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SCHOOL OF BUILT ENVIRONMENT

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION MANAGEMENT

AN INVESTIGATION OF THE CAUSES OF ACCIDENTS AND HEALTH HAZARDS ON CONSTRUCTION SITES AND THEIR MANAGEMENT IN KENYA (CASE STUDY OF NAIROBI COUNTY)

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DECLARATION

This research project is my original work and has not been presented for examination in any university.

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DEDICATION

This work is entirely dedicated to my family, you are forever my inspiration.

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To the Almighty God, I return all the glory.

ACRONYMS

GDP – Gross Domestic Product

KSHS – Kenya Shillings

KNBS – Kenya National Bureau of Statistics

MDGs – Millennium Development Goals

NCA – National Construction Authority

NEMA – National Environment Management Authority

KPRS II – Kenya Poverty Reduction Strategy II

KNCPC – Kenya National Cleaner Production Centre

ILO – International Labour Organisation

OH&S – Occupational Health and Safety

GoK – Government of Kenya

ISO – International Organization for Standardization

OSHA – Occupational Safety and Health Administration

UNCHSEO – United Nations Centre for Human Settlements & Habitat Organization

ABSTRACT

Construction industry is an important part of the economy in most countries; often seen as a driver of economic growth especially in developing countries. Typically, construction industry contributes significantly to gross domestic products (GDP) in most developing countries. Through the construction industry a number of facilities have been created such as transportation infrastructure, housing, health facilities, markets, electricity and water supply which also stimulate development of the other sectors such as agriculture, manufacturing industries, tourism, and transportation. However, the construction industry in Kenya continues to fail to fulfill this fundamental role due to the increased accidents and health hazards. The aim of this study was to investigate the factors causing accidents and health hazards and their extent in the construction sites in Nairobi County.

The factors identified in this study include workers false acts, inadequate safety performance, unusable materials, fate, low tool mainatances, supervisory fault and violations of safety procedures. The research design employed by the study was descriptive research. The target population was selected 'Class A' construction firms in Nairobi. Questionnaires were used to collect data. The completed questionnaires were analyzed using SPSS and findings presented using tables summarized according to the common themes. From the study it can be concluded that the occupational Safety and Health Act of 2007 was enacted to provide for safety, health and welfare of workers and all persons lawfully present at workplaces, including construction project sites to enable the elimination of the factors that increase accidents and health hazards in the construction industry in Kenya. However, lack of a clear and well-defined supervisory authority in the construction industry means such guidelines exist only on paper. Therefore the health and safety of construction sites in Kenya has been left at the mercy of developers. In the construction project sites therefore there exist good health and safety rules and regulations but very little enforcement.

Further research was recommended on the effectiveness and impact of health and safety management regulations on safety performance of construction companies in Kenya and the role and influence of clients and designers in construction.

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CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The construction industry is generally defined as economic activities that focus on the construction of physical structures, such as buildings and infrastructure, regardless of the construction being land or marine based (Omar, 2006). The industry plays an important role in any economy and its activities are also vital to the achievement of the socio-economic development goals of providing shelter, infrastructure and employment (Anaman and Osei 2007). Indeed, the interdependence of the construction sector and economic development has been addressed by various writers and in all cases, there is evidence indicating a direct link between investment in construction and economic growth. For instance, in an extensive study by Lopes (1998), it was revealed that countries that invested minimum of 4% into construction industry are likely to grow faster in their Gross Domestic Product (GDP). In Kenya, just like many other developing countries the construction industry is playing a vital role to achieve socio-economic development goals, providing shelter, infrastructure and employment, and above all contributing significantly to the GDP of the country. According to Kenya National Bureau of Statistics (KNBS) In 2015 Real Estate grew by 8.9% buoyed by the continued demand for residential and office space. The data shows that the growth was mainly in urban areas where there was suitable growth in demand for both residential and non-residential structures. The Economic Survey 2016 further supports the above by indicating that loans and advances for building and construction registered a substantial increase from Kshs 80.4 Billion in 2014 to 106. 3 Billion in 2015. It further states that the share of real estate to the Gross Domestic Product has been increasing steadily from 5.5% in 2010 years ago to 6.2% in 2015. Indeed, the construction industry in Kenya was the third largest growing economic sector outstripping the manufacturing industry in 2004 with a constant GDP growth of about 5.8 % from 2004 to 2005. This remarkably consistent growth increased to 6.1% in 2006. Furthermore, in 2007, it picked up again from 6.2% and peaked at 7.3% in 2008 (ISSER, 2005).

According to The Kenya Economic Survey of 2012 the building and construction sector recorded a slowed growth of 4.3 percent in 2011 compared to growth of 4.5 per cent in 2010. Loans and advances to the sector from commercial banks increased by 55.8 per cent from KSh 32.6 billion

in 2010, to KSh 50.8 billion in 2011. Overall expenditure for the Ministry of Roads in 2011/2012 was expected to rise by 34.4 per cent, from KSh 61.2 billion to KSh 82.3 billion. Cement consumption rose by 10.6 per cent from 3.1 million tonnes in 2010 to 3.4 million tonnes in 2011. Total value of private building works completed went up from KSh 38.3 billion in 2010 to KSh 43.1 billion in 2011.

These statistics show that the industry has a huge potential of leading the way for the economic development of developing countries such as Kenya if well exploited. Thus in specific terms, the Kenya construction industry could be the instrument for achieving the infrastructural guidelines of the Millennium Development Goals (MDGs) and The Kenya Poverty Reduction Strategy II (KPRS II) agenda. One of the main agenda of MDGs and KPRS II is to address human development issues of which Cotton et al (2005) noted that the agenda is achievable by the provision of infrastructure for services and employment through the construction industry if health and safety on construction sites are improved to promote and sustain efficiency. However, despite this strategic importance of the Kenya construction industry, the industry is fraught with health and safety issues. For example, it was reported that the construction industry, recorded 902 accident cases comprising 56 fatal accidents in 2000 and 846 non-fatal accidents (Danso, 2005). The same report indicated that Nairobi, the regional capital of Kenya, alone recorded 124 construction accident deaths from 1999 to 2004.

Literature available on this subject indicates that the construction industry all over the world is among the leading in cases of accidents. The ILO's global estimates for 2003 indicate that each year at least 60,000 fatal accidents occur on construction sites around the world or one fatal accident in every ten minutes. The more important fact is that most accidents are preventable if proper safety precautions are taken and more caution on health and safety techniques implemented. Most construction companies now have specific safety initiatives, injury-free work-place programs in place, but the threat of accidents still continues to be a concern to the construction industry which therefore necessitates this study.

Construction, health and safety issues are anchored in the Ministry of Labour, department of Construction Health and Safety. The Kenya National Industrialization Policy Framework (2010)

states that a safe work place reduces occurrence of work related accidents, diseases and insurance claims resulting in higher productivity levels and low production costs. In Kenya, it is almost impossible to characterize the conditions under which employees work due to the scarcity of data.

1.2. Problem Statement

The status of construction health and safety conditions in Kenya is an issue of growing importance to the industrialists, practioners, the Government and consumers. Shortfalls remain as more than half of the industrial accidents and injuries in Kenya go unreported. In the fiscal year 2008/2009, 300 accidents were reported. In the same period, 4,550 routine inspections and 9,120 medical examinations were carried out and out of these 505 workers were diagnosed with occupational diseases (Muchiri 2010). It's estimated that reported construction fatalities and injuries for the last five years 2000-2004 were: 1528, 1923, 1332, 1599 and 1387. This is viewed against the backdrop of factories and other workplaces being registered by the Department of Construction Health and Safety, but by the end of 2004 only 11,387 such enterprises are registered excluding the 1.3 million micro- and small enterprises (Nyakang'o 2005). Most of the reported accidents are those seeking compensation under the Workman's Compensation Act. In the year 2003 data indicates that mining, construction and transport accounts for 41% of accidents in Kenya, machine operators and assemblers 28% while other occupations share 31% of workplace accidents (Nyakang'o 2005). This shows that these occupations are injury prone while matters of safety are treated casually by both the employer and employees. In relation to age groups 44.4% of the injuries occurred to persons in the age group of 20 to 29 years, 25% to the age group of 30 to 39 years and 24% to the age group below 20 years (Nyakang'o 2005).

In comparison with other industrial sectors, the construction industry has a disproportionately high percentage of injuries and fatalities, accounting for almost 20% of the fatalities of all industrial workers but employing only 6-8% of the industrial work force. It is important to acknowledge the fact that the construction industry accounts for nearly 15 % of the workers' compensation injuries. Of all the injuries and deaths occurring on construction sites, negligence

is the single largest cause, accounting for almost 38% of the construction worker deaths (Nyakang'o 2005).

The GoK (2009) attributes the increasing number of deaths, injuries and severe losses to the increased cases of collapsing buildings not to mention those waiting to collapse. Could these accidents be due to the poor and improper regulation of the construction industry? According to conservative, Architectural Association of Kenya (2010) estimates that over 65% of buildings in Nairobi are death traps/accidents waiting to happen. Consequently, the Occupational Safety and Health Administration (OSHA) Act of 2007 were enacted to reduce the number of work site injuries and fatalities. However, despite the OSHA various regulations, there is still an unusually high number of injuries. This indicates that there is still more that needs to done to prevent construction injuries. Could the problem be resident in the lack of information and experience as intimated by Adan (2004)? The tragic collapse of buildings under construction is not a new phenomenon in the construction industry in Kenya. What is always new however, are the myriad excuses that the authorities give when a building collapses. Could human error may also be responsible for loss of lives in collapsed building particularly those under construction such as the 2006 site in Nairobi where 16 people died and over 200 were injured (Beintema et al., 2010)? Or could poor workmanship and/or weak regulatory mechanisms be behind the disasters as had occurred in the collapsing houses under construction in Busia, Mwiki, Kasarani as reported in the Kenyan press Standard (2009a)? As recently as May 2016, a building collapsed in Huruma killing 49 residents and rendering over 200 people homeless (The Daily Nation May 10th 2016).

The purpose of this study is to investigate the factors that cause accidents and health hazards and their prevalence on the construction sites in Nairobi.

1.3. Objectives of the Study

1.3.1. Overall Objective

This study investigates factors that cause accidents and health hazards and their prevalence in the construction industry in Kenya.

1.3.2. Specific Objectives

The study will be guided by the following specific objectives:

i. To identify the factors that expose workers to accidents in the construction industry in Kenya.
ii. To establish the extent of the said factors in Kenyan construction sites for better management.
iii. To identify and evaluate the effectiveness of the regulatory framework in reducing the accidents and safety incidents on construction sites in Kenya.

1.4. Research Questions

The study is therefore guided by the following research questions:

i. Which factors expose workers to accidents and other safety hazards?
ii. What are their prevalence in the construction sites in Kenya?
iii. Is there a legal/regulatory framework to safeguard the safety of workers in the construction industry?

1.5. Research Hypothesis

The study postulates that lack of an effective regulatory framework and weak enforcement arm in eradication of accidents and health hazards in the construction industry in Kenya is the main cause of accidents and safety hazards in construction sites.

1.6. Significance of the Study

While this study may be of value to any person interested in, the accidents and health hazard issues in the Kenyan Construction Industry. It is hoped that its findings will specifically benefit the following groups of people.

(a) The Government and the Policy Makers

The government and the policy makers stand to benefit from the findings of the study as they will gain insight on accidents and health hazards management models to apply in construction sites to ensure safety in the Kenyan Construction industry. This model is to ensure that lives lost and the monies for compensation to injuries, loss of damage of properties will be saved. The work force at the construction sites are not depleted and time and money wasted due to disruptions when accidents happen are also saved. The Kenya National Industrialization Policy Framework (2010) states that a safe work place reduces occurrence of work related accidents, diseases and insurance claims resulting in higher productivity levels and low production costs.

(b) Academics

The study is expected to contribute to the existing literature in the field of health and safety management in the construction sites to ensure overall safety in the Construction Industry in Kenya. Future scholars can use this research as a basis for further research.

(c) **Professionals within the Construction Industry**

The study stands to benefit all the professionals within the Construction Industry both in the public institutions and private sectors as they will understand the best ways of eliminating accidents and health hazards within the construction sites to ensure safety in the Construction Industry.

The research findings would contribute to a better understanding of caution on worker safety and health in construction site. This may enable focused intervention strategies and also coordinate efforts aimed at eradicating causes of accidents and health hazards practices to construction workers safety and health in construction sites. It can expose areas for further research and recommend how the regulatory framework can be strengthened and thus made effective.

The close relationship between construction activity and economic growth underlines the pivotal role of the construction industry in the process of growth and development in Kenya. The best guarantee for effective and profitable production in a labour-intensive construction industry such as that found in Kenya is a hazard and efficient workforce. Given the vital contribution of the construction sector in the socioeconomic development process in Kenya, safety and hazard in the

construction industry must be given utmost priority and actively promoted to ensure the physical and mental well-being of the workers (UNCHSEO, 1995).

1.7. Scope and Limitation of the Study

1.7.1. Conceptual Scope:

The interest of the study lies in the health and safety regarding incidents of accidents and health hazards and the work environment of building construction sites during the construction process. The study is therefore concerned with the health and safety measures and the challenges encountered in their management. The study also looked at the effectiveness of the enforcement mechanisms on the said measures.

1.7.2. Geographical Scope:

The study was carried out within Nairobi. As the capital city of Kenya, Nairobi is the center of construction activity in the country. A quick observation and reconnaissance of the area at any one time reveals that many construction projects are under construction at the same time see table 1.1 below. Nairobi was also appropriate because it offers various sites, some with very limited space and others with high-rise buildings which are more prone to accidents. It thus provides a rich source of data.

Limitations of time and resources did not allow for data collection for the whole country the findings can thus be generalized for the whole country.

The Table 1.1 below indicates the number and value of houses completed by the National Housing Corporation of which Nairobi is on the lead as at the year 2009. Thus the ever increasing numbers of complete houses in Nairobi annually influenced the consideration of the scope.

Table 1.1 Number and Value of Houses Completed by the National Housing Corporation

Province	Number					Value (KSh Million)				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Nairobi	--	--	160	230	230	--	--	137	463	463
Coast	--	--	161	--	--	--	--	196	--	--
Eastern	--	--	--	--	--	--	--	--	--	--
Central	30	--	24	--	--	50	--	45	--	--
Rift Valley	--	--	15	--	--	--	--	33	--	--
Nyanza	--	--	--	69	69	--	--	--	11	11
Western	--	--	--	--	--	--	--	--	--	--
North-Eastern	--	--	--	--	--	--	--	--	--	--
Total	30	--	360	329	299	50	--	411	474	474

Source; Republic of Kenya (2009, p.140)

1.8. Organization of the Study

This study was organized into five chapters;

Chapter 1 of the research forms a general introduction of the study and contains the preliminary items forming the background of the study, statement of the problem, study objectives, research questions, significance and justification of the study.

Chapter 2 provides a review of the books, articles and researches related to the subject of the research as theoretical and practical foundations for the research. The theories and concepts in the literature review becomes the basis for identifying and understanding the accidents and health hazards issues. This is in the broader concept of health and safety management in the construction industry.

Chapter 3 explores the methodological guide for the conduct of the study particularly the data gathered, the data collection method, data analysis approaches, and ethical concerns such as credibility and reliability of the research.

Chapter 4 contains data analysis and presentation directed towards answering the problems identified in the research.

Chapter 5 contains the conclusions and recommendations of the researcher based on the data presented and analyzed.

1.9. Definition of Terms

Architect- a person who's main role is to come up with the concept of the said building design.

Client- a person who's building concept is being actualized.

Contractor- a person or a firm whose role is to implement the buildings structure.

Construction industry- constitutes of various professionals, whose roles vary in their scope of the building requirements.

Engineer- a person who's r main role is to learn the effectiveness of the buildings structure.

Regulatory Framework- an institution mandated to enforce the various Government Acts.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This chapter is concerned with the review of literature related to the study. It covers the theoretical review, the empirical review, the conceptual framework and the research gap. The literature touches on factors that expose workers to accidents and other safety hazards and their prevalence in the construction site, management concepts on eradicating the causes of accidents and hazards to workers on construction sites.

2.1. Significance of the Construction Industry to National Economy

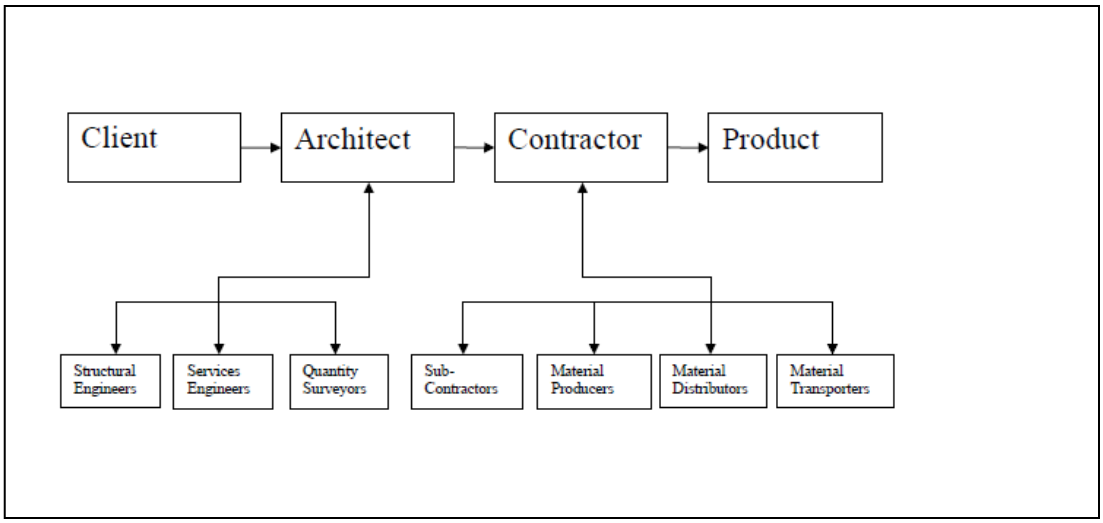
Construction contracting firms in both building and civil engineering sub-sectors require various types of efficiently managed assets in a different mix to successfully and profitably carry out their primary operation. In a complex and highly competitive industry as the construction industry, with ever changing operating environment, the asset portfolio of any contracting firm determines how far they can go, what they can handle and what share of the market they can get (CRB, 2010). The construction industry is vital in the development and maintenance of physical infrastructure of any economy. It provides the infrastructure that supports other sectors of the economy.

In developing countries the construction industry may account for anywhere between 1.8 – 11% of the GDP (Lopes, 1998) depending on the performance of the economy. This contribution could be much higher if the hidden economy, of which construction usually boasts a substantial proportion through its backward and forward linkages, is taken into account. Thus, construction plays an important role that goes beyond its share of national economy output in the development strategy of any country or region. In Kenya, the construction industry contributes about 4.0% of the GDP (GoK, 2009) and provides direct employment to 78,200 people. In the year 2005, this sector expanded by 7.2% (Kenya facts, 2006). Building construction is usually involved in nature of works which mostly have contracts. In Kenya, the cost of finance has been very high. Interest rates on borrowed funds have since the early 1990s been in excess of 20%. It is only recently that the rate has fallen below the said margin (20%). Firms have to decide on how to finance their operations.

Poor economic performance in Kenya characterized the last decade where the growth rate was very low. However, the economy has witnessed an upward growth in Real GDP from a low of 0.6% in 2002 to 6.1% in 2006 (GoK, 2009). NEPAD (2002) argues that many small and medium sized enterprises lack capital and that house-building contractors are particularly dependent on commercial financing. Access to finance on competitive and realistic terms is key to their viability and growth. Large firms have ready access both to debt and equity markets, but small firms have nowhere else to go but banks. Firms must be well financed for their continued stay in business. It is in the midst of this scenario that a cheap and reliable source of finance stands to enhance the performance of firms in the building construction industry. After deciding on the financing mix, the managers of the firm must still determine how best to physically acquire the needed funds. Lopes (1998) observed that according to the UN system of national accounts convention, construction is the only sector of the economy that appears twice in national accounts statistics: first as one of the sectors that compounds GDP by industry origin; and secondly as a component of a country's gross capital formation.

The structure of the construction industry generally is made up of building activities which in the words of Bon and Crosthwaite (2000, p. 2) 'entails the assembly of building materials and/or components on site; the materials and components are supplied by a variety of industries in the manufacturing sector; are delivered to the site by transportation and trade sectors; the assembly proceeds in accordance with plans, designs and management procedures supplied mainly by the business services industry in the service sector; most of the funds required are supplied by the financial services industry in the service sector'. In the Kenyan context, one of the most precise descriptions of the structure of construction industry is by Rado and Wells (1970) that, in this study, has been summed up diagrammatically as shown in Figure 2.0 that indicates the position of the contractor and his firm, and their activities that leads to site works.

Figure 2.0 Formal Structures of the Construction Firms in Construction Industry



Source; Wells and Rado (1970)

Architect is a person who plans, designs and oversees the construction of buildings.

Client is a person or an organisation using the services of an architect or any other professional person and provides the finances.

Contractor is an independent person, business or corporation which provides goods or services to another entity under terms specified in a contract.

Engineer is a person who designs various services of the building in accordance to set by-laws.

Product (in construction) is a combination of use of different materials.

Q**uantity surveyor** is a person who prepares a bills of quantities for the building.

Suppliers are nominated or appointed to supply the required materials as per the specifications of the building.

According to the above, on site it is the responsibility of the contractor to practice health and safety measures as mandated by the government, while it is the role of the architect or safety engineer to oversee that the contractor adheres to the role of health and safety regulations.

2.2. The Historic Evolution of Occupational Safety and Hazard Management

2.2.1 Evolution of the Concept of Occupational Safety and Hazard in Construction

The development of occupational safety and hazard management can be divided into two phases, i.e. before the Industrial Revolution and after the Industrial Revolution. The Industrial Revolution started in some Western countries at the end of the 18th century and early 19th century (Stranks, 2003). It marked the rise of machinery to replace manual work, and that permanently affected how people worked and changed their workplaces. After the Industrial Revolution era (i.e. from the early 19th century), the field of occupational safety and hazard management developed rapidly and still is today.

2.2.2. Pre-Industrial Revolution

The beginnings of occupational safety and hazard management can be traced back to the times of Babylon, i.e. around 2000 BC through the Hammurabi Code. Hammurabi was a Babylonian king who ruled his country based on a code he created (Levenstein and Wooding, 1997). The code encompassed all of the laws of the land at that time. The code emanated from the theory that is; Domino, Multiple causation and Human error.

The code was engraved on a 2.4-metre high black stone monument (Figure 2.1) that was erected in a public place for all to see. It contained clauses on safety and hazard laws, dealing with injuries, and monetary damages assessed against those who injured others. For example, if a man caused the loss of someone else eye, his own eye should be caused to be lost. If a person caused damage to the properties of others, he must pay compensation for the damage caused. The heaviest penalty or punishment prescribed in the code, if proven guilty, was the death penalty. The existence of the Hammurabi Code indirectly made the community of that time realize how important it was that they should look after not only the safety of their own families but also the safety of others a concept known as self-regulation as shown in a study by Manuele (2001).

Figure 2.1: The Hammurabi Code

Source; Adopted from Manuele, 2001

According to a study done by Wells (1997), she highlights that the movement continued to evolve in later Egyptian civilizations. Well known for their temples and pyramids, the Egyptian kings or pharaohs used slaves as labour for the construction of those mammoth structures. Large bricks and rocks were manually transported and laid in place under hot weather, thereby exposing the slave labourers at that time to harsh working conditions that eventually led to various hazard problems. Figure 2.2 illustrates a pyramid that was built using thousands of labourers at that time. King Rameses II (1200 BC), one of the great pharaohs at that time, provided hazard and medical services to his workers to ensure that they remained fit to complete the construction of many temples, including the Ramesseum Temple which was built during his reign. Similarly, during the Roman era, the Roman rulers were fairly concerned with safety and hazard of their living environments. They built sewerage and irrigation systems and well-ventilated houses in order to provide better living and working conditions.

Figure 2.2: The construction of the Giza

Source; Adopted from Wells, 1997

The fall of the Western Roman Empire in the fifth century AD to the beginning of the Renaissance in the 15th century AD was known historically as the middle Ages (Stranks, 2003). It was a period of great change in culture, politics, science, society, agriculture and economics. Urbanisation the rise of towns and cities in Northern and Western Europe raised awareness of workplace safety and hazard management further. In 1567, Philippus Aureolus (also known as Paracelsus) wrote a treatise on pulmonary diseases of miners, titled On the Miners Sickness and Other Diseases of Miners. Around the same time, Georgius Agricola published his treatise titled De Re Metallica, emphasising the need for ventilation in mines. The 18th century saw the contribution of Wentz (1998) who wrote Discourse on the Diseases of Workers, drawing parallels between diseases suffered by workers and their occupations. His discussion focused on diseases related to the handling of harmful materials and unnatural bodily movements**.**

Table 2.1: Writers and Their Writings

Writer	**Writing**
Philippus Aureolus	On the MinersÊ Sickness and Other Diseases of Miners
Georgius Agricola	De Re Metallica
Bernardino Ramazzini	Discourse on the Diseases of Workers

Source; Adopted from Wentz, 1998

2.2.3. Occupational Safety and Hazard Management; Post-Industrial Revolution

According to Levenstein and Wooding, (1997) the Industrial Revolution introduced changes to work operations and the workplace conditions. Steam power and machines brought new methods for converting raw materials into finished products, and along came new organisation and specialization of work (division of labour). These changes indirectly increased accident risks at the workplace. Furthermore, the relationship at the workplace could be described as a master-worker relationship. Workers were considered as slaves who must obey the command of their employers or masters. During that time, liabilities due to accidents were borne by the workers themselves. That meant in the event of any accident, the worker would have to shoulder the blame while the employer need not have to bear any liability. The development of occupational safety and hazard management after the Industrial Revolution began in England and later spread to the United States of America (USA). Most factories at that time exploited unskilled children and women to reduce production costs. The involvement of children and women inadvertently increased the risks of workplace accidents.

The existence of trade or labour unions probably began in the 18th century, when Europe was transforming from an agriculture-based economy to an industrialized, craft-based economy (Wells, 1997). Some of the changes brought on by the transformation, such as new methods of production that required unskilled and cheaply available labour, enabled employers of those times to exploit workers extensively. The unions, most of them considered illegal initially, were

formed to protect the interests of the workers and to wield political power so that they did not become unjustly exploited.

Due to the pressure from the workers and the public, the English government gazetted the Hazard and Morals of Apprentices Act in 1802. The Act reflected the government's official involvement in dealing with issues related to safety and hazard at the workplace. Table 2.2 summarises the significant milestones in the development of occupational safety and hazard management in the USA. The development in the USA had a great influence on similar development in other countries, as the USA was the economic superpower at that time (ibid, 1997).

Table 2.2 Summary of the Development of Occupational Safety and Hazard Management

Year	**Milestones**
1867	Factory inspection introduced in Massachusetts.
1868	Patent awarded for first barrier safeguard.
1877	Law on safeguards for hazardous machines passed in Massachusetts; Employees Liability Act passed.
1892	First recorded safety programme was established.
1900	Studies of efficiency in manufacturing carried out by Fredrick Taylor.
1908	The compensation law was introduced in the USA.
1913	The first National Council of Industrial Safety was established.
1915	The name of the National Council for Industrial Safety was changed to the National Safety Council.
1916	Concept of negligent manufacture was established.

1970	Occupational Safety and Health Act passed in the USA.
1977	Federal Mine Safety Act passed.
1990	Amended Clean Air Act of 1970 passed.
1996	The Total Safety Management concept was introduced.
2000	Companies in the USA begin to pursue ISO 14000 certification for environmental safety management.
2003	Violence at workplace received the attention of occupational safety and health experts in the West.

Source; Adopted from Wells, 1997

Labour unions also played an important role in the development of occupational safety and hazard management. Beginning with the Industrial Revolution, labour unions in the USA fought for safer working conditions and reasonable compensations for work-related injuries. Among the major contributions were their efforts in opposing anti-labour laws and securing safe and hazardous environment at the workplace (McShane and Glinow, 2009).

2.2.4 Domino Theory

In 1930, research in accident causation theory was pioneered by Heinrich. Heinrich (1959) discussed accident causation theory, the interaction between man and machine, the relationship between severity and frequency, the reasons for unsafe acts, the management role in accident prevention, the costs of accidents and finally the effect of safety on efficiency. In addition, Heinrich developed the domino theory (model) of causation, in which an accident is presented as one of five factors in a sequence that results in an injury. The label was chosen to graphically illustrate sequentially the events Heinrich believed to exist prior to and after the occurrence of accidents. In addition, the name was intuitively appealing because the behavior of the factors

involved was similar to the toppling of dominoes when disrupted: if one falls (occurs) the others will too.

Heinrich had five dominoes in his model: ancestry and social environment, fault of person, unsafe act and/or mechanical or physical hazard, accidents, and injury. This five-domino model suggested that through inherited or acquired undesirable traits, people may commit unsafe acts or cause the existence of mechanical or physical hazards, which in turn cause injurious accidents. Heinrich defined an accident as follows: An accident is an unplanned and uncontrolled event in which the action or reaction of an object, substance, person, or radiation results in personal injury or the probability thereof. The work of Heinrich can be summarized in two points: people are the fundamental reason behind accidents; and management-having the ability-is responsible for the prevention of accidents (Petersen, 1982).

Some of Heinrich's views were criticized for oversimplifying the control of human behavior in causing accidents and for some statistics he gave on the contribution of unsafe acts versus unsafe conditions (Zeller, 1986). Nevertheless, his work was the foundation for many others. Over the years the domino theory has been updated with an emphasis on management as a primary cause in accidents, and the resulting models were labeled as management models or updated domino models. Management models hold management responsible for causing accidents, and the models try to identify failures in the management system. Examples of these models are the updated domino sequence, the Adams updated sequence, and the Weaver updated dominoes. Two other accident causation models that are management based but not domino based are the stair step (Douglas and Crowe, 1976) and the multiple causation models. From these, the multiple causation models are as briefly discussed below.

2.2.5 Multiple Causation Model

Petersen introduced this management non-domino-based model in his book Technique of Safety Management (Petersen, 1971). Petersen believed that many contributing factors, causes, and sub causes are the main culprits in an accident scenario and, hence, the model concept and name "multiple causation." Under the concept of multiple causation, the factors combine together in random fashion, causing accidents. Petersen maintained that these are the factors to be targeted in accident investigation. Petersen viewed his concept as not exhibiting the narrow interpretation

exhibited by the domino theory. To explain his concept, Petersen provided an example of a common accident scenario, that of a man falling off a defective stepladder. Petersen believed that by using present investigation forms, only one act (climbing a defective ladder) and/or one condition (a defective ladder) would be identified. The correction to the problem would be to get rid of the defective ladder. This would be the typical supervisor's investigation if the domino theory was used.

Petersen (1971) claimed that by using multiple causation questions. The surrounding factors to the "incident" (Petersen uses the word accident and incident interchangeably) would be revealed. Applicable question to the stepladder accident would be: why the defective ladder was not found in normal inspections; why the supervisor allowed its use; whether the injured employee knew that he/she would not use the ladder; whether the employee was properly trained; whether the employee was reminded that the ladder was defective; whether the supervisor examined the job first. Petersen believed that the answers to these and other questions would lead to improved inspection procedures, improved training, better definition of responsibilities, and pre-job planning by supervisors.

Petersen (1982) also asserted that trying to find the unsafe act or the condition is dealing only at the symptomatic level, because the act or condition may be the "proximate cause," but invariably it is not the "root cause." As most others did, Petersen emphasized that root causes must be found to have permanent improvement. He indicated that root causes often relate to the management system and may be due to management policies, procedures, supervision, effectiveness, training, etc.

2.2.6 Human Error Theories

Human error theories are best captured in behavior models and human factor models. Behavior models picture workers as being the main cause of accidents. This approach studies the tendency of humans to make errors under various situations and environmental conditions, with the blame mostly falling on the human (unsafe) characteristics only. As defined by Lopes, J. (1998), human error is anyone set of human actions that exceed some limit of acceptability. Many researchers have devoted great time and effort to defining and categorizing human error e.g., Danso (2005).

Similar to behavioral models, the human factors approach holds that human error is the main cause of accidents. However, the blame does not fall on the human unsafe characteristics alone but also on the design of workplace and tasks that do not consider human limitations and may have harmful effects. In other words, the overall objective of the human factors approach is to arrive at better designed tasks, tools, and workplaces, while acknowledging the limitations of human's physical and psychological capabilities. This approach stems from the relatively new engineering field known as human factors engineering.

Behavior Models

The foundation of most behavior models is the accident proneness theory (Accident, 1983). This theory assumes that there are permanent characteristics in a person that make him or her more likely to have an accident. The theory was supported by the simple fact that when considering population accident statistics, the majority of people have no accidents, a relatively small percentage have one accident, and a very small percentage have multiple accidents. Therefore, this small group must possess personal characteristics that make them more prone to accidents (Klumb, 1995). This concept has been accepted by many researchers; however, there are a number of arguments against it which are documented in Heinrich et al. (1980).

Many behavior models have been developed to explain the reason for accident repeaters. These models include the goals freedom alertness theory (Kerr, 1957), and the motivation reward satisfaction model.

2.3.0. The Need for Safety and Hazard Management in the Construction Industry Universally

According to Wells (1997), the international community today sees occupational safety and hazard management as an important field that must be managed efficiently to ensure a safe and hazardous free workplace. This field does not focus merely on the safety, hazard and welfare of workers, but also takes into account the safety and hazard of the public and the working environment. Therefore, all parties, particularly employers and various government departments must play their role to ensure effective implementation of occupational safety and hazard management. Failure of employers, employees and the authorities to ensure the safety and hazard of workplace may result in accidents. Accidents will lead to losses in terms of time, human

resources and finance, not to mention the negative impact such incidents will have on the affected organisations. Such losses might also affect the productivity of workers and the quality of products and services.

Adopting new technologies such as computers and robots at work has in some ways facilitated the production process, saved time and ensured product quality. However, these new production methods still pose dangers to workers, as they require new skills and training to always operate the machinery and be constantly mindful of safety rules on the production floor. Without close human monitoring, the new technologies and machinery will potentially be accident risks. This, in a way, is a new challenge in the field of occupational safety and hazard management. The traditional approach to reducing accident risks through enforcement and engineering (i.e. reducing risk exposure by using machinery to take over dangerous jobs) is no longer effective without the participation of workers. Today, as studied by Levenstein and Wooding (1997), occupational safety and hazard management focuses on inculcating safe and hazard working methods at the workplace by involving workers and encouraging them to change their attitude at the workplace.

This development has brought about changes in the demand for occupational safety and hazard management experts in the labour market (Mc Shane and Glinow, 2009). Nowadays, companies are more willing to hire experts from among engineers, doctors and occupational safety and hazard management officers to help reduce accident risks at the workplace. Companies are now prepared to invest heavily to develop safety and hazard programmes in order to ensure that the workplace is safe, hazard free and comfortable. A good safety and hazard management practice will not only reduce the risk of potential accidents, but will also bring profit to the company in the long run. In addition, providing a safe and hazard free working environment is also seen as a competitive tool to win over good employees. Today, this field is seen as a total quality management approach through the implementation of OSH 1800 and ISO 14000 standards in an effort to create a safe and hazard working environment (Manuele, 2001).

Incidents of work related ill health in the construction industry run into the tens of thousands every year. The HSE (2004) claim there were 1107 major injuries as a result of falling from a

height in 2003/04 (HSE, 2004). They have also estimated that reoccurring musculoskeletal injuries range from 30,000 to 50,000 every year, respiratory diseases affect up to 20,000 construction workers every year and skin diseases affect up to 10,000 workers every year. Many other health hazards exist on construction sites such as noise, irritants and stress. Construction sites are hazardous places to work! This is not a new message; Dong et al (1995) identified that working in the construction industry can lead to malignant diseases including lung, Mesothelioma and stomach cancers in their survey. In recent years the focus has been on site hazard in order to reduce the major injuries and deaths that regularly feature on the front page of our newspapers. Gyi et al., (1999) found that although hazard was a priority for companies, health (i.e. medicals and monitoring systems) had not been given the same consideration, especially with regard to subcontracted labour.

The acceptance being that the larger organizations are making efforts to engage with their employees through site inductions but the majority of construction employees are without the essential information that can improve their long term health prospects. Lingard and Holmes (2001) stated that small business construction firms are engaged as subcontractors in the construction industry and are located at the lower end of the inter-organizational hierarchy in a construction project. Thus, their ability to exert an influence on decision-making in the construction process is limited, despite their employees' day to day exposure to OHS risks. In addition, there is a lack of concise educational information that operatives and their supervisors may use to inform themselves about the hazards and risk they face in relation to their daily tasks of work.

There are daily hazards faced by construction workers that describe exposure levels that exceed recommended limits for the construction industry. For example, Tjoe Nij et al (2003) found that exposure to quartz, a human carcinogen and a causative agent of silicosis, to be particularly high. They stated the complex structure of the construction industry, the variability in sources of exposure and the frequent changes of worksite makes it difficult to implement simple and potentially effective control measures. Inferring that, although exposure was sometimes unavoidable, measures can be taken to; Limit exposure, wear appropriate personal protective equipment (PPE) and monitor the effect on an individual’s health. Unfortunately it is not until many years after the exposure event that the operative will exhibit signs of deteriorating health

and by then it is too late. The operative may be beyond help, likely to no longer be working for the same company and even that the company he worked for no longer exists. This leaves the operative with no support or compensation for enduring the poor work practices employed by his previous employer.

Governments and major construction employers groups have recognized that accidents have been a principle cause of injury in the construction workplace and have concentrated on cleaning up the work place and designing for hazard with their legislation. Pendlebury (2004) on his talk about health and hazard (H&H), great efforts have indeed made our construction sites safer places but the health of the individual operative is still often overlooked. In recent years the expense of courtroom claims (Fairchild, 2002) and the impact on eventual cost to the nation has reinforced the urgent need to address the effect construction can have on the long term health of individuals. Another Government initiative, Respect for People, has gone some way toward requiring employers to give more thought to their workforce in general. This in turn has made an impact on the construction industry and already there are many examples of larger employers taking more precautionary measures. What appeared to be missing was advice that an individual can access information on construction hazards, information of the magnitude of danger they might face and the precautionary measures they can take before going about their daily activities.

2.3.1. Safety and Hazard in the Construction Industry in Kenya

Monyo (1990) cites that the construction industry in Kenya is a vast sector. It is, however, variable hence the greater number, by far, of workers is not permanent. The labour force in the construction industry comprises largely of unskilled workers, who are typically employed and paid on daily basis as casual labourers. The inconstant engagement, training difficulties also militates against safety and hazard awareness. Workers in the construction industry are engaged in work which is often heavy, laborious, monotonous, ergonomically inappropriate, and involves self-control over the job. Working time is a cardinal aspect of conditions of work, and workers in the construction industry in Kenya put in many hours a day. Moreover, the construction industry is arguably the most dangerous employment sector involving numerous hazards, including the following: excessive exposure to weather, dust, noise, heat stress, falls from heights, falling objects, collapse of ground, lifting of heavy objects, machinery, equipment and tools accidents and ergonomic problems.

The vast majority of injuries incurred in construction work are due to simple causes, similar to those encountered in other activities (Rantmn, 1989). However, compared to factory accidents in general, accidents in the construction industry in Kenya are far more severe (Kamoing, 1990). Physical overstrain of workers in the construction industry, Technology, as it is applied in the construction industry in Kenya, has done little to make the workers' life any easier or diminish the physical strain. Workers are bound to the work place and movements of tools, equipment and machinery without appropriate ergonomic arrangements. The mostly manual work involved in the construction industry causes physical overload. Temperature stress, brought about by the country's hot climate, further increases the workload. In many cases, workplace strain is aggravated by no provision of wholesome drinking water, meals, rest breaks, and transport to and from construction sites.

Consequences of labour injuries, labour accidents and occupational diseases are of much more consequence, both medically and socially, in a developing nation like Kenya than they are in the industrialized countries (Rantanen, 1989). Owing to the concurrent incidence of microbial and parasitic diseases, deficient nutrition, inadequate sanitation and hygiene, and poor housing conditions, the sequel of accidents and occupational diseases are exacerbated. In point of fact, approximately 60% of the urban population in Kenya lives in informal settlement, whereby they live in neighborhoods and dwellings in which their life and hazard are continually threatened because of the inadequacies in provision for clean water and sanitation, removal of liquid and solid wastes, and hazard care and emergency services. A substantial percentage of informal settlement residents are casual laborers' in the construction sector who are the sole breadwinners in households with a high number of dependents. More often than not, there is no compensation paid to such workers in the event of accidents or disease, any compensation paid may be minimal.

The different types of tools, equipment and machinery used in construction cause numerous severe injuries and fatalities in Kenya (Kamoing, 1990). Despite the surplus of labour force in Kenya, skilled and trained manpower, to maintain and run the construction industry is seriously lacking. Owing to the rapid population growth rate, which rates as one of the highest in the world, the infrastructure for education and training lags behind-hence the supply of the requisite skilled workforce in the construction industry becomes even more crucial. Accidents and

diseases counteract endeavors to provide the construction industry in the country with well-trained workers. Work injuries impact also on the national economy.

2.4. Safety and Hazard Dangers on Construction Sites

Safety and hazard aims to protect and promote the hazard of all workers from the danger of accidents, diseases and diseases in general. In this respect, workers in the construction industry in Kenya have particular needs. Tests to determine prospective workers physical condition and hazard status will ensure that only suitable persons are employed. Regular screening and check-ups and prompt treatment of ailing individuals will ensure that workers in the construction industry remain in good hazard and are productive at the workplace. The effective control of safety and hazard hazards requires a preventive approach, i.e., consideration of safety and hazard requirements in the planning stage of the (Rantanen, 1989). The establishment and strengthening of structures to facilitate inspection, training and information in the construction industry are tasks of utmost priority.

Casual workers, who constitute the greater part of the workforce in the construction industry, are generally not trained but rather acquire their skill on the job, risking their safety and hazard in the process. It is highly improbable that such workers will revive training on safety and hazard issues (Kamoing, l990). Lack of comprehensive policies; on safety and hazard, poor access to vital information and inadequate trained manpower, make planning and organization of hazard services difficult at the construction site. Training of stakeholders in the construction industry will create safety and hazard awareness and improve working conditions in the sector. Safety and hazard in practice aims at the prevention of accidents and occupational diseases. Workers are a fundamental asset in fostering development of any nation. The consumer products and other general services enjoyed by a nation are the result of workers' inputs in their respective workplaces. The need for improved working conditions on construction sites where a substantial proportion of the total labour force is employed is hence imperative. According to the UK publication on Health and Safety in Construction the key to achieving health and safe working conditions is to ensure that health and safety issues are planned, organized, controlled monitored and reviewed HSE(2006).

The environment in which people work has a great bearing on productivity. Polluted working environments are inimical to efficient work and harmful to production. There are a number of factors that are external to the task being undertaken by workers in the construction industry and yet have a great effect on performance and job satisfaction. These include the following: Dust, Noise, Vibration and Chemical (cement/asbestos). Exposure to the above will vary from one construction site to another, but hand tools and diesel engines are the major source of dust, noise and vibration. Silica dust associated with the production of concrete and the handling of concrete surfaces is the source of the main type of hazardous dust exposure. Chemical exposure in Kenya is somewhat limited, and consists mainly of paints and lacquers with glue in the case of building projects (Takala and Vahapassia, 1990).

Exposure to various hazardous substances causes fatigue, headache and dizziness, and can also cause irritation of air passages and eyes of workers in the construction industry. In addition to reduced levels of productivity and quality, this will also result in increased absenteeism and staff turnover. Appropriate measures should thus be taken to limit exposure of workers to hazardous substances. Moreover, Rantmn (1989) indicates that many of the work related problems associated with hazardous substances can be solved at little or no cost.

Provision of Personal Protective Gear

Working conditions on construction sites in Kenya almost always such that protective gear should be worn. Certainly, specially designed work attire can help reduce accidents on construction sites. The following personal protective gear should therefore be provided for workers in the construction industry as required: helmets; overalls; safety shoes; eye and ear protectors; dust masks/respirators; and gloves.

Good Housekeeping

The handling and storage of machinery, equipment, tools and materials is an integral part of all construction activity. But because efficient storage and handling are not in themselves sources of additional value and profit, the need for the same on construction sites is frequently overlooked. Improved performance on construction sites can be realized through better-organized storage, fewer and shorter transportation and handling operations, and fewer and more efficient heavy

handling operations. Good housekeeping should thus be encouraged on all construction sites, with special attention paid to the following: cleanliness; gangways; means of access and egress; arrangement of materials on site; and storage of materials, tools, equipment and machinery. In comparison in the UK, it is required that a plan on how the site will be kept tidy and how housekeeping will be actively managed is in place. Everyone who works on any site must have access to adequate toilet and washing facilities, a place for preparing and consuming refreshments and somewhere for storing and drying clothing and personal protective equipment (HSE 2006).The converse is a recipe for possible accidents and exposure to health risks.

Work-related Welfare Facilities

Work-related facilities are often disregarded in the construction sector in Kenya. Employers typically care little about providing clean drinking water, sanitary facilities, first aid kits and medical care, or lockers or changing rooms. The need for remedial measures in case of incidents of accidents and health hazards cannot be overlooked. Accidents on construction sites in Kenya are a regular occurrence. All construction sites should therefore have a well-stocked first aid kit box. Workers should also be well-versed in the procedure for getting medical assistance in the event of an accident or other emergency.

Drinking Water

Clean drinking water is essential for all types of work. Workers in the construction industry in Kenya can easily lose several litres of water because clean drinking water will reduce fatigue and improve productivity of workers in the construction industry. Unclean water in itself can expose workers to health hazards.

Sanitation

Although the need for toilets is obvious, it is frequently ignored on construction sites not withstanding that sanitary accommodation for both sexes is a legal requirement. The provision of an adequate number of conveniently located sanitary facilities on construction sites is essential in the prevention of health hazards and productivity of the workers.

Washing

The sites on which workers in the construction industry in Kenya are employed are, not infrequently, hot and dusty. Washing facilities should be provided, not only because they are required for basic hygiene after using the toilet, but also to reduce dirt and grime that that can be ingested and cause illness or disease. Adequate facilities for secure storage of construction workers clothes should be provided on site, as this will greatly assist in their personal hygiene. Moreover, it will relieve anxiety about theft of personal effects, meaning that workers can concentrate better on the job at band.

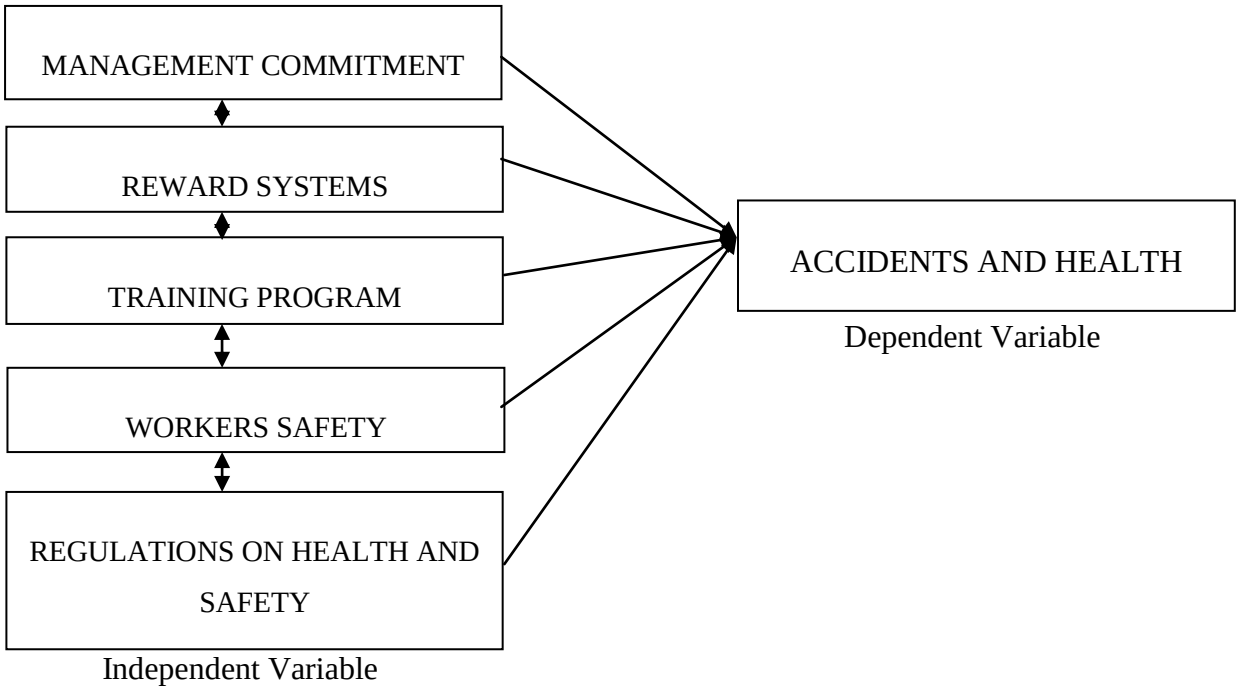
Arrangement for meals.

Lack of adequate arrangements for meals for workers is a recurrent problem on construction sites in Kenya. In most cases, workers either buy food from itinerant vendors or patronize eating facilities near the construction site that may be inappropriate due to poor hygienic conditions and the poor nutritional value of the food. Services should be established on all construction sites to ensure that workers can be served meals, paying attention to nutritional value and hygienic conditions.

Transport

Workers on construction sites regularly have to travel long distances on foot to and from their workplaces. They are consequently often fatigued which greatly affects their productivity levels. Transport arrangements to minimize the distance that workers have to walk will significantly improve productivity of the workers.

Figure 2.3: Conceptual Framework



Source; Ngumba, 2012

Figure 2.3 illustrates conceptual framework for effective health and safety management in construction sites;

2.4.1. Factors That Expose Workers to Accidents

Construction work is hazardous work. The National Safety Council reports that in 1996 alone, 1,000 construction workers lost their lives at work and another 350,000 received disabling injuries. Construction accounted for only 5% of the United States' workforce but claimed a disproportionate 20% of all occupational fatalities and 9% of all disabling occupational injuries (Accident, 1997). A review of the literature on construction safety reveals that much research effort has been directed at examining accident records to categorize the most common types of accidents that occur to a specific trade, and how these accidents happen (Fullman, 1984). These studies reveal many important trends about construction accidents within a construction trade and also reveal the most hazardous accidents. For example, Helander (1991) reported that

carpenters tend to have more finger accidents compared to masons who suffer more from overexertion injuries.

Culver et al. (1990) and others reported that most fatalities in construction occur due to falls. Despite the importance of such study findings to guide accident prevention plans, it is the assertion that construction accident investigations stop at a premature level or are missing important steps to identify the root causes of accidents. As summarized by Herzberg (1987), accident reporting is a means to an end, not an end in itself. In other words, the answers that accident investigations provide for the "what" and "how" questions, should be used to determine the factors that contributed to the accident causation (i.e., why the accident occurred). Brown (1995) argued convincingly that accident investigation techniques should be firmly based on theories of accident causation and human error, which would result in a better understanding of the relation between the "antecedent human behavior" and the accident at a level enabling the root causes of the accident to be determined. Consequently prevention efforts could be directed at the root causes of accidents and not at symptoms, leading to more effective accident prevention.

Accident don't just happen, they are caused. According to Ridley, (1986), 99 per cent of the accidents are caused by either unsafe acts or unsafe conditions or both as such accidents could be prevented. The unsafe act is a violation of an accepted safe procedure which could permit the occurrence of an accident. The unsafe condition is a hazardous physical condition or circumstances which could directly permit the occurrence of an accident. Most accident results from a combination of contributing causes and one or more unsafe acts and unsafe condition. Accident theories and models discussed in the previous section have evolved from merely blaming workers, conditions, machineries into management roles and responsibilities. Nowadays, accident models are being used to better explain the causes of accident so that appropriate actions could be taken to make improvement. However, in order to effect permanent improvement, we must deal with the root causes of accident.

A review of the literature indicates that finding the factors and causes that influence construction accidents has been the passion of many researchers. Kartam and Bouz (1998) did a study in Kuwaiti construction and noted that the causes of accidents were due to worker turnover and

false acts; inadequate safety performance; improper cleaning and unusable materials; destiny; low tool maintenance; supervisory fault; and misplacing objects. Abdelhamid and Everett (2000) conducted a more comprehensive study in the USA and classified the causes into human and physical factors. Human factors contribute to accident due to; Failure to wear personal protective equipment (PPE); horseplay; operating equipment without authority; operating at unsafe speed; personal factor; remove safety device; serviced moving and energized equipment; took unsafe position or posture; used defective tool or equipment; and other unsafe action. While, physical factors were due to; unsafe act of another person(s); disregard known prescribed procedures; defects of accident source; dress or apparel hazard; environmental hazard; fire hazard; hazardous arrangement; hazardous method; housekeeping hazard; improper assignment of personnel; inadequately guarded; public hazard; and other unsafe conditions.

Lubega et al (2000) did a study in Uganda and concluded the causes of accidents were mainly due to lack of awareness of safety regulations; lack of enforcement of safety regulations; poor regard for safety by people involved in construction projects; engaging incompetent personnel; non-vibrant professionalism; mechanical failure of construction machinery/equipment; physical and emotional stress; and chemical impairment. Pipitsupaphol and Watanabe (2000) did a study in Thailand construction sites and classified the causes into the most influential factors i.e. unique nature of the industry; job site conditions; unsafe equipment; unsafe methods; human elements; and management factors. They further concluded that major immediate causes were due to failure to use personal protective equipment; improper loading or placement of equipment or supplies; failure to warn co-workers or to secure equipment; and improper use of equipment.

Toole (2002) also did a study in the USA and suggested that the causes of accidents were due to lack of proper training; deficient enforcement of safety; safety equipment not provided; unsafe methods or sequencing; unsafe site conditions; not using provided safety equipment; poor attitude toward safety; and isolated and sudden deviation from prescribed behavior. Tam et al (2004) did a study in China and noticed that the causes of accidents were due poor safety awareness from top leaders; lack of training; poor safety awareness of project managers; reluctance to input resources for safety; reckless operation; lack of certified skill labor; poor equipment; lack of first aid measures; lack of rigorous enforcement of safety regulation; lack of organizational commitment; low education level of workers; poor safety conscientiousness of

workers; lack of personal protective equipment (PPE); ineffective operation of safety regulation; lack of technical guidance; lack of strict operational procedures; lack of experienced project managers; shortfall of safety regulations; lack of protection in material transportation; lack of protection in material storage; lack of teamwork spirits; excessive overtime work for labor; shortage of safety management manual; lack of innovative technology; and poor information flow. In addition, an Australian publication shows that over two thirds(69%) of construction employers felt that the main cause of work related injury was the worker being careless. This was followed by the worker not thinking and by the nature of manual tasks (41% and 33% respectively). Risk taking was also identified by one quarter of construction employers and 21% indicated unsafe work practices or procedures were causes of work related injury (www.safeworkaustralia.gov.au).

2.5. Industry Measures to Manage Loss or Damage when they occur Due to Accidents and Exposure to Hazards

Insurance companies play an important role in the improvement of health and hazard standards. Since 1969, it has been a legal requirement for employers to insure against liability for injury or disease to their employees arising out of their employment. This is called employers' liability insurance. Certain public sector organizations are exempted from this requirement because any compensation is paid from public funds. Other forms of insurance include fire insurance and public liability insurance (to protect members of the public). Premiums for all these types of insurance are related to levels of risk which is related to standards of health and hazard. In recent years, there has been a considerable increase in the number and size of compensation claims and this has placed further pressure on insurance companies. Insurance companies are becoming effective health and hazard regulators by weighing the premium offered to an organization according to its hazard (Leigh, 1989).

Miller, (1997) depicts the many influences of hazard and health interventions. As the worker compensation laws created a need for industries to invest in additional insurance, insurance companies need to assess their clients' risks to assign proper rates. Thus, in the early 1900s, insurance companies created inspection departments. The inspectors would visit their policy holders to assess workplace hazards and assign the proper rate. As these insurance inspectors

gained valuable experience in looking for hazards in various industries, these hazard consultants became the major impetus in organizational hazard and health. During an inspection, for instance, if the insurance representative found a hazardous situation, he would make suggestions on how the organization could remedy the hazard and obtain a lower premium (also to control the insurance companies' losses).

The insurance companies were serving the employer while at the same time trying to control their own losses. Consequently, the only hazard concerns addressed by the insurance inspectors were ones currently covered by Worker Compensation laws. Furthermore, once the insurance agent assigns coverage rates, there were several self-serving mechanisms to motivate employers to improve the hazard of their workplace. Merit rating schemes (i.e., scheduled rating), for example, rewarded loss control and penalized high worker compensation claims. The scheduled rating system may have motivated many companies to cover-up or not report certain claims to insurance companies in order to avoid a penalty or keep their current coverage rate (Geller, 1996). Whereas it seemed the early insurance companies were striving for a safer workplace, they were instead trying to control their own loss and motivate employers to address only hazards covered by Worker Compensation (Heinrich, et al., 1980). If fact, most of the insurance inspector's time and hazard materials went to the larger companies who paid massive premiums, leaving out the mid-sized to smaller organizations. Insurance companies did develop hazard guidelines and training materials that made an impact on health and hazard. Nevertheless these interventions were guided by current governmental regulations and the need to control loss and not for the hazard of employees.

2.5.1. Management Styles (or Model)

Corporate management plays an important role in organizing and implementing safety policies on construction sites (Mohamed, 2002). The interaction and communication of management with workers in terms of their commitment support and motivation can have a positive (or negative) influence on workers' perceptions, attitudes, competence, and behaviors towards safety. Herzberg (1987) proposed that there is a connection between management's approach to safety and employees' perception of how important safety is to the management team. For instance, the management approach to safety generates as well as reinforces employee perceptions about what gets rewarded, supported and expected in a particular setting. Neale (1997) identified two

distinct management approaches to safety: 1) safety compliance, which involves requiring adherence to safety procedures and carrying out work in a safe manner, and 2) safety participation, which involves supporting and helping workers, promoting the safety program within the workplace, demonstrating initiatives, and putting efforts into safety for improving the safety performance. Hence the management approach/ attitude towards safety must be taken into account while addressing the safety performance of a construction organization.

Safety attitude of management in the industry was done by Mohamed (2002) by conducting a safety attitude survey in construction organizations that examined the management approaches and practices as a predictive tool to demonstrate how safety is operational within the construction organizations in the industry. A survey was designed and distributed to contractor and subcontractor top management for assessing the overall safety attitudes in their companies by taking into account their safety policy, commitment and support , responsibility structures, communication and authority, decision making, training and orientation, administration and procedures, inspections, accident investigation and reporting, and safety nonperformance issues. Conclusions were to strengthen or weaken the argument that the top management in construction organizations in the U.S. and it was found that they focused towards safety compliance rather than safety participation. The role management plays in promoting safety cannot be overemphasized. Management's role has to go beyond organizing and providing safety policies and working instructions. Several studies show that the management's style and involvement in safety is the factor of most importance for a satisfactory safety level (Jaselskis et al., 1996).

Langford et al. (2000) found that when employees believe that the management cares about their personal safety, they are more willing to cooperate to improve safety performance. Thus, the greater the level of management commitment toward safety, the more improved the safety performance. This construct consisted of a number of indicators determining the nature and extent of management commitment and support towards safety in construction organizations. These included; demonstrated emphasis of safety over productivity, setting of corporate safety goals, executive management involvement in safety activities, executive management review process on safety, employee empowerment to providing feedback on health and safety matters, continuous support for updating health and safety procedures, presence of a safety responsibility structure at the organizational level, presence of project safety committees, delegation of

authority to safety officers to respond independently in case of unsafe acts, provision of appropriate safety support personnel on work sites, and safety performance evaluation of supervisors. Effective management of work activities and competent site supervision are essential in maintaining healthy and safe conditions. It should be made clear to supervisors exactly what it is they are expected to do and how they are expected to do it. According to the HSE (2006), the greater the risk, the greater the degree of control and supervision required.

Neale (1997) identified that the construct consisted of a number of indicators determining the nature and effectiveness of safety administration and procedures provided by management in construction organizations. These included constituent administrative procedures of company's written safety program, documentation of safety work rules for various site operations, review and revision process of work rules, requirement for pre-task safety meetings, discussion of safety at all preconstruction and progress meetings, requirement to perform site layout planning before commencement of work, maintaining first aid facilities on work sites, conductance of emergency response drills, provision of safety bulletin boards, safety signs and posters, system of incentive mechanisms, system of disincentive (penalty) mechanisms, established mechanism to recognize safety accomplishments, maintaining Personal Protective Equipment (PPE) on work sites, procedures to ensure proper use of PPE, requirement to maintain a site hazard register containing hazards, impacts and preventive measures, conducting regular job site safety inspections, conducting routine safety inspection of equipment, maintaining jobsite safety checklists (or similar tools) for inspection, a system to monitor the effectiveness and thoroughness of safety inspection, a system to collect and analyze the results of safety inspections, and a system to ensure that action is taken as a result of the findings of safety inspections.

Supervisory commitment and support are central to maintaining a safe work environment. Supervisor's role has to go beyond organizing and providing safety administration and work rules. Supervisory commitment and involvement in safety is a factor of key importance for a satisfactory safety level. Langford et al. (2000) found that when employees believe that the management cares about their personal safety, they are more willing to cooperate to improve safety performance. Having demonstrated supervisory commitment and support to safety develops trust and fosters closer ties among workers, and between workers and supervisors. This

construct consisted of a number of indicators determining the nature and extent of supervisory commitment and support towards safety in construction organizations.

Aspects of supervisory commitment and support include emphasizing a no-blame approach to highlight unsafe work behavior, reminding workers to work safely, facilitating in maintaining a safe workplace environment, emphasizing on workers to help fellow workers and to maintain good working relationships, ensuring that the workload is reasonably balanced among workers, emphasizing on workers to achieve high levels of safety performance, play an active role in identifying site hazards, report accidents, incidents, and potentially hazardous situations, maintaining a positive attitude towards safety during meetings, allowing and encouraging workers to act decisively if they find any unsafe situation, emphasizing on workers to reflect on safety practice, contribute to accident investigations and job safety analysis, participating actively in developing/ reviewing health and safety procedures, ensuring good emergency preparedness among workers, providing safe equipment, keeping safety as a primary consideration when planning, and identifying potential risks and consequences prior to execution (Klumb, 1995).

Motivating refers to promoting a feeling of belonging, job satisfaction, care for personal problems, and recognition among workers in order to strengthen the workers' positive attitude towards safety. Motivation by supervisors strengthens relationships and fosters closer ties between the supervisors and workers. It also improves the general morale and worker attitude towards safety. Motivation may include promoting job satisfaction among workers, creating a feeling of belonging among workers, demonstrating a commitment of help and care for workers' personal problems, guaranteeing job security, and recommending recognitions and benefits. Langford et al. (2000) indicate that the more motivated the workers are, the more likely it is that they will perform safely. This construct consisted of a number of indicators determining the role of supervisors in motivating workers in construction organizations. Aspects of motivation by supervisors include promoting a feeling of belonging among workers, promoting job satisfaction, caring for workers' personal problems, guaranteeing job security, and recommending recognitions and benefits.

2.5.2. Conclusion and Summary of Hazard Management Models

Construction accidents and hazards have a direct impact on the individuals involved in construction as well as on the work itself. Impacts include personal suffering of the injured worker, construction delays and productivity losses, higher insurance premiums that result from injuries, and the possible liability suits for all parties involved in the project. There are many other indirect impacts such as revenue losses on the part of the owner for late project delivery and reduced morale of the work force. The most frequent causes of injuries and deaths on construction sites are falls, being struck-by an object, being caught in or between objects, electrocution, and others, such as toxic gases, drowning and fire (HSE 2008).

It has been argued that all parties have a moral, economic, and legal responsibility to ensure that working conditions on site are healthy and safe. Provisions for safety therefore must commence before the construction phase of a project, design team must have technical knowledge to design buildings which can safely be constructed, as well as a commitment to safe working conditions for site workers. Further management should also not see health and safety merely as a hindrance to productivity, but as a component of an efficient mechanism of production. Training must also be provided if risks change, and refresher training when skills are not frequently used. Work in the construction industry is tough and involves much manual or physical activity. It is also hazardous and dirty and therefore necessary measures are required not only to improve workers' productivity but also enhance efficiency. Enforcement of these measures is also essential to ensure that they are implemented. Health and safety inspectors/officers are required to visit the sites to ensure compliance.

Finally the integration of health and safety management into construction processes requires responsibility for health and safety to be equitably shared between the key participants in a construction project. This therefore requires project participants to "think health and safety" throughout the phases of a project to overcome the various challenges encountered in health and safety management. To manage health and safety effectively, it is essential that owner/managers have the right attitude and perceptions about hazards on construction sites.

2.5.3. Reward System on Workers Safety and Health

Reward system, reward strategy, incentive plan, incentive structure etcetera are all terms used in the literature describing the systems or plans management utilise in order to influence the behaviour of its construction workers' (Kerr, 1995). The following section will introduce the concepts of reward systems and incentives as well as describe how management utilise these with the aim of influencing construction workers. Lastly, it will present the concept of rewards and propose that individuals value different types of rewards.

Reward Systems

Reward systems are methods of achieving control in managements well as defining the relationship with the individual employee and the management (Kerr and Slocum, 2005). Equally, a reward system denotes what is expected of the individual workers and what they may expect in return. Further, reward systems are ways of promoting individual and organizational behaviour needed to achieve the contractual strategy and the contractor's goals (Lawler, 1995; Kerr and Slocum, 2005).

Lawler (1995) draws on previous research when implying that reward systems influence a construction workers safety and health in six ways, (1) by attracting and retaining construction workers, (2) by motivating workers safety and health, (3) by promoting skills and knowledge development, (4) by shaping corporate culture, (5) by reinforcing and defining structure and (6) by determining pay costs. Furthermore, how construction workers are compensated, how the compensation is delivered and in what form compensation is provided signals what values, goals and priorities the constructor have (O'Neil, 1995).

Traditionally, job specifications, levels of compensation in the construction place and the need to maintain equity among construction workers were used to determine the level of workers safety and health, which was the traditional way of rewarding construction workers (Kerrin and Oliver, 2002). Nowadays the level of reward is more often determined by individual workers safety and health using bonus systems and individually set salaries based on individual achievement (Lawler, 1995). Thus, workers safety and health and rewards constitute vital parts of the reward system. However, how workers safety and health is defined, evaluated and measured differs between constructors, also the utilisation and variety of reward types differ among management

(Kerr and Slocum, 2005). In a study aimed at investigating reward systems and workers safety and health, Kerr and Slocum (2005) revealed two extreme types of corporate cultures and workers safety and health. The first extreme identified, was named corporate hierarchy. Here, subjective assessment was used to evaluate and determine employee construction safety and health when rewarding their construction workers. In the other extreme, named the workers safety and health based, quantitative measures connected to corporate and individual results were used when evaluating and rewarding its construction workers. Hence the corporate hierarchy emphasizes relations between superior and subordinate as being important when rewarding construction workers, whereas in the workers safety and health based objective measurements are emphasized. Both systems disbursed variable bonuses depending on workers safety and health, the difference was that the corporate hierarchy paid out a collective bonus, whereas the workers safety and health based system paid out individual bonuses.

Another significant difference found was the distribution in compensation between the two systems. The corporate hierarchy awarded the base salary a higher portion than did the workers safety and health based system, which put more emphasis on workers safety and health bonuses. The researchers point out that in most companies the two extremes identified in their study usually co-exist within management (Kerr and Slocum, 2005). However utilizing reward systems is no guarantee for individuals behaving the way the contractor intended. This is recognized by Kerr (1995). He argues that reward systems might lead to dysfunctional behaviour by rewarding actions not sought for by the contractor. One example of this in provided from business where companies hope for long-term growth although reward on quarterly earnings. This suggests how the reward systems in use are in conflict with the contractor's business goals, a problem still present in many corporations. Furthermore, Kerrin and Oliver (2002) showed in a study how reward systems can be of contrary nature.

The study concerned how the use of team based and individual based rewards affected the continuous improvement work in a manufacturing context. They investigated that contractors had made a contractual change in implementing quality improvement teams and rewarding them for improvements. However, they did not disregard of the old system, a suggestion scheme rewarding individuals for improvement ideas, which had been in place for many years in the construction (Kerr, 1995). The implication of having both reward systems in use was, among

others, that construction workers withheld ideas when working in the team and instead provided their ideas through the suggestion scheme. In summary, the two systems used in the case construction contradicted each other (Kerrin and Oliver, 2002). Thus, it becomes important to understand the whole contractual context when designing and implementing reward systems. In Australia according to the Safe Work report (2015), the top three motivators for workers in the construction industry were 'concern about being personally responsible for someone being injured or made ill through work' (85%), 'when weighing up the cost, you realize it actually doesn't take too much time or effort to take action' and 'wanting to do the job more easily or efficiently' (81% each).

Incentives

Similar to reward systems, what kind of incentives the contractor offers to its construction workers will influence the behaviour of individuals at the site. An external incentive is defined by Locke (1968), "...as an event or object external to the individual who can incite action". Therefore, offering the right incentives to workers safety and health construction workers will benefit the contractor. In a paper by Kadefors and Badenfelt (2009), the authors define three roles for incentives to workers at a construction site. The first role being, incentives as sources for extrinsic motivation, here the focus is on the direct effect incentives have on individuals. The symbolic role of incentives is also recognised, meaning that intrinsic motivation, workers safety and health may be enhanced or decreased based on how the underlying incentive is perceived. Lastly, the third role relates incentives to the influence on contractual processes and is called; incentives as process generators (Kadefors and Badenfelt, 2009).

Clark and Wilson (1961) place incentives under three different categories being material, solidary and purposive incentives. Under material incentives tangible rewards, such as salaries, bonuses and other rewards which easily can be translated to monetary value, are placed. The second category involves mostly intangible rewards which do not have a monetary value, examples include, socialising, the sense of group membership, fun, status etcetera. Solidary incentives are not directly connected to the purpose of the contractor. Finally, purposive incentives are also intangible as the solidary. However, purposive incentives are aligned with the end purpose of the contractor. Consequently purposive incentives are often equal to the goals of the contractor (Clark and Wilson, 1961).

In a paper by Locke (1968), the author reviews previous research investigating the relationship between workers safety and health and consciously set goals. He found that the investigated incentives did not affect workers safety and health separated from the individual's goals and intentions. However, incentives did affect the goals and intentions of individuals. Incentives investigated in the previous research included; instructions, money, knowledge of score, time limits, participation, competition, praise and reproof. For these incentives to affect behaviour, incentives must be recognised and evaluated by the individual who then will base his/hers level of goals on that, thus individuals safety and health are influenced by different incentives and "a given incentive may have more effect upon some individuals safety and health than others" (Clark and Wilson, 1961). However, incentive literature does in general treat safety and health as being equal. Thus, the literature does not recognise the differing goals management and individuals may have (Bresnen and Marshall, 2000). Further, Kohn (1993) argued, in a critical article in Harvard Business Review, for how incentives and rewards provided by management do not work, as the individual motivators they are intended, in the long run. However, rewards and incentives for individuals have proven to provide temporary compliance and changed behavior of construction workers safety and health in the short-term.

Reasons behind the extensive use of incentive plans in corporate America, Kohn (1993) argues, could be lack of time in investigating connections between incentives, productivity and workplace morale. Further arguments are the inadequacy of psychological assumptions and the constant use of rewards in upbringing, "do this and you'll get that" (Kohn, 1993). An additional reason is provided by Cox et al. (2010), in a literature review paper, who also suggests negligence towards psychological factors as one reason, the cause for this being partly how reward management is theorised as an economic subject. However, previous literature does not only recognise monetary incentives to be used within contractors. Promotions and being rewarded for acquiring specific skills are also mentioned. Moreover, externally imposed constraints such as deadlines, control and job restrictions, as well as social rewards are mentioned in previous literature.

When implementing incentive plans within contractors, Rubenfeld and David (2006) stress the importance of considering the payout criteria, the frequency and timing of the payout, the sum of the payout, and lastly the construction workers covered by the incentive plan. Also, utilising

multiple incentives within the same context might lead to problems for construction workers to identify contractual priorities and neglecting activities which are not tied to an incentive and possibly harm social relationships. Analysing how multiple incentives interact is therefore vital. Athey and Roberts (2001) realise this inter-linkage by stating; "the means available to affect one sort of behavior or decision inevitably affect the incentives governing other choices". Moreover, the use of incentive plans in different levels within management may lead to conflicting incentive plans.

One example of a dysfunctional incentive plan where construction workers worked in their own interest to receive the promised incentive payout is brought up by Gibbons (1998) in an evaluation (Locke, 1968). Moreover, Kohn (1993) draws on studies investigating the effect of contractual incentives on motivation. Results in previous studies suggest that individuals expecting rewards do not enhance their workers safety and health compared to persons not expecting rewards plus no correlation between managerial incentives and workers safety and health. Instead, one comprehensive study by Guzzo in the eighties on the subject found training and goal-setting programmes to be of greater motivation than incentives and rewards (Kohn, 1993). On the contrary, Kohn (1993) reports of increased productivity among workers working under earnings at risk incentive plan. However results also show that they were dissatisfied with their base wage. These examples show that incentive plans do influence individual behaviour however incentives must be adopted to fit its surrounding environment.

A problem related to incentive plans is to assess the individual safety and health upon which the level of payout is determined in the incentive plan (Baker et al. 1988). Two types of measuring and assessing workers safety and health are mentioned in the literature, objective workers safety and health measurement, also known as quantitative and subjective workers safety and health measurement, also known as qualitative. The first type considers the fulfillment and achievement of predetermined indicators and bases the level of payout upon them. Subjective workers safety and health measurements on the other hand, determine workers safety and health through superiors' assessment of the estimated contribution by the employee to the firm. Subjective workers safety and health assessment is often used when determining future promotions, future compensation and continued employment. Such relational incentives are subjective and they are agreements enforced by the included parties' concern for their reputation (Gibbons, 1998). In a

multitask setting it is recommended to use multiple incentive packages and the use of both formal and relational incentives reduces the distortion of an employee's incentives.

2.5.4. Reward Types

Previous literature recognises rewards to be of either intrinsic or extrinsic nature. Intrinsic rewards are those rewards existing in the job itself, for instance interesting and challenging work, while extrinsic rewards are tangible, such as salary or bonuses. Building upon previously constructed reward dimensions Chen et al. (1999) used this in a study aiming to find how different reward types benefit contractors. Table 2.1 below describes the different types of contractual rewards used in their study. The reward types used in their study were intrinsic rewards such as autonomy and responsibility, collective rewards for instance profit-sharing and medical insurance, variable (individual) rewards such as a monetary bonus, fixed (individual) rewards, salary increase, and socio-emotional rewards including for instance awards and recognition. Intrinsic collective and collective socio-emotional were also identified, however disregarded since such rewards seldom are used in corporate America (Chen et al. 1999). Table 2.3 below illustrates examples of rewards belonging to the different types.

Table 2.3: Contractual Reward Types

Intrinsic	Feelings of competence, autonomy, responsibility
Collective	Medical insurance, profit sharing (more egalitarian than individual). Rewards that are system-wide and provided to a broad classification of employees.
Variable	Rewards which are provided one time only, such as merit bonus
Fixed	Rewards which are added on base salary, such as merit pay increase
Socio-emotional	Awards, recognition, (dinners, tickets has limited monetary value and counts therefore as non-monetary)

Source; Adopted from Chen et al., 1999

The effects of different rewards are investigated in many contexts. Mahaney and Lederer (2006) studied how the use of extrinsic and intrinsic rewards affected project success. Three factors of

project success were identified, as well as different intrinsic and extrinsic rewards. Construction workers safety and health satisfaction and perceived quality were found to have a correlation with intrinsic rewards, whereas implementation process correlated with the use of extrinsic rewards. The study also found that the correlation between the intrinsic rewards and project success was stronger than the correlation between the extrinsic rewards and project success. This finding supports Hertzberg's (1987) theory of intrinsic motivators being stronger than extrinsic. In Chen et al. (1999) study they examined the perceptions of research and development professionals. Using their identified contractual reward types, the researchers' result listed intrinsic rewards as being the most beneficial for contractors, while individual variable rewards were regarded being least beneficial. Fixed monetary rewards were regarded to be more beneficial than variable. Thus management would benefit the most from offering freedom and autonomy in combination with financial security and stability to construction workers safety and health.

In line with Herzberg (1987), Kohn (1993) argued for how rewards have the possibility to undermine interest. Extrinsic motivators, such as monetary rewards, are more destructive if tied to activities perceived to intrinsically motivating and will in these cases be negatively motivated. In a meta-analysis examining the effects of extrinsic rewards on intrinsic motivation the result showed how extrinsic tangible rewards negatively influenced the intrinsic motivation. Results from the same study also suggest the effect of tangible rewards be correlated with age (Deci et al. 1999). An additional way of defining rewards is using the total rewards concept, which is considering what the employee actually values in the relationship with the employer.

In total rewards contractual rewards are divided into four different reward categories, being (1) Compensation, (2) Benefits, (3) Development and (4) Work Environment (Kaplan, 2005). The first includes salary, bonus programs and equity programmes. Benefits encompass health and welfare as well as other benefits programmes such as child care or memberships in fitness centres. The third category, development relates to programmes and measures related to learning, skill development and personal growth. Lastly, work environment includes both tangible and intangible rewards promoting a positive working environment. Examples include flexible working times, recognition and job design. Table 2.2 below is adopted from Kaplan (2005) and illustrates examples of rewards under each category included in the total rewards concept.

Table 2.4 Total Rewards Categories and Examples of Rewards

Compensation	**Benefits**	**Development**	**Work Environment**
Base Salary	Health Care	Career Planning	Flexible Workweek
Annual Incentives	Life Insurance	Succession Planning	Telecommuting
Long-Term Cash Incentives	Disability	Professional Membership	Job Design Modifications
Equity	Retirement	Training Programs	Comfortable Workstations
Spot Awards	Child-Care Resources	Annual Conferences	Recognition Programs
Project Incentives	Fitness Center	Mentoring Program	Community Volunteer Programs
Employee Referral Program	On-Site Conveniences	Lunch and Learns	Business Casual Dress Policy

Source, Adopted from Kaplan, 2005

Here, rewards included in the two first categories are of transactional nature, which means they are of monetary nature and involve specific programmes. In the development and working environment categories on the other hand, rewards are relational. Hence they are related to emotional aspects of an employment relationship (Kaplan, 2005). Moreover, Kaplan (2005) stress the importance to consider relational rewards to construction workers, since these are not easily replicated by competitors and relational rewards strengthen individual safety and health. Additionally, transactional rewards must be set so that management is able to attract and retain talented construction workers.

2.5.5. Communication and Feedback

Management is expected to use a variety of formal and informal means of communication to promote and communicate its commitment to safety. Simon and Agnvall (2001) suggest that both management communication and employee feedback are critical for suggesting safety improvements and reporting near misses as well as unsafe conditions and practices. Thus, the

more effective the organizational communication dealing with safety issues, the more improved the safety performance. This construct consisted of a number of indicators determining the nature and effectiveness of safety communication and decision making by top management in construction organizations. These included requirement of site managers and supervisors engage themselves in regular safety talks with operatives, presence of formal behavior observation programs on work sites, encouragement provided to workers to raise safety concerns with their supervisors, a work environment provided by management wherein safety problems are openly discussed between workers and supervisors, involvement of workers in preparation of site safety plans, communication of lessons learned from accidents to workers, and involvement of workers and subcontractor representatives in site safety decisions. Similarly, in Australia according to the Safe Work report (2015), The MAPS survey reports that 84% of construction workers agreed that there is good communication in their workplace about health and safety. 90% of them agreed that workers are encouraged to raise health and safety concerns in their workplace. 86% of construction workers also agreed that workers often give tips to each other on how to deal with health and safety issues.

This construct consisted of a number of indicators determining the nature and effectiveness of safety administration as provided and facilitated by supervisors in construction organizations. Aspects of administering safety in the workplace include taking unsafe tools out of production, reporting and investigating accidents, maintaining a continuous supply of first aid facilities on site, establishing inspection teams for hazard analysis, inspecting work, and correcting unsafe conditions and acts. The aim in maintaining discipline in the workplace is to produce a functional working environment that will maximize productivity and minimize risks. Sites where discipline in the workplace has been adequately maintained are more likely to provide a high level of safety performance (Al-Mufti, 2009). This construct consisted of a number of indicators determining the nature and effectiveness of the discipline maintained by supervisors in construction organizations. Aspects of maintaining discipline in the workplace include issuing warnings to workers, recommending promotion or demotion to a worker, granting pay raises to workers, requiring workers to report any unsafe behaviors by a fellow worker, enforcing the use of personal protective equipment whenever needed, and conducting emergency response drills.

Supervisors are expected to use a variety of formal and informal means of communication to promote safety in the workplace. Anon (1999) suggests that both management communication and employee feedback are critical for suggesting safety improvements and reporting near misses as well as unsafe conditions and practices. This construct consisted of a number of indicators determining the nature and effectiveness of the safety communication by supervisors in construction organizations. Aspects of supervisor-level communication include authorizing timely maintenance/ repairs of equipment, making informed suggestions to improve safety, discussing safety issues with the top management, recommending changes in safety policies and procedures if needed, improving work procedures through worker involvement, keeping an open-door policy on safety issues, encouraging feedback from workers on safety issues, and communicating workers' safety concerns to top management.

Positive attitude towards safety refers to the degree of emphasis, encouragement and support provided by supervisors to their workers in terms of identifying, reporting, solving, advocating, and prioritizing safety concerns and issues. Having a positive attitude towards safety by the supervisors demonstrates their unequivocal commitment to safety and hence the desired and approved worker behaviors. Bird (2000) indicates that the more positive the attitude of supervisors is towards safety, the more likely it is that workers will perform safely. This construct consisted of a number of indicators determining the role of supervisors in maintaining a positive attitude towards safety in construction organizations. Aspects of maintaining a positive safety attitude by supervisors include engaging oneself in regular safety talks, discussing safety problems openly with workers, welcoming the reporting of safety hazards, resolving safety issues, never advocating working around safety procedures to meet deadlines, valuing ideas from workers about improving safety, providing the help, authority, information and resources workers need to behave safely, having safety as one's top priority, and always informing workers of safety concerns and issues.

2.5.6. Safety Training Programs

Training is a major component of safety. Safety training can modify worker safe behavior; the workers can understand the work potential hazard such that they can prevent it (Bresnen, M. and Marshall, 2005). This construct consisted of a number of indicators determining the nature and

effectiveness of safety training and orientation procedures provided by management in construction organizations. These included presence of a health and safety training program/ plan, review and revision process of the training program, levels of training focused in the program, inclusion of safety training as a line item in project budget, requirement for conductance of site safety orientation for every new person to a job site, requirement of safety training meetings for each supervisor (foreman and above), requirement for holding tool box/ tailgate safety meetings focused on specific work operations/exposures, emphasis on site managers and supervisors in meetings to maintain a positive attitude towards safety so that workers take safety on the site seriously, requirement of equipment operation/certification training, requirement for conductance of safety inductions for site visitors, requirement for subcontractor workers to attend formal standard safety orientation, requirement for subcontractors to hold regular safety meetings, and monitoring of the effectiveness of health and safety training checking new skills. Example in the UK Construction sector, employers are responsible for ensuring health and safety and must ensure that they have a competent source of advice. The person providing this advice may need extra training in health and safety to meet this responsibility properly. Sometimes it may be necessary to use external advisers. Workers must be trained in safe working practices. Employers' need to be sure of their employees abilities before setting them to work and need to provide necessary training where it is required HSE (2006).

Even skilled and experienced workers need a firm-specific safety and health orientation and training. Safety training can modify worker safe behavior; the workers can understand the work potential hazard such that they can prevent it (Goldstein, 1993). Supervisors play a significant role in the training and orientation process of workers. This support comes in the form of explaining safety operations and rules to workers, holding regular safety meetings, coaching workers, providing job-specific safety training, and holding toolbox safety meetings focused on specific work operations and exposures. The greater the level of supervisory commitment toward worker safety training and orientation, the better would be the site safety performance. This construct consisted of various indicators determining the nature and extent of support provided by supervisors in terms of worker safety training and orientation.

A common method (or reflexive action) to encourage safe work-related behavior is for organizations to create or purchase an education and/or training program (Jewell, 1998). In one survey, the majority of organizations (96%) responding indicated that they offered safety training, while another questionnaire found that 46% provided some form of safety training as part of their regular construction site safety efforts (Kaplan, 2005). Furthermore, a 1996 survey of over 1200 readers of Industrial Safety and Hygiene News revealed industrial education and training in safety to be a top priority for 1997. Educational safety programs focus on increasing peoples' knowledge by giving them a background on theories, principles and techniques for improving their future problem-solving abilities. In the Psychology of Safety, Fullman (1984) stresses the need for safety-related processes to begin with theory and build from solid psychological principles. Geller also emphasizes the importance of training. Training compliments education by providing employees opportunities to apply the knowledge provided by the education. Thus, the purpose of an education/training procedure "is to provide an environment for the acquisition of attitudes, knowledge or skills, so that newly acquired behaviors may be transferred to the job setting". A successful education/training program can impact workers' safety by giving them the tools and knowledge to use when faced with a novel emergency on or off the job.

Viscusi (1983) hypothesizes an alternate motivation for construction site safety and health education/training. In his book, Risk by Choice, he examines the motivation behind adopting various types of education/training programs and criticizes the content of such programs. Although employers never provide prospective employees the average annual death risk or chance of acquiring an injury, when workers begin a job they have some general idea of the risks they face. However, once they gain experience on the job, their risk perception changes. From a sample of 6,000 employees, Viscusi (1983) found that when workers' risk perceptions increase, their propensity to quit also increases by 35%. Since hiring new employees is costly (due to retraining and loss of experience), the content of education/training programs is not intended to enable workers to assess the risk more accurately…it is directed at lowering workers' assessment of the risk. Consequently, the information given to employees in education/training sessions reduces the perceived risk of their job and avoids costly turnover.

Furthermore, results of education/training efforts have been inconclusive, since intervention research seldom solely relies on education/training alone. Petersen (1982), states that "safety training historically has involved more preachments than real teaching of skills to achieve results" (p. 12). However, Cox et al. (2010) found significant improvement in lost-time injuries and number of Mining Safety and Health Administration (MSHA) citations received following a management education/training safety program. Moreover, Bresnen and Marshall (2000) surveyed 20 industries (four from metal fabrication, food processing, chemical, and textile) and found that perceived safety importance was significantly related to the organizational safety climate (i.e., workers' perceptions of structure, system, goal direction, and management leadership style). Clearly, more research is needed to ascertain the effectiveness of education/training for reducing industrial injuries. Although widespread, education/training programs are rarely systematically evaluated in any type of industrial application. Evaluative research in construction site safety is seldom initiated because of methodological and design constraints that prohibit many types of teaching methods from being evaluated (U.S. Department of Health and Human Services and Public Health Services, 1990). For instance, in a survey given to individuals involved in the evaluation of safety and health programs (n = 124), 40% of these safety professionals were dissatisfied with their attempts to demonstrate the beneficial impact of their safety education/training (Al-Mufti, 2009).

Due to inconclusive findings, construction site safety research needs to address the longer-term benefit of educational/training programs and how these approaches can be combined with others to accelerate behavior change (Abdelhamid and Everett, 2000). Additional research is also required to identify the conditions under which employees are most likely to participate willingly in the development and implementation of methods to increase the occurrence of safe work behaviors among themselves and others. Finally, if education and training methodologies are combined, implemented in good faith, and evaluated systematically to assess the transfer of knowledge, education/training programs have great potential to make a difference in the safety and health of many employees. This should be further emphasized in the built environment professional courses and syllabuses and enriched but practical learning experiences for the trainees.

2.6. Regulatory Framework on Health and Safety in Construction Industry

Factories Act

In Kenya the legislation governing occupational health and safety is the occupational health and safety act 2007 which repealed the Factories Act CAP 254 of the Laws of Kenya. The acts main purpose is to provide for the safety, health and welfare of workers and all persons lawfully present at work places to provide for the establishment of the National Council for Occupational Safety and Health purposes. The Acts seeks to achieve its purposes through three main ways. These are creation of preventive measures, institutional frameworks that shall enforce its objectives and punitive measures (www.kenyaplex.com).

Labour Act

Labour law refers to a body of legal rules which regulates the relationship between:

- An Employer and a Worker.
- An Employer and Workers.
- Employers and Trade Union representing workers.
- Employers' organization and Trade Unions.
- The State, Employer, Workers, Union and Employers Organisation.

As per this Act, work injury benefits act 2007 provides for Compensation of all employees for work related injury or occupational diseases (https://www.kenya-labour-laws-a-regulations-html).

Public Health Act

This act may be stated as public health act unless the context otherwise requires communicable disease means any disease due to a specific infectious agent or its toxic products which arises through transmission of that agent or its products from an infected person (https://www.moj.gov.jm).

Environmental Laws

Environmental Management and Coordination Act (EMCA) 1999 assented to in 1999 and commenced in 2000.

This is an act of parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for the matters connected herewith and incidental thereto.

The institutions under EMCA are:

- National Environmental Management Authority (NEMA) whose role is to exercise general supervision and coordination over all matters relating to environment and to be the principle instrument of government in the implementation of all policies relating to the environment.

- National Environmental Council (NEC) is responsible for policy formation, directions for the purposes of the act. The council also sets national goals and objectives and determines policies and priorities for the protection of the environment.

- Provincial and District Environment Committees contribute to decentralization of environmental management and enable participation in local communities (https://www.susbizkenya.org)

Building Code and By-laws

A building code is a set of rules and laws which govern and specify the minimum agreed levels of safety for the structures and buildings. There exist various models depending with the countries of origin. Currently in Kenya the building code (Local government 1969) which is in force being regulated by the local government authority and was adapted from the British imperial codes (www.iiste.org). This law is also known as the Government Act CAP 256 which guides the local government on how buildings should be built to the standards. It entails adoptive by-laws of the building structure (KS 1997).

The 103 statutes which form the construction laws contradict each other in many cases and are subjective. These building codes came into law in 1968 during the post-colonial era and some of the clauses were and are still are subjective since the post-colonial government (www.iiste.org).

2.6.1. The Occupational Safety and Health Act of 2007

In Kenya the health, safety and welfare of workers was regulated by the factories Act Chapter 514. However, this Act was repealed in 2007 to the Occupational Health and Safety Act in 2007 (OSHA) which is currently in force. This Act was enacted to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, and also to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The purpose of this Act is to:

- Secure the safety, health and welfare of persons at work; and
- Protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

This Act applies to all workplaces where any person is at work, whether temporarily or permanently. Therefore the act and its provisions apply to the construction industry since the construction site is regarded as a factory. The Act provides for duties of both employer/occupier and the employees in ensuring the safety, health and welfare at work.

2.6.2. Enforcement on Health and Safety Matters

Safety and Health committee

The Act requires every occupier to establish a safety and health committee at the workplace in accordance with regulations prescribed by the Minister if there are twenty or more persons employed at the workplace; or the Director directs the establishment of such a committee at any other workplace. The Minister may make regulations to provide for the organisation, functions and activities of the safety and health committees, including the election of safety representatives, their rights and duties, and for the training of the members of the safety and health committees and the safety and health representatives.

Health and Safety Audit

The Act in Section 11 requires the occupier of a workplace to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor, and a copy thereof sent to the Director. The report should be preserved and be available for inspection by the occupational safety and health officer. An occupier's failure to comply with this duty is an offence and shall on conviction be liable to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding six months or to both

Role of occupational safety and health officer

This Act requires an occupational safety and health officer to enforce the provisions on health and safety. The officer is mandated to do all or any of the following things

- To enter, inspect and examine, by day or by night, a workplace, and every part thereof,
- With regard to any place of work which he has power to enter, to direct that those premises or nay part of them or anything therein, shall be left undisturbed long as is reasonably necessary for the purpose for the purposes of any examination or investigation:
- To take such measurements and photographs and making such recording as he may consider necessary for the purposes of any examinations or investigation under this Act.
- To develop and print photographs of scenes of occupational accidents:
- Take and remove samples of nay articles or substances found at any place which he has power to enter and of the atmosphere in or in the vicinity of such place of work subject to the employer being notified of any sample so take:
- To take with him a police officer if he has reasonable cause to apprehend any serious obstruct in the execution of his duty:
- To require the production of the registers, certificates, notices and documents kept in pursuance of this Act and to inspect, examine and copy any of them;
- To make such examination and injury as may be necessary to ascertain whether the provisions of this Act, and of the enactment for the time being is force relating to public health, are complied with, so far as respects a workplace and may be employed in a workplace.

- To require any person whom he finds in a workplace to give such information as it is in power to give as to whom is the occupier of the workplace; (OSHA, 2007).

2.6.3. General Provisions Health and Safety:

The Act provides for health and safety provisions including cleanliness of the workplace, ventilation lighting and sanitary conditions among others. Section 56 of the Act provides that all plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be used for work which they are designed for and be operated by a competent person. Section 63 provides that Hoists, Cranes and other lifting machines shall be of good mechanical construction, sound material and adequate strength, free from patent defect and be properly maintained.

Section 75 of the Act provides that every ladder to be issued in workplace shall be of good construction, sound material adequate strength and suitable for the purpose for which it is used and shall be properly maintained. No ladder shall be used unless it is securely fixed in a position to prevent it from slipping or falling; or a person shall be stationed at the base of the ladder to prevent it from slipping or falling; or it is secured where necessary to prevent undue swaying or sagging; it is equally and properly supported on each stile or side and there is sufficient space at each rung to provide adequate foothold. Section 76 provides on the Ergonomics at workplace and Section 77 provides for safe means of access and safe place of employment.

Section 89 of the Act requires that in a workplace where any process carried on gives off any dust or fume injurious or offensive to the persons employed, all practicable measures shall be taken to protect the persons employed against inhalation of the dust or fume etc. and to prevent its accumulation in any workroom.

The Act provides for personal Protective Equipment (PPE) to be provided to the employees, Section 101 states that "Every employer shall provide and maintain for the use of employees in any workplace where employees are employed in any process involving exposure to wet or to any injurious or offensive substance, adequate, effective and suitable protective clothing and appliances, including, where necessary, suitable gloves, footwear, goggles and head coverings."

The Director is required to register safety consultants to assess the suitability and effectiveness of protective clothes and appliances. Therefore this Act provides for the legislation and the enforcement mechanisms on health and safety matters in the construction industry. The health and safety officers are required to inspect the sites to ensure that the provisions of this Act are adhered to by all parties.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the methodology that was used for collection analysis and the presentation of data for the study based on the outlined objectives. It covers the research design, the target population, data collection instruments and procedures.

3.2. Research Design

The research design to be used in this study is descriptive survey. A survey research is one of the most important areas of measurements in applied social research. The broad area of survey research encompasses any measurement procedures that involve asking questions of respondents Maina (2012). The researcher has chosen this research design because the study aims at collecting information from respondents on their attitudes and opinions in relation to factors that cause accidents and health hazards and their prevalence in the construction site in Kenya.

3.3. Location of the Study

The study was done in construction sites within Nairobi, due to its expansive size and a rich menu of construction sites. Tracking growth of what has become a lucrative market, the Kenya National Bureau of Statistics (KNBS) shows an average growth in the construction sector of 4.8 per cent in the year 2012 compared to 4.3 per cent rise in 2011. Construction loan rose from 50.8 Billion in 2011 to 69.2 Billion in 2012 while the Value of the Private and Public buildings rose from 46.4 Billion in 2011 to record a high of 50.8 Billion in the year 2012 which is clearly evident in the city of Nairobi thus the choice of location.

3.4. Target Population

Target population was the construction industry in Nairobi. These consisted of registered and practicing construction firms in Nairobi. The sample size was drawn randomly from the list of the registered firms by the National Construction Authority (NCA). The total number of registered construction firms in Kenya 2,943. According to the NCA, the registered construction firms in Nairobi are 109 and those registered as 'Class A' are 57 (www.softkenya.com). The 'Class A' category are the firms which are responsible for carrying

out building and civil construction works of unlimited amounts of money, usually running into billions of shillings. This class of contractors was chosen for the study since they are licensed to handle big projects and thus a rich source of information.

3.5. Sample Design

Using simple random sampling design, a representative sample was drawn for each of the categories of the respondents from the list of the registered construction firms within Nairobi. According to the NCA, 3% of the registered construction firms are in Nairobi and 52% of these firms in Nairobi belong to Class A category. This method of sampling involves giving a number to every subject or member of the accessible population, placing the numbers in a container and then picking the numbers at random. Another strategy involves the use of a table of random numbers Mugenda and Mugenda (2012). A table of random Numbers was used to select the individual respondents for the study. The total population of practicing building contractors (Category A) in Nairobi is 57 (www.softkenya.com).

To determine the appropriate sample size for the survey, the study use the formula stated below;

$$n = \frac{NC^2}{C^{2+}(N-1)\,e^2}$$ (adopted from Nassiuma, 2000)

Where *n* is the sample size being determined

N is the total population of the practicing building contractors in Nairobi.

C is the coefficient of variation 30% usually acceptable (Nassiuma, 2000)

e is the relative standard error, 5% is acceptable

Therefore;

$$n = \frac{NC^2}{C^{2+}(N-1)\,e^2} = \frac{57(0.3^2)}{0.3^2 + (57-1)(0.05^2)}$$

$$= \frac{57 \times 0.09}{0.09 + (56 \times 0.0025)} \qquad \frac{= 5.13}{0.23}$$

$$= 36.3$$

$$= 36$$

3.6. Data Collection Instruments

Questionnaires and direct observations were used as the main instruments of data collection in the study. The study used a questionnaire as a data collection instrument. Maina (2012), states that structured surveys employ the use of a questionnaire. A questionnaire consists of a set of questions presented to respondents for answers. The respondents read the questions, interpret what is expected and write down the answers themselves. Both primary and secondary data were collected. Primary data was obtained using questionnaires while secondary data from the internet, newspapers, journals, construction publications and magazines. The questionnaire was made up of both structured and unstructured questions so that quantitative and qualitative data would be collected for the study. In order to ensure validity and reliability, the questionnaires were composed of carefully constructed questions to avoid ambiguity and in order to facilitate answers to all the research questions.

The study also used observation method to collect data. Commonly used in behavioral sciences, it is the gathering of primary data by the researchers own direct observation of relevant peoples actions and situations without asking the respondent Maina (2012).

3.7. Data Collection Procedures

The researcher visited the sites of the respondents in the month June 2013. Permission to collect data through handing out of questionnaires was sought from the site agents who are in-charge and represent the contractor at the site. The site agent called the site contractor to seek permission to carry out data for the research. Upon approval, the foremen were handed the questionnaires, which they distributed to the various respondents in different sections of each site. This was done so as the foremen are aware of the persons working in each section of the site and thus the data collected would be covering all areas on site. The questionnaires were collected after two weeks. In the same period it was also observed in detail and the data required was collected as all the respondents were within close proximity to each other, domesticated by the nature of their employment.

3.8. Data Analysis Procedures

Qualitative and quantitative analysis of data was done in order to answer the research questions of this study. Both descriptive and inferential statistical analysis techniques were used. The researcher chose to use chi square. Chi square is a statistical test commonly used to compare observed data we would expect to obtain according to a specific hypothesis. Although it is a test of association as the responses are nominal in nature and therefore inappropriate for the other non-parametric tests. For example spearman's rho (p) which would require ordinal data or a parametric test like; Pearson's product moment this would require data to be interval (ratio) Mugenda and Mugenda (2003).

Data collected was sorted, classified and coded then tabulated for ease of analysis. The data was summarized and categorized according to common themes. Data collected was analyzed using frequency distribution tables, descriptive statistics and inferential statistics. Chi square was used for Hypothesis testing and the results of the survey presented using tables, charts and graphs. The SPSS (version 17) computer software aided the analysis as it is more users friendly and most appropriate for analysis of management related attitudinal responses (www.hks.harvard.edu).

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1. Introduction

This chapter presents the findings of the study that was carried out to investigate into the factors causing accidents and health hazards and their extent in the construction industry in Kenya. The objectives of the study were threefold and included; to establish the factors that expose workers to accidents and other safety hazards on construction site, to establish the extent of the said factors for better management and to investigate the management commitment to eradicate the causes of accidents and hazards to workers by examining the existence of safety and hazard management programs in the construction firms. In this chapter, the data obtained from the research instruments are examined, analysed and interpreted in line with the purpose and objectives of the study, with a summary of the findings presented at the end of the chapter.

4.2. The Response Rate

The survey targeted 36 respondents, mainly being site supervisory staff or the construction site managers within the Class 'A' Construction Sites. From the total sample size of 36 members, 33 (91.67%) positively responded to the survey request. The percentage of those interviewed is statistically adequate to represent the whole. Furthermore, Babbie (2007) suggested that any return rate over 50% can be reported, that over 60% is good, and that over 70% is excellent as indicated by the survey's response rate. The response rate is further summarized as indicated in Table 4.0 below.

Table 4.0: The Response Rate

Category	**Questionnaires Sent**	**Questionnaires Returned**	**Response Rate (%)**
Site Supervisory Staff	**36**	**33**	**91.67%**

Source; Ngumba, June, 2013

Mugenda and Mugenda (2003) further assert that in questionnaire administration, a response rate of 50% is adequate for analysis and reporting. He further suggests that 60 percent is good response while 70% is very good. The researcher therefore considers that the general response rate of 91.67% is very good and sufficient for data analysis, reporting and drawing conclusions.

4.3. Generalities

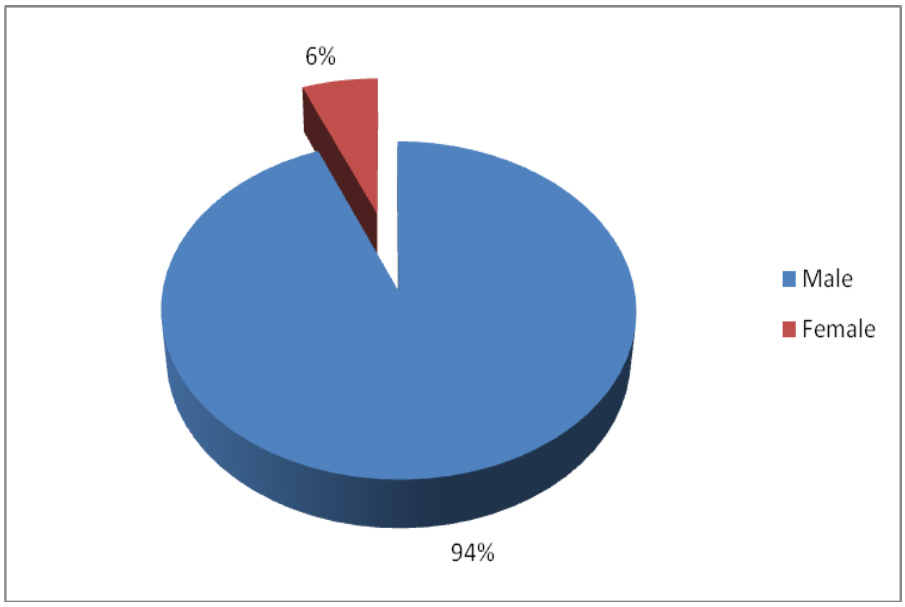
From the 36 Class 'A' Construction sites visited during the survey, 31 (93.9%) sites had male supervisors or site managers and only 2 (6.1%) had female site supervisors or site managers. This indicates a wide gender disparity in construction site management. Figure 4.1 below illustrates these variations. Majority fell between the age of over 36 years represented by 36.4% of the respondents and followed 26-30 years which is 33.3% of the respondents, below 25 years and 31-35 years which are18.2% and 12.1% respectively as indicated in Table 4.1 below. This indicated the levels of experience of the respondents in construction site management and acquaintance with health and safety issues within the construction sites and the factors that increase accidents and health hazards and their extent in the construction industry in Kenya. Majority of the respondents were members of the civil and structural engineering department 39.4% followed by site agents; 24.2%, building and construction; 21.2%, safety and stores; 9.1% and survey; 6.1% departments respectively. This indicated the department that is charged with health and safety issues in the construction site. This is illustrated by Figure 4.2 below.

Table 4.1 Age Variations of the Respondents

Age		Frequency	Percent
Valid	Below 25 years	6	18.2
	26-30 years	11	33.3
	31-35 years	4	12.1
	Over 36 years	12	36.4
	Total	33	100.0

Source; Ngumba, 2013

Figure 4.1. Gender Disparities in Construction Site Management

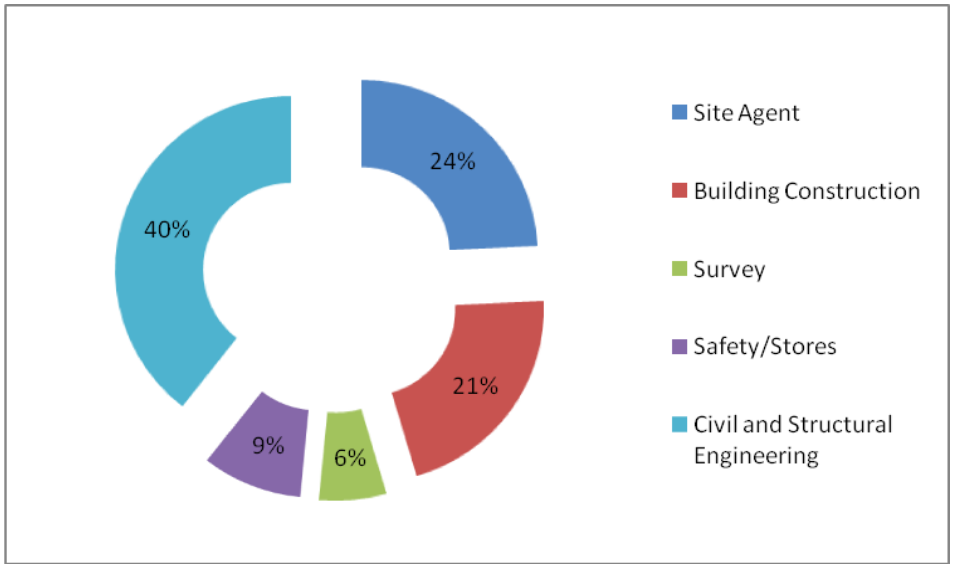


Source; Ngumba, 2013

Furthermore, the respondents indicated that they were mainly supervisory staff 63.3%, site management staff 24.2% and support staff 12.1%. 54.5% of the respondents had worked in their current departments for 0 to 5 years, 24.2% for 6 to 10 years and 21.2% for 11 years and above. There appears to be reliance on younger and inexperienced employees on sites and there is particular concern about early responsibility and use of dangerous equipment by younger workers. Although younger workers were described as more likely to follow work instructions, it was perceived that they experienced a high accident rate; especially within their first week of appointment which performances approach issue. It was also noted that construction does not attract high caliber school leavers which is a global challenge and at management level there was a certain amount of concern about the impact of inexperienced people on site, and especially about the lack of even the most basic common sense among newcomers. There were also references to lack of concentration and carelessness. The verification of what constitutes 'experience' was reported as difficult to assess. Concerns were people with inadequate skills presenting themselves as a skilled trade person's, or the use of trades' people from outside the industry being appointed despite reservations of the transferability of their skills onto site. Although experienced workers were described as having fewer accidents, experience was also

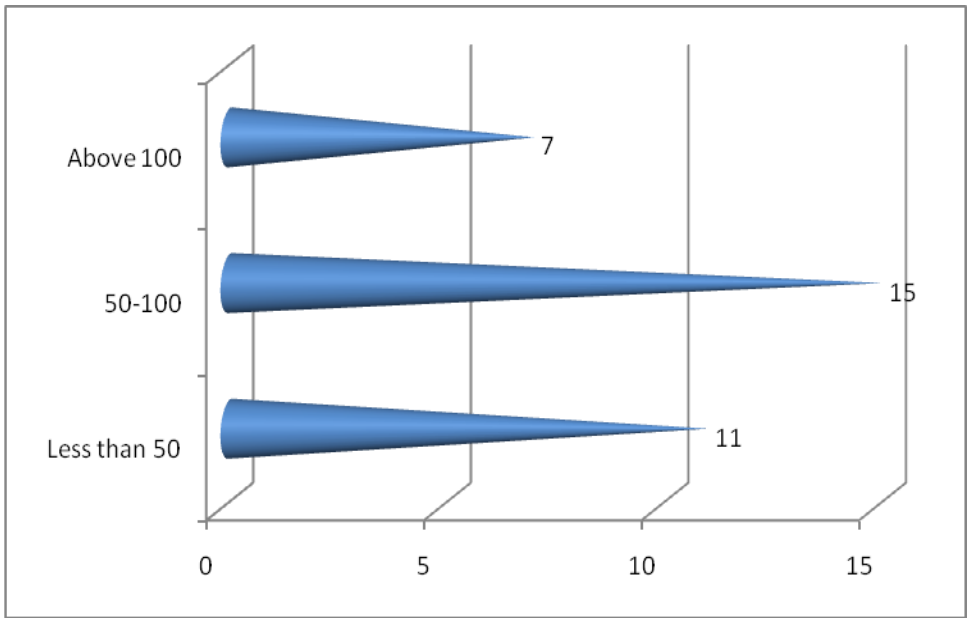
seen to have a negative side. The range of problems associated with experience were noted as work fatigue, over-familiarity and over-confidence, complacency, omission of or low safety awareness, and difficulties in changing work techniques. The total number of employees within their respective department were as illustrated in Figure 4.2 below. The total number of employees within the department indicates the levels of commitment and effectiveness in the management of health and safety issues within the construction sites.

Figure 4.2 Department Charged with Construction Site Management



Source; Ngumba, 2013

Figure 4.3 Total number of Employees in your Department

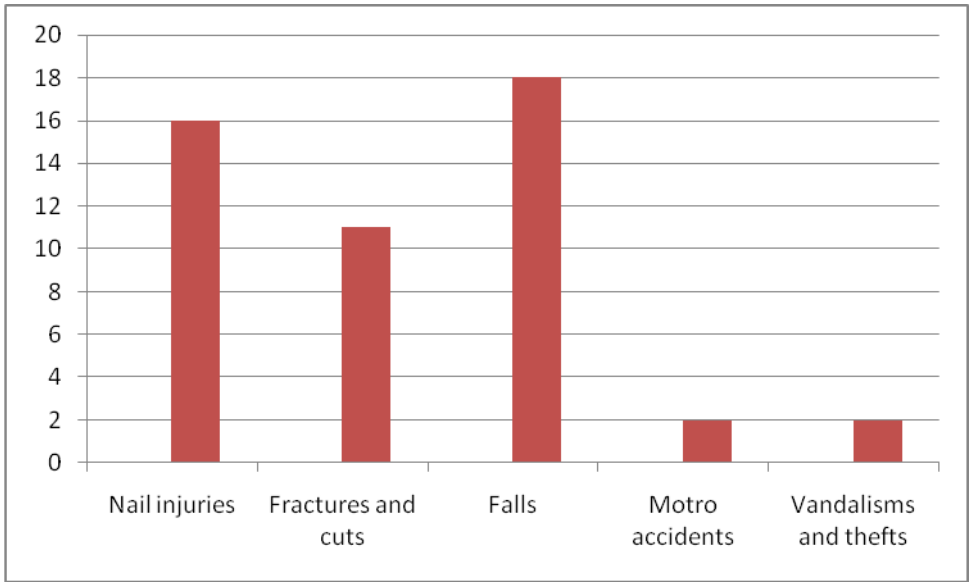


Source; Ngumba, 2013

4.4. Factors that Expose Workers to Accidents and Other Safety Hazards

The respondents interviewed during the survey indicated that their firms observe the health and safety of workers at the costruction site. The main accidents and incidents within the construction sites observed by the respondents were nail injuries, fractures and cuts, falls, motor accidents and vandalisms and thefts. There frequency distrubutions are illustrated oin the Figure 4.4 below. In the developed counties such as the UK, the main accidents are falls from a height, slips, trips and falls on same level, injuries while handling, lifting or carrying, struck by moving (flying / falling) object, struck by moving vehicle Contact with electricity or electrical discharge, traps by something collapsing or overturning, strikes against something fixed or stationary and contact with/by moving machinery. On the factors that causes accidents at the construction site, the respondents asserted that workers false acts caused accidents at the construction sites to a very great extent by 21.2%, to great extent by 21.2%, to a moderate extent by 15.2%, to a little extent by 27.3 and to completely no extent by 15.2%. This indicates that workers false acts is not a main factor that causes accidents at the construction sites as indicated by an overal percentage of 42.5% of both to a little extent and 15.2% of completely no extent. See table Table 4.2 below

Figure 4.4 The Main Accidents and Incidents in Construction Sites



Source; Ngumba, 2013

Table 4.2 Worker False Acts

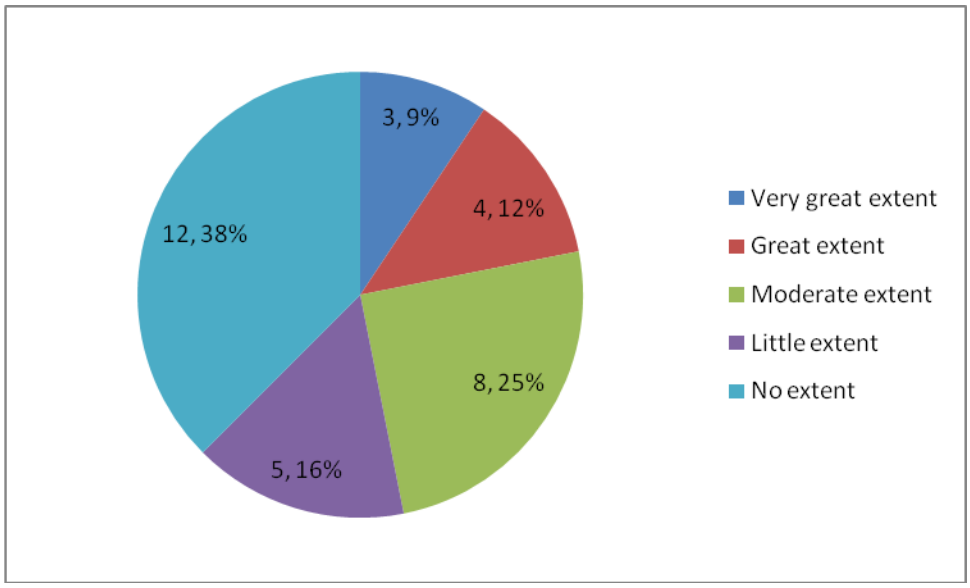
		Frequency	Percent
Valid	Very great extent	7	21.2
	Great extent	7	21.2
	Moderate extent	5	15.2
	Little extent	9	27.3
	No extent	5	15.2
	Total	**33**	**100.0**

Source; Ngumba, 2013

The respondents noted that inadequate safety performance causes accidents at the construction site to very great extent by 27.3% similar to that percentage of completely to no extent, 18.2% attributed this to great extent, 15.2% to moderate extent and 12.1% little extent. The total percentage of that of very great extent, great extent and moderate extent is are high; 82.8% and

this indicates that the factor of saftey performance as a major cause of accidents at the construction sites in Nairobi. That frequency distribution of the unusable materials as factor that causes accidents at the construction stie is illustarated in the Figure 4.4 below with a majority 36.4% indacting to ne extent although the totat percentage of little extent, moderate extent, great extent and very great extent is 60.6%.

Figure 4.5 Unusable Materials



Source; Ngumba, 2013

Fate as a cause at the construction sites had the highest percentage of 42.2 of no extent and followed by 30.3% of little extent. This indicates that this is not a main factor that cause accidents at the construction sites. Low tool maintenace as a factor that causes accidents at the construction sites was also noted by the respond. The percentages; 45.5% of that of very great extent, great extent and moderate extent was high compared to that of little extent and no extent 44.6%. supervisory fault was not a major factor that causes accidents at the construction site as this was indicated by the high percentages of 27.3% and 45.5 for little extent and no extent respectively. Violation of safety procedures was a major factor that causes accidents at the construction sites as noted by the respondents in the Table 4.5 below. Hazardrous physical condition caused accidents at the construction sites by 12.1% to very freat extent, 21.2% to great extent, 15.2% to moderate extentand 24.2% to little extent and 27.3% to no extent. The total

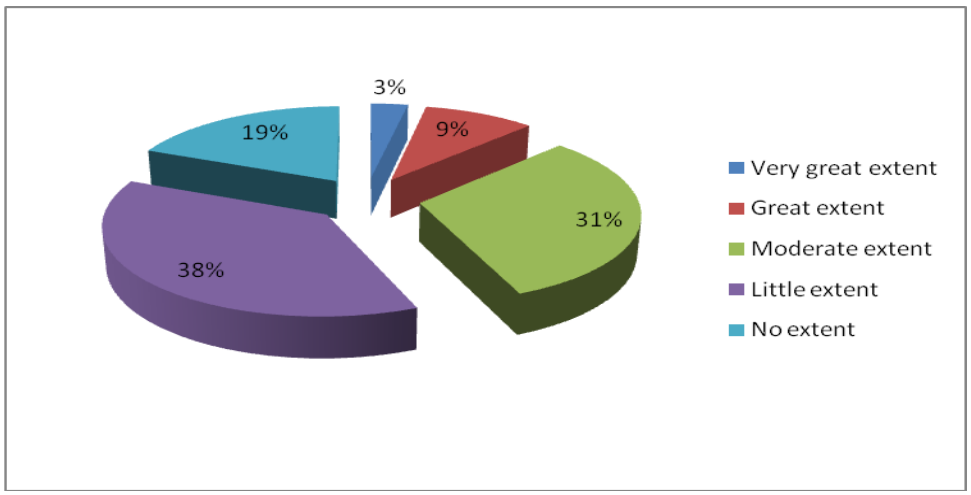
percentage; 45.4% of very great extent, great extent and moderate extent as to the extent of which misplacing objects as a factor that causes accidents at construction sites is lower than that of little extent and no extent which is 54.5%. The Table 4.3. The combination of the contributing causes are as illustrated in the Figure 4.5 below.

Table 4.3 Violation of safety procedure

	Frequency	Percent
Very great extent	8	24.2
Great extent	7	21.2
Moderate extent	6	18.2
Little extent	3	9.1
No extent	9	27.3
Total	33	100.0

Source; Ngumba, 2013

Figure 4.6 Combination of Contributing Causes



Source; Ngumba, 2013

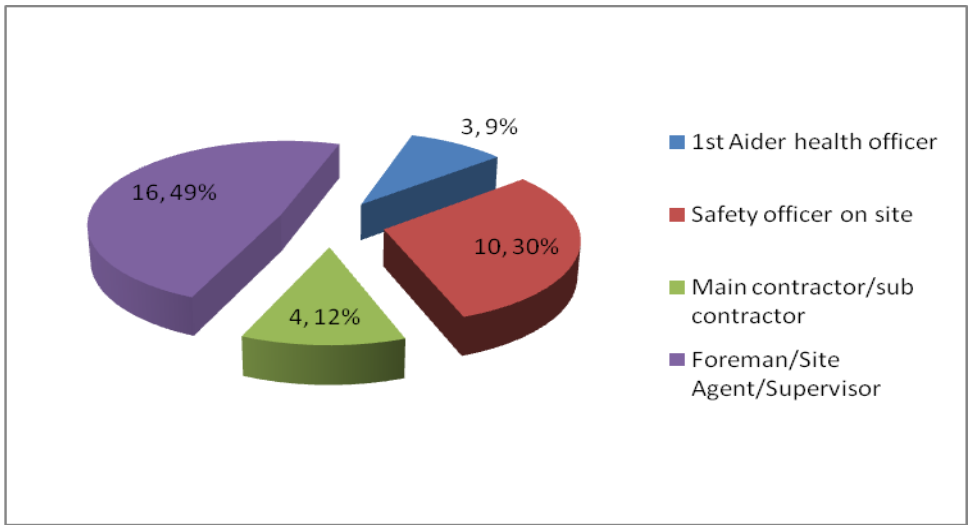
4.5. Management Styles or Models on Workers Safety

Positive comments were made about the improvement in safety culture in the industry over recent years, and all participants appreciated this. The success of top-down commitment was reported to depend heavily upon the attitude of the project or site manager and of the supervisors or team/gang leaders. Inhibitors to effective safety culture were that management on site was generally seen as reactive rather than proactive. Time pressure plays a considerable part in work methods chosen and although it was reported that management may be committed to safety, it was at times portrayed as a competing priority at site level. The traditional 'blame-culture' showed signs of receding, but there were still cases where individuals were blamed if procedures were violated.

There were also criticisms of the accident reporting system, in that some participants felt that they were prohibitive and that the recording of remedial action could appear very trivial. The safety advisor role was generally reported positively and it was felt that support would be given to operatives should they have any safety concerns. It was noted that, to make a stand, a certain amount of self-confidence was needed by operatives and that this is how some less experienced / familiar operatives can be influenced to work in an unsafe manner. A number of participants indicated that they perceived that the state of housekeeping on a site closely reflects the site safety culture and the attitude of the project/site manager/site agent.

Those charged with safety at the construction sites includes the first aiders or health officer on site, safety officers on site, main contractors or sub-contractors and foreman or site agent. Their frequency distribution according to the survey is as indicated in the Figure 4.6 below. From the table it is clear that majority of those charged with safety at the construction site are mainly foremen or site supervisor and who lacks the capacity to handle health and safety issues.

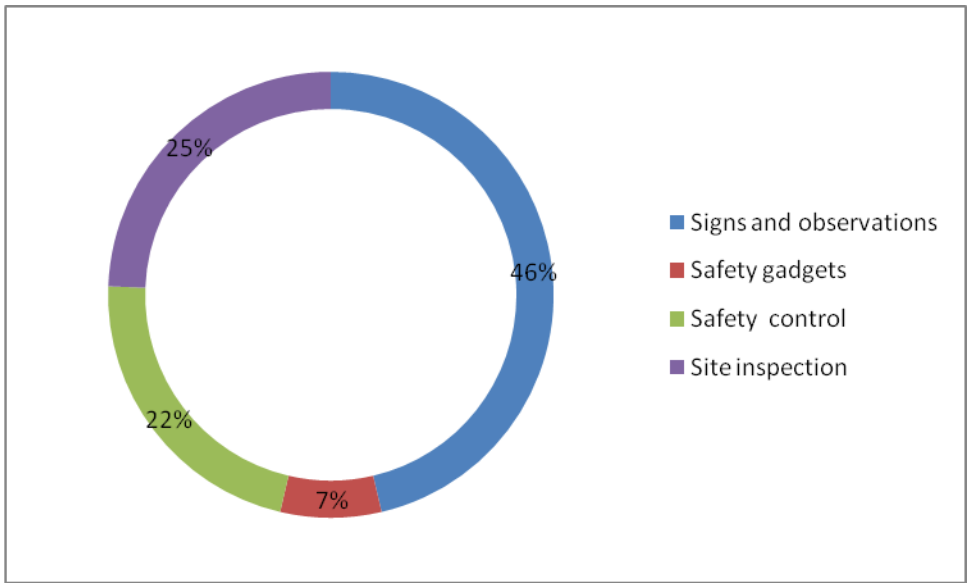
Figure 4.7 Who takes Responsibility



Source; Ngumba, 2013

Monitoring activities used on site include signs and observations, safety gadgets, safety control, site in inspection by safety officers or health and safety committee as illustrated in Figure 4.7 below.

Figure 4.8 Safety Monitoring Activities



Source; Ngumba, 2013

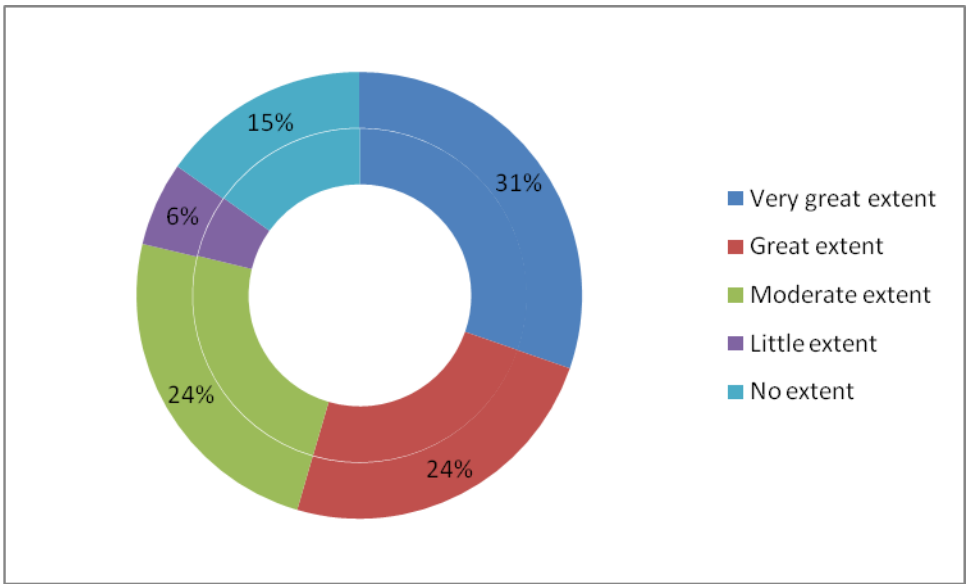
The respondents indicated that the extent to which Department of Labour inspectors assess designer performance relative to construction OH&S on the issue of Designer OH&S is to very great great extent by 39.4% and very great extent by 24.2%. On the issues of effectiveness of the design is to great extent by 39.4% and to great extent by 30.3% and moderate extent by 18.2%. The issues of documentations is to great extent by 36.4% and to very great extent by 33.3. That of Hazard elimination is to great extent by 39.4% and to very great extent by 33.3%. Communication and information is to very great extent by 36.4%, to great extent by 27.3% and to moderate extent by 15.2%. Other issues included contribution to the project occupation health and safety, occupational health and safety related interventions, provision of health and safety information and hazard information which are illustrated in the Tables 4.4 below.

Table 4.4 Contribution to the project Occupational Health and Safety

	Frequency	Percent
Very great extent	9	27.3
Great extent	13	39.4
Moderate extent	2	6.1
Little extent	5	15.2
No extent	4	12.1
Total	33	100.0

Source; Ngumba, 2013

Figure 4.9 Occupational Health and Safety related Interventions



Source; Ngumba, 2013

Table 4.5 Provision of Health and Safety information

	Frequency	Percent
Very great extent	11	33.3
Great extent	7	21.2
Moderate extent	9	27.3
Little extent	3	9.1
No extent	3	9.1
Total	33	100.0

Source; Ngumba, 2013

Table 4.6 Hazard Elimination

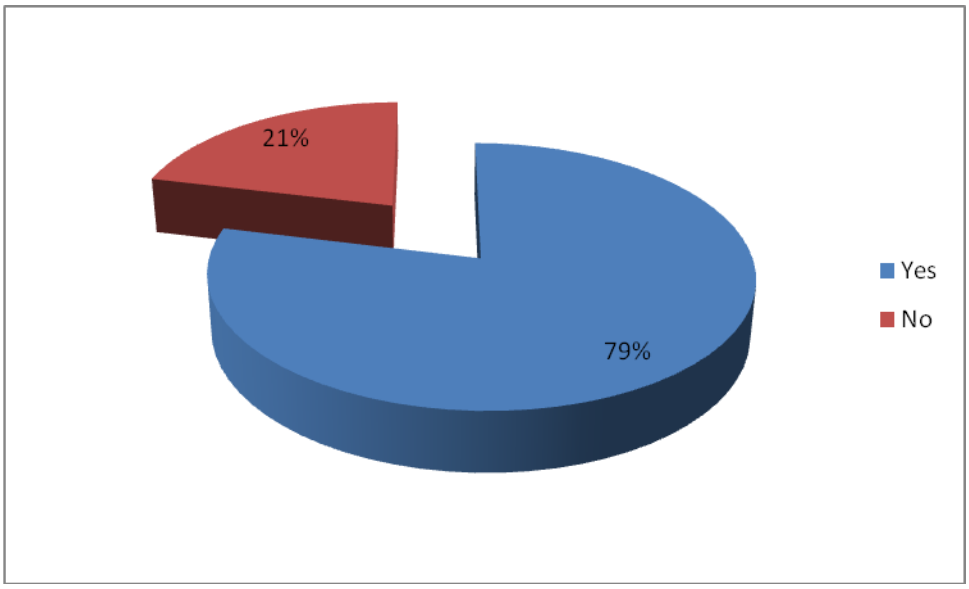
	Frequency	Percent
Very great extent	10	30.3
Great extent	12	36.4
Moderate extent	8	24.2
Little extent	1	3.0
No extent	2	6.1
Total	33	100.0

Source; Ngumba, 2013

4.6. Reward System on Workers

A range of practical schemes were described as reward syatem on workers globally. In the developed countries such the UK, motivational methods included financial incentives to meet target dates 'job and knock' (especially on Friday's and weekend work) and increased hours or double shifting, however 'job and knock' is not necessarily believed to compromise safety. On the reward systems on workers, 78.8% of the respondeds indicated that the companie set, reward or enforce safety and technical training among the workfoce, supervisors and managers. While 21.2% incated otherwise. This is as indicated in Figure 4.9 below. The extent to which the respondents support the implementation of the workers incentive scheme which recognises a reduction of occupational health and safety injuries and fatalities is illustrated in the Table 4.7 below. From the table it is evident that the respondents support the incentive scheme to very great extent by 36.4%, to a great extent by 30.0% and to moderate extent by 15.2% compared to the lower percentages of that to little extent or completely no extent which is 6.1% for each respectively.

Figure 4.10 Reward Systems on Workers



Source; Ngumba, 2013

Table 4.7 Support of Implementation of Workers Incentive Scheme

	Frequency	Percent
Very great extent	12	36.4
Great extent	10	30.3
Moderate extent	5	15.2
Little extent	2	6.1
No extent	2	6.1
Total	31	93.9
System	2	6.1
Total	33	100.0

Source; Ngumba, 2013

Respondents' statements in regards to workers reward scheme and their impact on the construction workers safety and health on the issues of attracting and retaining construction workers was to very great extent by 30.3%, great extent by 42.4%, moderate extent by 12.1% and little extent by 6.1% and o completely no extent by 9.1%. Statement on promoting skills and

acknowledge development was to very great extent 36.4%, to great extent 33.3%, moderate extent by 15.2%. This is also geared towards motivating workers safety and health which respondents indicated to very great extent by 45.4%, greaat extent 24.2%, moderate extent 12.1%, lttle extent by 12.1% and no extent by 6.1%. The incentive scheme also shape cooporate culture to very great extent by 36.4%, to great extent by 24.2%, to moderate extent by 27.3% and little extent by 12.1%. In reinforcing and defining structure it varied to very greta extent by 30.3%, great extent by 39.4%, moderate extent by 18.2%, little extent by 6.1% and no extent by 3.0% and that of how it determines pay costs is as shown in Table 4.8 below on which to very great extent by 27.3%, to great extent 33.3%, to modearte extentby 21.9%, to little extent by 3.0% and to extent by 12.1%.

Table 4.8 Determing Pay Costs

	Frequency	Percent
Very great extent	9	27.3
Great extent	11	33.3
Moderate extent	7	21.2
Little extent	1	3.0
No extent	4	12.1
Total	32	97.0
System	1	3.0
Total	33	100.0

Source; Ngumba, 2013

4.7. Communication and Feedback

Generally inadequacies are reported with both supervision and communication across the different disciplines at task level, and these are seen as contributing towards accident potential. It is generally indicated that there is more supervision on larger sites. At site level, the efficiency of supervision was seen to deteriorate with a rise in the volume of sub-contractor labour, yet where supervision was regarded as good, sub-contractors would conform to standard. There were

indications, however, that some task requests were inappropriate and that these relate to problems with communication. Within this there were indications that adequate consultation and liaison at trade level was lacking. On communication on safety as on importance for the company, 97.0% indicated yes as 0.3% indicated otherwise. The safety contents communicated included meetings 75.8%, ensuring the workers put on safety equipment 15.2% and prioritizing safety and first aid 6.1%. The effectiveness of the communication used, the respondents indicated that mobilization and ensuring the workers follow the safety rules is by 33.3%, company motto by 12.1% and 33.3% noted that the communication used was not effective as staff feared being sacked.

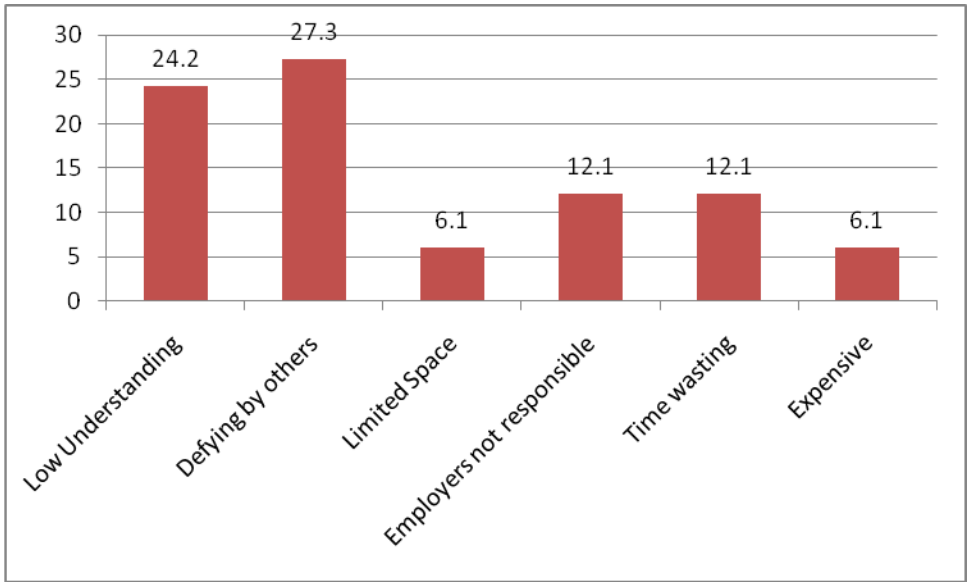
The kinds of channels normally used by the company when dealing with safety related aspects were verbal which included meetings, one-to-one discussions, team briefings, quality circles and tool box talks. Meetings was to very great extent by 59.4%, one-to-one discussions to very extent by 51.5%, team briefings to very great extent by 57.6%, quality circles to very great extent by 33.3% and tool box talks to very great extent by 27.3%. Another channel used was observed communication which included regular inspection tours, senior management involved in meetings, setting an example, joint consultations meetings and presentations or training sessions and workshops. Senior management involvement in meetings is to very great extent by 54.5%, setting an example 69.7%, joint consultation meeting 48.5%, presentations by 21.2%. Written communication channels included policy statements, organization charts, performance standards, and posters, newsletters which varied to very great extent by 39.4%, 33.3%, 42.4%, 45.5%, 42.4% and 15.2% respectively. External communication channels included reporting accidents and ill health, dealing with statutory paper works, interfacing with information services and liaison with statutory undertakings and bodies which vary to very great extent by 54.5%, 27.3%, 39.4% and 33.3% respectively. The major limitations of the ways of communication were mainly due to defying of safety rules 24.2%, language barriers 27.3% and low understanding 12.2%.

4.8. Training Program

Safety training carried out in the companies included first aid training 69.7%, morning safety assembly 6.1%, fire safety and prtoctive clothing 9.1% and 9.1% had completly no safety training programs. Those legible for the safety training included training officers 9.1%, safety

officers 6.1%, all workers 57.6%, supervisors/foremen 18.2%. The training is effective because the training for the persued goals help in developing a safety culture that help avoiding injuries as indicated by 42.4%. However, the coperation among those eligible for training is a challenge to this vital process in ensuring health and safety in construction. Other main liminations for carrying out the training program is as illustrated by Figure 4.10 below. 100.0% of the respondents indicated that company is concerned about operatives and sub-contractors' competence at the recruitmet stages, 97.0% are conncerned about managers or supervisors competence at the time of recruitment and finally 81.8% of the companies provides ongoing training for operatives.

Figure 4.11 Limitations for the Training Program



Source; Ngumba, 2013

CHAPTER FIVE: DISCUSSION OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was an investigation into the factors causing accidents and health hazards and their extent in the construction industry in Kenya. The objectives of the study included; to establish the factors that expose workers to accidents and other safety hazards on construction site, to establish the extent of the said factors for better management and to investigate the management commitment to eradicate the causes of accidents and hazards to workers by examining the existence of safety and hazard management programs in the companies. Consequently, research questions were formulated in accordance to the research objectives, which the researcher set out to look for answers.

With a sample of 36 construction sites selected randomly, the researcher used questionnaires and direct observation to gather information related to the study. The study findings were analyzed, presented and interpreted. This chapter therefore presents discussions of the study findings, conclusion and recommendations on important issues that arose from the study and ends by recommending areas for further research work.

5.2 Discussion of Study Findings

It is evident from the analysis that health and safety measures on construction project sites are rarely enforced because accidents such as nail injuries, fractures and cuts, falls, motor accidents and vandalisms and thefts are experienced at the construction sites. The frequency distrubutions were 18 for falls, 16 for nail injuries, 11 for fractures and cuts and 2 for both motor accidents and vandalism and thefts. This case is different to the developed countries such as UK, where the factors are in evem more, the main accidents are falls from height by workers indicating the mega nature of the construction works compared to what happens in Kenya. The supervision to ensure that workers put on personal protection equipments also has help to reduce significantly the injuries and accidents caused by nails and falling objects.

The factors that causes accidents at the construction revealed by the study were workers false acts, inadequate safety performance, unusable materials, fate, low tool mainatances, supervisory fault and violations of safety procedures which was a major factor as indicated in the section 4 of the previous chapter. In terms of management committment on workers safety, those charged with safety at the construction sites includes the first aiders or health officer on site, safety officers on site, main contractors or sub-contractors and foreman or site agent. The research indicated that majority of those charged with safety at the construction site are mainly foremen or site supervisor and who lacks the capacity to handle health and safety issues.

Monitoring activities used on site include signs and observations, safety gadgets, safety control, site in inspection by safety officers or health and safety committee. Furthermore, health and safety risk assessment on the construction sites are carried out on a few construction sites at the beginning of a project while on others it is never carried out unless it is required by the client. The respondents indicated that the extent to which Department of Labour inspectors assess designer performance relative to construction OH&S was very low. To ensure safety based on performance approach model where the main contractor and sub-contractors are held responsible for their activities or functions on the construction site there is need to conatract safety engineers. The safety engineer will ensure each of the sub-contractors observes the safety measure based on the different roles.

On the reward systems on workers, the study indicated that the companies set, reward or enforce safety and technical training among the workfoce, supervisors and managers. The extent to which the respondents support the implementation of the workers incentive scheme which recognises a reduction of occupational health and safety injuries and fatalities was to very great extent. On communication on safety as on importance for the company, the safety contents communicated included meetings, ensuring the workers put on safety equipment and prioritizing safety and first aid. The effectiveness of the communication used, the respondents indicated that mobilization and ensuring the workers follow the safety rules, company motto and the communication used was not effective due to fear of repatriation.

The kinds of channels normally used by the company when dealing with safety related aspects were verbal which included meetings, one-to-one discussions, team briefings, quality circles and tool box talks. Observed communication which included regular inspection tours, senior management involved in meetings, setting an example, joint consultations meetings and presentations or training sessions and workshops. Written communication channels included policy statements, organization charts, performance standards, posters and newsletters and finally external communication channels included reporting accidents and ill health, dealing with statutory paper works, interfacing with information services and liaison with statutory undertakings and bodies.

5.3 Conclusions

The findings of this study shows there is significant relationship between the factors casing accidents and health hazards and the prevailing regulatory frame for managing safety on construction sites can be proved true based on the data analysis and interpretation. It is evident that the enforcement mechanisms were lacking in most construction project sites. It's worth noting that ensuring safety and occupational health programs is a sound business strategy, for any company regardless of size, and will lead to having a positive impact on the financial bottom line. This should not be regarded only as a requirement under the law, but should become and remain a core business strategy. However, lack of a clear and well-defined supervisory authority in the construction industry means such guidelines exist only on paper. Therefore the health and safety of construction sites in Kenya has been left at the mercy of developers. In the construction project sites therefore there exist good health and safety rules and regulations but very little enforcement.

Solid safety and health management plans with senior management commitment will improve productivity and employee's moral hence should be encouraged. Lack of proper information and ignorance are also to blame for the poor safety measures in construction sites. Therefore unless radical and drastic measures are taken in the construction industry which is one of the highest risk sectors will continue to court disasters due to the unsafe and unhealthy practices. However, the Kenya National Cleaner Production Centre (KNCPC) is playing active role in building national capacity in construction health and safety. Since the year 2003, the center has integrated

construction health and safety issues in its programs especially at the construction site and Environmental Audits. It has assisted a total of 85 enterprises train staff and implements construction health and safety (OHS) programs. By mid-2010, the center had conducted more than 450 training and awareness raising events (www.cpkenya.org).

In Kenya, lack of awareness of the OSH Act of 2007 undermines the safety and health of workers. This has partly contributed to the weak safety culture in the workplace and non-compliance with international safety and health standards. It is important to note that the occupational Safety and Health Act of 2007 was enacted to provide for safety, health and welfare of workers and all persons lawfully present at workplaces, including construction project sites to enable the elimination of the factors that increase accidents and health hazards in the construction industry in Kenya.

5.4 Recommendations

Employers and contractors should provide suitable programmes that are consistent with national Laws and Regulations to ensure the Health and safety of workers. This includes maintaining a workplace that has minimal risks and accidents that can result in injury or death. They should also ensure that a competent person inspects the construction project site at suitable intervals to ensure safety guidelines are adhered to. He or she should also test any safety equipment to make sure they are at par with internationally accepted standards. All construction projects must be certified by National Environment Management Authority (NEMA) during the Environmental Impact Assessment (EIA) phase to ensure standard health and safety guidelines have been met. Site supervisory staff should be conversant with OHS and should share that knowledge with co-workers. The supervisors should incorporate safety officers to make rules, warning signs and other measures governing the sites. The rules should apply to everyone on site and should be in writing and be brought to the attention of all those who may be affected. There contractors should plan for accident prevention and occupation health should be in a way to fit needs of the concerned construction site or particular on-going works. It's also recommended that inspection of plants and scaffolding at least once a week should be carried out.

Contractors should make provision for safety and health when preparing bids. The provision for safety and health must be made competitive with the aim to compete with other bidders and to

avoid a monetary loss. Costs for PPE's measures should be explored and explicitly be part of tendering and costing for the project implementation. Workers at a construction site have a right to proper information regarding their safety before commencement of a project. This information should be presented in a language that they understand. Workers should be assigned to work with plants after being trained to acquire necessary skills. Most accidents happen because jobs requiring the use of plants are assigned to workers with insufficient skills to operate them. Workers must wear their personal protective equipment properly and as directed by their employer or comply by the person in control of the site. They should take care of the equipment, not misuse them and report any defects and problems to the supervisors. The personal protective equipment should be regularly checked for damage and replaced whenever necessary or as recommended by the manufacturer. Contractors should keep accident registers at sites, and make record of all kind of accidents from minor bruises to major and fatal accidents, and submit reports to relevant Authorities; failure to report is an offence. Contractors/site supervisors should ensure that work environment is improved and work places should be kept well for employee's comfort and convenience. Accommodation in case of bad weather, safe drinking water, washing facilities including toilets and accommodation for meals should be provided and properly maintained. Plans related to cases of death or serious injury of the works to be transparent to workers, thus any occurrence of either of the two should be taken as violation and the employee could be prosecuted under criminal laws if found deliberately exposing him/herself to injury. Finally all parties in construction project must contribute their rightful parts towards making construction sites healthy and safe.

5.5. Areas of Further Study

Further research can be done on the effectiveness of the existing framework and impact of health and safety management regulations of construction companies in Kenya. The role and influence of clients and designers on these issues can also be discussed.

The study proposes the performance approach to accidents and safety hazard management as the most effective model.

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APPENDICES

Appendix I: Photos of Collapsed Buildings

Source; Adopted from http://news.yahoo.com/nphotos, June 14, 2011

Source; Adopted from http://news.yahoo.com/nphotos, June 14, 2011

Source; Adopted from http://news.yahoo.com/nphotos, June 14, 2011

Source; Adopted from http://news.yahoo.com/nphotos, 2006

Source; Adopted from Bernard Momanyi on May 7, 2012

Source; Adopted from http://www.a4architect.com, February 2012

Source; Adopted from http://www.a4architect.com, February 2012

Appendix II. Questionnaire

UNIVERSITY OF NAIROBI

DEPARTMENT OF CONSTRUCTION MANAGEMENT

RESEARCH PROJECT

AN INVESTIGATION INTO THE CAUSES OF ACCIDENTS AND HEALTH HAZARDS ON CONSTRUCTION SITES AND THEIR MANAGEMENT IN KENYA:

(CASE STUDY OF NAIROBI COUNTY)

Declaration: This information is confidential and is meant for academic purposes only

Name of Interviewer_____ Questionnaire No: _____
Date of Interview: _____ Location _____

Personal Information (optional)

1. Sex: Male [ ] Female [ ]
2. Age

   Below 25 Years [ ] 26-30 Years [ ]

   31-35 Years [ ] Over 36 Years [ ]

3. Department ……..

4. How many years have you been working at your current department?

   0 to 5 Years ( ) 6 to 10Years ( ) 11 Years and above ( )

5. Which category best describes your position in the organization:

   Support Staff ( ) Supervisory Staff ( ) Management Staff ( )

   Please specify

6. What is the total number of employees in your department: Please tick one

   Less than 50 [ ]

   50 – 100 [ ]

   Above 100 [ ]

Factors Expose Workers to Accidents and Other Safety Hazards

7. Does your firm observe workers safety at the construction site?

   Yes [ ] No [ ]

8. In your opinion, which are the main accidents and incidents in construction sites?
   ……
   ……
   ……
   ……

9. Kindly rate the following causes of accidents at the construction site. Use a scale of 1-5 where; 1 Very great extent, 2 Great extent, 3 Moderate extent, 4 Little extent, 5 No extent.

	1	2	3	4	5
Worker turnover/Casual employment of workers site					
Worker false acts					
Inadequate safety performance					
Improper cleaning					
Unusable materials					
Fate					

low tool maintenance					
Supervisory fault					
Violation of an accepted safety procedure					
Hazardous physical condition or circumstances due to unfavorable environment					
Misplacing objects					
Combination of contributing causes					

Management Commitment

10. Who takes responsibility for safety on site?

…….....**.....**

……

11. What monitoring activities are used on site?

……

……

12. On a scale of 1 (minor) to 5 (major), indicate the extent to which Department of Labour inspectors assess designer performance relative to construction Occupational Health and Safety. Use a scale of 1-5 where; 1 Very great extent, 2 Great extent, 3 Moderate extent, 4 Little extent, 5 No extent.

	1	2	3	4	5
Designer Occupational Health and Safety competency					
Effectiveness of the design process relative to construction					
The documentation / audits used relative to the reduction of construction hazards during design					
Hazard elimination or mitigation during design					
The communication of information on residual risks					
Contributions to the project Occupational Health and Safety specification					
Contributions to the project Occupational Health and Safety plan					
OH&S related interventions during procurement e.g. assessment of contractor financial provision for Occupational Health and Safety					
Provision of Health and Safety information Occupational Health and Safety implications of variation orders					
Hazard elimination or mitigation during construction					

Reward System on Workers

13. Does the company set, reward or enforce safety and technical training among the workforce, supervisors and managers? Yes [ ] No [ ]

14. On a scale of Very great extent to No extent, to what extent do you support the implementation of a workers incentive scheme which recognises a reduction in Occupational Health and Safety injuries and fatalities? Use a scale of 1-5 where; 1 Very great extent, 2 Great extent, 3 Moderate extent, 4 Little extent, 5 No extent.

    …….

15. The following are statement in regards to workers reward scheme and their impact on construction workers safety and health. In your own opinion rate them using a scale of 1-5 where; 1 Very great extent, 2 Great extent, 3 Moderate extent, 4 Little extent, 5 No extent.

	1	2	3	4	5
Attracting and retaining construction workers					
Promoting skills and knowledge development					
Motivating workers safety and health					
Shaping corporate culture					
Reinforcing and defining structure					
Determining pay costs					

Communication and Feedback

16. Is communication on safety a variable of importance for the company? Yes [ ] No [ ]
17. If yes,‘ what (safety content) is communicated? ……

    ……

18. How effectively is the communication used?

    ……..

    .....

19. What kinds of channels are normally used by the company when dealing with safety related aspects?

		1	2	3	4	5
VERBAL COMMUNICATION:	Meetings					
	One-to-one discussions					
	Team briefings					
	Quality circles					
	Tool box talks					
OBSERVED COMMUNICATION:	Regular inspection tours					
	Senior management involvement in meetings					
	Setting an example					
	Joint consultation meetings					
	Presentations/training sessions and workshops					
WRITTEN COMMUNICATION:	Policy statements					
	Organisation charts					
	Performance standards					
	Risk assessments					
	Posters					
	Newsletters					
EXTERNAL COMMUNICATION	Reporting accident and ill health					
	Interfacing with HSE					
	Dealing with statutory paperwork					
	Interfacing with information services					
	Liaison with statutory undertakings and bodies					

20. What are the limitations of the present way of communicating?

i.

ii.

iii.

iv.

Training Program

21. What safety training is done in the company?

……

……

22. Who is eligible for that training, your own employees, all staff?

……

……

23. How effective is that training for the pursued goals?

.....

……

24. What are the main limitations for carrying out the training program?

i.

ii.

iii.

iv.

25. The Company is concerned about operatives and subcontractors competence at the recruitment stage? Yes [ ] No [ ]
26. The Company is concerned about managers/supervisors competence at the time of recruitment? Yes [ ] No [ ]
27. The Company provides ongoing training for operatives? Yes [ ] No [ ]
28. The Company provides ongoing training for managers and supervisors? Yes [ ] No [ ]

Appendix III. Research Permit

UNIVERSITY OF NAIROBI
DEPARTMENT OF REAL ESTATE AND CONSTRUCTION MANAGEMENT
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17/05/2013

REF: B50/71957/2008

WHOM IT MAY CONCERN

Dear Sir/Madam,

FRANCIS NGUMBA MWANGI

We confirm that the above named student is in the Department of Real Estate and Construction Management pursuing Masters degree course in Construction management.

He is carrying out his research project entitled; "**An Investigation Into The Factors That Increase Accidents And Health Hazards And Their Extent In The Construction Industry In Kenya; The Case Of Construction Sites In Nairobi**.

Any assistance accorded to him will be appreciated.

Mary Kimani, PhD, MBS.
Chair & Senior Lecturer
Dept. of Real Estate and Construction Management