

AN ASSESSEMENT OF OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS
ON THE AYANFURI RESETTLEMENT PROJECT IN GHANA

By

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ABSTRACT

Construction projects involve a lot of hazards and hazardous activities. There are several legislative frameworks that seek to address occupational health and safety at various workplaces in Ghana. However, incidents and near misses usually occur, and may result in disabilities and fatalities if the necessary steps are not taken. The aim of the study is to audit and review occupational health and safety requirements on the Ayanfuri Resettlement project for improvement. The objectives are to identify the occupational health and safety requirements on the Ayanfuri Resettlement project, assess the level of awareness of personnel involved in the project of the occupational health and safety requirements, identify shortfalls and outline ways of improving the shortfalls in the requirements. The research adopted a quantitative research method where all 56 personnel involved with the project were sampled. Numbers mostly presented as frequencies and percentages were used to depict responses from respondents. The study established that 60.00% of project managers/ coordinators and supervisors say there is no project management plan being used on the project, there is no permanent OHS officer on the project, 57.10% of the respondents said no to first aid boxes at their work areas, 65.50% said no to the conduction of safety emergency simulations and although no documented safety management plan, most workers were aware of their duties and responsibilities when it comes to safety. These imply there may be lapses in the management of occupational health and safety on the project. It was, however, recommended that the project managers and project team members develop a safety management plan for the project, a permanent OHS officer be employed to be part of the project team, first aid boxes to be made available at all work areas and the frequent conduction of simulation drills.

KEYWORDS: Health, Safety, Occupational Wellbeing, Safety Requirements

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LIST OF ABBREVIATIONS

BSc.	Bachelor of Science
FOSA	Factories, Offices and Shops Act
GHS	Global Harmonized System
HND	Higher National Diploma
ILO	International Labour Organisation
JHA	Job Hazard Analysis
JHS	Junior High School
LI	Legislative Instrument
LTI	Loss Time Injury
MSDS	Material Safety Data Sheet
OHS	Occupational Health and Safety
OHSE	Occupational Health, Safety and Environment
PMGL	Perseus Mining (Ghana) Limited
PPE	Personal Protective Equipment
SHS	Senior High School
SPSS	Statistical Package for Social Sciences

DEDICATION

I dedicate this work to the almighty God who has been so merciful to me, my lovely wife Leticia Boakye, my children Eliana Nkunim Darko and Eldad Nyameba Darko and not forgetting my sweet sisters Janet, Juliana and Mercy.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Occupational health and safety policies and practices when initiated can help in the safe delivery of projects. The International Labour Organisation (ILO) convention number 155 has not been ratified by the government of Ghana. Documented evidence shows no national policy about health and safety but certain industries in Ghana have laws and regulations guiding their approach to occupational health and safety (Annan, Addai and Tulashie, 2015; Mustapha, Aigbavboa and Thwala, 2018). The Ghana Labour Act 2003, (Act 651) section 119 talks about how health and safety can be improved at the workplace. Although health and safety need to be managed proactively to prevent injuries and accidents, the Workmen's Compensation Act 1987 (PNDCL 187), also talks about how workers need to be compensated, should they get injury on the job.

The Mineral and Mining Regulation 2012, L.I. 2182 also outlines roles and responsibilities for employers and employees working in the mining industry to always adhere to safety. Individuals who contravenes any regulation in the L.I. is culpable and may be liable to a series of punishment including fines and imprisonment. All activities and projects initiated by a mining outfit needs to be managed with the occupational health and safety provisions in the L.I. Mining involves a lot of hazardous activities and processes and according to the mining regulations L.I. 2182, communities and settlements needs to be a least 500m away from mining sites before mining activities starts.

The Ayanfuri resettlement project was initiated to relocate settlers from Fobinso, Abnabna, Chirawewa, Esuajah North, Nkonya and Fetish which were all earmarked for mining activities by Perseus Mining (Ghana) Limited (PMGL). Resettlement projects involve primarily the construction of buildings and roads. Construction works also involve high risk activities which

can also result in injuries and accidents. There are several hazards at construction sites that also poses a serious threat to the safety and well-being of workers. Dust, noise, unsafe conditions and unsafe acts poses serious dangers to the health of workers. Awarded contracts need to stipulate clearly the safety requirements and how they will be managed on a project. The project managers, supervisors, health and safety officers of both the mining and contraction firm need to play various important roles in the management of health and safety on a project. Safety protocols need to be clear and easily understood by all to enable full participation. Daily prestart meetings and prestart inspections needs to be performed by individuals who are directly involved in the day to day execution of construction works.

To ensure safe working environments, safety requirements needs to be audited and reviewed periodically to enable safe delivery of mining projects.

1.2 PROBLEM STATEMENT

The Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182) assigns various responsibilities and duties to employers and employees in addressing health and safety management in the mining industry in Ghana. Mining institutions are then supposed to manage their health and safety on any programme, project or activity they conduct with strict adherence to the requirements in L.I. 2182. In order to achieve incident-free and good working environment on mining-initiated projects, occupational health and safety requirements are clearly defined in contract documents in relation to hazards and high-risk activities. These requirements include occupational health and safety protocols and practices that needs to be adhered to during the execution of the project to realise no near misses or incidents. The roles of the contracting parties and PMGL are also clearly stated to aid in smooth administration of these protocols.

Although Ghana has no national policy on occupational health and safety (OHS), there are still legislative instrument that carter for occupational health and safety at various workplaces. There

are laws like the Ghana Labour Act 651, Part XV (2003), Workmen's Compensation Law 187, 1987 and Factories, Offices and Shops Act 328, FOSA 1987 (Annan, Addai and Tulashie, 2015), which spells out duties and responsibilities when it comes safety at the workplace and occupational wellbeing. However, PMGL Occupational Health and Safety (OHS) department statistics shows that historical and current projects initiated by PMGL records incidents and near misses which at times results in lost-time-injury (LTI) (OHS, 2018). These LTIs being recorded might result in disabilities or fatalities if measures are not put in place to curb them.

The research will thus audit and review occupational health and safety requirements, which includes the protocols and practices, which are being used on the Ayanfuri Resettlement project and how they can be improved to curb the occurrences of LTIs which can be disabling and fatal.

1.3 RESEARCH QUESTIONS

The research sought to answer the following questions;

- i. How does Perseus Mining (Ghana) Limited (PMGL) and contracting parties handle occupational health and safety on the Ayanfuri Resettlement Project?
- ii. What is the level of awareness and participation of personnel (project managers, supervisors, construction workers) with regards to the occupational health and safety requirements on the Ayanfuri Resettlement project?
- iii. Are there any shortfalls in the occupational health and safety requirements on the project?
- iv. How can occupational health and safety requirements and practices be improved on the current and future projects?

1.4 AIM OF STUDY

The study sought to assess occupational health and safety requirements on the Ayanfuri Resettlement Project towards recommending improvements in them.

1.5 SPECIFIC OBJECTIVES OF THE STUDY

To achieve the aim of the study, the research adopted the following objectives:

- i. To identify the occupational health and safety requirements on the Ayanfuri Resettlement Project;
- ii. To assess the level of awareness of personnel (project managers, supervisors and construction workers) involved in the Ayanfuri Resettlement Project of the occupational health and safety requirements;
- iii. To identify any shortfalls in the requirements; and
- iv. To outline ways of improving shortfalls in the occupational health and safety requirements.

1.6 SCOPE OF THE STUDY

The research was carried out on the Ayanfuri Resettlement project. Respondents included all personnel who are involved in the current phase of the project which includes project managers and supervisors from contracting firms and Perseus Mining Ghana Limited (PMGL) and construction workers.

1.7 LIMITATIONS OF THE STUDY

Primary data was gathered only from personnel who are involved in the current phase of the project. The research also did not include analysis of historical statistics of occupational health and safety incidents on the project. Access to the occupational health and safety requirements on the project was not successful and thus only deduced from the study.

1.8 SIGNIFICANCE OF THE STUDY

There have been a rise in accidents around the mines in the past decade around the world (Ngubo *et al.*, 2016). This shows that more need to be done in developing requirements which will aid in the effective management of occupational health and safety on programmes, projects and activities of mining companies. The study sought to:

- i. expose the lapses in occupational health and safety requirements on mine-initiated projects;
- ii. assist mining companies to review their requirements in engaging external parties to undertake a venture on their behalf;
- iii. be a source for information for Minerals Commission of Ghana and other policy makers to adopt measures that will help ensure the occupational health and safety of workers on mining-initiated projects; and
- iv. serve as a basis for further research into the subject area.

1.9 RESEARCH METHODOLOGY

The research was designed to assess the occupational health and safety requirements on the Ayanfuri Resettlement project. Questionnaires was employed to access primary data from all the personnel involved in the project. Data was then analysed to draw out conclusions and recommend improvements. Thus:

- i. Questionnaire was developed to aid gather information from workers on the Ayanfuri Resettlement project to identify the occupational health and safety requirements.
- ii. Quantitative analysis was used to analyse data with the aid of Statistical Package for Social Sciences (SPSS).
- iii. Conclusions and recommendations were then drawn from the analysis.

1.10 ORGANISATION OF CHAPTERS

The research paper has five (5) chapters.

- i. Chapter One: Introduction. This contains brief information of the research and set the tone in understanding the subsequent chapters.
- ii. Chapter Two: Literature Review. This contains review of papers and current knowledge in occupational health and safety.
- iii. Chapter Three: Research Methodology. This involves how data was collected and analysed.
- iv. Chapter Four: Data Analysis and Discussion. A section for detailed examination of data and interpretation of findings in relation to existing literature.
- v. Chapter Five: Conclusion and Recommendation. This contains concluding findings, interpretations and suggested opinions.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The chapter first and foremost talks about the overview of occupational health and safety (OHS) at workplaces and brief history into its origin. It further discusses the laws in Ghana that pertain to health and safety in various industries. It highlights the occupational health and safety services, its principles and problem encountered during its development. It also throws light on the recognition of hazards at the workplace thereby bringing the various types of hazards to bear. It talks about OHS in the construction industry, touching more on the hazards associated and how they can be evaluated. It also highlights the level of awareness of employers and employees to OHS requirements. Again, it talks about prevention and control of hazards and last highlights more on OHS management plan for projects.

2.2 OVERVIEW OF OCCUPATIONAL HEALTH AND SAFETY PRACTICES

Around 270 million individuals on the planet succumb to work related wounds, deadly and non-lethal consistently. A current International Labour Organization (ILO) reports assesses that roughly 2 million work related fatalities happen over the world every year. The social and financial expense to the work environment just as to people is noteworthy (Alli, 2008).

Work related wellbeing is a multidisciplinary activity aimed at;

- The assurance and advancement of the soundness of laborers by averting and controlling work related ailments and mishaps and by taking out work related factors and conditions dangerous to wellbeing and security at work;
- The improvement and advancement of sound and safe work, workplaces and work associations;

- The upgrade of physical, mental and social prosperity of workers and backing for the advancement and upkeep of their working limit, just as expert and social improvement at work;
- Enabling workers to direct socially and financially beneficial lives and to contribute decidedly to reasonable improvement.
- Work related wellbeing has continuously created from a mono-disciplinary, hazard situated action to a multi-disciplinary and thorough methodology that considers a person's physical, mental and social prosperity, general wellbeing and individual's development (Shimwell, 2001).

2.2.1 Brief History of Occupational Health and Safety

Worry for work related security and wellbeing is not a current issue. Numerous of the present wellbeing and security concerns were first seen more than 4000 years ago. An early record is related with the Code of Hammurabi that goes back to roughly 2100BC. Greek and Roman doctors, rehearsing somewhere in the range of 400BC and 300AD, communicated worry for the strength and wellbeing of people exposed to the metals regularly utilized during this period. These included Hippocrates, the Father of Medicine, and Pliny the Elder, a Roman doctor and researcher (Friend and Kohn, 2007).

Galen, a Roman doctor who lived during the subsequent century, expounded on work related infections and threats of corrosive mist to copper excavators. Ulrich Ellenborg, perceived, recognized and provided details regarding "the harmful and toxic vapours and exhaust of metals". Bernardo Ramazzini, or *The Disease of Workers*, thought about the primary treatise on work related ailment. At the beginning of the Industrial Revolution in England, Charles Thackrah, became concerned and worried about work related security and wellbeing and concentrated his efforts on the study of the impacts of expressions, life propensities, urban status, on wellbeing and life span (Friend and Kohn, 2007)

2.3 LAWS AND REGULATIONS ON OCCUPATIONAL HEALTH AND SAFETY IN GHANA

Proper enactment and guidelines, together with satisfactory methods for authorization, are key strategy instruments for the security of workers. They structure a reason for endeavours to improve working conditions and the workplace. The inspection component should make use, in addition to other things, of a worker's wellbeing observation framework, which might be controlled by the legislature, the network or the endeavour. Work enactment sets down minimum norms which are necessary and pertinent to everybody at the workplace (Alli, 2008).

The legal requirements for occupational and safety management in Ghana can be found in the Labour Act 651, Part XV (2003), Workmen's Compensation Law 187 (1987) and Factories, Offices and Shops Act 328, FOSA(1970) (Dwumfour-Asare and Asiedu, 2013), and also the Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182).

The previously mentioned lawful instruments or laws are worked under various associations, for example, the Inspectorate Division of the Minerals Commission, the Department of Factory Inspectorate, and the Labour Commission. The presence of the various kinds of ventures, (for example, mining, development, vitality, sustenance handling, fabricating, agriculture, transport, and the present oil and gas) in Ghana has prompted the presence of a huge Ghanaian workforce with numerous comparative introduction gatherings, showing shifting modes, degrees, and frequencies of exposures to various synthetic, physical, ergonomic, and organic operators at various work environments (Annan, Addai and Tulashie, 2015).

Ghana has not yet endorsed the International Labour Organization (ILO) convention number 155, and hence, the global OHS prerequisite isn't pertinent in Ghana (Annan, Addai and Tulashie, 2015).

2.3.1 Ghana Labour Act 651, Part XV (2003)

According to the Labour Act 651, It is the obligation of an employer to guarantee that each employee works under acceptable, sheltered and sound conditions are protected and without hazards and also guarantees his/ her wellbeing. It shall also include the avoidance of pollution of the work environment by protecting workers from, poisonous gases and vapours, harmful substances, dust, exhaust and different substances or materials that might be detrimental to the security or wellbeing of workers. At the point when an employee gets him/herself in any circumstance at the work environment which she or he has sensible reason to accept it presents an inevitable and genuine risk to his or her life, security or wellbeing, he or she shall promptly report this reality to his or her immediate supervisor and expel oneself from the circumstance. An employer will not reject or fire the employee or retain any compensation from him/ her and the employer will not require an employee to come back to work in conditions where there is a proceeding inevitable and genuine risk to his life, security or wellbeing. An employee is required to report when practicable and not later than seven days from the date of any work-related mishaps and illnesses which happen in the work area. The Minister may by authoritative instrument make Regulations detailing explicit measures to be taken by bosses to protect the wellbeing and security of their workers (Annan, Addai and Tulashie, 2015).

2.3.2 Workmen's Compensation Law 187 (1987)

The Workmen's Compensation Law 1987 (PNDCL 187) was authorized in 1987 to supplant the old Workmen's Compensation Act 1963 (Act 174). The law gives that a worker regardless of his status who get hurt out of and over the span of his work must be paid money remuneration by his manager. The Armed Forces are not secured by this law. Should there be a mishap and over the span of one's work, the harmed individual should answer to his/ her supervisor of the organization for him/ her to observe the damage (if any). The Supervisor will present the harmed worker to the closest clinic or health facility for treatment. All pay cases will be paid

before a labour Officer. Be that as it may, on account of death, it will be paid at the Court. No pay will be payable in regard of any inadequacy or demise coming about because of purposeful self-damage. Where demise results from the mishap, payment is made to the ward of the perished worker. The organisation will pay the medicinal costs in regard of the damage, but if the worker doesn't survive, the organisation will bear the costs of the entombment. The law helps give salary and health advantages to work-mishap unfortunate casualties, give pay advantages to wards of those workers who die due to business related mishaps or diseases. It ensures by constraining the sum a harmed worker can recoup from an organisation through claim (Annan, Addai and Tulashie, 2015).

2.3.3 Factories, Offices and Shops Act 328, FOSA (1970)

FOSA has impediments, as of now counted despite the fact that it has been changed around multiple times under: (1) the Provisional National Defence Council (PNDC) Law 66 (1983), (2) PNDC Law 275 (1991) and (3) Ghana National Fire Service Act, 1997 (Act 537) (Ghana, Factories Offices and Shop Act 328, 1970), all to broaden its extension (Dwumfour-Asare and Asiedu, 2013). In any case, there are parts and segments of the record that expressly try to advance OSH. These are Parts 4 through to Part 7, and afterward Part 9 covering the accompanying: warning of mishaps, wellbeing and welfare, security, hazardous conditions and practices, and offenses and legitimate procedures. Some essential and basic prerequisites of FOSA are work environment pleasantries expected to advance wellbeing, security, welfare and individual cleanliness. These incorporate toilets, cover, seating, lounge areas, change rooms, drinking water, individual stockpiling, washing offices, workspace, temperature, air quality, lighting and ground surface, putting out fires and so on (Dwumfour-Asare and Asiedu, 2013).

2.3.4 Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182)

According to L.I. 2182, the manager of a mine is required to guarantee that changing rooms are given close to a man riding shafts on an underground mine and at work areas of a surface mine, with isolated arrangements for males and females and are proportionate in size to the quantity of people who will utilize them in the mine. The holder of a mining lease is additionally required to, with the endorsement of the Chief Inspector of mines before the initiation of mining activities, choose a confirmed chief or manager for the mine. People working in a mine are required to co-work with the supervisor of the mine in regard of the administration of the significant commitments under L.I. 2182. Workers are likewise required to evacuate people whom they know can unconsciously be exposed to poisonous gas or fumes, dust or hurtful temperatures and promptly alert the manager of the mine of the conditions. The manager is required to make further strides to guarantee the wellbeing and security of every individual who has been or may be exposed to the conditions indicated and amend and avert a repeat of those conditions.

2.4 NATIONAL POLICY ON OCCUPATIONAL HEALTH AND SAFETY

Sadly, Ghana like other third world nations has no thorough national strategy or policy on Occupational Safety and Health (OSH) (Dwumfour-Asare and Asiedu, 2013; Asumeng *et al.*, 2015). To guarantee that a National OSH (Occupational Safety and Health) strategy is extensive, measures ought to be taken to guarantee tripartite interest or, in other words, cooperation by government, managers and workers associations, in its plan, execution and audit. There must be cognizance as far as strategy content, just as during usage (Alli, 2008).

2.4.1 Key Features of a National Policy on Occupational Health and Safety

Below are the key primary highlights of a national approach on work related wellbeing (Alli, 2008):

- The plan of approach ought to reflect tripartite cooperation, for example there ought to be contributions from employers and employees' associations just as from government and others engaged with the area of work related to security and wellbeing
- The strategy ought to be predictable with national improvement goals and strategies all in all.
- The strategy ought to advance the privilege of employees to conventional, sheltered and sound working conditions.
- The approach ought to advance the improvement of a national preventive wellbeing and safety of the society that incorporates information, discussion and training.
- The arrangement ought to incorporate an arrangement for assembling the important institutional and financial assets.
- Coordination among every concerned organization ought to be cultivated as an inborn component of the strategy.
- All accessible methods for activities ought to be utilized reliably.
- The arrangement ought to support wilful compliance at managerial level.
- The strategy ought to be evaluated periodically.

2.4.2 Principles of Occupational Health and Safety Services

The fundamental standards for the advancement of work-related wellbeing and security administrations are as follows (Tadesse and Admassu, 2006). The service:

- should ideally be preventive oriented and multidisciplinary.
- ought to incorporate and supplement the current general wellbeing administration.
- should address natural contemplations.
- ought to include, investment of social accomplices and different partners.
- Should be based on state-of-the-art information, instruction, preparation, consultancy, advisory services and research discoveries.

- ought to be conveyed on planned approach.
- ought to be considered as a venture contributing emphatically towards guaranteeing efficiency and profitability.

2.4.3 Common Problems Encountered in the Development of OHS Services

Below are the basic issues experienced in the improvement of work-related wellbeing administrations incorporate (Tadesse and Admassu, 2006):

- Lack of awareness among workers, employers, wellbeing organizers and planners, strategy initiators, wellbeing experts and the whole population at large.
- Lack of human preparedness.
- Inadequate, difficult to reach and unjustly disseminated wellbeing administration organizations.
- Lack of multidisciplinary staff, absenteeism of field-testing hardware for natural and organic checking of the workplace and the accuracy of the employees.
- Insufficient spending plan for doing ordinary examinations, leading exploration exercises.
- The qualities of the workers, most are ignorant.
- Poor working condition.
- No explicit guideline/enactment on work related wellbeing and security issues.
- Unfavourable climatic condition and overwhelming heap of endemic infection, for example, bilharzias, onchocerciasis and trypanosomiasis.
- Absence of proper foundations on work related wellbeing and security.
- Little or no coordinated effort or collaboration among partners.
- Poor information trade/organization in the region of OHS.
- Lack of multidisciplinary discussion.

- Absence of incorporation of work-related wellbeing and security with general wellbeing administration.

2.5 RECOGNITION OF OCCUPATIONAL HEALTH AND SAFETY HAZARDS

Identifiable proof of work-related wellbeing and security dangers has frequently originated from observations of unfriendly wellbeing factors among workers. The potential issue must be distinguished, and its degree ought to be characterized (Tadesse and Admassu, 2006).

The motivation behind identification is to (Tadesse and Admassu, 2006):

- Obtain data on work related wellbeing stresses.
- Collect data on working conditions.
- Collect data on procedures.
- Obtain as far as possible qualities for substances.
- Collect data on the impacts on humans.
- Collect information on levels by using rudimentary estimations.
- Determine where issues or potential issues exist.

2.5.1 Classification of Occupational Health and Safety Hazards

The different Hazards which can cause work-related wounds, illnesses, disabilities or demise are (Tadesse and Admassu, 2006):

- Physical Hazards
- Mechanical Hazards
- Chemical Hazards
- Biological Hazards
- Ergonomic Hazards
- Psychosocial Hazards

2.5.1.1 Physical Hazard

Physical dangers integrated into the surroundings of the workers; for example, heat, cool, noisy noise, poor lighting, poor ventilation, vibration, power and radiations. Exorbitant warmth from stoves and heaters may cause exhaustion, cramp and heat stroke. It is normal industry medical issue might be hard to recognize as it develops gradually with time. Other non-sound-related impacts of noise include tinnitus, exhaustion, anxiety and annoyances decreasing human proficiency. Vibration from penetrating, hammer and etch may cause white fingers because of vascular fit and musculoskeletal wounds. Welding arc keratitis and corneal foreign bodies is normal if appropriate precautionary measures are not watched. Electrical damage happens when a flow goes through the body, meddling with the capacity of an inward organ or in some cases consuming tissue. Hazardous housing and dirtied general condition affect the health of the worker further (Ahmad and Nawaz, 2016; Foster and Barnetson, 2016).

2.5.1.2 Mechanical Hazards

Mechanical risks are those related with power driven machines, regardless of whether robotized or physically worked. Worries about such hazards go back to the Industrial Revolution and the early periods of motorization. In modern settings, individuals use machines intended to bore, shear, chip, staple, scrape, punch, shape, stamp, and cut (Tadesse and Admassu, 2006). A strain results when muscles are overstretched or torn. Strains and sprains can cause swelling and exceptional torment. A cut happens when a body part interacts with a sharp edge. Smashing wounds happen when a piece of the body is gotten between hard surfaces that continuously move together squashing anything between them. A basic crack is a break that does not puncture the skin. A compound crack is a break that has gotten through the encompassing tissue and skin. Puncturing results when an object enters straight into the body and comes straight out. Making an injury in the state of the entering object. The greatest danger is potential for harm to internal organs (Tadesse and Admassu, 2006).

2.5.1.3 Chemical Hazards

Numerous hazardous substances are utilized in industry, trade, farming, research activities, clinics and teaching institutions. The arrangement of hazardous substances depends to a great extent on the properties of such substances and their impacts on man. Enactment regarding this matter requires providing a specific pictorial image on any bottle or container. The terms utilized in the characterization of hazardous substances in the classification, labelling and packaging of Dangerous Substances Regulations 1984, are corrosion, explosive, oxidizing, harmful, highly flammable, very toxic and irritant (Wells *et al.*, 1991; Foster and Barnetson, 2016). The nine (9) Globally Harmonized System (GHS) Hazard pictograms relating to wellbeing, physical and ecological dangers are shown below.

<u>Pictogram</u>	<u>Hazard</u>	<u>Pictogram</u>	<u>Hazard</u>
 Exploding bomb	- Explosive	 Gas cylinder	- Gases under pressure
 Flame	- Flammability	 Corrosion	- Corrosive
 Flame over circle	- Oxidising	 Skull and crossbones	- Acute toxicity
 Health hazard	- Chronic health hazards	 Exclamation mark	- Certain health hazards (e.g. sensitisers)
 Environment	- Environmental hazard		

Fig 2.1: Globally Harmonized System of Labelling and Classification of Chemicals (Pryor and Capra, 2012)

2.5.1.4 Biological Hazards

Numerous biological agents, for example, infections, microorganisms, parasites, growths and organic dust have been found to happen in work exposures. In the industrialized nations, around

15 % of workers might be in danger of viral or bacterial contaminations and respiratory illnesses. In many developing nations, one of the main exposures is biological agents. Introduction to natural perils in working environment brings about a lot of occupationally related sicknesses. Natural perils include infections, microbes, growth, parasites, or any living organism that can make people sick (Rim and Lim, 2014; Messens *et al.*, 2019). Biological hazards can be transmitted to an individual through breathing, injection, ingestion and contact with the skin (Pryor and Capra, 2012)

2.5.1.5 Ergonomic Hazards

Ergonomics, otherwise called human factors engineering, is the science of structuring machines and items to boost the security, solace, and effectiveness of the general population who use them. Ergonomists draw on the standards of modern engineering, science of human measurement, muscular activity, psychology and anthropometry to adjust the plan of items and work environments to individuals' sizes and shapes and their physical qualities and confinements. Ergonomists likewise consider the speed with which people respond and how they process data, and their abilities for managing mental variables, for example, stress. Outfitted with the total picture of how people connect with their environment, ergonomists build up the most ideal structure for items and systems, running from the handle of a toothbrush to the flight deck of the space transport (Tadesse and Admassu, 2006; Putra *et al.*, 2018).

2.5.1.6 Psychological Hazards

Troublesome working hours, poor work-life balance, job insecurity, consistent pressure from top management for more profit, poor profession openings, discrimination, absence of correspondence, and low pay bring about working environment stress. Stress can cause different reactions among workers depending upon their age, sex and social support. Different sorts of characters, for example, some people will in general, experience more stress than others. At individual levels, it shows in two separate ways. Psycho-socially, it appears as time pressure,

animosity, uneasiness, misery, frailty, relational clashes, strain, decreased job satisfaction, restlessness, workplace violence, alcoholism and drug abuse (Asumeng *et al.*, 2015; Ahmad and Nawaz, 2016).

2.5.2 Factors Related to Injuries at the Workplace

Injury in the work environment is a worldwide significant hazard factor to the worker's physical and emotional wellness, which brings about financial weight on them, their managers and the general public. Should employers and workers comprehend their jobs, responsibilities and duties in guaranteeing hazard identification, evaluation and control at the workplace, it will counteract untoward episodes that causes damage, sickness, death and property damage. Powerful counteractive action makes organizations increasingly effective and spares lives. This is the reason, everywhere throughout the world, counteractive action is the concentration for governments, policy makers, financial chiefs and directors, and all partners of society (Adaeze, Ariffin and Huda, 2017).

2.5.2.1 Individual Factors Associated with Injuries at the Workplace

Age is a contributing individual factor in work-related wounds and fatalities. In Australia, the most noteworthy rates of work environment wounds experienced by men were in the age gatherings of 45-49 years (72 for every 1000 individuals) and 20-24 years (63 for every 1000 individuals). The most minimal age bunch for harmed men was 65 years and more than (30 for each 1000 individuals). The most noteworthy number of cases from injured workers for workers compensation were in the 45-49 years age range (13.7%), pursued by the 40-44 years age group (12.4%) and the 35-39 years age range (11.6%). A high number of males lodge compensation claims (88,865) than female workers (42, 245) (Kumar, 2011a). Such statistics put blame on individual workers for work-related wounds and fatalities based on their individual mentalities, convictions and practices with no assessment of the social and managerial commitments of the working environment. Individual workers do not do their work' in a 'social vacuum' based only

on their individual qualities. They work in 'socially organized and structured workplaces. Therefore, a thought of the social and organization variables related with work-related injuries is essential in completely understanding the complexity of injuries and fatalities (Kumar, 2011a).

2.5.2.2 Social Factors Associated with Injuries at the Workplace

The absence of safety culture in the workplace is a contributing social factor in work-related wounds and fatalities. Wellbeing at work is a product of safety culture, a result of social learning and the inculcation of safety in work processes and practices (Kumar, 2011a). Working environment and physical conditions are related as a contributing social factor in work environment wounds and fatalities. The physical parts of a work environment condition directly affect the efficiency, wellbeing and safety, comfort, concentration, job fulfilment and confidence of the general population. Moreover, factors in the workplace that are related to work-related wounds include work area layout, workstation set-up, furniture and equipment nature and quality, space, temperature, ventilation, lighting, vibration, radiation and air quality. Insufficiently planned and inadequately kept up work environments bring about poor physical working conditions that add to higher rates of worker wounds and fatalities (Kumar, 2011b).

2.6 OCCUPATIONAL HEALTH AND SAFETY IN CONSTRUCTION

High injury and fatality rates have always been associated with the construction industry. Earlier research has also established that small construction companies have a higher injury rates than larger ones. Three (3) main variables that affect small construction companies are time barriers, cost barriers and lack of safety awareness by workers and personnel involve in the construction project (Wong, Gray and Sadiqi, 2015).

Workers in the construction industry are exposed to greater proportions of injury resulting from fall from height compared to other industries. Workplace disease causing hazards construction workers are usually exposed to are dust, vibration and noise (Wong, Gray and Sadiqi, 2015).

2.6.1 Common Hazards in Construction Industry

Some of the common hazards associated with construction activities are as follows:

➤ Slip, Trip and Fall

Something as basic as a slip or outing is the single biggest reason for wounds on construction sites, prompting in excess of 1000 noteworthy wounds every year. Most of these wounds can be avoided by proper management of the site where workers need to go, for example, hallways, pathways and stairwells. The primary causes of this kind of accidents are walking over uneven ground, tripping over materials left around, slipping as a results of poor ground conditions, trips due to changes in level and tripping over cables (Anon., 2007).

➤ Fall from height

To avoid or minimise associated risk of hazard when planning, assume the work to be done and adopt a reasonable hazard-based strategy to identify appropriate safety measures. Slips usually occurs when there is not enough grip between leg and floor. Trips also occurs when one hits his leg against a lower object in his pathway (Anon., 2007b; Ismail, Dora and Ghani, 2012).

➤ Noise

Noise and vibration are connected in that noise emanates from a vibrating body and both noise and vibration are transmitted as waves through a medium. For noise, the medium is generally air. Vibration might be transmitted through strong structures, for example, the floor or the handles of equipment. Noise hazards tends to be detrimental the ears by causing hearing loss (Pryor and Capra, 2012).

➤ **Vibration and Motion**

The impact from vibration is entire body which can cause harm to the lower spine zone and harm to inside organs may happen. Research has shown that entire body vibration can increase rate, respiratory rate and oxygen uptake, and can result in changes in blood and pee; produce reduction in workers performance. The impact of vibration on the hand bring about the interruption of blood and oxygen supply to the fingers, bringing about harm to veins and sensory systems that are reversible, however with continuous exposures in the long run become irreversible. Vibrations from hand-held power equipment affects the operator's fingers and may cause shivering and deadness after a moderately brief timeframe. Vibrations brought about by hand-held power equipment are typically found in the higher frequencies (for example 40–300 Hz) (Pryor and Capra, 2012).

➤ **Crushing**

Crushing wounds happen when a piece of the body is gotten between hard surfaces that continuously move together squashing anything between them. Two classifications are squeeze-point types and run-in points. Squeeze-point exist when two hard surfaces, at least one of them moving, push close enough together to squash objects between them. Run-in point Hazards exist where two items, at least one of them rotating, come nearer together. Body parts can be squashed in different ways. A substantial heavy object falling on a foot; a mallet hitting a finger.

2.7 EVALUATION OF OCCUPATIONAL HEALTH AND SAFETY HAZARDS

The fundamental standards to assess work related wellbeing and safety hazards, and the philosophical reason for building up safe degrees of interventions to substances, physical and biological agents depend on the assessment or evaluation of the work environment. Assessment can be characterized as the processes that produce outcomes to curtail exposure to hazards. It

includes making decisions on the risk associated with a hazard from a procedure or work task and the adequacy of any control measures (Tadesse and Admassu, 2006).

2.7.1 Sampling for Hazards

There are various ways through which hazards can be evaluated at workplaces and among workers. These will help in proper evaluation of the various hazards that can affect the wellbeing of workers and make their work areas less hazardous.

2.7.1.1 Environmental Sampling

Environmental inspecting incorporates examining for gases, noise, temperature and so forth, which are found on the worker or the work area. General room air samplings are taken at fixed areas in the workplace. This kind of examining does not fully show the level of exposure of the worker. It is utilized principally to pinpoint high exposure zones, combustible or hazardous substances, or decide whether a region ought to be confined or not (Tadesse and Admassu, 2006).

2.7.1.2 Personal sampling

The goal of individual testing is to see the degree of exposure of the individuals working within a specific area or workplace. For instance, if the worker is working in a dusty area, you want to find out exactly how his health has been affected by working in such a place. It is the best way for assessing workers to identify any work-related illness or effects (Tadesse and Admassu, 2006).

2.7.2 Job Hazard Analysis

Job Hazard Analysis (JHA) is an analytical way that can improve an organization's general performance by identifying, analysing and remedying unwanted occasions that could bring about mishaps, ailments, wounds, and decreased in quality and low productivity. It is an employee/worker support program in which occupation exercises are watched; isolated into

individual units or steps; talked about; and recorded with the goal to identify, evaluate, eliminate or control hazards (unsuitable objects or conditions). JHA viably achieves this objective since it works at an exceptionally essential level. It audits each activity and separates it chronologically. When potential undesirable events are perceived, the procedure is repeated, and corrective measures identified. Leading a JHA can be an important learning background for both new and experienced representatives. In addition to the fact that it helps them comprehend their employments better, however it additionally acquaints them with potential hazards and includes them in finding solutions. Workers are bound to pursue systems if they have a voice in its planning. The JHA procedure makes workers consider wellbeing and how it is in line with their jobs (Friend and Kohn, 2007).

JHA can be conducted in three (3) ways (Friend and Kohn, 2007):

- Direct Observation Method: uses observational interviews to outline the various steps within a task and the associated hazards.
- Discussion Method: involves people who have done the job before brainstorming. It is done usually for infrequent task.
- Recall-and-Check Method: ideas are solicited whilst the task is ongoing and compiled and later sent to each member of the team involved in performing the task.

A typical JHA involves the following steps (Friend and Kohn, 2007):

- Breaking down the task into steps
- Identifying potential hazards
- Outlining solutions

Job Hazard Analysis: Hazard Identification, Risk Assessment and Control

Form

Task			Date		
Task Supervisor			Location		
Permits Required			PPE Required		
<input type="checkbox"/> Confined Space	<input type="checkbox"/> Working at height	<input type="checkbox"/> Land Clearance	<input type="checkbox"/> Hard Hat	<input type="checkbox"/> Safety Glasses	<input type="checkbox"/> Safety Boots
<input type="checkbox"/> Hot Work	<input type="checkbox"/> Excavator	<input type="checkbox"/> Electrical Access	<input type="checkbox"/> Gloves	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Overalls
<input type="checkbox"/> HV Access	<input type="checkbox"/> Isolation	<input type="checkbox"/> Other _____	<input type="checkbox"/> Dust Mask	<input type="checkbox"/> Other _____	<input type="checkbox"/> Other _____

RISK MATRIX AND CRITERIA

Rating	Consequences					Probability of Event					Risk Level	Action
	A	B	C	D	E	Rare	Unlikely	Possible	Likely	Almost Certain		
	People	Environment (reflects change from conditions existing before incident occurred)	Economic/ Production Loss (in USD)	Community Reputation	Compliance/Legal	Potential for incident to occur in the next 25 years	Potential for incident to occur in the next 5 years	Potential for incident to occur in the next year	Potential for incident to occur in the next month	Potential for incident to occur in the next week		
1 Insignificant	No injury or occupational illness	Insignificant impact identified	<\$10k	Low level/repairable damage to relationships/local complaints	Single, minor breach of internal/external obligations; no formal complaint	1	2	3	4	5	Low	Acceptable; manage with safeguards
2 Minor	First aid treatment (FAI)	Minor impact with timeframe = <1 week	\$100k - \$500k	Minor/medium term damage to relationships/minor adverse local public media or community attention	Breach of internal/external obligation with formal complaint	6	7	10	11	12	Medium	Tolerable with effective safeguards; monitor and review to confirm ALARP
3 Moderate	Medical treatment injury or occupational illness (recoverable)	Moderate impact with timeframe = 1 week to 6 months	\$500k - \$2M	Ongoing adverse impact to relationship/higher media and local community attention	Breach of internal/external obligations with penalties and/or rectification	8	9	13	19	20	High	Intolerable; action required to eliminate, reduce or transfer risk; monitor & review to confirm ALARP
4 Major	Lost time injury or occupational illness (recoverable)	Major impact with timeframe = 6 months to 1 year	\$2M - \$10M	Serious social impact/damage to corporate reputation at national level/raised in national media & criticism by NGOs	Loss of minor licences and potential for prosecution	14	15	18	22	23	Extreme	Intolerable; immediate action required to eliminate, reduce or transfer risk; monitor & review to confirm ALARP (as low as reasonably practicable)
5 Catastrophic	Disabling injury or occupational illness (non-recoverable); Fatality	Impact with timeframe = >1 year	>\$10M	Breakdown in social order/damage to corporate reputation at international level/raised in international media and by multiple NGOs	Loss of operating licence or prosecution potentially leading to major fines or imprisonment of executives or directors	16	17	21	24	25	Extreme	Intolerable; immediate action required to eliminate, reduce or transfer risk; monitor & review to confirm ALARP (as low as reasonably practicable)

Figure 2.2: A typical JHA form adapted from PMGL (OHSE, 2014)

2.8 PREVENTION AND CONTROL OF OCCUPATIONAL HEALTH AND SAFETY HAZARDS

Work related illnesses and wounds are, on a basic level, preventable. Among the ways to deal with it encompasses creating creating attention to work related wellbeing and safety hazards among employees and employers by finding powerful evaluation and control measures. This can go from support by suitable people or offices outside a working environment to the proclamation and thorough implementation of work-related wellbeing and safety guidelines. Working conditions, kind of work, professional status, and geographical area of the working environment affect the social health and status of workers (Tadesse and Admassu, 2006).

2.8.1 Hierarchy of Prevention and control techniques

To deal with the wellbeing and dangers because of different hazards and associated risks, measures should be set up for both anticipation and mitigation. In OHS, the chain of command of controls alludes to choosing control measures, from the best to the least powerful. The basic way of thinking is that it is in every case best to initially attempt to dispose of the hazard before it causes any harm. Where that is beyond the realm of imagination, the hazard ought to be contained at the source, along the way, and ultimately at the individual level. Each setting is unique, making a working environment evaluation important to distinguish risks and to characterize control measures (Anon., 2013).

There are five noteworthy classes of avoidance and control measures: elimination, substitution, engineering controls, administrative controls and personal protective equipment (PPE). Below is the hierarchy of prevention and control.

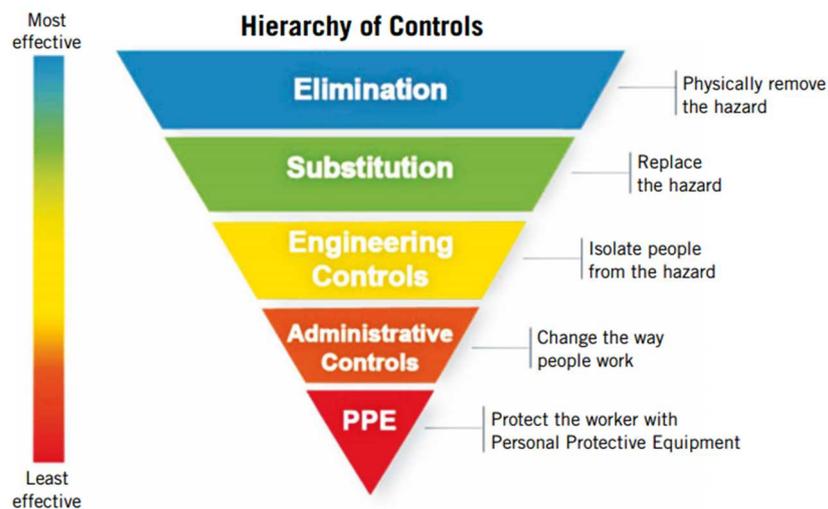


Figure 2.3: Hierarchy of Prevention and Control (Anon., 2013)

2.8.1.1 Elimination

Controlling at the source means disposing off the peril, or whatever is presenting the employee to risk. This includes executing a procedure to kerb patients from very infectious illnesses like viral haemorrhagic fevers (Anon., 2013). Hazard elimination is the best solution, but it is not

always easy to attain. Normally there are valid justifications why a procedure or activity must be done and why it must be done with a specific goal in mind(Tadesse and Admassu, 2006).

2.8.1.2 Substitution

Managers should where necessary, replace hazardous substance as a sense of protection for workers so far as it is possible. For instance, on account of asbestos or items containing asbestos, national laws and guidelines must accommodate its substitution, if in fact practicable different materials and items assessed by a skilled personnel to be less harmful are available (Alli, 2008).

2.8.1.3 Engineering controls

It includes controlling the hazards at the source. The management of the organization ought to guarantee that introduction to perilous substances, (for example, asbestos), is avoided or constrained by recommending engineering controls and work processes which ensures the safety of workers. Engineering controls worked in during the planning stage; might be executed later, however this will in general be more expensive. Engineering controls might be more costly than techniques which rely upon the worker's intervention but are safer. Another type of engineering control is the automation procedure which involves employing machinery to do more hazardous jobs instead of a person. These and other measures ought to be taken with the goal that the exposure levels are reduced to a level which is not perilous to the wellbeing and health of workers. Great work practices and working techniques can guarantee that perilous materials are contained before they become an issue. Where complete control has not been accomplished, good housekeeping and individual cleanliness are significant to guarantee working environment and individual safety (Alli, 2008).

2.8.1.4 Administrative Controls

Administrative controls expect to forestall dangerous practices and incorporate training workers in safe working strategies, standard working procedures, and limiting access to high-hazard work environment. Training on strategies, in wearing personal protective equipment (PPE), and isolation procedures are examples of administrative controls to avoid transmission of infections (Anon., 2013).

2.8.1.5 Personal Protective Equipment (PPE)

Control on a person is the least reliable measure in the hierarchy of controls. It includes the utilization of PPE, including impermeable outfit or coverall, hand gloves, respirator, hood to cover neck and face, eye security (goggles or face-shield) and boots with steel toe. Moreover, training in appropriate PPE wear, removal, storage and upkeep is expected to guarantee health, safety and wellbeing of workers. PPE ought to be worn after a proper job hazard analysis is completed. PPEs should not be shared among workers which will aid in the elimination of person-to-person infections (Anon., 2013).

2.9 SAFETY MANAGEMENT PLAN

Current worldwide workforce remains at about 2.8 billion. Workers spend around 33% of their lifetime at work. Workers deem safe workplace as their essential human right. Anyway, there are poor working conditions particularly in developing nations. Workers everywhere throughout the world, face work-related perils, the conventional as well as industrial due to mechanisation and globalization. This is bringing about more wounds, mishaps, diseases, disabilities and death. Work-related illness affects people, families and entire communities (Ahmad and Nawaz, 2016).

Employers needs to make sure that the health and wellbeing of workers are always assured. To be able to achieve this, a safety plan needs to be developed for the various projects they

undertake. A Safety Management Plan is a written document that portrays the potential hazards in the work environment, and the organization policies, controls and work practices used to limit those dangers. A safety management plan may comprise (Anon. 2019):

- Hazard Communication
- Emergency Action Plan and Fire Prevention Plan
- Bloodborne Pathogens Exposure Control

Regardless of the current conditions in a workplace requiring a Safety Plan, OHS requires that workers and their supervisors be trained in the dangers and control measures related with their allocated work. A Safety Plan serves as a tool for training (Anon. 2019).

A good safety management plan should have the following elements (Anon., 1997):

- Policy Statement: is a document detailing management's commitment to a safety, industry requirement, and so forth. It is signed by a top management member most the general manager.
- Responsibility for Safety: defined in writing for managers, supervisors, safety officers and general workers.
- Inspections: are carried at regular intervals within a period at the various work areas in an institution. A report produced each time after inspections are carried out.
- Incident and Accident Investigation: are carried out when any work-related injury occurs. First aid injuries and Lost time injuries are investigated to find root causes, corrective actions implemented when required.
- Safety Meetings: are held daily and monthly to discussed work-related hazards and infections. An attendance record kept.
- Safety Rules: are developed by management to ensure all workers are fit for work each time they come to work. These rules are made accessible to all employees.

- Training: programmes are implemented by management to indoctrinate new employee and old employees as well. Various equipment and procedural trainings too will be made available to the worker and his supervisor
- Records: are kept for future reference. These include accident investigation reports, safety meetings, training records, minutes of safety meetings and inspection records.
- First Aid: is available at each work area for easy by workers. A fully stocked first aid boxes is maintained and restocked as and when need be.
- Emergency Preparedness Programme: an emergency preparedness plan is developed by management to ensure safety to everybody that have access to the work area or site. Workers, visitors, contractors and vendors are evacuated during fires, flooding, explosions, chemical spillages and others. Employees are trained to be able to save lives and properties during emergencies and the handling of hazardous materials. All plans comply with the law of the land.

2.10 LEVEL OF AWARENESS OF OHS REQUIREMENTS TO PERSONNEL ON PROJECT

The level of awareness of workers to the requirements that aid in the administration of OHS on projects goes a long way in the prevention of workplace injuries and adverse effect on their health and wellbeing. The laws of the land about health and safety serves as a basis on which other requirements are developed for projects. A survey conducted on 1,003 employers in the manufacturing industry in Taiwan showed employers were aware of their responsibility in posting safety warnings and providing PPEs (Hu *et al.*, 1998). However, employers were less aware of their responsibilities in putting in measures to minimize injuries, accidents in the workplace, and hiring unfit employees. Less than half also knew about regulations in managing environment safely and few knew about Material Safety Data Sheet (MSDS) (Hu *et al.*, 1998).

To stimulate awareness of OHS among workers, the formation of health and safety committees ought to include employers and employees (Anon., 2010). The success of health and safety committees in creating awareness among workers has to do with the committees operating in an atmosphere of cooperation and be effective in the promotion and monitoring of a good OHS management plan (Anon., 2010).

Although Ghana has no national policy on OHS (Dwumfour-Asare and Asiedu, 2013; Annan, Addai and Tulashie, 2015), there are laws that helps govern work related injury and health issues. These include Workman's Compensation Law 1987, the Ghana Labour Act 2003, the Ghana Health Services and Teaching Hospital Act 526 (1999), the Radiation Protection Instrument LI 1555, the Environmental Protection Agency Act 490 (1994), the Factories, Offices and Shops Act 328 (1970) and the Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182) (Annan, Addai and Tulashie, 2015). A survey conducted by Dwumfour-Asare and Asiedu, 2013, at KNUST, revealed that generally, there is low level of awareness to the laws and regulations relating to OHS in Ghana. However, most people were aware of the Ghana Labour Act 651 (2003), followed by the FOSA (Act 328) and the Workmen's Compensation Law 1987 (PNDCL 1987) (Dwumfour-Asare and Asiedu, 2013).

2.11 SUMMARY

Construction involves hazardous activities and tasks with some common ones being noise, dust, slip, trip and fall. The hazardous items and activities if not well managed will affect the wellbeing and safety of workers. Infections and injuries can result in the payment of high compensation cost also robs you of future projects if injuries and accidents become common on your construction site. To safely deliver a construction project, occupational health and safety (OHS) needs to be managed effectively. This can be achieved by possessing and employing well-structured safety requirements with which safety on the project will be administered by.

The safety requirements on a construction project can be grouped into mandatory, customer and client. In Ghana, mandatory requirements are the legislation which includes the Minerals and Mining (Health, Safety and Technical) Regulations, 2012 L.I.2182, Factories, Offices and Shops Act 1970, Workmen's Compensation Law, 1987 (PNDCL 187) and the Labour Act, 2003 Act 651, Part XV. The customer and performing organisation requirements, which includes their policies about safety and their management plans about the projects being executed, which are all in accordance to the mandatory requirements. The safety management plan outlines the various ways all safety needs will be achieved on the project.

An effective safety management plan should have components like responsibility for safety, inspections, incidents and accidents investigation, safety meetings and indoctrinations, first aid, training, records keeping and emergency preparedness. One of the major problems with the occupational health and safety requirements on construction projects, has to do with the awareness of workers and all stakeholders involved with the project about their existence and the details entailed.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter highlights the research design and method, the sample size and techniques adopted for the study. The strategy employed in the research is survey, with a quantitative research method. The sample size and technique used are highlighted as fifty-six (56) and census respectively. It also talks about data source being primary, gathered with a well-designed and self-administered questionnaire. It also talks about analysis of data with the help of Statistical Package for Social Sciences (SPSS) and the ethical considerations involved in carrying out the survey.

3.2 RESEARCH DESIGN

A research design is a technical plan that is implemented by the researcher to answer questions carefully, validly, factually and accurately (Kumar, 2011b). It is also the techniques employed in the conduct of a research. They provide ways of collecting, sorting and analysing data to come to conclusions (Walliman, 2011). The main purpose of research design is to provide the collection of relevant evidence with significant effort, time and resources. But how all these can be accomplished depends essentially on the reason for the research (Pandey and Pandey, 2015).

The design of the research was to assess the occupational health and safety requirements on the Ayanfuri Resettlement project. A survey was conducted to sample views of personnel involved in the project to determine the OHS requirements on the project, their awareness to those requirements, shortfalls in them and outlined ways for improvement in them. Questionnaires were used in gathering primary data and Statistical Package for Social Sciences (SPSS) was used in analysing the data, percentage descriptive and mean score rank were employed.

3.3 RESEARCH METHOD

Traditionally, quantitative and qualitative are the main categories that research methods are grouped (Nyame-asiamah and Patel, 2009). Quantitative method is used to test hypothesis by ultimately describing an occurrence with figures whilst Qualitative methods explore ideas through interpretation and explanation of events (Techo, 2016). A third method also exist in which both quantitative and qualitative methods are employed to test and explore ideas with figures and attempting to interpret and explain at the same time. This is known as mixed method (Creswell, 2003; Techo, 2016).

The research adopts quantitative approach after conducting a survey among personnel involved in the Ayanfuri Resettlement project. Numbers, in the form of percentages and mean score ranks, are used to depict responses from respondents regarding the presence of safety requirements, their awareness to those requirements and shortfall in them by presenting respondents with well-structured questionnaires. Views from respondents about ways for improvements are also outlined.

3.3.1 Population

Population is all the items of interest. Items of interest is what the researcher wishes to study. Population is group into general, target and accessible. The general population is what is always referred to by researchers. Items in the general population share at least a common characteristic (Asiamah, Mensah and Oteng-abayie, 2017).

The population is the personnel involved in the Ayanfuri Resettlement project.

3.3.2 Sample Size and Sampling Technique

The number of items selected from the population to form a sample, constitute a sample size. It ought not to be too large or too small but optimum. Cost can be determinant in determining sample size (Kothari, 2004). In order to get good samples, sample accuracy, which is making

sure all samples in the population has the same chance of being selected, and also sample precision, which has got to do with the increase in unbiased samples (Bernard, 2006) needs to be observed.

Sampling technique is the process of obtaining samples from a given population (Kothari, 2004). The sampling technique adopted for the research is census. Census is a technique in which all the entities or items within a population is selected. It is assumed that it achieves high accuracy as all elements are sampled and none is left (Kothari, 2004).

Due to the small number of personnel involved in the Ayanfuri Resettlement project, a census technique was adopted. All project managers/coordinators, supervisors and construction workers were involved in the sampling process. A total of fifty-six (56) personnel were on the project, three (3) project managers/coordinators, seven (7) supervisors and forty-six (46) construction workers.

3.4 DATA COLLECTION

Data collection becomes necessary after framing a research problem, developing a research design, creating a research instrument and selecting a sample (Kothari, 2004; Kumar, 2011b). While considering the tool that will be employed in collecting data, the researcher ought to consider whether primary or secondary data will be used because the methods involved in collecting the two (2) differs (Kothari, 2004). The type of data collection selected also has its associated ethical issues (Kumar, 2011b). Data collection methods includes questionnaires, interviews, schedules, observation techniques and rating scales (Pandey and Pandey, 2015).

The research employs the collection of primary data by using well-structured and self-administered questionnaires. Questionnaires are lists of questions related to one topic (Pandey and Pandey, 2015). Questionnaires were delivered to all personnel on the project.

3.4.1 Primary and Secondary Data

Primary data is obtained through first hand exploration like experimental and survey researches (Kothari, 2004). It involves the invitation of your sample to complete the questionnaires (Naoum, 2007). The research involved the gathering of primary data using well-structured self-administered questionnaires.

Secondary data involves data obtained through means other than primary. It may involve contacting organisations for information relevant to the research (Naoum, 2007). The research did not employ secondary data.

3.4.2 Questionnaire Design

The questionnaire was designed to capture information that will be analysed quantitatively. The objectives of the survey were the first consideration made by making sure all sections within the structure of the questionnaire will bring to bear each one of them. Again, the way the survey was going to be conducted was also taken into consideration. Introductory messages were clear enough so respondents would be able to provide the clear answers required. Questions and answers were framed from the point of view of the respondent. Open ended and close ended questions were asked, with most of the answers being nominal, ordinal and scales. The interviewer was also taken care of, to be able to explain clearly explain the point of view of the researcher to the respondents in conducting the survey. Lastly, how the data was going to be analysed was also taken into consideration (Abawi, 2013; Etikan and Bala, 2017).

The questionnaire was put into five (5) sections where section one (1) gathered demographic information about respondents. Chapter two (2) sought to identify the occupational health and safety (OHS) requirements on the Ayanfuri Resettlement project. Chapter three (3) explored the awareness of personnel to the OHS requirements on the project. Chapter four (4) also dealt with the lapses in the requirements whilst chapter five (5) gave room to respondents to predict or outline ways of improvements in those requirements. Chapters 1 and 2 used nominal scales

in its range of answers. Chapter 3 employed the ordinal scale, Likert to be precise. Chapter 4 used both the nominal scale and had a column for the respondent to fill in with his/her desired answer. Chapter 5 gave room for the respondent to write his/her desired answer.

The questionnaire was piloted among ten (10) people to see if it would achieve the intended purpose. The people answered questions on clarity, freedom of expression, protection of the privacy of the respondents and the total time it took to complete the survey.

3.5 DATA ANALYSIS

Data analysis is the examination for patterns in information and for thoughts that help clarify why those patterns are there. Ultimately, all analysis are qualitative because before you start any, you first have to conceive ideas, which will be the case throughout the life of the research (Bernard, 2006). The data was processed according to the plan used in developing the questionnaire (Kothari, 2004). The data was firstly edited, coded, classified and tabulated. Analysis was undertaken to establish the relationship between groups of questions. Statistical Package for Social Sciences (SPSS) was used to carry-out quantitative analysis on the data. Percentage descriptive and mean score rank were mostly employed.

3.6 ETHICAL CONSIDERATION

Several ethical considerations were observed in the conduct of the research. Participants in the survey were told the truth about the conduct of the study. They were encouraged to voluntarily engage in the process. They were also told that they could decide not to continue at any point in time they feel they don't want to do so. Their anonymity was assured as they were not required to give any information that might sell them out. The researcher also did not engage in any falsification of information and that the responses were as they were received from the respondents. The researcher also made sure to credit ideas that were gotten from previous researchers (Fouka and Marianna, 2011; Akaranga and Makau, 2016). Competency of the researcher in depicting dignity and honesty was brought to bear in the conduct of the research.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The chapter entails analysis of data gathered from respondents and discussion of the results. It highlights background profile of respondents, identification of the various occupational health and safety requirements on the projects, the awareness of project workers to them, shortfalls in safety requirements and ways by which they can be improved.

4.2 BACKGROUND OF RESPONDENTS

The fifty-six (56) people involved in the Ayanfuri Resettlement project took part in the survey. From table 4.1, out of the 55 respondents who indicated their literacy level, 41 were literates whilst 14 were illiterates, representing 74.50% and 25.50% respectively. The various positions on the project are Project Manager/ Coordinator, Supervisor and Construction worker. There was however no OHS Officer. 55 respondents indicated their positions out of which 3 are Project Managers/ Coordinators representing 5.50%, 7 are Supervisors representing 12.70% and 45 are Construction workers representing 81.80%. Again, out of the 55 respondents who indicated their academic qualification, there are no MSc/ MPhil graduates on the project. However, 6 have BSc/ HND qualification representing 10.90%, 21 have SHS qualification representing 38.20%, 15 have JHS qualification representing 27.30% whilst 13 people, representing 23.60% have no academic qualification. When it comes to the practical experience of respondents in the construction industry, all 56 respondents indicated. 50.00% which is 28 people have 1-5yrs experience, 11 people which represents 19.60% have 6-10yrs experience, 7 people representing 12.50% have 11-15yrs experience, 6 people representing 10.70% have 16-20yrs experience and 4 people, representing 7.10% have over 20yrs experience.

Table 4.1: Analysis of Background of Respondents

VARIABLE	OPTIONS	FREQU ENCY	PERCEN TAGE	VALID PERCEN TAGE	CUMM. PERCEN TAGE
Please indicate whether you are literate/ illiterate	Literate	41	73.20	74.50	74.50
	Illiterate	14	25.00	25.50	100.00
	Total	55	98.20	100.00	
	Missing	1	1.80		
	Total	56	100.00		
Please indicate your position on the Ayanfuri Resettlement Project	Project Manager/ Coordinator	3	5.40	5.50	5.50
	Supervisor	7	12.50	12.70	18.20
	OHS Officer	0	0	0	18.20
	Construction Worker	45	80.40	81.80	100.00
	Total	55	98.20	100.00	
	Missing	1	1.80		
	Total	56	100.00		
Please indicate your academic qualifications	MSc/ MPhil	0	0	0	0
	BSc/HND	6	10.70	10.90	10.90
	SHS	21	37.50	38.20	49.10
	JHS	15	26.80	27.30	76.40
	None	13	23.20	23.60	100.00
	Total	55	98.20	100.00	
	Missing	1	1.80		

	Total	56	100.00		
Please indicate your years of practical experience in the construction industry	1-5yrs	28	50.00	50.00	50.00
	6-10yrs	11	19.60	19.60	69.60
	11-15yrs	7	12.50	12.50	82.10
	16-20yrs	6	10.70	10.70	92.90
	Over 20yrs	4	7.10	7.10	100.00
	Total	56	100.00	100.00	

Source: Field Study, 2019

4.3 OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS ON THE AYANFURI RESETTLEMENT PROJECT

The study sort to identify the occupational health and safety requirements on project by seeking the views of respondents.

4.3.1 Frequency of Responses on OHS Requirements

Responses were received for two (2) questions about occupational health and safety policy and occupational health and safety management plan. From table 4.2, all 56 respondents provided answers for the question on the policy statement. 30 people, representing 53.60% said ‘Yes’, 19 respondents representing 33.90% said ‘No’ and 7 respondents, representing 12.50% said they ‘Don’t Know’. When it comes to the question on occupational health and safety management plan, one (1) person did not provide an answer, thus 55 valid responses were received. 30 respondents representing 54.50% said ‘Yes’, 20 respondents representing 36.40% said ‘No’ and 5 respondents representing 9.10% said they ‘Don’t Know’.

Table 4.2: Frequency of Responses on OHS Requirements

VARIABLE	OPTIONS	FREQUENCY	PERCENTAGE	VALID PERCENTAGE	CUMM. PERCENTAGE
Does your company have an Occupational Health and Policy statement dully signed by your company’s CEO in accordance to the legislations in Ghana?	Yes	30	53.60	53.60	53.60
	No	19	33.90	33.90	87.50
	Don’t Know	7	12.50	12.50	100.00
	Total	56	100.00	100.00	
Does your company have an Occupational Health and Safety Management Plan for the Ayanfuri Resettlement Project?	Yes	30	53.60	54.50	54.50
	No	20	35.70	36.40	90.90
	Don’t Know	5	8.90	9.10	100.00
	Total	55	98.20	100.00	
	Missing	1	1.80		
	Total	56	100.00		

Source: Field Study, 2019

4.3.2 Comparative Analysis on OHS Requirements

Comparative analysis is used to define the occupational health and safety requirements, namely safety policy statement and safety management plan, on the Ayanfuri Resettlement project by exploring the responses of respondents who are involving in developing and implement them. Among the various positions, project managers/ coordinators, OHS officers and to some extent supervisors, are in the best position to tell us about the various occupational health and safety requirements on the project. The frequencies of these respondents are used to determine the associations between the two (2) variables.

Table 4.3: Response on OHS Requirements

Does your company have an Occupational Health and Safety Policy statement dully signed by your company's CEO in accordance to the legislations in Ghana?						
Options	Yes		No		Don't Know	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Project Manager/ Coordinator	0	0.00	3	30.00	0	0.00
OHS Officer	0	0.00	0	0.00	0	0.00
Supervisor	2	20.00	5	50.00	0	0.00
Total	2	20.00	8	80.00	0	0.00

Does your company have an Occupational Health and Safety Management Plan for the Ayanfuri Resettlement Project?						
Options	Yes		No		Don't Know	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Project Manager/ Coordinator	2	20.00	1	10.00	0	0.00
OHS Officer	0	0.00	0	0.00	0	0.00
Supervisor	2	20.00	5	50.00	0	0.00
Total	4	40.00	6	60.00	0	0.00

Source: Field Study, 2019

4.3.2.1 Occupational Health and Safety Policy Statement

From table 4.3, there are no OHS officers on the project. However, there are 10 respondents who are project managers/ coordinators and supervisors. 2 respondents representing 20.00% said 'Yes' and 8 respondents representing 80.00% said 'No' to the question. It helps confirm that contractors working on the Ayanfuri Resettlement project do not have occupational health

and safety policy dully signed by their company’s CEO in accordance to the legislations in Ghana.

4.3.2.2 Occupational Health and Safety Management Plan

Again, from table 4.3, 4 respondents out of the 10 representing 40.00%, said ‘Yes’ whilst 6 respondents representing 60.00% also said ‘No’. This confirms that there is no occupational health and safety management plan developed for the Ayanfuri Resettlement project.

4.4 AWARENESS OF OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS ON THE PROJECT

The various variables used to assess the awareness of respondents on the occupational health and safety requirements on the Ayanfuri Resettlement project is captured in table 4.4. From table 4.4, a high number of respondents expressed strong agreement to their awareness of most of the various occupational health and safety requirements with their mean values more than 4. However, opinions seem to be divided with respondents to their awareness of three (3) variables ultimately disagreeing with them. These had mean values more than 3 but less than 4 with the presence of a safety management plan having a mean value of 3.24 and a variance of 2.262.

Table 4.4: Mean Rank of Awareness of Respondents to OHS Requirements

Variable	N	Variance	Mean	Rank
I know I must not take drugs and alcohol	56	0.636	4.73	1 st
I always know the appropriate PPEs I must use	56	0.658	4.68	2 nd
I fully understand my duties and responsibilities in terms of health and safety	56	0.679	4.61	3 rd
I know I must attend safety meetings and trainings	56	0.679	4.61	3 rd
I know how to undertake my task in a safe manner	56	0.577	4.57	4 th

I know who to report to when I encounter any health or safety issue	56	0.577	4.57	4 th
Safety awareness campaign is held regularly	56	0.690	4.54	5 th
I know I must report all incidents and near misses	56	0.800	4.50	6 th
I know the necessary safety precautions and needs of my job	56	0.471	4.46	7 th
I know what I must do when there is an emergency	56	0.716	4.39	8 th
I fully understand the duties and responsibilities my employer has in terms of health and safety	56	0.877	4.32	9 th
I know what I must do before I undertake a hot task	56	1.070	4.20	10 th
We have a Health and Safety rep	55	1.490	3.65	11 th
I know of the various legislation about Occupational Health and Safety in Ghana	56	1.852	3.45	12 th
We have a copy of the Safety Management Plan for the project	54	2.262	3.24	13 th

Source: Field Study, 2019

4.5 SHORTFALLS IN THE OHS REQUIREMENTS

To identify the shortfalls in the occupational health and safety requirements, sets of questions on an ideal safety management plan were presented to respondents on topics including policy statement, leadership, administration, responsibilities for safety, inspections, incident and accident investigations, safety meetings, training, first aid, emergency preparedness, records keeping, personal protective equipment (PPE), organisational rules, policies and procedures. Respondents were also provided spaces to write down other shortfalls they have noticed.

4.5.1 Shortfalls in Occupational Health and Safety Management Plan

Twenty-nine (29) questions on various components of an ideal occupational health and safety management plan were presented to respondents for them to indicate what they have and do not have on the project.

Table 4.5: Shortfalls in Occupational Health and Safety Management Plan

Safety Meetings and Training				
Are formal training organized for personnel responsible for conducting and investigating accidents and near misses?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	24	42.90	45.30	45.30
No	21	37.50	39.60	84.90
Don't Know	8	14.30	15.10	100.00
Total	53	94.60	100.00	
Missing	3	5.40		
Total	56	100.00		
First Aid				
Are there first aid boxes in your various work areas?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	22	39.30	39.30	39.30
No	32	57.10	57.10	96.40
Don't Know	2	3.60	3.60	100.00
Total	56	100.00	100.00	
Emergency Preparedness				
Does your company conduct regular safety emergency simulation with its emergency response team to test and review the effectiveness of the emergency response plan?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage

Yes	16	28.60	29.10	29.10
No	36	64.30	65.50	94.50
Don't Know	3	5.40	5.50	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Source: Field Study, 2019

From table 4.5, 36 respondents representing 65.50% said 'No', 3 respondents representing 5.50% said they 'Don't Know' and only 16 respondents representing 29.10% said 'Yes' to the conduction of emergency simulation with its emergency response team to test and review the effectiveness of the emergency response plan. This is an indication that the emergency plan does not cater for simulation exercises. Also, on first aid, 32 respondents representing 57.10% said 'No', 2 respondents representing 3.60% said they 'Don't Know' whilst 22 respondents representing 39.30% said 'Yes' to the presence of first aid boxes at their work areas. This is an indication that not all work areas have first aid kits, and an indication that, most work areas rather don't have it. On safety meetings and trainings, 24 respondents representing 45.30% said 'Yes', 21 respondents representing 39.60% said 'No' and 8 respondents representing 14.30% said they 'Don't Know' about formal training being organised for personnel responsible for conducting and investigating accidents and near misses. A vast majority said no, or they have no idea about such trainings, an indication that requirement is not available on the project.

4.5.2 Shortfalls Outlined by Respondents

A total of thirteen (13) respondents outlined shortfalls in the occupational health and safety requirements on the project. A couple of items were repeated between the respondents. Their observations are outlined below:

- Not all work areas are equipped with first aid boxes.
- No safety reps and safety officers on site.
- Poor personal protective equipment (PPE) policy.
- No tag-in tag-out system on site.
- No emergency response training held on the project site.
- No permanent emergency response team on site.
- Records of incidents not readily available on the project site.
- No organisation of safety simulation drills.
- No documented safety management plan.

4.6 WAYS OF IMPROVING OHS REQUIREMENTS

Respondents on the project were to suggest ways of improving the occupational health and safety requirements. Fourteen (14) respondents had certain improvement ways repeated between them, with the provision of safety management plan having a high frequency.

Suggested ways are as follows:

- There should be a safety management plan on site.
- First aid boxes must be provided at various work areas.
- Implement a proper personal protective equipment (PPE) policy which will also seek to maintain and regulate its usage.
- There should be safety reps among the construction workers and permanent safety officers on project site.
- There should be regular safety simulations.
- There should be formal training on safety for workers working on the project.
- Drug and alcohol policy should be implemented.
- The provision of safety signages at various locations at the project site.

- Increase in frequency of the visit by the occupational health and safety officers of Perseus Mining Ghana Limited (PMGL) to the project site.
- Records of incidents must be documented and kept on the project site for easy access.
- There should be a permanent emergency response team on site.
- There should be punitive measures nonconformance to occupational health and safety practices.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This is the concluding chapter of the research study conducted on the Ayanfuri Resettlement project that sought to assess the occupational health and safety requirements on the project. It entails key findings made from the study, conclusion and recommendation.

5.2 SUMMARY

The main aim of the research study was to assess the occupational health and safety (OHS) requirements on the Ayanfuri Resettlement project. The Ayanfuri Resettlement project was initiated by PMGL which involves the construction of buildings and roads in order to relocate residents of prospective areas for mining. The current phase of the project on which the study was carried out on, involves the construction of eight (8) units of houses with varying specifications. Literature on OHS was reviewed. OHS has to do with wellbeing and the safety of employees at their various workplaces. There are legal requirements under which the various responsibilities of employers and employees on occupational health and safety are spelt out. In Ghana, laws on OHS includes Ghana Labour Act 651, Part XV (2003), Workmen's Compensation Law 187, 1987 and Factories, Offices and Shops Act 328, FOSA 1987. For the Ayanfuri Resettlement project being initiated by a mining institution and being considered a mining-related project, Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182) is a necessary consideration as well. With constructions activities being associated with a lot of hazards and high-risk activities, occupational health and safety needs to be managed well on the project to help detect, analyse and eliminate hazards, incidents and accidents on the project. A good safety management requires adequate requirements. Safety requirements are group into mandatory, customer and performing organisation. Safety

management plans are occupational health and safety requirements developed for projects to aid in safety management and are unique to every project.

In assessing the safety requirements on the project, questionnaires were issued to the respondents on the project based on the following research objectives:

- i. To identify the occupational health and safety requirements on the Ayanfuri Resettlement Project;
- ii. To assess the level of awareness of personnel (project managers, supervisors and construction workers) involved in the Ayanfuri Resettlement Project of the occupational health and safety requirements;
- iii. To identify any shortfalls in the requirements, and;
- iv. To outline ways of improving shortfalls in the occupational health and safety requirements.

A census was conducted on the 56 respondents on the project. Statistical Package for Social Sciences (SPSS) was used in analysing the data. The percentages and frequencies of variables were mostly used in the analysis of the data and discussion of results. Mean score of ordinal data were also ranked to aid in the analysis and discussions as well.

5.3 RESEARCH FINDINGS

The project currently has 56 workers out of which 74.50% are literates whilst 25.50% are illiterates. 3 are project managers/ coordinators, 7 are supervisors, 45 are construction workers whilst 1 person did not indicate his position on the project. 10.90% have BSc/HND, 38.20% have SHS, 27.30% have JHS, whilst 23.60% have no academic qualification. Half of the 56 workers have 1-5yrs, 19.60% have 6-10yrs, 12.50% have 11-15yrs, 10.70% have 16-20yrs and 7.10% have over 20yrs experience in the construction industry.

Although majority of the respondents, 53.60% said Yes to the fact that they have an occupational health and safety policy statement in accordance with the legislation in Ghana dully signed by their company's CEO, all 3 project managers/ coordinators and 5 out of 7 supervisors on the project said otherwise. This is an indication that contractors working on the project do not possess an occupational health and safety policy statement dully signed by their CEO.

Safety management plans are unique, and every well initiated project should have one, but unfortunately, the Ayanfuri Resettlement project does not have one. Safety management plans are usually developed by project managers with the project management team and later made known and available to everybody on the project. However, out of the 10 project managers /coordinators and supervisors on the project, 60.00% of them says there is no safety management plan for the project whilst the remaining says otherwise. Supervisors spend more time on the project phase and in the discharge of their duties, safety management plans are paramount in their administration of safety and thus will be available to them if the project has one. 5 out of the 7 supervisors says there is no safety management plan for the project. Also, many respondents who suggested ways of improving safety requirements on the project suggested that, a documented safety management plan be made available on the project and the various work sites. On inquiring on the awareness of the respondents on the project to a safety management plan, the response of the 54 who answered tends to suggest that, they disagree to the existence of such document on the project.

Most of the respondents were fully aware of certain safety practices and rules although not documented in a safety management plan. There were high degrees of agreement to drug and alcohol policy, PPE policy, duties and responsibilities in terms of safety, safety meetings and trainings, undertaking task in a safe manner and what is required of them in terms of

emergencies. This awareness is as a result of a daily prestart safety meeting by the project team and monthly toolbox meetings organised by the OHS department of PMGL.

There is no permanent OHS officer on the project. None of the 56 respondents is a safety officer. There are also no safety reps among the 56 workers on the project. The response from almost all the respondents suggested a disagreement to a safety rep among them on the project. Again, recommendation from some respondents was also to get a permanent safety officer and safety reps. The absence of a permanent safety officer suggests that safety officers from PMGL pay visit to the project site from time to time and are not always present.

There has never been a safety emergency simulation drill on the project. Although almost all respondents indicated they were aware of what to do in terms of emergency, there has never been a drill to test them. 65.50% of respondents said 'No' to the conduction of emergency simulation drills. Some respondents also indicated that there are no permanent emergency response team on the project site.

First aid kits or boxes are not present in all work areas. 57.10% said 'No' to having first aid boxes in their work area. This is an indication that most work areas do not have them, and a few have.

Responses on formal training was from no idea to a disagreement over their occurrence. 45.30% said there have been formal training on safety on the project whilst 39.60% said otherwise. This implies even if they do occur, not all workers are aware and as such a few are, and those few participate as well.

Records of previous incidents are also not readily available on the project site and as such project workers are dependent on the OHS department of PMGL for records keeping and management.

5.4 RECOMMENDATIONS

The following recommendations have been made by the researcher based on the findings from the study:

- The policy statement on Occupational Health and Safety be pasted on notice boards on the project sites.
- A safety management plan be prepared for the project by the project team members, project managers from PMGL and the OHS department of PMGL. A copy of the plan should be left at the project site to be accessible to all.
- A permanent OHS officer be hired for the project to oversee the day-to-day safety activities on the project.
- Safety reps should be identified and selected among project team members and be trained.
- An emergency response team to be formed from project team members.
- There should be the conduction of safety simulation drills from time to time to help position project team members adequately in case of an emergency.
- There should be formal safety training for personnel on the site to broaden their safety knowledge and put them in good standing to deal with safety issues on the project.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

- A similar research should be conducted in a similar mining company-initiated construction project.
- Quantitative and qualitative methods should be used to carry out a similar research.
- A similar research should be conducted by taking into consideration the OHS statistics since the project initiation.

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APPENDIX A: ANALYSIS OF SECTION D

Policy Statement, Leadership and Administration				
Does the top management of your organisation show commitment to Occupational Health and Safety on the project?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	51	91.10	91.10	91.10
No	2	3.60	3.60	94.60
Don't Know	3	5.40	5.40	100.00
Total	56	100.00	100.00	
Does your senior management communicate policy, safety management plan on the project?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	54	96.40	96.40	96.40
No	1	1.80	1.80	98.20
Don't Know	1	1.80	1.80	100.00
Total	56	100.00	100.00	
Responsibilities for Safety				
Does your company's Occupational Health and Safety Policy specify responsibilities for Management, Employees and Contractors?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	52	92.90	94.50	94.50
No	0	0.00	0.00	94.50
Don't Know	3	5.40	5.50	100.00

Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		
Inspections				
Does your safety management team participate in workplace inspections and observations?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	54	96.40	98.20	98.20
No	1	1.80	1.80	100.00
Don't Know	0	0.00	0.00	
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		
Does your safety management plan specify the requirement for supervisors and employees to conduct periodic inspections of equipment and conditions at work areas?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	47	83.90	85.50	85.50
No	2	3.60	3.60	89.10
Don't Know	6	10.70	10.90	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Does your safety management plan specify how substandard safety practices are identified and reported?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	43	76.80	78.20	78.20
No	3	5.40	5.50	83.60
Don't Know	9	16.10	16.40	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Incident and Accident Investigations

Does your safety management plan document how accidents and near misses are reported and investigated?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	48	85.70	85.70	85.70
No	1	1.80	1.80	87.50
Don't Know	7	12.50	12.50	100.00
Total	56	100.00	100.00	

Does top management review and sign incident reports?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Ye	37	66.10	66.10	66.10
No	6	10.70	10.70	76.80

Don't Know	13	23.20	23.20	100.00
Total	56	100	100.00	

Are follow-ups on incident reports carried out?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	47	83.90	85.50	85.50
No	2	3.60	3.60	89.10
Don't Know	6	10.70	10.90	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Safety Meetings and Training

Does your company conduct inductions for everybody who enter your work area?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	55	98.20	98.20	98.20
No	1	1.80	1.80	100.00
Don't Know	0	0.00	0.00	
Total	56	100.00	100.00	

Does your company organise safety indoctrination and job orientation for newly hired employees?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	54	96.40	96.40	96.40

No	0.00	0.00	0.00	96.40
Don't Know	2	3.60	3.60	100.00
Total	56	100.00	100.00	
Are toolbox meetings conducted?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	54	96.40	96.40	96.40
No	1	1.80	1.80	98.20
Don't Know	1	1.80	1.80	100.00
Total	56	100.00	100.00	
Does your company organize regular periodic safety meetings?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	55	98.20	98.20	98.20
No	0	0	0.00	98.20
Don't Know	1	1.80	1.80	100.00
Total	56	100.00	100.00	
Are formal training organized for personnel responsible for conducting and investigating accidents and near misses?				
Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	24	42.90	45.30	45.30
No	21	37.50	39.60	84.90
Don't Know	8	14.30	15.10	100.00

Total	53	94.60	100.00	
Missing	3	5.40		
Total	56	100.00		

Does the company provide emergency response training to its employees?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	35	62.50	62.50	62.50
No	19	33.90	33.90	96.40
Don't Know	2	3.60	3.60	100.00
Total	56	100.00		

Are employees trained and instructed on the proper use and care of Personal Protective Equipment (PPE)?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	55	98.20	98.20	98.20
No	1	1.80	1.80	100.00
Don't Know	0	0.00	0.00	
Total	56	100.00	100.00	

First Aid

Are there first aid boxes in your various work areas?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	22	39.30	39.30	39.30
No	32	57.10	57.10	96.40

Don't Know	2	3.60	3.60	100.00
Total	56	100.00	100.00	

Emergency Preparedness

Are there Emergency Response Plan relative specific activities and work areas?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	35	62.50	63.60	63.60
No	16	28.60	29.10	92.70
Don't Know	4	7.10	7.30	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Does your company conduct regular safety emergency simulation with its emergency response team to test and review the effectiveness of the emergency response plan?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	16	28.60	29.10	29.10
No	36	64.30	65.50	94.50
Don't Know	3	5.40	5.50	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Records Keeping

Are historical data relating to incidents as well as regular review and report kept?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	50	89.30	90.90	90.90
No	3	5.40	5.50	96.40
Don't Know	2	3.60	3.60	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Are records of safety meetings and training kept?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	51	91.10	92.70	92.70
No	1	1.80	1.80	94.50
Don't Know	3	5.40	5.50	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Organisational Rules, Policies and Procedures

Does your company have risk assessment procedures to identify hazards at the workplace and recommend appropriate controls?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	51	91.10	94.40	94.40
No	1	1.80	1.90	96.30

Don't Know	2	3.60	3.70	100.00
Total	54	96.40	100.00	
Missing	2	3.60		
Total	56	100.00		

Does your company have requirement for high risk works in reference to procedures and rules for assessment of hazards and safe working plans (e.g.: working at height)?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	50	89.30	92.60	92.60
No	1	1.80	1.90	94.40
Don't Know	3	5.40	5.60	100.00
Total	54	96.40	100.00	
Missing	2	3.60		
Total	56	100.00		

Does your company have a drug and alcohol policy?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	53	94.60	96.40	96.40
No	1	1.80	1.80	98.20
Don't Know	1	1.80	1.80	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Does your company have procedures to prevent accidental operation of equipment, which might result in an accident (e.g.: work permit, lockout-tagout)?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	50	89.30	90.90	90.90
No	5	8.90	9.10	100.00
Don't Know	0	0.00	0.00	
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Does your company have a policy about PPE usage?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	55	98.20	100.00	100.00
No	0	0.00		
Don't Know	0	0.00		
Total	55	98.20		
Missing	1	1.80		
Total	56	100.00		

Does your company periodically audit and review the safety management plan?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	38	67.90	71.70	71.70
No	9	16.10	17.00	88.70

Don't Know	6	10.70	11.30	100.00
Total	53	94.60	100.00	
Missing	3	5.40		
Total	56	100.00		

Does your company have an active health and safety officer or rep?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	46	82.10	83.60	83.60
No	8	14.30	14.50	98.20
Don't Know	1	1.80	1.80	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

Personal Protective Equipment (PPE)

Does your company have a procedure for determining the PPE requirements for various kinds of works?

Options	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Yes	52	92.90	94.50	94.50
No	2	3.60	3.60	98.20
Don't Know	1	1.80	1.80	100.00
Total	55	98.20	100.00	
Missing	1	1.80		
Total	56	100.00		

APPENDIX B: RESEARCH QUESTIONNAIRE

To whom it may concern

Dear Sir/Madam,

Invitation to participate in a research into an assessment of occupational health and safety requirements on the Ayanfuri Resettlement Project

I write to request your assistance as personnel involved with the Ayanfuri Resettlement Project to complete the attached questionnaire. Currently, I am undertaking a Master of Science (MSc) in the Department of Construction and Technology Management of the Kwame Nkrumah University of Science and Technology (KNUST) under the supervision of Prof. Edward Badu. This research is entitled “**An Assessment of the Occupational Health and Safety Requirements on the Ayanfuri Resettlement Project**”.

This research seeks to assess the occupational health and safety requirements on the Ayanfuri Resettlement Project among personnel involved, identify lapses and recommend remedies.

The questionnaire will take 10 to 15 minutes. All your responses will be treated with strict confidentiality and used only for academic purpose. Your views are valuable for the success of this research. After the research, we are willing to share a summary of the outcomes with Perseus Mining Ghana Limited. For any enquiries, please contact James Asare Darko {Tel.: **020 433 8018**; & email: jamesasaredarko@gmail.com}.

Sincerely,

Asare, James Darko, MSc Student

Prof. Edward Badu, Supervisor

Department of Construction and Technology Management

**An assessment of Occupational Health and Safety Requirements on the Ayanfuri
Resettlement Project**

Questionnaire Survey

Important Instructions:

1. Please duly fill this questionnaire with reference to your current involvement with the construction activities on the Ayanfuri Resettlement Project.
2. Please answer the questions by ticking {such as “✓”} or checking {such as “☒”}.
3. If you wish to have a copy of the report on research findings, please provide your email address:

Section A: Background of respondent

Q1. Please indicate whether you are literate/ illiterate.

Literate ; Illiterate

Q2. Please indicate your position on the Ayanfuri Resettlement Project.

Project Manager/Coordinator ; OHS Officer ; Supervisor ; Construction
Worker

Q3. Please indicate your academic qualifications.

MSc/MPhil ; BSc/HND ; SHS ; JHS ; None

Q4. Please indicate your years of practical experience in the construction industry.

1-5yrs; 6-10yrs; 11-15yrs; 16-20yrs; Over 20yrs

Section B: Occupational Health and Safety Requirements

Question: Safety Requirements on the Ayanfuri Resettlement Project: Do you have knowledge of the **safety requirements** on the project?

Please, answer appropriately the questions on the safety requirements on the resettlement project.

Y = Yes; N = No; DK = Don't Know.

No.	Safety Requirements	Response
A	Policy Statement, Leadership and Administration	
1	Does your company have an Occupational Health and Policy statement dully signed by your company's CEO in accordance to the legislations in Ghana?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your company have an Occupational Health and Safety Management Plan for the Ayanfuri Resettlement Project?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>

Section C: Awareness of Occupational Health and Safety Requirements

Question: Safety Awareness: How **aware** are you of the occupational health and safety requirements on the Ayanfuri Resettlement Project?

Please, indicate your level of agreement with each of the following statement.

1 = Don't Know; 2 = Strongly Disagree; 3 = Disagree; 4 = Agree; 5 = Strongly Agree.

No.	Awareness	Degree of Agreement
		Weak <<<----- >>>Strong
	At the workplace,	
1	I fully understand my duties and responsibilities in terms of health and safety	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
2	I fully understand the duties and responsibilities my employer has in terms of health and safety	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
3	I know how to undertake my task in a safe manner	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
4	I know who to report to when I encounter any health or safety issue	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
5	I always know the appropriate PPEs I must use	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
6	I know what I must do before I undertake a hot task	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
7	I know what I must do when there is an emergency	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
8	I know I must not take drugs and alcohol	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
9	I know I must report all incidents and near misses	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
10	I know I must attend safety meetings and trainings	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5

11	We have a Health and Safety rep	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
12	We have a copy of the Safety Management Plan for the project	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
13	I know of the various legislation about Occupational Health and Safety in Ghana	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
14	I know the necessary safety precautions and needs of my job	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5
15	Safety awareness campaign is held regularly	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5

Section D: Occupational Health and Safety Requirements

Question: Safety Management Plan on the Ayanfuri Resettlement Project: How is your knowledge of the **elements** in the Safety Management Plan?

Please, answer appropriately the questions under the following elements of an Occupational Health and Safety Management Plan.

Y = Yes; N = No; DK = Don't Know.

No.	Safety Management Plan	Response
A	Policy Statement, Leadership and Administration	
1	Does the top management of your organisation show commitment to Occupational Health and Safety on the project?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your senior management communicate policy, safety management plan on the project?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
B	Responsibilities for Safety	
1	Does your company's Occupational Health and Safety Policy specify responsibilities for Management, Employees and Contractors?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
C	Inspections	
1	Does your safety management team participate in workplace inspections and observations?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your safety management plan specify the requirement for supervisors and employees to conduct periodic inspections of equipment and conditions at work areas?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>

3	Does your safety management plan specify how substandard safety practices are identified and reported?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
D	Incident and Accident Investigations	
1	Does your safety management plan document how accidents and near misses are reported and investigated?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does top management review and sign incident reports?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
3	Are follow-ups on incident reports carried out?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
E	Safety Meetings and Training	
1	Does your company conduct inductions for everybody who enter your work area?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your company organise safety indoctrination and job orientation for newly hired employees?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
3	Are toolbox meetings conducted?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
4	Does your company organize regular periodic safety meetings?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
5	Are formal training organized for personnel responsible for conducting and investigating accidents and near misses?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
6	Does the company provide emergency response training to its employees?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
7	Are employees trained and instructed on the proper use and care of Personal Protective Equipment (PPE)?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
F	First Aid	
1	Are there first aid boxes in your various work areas?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
G	Emergency Preparedness	

1	Are there Emergency Response Plan relative specific activities and work areas?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your company conduct regular safety emergency simulation with its emergency response team to test and review the effectiveness of the emergency response plan?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
H	Records Keeping	
1	Are historical data relating to incidents as well as regular review and report kept?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Are records of safety meetings and training kept?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
I	Organisational Rules, Policies and Procedures	
1	Does your company have risk assessment procedures to identify hazards at the workplace and recommend appropriate controls?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
2	Does your company have requirement for high risk works in reference to procedures and rules for assessment of hazards and safe working plans (e.g.: working at height)?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
3	Does your company have a drug and alcohol policy?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
4	Does your company have procedures to prevent accidental operation of equipment, which might result in an accident (e.g.: work permit, lockout-tagout)?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
5	Does your company have a policy about PPE usage?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
6	Does your company periodically audit and review the safety management plan?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>
7	Does your company have an active health and safety officer or rep?	Y <input type="checkbox"/> ; N <input type="checkbox"/> ; DK <input type="checkbox"/>

