record to have require of a lot of investment in its operations and at same time noteworthy of risks associated with its implementations as thus according to Mohammed (2003). Its further stated that the incidents rates result in damages to construction workers thereby affecting

productivity on construction projects sites. As indicated by Mbuya and Lema, (2004) in most growing nations, safety practices in construction projects is not given attention and weight and this affects the wellbeing of personnel and success of projects. As indicated by Adan, (2004) safety has to be prioritized along construction indicators like cost, quality and time for construction project to be deemed successful.

## **2.2 SAFETY POLICY**

A safety policy is a formed report which indicates that safety is an essential part of the projects execution. The safety policy must: be crucial to the risks and threats of the organisation's work practices and programmes. Safety policy is deemed relevant so far as is sensibly practicable, legally binding workers and people to adhere to safety codes of Practice and standards.

## **2.3 HEALTH AND SAFETY MANAGEMENT SYSTEM**

A safety organizational system incorporates in the organisation, structures which include:

- Safety working methodology
- Safety commitments and the practices,
- Safety methods and resources for making it workable.

The system should incorporate other safety related issues and the significant factors of the system should include:

### **2.3.1 Policy and Commitment**

The construction company or organisation should have a well define programmes and policies that ensures that safety practices are complied with. Effective safety policies reduces incidents rates on construction sites. Effective safety policies assigns responsibilities and task to every member of the organisation thereby cutting

unnecessary expenditure to the organisation budget. This ensures cost-effectiveness to financial and physical infrastructures.

### **2.3.2 Planning**

Safety Planning is essential to safety policy. Safety planning gives out the policy directions to achieve set safety objectives and targets for the organisation.

### **2.3.3 Implementation and Operation**

For efficient implementation of safety programmes and policies, the organisation should develop the capacity of its employees to be able to understand the safety requirement in the organisations. Capacity building could be done through staff involvement of safety capacity building workshops, engagement with safety consultants. These will equip workers to be abreast with modern trends of safety management.

### **2.3.4 Measuring Performance**

The organization should measure, monitor and evaluate safety and health performance. Performance can be measured against agreed standards to reveal when and where improvement is needed. Active self-monitoring reveals how effectively the safety and health management system is functioning. Self-monitoring looks at both hardware (premises, plant and substances) and software (people, procedures and systems, including individual behaviour and performance). If controls fail, reactive monitoring should find out why they failed, by investigating the accidents, ill health or incidents, which could have caused harm or loss. The objectives of active and reactive monitoring are: to determine the immediate causes of substandard performance to identify any underlying causes and implications for the design and operation of the safety and health management system.

### **2.3.5 Auditing Safety Practices**

The organisation should institute an auditing system to peruse the safety policies and programme in a bit to improve safety management practices continuously. Auditing safety polices ensures performance to achieve safety objectives and targets. The organisation can learn from relevant experience and apply the lessons. There should be a systematic review of performance based on data from monitoring and from independent audits of the whole safety and health management system. These form the basis of complying with the organisation's responsibilities under the Safety, Health and Welfare at Work Act 2005 and other statutory provisions. There should be a strong commitment to continuous improvement involving the development of policies, systems and techniques of risk control. Performance should be assessed by: internal reference to key performance indicators, external comparison with the performance of other organisation and best practice in the organisation's employment sector.

## **2.4 SAFETY IN CONSTRUCTION**

Laryea and Mensah (2010), states that because of the physical environment and nature of the construction works is widely regarded as risky and accident prone. According to Health and Safety Executive (2009), the main safety site requirements in construction relate to tidy up sites and decent welfare avoid falls from height, manual handling, and multiple movement on site. Site foreman are normally required to plan and organize their operations, ensure that they are trained and competent and know the special risks of their trade and raise problems with their site supervisor or safety representative.

Personal protection equipment (PPE), including clothing protection should be provided to all employees. Safety at construction site must be a concern to all



stakeholders in the industry. The department or contractor subletting contracts should ensure that safety protection equipment are provided to the employees without additional charges. Employees should be made aware that safety on construction site is must and should wear the safety gadgets before been involved in the construction works.

According to Laryea and Mensah (2010), there are safety problems on almost all construction sites which relate to reporting accidents, employing and subcontracting. All personnel who are employed to carry out construction works on site must be trained, competent and fit to do the job safely and without putting their own life or others at risk, properly supervised and given clear instructions; have access to washing and toilet facilities; have the right tools, equipment, plant and protective clothing; educated about safety issues.

#### **2.4.1 Road Construction Safety**

Workers on construction sites are constantly exposed to a variety of incidents and hazards including construction equipment and plants. Workers on foot are exposed to passing traffic, often at high speeds, while workers who operate construction vehicles are at risk of injury due to overturn, collision, or being caught in running equipment. Regardless of the responsibility of the worker, they must be protected at all times on a construction site

#### **2.4.2 Efforts to Improve Health and Safety**

The ministry of Employment and social welfare is drafting a national safety policy aim at reducing industrial incidents on construction sites thus according to the Daily Graphic 23<sup>rd</sup>, July 2011. Additionally, the ministry is receiving support from the International Labour Organization (ILO) to develop legislation on occupational safety and health as a step towards a comprehensive review of the Factories, Offices and

Shops Act, 1970 (Act 328) to reflect the technological advancement in factory inspection. It's understood that the International Labour Organisation is assisting the ministry to compile the occupational safety profile for construction workers in the country.

### **2.4.3 Hazards to Non-Workers**

Many construction sites cannot completely exclude non-workers or passers-by. Road construction sites must often allow traffic to pass through. This places non-workers and passers-by at some degree of danger. Road construction sites are hoarded to ward off non-related construction workers getting involved in the construction process, nonetheless they must always be protected during construction works.

## **2.5 SAFETY IN THE WORK PLACE**

The International Labour Organisation (ILO) defines occupational safety as the “prevention and maintenance of the highest degree of physical, mental and social well-being, the prevention of ill-health among workers caused by their working conditions.” The organisations implores all institutions to uphold high safety standards in the working conditions, environment of all construction works.

### **2.5.1 Construction Industry Safety**

Construction site workers are constantly exposed to occupational dangers resulting in sometimes injuries that affects the productivity level of the workers. Construction equipment and plants likewise posed dangers sometimes resulting in broken limbs destroying the life and hope of families of the construction worker. In this regard, the construction worker should be carefully assign his or responsibility to ensure that safety is not compromise on construction sites.

## **2.5.2 Safety Measures in Construction**

### **2.5.2.1 Site Layout and Planning**

Construction sites must be properly planned to avoid unnecessary movement of workers, equipment and plant thereby avoiding unnecessary accidents on construction sites. Proper planning by management is an essential part of preparation and budgeting for the safe and efficient running of construction works. There are many accidents due objects lying unprotected and hence site layout and planning is necessary for safe construction works operation.

### **2.5.2.2 Personal Protective Clothing (PPE)**

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other PPE program to be implemented. The organisation must be able to identify the potential dangers on construction site and provide appropriate safety protection against its effect on construction workers.

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other protection gadgets deemed appropriated for that particular construction site.

### **2.5.2.3 First Aid Kits and Accident Reporting**

Construction sites are dangerous workplaces, and first aid and rescue equipment should always be made available. What is required depends on upon the measure of the site and the workers involve, however there should be a spread and a stretcher. On large construction sites with a lot of construction workers, there should be conscious effort to provide a treatment room or clinic so that construction workers can easily get treated when hurt. A professional medical officer is usually employed to treat accidents on large construction sites.

### **2.5.3 Safety Warning Signs**

Safety warning signs are warning signs intended to communicate a safety information to construction workers and non-workers alike on construction sites. These may include illuminated signs, hand and acoustic signals, indicating dangerous substances and equipment. Safety warning signs must be very clear to understand and interpret.

### **2.5.4 Site Safety Policy**

Construction site managers should have a site policy setting out safety standards that is needed to be achieved. The policy should give out responsibility to supervisors for ensuring that safety is achieved. Construction safety policy therefore is something that must be developed by each site manager and operating company prior to starting any construction works. Once developed the construction safety plan should be placed into a training program to be participated in by every site worker before partaking in any construction works.

### **2.5.5 Safety Risk Assessment**

Risk evaluation on construction site is a key measure towards reduction of hazards and incidents. In the context of safety, common definitions used for risk are that: risk is the likelihood of a substance to cause harm; and risk is a combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure.

According to Health Safety Executive (2004), it's the duty of the employer to make an evaluation of safety risks to which employees and others are exposed on construction sites. The significant findings are recorded and worked on to mitigate further accidents on project sites.

### **2.5.6 Health and Safety Training in Construction Sites**

With regard to Occupational Safety, training consist of instruction in hazard recognition and control measures, learning safe work practices and proper use of personal protective equipment, and acquiring knowledge of emergency procedures and prevention.

Employers should insist that employees are given training in safety practices before construction works are started. The training should include identification of potential dangers on construction sites, training in firefighting, first aid administration.

Training must also be provided if potential dangers are identified and mitigated against.

### **2.5.7 Working Environment**

Chemical Substances are major health hazards in the construction industry which include insecticides, fungicides etc. thus according to the International Labour Organisation (1999). Chemical substances are harmful and emanate from various sources at construction sites. Large portions of these chemicals are dangerous, with a possibility to bringing about harm. These substances must be guided against during construction works.

### **2.5.8 Welfare Facilities**

Welfare facilities are essential to successful construction works. Welfare facilities improves efficiency and productivity of workers.

Welfare facilities such as the provision of drinking-water, washing, sanitary and changing accommodation, rest-rooms and shelter, facilities for preparing and eating meals, temporary housing, assistance in transport from place of residence to the work

site and back, all help to reduce fatigue and improve workers' and safety performance.

It's the responsibility of the employer to provide adequate welfare facilities to the employees.

## **2.6 REGULATIONS AND LAWS ON HEALTH AND SAFETY**

There are legal frameworks in developed countries regarding health and safety regulations. Regulations such as the Health and Safety at Work Act (Act 1974) regulate safety activities. In the United States, the Occupational Safety and Health Administration (OSHA) sets and enforces standards concerning workplace safety and health.

In Ghana, there are not well defined regulations governing health and safety practices on construction site, however adoption are usually made to the international frameworks to regulate its practice.

### **2.6.1 Current Situation of Laws or Regulations on Safety in Ghana**

There are two editions that provided guidance in the regulation and practice of health and safety in Ghana. These are the Factories, Offices and Shops Act 1970, Act 328 and the Mining Regulations 1970 LI 665. In addition, there is the Workmen's Compensation Law 1987 (PNDC Law 187) which relates to compensation for individual injuries resulting from accidents on construction sites. The Teaching Hospital Act 526, 1999 and the National Road Safety Commission Act 567(1999) also provide guidance on safety practice. Ghana is among the 183 section countries of the International Labour Organisation (ILO) which requires that member countries formulate, implement policy to regulate safety practices though that has not been effectively implemented. However, the Ghana Labour Act 2003, Act 651, requires

organizations and agents to show commitments in the operationalization of occupational safety. It further states that it's the responsibility of the employer to ensure that employees are safe from all dangers during construction works.

### **2.6.2 The Labour Act 2003, Act 651(General Health and Safety Conditions)**

It is the obligation of the employer to ensure that every employee on the construction site works under adequate, shielded and sound conditions. The employer shall provide and keep the workplace safe, plan the course of action of work that are protected and without risk to safety and give the basic information.

The Minister may by legislative instrument make regulations providing for specific measures to be taken by employers to safeguard the health and safety of workers employed by them. The nation has seen some best safety practices among some of our Ghanaian companies. This is as a result of the influx of some multinational companies into the country.

## **2.7 PERFORMANCE**

According to [www.businessdictionary.com](http://www.businessdictionary.com) viewed on 08/06/2016, performance is the accomplishment of a given task measured against known targets. In evaluation of performance, standards are met against all odds.

### **2.7.1 Safety Performance**

The rate of industrialization in Ghana is on the increase and this has got a lot of construction workers involved in the construction works thereby exposing them to construction dangers, however the nation does not have an institutional systems to check monitoring and evaluation on those projects. The Ghana Labour Act 2003, Act 651 requires that employers provide serene working environment to employees so that they are not exposed to dangers resulting from construction site incidents.

### **2.7.2 Factors That Influence Construction Safety Performance**

Construction safety is of utmost importance to the construction industry and many researchers think it's the most critical factor that affect the performance of the construction industry. Researchers have identified a number of ways that construction site managers can help improve the safety performance of the construction projects.

According to Priyadarshani et. al. (2013), the non-adherence to the established safety standards, results in incidents and injuries at construction sites leading to low safety performances.

In general, the occurrence of construction accidents are largely due to inadequate knowledge of safety principles, inefficient supervision by site supervisors, wrong judgment, lack of safety understanding and sometimes recklessness on the part of construction workers. These factors are not exclusive, the uncontrolled nature of the working environment, the complex nature of the construction project, and the transitory nature of the construction industry all have effect on the safety performance on the construction industry.

These efforts identified a variety of ways that supervisors and managers of construction companies can impact on the safety performance of a construction project. Most companies follow established safety guidelines and policies that meet Occupational Health and Safety guidelines. As indicated by Priyadarshani, et. al. (2013) states however, most incidents and injuries at construction sites are a direct result of not adhering to the established safety procedures; hence, construction safety performance can be affected by several factors.

Sawacha et al., (1999) states that in construction works, 'unsafe conduct' is the most identified factor being the huge reason why construction accidents occur and hence



gives proof of a poor safety practice. (Sawacha et al. (1999), further states that safety performance is linked with the following:

- Psychological,
- Technical,
- Procedural,
- Organizational
- Environmental issues

The Historical factor is determined by the background and qualities of the individual, for example, age and experience.

The economic factor is dictated by the fiscal qualities which are connected with safety, for example, identified hazard. The Psychological factor is determined by fellow construction workers behaviour towards safety.

The Technical and procedural factors are determined by the handling of safety equipment on site and ensuring that supervisors are trained. As indicated by Priyadarshani et al, (2013) the organizational safety management is determined by the kind of approach that the organisation shows towards site safety. Abdul-Rashid (2007), indicates that many researchers have found other factors that affect safety performance in international write ups.

**Table 2.1 Factors affecting Safety Performance in International Literature**

<b>Literature</b>	<b>Factors affecting Safety Performance</b>
Jaselskis, et al. (1996)	<ul style="list-style-type: none"> <li>• Upper administration support.</li> <li>• Time dedicated to safety issues for the organisation supervisor.</li> <li>• Meetings with the site supervisors and other labourers.</li> <li>• Safety programme foremen and safety coordinators</li> <li>• Increased site supervisor experience.</li> <li>• Increased time committed to safety</li> <li>• More formal gatherings with managers and claim to fame temporary workers.</li> <li>• A more prominent number of casual site safety reviews.</li> <li>• Increased resources to safety performance.</li> </ul>
Sawacha, et al. (1999)	<ul style="list-style-type: none"> <li>• Management meeting on safety performance</li> <li>• Provision of safety handouts</li> <li>• Availability of equipment for safety purposes</li> <li>• Conditioned working environment.</li> </ul>
Hinze and Gambatese (2003)	<ul style="list-style-type: none"> <li>• Limited budget for safety workers</li> <li>• Implementing representative medication testing with different components starting the testing.</li> <li>• Training with the help of temporary workers</li> <li>• Growth in organization size.</li> </ul>
Fang, et al. (2004a)	<ul style="list-style-type: none"> <li>• Frequency of a team's getting safety examination.</li> <li>• Frequency of a foreman's in attending safety meeting..</li> <li>• Frequency of a foreman's reporting on safety.</li> <li>• Reportage of safety issues by site supervisor.</li> </ul>
Fang, et al. (2004b)	<ul style="list-style-type: none"> <li>• Quantity of safety coordinators.</li> <li>• Management involvement in safety meetings.</li> <li>• Authority of safety boss.</li> <li>• Authority of foremen.</li> <li>• Size of the team.</li> <li>• Safety venture. Worker pay protection.</li> <li>• Safety speculation on individual defensive hardware.</li> </ul>
Tam, et al. (2004)	<ul style="list-style-type: none"> <li>• Inexperience safety mentality by management.</li> <li>• Lack of interest in safety by managers</li> <li>• Inadequate training for site supervisors</li> <li>• Reluctance to information assets to security.</li> <li>• Reckless operations.</li> </ul>

Ng, et al.(2005)	<ul style="list-style-type: none"> <li>• Implementation of safety regulation framework as per enactment.</li> <li>• Compliance with standards, codes and guidelines.</li> <li>• Definition of safety obligation.</li> <li>• Development of safety approach.</li> <li>• Provision of safe workplace</li> <li>• Development of crisis arrangement and techniques.</li> </ul>
Fung, et al. (2005)	<ul style="list-style-type: none"> <li>• Accurate reporting on accidents</li> <li>• Commitment by management to safety.</li> <li>• Definition role for supervisor</li> <li>• Active individual role.</li> </ul>
Teo, et al. (2005)	<ul style="list-style-type: none"> <li>• Understanding and implementation of safety management system.</li> <li>• Understanding and execution of safety practice</li> <li>• Quality of subcontractors.</li> <li>• Type and strategy for construction.</li> <li>• Management mentality towards safety.</li> <li>• Supervisors and labourers demeanor towards safety.</li> <li>• Contextual attributes of supervisors</li> <li>• Monetary motivations.</li> <li>• Non-financial motivating forces.</li> <li>• Disciplinary activity.</li> </ul>

*Source: (Abdul-Rashid, 2007)*

### **2.7.3 Prioritizing the Factors That Influences Safety Performance on**

#### **Construction Sites**

A research by Chia-Kuang and Yusmin (2012), explained that safety performance on construction sites are greatly influenced by a number of factors. He mentioned the factors to include:

- Management,
- Incentives,

These factors are significant in adhering to safety practices on construction sites.

## **2.8 HEALTH AND SAFETY EVALUATION**

Evaluation is a conscious determination of a construction activity using a predetermined set of plan standards. It helps an organisation, to assess ideas, policies, to determine the attainability of those policies that will help in decision making. The aim of evaluation, is to gain an insight into future endeavours that will help organisation reflect in the identification of programmes. Evaluation can be formative which can take place during a proposal or suggestion, with the aim of enhancing the effectiveness of the proposal.

It can in like manner be assumptive, drawing lessons from a completed action or a relationship with other partners. ([www.businessdictionary.com](http://www.businessdictionary.com)) viewed on 8<sup>th</sup> July 2016.

### **2.8.1 Tools for Evaluating Safety Performance**

#### **2.8.1.1 Previous Research on Safety Performance Evaluation Methods**

A study by Ng et al. (2005) on safety performance of construction contractors indicates that safety performance is influenced by methods such as: accident rates, incident rate, experience modification rating, and score card.

## **2.9 ROAD WORKS**

### **2.9.1 Characteristics of Road Works**

The administration of roads in Ghana is the obligation of the Ministry of Roads and Highways, which plays out this responsibility through three (3) primary agencies (offices); to be specific these are Department of Feeder Roads, Department of Urban Roads and Ghana Highway Authority (Ministry of Roads and Highways, 2010). Roads in Ghana have been put under three classifications,

- 1) Trunk highway road;
- 2) Urban road; and
- 3) Feeder road.

#### **2.9.1.1 Trunk Highway Road**

According to the Ministry of Roads and Highways report, (MRH, 2012), the national road network is classified as strategic roads which are very important for the development of national economy and wider region, including connections between the towns and regional capitals. The Ghana Highway Authority is in charge of trunk roads in Ghana.

#### **2.9.1.2 Feeder Road**

Feeder roads are roads that connect villages to one another and to the main road creating available means to ready markets in the villages thus according to the ministry of roads and transport report, MRH(2012). Due to the fact that rural folks contribute to the growth of the country's economy and the fact also that most of the cocoa growing areas are in the hinder land, feeder roads have been considered important and play a role in poverty reduction through linking rural farming to ready market thereby improving their productivity and increase income levels.

#### **2.9.1.3 Urban Roads**

The Department of Urban Roads (DUR) is an agency of the Ministry of Roads and Highways (MRH) set up in 1988 to manage the road network within the urban jurisdictions of the country. It's largely in charge of roads construction in the municipal and metropolitan areas of Ghana. (MRH, 201

## **2.9.2 Understanding Road Works; Urban Roads**

Urban roads can be classified as Major Arterial, Minor Arterial, Distributor/Collector roads and Local/Access roads

### **2.9.2.1 Major Arterial Roads**

According to the Ministry of Roads and Highways Report MRH, (2012) major arterial roads are roads that form the primary network of the urban area. They usually join two cities and are long in nature. They are also continuous and also take the mainstream traffic to and from the urban area. The traffic volume is usually 4000veh/day and has an average width of 7.5m. Speed on these roads is usually 80km/h or more and due to this, access from individual properties are greatly limited. The main function of this type of road is to facilitate high mobility delays and parking is highly not encouraged. The most common type of vehicle found on this type of road is the heavy duty vehicles.

### **2.9.2.2 Minor Arterial Roads**

According to the Ministry of Roads and Highways Report MRH, (2012) minor arterial are roads that carry traffic for the collectors unto the major arterials and vice versa. They also have controlled access but more than the major arterial roads. Though they function like the major arterial roads, they usually carry a lot more local traffic of about 2000veh/day. The speed limit on these roads usually ranges from 60-65km/h. Due to this speed, access from individual properties are minimal but allowed. They also just like the major arterial have a width of 7.5m. Intersections are signaled to offer right of entry to other motorist from different approaches.

### **2.9.2.3 Distributor/Collector Roads**

According to the Ministry of Roads and Highways Report MRH, (2012) distributor roads serve as links between the minor arterial and the local roads. Their prime purpose of this type of road is to collect traffic from the minor arterial roads to the local roads and vice versa. Because of these, the roads are usually within built-up environment and speed is not encouraged and are usually between 40-50km/h. The traffic volume per day is about 500-2000 but may at times carry more traffic than the major arterial roads. Some of the features usually on this road are bus bays, walk ways, layby and at times speed rumps. Due to the width of this type of road which is 7.0m-7.3 heavy duty vehicles are usually not found on them. (MRH, 2012)

### **2.9.2.4 Local/Access Roads**

According to the Ministry of Roads and Highways Report MRH, (2012) local roads are usually residential roads which give a through way to building and other land uses within an area. They usually have narrow road with width of 6m. As such heavy duty vehicles are not usually found on this type of road. Also certain features are also adopted to discourage heavy vehicles from using them. Some of features include sharp curves and looping roads. Due to the residential nature of these roads speed is not encouraged since social and environmental concern are paramount. Some of the features adopted on the road to discourage speeding include speed rumps and speed strips.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter discusses the research methodology adopted for the study. The systemic rules and procedures upon which this research agenda is based and against which the data collected is interpreted and the findings evaluated are detailed here. The purpose of this study was to evaluate the safety management practices employed by the Department of Urban Roads in the execution of road works and current safety management practices employ by the department in the execution of road works and challenges affecting the implementation of safety management practices. In order for this research to be effective a method was required to standardise the measurement of each safety management practices. A number of previous researchers have considered this issue. Safety performance of road contractors in Ghana, (unpublished thesis, Peter Kwasi Dodzi 2014). Jaselskis (1996) recommended that companies should set Occupational Health Safety (OHS) benchmarks; his methodology was based on collecting, demographic, occupational data, Lost Time Accident Rate and information about the company's safety policy to determine Occupational Health Safety (OHS) performance. The data collection procedure is also described in this chapter. Subsequently, the relevant information on the potential respondents, the sampling frame, the sample size and the field work are presented. The chapter concludes with a commentary on how the data collected was analysed.



### **3.2 RESEARCH DESIGN**

According to Tashakkori and Teddlie, (1998) philosophical design and methodological approach are issues that have to be taken into consideration in a research. Philosophical questions of existence, knowledge and value, have significant impacts in the research design.

Further a study conducted by Burns & Grove, (2005) research design is the blueprint for conducting the study that maximises control over factors that could interfere with the validity of the findings.

The study used survey design technique. The survey technique was significant in gathering information from site supervisors and the workers on the construction sites by use of questionnaires.

### **3.3 SOURCES OF DATA**

Primary data was mainly collected and analysed for the purpose of this research through the use of questionnaires. This data made it possible to gather professionals' activities in relation to safety management practices in the construction of road works in the Department of Urban Roads.

### **3.4 UNIT OF ANALYSIS**

The unit of analysis refers to the major entity that is being analysed in a study. It is the analysis that is done in the study that determines what the unit is. It defines the 'what' or 'who' that is being studied. In social science research, typical units of analysis include individuals, groups and social organisations. The unit of analyses in this study are key professionals in the Department of Urban Roads and contractors that have worked or working on urban road awarded and supervised projects.

There are approximately Two Hundred (200) professionals, including quantity surveyors, civil engineers, developments engineers, and geomatic engineers etc. working for the Department of Urban Roads nationwide and over five hundred (500) contractors registered with the progressive contractors association of Ghana and are in good standing. However for the purpose of the research which was undertaken in the Greater Accra Region of Ghana, twenty (20) professionals of the department were used. Approximately Fifty (50) contractors are sourced by the department in greater region who are in good standing however twenty five (25) contractors were engaged for the research purposes.

### **3.5 SAMPLING SIZE**

Sampling is defined as a process of selecting a section to represent a whole. In most instances it is impractical to conduct a census as conducting a census could be very expensive and time consuming.

A sample size of 45 professionals and contractors or and contractor's representative were selected. However, for the purpose of time and inability to retrieve some of the questionnaires from some of the respondents; a sample size of 35 professionals and contractors were used in this study.

### **3.6 THE SAMPLING TECHNIQUE**

The sampling techniques adopted in this study for the selection of the respondents were purposive and convenient. The respondents were purposively selected because specific data and information were needed by the researcher to measure the involvement level of the respondents.

Significantly, the process of obtaining the members to be involved in the study was very critical and central to ensuring that each unit within the sample population has an equal representative in the process.

### **3.7 DATA COLLECTION INSTRUMENT**

In a the quest to report on the activities on construction sites in order to evaluated the safety performances, descriptive style was adopted since it could identify the current safety management practices on construction sites. The primary source of data collection was the use of questionnaires. Sekaran, (2003) defines questionnaires to be a well set of questions posed to respondents to solicit their opinion or view on a subject matter usually with the option of having alternatives. The questionnaires were handed over personally to each respondent to ensure security of the questions were guarded.

#### **3.7.1 Questionnaires Design**

Information from the existing literature were reviewed and relevant data that could aid the study objectives were collected and used.

The close ended questionnaire was employed and this was made up of different sections to capture the objectives of the research. The questionnaire was provided with a covering letter explaining the purpose of the study, the method of responding, the aim of the research and the security of the information in order to encourage better response. The questionnaire was designed into three sections as in appendix.

For each factor, respondents were asked to rate from a scale measuring the frequency of usage, degree of influence and degree of challenges affecting safety management practices. Below are tables for illustrations

**Table 3.1 Likert Scale: extent of employment of safety management practices**

Always	5
Often	4
Little	3
Sometimes	2
Never	1

**Table 3.2 Likert Scale: Factors influencing safety management practices**

Extremely	5
Very Significant	4
Moderately Significant	3
Slightly Significant	2
Not Significant,	1

**Table 3.3 Likert Scale: Challenging factors of safety management practices**

Strongly Agree	5
Agree	4
Neither agree nor disagree	3
Disagree	2
Strong disagree	1

### **3.8 DATA ANALYSIS**

Data analysis can be defined “as consisting of three concurrent flows of activity: data reduction, data display and conclusion drawing or verification” (Saunders et. al., 2007).

Data analysis of this thesis was based on the three steps defined by (Saunders et. al., 2007), data reduction, data display and conclusion. After completing the data collection the researcher organised the data for the survey based on the issues that have been selected according to the research question and literature review. The data

collected was cleansed to check the incorrectly responded questionnaires from the correctly responded ones. The cleansed data were coded and analysed using the Statistical Package for Social Sciences (SPSS). The SPSS brought out data, which was then checked to ensure error free. The data were then summarised and illustrated using the various statistical analysis tools such as the use of charts, graphs, frequency tables and percentages.

Data was analysed using both descriptive data and adopting the relative importance index to find the ranking factor among all the factors articulated from the literature review.

$$\text{Relative importance index RII} = \frac{\sum W}{A \times N}$$

W – the weight given to each factor by the respondents and ranges from 1 to 5;

A – the highest response integer (5); and

N – the total number of respondents.

The needed data were collected in the format of a questionnaire that had been designed based on the literature related to perceptions, attitude and behaviour of customers in relation to store image, involvement and brand equity studies.

### **3.9 SUMMARY OF CHAPTER**

This chapter addressed the various methodologies available for the research and the reason for the adoption of the methodology used for this research. The research approach used and the method of data collection was discussed i.e. the use of survey questionnaires. The chapter concluded with the research process and covered issues such as; the study area, sources of data, questionnaire developments, content and design of the questionnaires, distribution of questionnaire, targeted respondents, the scope of questionnaire survey, sample size determination, and data analytical tools.

## **CHAPTER FOUR**

### **DATA ANALYSIS AND DISCUSSION**

#### **4.1 INTRODUCTION**

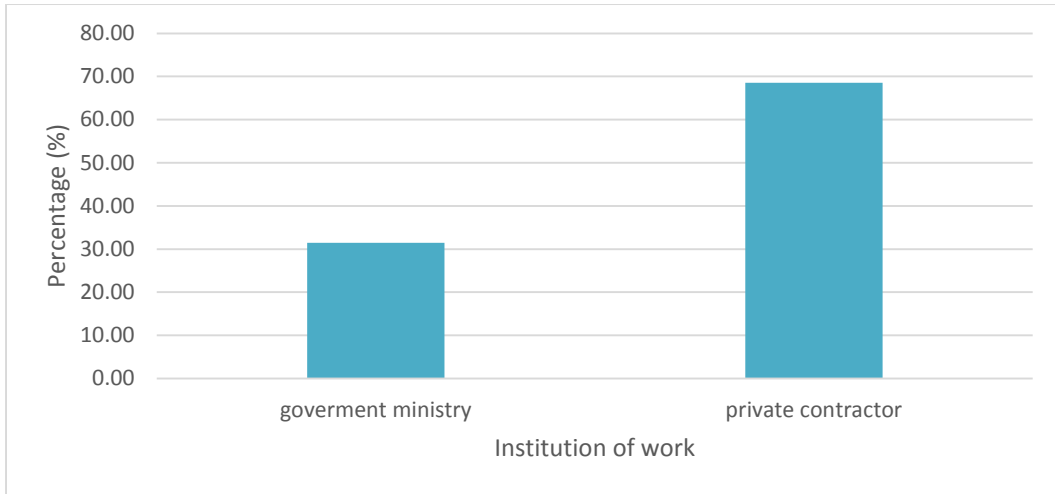
This section contains discussions on the findings of the study. The findings are analysed in line with objectives that were out in the study.

A total number of forty five (45) questionnaires were administered, out of which thirty five (35) were obtained and used for data analysis. These valid questionnaires used for the analysis yielded 82% of response rate. The data from each response was entered into an SPSS software and used for analysis. This indicates that, the response was quiet high and reflects the views of the entire population. The questionnaires for survey and evaluation was developed based on extensive literature on Safety management practices. Also included were some demographic questions of the respondents relating to the age, marital status, type of company, experience in the road industry and the stage of involvement of project execution.

#### **4.2 BACKGROUND INFORMATION OF RESPONDENTS**

##### **4.2.1 Institution of Respondents**

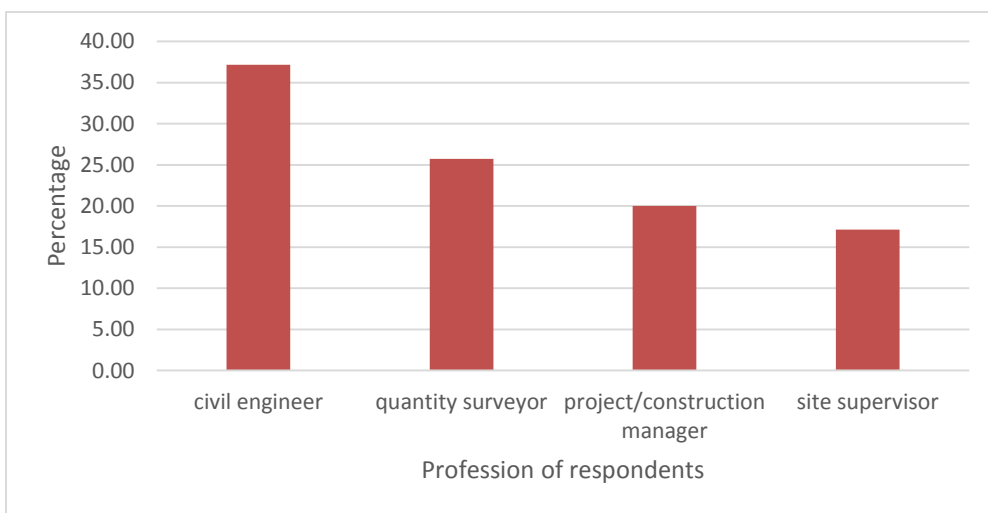
The findings of study indicated that a greater proportion of the respondents worked for private contractors as compared to those that worked with the Department of Urban roads. Thus the findings of the study reflect more, the views of those working for private contractors. Table 4.1 represents pictorially the findings of the institutions of respondents.



**Figure 4.1 Institution of respondents** (Source: Field survey, 2016)

#### 4.2.2 Profession of Respondents

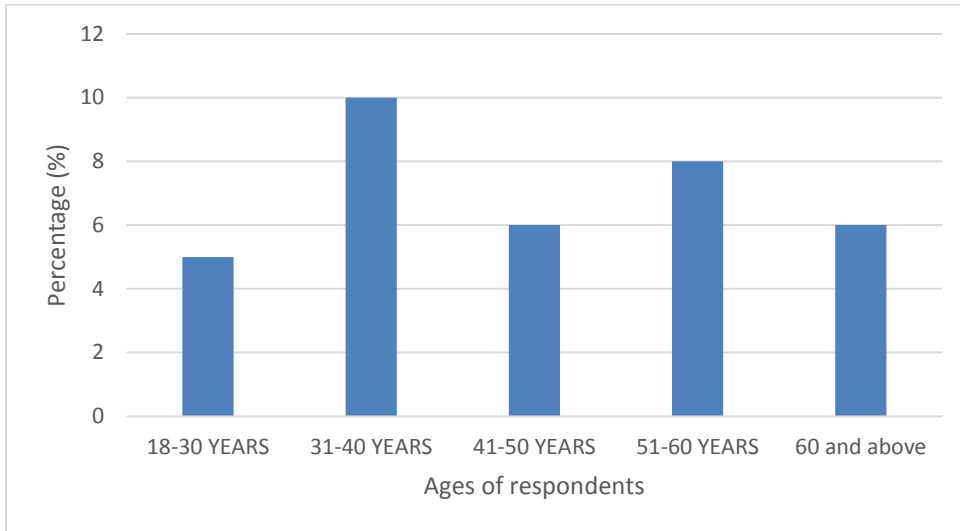
Fig 4.2 shows that the profession of the respondents, 37% of the respondents were Civil Engineers, 26% were Quantity Surveyors, 20% were Project/Construction Managers and 17% represented Site Supervisors. The findings show that most respondents were Civil Engineers and Quantity Surveyors and the least been site supervisors. This depicts that the results of the research could be relied on particularly looking at the category of contractors and professionals the whole research bothered on.



**Figure 4. 2 Profession of respondents** (Source: Field survey, 2016)

### 4.2.3 Age of Respondents

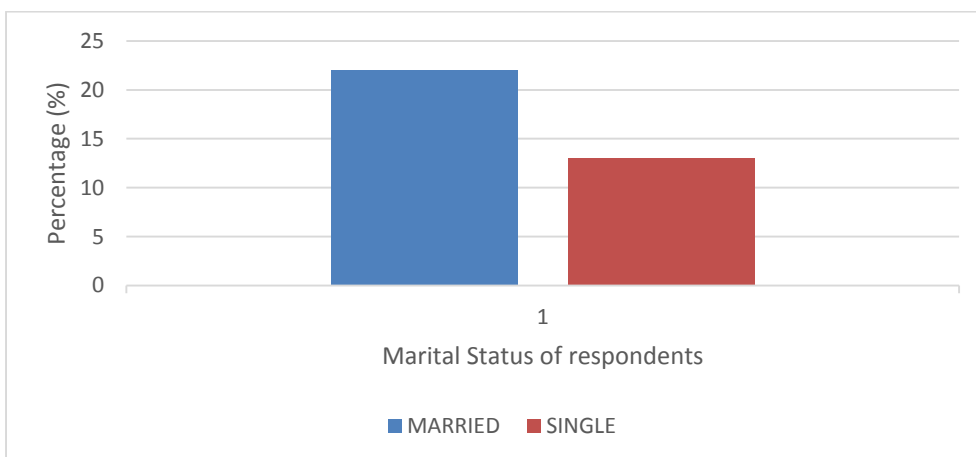
The figure below show the ages of the respondents. It shows that greater percentage of the respondents were aged above thirty (30) showing indicating some sense of maturity in their ages.



**Figure 4.3 Ages of respondents** (Source: Field survey, 2016)

### 4.2.4 Marital Status of Respondents

The figure 4.4 indicates the marital status of the respondents. The findings indicates that once a greater percentage is married there will exhibit high sense of responsibility on construction sites



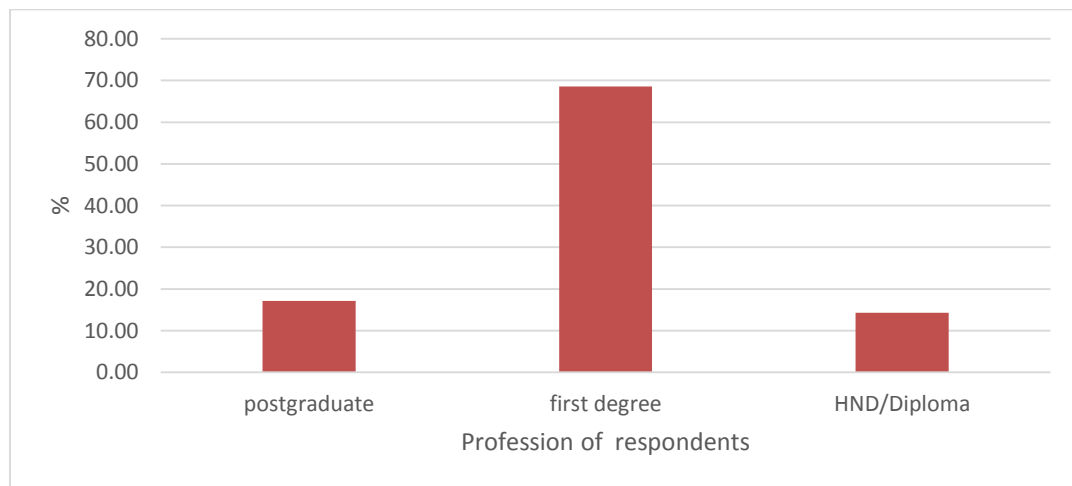
**Figure 4.4 Marital Status of Respondents**

Source: Field survey, 2016



#### 4.2.5 Educational Qualification

The figure above indicates that, all the respondents selected were educated, this was not unusual since the respondents were already working in the department and also in the construction industry which needed some minimum qualification. The findings showed a greater majority of the respondents had acquired Bachelor of Science (B.Sc.) which represents 69%, postgraduate respondents represented 17% and HND/Diploma holders represented 14%. The respondents have demonstrated knowledge in the safety practices during construction works. This confirms Oppong (2013) assertion that majority of employees of most contractors in the road construction have a minimum of first degree.

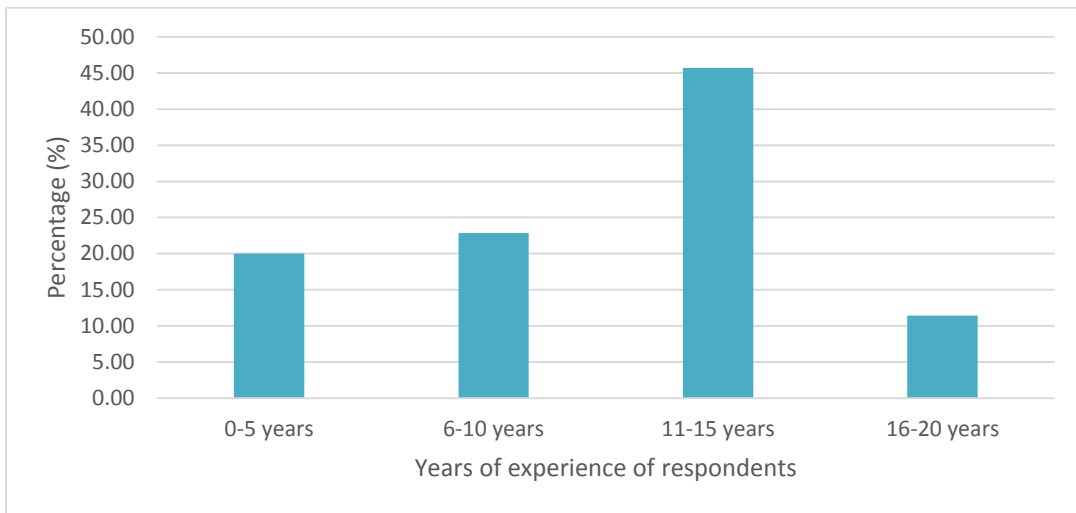


**Figure 4.5 Educational qualification of respondents** (Source: Field survey, 2016)

#### 4.2.6 Experience in the Industry

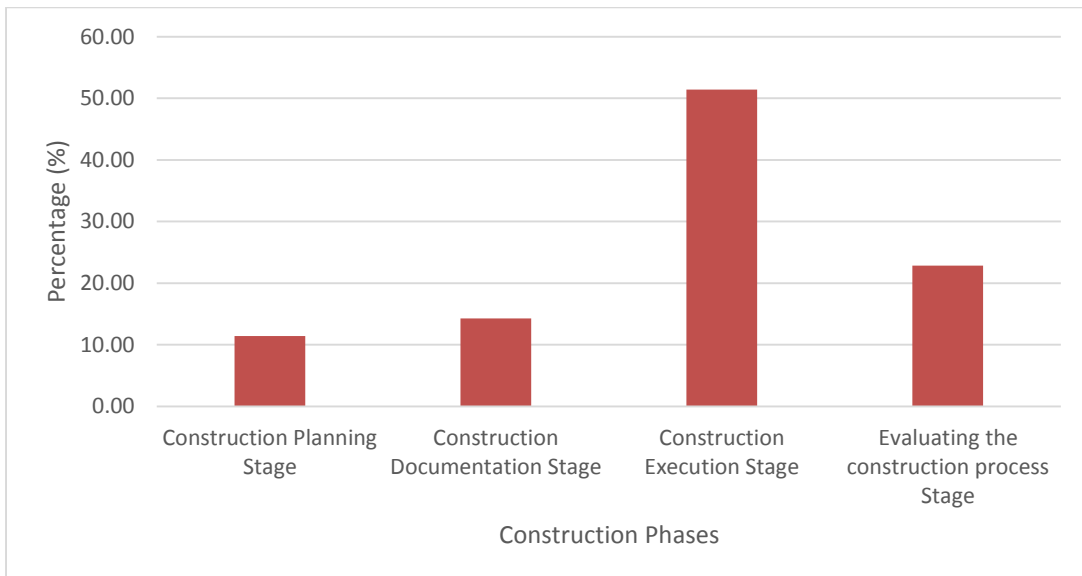
According to the table below, the survey conducted indicated that most of the respondents had worked between the periods of 11-15 years in the road construction industry representing 46%, 6-10 years working experience were 23%, 0-5 years working experience were 20% and those who had worked more than 16-20 years working experience had a representation of 11%. Majority of respondents had

extensive working experience and hence gives the findings more reliability. It implies that they are capable, experienced and good at giving clear judgment.



**Figure 4.6 Years of experience in the road construction industry of respondents**

(Source: Field survey, 2016)



**Figure 4.7 Stages of construction phase respondents are involved in** (Source: Field

survey, 2016)

#### **4.2.7 Construction Phase**

The various stages that respondents were involved in the construction phases were, construction planning stage, construction documentation stage, construction execution stage, and evaluation and monitoring of construction process stage. The findings of the study revealed that most respondents were involved in the construction execution stage representing 51% and the least was 11% representing respondents involved in the construction planning stage. This is shown in figure 4.4 above. The greater majority involved in project execution implies that implied that respondents had extensive working experience knowledge of project construction.

#### **4.2.8 Development of Relative Importance Index**

Respondents were asked to rank influences of the safety management practices on the performance of their construction company based on their personal experience in the construction of road projects. The rating involved the respondents deciding on how they employed the various safety management practices and had to choose from ‘never,’ ‘sometimes,’ ‘little,’ ‘often,’ and ‘always’. Respondents’ attitudes were measured on a five-point Likert-type scale and the resulting data were analysed using the relative importance index (RII) method. RII is computed as:

$$RII = \frac{\sum W}{A * N}$$

where: W – the weight given to each factor by the respondents and ranges from 1 to 5;

A – the highest response integer (5); and N – the total number of respondents.

### **4.3 SAFETY MANAGEMENT PRACTICES**

This sections gave the respondents the opportunity to rank the extent to which they employ various safety practices in order to ensure safety on construction sites. The respondents to the questionnaires were asked to respond on a five-point Likert scale of never(1), sometimes(2), little(3), often(4), and always(5) on how they employ the safety management practices in the construction of road works. The table below shows the responses of the respondents.

**Table 4.1 Frequency of safety management practices**

No	Safety Management Practices	1 (Never)	2 (Sometimes)	3 (Little)	4 (Often)	5 (Always)
		<b>Frequency/Percentage</b>				
1.	Provision of adequate welfare facilities on site	(1) 2.86%	(7) 19.09%	(6) 15.20%	(10) 29.80%	(11) 30.20%
2.	Provision of health and safety clothing and equipment	(1) 2.86%	(6) 17.11%	(8) 22.89%	(10) 29.56%	(10) 27.58%
3.	Provision of healthy and safe working environment	(2) 5.71%	(7) 19.88%	(6) 17.26%	(10) 29.14%	(10) 28.00%
4.	Provision of health and safety signs at vantage points to educate and inform workers and visitors on site	(3) 8.57%	(7) 20.56%	(6) 16.58%	(10) 29.19%	(10) 25.10%
5.	Control of hazardous activities on site	(5) 14.29%	(6) 15.88%	(5) 15.55%	(10) 29.49%	(9) 24.8%
6.	Site meetings specially for safety purposes	(7) 20.00%	(4) 12.50%	(5) 13.21%	(11) 30.39%	(8) 23.90%
7.	Information posters on safety	(2) 5.71%	(7) 20.44%	(7) 19.56%	(11) 30.29%	(8) 24.0%
8.	Ensuring health and safety education of various work trades on site	(5) 14.29%	(6) 18.26%	(6) 16.03%	(9) 26.23%	(9) 25.2%
9.	Designated health and safety person	(10) 28.57%	(3) 7.8%	(4) 12.20%	(9) 26.83%	(9) 24.6%
10.	Communicating health and safety performance to employees	(1) 2.86%	(8) 23.5%	(8) 22.21%	(9) 25.03%	(9) 26.4%
11.	Provision of canteen service on site	(5) 14.29%	(8) 21.60%	(7) 21.26%	(7) 20.96%	(8) 21.9%
12.	Provision of first aid box	(6) 17.14%	(8) 21.44%	(6) 18.56%	(7) 20.46%	(8) 22.40%
13.	Workers participation in hazard identification on sites	(3) 8.57%	(9) 25.10%	(8) 23.47%	(7) 19.76%	(8) 23.1%
14.	Using outside health and safety consultants	(12) 34.29%	(5) 15.40%	(5) 13.17%	(7) 20.34%	(6) 16.8%

Source: Field Data, 2016

The table 4.1 above summaries the results of the analyses. The table indicates that for all the safety practices identified in the construction works posed to the respondents, ‘using outside health and safety consultants’ was ticked as the practice that was summarily ‘never’, ‘sometimes’ and ‘little’ employed and had a percentage of 62.85%. This is due to the fact that departments/companies do not feel it is part of the contract execution activity and don’t want to expend money on hiring the services of a consultant at a cost which was part of the original bill of quantities. Departments or companies will always want a return of their investment in the execution of construction activities. The table 4.1 further indicated the respondents ranked ‘workers participation in hazard identification on site’ as the second highest practice with a percentage (57.15%) not employed (‘never’, ‘sometimes’, ‘little’). ‘Provision of canteen service on site’ was ranked third with a percentage of 57.14% and the fourth ‘Provision of first aid box’ had a percentage of 57.13% respectively. This is because of the lack of proper understanding for the need for safety.

#### **4.3.1 Using Outside Safety Consultants**

Using outside safety consultants was rated the second highest by the respondents with a percentage of 62.85% as being not employed on construction sites. Safety consultants have to execute the self-inspection programme and ensure acceptable safety performance achieved by appropriate means (Koehn et al., 1995). They are always employed for large projects by main contractors to oversee all safety issues on the construction site (Wilson and Koehn, 2000). This confirms the findings since most of the contracts executed by urban contractors are of not large magnitude.

#### **4.3.2 Workers Participation in Hazard Identification on Sites**

Workers participation in hazard identification on sites was ranked with the highest percentage of 57.15%. The ability to identify hazards on construction sites increases

with length of experience. This finding would suggest that the hazardous environment becomes “wallpaper” and as Manuele (2010) argued the hazards are simply not being recognised by those who have worked in the industry over a long period of time.

#### **4.3.3 Provision of Canteen on Site**

Provision of canteen on site was rated the third highest by the respondents with a percentage of 57.14% of not being employed by respondents in the execution of road projects. Traditionally the provision of welfare facilities such as sanitary facilities, resting places, canteens and first aid facilities has been stipulated in working conditions of employers. Maintaining sanitary conditions of these facilities has usually been within the scope of safety programmes. The roles of these facilities, however, are being re-assessed recently because of the additional financial implication to the employer.

#### **4.4 RANKING OF FACTORS THAT SIGNIFICANTLY INFLUENCE SAFETY MANAGEMENT PRACTICES**

The factors identified in Literature that could influence safety management practices on construction sites were tabulated in a form of questionnaires and distributed to respondents to measure the degree of significance of impact of the safety management practice in the construction of road works. Table 4.2 shows the findings of the research.

**Table 4.2 Safety management practices influencing factors**

<b>SAFETY MANAGEMENT PRACTICE INFLUENCING FACTORS.</b>	<b>WEIGHTING</b>	<b>RII</b>	<b>RANK</b>
Formal Health and Safety Policy	154	0.88	1 <sup>st</sup>
Training requirement on safety for site supervisors and top managers	148	0.85	2 <sup>nd</sup>
Development of Health and Safety Policy	145	0.83	3 <sup>rd</sup>
Health and Safety information management	145	0.83	4 <sup>th</sup>
Conduction of Organizational Policy Review	145	0.83	5 <sup>th</sup>
Accident reporting and maintenance of records	145	0.83	6 <sup>th</sup>
Reluctance to input resources to safety	144	0.82	7 <sup>th</sup>
Incentives for good safety performance	143	0.82	8 <sup>th</sup>
Top management checks of health and safety records	140	0.80	9 <sup>th</sup>
Developing new technologies in execution of construction	140	0.8	10 <sup>th</sup>
Insurance cover for sites	140	0.8	11 <sup>th</sup>
Verbal communication with operatives site tours	139	0.8	12 <sup>th</sup>
Implementation of safety management systems	139	0.79	13 <sup>th</sup>
Insufficient funding of health and safety activities	137	0.78	14 <sup>th</sup>
Lack of understanding for the need for health and safety practice	137	0.78	15 <sup>th</sup>
Training of health and safety officers to improve on their performance on safety and relevant legislation	135	0.77	16 <sup>th</sup>
Frequency of site supervisors correcting workers	134	0.77	17 <sup>th</sup>
Disciplinary action for not conforming to safety	134	0.77	18 <sup>th</sup>
Development of emergency plan and procedures	134	0.77	19 <sup>th</sup>
Documenting risk assessments	133	0.77	20 <sup>th</sup>
Provide incentive for workers who exhibit good behaviour on safety practices.	133	0.76	21 <sup>th</sup>
Providing inadequate information on health and safety practices	133	0.76	22 <sup>nd</sup>
Frequency of a foreman's announcing safety related matters to workers	131	0.75	23 <sup>rd</sup>
More supportive upper management attitude towards safety	136	0.72	24 <sup>th</sup>



#### **4.4.1 Safety Management Practice Influencing Factors**

Table 4.2 above indicates in rank the order of the safety management practices that significantly affect the construction of road projects. The variables with relative importance index of 0.80 and above were considered to have high ratings and therefore highly significant in influencing the safety management practices on construction sites. The limits of definition used for the RII were  $0 < RII < 1$  for all factors with  $0 < RII < 0.20$  indicating a very low significance factor,  $0.20 < RII < 0.40$  for a low significance factor,  $0.40 < RII < 0.60$  for a moderate significance factor  $0.60 < RII < 0.80$  for a high significance factor and  $0.80 < RII < 1$  for a very high significance factor. This is consistent with the findings of Donkor (2011) and Badu and Owusu (2013). From table 4.2 above, formal health and safety policy came first with a relative importance index of 0.88. This was followed by training requirement on safety for site supervisors and top managers with an index of 0.85. Development of health and safety policy was third with an index of 0.83. Health and safety information management records fourth with an index of 0.83, Conduction of organizational policy review came in fifth with an index of 0.83, accident reporting and maintenance of records came in sixth with an index of 0.83. Reluctance to input resources to safety recorded seventh 0.82. Incentives for good safety performance recorded eighth 0.82. Top management checks of health and safety records, Developing new technologies in execution of construction, Insurance cover for sites verbal communication with operatives site tours each recorded and index of 0.80.

##### **4.4.1.1 Safety Policy**

Safety policy ranked the highest in terms of significance factors influencing the safety management practice on construction sites. Safety policy statements should indicate how the company is organised with respect to the safety responsibilities of the

management, and should further state the managers' commitment to providing safety information, training and advice to employees. It is very important to enhance the ability of the workers and the managers to anticipate possible hazards in the work place. This assertion is confirmed by Davies and Tomasin (1999) who suggest that the organizational safety policy statements issued by employers should be clearly understood by their employees since it could significantly affect the safety performance of safety practices on construction sites.

#### **4.4.1.2 Training requirement on safety for site supervisors and top managers**

Training requirement on safety for site supervisors and top managers was ranked second highest by the respondents as the issue that will significantly affect safety management practices on construction sites.

This findings is confirmed by Wilson (2000), and according to Wilson (2000), companies with poor safety management practices often leave safety training to site experience, and this may be inadequate to prevent occupational accidents. Also Nishgaki (1994), and Garza (1988) both recommended that educating workers about all aspects of work safety and giving them the skill to look after themselves is the right thing to do. Furthermore, Davies and Tomasin (1999) suggest that effective training in the construction industry is one means by which safety can be improved and company management must be active in order to reduce the number of injuries and fatalities.

#### **4.4.1.3 Development of safety policy**

Development of was ranked third as factors that will significantly affect the safety management practices and this was not a surprising findings since the formal safety policy was ranked first and its synonymous and that has being explained previously.

#### **4.4.1.4 Safety information management**

Safety information management is essential in providing information and advisory service for all concerned on safety management practices matters on construction sites. Employers have a duty to give to workers or employees, where this is necessary to keep them adequately informed about their safety and welfare, factual information about the premises where they work and information about any action that could affect safety management practice on construction site and hence could affect safety management practices.

#### **4.4.1.5 Conduction of organizational policy review**

Conducting an organizational policy review is a feedback tool providing a "suitable and sufficient" assessment of safety risks to employees, and safety risks to other people who might be affected by the business, such as visiting members of the public. It's a comprehensive investigation of safety risks involved in all areas of the execution of the contract.

#### **4.4.1.6 Accident reporting and maintenance of records**

According to the findings of the study accident reporting and maintenance records significantly affect safety management practices on construction sites. It is important to mention that despite the importance of safety, serious accidents still occur in various construction projects. The findings of the study re-affirms (Fredericks et al., 2002; Yates and Lockley, 2002) who says that a well reported and recorded incident on construction sites shall avert further construction accidents cause injuries, illnesses, or even fatalities and usually happen due to construction failures. Research by Dejoy (1985) also showed that safety records reflect how upper management perceives the causes of safety performance. Accident reporting and documentation on safety risk assessment is readily accessible and comprehensible, internal communication is more

effective. The information available through documentation will, therefore, enhance the firm's internal safety social capital since accessibility increases the organizational dimension of individual knowledge

#### **4.4.1.7 Reluctance to input resources to safety**

Reluctance to commit resources to safety affect safety management practices on construction sites. The findings of the study confirms Nishgaki (1994) who carried out an investigation of 35 cases of construction injuries that occurred between period 1981 to 1985 in China. During interviews with construction managers and workers he found that reluctance to commit resources to safety accounted for much of the underlying causes of occupational construction accidents recurrence on construction projects. However, this could be so because high level management often has little firsthand experience on construction site and it is therefore difficult for them to relate to the needs of the workers

#### **4.4.1.8 Incentives for good safety performance**

Incentives for good safety performance ensures consistent good safety management practices and leading to total reduction of construction incidents. It was a factor respondents identified that it could affect safety performance on construction site. Jaselskis (1996) commented that management needs to be more active in the safety program and where possible, supervisor should also play a significant role in determining incentives for good safety performance as this likely to affect the safety performances on their projects.

#### **4.4.1.9 'Others factors'**

Top management checks of health and safety records, developing new technologies in execution of construction, insurance cover for sites, and verbal communication with

operatives on construction sites. The above factors also affect the safety performance of construction projects. . Lingard and Rowlinson (1994), found out top management checks of health and safety, developing new technologies in the execution of construction, improve safety performance standards. This confirms the findings of the study. Research by Tang (1997) into the safety management practice on construction projects suggested that the higher the insurance cover for sites and verbal communication with operatives on construction sites, the better the safety performance.

#### **4.5 SAFETY MANAGEMENT PRACTICE CHALLENGES**

The respondents were asked to rate the extent to which the following factors tabulated below could have a challenging impact on safety management practice on construction sites. As stated earlier, these reasons could be seen as the factors challenging total site safety site performance. The results of the findings are given in the table below. The limits of definition used for the RII were  $0 < RII < 1$  for all factors with

$0 < RII < 0.20$  indicating a very low challenging effect,  $0.20 < RII < 0.40$  for a low challenging effect,  $0.40 < RII < 0.60$  for a moderate challenging effect  $0.60 < RII < 0.80$  for a high challenging effect and  $0.80 < RII < 1$  for a very high challenging effect. This is consistent with the findings of Donkor (2011) and Ayegba (2013). From the table below inadequate safety training and education for workers was ranked as the top most challenging factor with a relative importance index of 0.87 that in their view affects safety management practices on construction sites. The second topmost factor was inadequate provision of appropriate resources and logistic for performance of safety management practices with a relative importance index of 0.80, followed by Lack of attention to safety management by the department/company on third position

with a relative importance index of 0.77. Insufficient involvement of the Department/ Company, too complicated construction project, low level of construction technology with a relative importance index of 0.77, 0.75, and 0.73 came fourth, fifth and sixth respectively.

**Table 4.3 Safety management practices challenging factors**

<b>SAFETY MANAGEMENT PRACTICE CHALLENGES</b>	<b>WEIGHTING</b>	<b>RII</b>	<b>RANK</b>
Inadequate safety training and education for workers	152	0.87	1 <sup>st</sup>
Inadequate provision of appropriate resources and logistics for performance safety management practices	140	0.80	2 <sup>nd</sup>
Lack of attention to safety management by the department/company	135	0.77	3 <sup>rd</sup>
Insufficient involvement of the Department/Company	134	0.77	4 <sup>th</sup>
Too complicated construction project	131	0.75	5
Low level of construction technology	128	0.73	6
Inadequate safety inspection	119	0.68	7
Insufficient conduct of safety operations	117	0.67	8
Poor quality of construction materials and equipment	114	0.65	9
Insufficient involvement of the Department/Company	112	0.64	10 <sup>th</sup>

Source: Field Data, 2016

#### **4.5.1 Inadequate safety training and education for workers**

Inadequate safety training for construction workers was identified as the topmost factor that challenges total safety management practices on construction sites and this is in agreement with existing literature. This implies that they received very little safety training and education. This is consistent with existing literature, which suggests that training and education are insufficient in construction projects (Laukkanen, 1999; Baxendale and Jones, 2000; Toole, 2002). Without adequate safety

training and education, construction participants cannot recognize their safety roles clearly. Mohamed (2002) referred to safety training and education as a competence construct that may lead to a safety climate. He further found that the safety climate is a determinant of safe work behaviour. Tam and Fung (1998) reinforced that the provision of safety training is an effective tool in mitigating site casualties. With such consistent findings, it is essential for construction companies to set up safety training and education programmes to clarify the safety roles and enhance safety awareness, which in turn leads to a safe and successful project

#### **4.5.2 Inadequate provision of appropriate resources and logistics for performance safety management practices**

Provision of adequate resource and logistics ensures good safety performance which leads to total safety management practices. Since safety management practices are core issues of every construction project, a proportion of project investment, resources and logistics should be spent on ensuring that a project is to be undertaken safely. This findings of the study is in agreement with Suraji et al. (2001) who referred to lack of investment in safety performance as causing unwanted, undesired incidents on construction sites.

#### **4.5.3 Lack of attention to safety management by the department/company**

Attention to safety management by organisation improves safety management practices on construction sites thus according to the respondents of the study. Management and project managers lacked attention to safety management. According to Monk (1994) many occupational accidents and injuries are due to lack of attention by management and this confirms the findings of the study.

#### **4.5.4 Insufficient involvement of the Department/Company**

Lack of involvement of management in the safety performance on construction sites has greater implications on safety performance this was indicated by the respondents of the study. As a management concept, safety should be embedded into every level of a company and every party of a cross-organizational project. It has also been seen as a broad quality measure (Walker et al., 2001). Positive safety performances are directly related to commitment by management, involvement of construction workers, good working environment and attitudinal change of supervisors and workers.

#### **4.5.5 Too complicated construction project**

Too complicated construction project increases the complexity and scope of construction project. This makes safety performance difficult to achieve on construction site and this was enumerated by the respondents of the study.

#### **4.5.6 Inadequate safety inspection**

Safety inspection is critical to safety performance on construction as was mentioned by the respondents as one of the factors challenging total implementation of safety performance. This findings was confirmed by (Koehn et al., 1995) who said site safety inspection should undoubtedly be a core component of every safety programme. Site inspection should usually be carried out by different parties, such as senior management, project managers, construction managers, safety officers, foremen, and so on. Site Inspection demonstrates senior management commitment to safety, to encourage and remind the site workers to work safely, to measure the operation of the safety programme and to publicize updated site safety requirements.



#### 4.6 EVALUATION OF SAFETY MANAGEMENT PRACTICES

The respondents were asked to evaluate their safety management practices against standard practice which was obtained from existing literature. The evaluation was done on various factors as grouped into appropriate headings and tabulated in the table below.

**Table 4.4 Evaluation of safety management practices**

No.	Group	Percentage score for each Scale					Total Score
		1	2	3	4	5	%
A	Management Commitment	3	12	24	10	0	49
B	Safety Responsibility and Job Training	4	11	23	22	0	60
C	Incident Reporting & Investigation	2	38	2	0	1	43
D	Inspections & Hazard Identification	5	18	6	0	1	30
E	Medical/Welfare Facilities	2	16	35	0	0	53
F	Technical Factors	10	15	14	0	0	39
<b>TOTAL EVALUATED SCORE</b>							<b>47%</b>

Source: Field Data, 2016

From the table 4.4 above the respondents response was that management commitment ranked 49%, safety responsibility and job training scored 60%. 43% was ranked for incident reporting and investigation. Inspections and hazard identification, medical/welfare facilities and technical had scores 30%, 53% and 39% each respectively. The findings of the evaluation results shows that none of the safety management practices scored more than 50% and thus the hence safety management practices are not to acceptable standards practice internationally.

## **CHAPTER FIVE**

### **FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

This chapter of the research focuses on key findings of the study. The research work was on safety management practices in the construction of road works in the public sector- a case study of the Department of Urban Roads. It also draws out the main conclusion from the study and provides recommendations for improving safety management practices in the department of urban roads and make recommendations based on the findings. Introduction to the study was captured in chapter one, chapter two dealt with existing literature reviewed and discussion for which reason the analysis and interpretation of the research data was formed. In chapter three, the appropriate research approaches were adopted to address the objectives of the research. Chapter four gave a whole view of the analysis and discussions made on the results obtained. Finally, this chapter of the research is brought to a closure by summarising all what had been done to address the aim and objectives of the work.

#### **5.2 HOW THE RESEARCH OBJECTIVES WERE ADDRESSED**

This research was initiated with the primary aim to evaluate safety management practices used in the construction of road works in the public sector. In order to attain the specified aim, four research objectives were made:

- To identify a standardised criteria based on standard safety management practices for evaluating safety management practices by respondents.
- To identify the current safety management practices on road works.
- To identify the factors that significantly influence safety management practices on road works

- Examine the challenges in the management of safety practices.

**5.2.1 Objective 1: To develop a standardised criteria based on standard safety management practices for evaluating safety management practices by respondents**

This research objective was achieved mainly through the existing literature reviews and conducting of survey questions. The existing literature review detailed out the standard safety management practices that are employed by construction companies for standard practices. This include eleven (11) management commitment of safety management practices, seven (7) safety responsibility and job training of safety management practices, three (3) incident reporting and investigation of safety management practices, five(5) safety inspections and hazard identification, seven (7) medical/welfare of safety management practices, six (6) technical factors of safety management practices

The results of the survey questions then confirmed that management commitment to safety management practices got 49% as an evaluated figure of standard safety management practice against safety management practice on construction sites. Safety responsibility and job training had 60%, 43% was scored for incident reporting and investigation. Safety inspection and hazard identification, Medical/Welfare facilities, and technical factors scored each of 30%, 53%, and 39% respectively. It was concluded that majority of the practices identified from literature where not employed by respondents on construction sites. Management commitment to safety management practices and medical and welfare facilities of safety management practices were identified to be employed by the respondents.

### **5.2.2 Objective 2: To identify the current safety management practices on road works**

The second objective of the study was to identify the current safety management practices on construction sites. Through existing literature, fourteen (14) safety management practices were identified. The respondents ranked the frequency to which safety management practices were employed on a five point likert scale. The findings of the study showed that the most employed safety management practice was the provision of adequate welfare facilities on site, followed by Provision of health and safety clothing and equipment. The least employed safety management practice was workers participation in hazard identification on construction sites.

### **5.2.3 Objective 3: To identify the factors that significantly influence safety management practices on road works.**

The third objective of the study was to identify the factors that significantly influence safety management practices on construction sites. Through existing literature, twenty four (24) factors were identified that could significantly influence safety management practices on construction sites. The respondents rated the frequency to which those factors will significantly influence safety management practices on a five point likert scale. The findings of the study showed that the factor that most significantly influence safety management practice on construction site was formal Safety Policy, the second factor was planned safety training for supervisor and senior management. The least employed safety management practice was more supportive upper management attitude towards safety.

### **5.2.4 Objective 4: Examine the challenges in the management of safety practices**

The fourth objective of the study was to examine the challenges encountered in the safety management practices during construction works. From existing literature, ten

(10) key challenging factors expected of a typically effective safety management practice were identified that could affect the implementation safety management practices on construction sites. The respondents rated the frequency to which those factors will a challenge to implementing good safety management practices on a five point likert scale. The findings of the study showed that the most challenging factor was inadequate safety training and education for workers, inadequate provision of appropriate resources and logistics for performance safety management practices was identified as the second most challenging factor that affects the implementation of good safety management practice.

Insufficient involvement of the Department/Company was identified by the respondents to be the least challenging factor affecting the implementation of good safety management practice.

### **5.3 RECOMMENDATIONS**

Safety management practices are integral part of a well-planned project construction and hence it's important for a good understanding of its implementation to ensure a successful project completion. The following recommendations are therefore measures that could be adopted to improve on the safety management practices the department employs on construction sites.

- The department should provide or urge contractors to provide suitable programmes that ensure safe working conditions for construction workers. The safety programmes should be such it identifies and eliminates potential dangers that are likely to cause injury or death. It should also provide the platform to ensure sufficient safety inspection and hazard identification before construction works starts. Provision of first kit box, other medical facilities

and the provision of welfare facilities like provision of canteen on construction site should be made compulsory.

- In order to enhance more support from upper management towards safety, the provision should be made legal to incorporate safety programmes and management must be involved in drafting the safety programmes such that responsibilities are assigned to stakeholders before the commencement of project works.
- Management must indicate through evaluation of potential risks, hazards and dangers that employees are likely to be exposed to and the safety measures put in place to mitigate its effects.
- The department must give adequate safety training and education, induction training to contractors and or construction employees before they resume construction works. The training by its nature should include firefighting and first aid techniques. Constant training are needed to refresh the knowledge on safety management practices and should be done through education to create awareness the needed to avoid accident occurrence on construction sites. Refresher training should be provided when different dangers and risks are identified. Provision for safety practices when preparing bids should be made in order to provide of appropriate resources and logistics for implementation of safety during construction works.
- Finally, stakeholders in the construction industry in this case the department of urban roads and the contractors or their representatives must be cautious of safety practices on construction project and endeavour to adhere its standard safety practices to eliminate avoidable accidents on construction sites.

#### **5.4 LIMITATIONS OF THE RESEARCH**

This study is completed with limitations. First, the research is limited due to time and cost constraints.

The study focused on the use of questionnaires because of time constraints. Further studies should include the use of interviews and site observations into the scope of work. Secondly, the study focused on evaluating safety management practices by the respondents but did not explore the consequences of non-compliance.

#### **5.5 CONCLUSION**

The study revealed that ensuring good safety management practices requires a proactive, precautionary approach that seeks to eliminate all risk factors inherent in a construction project or at least ameliorate the impact of in their occurrence on construction project. The study also established that the most significant factor influencing the performance of safety management practices is the lack of safety policy and training for supervisors and senior management and the most challenging factor affecting the implementation of safety management practices are inadequate safety training and education for workers, and lack of provision of appropriate resources and logistics for performance of safety management practices. The conclusion drawn is that the department gives training a high priority and importance thus providing a platform for constructions workers to be engaged in continually acquisition of knowledge on safety practices to make construction projects productive.

The overall aim of the research is to evaluate the safety management practices employed by the department in the execution of road works, the study revealed that the evaluated safety performance is an average of forty seven percent (47%).

## REFERENCES

- Abdul-Rashid, I., Bassioni, H. and Bawazeer, F. (2007), Factors affecting safety performance in large construction contractors in Egypt", Boyd, D (Ed) Proc 23<sup>rd</sup> Annual ARCOM Conference-Belfast, UK, Association of Researchers in Construction Management, 661-670.
- Adan, E. (2004), Factors affecting Safety on Construction Projects. Department of Civil Engineering, Palestine.
- Agbaxode, P.K.D, (2012), Safety Performance of Road Contractors in Ghana. Unpublished Thesis. Kwame Nkrumah University of Science and Technology, Kumasi-Ghana
- Available: <http://www.hse.gov.uk/construction/healthrisks/monitoring.htm> (15 June 2016)
- Ayegba, C., (2013), Assessment of Materials Management on Building Construction Sites. Journal of Civil and Environmental Research.
- Badu, E. & Owusu-Manu, D.-G., (2013), Rural Infrastructure Development in the Volta Region of Ghana; Barriers and Interventions. Journal of Financial Management of Property and Construction, 18(2), pp. 142-159.
- Baxendale, T. and Jones, O (2000), International Journal of Project Management
- Burns, N. and Grove, S.K. (2005), The Practice of Nursing Research: Conduct, Critique, and Utilization, 5th edition, St. Louis: Elsevier Saunders
- Burstyn, I. Boffetta, P. Kauppinen, T. Heikki, P. Svane, O. Partanen, T. Stjcker, I. Frentzel-Beyme, R. Ahrens, W. (2001), Estimating exposures in asphalt industry for an international epidemiological cohort study of cancer risk.
- Chia-Kuang, L. and Yusmin, J. (2012), Prioritization of Factors Influencing Safety Performance on Construction Sites: A Study Based on Grade Seven (G7) Main Contractors" Perspectives" DOI: 10.7763/IPEDR. 2012. V57. 2 Construction (Design and Management) Regulations 2007, (on-line), Available: <http://www.hse.gov.uk/construction/cdm.htm> (09 July 2016).
- Colak, B. Etiler, N. & Bicer, U. (2004), Fatal occupational injuries in the construction sector in Kocaeli, Turkey, 1990-2001.
- Davis, V. Tomasin, K. (1999), Construction Safety Handbook, 2<sup>nd</sup> ed., Thomas Telford, New York,
- Donkor S., (2011), Determinants of Business Failure: the perspective of SME'S Building Contractors in the Ghanaian Construction Industry, An MSc Thesis he Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology. Kumasi.



- Ebenezer A, T. (2014), Risk Management in the Procurement Of Road Works in the Public Sector-A Case Study of The Department Of Feeder Roads. Unpublished thesis. Kwame Nkrumah University of Science and Technology, Kumasi-Ghana
- El-Mashaleh, M. Ahmed, N. B. Zeyad, T, Thakir A. (2015) Analysis of Hospital Staff Exposure Risks and Awareness about Poor Medical Waste Management -A Case study of the Tabuk Regional Healthcare System-Saudi Arabia
- European Commission. (2002), European social statistics: accidents at work and work related health problems 1994-2000. European Communities, Luxembourg. Accessed from website on 18th July 2016.
- Fang, F. Hoskins, J. Butler, J.S. (2004), 5-Fluorouracil enhances exosome-dependent accumulation of polyadenylated rRNAs
- Frederick, S. G. Loewenstein, et al. (2002), Time Discounting and Time Preference: A Critical Review. *Journal of Economic Literature* XL.
- Fung, E. W.W. Wong, J.K. Suen, T. Bulter, S.G. Lee, J.C. Liao. (1998), A synthetic gene-metabolic oscillator.
- Garza, J. (1988), Analysis of safety indicators in construction", *Journal of Construction Engineering and Management*, Vol. 124 No.4, pp.31
- Hämäläinen, P., Takala, J., and Saarela, K. L. (2006). Global estimates of occupational accidents. *Safety Science*, 44, 137-156.
- Harper, R.S. and Koehn, E. (1995), Managing Industrial Construction Safety in Southeast Texas. *Journal of Construction Engineering and Management*, 124 (6)
- Health and Safety at work Act, Act 1974.
- Health and Safety Executive (2004), Monitoring Health and Safety in Construction, (online), Available:<http://www.hse.gov.uk/construction/healthrisks/monitoring.htm> (15 June 2016)
- Health and Safety Executive (2009), Measuring Health and Safety Performance Construction Division, The Construction Intelligence Report, (on-line), Available:<http://www.hse.gov.uk/construction/pdf/conintrep0405.pdf> (24 July 2016).
- Hinze, J. and Wilson, G. (2000), Moving toward a zero objective. *Journal of Construction Engineering and Management*.
- International Labour Organization (ILO), (1999)
- Jannadi, M.O. and Al-Sudairi, A (1995), Safety Management in the Construction industry in Saudi Arabia. *Building and Research and Information*.

- Jaselskis, E. (1996), Strategies for achieving excellence in construction safety performance, *Journal of Construction Engineering and Management*, Vol. 122
- Jaselskis, E., Anderson, S and Russell, J (1996), Strategies for Achieving Excellence in Construction Safety Performance. *Journal of Construction Engineering and Management*.
- Kavianian, H.R. and C.A. Wentz, Jr. 1(990). Occupational and environmental safety Engineering and management. Van Nostrand Reinhold, New York, NY.
- Kheni, N. A. (2008), Impact of health and safety management on safety performance of small and medium-sized construction businesses in Ghana", PhD thesis, Department of Civil Engineering, Loughborough University, UK.
- Kheni, N; Gibb, A.G.F. & Dainty, A.R.J., Health and safety management in developing countries: a Study of construction SMEs in Ghana, *Construction Management & Economics*, 2008, (<http://www.ghana.gov.gh/index.php/ment/3786-meet-the-press/2010>). Viewed on (16/06/2016)
- Laryea, S. and Mensah, S. (2010), Health and safety on construction sites in Ghana", The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors-Held at Dauphine Université, Paris.
- Laukkanen, T. (1999), Construction Work and Education: Occupational Health and Safety Reviewed. *Construction Management and Economics*.
- Lingard, H. and Rowlinson, S. (1994), Construction site safety in Hong Kong. *Construction Management and Economics*, 12 (6), 501–10
- Lingard, H. and Rowlinson, S. (2005), Occupational Health and Safety in Construction Project Management, Spon Press, ISBN 0 419 26210 5.
- Manuele, F. A. (2010), Acceptable risk: Time for SH&E professionals to adopt the concept, *Professional Safety*, May pp. 30 - 38.
- Mbuya, E. and Lema, N. (2004), Towards development of framework for integration of safety and quality management techniques in construction project delivery process
- Menzel, N. N. and Gutierrez, A. P. (2010), Latino Worker Perceptions of Construction Risk, *American journal of industrial medicine*, 53: 179-187
- Mohamed, S. (2003), Scorecard approach to benchmarking organizational safety culture in construction, *Journal of Construction Engineering and Management*,
- Mohammed, S. (2002), Safety Climate in Construction Site Environments. *Journal of Construction Engineering and Management*, pp.375
- Monk, V. (1994), Occupational Health and Safety Management Systems and Safety Performance in the Building and Construction Industry, Work safe Australia, Melbourne.

- National Road Safety Commission Act 567 (1999).
- Ng, S.T., Cheng, K. P. and Skitmore, M. (2005), A framework for evaluating the safety performance of construction contractors". *Building and Environment*.
- Nishgaki, S. (1994), Humanware, human error and Hiyari-hat: a template of unsafe symptoms, *Journal of Construction Engineering and Management*, Vol. 120 No.2.
- Occupational Safety and Health Administration, (OSHA) (*on-line*), Available: [http://www.osha.org/crash\\_data](http://www.osha.org/crash_data) (17 June 2016).
- Oxford Advanced Learners Dictionary (2010).
- Pilot, D. F. & Hunglar, B.P. (1999), *Nursing research principles and methods*, Philadelphia: Lippincott.
- Priyadarshani, K., Gayani, K. and Sajani, J. (2013), Construction Safety Assessment Framework for Developing Countries: A Case Study of Sri Lanka", *Journal of Construction in Developing Countries*, 18(1), 33–51, 2013
- Republic of Ghana (2003) *Labour act, (Act 651)*. Accra: Ghana Publishing Corporation.
- Safety, Health and Welfare at Work Act (2005)
- Saunders, M., Lewis, P. and Thornhill, A. (2007) *Research Methods for Business Students (4th edn)*. Harlow: FT Prentice Hall.
- Sawacha, E., Naoum, S. and Fong, D. (1999), Factors Affecting Safety Performance on Construction Sites", *International Journal of Project Management*, Vol. 17, No. 5,
- Sekaran, U. (2003), *Research Methods for Business – A Skill Building Approach (4<sup>th</sup> edn)*. New York: John Wiley & Sons.
- Suraji, A., Duff, A.R., (2001), Identifying the root causes of construction accidents discussion. *J. Construct. Eng. Manage.*
- Takala, J. (1999), Global estimates of fatal occupational accidents. *Epidemiology*
- Tam, C.M and Ivan W.H. Fung, (1998), Effectiveness of safety management strategies on safety performance in Hong Kong.
- Tam, C.M. and Fung, W.H.I. (1998), Effectiveness of safety management strategies on safety performance in Hong Kong. *Construction Management and Economics*.
- Tam, C.M., Zeng, S.X. and Deng, Z.M. (2004), Identifying Elements of Poor Construction Safety Management in China, *Safety Science*

- Tang, S. (1997), Safety cost optimization for building projects in Hong Kong, *Construction Management and Economics*, Vol. 15.
- Teddlie C, Tashakkori A. (1998), Foundations of mixed methods research: integrating quantitative and qualitative approaches in the social and behavioural sciences.
- Teo, H.H., Wei, K.K. and Benbasat, I. (2003), Predicting intention to adopt interorganizational linkages: An institutional perspective.
- The Factories, Offices and Shops Act, 1970 (Act 328) and the Mining Regulations 1970 LI 665
- Toole, O.M (2002), The relationship between employees' perceptions of safety and organizational culture
- United States Census and Works Bureau, Geography Division, Census Regions and Divisions of the United States", (on-line), Available: [http://www. United States census /works bureau/geography division](http://www.United States census /works bureau/geography division) (16 July 2016).
- Walker, A. and Newcombe, R. (1998), The positive use of power to facilitate the completion of a major construction project: A case study, *Construction Management and Economics*.
- Walker, D. and Hampson, K. (2001), Enterprise networks, partnering and alliancing, in D. Walker and K. Hampson (eds), *Procurement Strategies: A Relationship-based Approach*, Blackwell Science Ltd Press, UK.
- Wilson Jr, M.J. and Koehn, Ed. E. (2000). Safety management: Problem encountered and recommended solutions. *Journal of Construction Engineering and Management*, Vol, 127
- Wilson, G. (2000), Moving Towards a Zero Injury Objective. *Journal of Construction Engineering and Management*,
- Wilson, J. (2000), Safety management: problems encountered and recommended solutions", *Journal of Construction Engineering and Management*, Vol. 126
- Workmen's Compensation Law 1987 (PNDC Law 187)
- Workzone Safety, (on-line), Available: [http://www.workzonesafety.org/crash\\_data/occupational injuries](http://www.workzonesafety.org/crash_data/occupational_injuries)
- Yates, J. K and Lockley, E.E. (2002), Documenting and Analysing Construction Failures. *Journal of construction Engineering and Management*, Vol.128

## **APPENDIX A (SURVEY QUESTIONNAIRE)**

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF BUILDING TECHNOLOGY**

*Confidential questionnaire survey*

This questionnaire is part of a survey being conducted on **SAFETY MANAGEMENT PRACTICE IN THE CONSTRUCTION OF ROAD WORKS IN THE PUBLIC SECTOR-A CASE STUDY OF THE DEPARTMENT OF URBAN ROADS**. It is in partial fulfillment for the award of a Master of Science Degree in Construction Management at the Kwame Nkrumah University of Science and Technology, Kumasi. I shall be extremely grateful if you could take part in the survey by responding to the following set of questions. It is purely for academic and research purposes only. Your anonymity is assured and information given shall be treated confidential.

**Please tick [] where appropriate**

### **SECTION A-BACKGROUND INFORMATION (RESPONDENTS DATA)**

1. Please indicate institution of work:

a) Government ministry [  ]

b) Private Contractor [  ]

2. What is your profession?

[  ] Civil engineer

[  ] Quantity Surveyor

[  ] Material engineer

[  ] Project/Construction Manager

[  ] Site Supervisor

[  ] General Foreman

Others (please specify.....)

3. What is your highest educational qualification?

Postgraduate

First Degree

HND/ Diploma

Technician (CTC I CTC II CTC III)

Others (please specify.....)

4. How old are you?

18-30 years

31-40 years

41- 50 years

51-60 years

Over 61years

5. What is your marital status?

Married

Single

6. How many years of experience do you have in the road construction industry?

0-5 years

6-10 years

11-15 years

16-20 years

Over 20 years

7. Which stage of construction phases are you involved in?

Construction Planning Stage	Construction Documentation Stage	Construction Execution Stage	Evaluating the construction Process Stage(The Whole Construction Process	None
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PART B**

7. Kindly indicate on Scale 1-5, the extent to which you employ the following safety management practices on construction site

On a scale of 1= Never, 2=Sometimes, 3=Little, 4=Often, 5=Always. How would you rate the following statements (Tick/cross)	1	2	3	4	5
1. Provision of Safety Posters and safety boards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Provision of health and safety clothing and equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Provision of health and safety signs at vantage points to educate and inform workers and visitors on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Provision of adequate welfare facilities on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Provision of health and safe working environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Ensuring Health and safety education of various work trades on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Control of hazardous activities on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Discussing health and safety during site meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Designated health and safety person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Using outside health and safety consultants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Provision of canteen service on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Provision of first aid box	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Workers participation in hazard identification on Sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Using health and safety posters and directions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Using health and safety posters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Communicating health and safety performance to employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PART C**

On a scale of 1= Not Significant, 2=Slightly Significant, 3=Moderately Significant, 4=Very Significant, 5=Extremely Significant, how would you rate the following statements (Tick/cross)	1	2	3	4	5
<b>How significant are the following factors in the influencing safety management practices</b>					
1. Development of health and safety policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Reward workers who demonstrate exemplary health and safe behaviour on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Top management checks of health and safety records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Implementation of safety management systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Documenting risk assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Training of health and safety officers to improve on their performance on safety and relevant legislation on the jobsite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Developing new technologies in the execution of construction projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Frequency of a site supervisor's correcting workers' unsafe actions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Disciplinary action for not conforming to safety practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Development of emergency plan and procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Frequency of a foreman's announcing safety related matters to workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. More supportive upper management attitude towards safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Insufficient funding on health and safety activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Providing inadequate information on health and safety practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Lack of understanding for the need for health and safety practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Reluctance to input resources to safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Health and Safety information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Incentives for good safety performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Conduction of organizational policy review	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Formal health and safety policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



21. Insurance cover for sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Planned health and safety training for supervisors and/ or senior management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Verbal communication with operatives during site tours	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Accident reporting and maintenance of records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>The following factors can have a challenging impact on safety management practices on construction sites on a scale of 1= strongly disagree, 2=Disagree, 3=neither agree nor disagree, 4=Agree, 5=Strongly Agree, how would you rate the following statements (Tick/cross) in your opinion</b>					
<b>SAFETY MANAGEMENT PRACTICE CHALLENGES</b>					
1. Low level of construction technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Lack of attention to safety management by the department/company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Inefficient communication channel notifying all staff about the safety responsibilities of every employee?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Inadequate provision of appropriate resources and logistics for performance safety management practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Inadequate safety training and education for workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Inadequate safety inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Insufficient conduct of safety operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Poor quality of construction materials and equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Insufficient involvement of the Department/Company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Too complicated construction project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Thank You**

## **APPENDIX B (EVALUATION QUESTIONNAIRE)**

**KWAME NKURUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF BUILDING TECHNOLOGY**

**MSc. CONSTRUCTION MANAGEMENT**

### ***EVALUATION QUESTIONNAIRE***

This questionnaire is part of a survey being conducted on the **SAFETY MANAGEMENT PRACTICES IN THE CONSTRUCTION OF ROAD WORKS IN THE PUBLIC SECTOR-A CASE STUDY OF THE DEPARTMENT OF URBAN ROADS**. It is in partial fulfillment for the award of a Master of Science Degree in Construction Management at the Kwame Nkrumah University of Science and Technology, Kumasi. I shall be extremely grateful if you could take part in the survey by responding to the following set of questions. It is purely for academic and research purposes only. Your anonymity is assured and information given shall be treated confidential.

**Please tick [✓] where appropriate**

#### **RATINGS SCALE DEFINITIONS**

No –Not in place

Yes- In Place

- 1- In place but limited or little/no documentation
- 2- In place, including documentation, no audit or review
- 3- In place, proven performance, up to date documentation, periodic audits

No	<b>SAFETY MANAGEMENT PRACTICES (MANAGEMENT COMMITMENT)</b>	No	Yes	1	2	3
1	Does the Department/Company have a written Safety Policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Does the Department/Company have a Safety Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Does the Department/Company conduct workforce Safety meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Do Management/ supervisors participate periodically in safety meetings with construction employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Does management always Personal Protective Equipment (PPE)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Is management committed to ensuring safety on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Does management put in measures to prevent accidents on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Does top management check safety records of the Department/Company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Does management makes well enough budgetary allocation for the implementation of safety programs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Does the Department/Company have a Safety Officer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Does the Department/Company have Safety goals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	<b>SAFETY RESPONSIBILITY AND JOB TRAINING</b>	No	Yes	1	2	3
12	Does the Department/Company assign Safety responsibilities do individuals on construction sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Does the assigned Safety personality clearly identifies with the Department/Company's Safety policies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Does the assigned personality works full time as a Safety Person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Does the Department/Company have printed brochures and publication on safety?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Does the Department/Company provide Toolbox meetings to construction employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Does the Department/Company conduct regular supervision to ensure projects are carried in compliance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Does the Department/Company train its employees in the	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	<b>INCIDENT REPORTING &amp; INVESTIGATION</b>	No	Yes	1	2	3
18	Does the Department/Company have a process in place for immediate reporting and investigation of accidents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Does the process include immediate notification of top management of the Department/Company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Does the process include root causes analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	<b>INSPECTIONS &amp; HAZARD IDENTIFICATION</b>	No	Yes	1	2	3
21	Do Safety committee/Auditor conduct pre-task safety assessments task?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Do supervisors and managers periodically perform Safety inspections of the construction site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Does the Department/Company keep safety inspections records on file and are they readily available for reviews?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Does Management have a program in place for employee recognition and reporting of work place hazards that encourages employee to intervene when	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	Does the program include a follow-up system to ensure that all reported incidents and conditions are corrected in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	<b>MEDICAL/WELFARE FACILITIES</b>	No	Yes	1	2	3
26	Does the Department/Company have a process in place to provide emergency medical /first aid?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Is first kit/aid provided on construction site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Are first aid provided on site adequate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Do you have adequate Personal Protective Equipment(PPE) on construction site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	Does management provide workers with good shelter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Does management provide construction workforce with food and good drinking water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Does management provide workers with adequate facilities for washing, cleaning, drying, smoking, toilets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	TECHNICAL FACTORS	No	Yes	1	2	3
33	Do the Department/Company have regulations in place to ensure that works are carried out in safe manner?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	Does the Department/Company have a written maintenance policy covering the maintenance of facilities,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	Does the Department/Company conduct training for workers on the proper handling of tools, equipment and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	Does the Department/Company have adequate fire extinguishers on construction sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37	Does the Department/Company conduct periodic servicing or maintenance of equipment on construction sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38	Does the Department/Company have regulations or policies governing the storage of flammable liquids and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No	OTHER COMMENTS	No	Yes	1	2	3
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>