OCCUPATIONAL SAFETY AND HEALTH IN CONSTRUCTION SITES IN NAIROBI COUNTY

RAYMOND KIPCHIRCHIR KEMEI

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Occupational Safety and Health in Construction Sites in Nairobi County

Raymond Kipchirchir Kemei

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature …………………………………….   Date ……………………………

Raymond Kipchirchir Kemei

This thesis has been submitted for examination with our approval as University Supervisors.

Signature …………………………………….   Date ……………………………

Prof. James W. Kaluli, PhD

JKUAT, Kenya

Signature …………………………………….   Date ……………………………

Dr. Eng. Charles Kabubo, PhD

JKUAT, Kenya

DEDICATION

This dissertation is dedicated to my parents, wife and sons for the support they gave me during my studies.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	African Development Bank
CEF	Construction Employers Federation.
CIDB	Construction Industry Development Board
CIF	Construction Industry Federation.
COTU-K	Central Organisation of Trade Union, Kenya
DOSH	Directorate of Occupational Safety and Health.
DOSHS	Directorate of Occupational Safety and Health Services.
FKE	Federation of Kenya Employers
FY	Financial Year
GDP	Gross Domestic Product.
HSE	Health and Safety Executive
ILO	International Labour Organisation.
KES	Kenya shillings
KNBS	Kenya National Bureau of Statistics.
NACOSH	National Council for Occupational Safety and Health
NCA	National Construction Authority
NHC	National Housing Corporation.

OSH	Occupational Safety and Health
OSH	Occupational Safety and Health Act
STS	Sociotechnical System
UK	United Kingdom
USA	United States of America
WB	World Bank.
WHO	World Health Organisation
WIBA	Work Injury Benefits Act

ABSTRACT

Construction industry in Kenya is regarded as the 2nd most risky sector in terms of Occupational Safety and Health after transport Sector. This research was undertaken to understand Occupational Health and Safety in construction in Nairobi County. The study included collection of field data using questionnaires and analysis of secondary data from Kenya's Directorate of occupational safety and Health (DOSH) covering the period between 2010 and 2014. To make assessment of various parameters in the research, the study used Likert Scale between 1 and 5, where 1 is "the least contributing factor in construction accidents" and 5 "the most contributing factor in construction accidents". Perhaps due to inadequate training in safety and lack of experience, 74 % of the workers who were injured or killed when accidents occurred in construction sites were below 40 years old. Some 26% of the accidents occurred during the busiest months of the year, June and July, a period which coincides with the closure of financial year. Also, about a third of construction site accidents occur during the busiest hours of the day (10-11 am, and 3-4 pm). Falling from height and being hit by falling objects contributes towards about 64% of all construction site accidents. The majority of construction companies in Nairobi allocate less than 1% of project budget to health and safety. This could be because most companies do not have a clear accident prevention policy. Five administrative factors rated on a scaled of 1-5, were thought to contribute to accidents: (1) reluctance to provide resources for safety (4.10±0.2); (2) lack of staff training (4.07±0.2); (3) safety regulations not enforced (3.98±0.2); (4) workers not safety conscious (3.83±0.2); and (5) top leaders not being safety aware (3.71±0.2). It is recommended that investment in Occupational Health and Safety (OSH) and also in health and safety training should be prioritized in construction industry. Directorate of occupational safety and Health (DOSH) should be empowered to provide customized safety training, workshops and seminars to enable construction workers minimize accident occurrence.

CHAPTER ONE

INTRODUCTION

1.1 Background

Construction is a basic pillar to Kenya's Vision 2030. Kenya has experienced a construction boom between 2002 to 2012 (Kenya National Bureau of Statistics, 2013). According to Kenya National Bureau of Statistics (KNBS) the construction sector in Kenya contributes 4.9 per cent of the Gross Domestic Product (GDP) (KNBS, 2013). Infrastructure development accounted for 8.7 per cent of the total budget for Financial Year 2013/2014 of the total budget of Kenya Shillings (KES) 1.6 Trillion (KNBS, 2013). Further, construction sector has generated new jobs and has grown by 62 % between 2007 and 2013 ahead of other economic sectors. The number of people who worked in construction industry in 2013 stood at 130,300 (KNBS, 2014).

The economic report indicates that the construction industry continued to flourish which hitherto had not been witnessed in the country's history. The industry has employed many people due to labour intensive methods which are typically employed in the construction industry. Further, construction activities were among those consuming bank credit at the fastest rate in December 2012, the construction sector held KES 246 Billion of the total of KES 1.3 Trillion in loans from commercial banks which accounted to 20% (KNBS, 2013).

Despite the steady growth in the construction sector in Kenya, the industry is very accident prone. Data available from the International Labour Organization (ILO) report on Kenya (ILO, 2013) show that between 2010 and 2011 there were 5774 accidents across all industry sectors. In Financial Year (FY) 2010-2011, the construction industry was ranked second in reported accidents and accounted for 16% of fatal accidents (40 cases reported for 100,000 workers) and 7% of non-fatal cases (ILO, 2013). The leading industry with most fatal accidents was the transport industry with 77 fatalities which accounted for 31% of the fatal accidents (ILO, 2013).

An accident can be defined as an unplanned, undesirable, unexpected and uncontrolled event (Hinze, 1981). An accident does not necessarily result into an injury. It can be in terms of damage to equipment or materials; however those that result to injuries receive greatest attention (Hinze, 1981). Accidents that do not cause damage to materials or equipment or injury to personnel may foretell future accidents with less desirable results. Many workers have met their deaths in construction sites while others have become permanently crippled from construction related injuries (Hinze, 1981). Further, laws on occupational safety and health are not strictly enforced in Kenya (ILO, 2013). Safety rules in most construction sites do not exist and if they do, the regulatory authority is weak in implementing each rule effectively.

The difference in accident rates between developed and developing countries is high (Hamalainen, Takala & Saavela, 2006). In developed countries, construction businesses have embraced zero accident policy as their goal and implement effective health and safety practices (Hinze, 2005) but developing countries are still unable to identify their hazards (Hamalainen et al., 2006). Proper accident recording and notification systems are non-existent in many developing countries (Hamalainen et al., 2006). According to South Africa's Construction Industry Development Board (CIDB) report prepared by Smallwood, Haupt and Shankantu (2010) in Sub-Saharan Africa, the fatality and injury rates in construction industry are at 21 and 16,012 per 100,000 workers respectively. These records are higher than the average fatality rate at 4.2 and injury rate of 3,240 per 100,000 in developed countries (Smallwood et al., 2010).

According to United Kingdom Health and Safety Executive (HSE) Report 2013/2014, UK experienced 0.44 deaths per 100,000 workers in Financial Year (FY) 2013/2014 and 0.56 deaths per 100,000 workers in FY 2012/2013. In China, there are 3.8 deaths per 100,000 workers in construction industry in 2013 (China Statistical Yearbook, 2013). In South Africa, Smallwood et al. (2013) established there were 25.5 deaths per 100,000 workers in construction industry. This shows accidents in construction industry in Kenya are still high going by the annual ILO Report (2013).

It has been further noted that throughout the world, construction is one of the most hazardous industries (Suazo & Jaselskis, 1993). It has been acknowledged that 25-40% of fatalities in the world's occupational setting are contributed to construction (ILO, 2005). The major causes of these accidents are related to the unique nature of construction industry, human behaviour, difficult work site conditions and poor safety management which result in unsafe work methods and procedures (Koehn & Pan, 1995). When construction industry is compared with other labour intensive industries, construction industry has experienced a disproportionally high rate of disability injuries and fatalities (Hinze, 1997). Thousands of people are killed and disabled annually in industrial accidents (Jannadi & BuKhamsin, 2002). Hughes and Ferret (2005) identified the common accidents on site to be falling from heights, cutting of limbs due to mishandling heavy equipment, objects falling from height, electric shock from cables, caving in of excavations and lifting of heavy tools and equipment. Workers are also deemed to cause site accidents due to fatigue, lack of discipline, carelessness and distractions. Other causes are attributed to the senior management ignorance, lack of training and poor communication.

Safety should also be an integral part of the management of the construction industry. This should be reflected in the overall management instruments for the individual sites. Safety management is concerned with influencing human behaviour and with limiting the opportunities for mistakes to be made which result in harm or loss (Allan, 2000). Successful safety management demands comprehensive health and safety policies which are effectively implicated and which are considered in all business practice and decision making. Jaselskis, Anderson and Russell (1996) commented that management needs to be more active in the safety program and where possible, superintendents should also play a significant role in determining the safety performances on their projects. Research by Dejoy, Wilson and Peer (1997) showed that safety records reflect how upper management perceives the causes of safety performance.

The history of Occupational Safety and Health (OSH) in Kenya dates back to 1950, with the introduction of the Factories Act. In 1990 this Act was amended to the Factories and Other Places of Work Act, to enlarge its scope. The Occupational Safety and Health Act (OSHA) and the Work Injury Benefits Act (WIBA) were enacted in 2007, and are now the principal laws that govern OSH in the country. There are other laws that touch on OSH, but they are managed by other government ministries and corporations. In Kenya, OSH is managed by the Directorate of Occupational Safety and Health Services (DOSHS). DOSHS is the designated national authority for collection and maintenance of a database, and for the analysis and investigation of occupational accidents and diseases, and dangerous occurrences. The Directorate's policy and legal mandate are provided by the National Occupational Safety and Health Policy of 2012, OSHA 2007, and WIBA 2007.

The body responsible for reviewing national OSH legislation, policies and actions is the National Council for Occupational Safety and Health (NACOSH), whose composition includes the Federation of Kenya Employers (FKE) and the Central Organization of Trade Unions (Kenya) (COTU-K). The FKE is the national umbrella organization representing employers' interests in Kenya, and advocates an environment favourable to enterprise competiveness, sustainability and job creation. COTU-K is the most representative workers' organization. These include commerce, banking, metalwork, baking and confectionery, port work, pilots, building and construction, chemical engineering, game and hunting, local government, fishing, petrol and oil, plantations and agriculture, railway work, scientific research, shipping and clearing, domestic and hotels, entertainment, betting, journalism, printing and publishing, sugar plantations, seamen, tailoring and textiles, transport, post and telecommunications. NACOSH involves stakeholders in any review, and the process culminates in a national validation forum for approval. At enterprise level, a bipartite approach is facilitated by the Safety and Health Committees Rules made under OSHA (2007). Established safety and health committees include equal representation from management and workers.

To develop a safe construction site, owners, contractors and regulatory agencies are obliged by law to help to provide safe work environment to minimize injuries. The owner cannot have hands-off approach towards safety because construction activity will take place in the owner's property. Architects, Engineers, Project managers and employees also need a tool to integrate safety and health measures in project planning. It's against this background that it's pertinent to examine the safety of construction sites in Nairobi County in Kenya.

1.2 Statement of the Problem

The construction industry in Kenya is regarded the 2nd most risky business after transport industry where it accounts for 16% of fatal accidents and 7% of non-fatal cases (ILO report, 2013). Construction activity hazards include working at height, working underground, working in confined spaces, falling materials, use of plant and equipment, fire and exposure to live cables. Although regulations in occupational safety and health in Kenya are quite comprehensive, Directorate of Occupational Safety and Health Services (DOSHS) do not have the capacity to strictly undertake safety inspection and audit at regular times thus making accidents at construction sites to be high. There is a need to develop strategies to make the construction sector safer. Therefore this research sought to find out why accidents levels in the construction industry are still high. This information will help establish construction accident reduction strategies.

1.3 Justification of the study

Right to safe and healthy working conditions in construction industry has been a central issue in the global campaign where current health and safety laws and regulations have separate sections specifically for the construction industry (ILO, 2005; ILO, 2007). Safe and healthy working condition in construction industry is an important contribution to poverty alleviation and sustainable development since construction is labour intensive in developing countries (Charles, Pillay & Ryan, 2007). Building and construction sector will play a key driver to economic growth in quest of achieving Kenya's Vision 2030. The construction industry is a source of employment to many workers who are exposed to high risks due to the unique nature of the industry which is constantly changing. Currently OSH is not incorporated from the initial stage of preparation of the tender documents and the tender evaluation process. This causes a concern about how health and safety is managed on construction sites. This study is in line with Kenya's development strategies, which recognise the construction industry as central to the economic development of the country. To achieve the strategies, Kenya's construction industry policy needs to emphasize Occupational Health and Safety.

The study will contribute to the existing body of knowledge in the field of occupational health and safety in construction industry in Kenya. The outcomes of the study will reveal how differently engineers, project managers, contractors and workers construe the OSH measures in Nairobi. The study will also identify the varied levels of understanding of the OSH measures in the construction industry e.g. adherence to safety regulations in building projects and pinpoints the gap that needs to be filled. This study will answer most of the uncertain issues that are arisen on the level of accidents and safety in the construction industry in Nairobi County. This study aims to increase the awareness of the construction parties about the importance of complying with OSH regulation.

1.4 Research Objectives

The purpose of this study was to undertake an assessment of occupational safety and health in construction sites in Nairobi County. The objectives of the research are given below:

a. To identify common accidents in construction sites in Nairobi County.

b. To establish the factors causing construction site accidents in Nairobi County.

c. To examine human characteristics and environmental factors affecting safety in construction sites in Nairobi County, Kenya.

1.5 Research questions

To achieve the research objectives, the following are research questions which this study will answer:

a. What are the common construction site accidents in the study area?

b. What factors influence and contributes to construction site accidents in Nairobi County?

c. What is the nature of health and safety in Nairobi's construction industry?

1.6 Scope of Research

This research was confined to health and safety in building construction sites in Nairobi County and did not focus on road, mining or any or any other forms of construction currently taking place. Building projects were selected for study since there was a shortage of supply of houses in Nairobi and according to KNBS Economic Survey for FY 2013/2014, KES 190.6 Billion was invested in Nairobi to cater for the shortage (KNBS Report, 2013). To bridge the gap experienced in the housing sector, time is of essence to complete the projects and safety is compromised. The study targeted projects which have been registered with National Construction Authority (NCA) and to Directorate of Occupational Safety and Health (DOSH) thus limiting to major contractors between NCA1 and NCA4. Most minor contractors below NCA5 didn't adhere fully with the safety requirements by DOSH and were not considered in this study. The research involved collection of primary data from various construction sites in Nairobi for analysis. The research also analysed secondary data available at DOSHS offices obtained from occupational accident/disease of employee form (DOSH 1 form).

1.7 Limitation of Research

The study was only confined to Nairobi. The study was also limited to medium and large size companies registered with NCA as they were assessed that they had better grounds to implement safety management programmes due to the nature and size of their projects and were likely to take safety seriously. The Unit of analysis of this study was limited to building construction project sites. Consultants and clients were not targeted in the research design. The findings of the study is for Nairobi County but necessary generalisation can be used as a guide as to what happens elsewhere in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction.

This chapter provides the theories used for this research. The term ‘construction’ includes the erection, repair and demolition of things as diverse as houses, offices, shops, dams, bridges, motorways, home extensions, chimneys, factories and airports (Wilson, 1989). A construction site involves a lot of activities and participants, and to understand the process and the interacting elements there is a need to understand the whole system. System thinking has been used in this study to show the setup of construction projects on construction sites and the flow of information having an impact on safety in construction sites. In addition, some management factors and legislation on Occupation Safety and Health in Kenya is also discussed in the Chapter.

2.2 Conceptual Framework

In this research, a comprehensive literature review was undertaken related to injury and accident research. The researcher used a conceptual framework that defines a construction site as a system that is considered complex. Vivek (2012) defines a construction system as the composite of people, procedures, plant and hardware working within a given environment to perform a given task. Construction sites are complex systems involving multiple and mutual components. Thus construction sites have multiple participants such as clients, design teams and contractors, who have different roles from conceiving to commissioning a typical construction project. Construction is guided and regulated by different regulatory boards, professional societies, policies and regulations in both the designing and construction process.

Mohamed (2004) states that the foundation on which safety management systems are based is that all project participants (clients, designers, subcontractors, contractors) be included in considering safety systematically, stage-by-stage from the outset of the project. Figure 2.1 represents the typical setup of a construction project on a construction site in Kenya based on the government regulations and National Construction Authority (NCA) requirements.

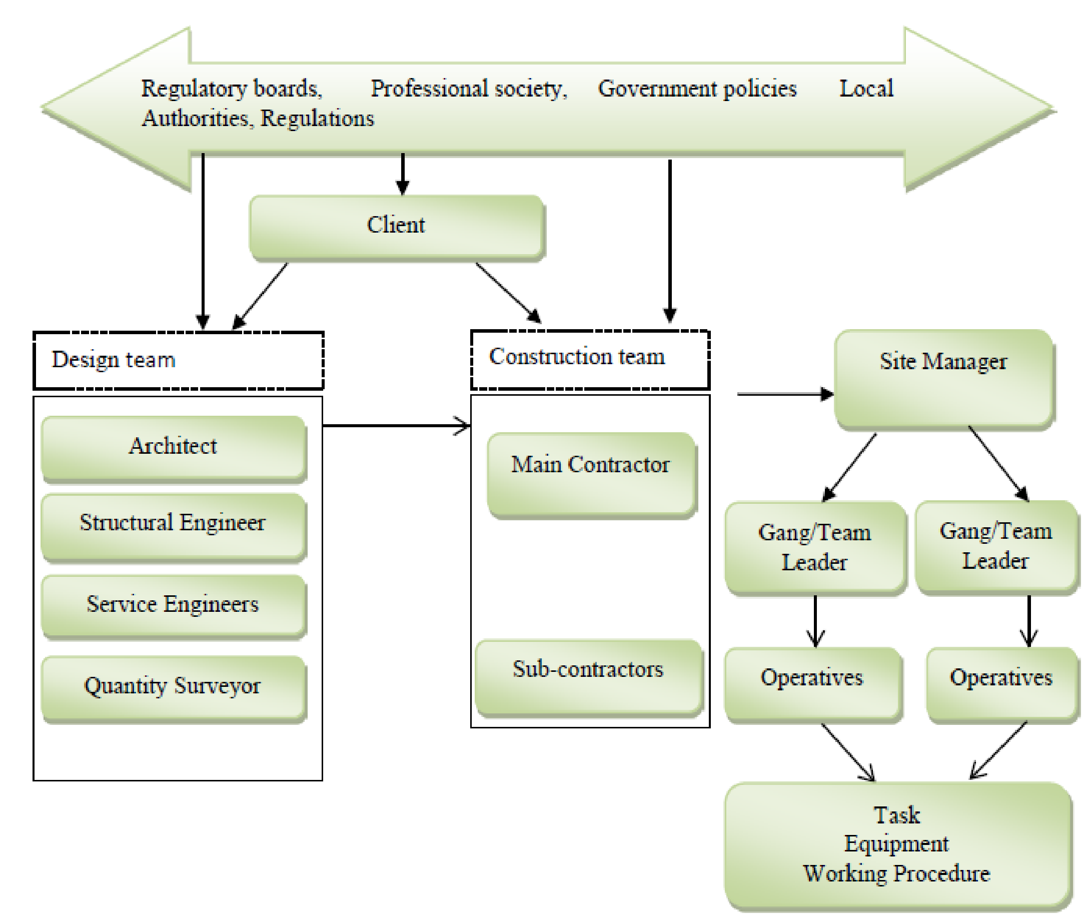

Figure 2.1: Construction project composition on a construction site (Sarah, 2012)

2.2.1 Theories of Accident Causation

An accident can be defined as an unplanned, undesirable, unexpected and uncontrolled event (Hinze, 1997). An accident can be in terms of damage to equipment and materials and those that result to injuries receive greatest attention (Hinze, 1997). All accidents that do not cause damage to materials or equipment or injury to personnel may foretell future accidents with less desirable results. An injury (to a human being) is defined as a wound or trauma; harm or hurt; or damage inflicted on the body of the injured by an external force (Webster, 2002). A hazard is defined as a thing that has potential to cause harm, or source of a danger (Webster, 2002). Hazards generally can be separated into two basic categories: physical and environmental (Davies & Tomasin, 1996).

Other types of hazards that are frequently overlooked are the unsafe actions taken by workers and a worker's lack of knowledge (Davies & Tomasin, 1996). Hazards at construction job sites are changing constantly as the job progresses (Hinze, 1997). Some specific types of hazards typically found at construction sites include falling on the same level or from an elevation; being hit by falling materials or equipment; getting caught in equipment or between objects; and receiving electrical shock from underground, frayed, or damaged electrical equipment and wiring or from making contract with overhead power line (Tam, Zeng & Deng, 2004). There are several factors that cause accidents on construction sites and vary from country to country. Tam et al. (2004) found out that in China, it's the poor safety awareness, lack of training, reluctance to commit resources to safety and reckless operations. Lubega, Kiggundu and Tindiwensi (2000) found out that in Uganda, construction accidents are caused by lack of knowledge about safety rules, engaging inexperienced workforce and poor respect for safety. Abdul, Muhd and Bachan (2008) carried out a survey in Malaysia and found out that unsafe methods, incorrect procedures, knowledge level and disobedience of procedures are the most common reasons accidents are caused at construction sites in Malaysia.

Hughes and Ferret (2005) identified the common accidents on site to be falling from heights, cutting of limbs due to mishandling heavy equipment, objects falling from height, caving in of excavations and lifting of heavy tools and equipment. They further stated that, workers are also deemed to cause site accidents due to fatigue, lack of discipline, carelessness and distractions. Other causes are attributed to the senior management ignorance, lack of training and poor communication. Pipitsupaphol and Watanabe (2006) did a study in Thailand construction sites and classified causes of accidents as unique nature of the industry, job site conditions, unsafe equipment, unsafe methods, human elements and management elements. Other factors identified are, 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 (Pipitsupaphol & Watanabe, 2006).

Research has been extensively conducted to identify the factors influencing safety performance in construction industry and the following have been identified; poor safety awareness from top leaders, lack of training, poor safety awareness of project managers, reluctance to input resource on safety, reckless operation of machines, lack of certified skilled labor, poor maintenance of equipment, lack of first aid measures, lack of rigorous enforcement of safety regulation, lack of organizational commitment, low level of education of workers, poor safety consciousness of workers, lack of personal protective equipment, ineffective operation of safety regulation, lack of technical guidance, lack of strict operational procedures, lack of experienced project managers, shortfall of safety personnel on site, lack of protection of material during transportation, lack of protection of material during storage, lack of teamwork sprit, fatigue by workers, shortage of safety management manuals, lack of innovative technology on safety and poor information flow. The factors were identified by; Dedobbeleer and Beland (1991); Ringen and Seegal (1995); Gillen, Faucett, Beaumont and McLoughlin (1997); Laitinen, Marjamaki and Paivarinta (1999); Tam et al. (2004); Sertyesilisik, Tunstall and McLouglin (2010) and Tam and Fung (2011).

From literature review, there are several theories that discuss in detail on accident causation. Vivek, Maiti and Ray (2012) divided these theories into four generations. The first generation hold a primitive viewpoint towards accident causation. These theories holds a person traits and unsafe behaviour as responsible for accident (Greenwood & Woods, 1919). The second generation theories (domino theories) conceptualise a chain of sequential events leading to an accident, these events are called dominos (Heinrich, 1932). Removal of any one of the domino from the chain would break the chain of accident events. Domino theories are widely used for accident mitigation in industry (Heinrich, Petersen & Ross, 1980). Deviation theory (Kjellen, 1984a, b) is a variation of domino theory where possible deviations in each domino are identified and evaluated quantitatively. The third generation theory of accident research is injury epidemiology (Haddon, Suchman & Klein, 1964). Injury epidemiology approach holds that accident prevention efforts do not necessarily lead to injury control in a work system. This approach focuses on energy transfer involved in injury incident and tries to minimise it in order to minimise the losses.

Systems approach to accident causation is the fourth generation and it emerged in 1970s as a response to the challenge of maintaining safety in increasingly complex work systems (Vivek et al., 2012). Socio-technical systems theory (originated in 1950's) is a parallel system-level approach for optimising safety performance (Trist & Bamforth, 1951). Macro ergonomics has evolved as an approach towards system safety improvement since late 1980s (Hendrick, 1986).

Researchers have summarised accident causes into three themes: person-as-cause, system-as-cause and system-person sequence as-cause (Leigh, Mulder, Want, & Farnsworth, 1990; Brown, Willis & Prussia, 2000; Paul & Maiti, 2008). Each theme examines specific causal factors to explain accident events causal factors responsible for accident/injury are divided into three types as: individual related, organisation related and job related factors (Paul &

Maiti, 2007; Bajpayee, Rehak, Mowrey & Ingram, 2004; Huang, Ho, Smith & Chen, 2006; Mullen, 2004; Kjellen & Hovden, 1993).

2.2.2 First generation: Accident causation theories

There are four prevalent theories which belong to the first generation of accident causation theories (Vivek et al, 2012). The theories are:

Pure chance hypothesis

Greenwood and Woods (1919) examined this hypothesis of accident causation that states that accidents happens by pure chance. Many researchers have disputed that pure chance hypothesis is the most primitive viewpoint of explaining accidents and generally not regarded as a theory (Haddon et al., 1964; Vivek et al., 2012). The hypothesis states that everyone in a population has an equal chance of meeting an accident. There are no patterns in the events leading to accident, and the accident is an Act of God. This hypothesis does not find a place in modern accident and injury research.

Accident proneness theories

Accident proneness theory is the first theory that systematically investigates accident proneness of individuals working in a system (Vivek & Ray, 2012). Researchers who are proponents of this theory are Greenwood and Woods (1919), Greenwood and Yule (1920) and Farmer and Chambers (1929). The theory states that there exists a certain subgroup within the general population that is more likely to meet accidents due to characteristics associated with dexterity, sensor-motor skill, personality or cognitive function. The liability is caused by some innate personality traits explained through the construct accident proneness (Davis & Coiley, 1959; Keehn, 1959; Irwin, 1964, Kunce, 1967; Guilford, 1973; Kunce, 1974). Accident proneness was initially perceived as non-modifiable characteristic.

Later studies suggested the role of transient factors like stress, socio-psychological make-up of an individual, safety culture and work environment in explaining accident proneness (Vivek et al., 2012). The membership of accident-prone group keeps changing, and a person's accident proneness may change with time. Liability towards accident is also influenced by previous accident experience.

The liability either decreases (burned fingers hypothesis) or increases (contagious hypothesis), after meeting an accident compared to the rest of the population (Schulzinger, 1954; Kirchner, 1961; Surry, 1969; Shaw & Sichel, 1971; Verhaegen, Vanhalst, Deijckle & Hoecke, 2002). Persons prone to injury at workplace are also prone to injury at other places (for example, home), and during other activities (for example, leisure activities or sports) (Salminen & Heiskanen, 1997). Number of individuals with repeated injuries is higher than that expected by chance (Visser, Pijl, Stolk, Neeleman & Rosmalen, 2007) indicating presence of accident proneness. Sometimes the term ‘‘differential accident involvement’’ is used to describe accident proneness. However, the term ‘‘accident proneness’’ lacks to convey the intention of prevention (McKenna, 1983), and puts more blame on individual than system. Accident proneness models align to person-as-cause theme of injury causation and suggest behavioural interventions for safety improvement.

Unconscious motivation Theory

The theory of unconscious motivation has its roots in psychoanalytic theory (Vivek et al., 2012). Accidents are caused by subconscious processes that include guilt, aggression, anxiety, ambition and conflict. This theory focuses on an individual and correlation of his/her perception of environment with personality traits. Low scores on positive or socially desirable traits, low opinions on jobs and work environment and withdrawals from work are found as significant contributors to accidents/injuries (Hill & Trist, 1953; Castle, 1956;

Davids & Mahoney, 1957; Fine, 1963; Eysenck, 1964; Verhaegen et al., 1976). The unconscious motivation theory is aligned with person-as-cause theme, and leads to behavioural interventions.

Adjustment-stress and goal-freedom-alertness theory

Adjustment-stress theory holds that individuals who cannot adjust with their work and work environment tend to have more accidents than those who can (Kerr, 1950). Failure to adjust is caused by a range of physical and psychological stressors. Goals freedom-alertness theory (Kerr, 1957) is an extension of adjustment-stress theory. This theory holds that certain persons are accident prone at work due to lack of alertness on the task at hand, which is a result of lack of freedom to set goals at work (Vivek et al., 2012). Hardly any researchers have examined and reported these hypotheses in the context of occupational injury thus being a gap in this theory.

2.2.3 Second generation accident causation theories.

There are two prevalent theories which belong to the second generation of accident causation theories (Vivek et al., 2012). The theories are:

Domino Theory

Accident causation theory was pioneered by Heinrich in 1930 who had studied and classified numbers of industrial accident. He concluded that 88 % of industrial accidents were caused by unsafe acts, 10 per cent were caused by unsafe conditions and only 2 per cent of industrial accidents were categorized as unavoidable (Heinrich et al., 1980).

Heinrich listed five factors in the sequence of events that results in an accident. The factors in the accident occurrence are summarized as follows;

a. Ancestry and social environment which is the mental and emotional character of the individual. This factor can contribute to a negative trait and may lead people to behave in an unsafe manner or can be an inherited trait driven by surrounding or social environment.

b. Fault of Person. This factor can be traced to a person's predisposition to unsafe behaviours or intolerance to follow the norm with respect to adherence to standards for hazardous conditions.

c. Unsafe act and/or mechanical or physical hazard. Unsafe acts that are committed by people and mechanical or physical hazards are the direct causes of accidents.

d. Accident. Normally accidents that result in injury are caused by falling or being hit by moving objects.

e. Injury. Typical injuries resulting from accidents include damage to soft tissue, lacerations and fracture.

Heinrich's theory has two central points: injuries are caused by the preceding factors and removal of the central factor (an unsafe act or hazardous condition) negates the action of the preceding factors and in so doing, prevents accidents and injuries. Accidents do not just happen, they are caused. There are two causes of accidents: unsafe conditions and unsafe acts.

Domino theory captures the dynamics of injury event. However, the theory does not account for complex interactions that take place during injury. Issues of risk quantification across each domino are not addressed in the theory. Focusing on only five dominos leads to an error of generalization. In practice, safety professionals perceive unsafe act as the ''easiest-to-blame'' domino, and leave unsafe conditions generally unattended. Out of this narrow focus on unsafe acts, behavioural interventions are commonly designed and implemented, when unsafe conditions demand more attention of the management.

Peterson accident/incident Theory

This model was presented by Peterson in 1971 and has been totally different concept with Domino theory that influenced many researchers during Heinrich time (during, 1930). Peterson queried the basis of the domino theories. This model was inspired by his believe that many contributing factors, causes, and sub-causes are the main culprits in an accident scenario. Under this concept, the factors combine together in random fashion causing accidents. His view is that many causes may come together as contributing factors to cause an accident. The theory highlighted new elements such as ergonomic traps, systems failures and wilful decision to err to the overload conditions in human factor theory as a more comprehensive look at human error cause. Figure 2.2 shows the model of the theory, under the theory, management’s responsibility for accident prevention is delegated to staff. It also stresses the key roles of management in accident prevention as well as broader concepts of safety and health in the place of work.

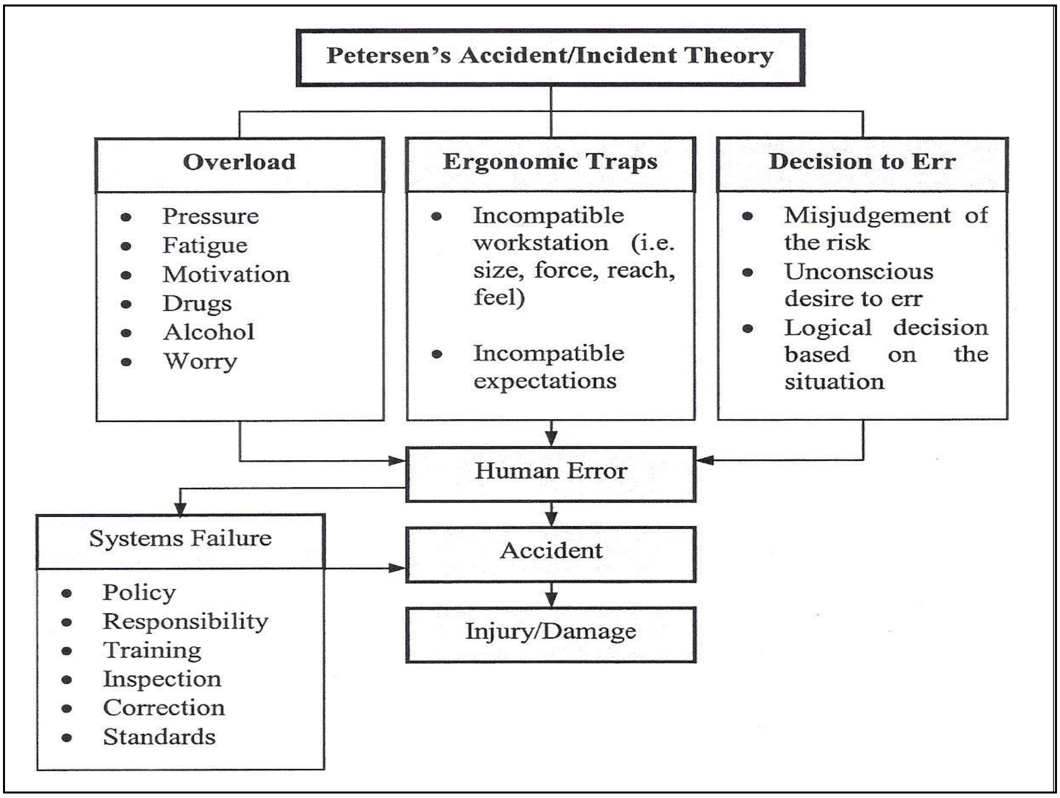

Figure 2.2: Model of Dan Peterson's Accident/Incident Theory.

Source: Heinrich (1980).

2.2.4 Third generation accident causation theories: Injury Epidemiology Theory

Injury Epidemiological Theory states that accidents are viewed as the result of a combination of forces from three different sources, host, environment and agent (Robertson, 1998). Mausner and Bahn, 1974 have recognized the requirement that more than one factor be present for disease to develop, by which they have referred as multiple causation. They further divided these factors into two groups which are host factors (intrinsic) and factors in the environment (extrinsic). While injuries damage the human body quickly, diseases do so at a slower pace (Haddon et al., 1964). Studies of injury patterns are useful for injury control. Injury epidemiology models perceive three factors to explain the injury phenomenon as (Haddon et al., 1964): the host (the person injured), the agent (the energy leading to the injury) and the environment (physical, biological and organisational).

Among the environmental factors, transient factors (those changing with time) are most immediate factors causing injury. Injuries resulting from such instantaneous factors are common, yet poorly understood from etiological perspective (Sorock, Lombardi, Courtney & Mittleman, 2001). Further research done by Sorock Lombardi, Hauser, Eisen, Herrick and Mittleman (2004) examines transient factors for hand injuries in different occupations in the USA and reports malfunctioning equipment and use of nonstandard method as significant factors. Chow, Lee, Lau and Yu (2007) examines transient risk factors for hand injuries in different occupations in Hong Kong and reports absence of hand-gloves, being rushed and working overtime as significant factors. Therefore the epidemiology is the study of causal relationship between environmental factors and disease. The same model has been applied to study causal relationships between environmental factors and accidents or diseases. In the epidemiology theory of accident causation, the key components are the predisposition characteristics of the workers and the situational characteristics of the job as shown in Figure 2.3. Applications of epidemiological approach in different work systems are scarcely reported.

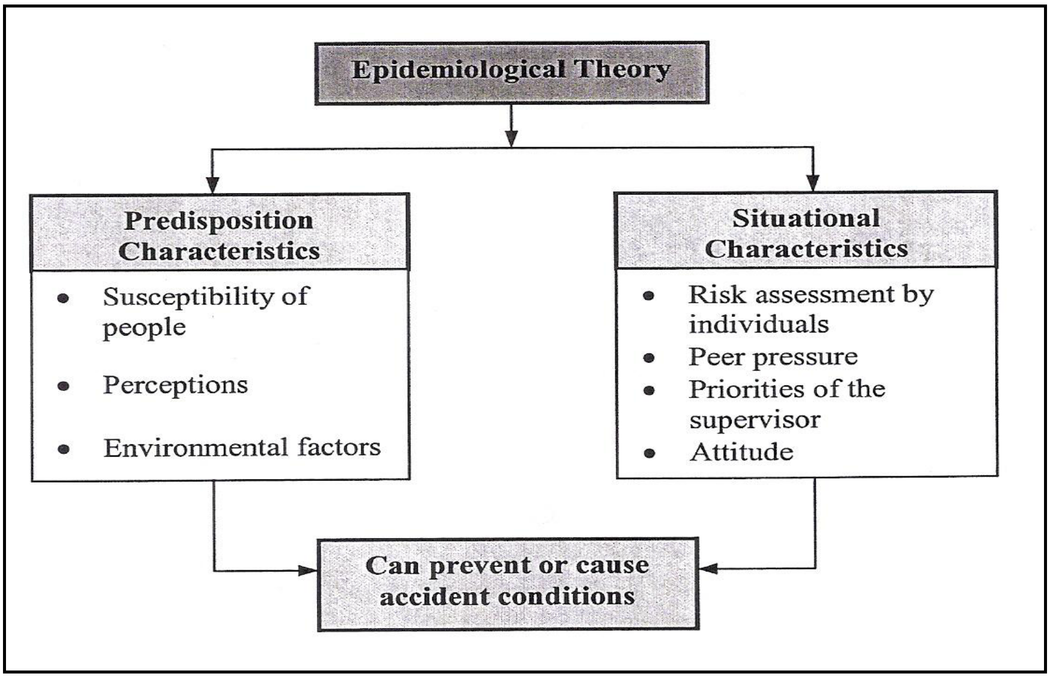

Figure 2.3: The Model of Epidemiological Theory of Accidents causation.

Source: Mausner and Bahn (1974).

2.2.5. Fourth generation accident causation theories: System models

There are two prevalent models which belong to the fourth generation of accident causation theories (Vivek et al., 2012). The models are:

System models

Over the years, organizations have become more and more complex to meet the societal demands in terms of productivity, safety and quality. Identification of deviation from normal operating conditions and propagation of injury event has become more complex. As linear approach is insufficient to understand such complex events (Leveson, 2004), holistic system approach is adopted to explain accident events (Leplat, 1984; Purswell & Rumar, 1984; Singleton, 1984b; Leveson, 2004).

However, holistic models for accident causation need to incorporate quantitative analysis to increase the strength of explanation (Attwood, Khan & Veitch, 2006). To explain accident events using a large number of system factors, simulation-based models are commonly used (Hale & Hale, 1970; Ayoub, 1975; Brenner, 1975; Smillie & Ayoub, 1976; Kjellen, 1987; Rao-Tummala & Leung 1996; Carder & Ragan 2003; Bellamy, Geyer & Wilkinson, 2008) propose system models for occupational safety and accident analysis. An integrated safety management information system is proposed for analysis and decision making related to accident events and safety interventions (Ayoub, 1979; Kjellen, 1982). System dynamic modelling and structural equation modelling approaches are employed to address coalmine safety issues (Maiti & Bhattacharjee, 2000; Bhattacharjee & Maiti, 2000).

Leamon's human machine model (Leamon, 1980) identifies components of work system, while his occupational health and safety model (Leamon, 1988) identifies interactions in work system leading to occupational accidents. However, applications of Leamon's model in analysing occupational injuries in different industrial settings are not reported. A number of factors affect safety in a work system. The relationships between these factors and the safety status of the system are multivariate in nature, and some studies examine these relationships (Brown, Willis & Prussia, 2000; Paul & Maiti, 2008). The prevailing system models analyse and explain only the accident causation and do not focus on injury event, energy interactions, and injury severity.

Sociotechnical and Macro-ergonomic Models

According to Sociotechnical system (STS), a system is composed of two interacting subsystems; social and technological subsystems. Joint optimization of these subsystems lead to better performance of the whole system. This model originated as a methodology to study productivity problem in UK coalminers in 1950s (Trist & Bamforth, 1951). Sociotechnical system (STS) approach evolve as a theory of organisation design in 1980s (Emery, 1969; Cherns, 1976, 1987; Susman, 1976; Clegg,1988, 2000; Carayon & Smith, 2000; Carayon 2006; Reiman & Oedewald, 2007). Macro ergonomic approach to work system design focuses on interactions at organisational level (Smith & Sainfort, 1989; Hendrick, 1980; Carayon & Smith, 2000; Kleiner, 2006).

2.3 Construction safety performance factors

A thorough and extensive review of literature from journal articles and conference proceedings identified several factors that influence safety performance in an organisation. The following factors influence safety performance in an organisation:

2.3.1 Organisational commitment

Most definitions of organizational commitment describes the extent to which an employee identities with and involved in an organisation (Curry, Wakefield, Price & Mueller, 1986). Organisation commitment has been identified as a critical factor in understanding and explaining the work related behaviour of employees in organizations (Bakshi, Kumar & Rani, 2009). Hofmann and Morgeson (1999) in a study between manufacturing employees producing commercial heating and air-conditioning systems found organization support and commitment on employee safety and quality of exchange relationships between supervisors and subordinates safety behaviour and reduced accidents.

Work place safety outcomes are influenced by a number of factors, including characteristics of individual workers and characteristics of the environment in which their work is carried out. While physical work environment can be engineered to reduce physical harm, safety culture reflects the reality of what happens in work environment and how people behave to ensure safe outcomes. Sawacha, Naoum and Fong (1999); Langford, Rowlinson and Sawacha (2000); Mohammed (2002) identified key factors in construction safety to be Organisation safety policy, supervision and equipment management, safety industry norms, management behaviour and leadership. Safety demands planning and detailed procedures to be effectively implemented in the field. A Safety, Health and Ergonomics (SH&E) professional needs to be involved during a project procurement and preconstruction stage.

2.3.2 Management Commitment

Management commitment is agreed as the main significant factors by many researchers in occupational health literature. Top management should actively lead the organization and employees towards achievement of organization safety goals by showing that organization is serious about safety. This statement is supported by Jaselskis, Anderson and Russel (1996) who reported that commitment and support by top management would significantly drive up the performance of safety.

Managers and employers should demonstrate their commitment through strongly realization of safety compliance to safety requirements and ensure that everyone in the organization is certain about their safety and health responsibilities (Fernando & Janbi, 2008). He summarized that manager commitment factors towards realization of safety compliance in Petrochemical Processing Area such as; properly constituted joint safety and health committees at site and departmental level, accountability of managers to the joint safety and health committee, engagement of safety and health representatives with the health and safety practitioners, dialogue among local area and line managers within the establishment of safety and health representatives, the provision time of facility to have the safety and health representative functions such as joint safety and health inspection, investigations of employees complaint, making representations to managers to managers and so on, involvement of safety and health representatives in reporting and monitoring on OSH, access of safety and health representatives to employees and access to have training for safety and health representatives (Fernando & Janbi, 2008). Management commitment towards safety and health at the workplace can change behaviour of their employees (Thye, 2006).

There are several methods which management can use to measure safety performance at construction sites so as to show commitment (El-Mashaleh, Rababeh & Hyari, 2009). Some of the methods that have been previously used include:

- Conduct a safety audit as a comprehensive review of company's safety programme. A properly conducted safety audit will determine strengths and weaknesses of a current safety programme (Kavianian & Wentz, 1990).
- Apply concept of profiling that consists of development of corporate safety performance standard in a number of categories that are considered important by clients' project managers. Companies are then compared with these categories based on which a profile is made (Kavianian & Wentz, 1990).
- Injury frequency, which is the number of lost-time injuries per million hours of exposure, is also a method to measure safety performance (Jannadi & Assaf, 1998).

Although there are established standardized check lists to assess safety at construction sites which assess both physical and technical safety aspects, they do not assess management aspects. Conventional benchmarking approach in construction safety is to assess safety performance by evaluating physical safety conditions at site as well as accident records, while no attention was paid to management factors that influence site safety (Feng, 2009). Thus, an effective measure or benchmark of safety management is an important ingredient to improve safety management and it should help to assess site safety and provide guidance in prioritizing safe management measures on construction sites.

2.3.3 Effective safety training

Effective safety training is important to educate employees on potential of accidents, how to prevent accidents and potential hazards involved in their jobs. Hence, training and education programs play a significant role in enhancement of safety in construction and important to increase safety awareness (Ghani, Abdul, Mohd, Abdul, Mohammed & Abdul, 2010) and change behaviour of employees (Wong, Chan, Tse & Love, 2000). According to study conducted by McDonald and Hrymak (2003) in 18 construction sites in Ireland, it was established that most companies carry out safety training without systematic schedule and primarily undertaken so that the companies can "cover themselves" and protect the company if something goes wrong with little expectation that it would influence the knowledge and behaviour of employees. Thus, it seems very clear that majority of employees have to gain knowledge of risks of their work through their experience of work itself. Insufficient safety training between the employees are general root cause of accidents in the construction sites because they did not have the knowledge, education and skills to recognized potential hazards at site (O'Toole, 2002). Komaki et al. (1980) studied vehicle maintenance employees and established that safety training have strong linkage to employees' safety behaviour improvement. According to Hopton (1969), trainings aimed at workers and operator would not only reduce accidents, but may also reduce costs and save lives.

2.3.4 Safety leadership

Senior management leadership play a primary role in shaping management behaviours that in turn influenced employee behaviour (Cooper, 2010). Achievement of the other safety management objectives are largely dependent on the quality and consistency of leadership demonstrated by management pertaining to safety exercise (Ismail, 2007). Leadership enables the employer to energize the employee to take OSH to the next level which leadership is all to do with people not a thing. Leadership is the quality that transforms good intentions into positive action, in turns a group of individuals into a team (Warmick, 2008). Michael, Guo, Wiedenbeck and Ray (2006) in a study between blue collar employees in wood product manufacturing facilities found that positive leadership improved safety behaviour of the employees.

2.3.5 Safety communication

Many construction accidents are found mainly caused by symptoms of safety non-compliance to safety requirements. Effective communications is an essential consideration to safe and efficient workplace. Leaders convey vision and values through interaction and communication (Ismail, Torrence & Abdul, 2007) and effective communication leads to commonly understood goals and mean to achieve them at all level. Zohar (2002) in a study between line workers and supervisors working in maintenance of heavy duty equipment found improved communication channel resulted in decreased in micro accidents and increased in using Personal Protective Equipment (PPE). Communication can be achieved in three ways:

- Through visible behaviour, employer can communicate the importance of safety and health. Employees soon recognize what employer regard as important and will adopt their own behaviour accordingly. Thus, through negative behaviour employer can undermine the safety and health culture of the organization.

- Written communication of Health and safety policy statements, statements concerning health and safety roles and responsibilities, performance standards and findings from risk assessments.
- Face to face discussions between employer and employee enable employees to make a personal contribution and helps employees feel involved in the safety and health of the organization. Ideally employees should be able to talk to employer during safety inspection.

2.3.6 Safety motivation

Employer or top management involvement such as relationship with employees, talk on safety and advise on safety matter is related to improve safety motivation and will encourage employees' safety behaviour (Che, Basha & Wan Hanafi, 2007). According to Evelyn, Florence and Derrick (2005), there are two types of motivation, the first is positive reinforcement which rewards employees outcomes such as monetary rewards, bonuses and job promotion whereas the other is negative reinforcement where employers may criticize, punish and threaten the employees so that they ensure they perform their jobs in the safe manner. However, reinforcement on positive motivation is more encouraged by many safety practitioners to maintain employees' good safety behaviour. Safety improvement also will only be achieved if incentives schemes are carried out to motivate employees to change their behaviours (Vrenderburgh, 2002). The organization that creates and maintains good quality employer and employee relationships will benefit from higher levels of the employee motivation, commitment and job satisfaction, which in turn impacted positively on the intention to stay and employee performance (Leung, Chong, Ng & Cheung, 2004).

2.3.6 Safety Management System

Construction Safety management is a method of controlling safety policies, procedures and practices in construction sites (Wilson & Koehn, 2000). It is a dynamic process involving small or large adjustments made to site operations to achieve desired goals without encountering unexpected 'shocks' to normal businesses (Chi, Chang & Ting, 2004). Further, they mentioned that safety should be embedded as a management concept into every level of a company and every party of a cross-organizational project. When considering Construction Safety Management, "Safety Culture" and "Safety Climate" are two important aspects (Flin, Mearns, O'Connor & Bryden, 2000). Safety culture is predated by an extensive body of research into organisational culture and climate, where culture embodies values, beliefs and underlying assumptions, and climate is a descriptive measure to resurrect workforce's opinion of organizational environment (Gonzalez-Roma, Peiro, Lloset & Zornoza, 1999). Pheng and Shiua (2000) stated that industry not only looks for good quality buildings but is keen to promote safe working environments at construction sites because quality and safety are two important aspects of a construction project. Unfortunately, both are frequently considered separately. Instead of operating two separate management systems, synergy can achieve by integrating quality and safety to work from a common platform.

Management of occupational safety and health in construction has unique challenges. Despite such challenges, firms that demonstrate commitment to well-structured and funded safety programs and techniques can effectively reduce incidents (Hallowell & Gambatese, 2009). Safety management techniques must often be adjusted to meet unique needs of the industry. Since most firms allocate limited resources for safety management; contractors are forced to select available elements (Hallowell & Gambatese, 2009). To manage construction safety effectively, adherence to safety procedures are important where safety performance comes in to effect. According to Jaselskis et al. (1996), construction safety management systems improved significantly following Occupational Safety and Health Act of 1970. It placed the responsibility of construction safety on employer as it resulted in a dramatic increase in safety planning and management efforts in construction industry.

Management must take active steps to implement sound OSH management system, including proper risk assessments, reporting systems, safety plan, clear delegation of responsibilities, provide adequate resources and ensure that full information is disseminated to workers and other person exposed to risks (Muhammad, 2006). Whittington, Livingstone and Lucas (1992) commented that construction industry characteristics lead to poor safety record and causes are deep rooted and complex. They further state that problems at site level could often be traced back to management issues such as poor contractor selection, lack of supervision or inadequate training. Whittington et al. (1992) indicated how the industry and potential clients were also seen to be responding to safety management demands in a fundamentally flawed manner by way of:

- Being dealt with at a late stage of the project cycle
- Undue emphasis on the failure of individual workers resulting in short term measures rather than resolving underlying organisational problems.
- Competitive tendering resulting in a failure to address safety requirements at bidding and tendering stages.

- Safety issues being inadequately addressed in planning and scheduling of work.
- Lack of safety performance monitoring and feedback.

2.3.7 Safety Guidelines and Regulation

The occupational, safety and health act OSHA (2007), is an example of safety guidelines and regulation which provide legislative framework to promote and encourage high standards of safety and health at work thus the primary aim of the act is to promote safety and health awareness and to instil safety culture among all Kenyan workforce (DOHSS Report, 2011). Besides, employee's poor perception on employer compliance to safety requirements could lead to negative behaviour and correlate with poor safety performance which carries enormous negative consequences to the individual and the organisation where they work (Jamal, 2003).

2.3.8 Personal Protective Equipment

The employer also has to supervise employee from time to time to ensure they will always follow the rules to wear safety tools to keep their safety is always a priority when perform jobs at construction sites. Frank and Ronald (1982) in their study established that the employer must provide protective personal equipment to the workers, especially for those that work in construction sites to reduce the death of the worker if they wear personal protective equipment. Duff, Robertson, Cooper and Philips (1993) in their study of construction industry in the United Kingdom found percentages of non-compliance with specific categories in six construction sites ranging from 22-38% of noncompliance in housekeeping, from 12-43% of noncompliance in scaffolding, from 20-26% of noncompliance in access-to-heights, and from 21-65% of non-compliance in using Personal Protective Equipment (PPE). Lingard (1997) did a similar study of non-compliance In Hong Kong and established that the percentage of non-compliance was 30-49% for housekeeping, from 30-66% for bamboo scaffolding, from 50-74% for access to heights and 49-69% for PPE. Among others, the factor of PPE shows high percentage of non-compliance percentage.

2.3.9 Safety and Health Officer

The requirement of safety and health officer is clearly stated in the occupational, safety and health (safety and health officer) regulation 2007 where the employer of the following class or description of industries shall employ a suitable, knowledge, experience and skills safety and health officer for the specific performance of the specific work. It is agreed that safety and health officer is highly empowered to change or improve the company's safety performance. A study by McDonald and Hrymak (2003) on construction sites recommended that all sites should have safety and health offices. The safety officers should demonstrate strong personality and influence both behaviour and compliance of employees to safety which demonstrate potentially strong role of safety and health officer can influence both behaviour and compliance of employees with safety requirements. He added, the strongest relationship with safety compliance is the presence of safety and health officer with better safety management performance for example response to audits and reporting the hazard to ensure it leads to better safety compliance on site in future. Hence, the role of safety and health officer should be strengthened and their function should be reinforced as part of the safety management system.

2.4 Legal Basis of Safety Laws in Kenya

2.4.1 Factories and other places of work Act 1951

Safety Laws in Kenya are traced back to 1951 where Factories and other places of work, Chap 514 was enacted. The Act made provision for health, safety and welfare of persons employed in factories and other places. The factory and other places of work act deals in detailed provisions with various matters concerned with the fencing and guarding of machinery, making the obligation mandatory in respect of prime movers and transmission machinery, other machinery being required to be fenced only if dangerous. The Act has since been replaced by other legislations that have been developed over time.

2.4.2 Building Operations and Works of Engineering Construction Rules, 1984

Building operations and works of engineering construction are excluded from the operation of certain sections of the Factories and other places of work Act and are subject instead to the Building operations and works of engineering construction rules. This Subsidiary rule was introduced in Kenya in 1984. The Law provides specific conditions applicable to building sites. Where the Act does apply, inspectors are empowered to enter premises at all reasonable times to inspect and examine, to ask for information, and to require production of certificates and other documents. A contractor who is about to undertake building or construction work must give seven days' notice in writing to the director, stating the nature of the operation of works (Building Operations Rules, 1984). All the construction players have to be aware of the legal framework of the construction site safety. With the detailed knowledge of the construction safety law, the parties involved will be aware of their own responsibilities in relation to the construction site safety.

Other Subsidiary legislation has since been made by Directorate of Health and Safety to introduce laws aimed at protecting the workers. The subsidiary legislation are:-

- Woodworking Machinery rules L.N 431/1959.
- Dock rules L.N 306/1962
- Cellulose solution rules L.N 231/1957, L.N 87/1964
- Eyes protection rules L.N 160/1979
- First Aid rules L.N 160/1979
- Electric power special rules L.N 340/1979
- Noise prevention and control rules L.N 296/1996, L.N 25/2005.
- Health and Safety committee rules L.N 31/2004.
- Medical examination rules L.N 24/2005

2.4.3 Occupational Safety and Health Act, OSHA (2007)

In 2007, through an Act of parliament, OSHA was enacted and is currently being used in the industry. Occupational safety and health is the discipline concerned with protecting the safety, health and welfare of employees, organisations, and others affected by the work they undertake such as customers, suppliers, and members of the public (David, 2002). The primary, and arguably most prominent reason for OSH standards are moral - an employee should not have to expect that by coming to work they are risking life or limb, and nor should others affected by their undertaking. OSH standards are, generally speaking, further reinforced in both civil law and criminal law; it is accepted that without the extra "encouragement" of potential litigation, many organisations would not act upon their implied moral obligations.

The OSH Act (2007), applies to most employers. If an organization has even one employee, it is considered and employer and must comply with applicable sections of the act. This includes all types of employer from manufacturing and construction to retail and service organizations. The mission and purpose of OSHA can be summarized as follows:-

- Encourage employers and employees to reduce workplace hazards.
- Implement new safety and health programs.
- Improve existing safety and health programs.
- Encourage research that leads to innovative ways of dealing with workplace safety and health problems
- Establish the rights of employers regarding the improvement of workplace safety and health.
- Monitor job-related illnesses and injuries through a system of reporting and record keeping
- Establish training programs to increase the number of safety and health professionals and to improve their competence continually.
- Establish mandatory workplace safety and health standards and enforce those standards.
- Provide for the development and approval of state level workplace safety and health programs.
- Monitor, analyse and evaluate state-level safety and health programs.

2.4.4 National Construction Authority Act, NCA (2011).

The National Construction Authority Act was established in 2011. The role of NCA is to streamline, overhaul and regulate construction industry in Kenya. The industry has for many years suffered poor legislative framework and had been dominated by quacks and unqualified persons. The Act contains provisions on quality and safety standards of any construction work.

The key functions of the board are to register, regulate and promote the activities and conduct of all contractors in Kenya. The act requires all construction sites to be boarded, all employers to maintain at every construction site an accident register book, in which all accidents and incidents are recorded, to provide appropriate safety gear to every person on site, to provide fire-fighting equipment on site and to provide welfare facilities such as clean, safe and sufficient drinking water, water for washing, toilets and changing rooms.

2.4.5 Employment and Labour Relations Act, (2007)

The application of the Employment and Labour Relations Act of 2007 covers some social aspects relating to construction sites. The purpose of the Act is to make provisions for core labour rights, to establish basic employment standards, to provide a framework for collective bargaining, and to prevent and settle disputes, among others. The Act prohibits child and forced labour, guarantees freedom of association, establishes minimum wages according to the sector, regulates working hours and administers different types of leave, such as annual leave, sick leave, and parental leave.

The act defines clearly the responsibilities and entitlements of both employers and employees, including the freedom of forming trade unions, which is the only way the construction industry, can demand their rights and build links among them. It also sets penalties and lays the grounds for disputes for both Employees and Employers.

2.4.5 Workers Compensations Act, 2007.

The Workers Compensation Act lays down the procedures for any worker, who gets injured while working, to be compensated, specifically if the injury or death has been caused by the irresponsibility of the employer. In fact, the Act aims to encourage safety and Health at workplaces including construction sites.

2.5 Validity and Reliability of research

Validity and reliability are the main issues of concern in research. No matter how scientific and robust data analysis tools are used, the results will be questionable if validity and reliability instruments are not taken into account. In terms of measurement procedures, Validity is defined as the degree to which the researcher has measured what he has set out to measure (Smith 1991). There are three common types of validity; (1) face and content validity; (2) concurrent and predictive validity and (3) construct validity (Kumar, 2005).

Face and content validity refers to the degree to which the instrument reflects a specific domain of the content. Specifically, face validity is the establishment of a logical link between each question or item on the scale and an objective; whilst content validity refers to how well the items and questions cover the full range of the issue or attitude being measured. One of the main advantages of face and content validity is that it is easy to apply (Kumar, 2005).

Concurrent and predictive validity are judged by the degree to which an instrument can forecast an outcome. Concurrent validity is judged by how well an instrument compares with a second assessment concurrently done (Kumar, 2005). Construct validity is determined by ascertaining the contribution of each construct to the total variance observed in a phenomenon (Feng, 2009). It is based on statistical procedures. In the research design and data collection stage, the validity of the research instrument is assured by taking the following precautions:

- The instrument used to identify accidents in construction sites and evaluate factors affecting health and safety in this study has gained its adequate content validity with solid theoretical support, as the design and selection of measurement items are based on an extensive literature review. The items for measuring safety performance were also derived from an extensive literature review, in which these items have been judged to be valid with adequate theoretical supports.

Reliability refers to the degree of consistency and stability in an instrument. It’s a scale or test that measures consistency if measurements are repeatedly made under constant conditions and give the same result (Moser & Kalton, 1989). Kumar (2005) noted that in the social sciences, it is impossible to have a research tool which is 100 per cent accurate, not only because a research instrument cannot be so but also because it is impossible to control the factors affecting reliability. These factors may include the following: (1) the wordings of questions; (2) the physical setting; (3) the respondent’s mood; (4) the nature of interaction; and (5) the regression effect of an instrument. Most of these factors are uncontrollable actions of the respondents, which are beyond the control of the study. In this regard, some precautions, such as pre-testing the instrument in the pilot study, asking the respondents to fill out the questionnaire in front of the researcher’s eyes, etc. are required to mitigate the potential threats of these factors and establish the reliability of the instrument. Peer review provides an opportunity for independent judges to question various aspects of the research, e.g. arguments, methodology, methods, interpretations and conclusions (Xiao, 2002).

2.6 Summary

In this chapter, theories relating to accident causation at construction sites have been discussed. The chapter traces the arguments that have been discussed by various researches on the causes of accidents and appreciates that construction is becoming a complex system and a simple linear approach is insufficient in understanding the complex events. Joint optimization of systems between social and technological systems can lead to better performance and interaction of organisations to reduce the levels of accidents.

The chapter also notes that prevention of construction accidents is influenced by a combination of many factors. These factors include management, regulatory, cultural, commitment of senior management, investment in health and safety, training among other factors. The chapter also identified areas where validity and reliability of data can be affected and compromise the data collected.

2.7 Research gaps

Studies have been done to examine the health and safety in construction sector around the world. Most of the studies which have been done, shed light on the causes of construction site accidents in developed countries. However, there is a research gap in developing countries in identifying the causes of construction site accidents in Sub-Saharan Africa where the fatality and injury rates in construction industry are at 21 and 16,012 per 100,000 workers respectively. These records are higher than the average fatality rate at 4.2 and injury rate of 3,240 per 100,000 in developed countries (Smallwood et al., 2010). Owing to this, this research was undertaken to understand the Kenyan context and identify why construction accidents are still high.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses how the research was carried out in order to meet the study's aim and objectives. To achieve these objectives, this research adopted mixed method approach. Each research strategy will be analysed taking into consideration the objectives set to be achieved in order to achieve results of what is under investigation.

3.2 Research Design

There are three types of research approach; qualitative approach, quantitative approach and mixed method approach. In deciding on the approach to be adopted, it was noted that using either a quantitative or qualitative approach alone may not provide complete insights into Occupational, health and safety in construction industry. Quantitative approaches adopt 'scientific method' in which initial study of theory and literature yields precise aims and objectives with proposition(s) and hypotheses to be tested (Fellows & Liu, 2008). Qualitative approaches involve research in which an exploration of the subject is undertaken without prior formulations (Fellows & Liu, 2008). Likewise, qualitative design alone will not provide adequate descriptive information on broader issues such as the stakeholder investment in occupational health and safety, compliance with regulation, construction industry stakeholder's relation with government institutions with regulatory duties. Furthermore, it will not provide evidence to support generalizations about health and safety management practices.

The approach used in this research is a mixed research (Multi methodology) approach which is a combination of both quantitative and qualitative approaches to data collection, the analysis of data and other phases of the research process (Creswell & Clark, 2007). This approach tends to base knowledge claims on pragmatic grounds, whereby research problems can be understood better by employing both methods rather than by using only one method (Creswell, 2003). The mixed method approach involves collecting both numeric and text information, either simultaneously or sequentially, so as to best understand research problems, with the final database representing both quantitative and qualitative information (Creswell & Clark, 2007). The advantages associated with multi-methodology are as follows:-

- Testing validity of theories involving multiple measures of theoretical concepts, multi methodology has the power to add strength of evidence. Conventional single method approaches are likely to be inappropriate (Kheni, Dainty & Gibb, 2007)
- One method may fail to accomplish all research objectives equally well. Weakness of conventional research are; nonreactive methods are prone to reactive errors, non-experimental research lacks causal precision, non-field studies tend to be artificial and overly simplified and non-survey research tend to be weak in generalizability (Brewer & Hunter, 2006).
- Imperfections in a particular single method or research situation where the use of ideal method is infeasible can limit the use of a single method approach (Kheni et al., 2007).
- Diverse data gives the researcher the opportunity to compare results and findings from different data sets (Kheni et al., 2007).

- Methodological biases associated with single methods can be avoided by use of multi-methodology since data from one method could corroborate evidence provided by another method (Kheni et al., 2007).

In formulating the research design, it is critically important to accurately identify the unit of analysis, such as the individual or the group (Fellows & Liu, 2008). The unit of analysis in this study is defined as a building construction project in Nairobi County. Construction site accidents and incidents are confined to those incurred by building contractors (including main contractors and subcontractors) within the study area. Consultant and client projects were not targeted in the research design. For the contractor's project in this context, typical members include: project manager/director, site manager, site engineer, site quantity surveyor, planning engineer, safety manager, safety officer, safety supervisor, foreman, etc. The unit of analysis for the research was building construction projects in Nairobi County.

A detailed and comprehensive analysis of occupational accidents in Nairobi's construction industry has yet to be carried out. The study was designed to fill this gap in literature, addressing the needs of researchers, academics and safety professionals not only in Nairobi but any individual who would like to understand the characteristics and accident causation factors in construction industry. The first phase of this study was to collect secondary data on construction accident from DOSH between January 2010 and December 2014. The data was collected from duly filled Occupational accident/ disease of an employee form (DOSH 1 form). The data was found to be more reliable than official statistics given by DOSH annual reports.

3.3 Target Population

Kenya's capital city, Nairobi is centrally located in the country and covers an area of 684 square kilometres (KNBS, 2009). It has an altitude of between 1600-1850 metres above sea level. Nairobi has a temperate tropical climate with two rainy seasons. Highest rainfall is received between March and April whereas the short rainy season is between November and December. The mean annual rainfall ranges between 850-1050mm. The mean daily temperature ranges between 12 and 26 degrees centigrade. It is usually dry and cold between July and August, but hot and dry in January and February (UNEP, 2003). The mean monthly relative humidity varies between 36 and 55 per cent. The mean daily sunshine hours varies between 3.4 and 9.5 hours (UNEP, 2003). Nairobi, like many other developing cities in Africa, is experiencing rapid urbanization growth (UN Habitat, 2008).

Nairobi County population grew from 8000 in 1901 to 118,579 in 1948 (UNEP, 2003). In 1962 the county had a population of approximately 343,500, and in 2009 census the population was 3,138,369 (KNBS, 2009). Currently the growth rate of Nairobi is 4.1% and it is estimated that the County's population will reach 5 million in 2025 (KNBS, 2009). The County's overall population density is 4516 people per square kilometre. The density varies across the County's different divisions. Central division is the most densely populated with 22,164 persons per square kilometre (KNBS, 2009).

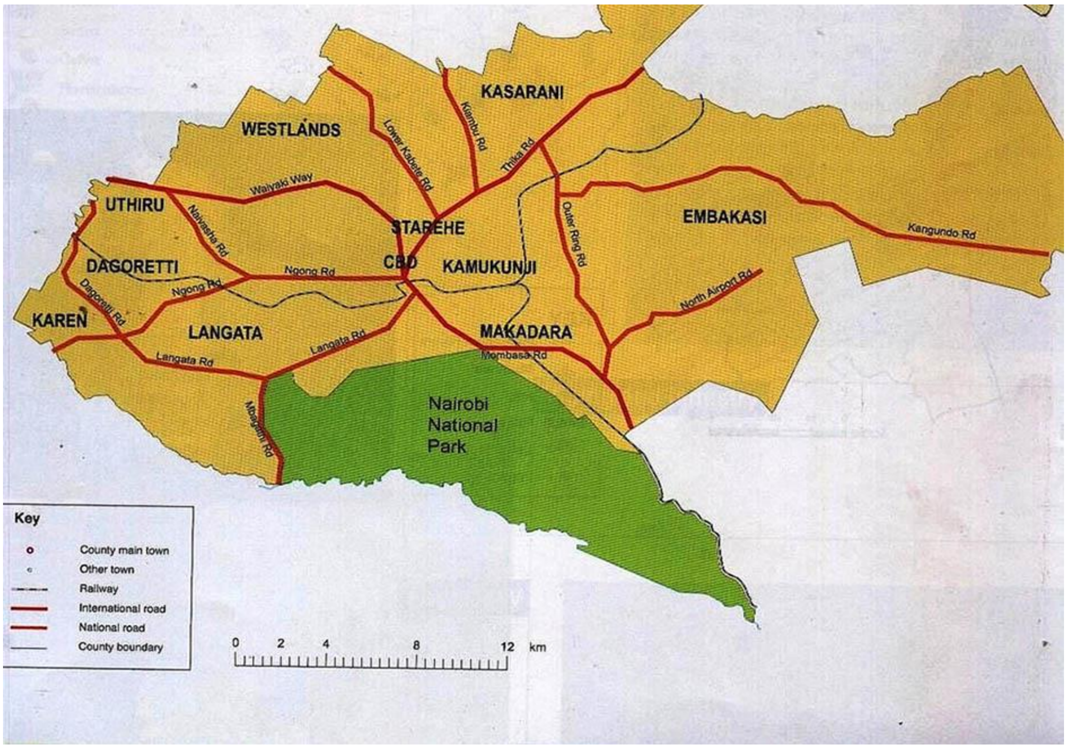

Figure 3.1: Map of Nairobi County

Nairobi population is mainly composed of young people, 56.5% of its population are below the age of 24 years (KNBS, 2009). The youthful structure of the population causes high dependency ratios and is responsible for high unemployment rates and demands for education, housing, health, transport and other social amenities. Illiteracy rates in Nairobi for the 15-54 age groups are 7.8% for women and 5.8% for men (KNBS, 2009).

Kenya continues to experience serious housing shortage with a supply of 35,000 units per year compared to a demand of 150,000 units per year (KNBS, 2009). The prolonged housing shortage has led to a proliferation of unplanned and informal urban settlements. Nairobi County is divided into 17 constituencies, namely Westlands, Dagoreti North, Dagoreti South, Lang'ata, Kibra, Roysambu, Kasarani, Ruaraka, Embakasi South, Embakasi North, Embakasi Central, Embakasi East, Embakasi West, Makadara, Kamukunji, Starehe and Mathare. There are 8 main administrative divisions of Nairobi, these are; Central, Dagoreti, Embakasi, Kasarani, Kibera, Makadara, Pumwani and Westlands. Most of the upmarket suburbs are situated to the west and north-central of Nairobi. According to KNBS Economic Survey for FY 2013/2014, there was an increase in housing by 34.2% from KES 181.1 Billion in 2012 to KES 243.1 Billion in 2013 and Nairobi County accounted for 41.1% to stand at KES 190.6 Billion in 2013. This is attributed to the rapid growth of population in Nairobi. The study targeted all the 8 main administrative divisions in Nairobi. Construction industry in Nairobi consists of both international/foreign contractors and domestic/local contractors. Construction projects in Kenya are registered with the National Construction Authority (NCA). The Authority has a board which comprise of Federation of Master Builders, Kenya Association of Building and Civil Engineering Contractors and Roads and Civil Engineering Contractors Association. Further, on-going construction projects are registered with Nairobi County Government Public Works, Roads and Transport department.

3.4 Sampling Frame

Sampling is the process of selecting a sample from the sampling population to provide a practical means of enabling the data collection and processing components of research to be carried out whilst ensuring that the sample is representative (Fellows & Liu, 2008). The unit of analysis implies that the target unit for sampling was the building projects in Nairobi County.

The goal of the research was to investigate the factors that influence safety in construction sites in Nairobi County. This required a sample to contain contrasting sites giving sufficient variance in the factors being studied. It was desirable that the sample be broadly represented. On-going projects within Nairobi County were the ultimate source of the information required for this study and the information was gotten from the engineering department of the county government. The list of the contractors gotten in those projects was established and they had to be registered with National Construction authority (NCA). This was a start point to build a comprehensive sampling frame for this study. Contractors registered with NCA are those considered as having sufficient resources, experiences and technical expertise to undertake contracts. Contact information of the selected contractors was collected through personal contacts. Good personal contacts with potential data providers tend to establish trust and confidence in the researcher, ease data collection process and increase response rate (Fellows & Liu, 2008).

Sampling frame was relied upon County Government Public Works, Roads and Transport department since its data is updated unlike NCA which was recently established.

3.5 Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

To cover all the seventeen regions of Nairobi County was beyond the ability of a single researcher which was also limited by time and budget. The eight major administrative regions in Nairobi were used as a sampling frame out of which four regions were selected using random simple sampling. The sample selected was defined by area of residence thus cluster sampling was used. Cluster (systematic) sampling has been defined by Kelly (2006) as survey sampling method which selects clusters such as groups defined by area of residence, organizational membership or other group-defining characteristics. Cluster sampling allows inferences to be made from the sample about the population and it is the most suitable choice where a researcher is faced with time and other resources constraints. To ensure representativeness, samples from each cluster were randomly selected. Therefore 10, administrative regions in Nairobi were selected as cluster and simple random sampling was used to select sites which were undertaking construction activities. Questionnaires were administered to at the construction sites the sampled regions.

3.5.2 Sample Size

The aim of the calculation of sample size is to determine an adequate population prevalence with a good precision (Daniel, 1999). According to the results of Knofczynski and Mundfrom's (2008) research, in order to derive a good prediction level, the recommended minimum sample size to predictor ratio was 13:1. This sample size to predictor ratio is higher than the ratio of 10:1 suggested by Miller and Kunce (1973).

The sample size was determined using Glenn (1992) Equation 3.1. The equation gives a well representative sample for a wide range of qualitative studies and is recommended by Glenn (1992) for assessing operational health and safety in construction sites.

$N = Z^2pq/d^2$ ....(3.1)

Where,

N is the required sample size,

Z is the value of standard variance at 95%,

P is the proportionate target population with the particular characteristics being measured,

q is equivalent to 1-p.

$N = 1.96^2(0.95)(0.05)/0.05^2$

$N = \mathbf{72}$

Assuming that 95% of the target population are operating in construction sites and at any time are likely to be involved in construction accidents (p = 95%) and taking a 95% confidence interval; Z = 1.96 (tabulated). Taking a statistical significance level of 5%, d = 0.05 and q = 0.05. This gives a sample size (N) of 72.

Based on this, a total of 72 questionnaires were distributed to various construction sites in Nairobi County.

3.6 Data collection instruments

As explained earlier, the type of research adopted in this study was a multi methodology approach. Secondary records are useful source of data collection, often taking the form of computer files and records (Kumar, 2005). Examples of secondary records include; public use files (e.g. census and other statistical data made available by government); service records (e.g. those showing the number of clients served over a given period of time); organisational records (e.g. budget and OSH records); personal records; maps and charts of the geographical characteristics of a place; and survey data (e.g. data previously collected about a site's employees, residents, or participants) (Yin, 2009). The strengths of secondary data include: stable; unobtrusive; exact; broad coverage; and precise and usually quantitative (Yin, 2009). The major weakness of the secondary data lies in the accessibility of such data due to privacy reasons. Unlike documentary evidence, Yin (2009) noted that the usefulness of these secondary records will vary from case to case. For some studies, the records can be so important that they can become the object of extensive retrieval and quantitative analysis; while in other studies, they may be of only passing relevance (Yin, 2009).

For qualitative data, interviews and questionnaires were carried out. A questionnaire is a written list of questions, the answers to which are recorded by respondents (Kumar, 2005). Questionnaire may be administered by post/email/web to respondents, groups or particular individuals, or to individuals personally by the researcher (Fellows & Liu, 2008). The only difference between an interview schedule and a questionnaire is that in the former it is the interviewer who asks the questions and records the respondent's replies on an interview schedule, and in the latter replies are recorded by the respondents themselves (Kumar, 2005). This distinction is important in accounting for the respective strengths and weaknesses of the two methods. Questionnaires were administered to those construction sites where project managers or safety officers were not available personally on sites on different occasions due to daily changing activities on the site. The respondents were not obliged to send their completed questionnaires through the post; as it was collected personally. In order to encourage the potential respondents to participate in this study, some measures were also taken during the data collection process: (1) confidentiality was assured verbally and confirmed in writing in the formal letter of invitation for participation, which contains an explanation of the research, the purpose of work, type of information required, etc. To further check the accuracy or trustworthiness of the data collected, some additional measures were taken:

- Reviewing the OSH regulations, OSH annual reports published by DOSHS in Kenya. These regulations and statistics may provide a good indication of the basic safety requirements and overall level of safety performance by industry.
- Reviewing the statistical information of labour market that was published in the Ministry of Labour
- Conducting informal conversations with the workers or staff of the interviewed projects and the industrial practitioners with whom the researcher has good contact.

The information obtained through the above ways was used to compare with the data collected through the interviews and archival records to identify the abnormal data or cases before they were processed and analysed.

3.7 Pilot survey

Before conducting the interviews, a pilot study was conducted with the following purposes: (1) to test the reliability of the data collection instrument; (2) to assure that the wording and text of the questionnaire was clear and understandable; (3) to validate the content of constructs and measures and identify if something unique to Nairobi County construction context was not considered in the data collection instrument; (4) to test the feasibility of data collection method; and (5) to obtain a reliable estimate of the anticipated completion time and valuable data collection experiences.

The data collection instruments were tested so that the respondents could be observed and questioned if necessary. This pilot study was conducted by means of structured interviews using the initially designed data collection instrument. The interviewees comprised three site agents and two safety officers from five different construction sites in Nairobi County. The three site agents that the researcher had built trust and confidence and was able to obtain more reliable feedback from them. All the three site agents had more than 10 years of experience in construction industry, and both the two safety officers are registered Directorate of Occupational Safety and Health and had more than 10 years of experience in construction safety. This indicates that all the interviewees have adequate recognition and knowledge of OSH in Kenya's construction context. The pilot study was divided into two phases. In the first phase, the questionnaire was delivered to the construction site to the three interviewees that had good personal contacts with the researcher. They were required to go through the research instrument carefully and provide their comments regarding the following questions: (1) are the wordings and organisations of questions clear and understandable? (2) are the items, measures, indicators and statements compatible with the organisation's construction context? (3) are there any other potential questions that are unique to Kenya's construction context to be added to the instrument? (4) are all the information required in the instrument available for your project? and (5) are there any other comments on the instrument?

Based on the feedback from the three respondents, some changes were made to the initially designed instrument: (1) some wordings of the instrument were changed to avoid confusion; (2) total number of injured workers was further categorized as depending with the number of off working days taken or fatal. In the second phase, five structured interviews were conducted using the revised instrument. During each interview session, the interviewee was requested to answer all questions in the instrument and rate the frequency of construction site accidents and the importance of factors that reduce construction site accidents (Appendix A). The results of the interviews show that all the information required in the instrument can be obtained through interviews and checking the archival records of the project. The wordings and text of the instrument were further checked during the five structured interviews. Also, a reliable estimate of the anticipated completion time (approximately 1 hour), and, more importantly, valuable experiences were obtained to enable subsequent interviews to be conducted more effectively and efficiently.

During pilot survey, it was difficult to eliminate or control all potential threats to the validity of the study (e.g., some uncontrollable actions of respondents were beyond the control of the study), this study adopted a proactive attitude to first identify the potential threats of bias, and then carry out precautions to mitigate them as far as possible throughout the research lifecycle. The following potential threats in the research design and data collection stage are identified and dealt with:

- *Accuracy/trustworthiness of data collected.* To ensure the accuracy of the data collected and maintain the integrity of research, the following precautions were adopted: (1) careful selection of appropriate respondents (i.e., only site managers and project safety managers/officers were selected as the key contact persons/interviewees of each selected project); (2) data sources triangulation (e.g., structured interviews, government accident records, informal conversations, insurance policy documents, internal safety management systems documentation, internal safety inspections records, safety audit records, etc.); (3) adequate transparency (i.e., this research has provided adequate transparency for potential replication to enhance the reliability of the results); and (4) Respondent cross-verification of the data (i.e., after the completion of each interview session, the interviewees were requested to review and confirm the answers and also give feedback (if any) on the data collection).

• *Errors by the respondents or interviewees* (e.g., forgetting, seriousness, embarrassment, misunderstanding, or lying) (Neuman, 2003). Although this type of threats was largely beyond the control of the research, they were mitigated by carrying out the following precautions: (1) allowing anonymity; (2) ensuring confidentiality; (3) ensuring clarity of questions through pilot study; (4) asking respondents to complete the questionnaire in front of the researcher's eyes; and (5) cross-checking the accuracy of the data collected using multiple sources (i.e., the accuracy of the data collected via interviewers' recollection were checked by reviewing relevant secondary data).

• *Unintentional errors or sloppiness of the interviewer* (e.g., contacting the wrong respondent, misreading a question, omitting questions, reading questions in the wrong order, recording the wrong answer to a question, or misunderstanding the respondent) (Neuman, 2003). The precautions to mitigate the influence of this type of bias include: (1) obtaining enough interview experiences by conducting pilot studies to enable the subsequent interviews to be smoothly conducted; (2) allowing the interviewees to have a copy of the interview questions during the interviews; and (3) requesting the interviewees to cross check the recorded answers.

• *Intentional subversion by the interviewer* (e.g., purposeful alteration of answers, omission or rewording of questions, or choice of an alternative respondent) (Neuman, 2003). This type of potential errors was strictly eliminated by conducting all the interviews personally by the researcher in this research. No other interviewers were employed in this research.

• *Influence on the answer due to the long duration of the interviews*. To mitigate this threat, the following 3 measures were undertaken: (1) a substantial amount of careful pre-planning was undertaken to ensure the smoothness of the whole process of interviews; (2) a suitable time for interview was scheduled to allow enough time to complete the interview questions; and (3) a follow-up interview was scheduled once the interview questions were not completed in one session due to the tight schedule of the interviewees or the availability of information.

3.8 Data collection procedure

3.8.1. Secondary data

The source of the secondary data for this study was from reported accidents at DOSH offices in Safety House, Industrial Area and recorded in Occupational accident/disease of an employee form DOSH 1 (Appendix B). The secondary data is available in Appendix C. This study analysed 237 accidents reported between January 2011 and December 2014. This data was from all the regions of Nairobi County. This study categorised occupational accident by Age, Location, Type of employment, Type of accident, Body part injured, Time the accident occurred, Month, Number of days lost from work and Amount of money compensated by insurance from the accident. The data gave the researcher broader information of the nature of construction sites in Nairobi County.

3.8.2. Interviews

Before the interviews and questionnaires were carried out, a key contact person for each target project construction site was identified by the researcher. This key contact person served as the link between the researcher and the potential sources of information or questionnaire respondents. The key contact person also enabled possible follow-ups if there was any unclear or missing information that was required later. In this context, typical targets as key contact persons included project managers, site engineers and project safety managers/officers. The next step was to conduct face-to-face interviews upon being granted the opportunity to interview the project managers or safety managers/officers. Site managers were the first choice of interviewees as they have deeper and broader understanding of the projects' OSH strategies and performance. Also, they are the most likely persons to get access to the archival records of the projects. The second choice was the project safety managers/officers, who are in charge of the OSH issues of the projects.

The interviewees were requested to recall or review the archival records of the project, or provide their estimation whenever the records were unavailable to complete Section A (project and contractor general information) and B (health and safety procedures). In general, the face-to-face project interviews took one to one hour to conduct depending on the number of accidents occurred in the project and the availability of records of the information. During the interview, the interviewees were requested to show the evidence or records of the information to be collected. Such evidence include: OSH statistics of the company and project; safety inspection records; safety audit report; project safety plan;

company and project organizational chart; insurance policy document; internal safety management systems; safety training records; name cards; company brochures; etc.

In most cases, the project manager or safety manager/officer did not answer all the questions by himself/herself. He/she had to consult other project personnel such as quantity surveyors and safety supervisors, or the personnel in the head office who was in charge of OSH issues during the interview. Secondary records, usually in the form of computer records, were also checked to ensure the accuracy of information. Sometimes, the interviewer did not obtain all the answers of the interview questions during the interview session due to the tight schedule of the interviewees or the unavailability of some data. In such situation, a follow-up face-to-face interview or telephone interview was scheduled to obtain the answers of all the interview questions. Upon completion of each interview session, the interviewees were provided with a copy of the recorded answers and were requested to review and confirm the answers and also give their feedback on their answers (if any) via email. This is to provide a chance to cross-verify the accuracy of the data collected with the respondents.

3.6.2. Questionnaire

The questionnaire developed had two sections; the first section had general information on the company. This part gives details of the construction company under study, the number of years of existence, their specialization in construction work the company undertakes and the number of employers. The study also established the professional body the company is registered with, classification and the approximate value of the contract currently being undertaken.

The second section of the questionnaire evaluated in details health and safety procedures. The study sought to establish the budget the companies allocate to health and safety, compliance to existing OSH laws and regulations, accident data for the last three years and institutions where these accidents are reported when they occur. The study also established the common construction sites accidents using Likert Scale between 1 and 5 where 1 indicate " accidents did not happen" and 5 " frequency of the accidents is high". Common construction accidents which were identified in literature research were; hit by falling objects, falling from heights, use of light machines with motor, lifting of heavy weights, operating heavy machines, toxic or suffocation, collapse of earthwork, electrocution and fire explosion. The third section had open ended questions allowing the interviewer to give personal judgement.

3.9 Data processing, Analysis and Presentation

This research commenced by reviewing the relevant literature on previous research through study of academic journals in order to develop in-depth understanding about accidents in construction sites. Based on the literature review, the researcher used semi-structured interviews, company visits, photo documentation and questionnaire was also designed. The initial questionnaire was revised based on interviewees' feedback.

The study area targeted Nairobi County construction sites which comprised of general building contractors and sub-contractors. The sampling frame consisted of large and medium sized contractors which have registered Building and Civil Engineering contractors in Kenya. The research focused on middle and large contractors in Nairobi County. In Kenya contractors are classified by National Construction Authority (NCA) between NCA 1 (can undertake contracts up to a value of Kshs 500,000,000) and NCA 7 (can undertake contracts up to a value of Kshs 20,000,000). The target respondents were persons who are well versed in construction work and in particular accidents at site such as project engineer, site manager, site engineer, safety and health officer, site supervisor, clerk of works and site agents. Respondents were from NCA 1, NCA 2, NCA 3 and NCA 4 contractors operating in Nairobi County.

The main administrative divisions of Nairobi are Central, Dagoreti, Embakasi, Kasarani, Kibera, Makadara, Pumwani and Westlands. The eight major administrative regions in Nairobi were used as a sampling frame out of which five regions were selected using cluster sampling. The regions of Nairobi County covered were North, South, East, West and Central Business District. Data was collected between 4th February 2014 and 6th June 2014. The number of questionnaires that were duly filled and returned was 41 representing 56% response. From the questionnaire 41 were usable.

Contractors working on construction sites visited were classified as follows, NCA 1 (87.8%), NCA 2 (4.9%), NCA 3 (2.4 %) and NCA 4 (4.9 %). The designation of the respondents were health and safety officers in the construction site (46.3%), Site agents (24.9%), Clerk of works (7.3%) and Site Engineer (4.9%). This shows that majority of the respondents scope of work strongly related to health and safety. Most of the respondents have sufficient knowledge in health and safety management. The respondents were middle management with distribution of years of experience as follows, 1-5 Years (39%), 6-10 Years (29.5%) 11-15 Years (4.9%) and above 15 Years (19.5 %). The average working experience of the respondents in the construction industry was 9 years. 72 questionnaires were distributed and 41 were received which were all filled and usable. Data was checked, edited, coded and analysed.

Statistical analysis was conducted using the Statistical Package for Social Science (SPSS) so as to get the mean values of each factor. The study further sought to establish the relative importance of the twenty five (25) factors identified by Tam et al (2004) that contribute to the construction site accidents using Likert scale between 1 and 5 where 1 " the least contributing factor in construction accidents" and 5 "the most contributing factor in construction accidents". Further, Statistical analysis was conducted using the Statistical Package for Social Science (SPSS) version (2014) so as to get the mean values of each factor.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Types of construction site accidents in Nairobi County

In achieving this objective, data collected was analysed using Statistical Package for Social Science (SPSS) so as to get the mean values of each factor. Likert scale between 1 and 5 where 1 "the least contributing factor in construction accidents" and 5 "the most contributing factor in construction accidents". According to field data illustrated in Figure 4.1, the three most common types of accidents for the period 2010 – 2014 included being hit by falling materials at 36.7% (rating of 2.5±0.2 out of 5), falling from height at 27.8% (rating of 2.1±0.2 out of 5) and injury from use of motor operated machines at 20% (rating of 1.8±0.2 out of 5).

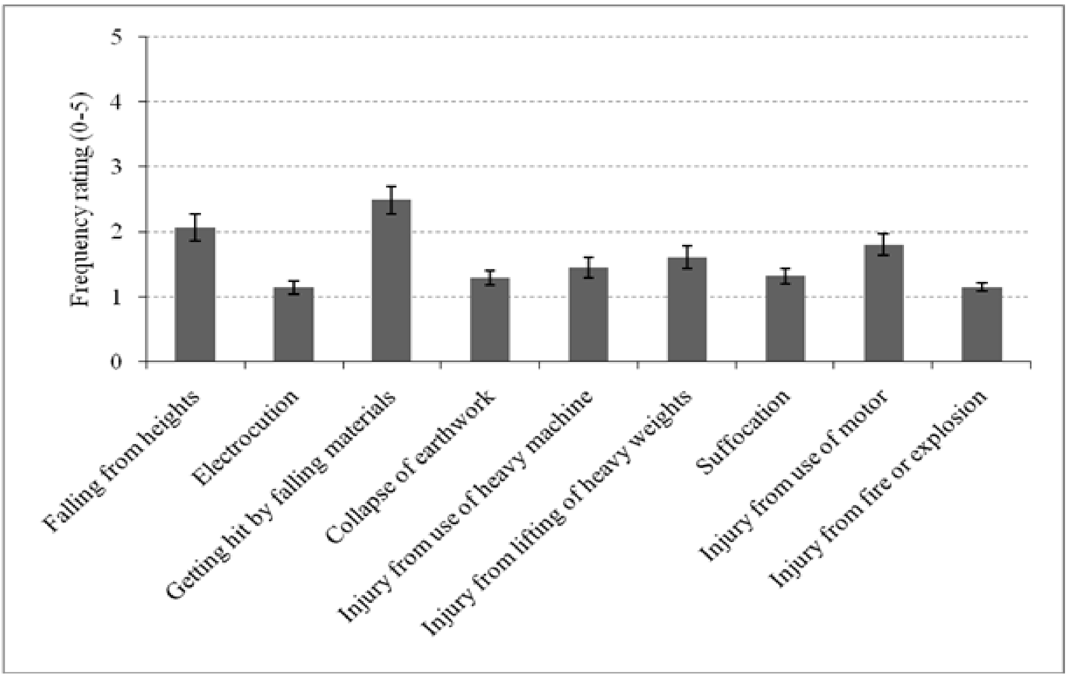

Figure 4.1: Frequency rating of construction site accidents for period 2011-2014

Secondary data obtained from DOSH in this study indicates that the body parts that are frequently injured after construction site accidents are the hands (41.4%), the head (30.8%), legs (25.3%) and the chest (2.5%). To reduce injuries to body parts, safety measures on site should be improved. Hinze et al. (2005) suggested that construction site injuries can be prevented by providing adequate protective support equipment (14%) to workers; proper training (13%); and provision of warning signs /working audible alarm (11%).

In Nairobi County, the likelihood getting injured as a result of falling from height, or being hit by falling objects, or being injured by machines is comparable to the likelihood in South Africa (CIDB report, 2010). In the study done in South Africa, being hit by falling objects contributed 44% of the injuries, falling from height contributed 14% and striking against an object 10% (CIDB report, 2010). In the USA (Suazo & Jaselskis, 1993) and China (Che et al., 2007), falling from heights contributes 37-50% of construction accidents, while electrocution, being hit by falling objects, collapsed earthworks and injuries by heavy machinery contribute (5-13%), 12-21%, 9% and 9% of construction accidents respectively.

Being struck by falling objects, was the most hazardous accident at construction sites (rating of 2.5±0.2 out of 5). Construction material may come off from height above and hit workers. The materials most commonly striking a victim are wood assemblies (walls, trusses, and form-work), concrete block walls, soil/rock (trench cave in), and steel (Hinze et al., 2005). Falling from height was the second most hazardous accident (rating of 2.1±0.2 out of 5). Chi et al. (2005) further categorized 10 different types of falls, these are (1) falls from stairs or steps, (2) falls through existing floor openings, (3) falls from ladders, (4) falls through roof surfaces, (5) falls from roof edges, (6) falls from scaffolds or staging, (7) falls while jumping to a lower level, (8) falls through existing roof openings, (9) falls from floors, docks, or ground level, and (10) other non-classified falls to lower levels. Most falls are falls from scaffolds, floor slab/platform edges and floor openings. This study didn't classify the different types of falls.

Research done by Chi et al (2005) established that falls from scaffold staging were associated with a lack of complying scaffolds and bodily action. Falls through existing floor opening were associated with unguarded openings, inappropriate protections or removal of protections. Falls from roof edges were associated with bodily actions and being pulled down by a hoist, object or tool.

To reduce injuries that occur as a result of falling from heights at construction sites, Che et al. (2007) suggested that primary prevention measures for fatal falls would include fixed barriers, such as handrails, guardrails, surface opening protections (hole coverings), crawling boards/planks, and strong roofing materials. Secondary protection measures would include travel restraint systems (safety belt), fall arrest systems (safety harness), and fall containment systems (safety nets).

While evaluating the objective, the study concluded that falling from heights and being hit by falling objects contribute about 65% of all construction site accidents in Nairobi County. This is contributed by lack of proper protection measures as shown in Figure 4.2 in one of the site visited. Using the secondary data, the study also established that the hands, the head and the legs contribute to 96% of the body part injured in an event of construction site accident. Therefore, construction companies need to provide workers with the necessary Personal Protective Equipment (PPE), which include safety belts, retaining belts, safety ropes, and safety harness and catch nets to prevent being hit by falling materials and falling from heights.

Accidents in construction sites are unplanned, unexpected and undersigned events which occur suddenly and causes injury or loss of man days and decrease on abilities (Tam et al., 2004). Accidents occur when many lines of defence have failed. Further research is required to investigate various variables of construction accidents e.g. study the different types of falls within the workforce.

Figure 4.2: Construction site without safety harness in Kasarani Division

4.2 Factors contributing to construction accidents.

Using data obtained from NCA1, NCA2, NCA3 and NCA4 contractors within Nairobi County, the study established that the ten most significant factors affecting safety in construction sites (Table 4.1) included (1) reluctance to invest in safety; (2) lack of training in safety management; (3) safety regulations not enforced; (4) workers not being safety conscious; (5) lack of strict operational procedures; (6) lack of personal protective equipment; (7) lack of organizational commitment to safety; (8) reckless operation of machines; (9) shortage of safety personnel on site; and (10) ignoring of safety regulations.

Table 4.1: Rating of factors that contribute to construction accidents

Factor	**Mean**	**Factor**	**Mean**
Reluctance to invest in safety	4.1±0.2	Lack of experienced project managers	3.29±0.3
Lack of training	4.07±0.2	Lack of certified skilled labour	3.22±0.2
Safety regulations not enforced	3.98±0.2	Low level of education of workers	3±0.2
Workers not safety conscious	3.83±0.2	Poor maintenance of equipment	2.98±0.2
Top leaders not being safety aware	3.71±0.2	lack of first aid measures	2.93±0.2
Lack of personal protective equipment	3.66±0.2	Lack of teamwork spirit	2.9±0.2
Lack of organizational commitment	3.51±0.2	Inadequate safety technology	2.8±0.2
Reckless operation of machines	3.49±0.2	Poor information flow	2.66±0.2
Shortage of safety personnel on site	3.34±0.2	Fatigue	2.34±0.2
Ignoring of safety regulations	3.29±0.2	No safety management manuals	2.15±0.2

Lack of technical guidance	3.29±0.2	Careless materials transportation	2.1±0.2
		Unprotected material during storage	1.83±0.2

4.2.1 Reluctance to invest in health and safety

The study revealed that reluctance to invest in health and safety was the leading factor that causes construction sites accidents (4.1±0.21) in Nairobi County. Employer or top management can use positive reinforcement to improve safety by employing safety officer, providing personal protective equipment, organizing training, providing posters at the site and give employees monetary rewards, bonuses and job promotion when they don't have accidents to motivate them (Vrenderburgh, 2002).

4.2.2 Lack of training

This study showed that lack of training in health and safety had a mean of 4.07±0.2 out of 5 in the Likert scale. Kenya has only 35 active training institutions that train in OSH (ILO, 2013). Effective safety training reduces the number of construction site accidents (O'Toole, 2002). Safety training is important to educate employees on potential of accidents, how to prevent accidents and potential hazards involved in their jobs. Hence, training and education programs play a significant role in enhancement of safety in construction and important to increase safety awareness (Ghani et al, 2010) and change behaviour of employees (Wong et al., 2000). Three conditions need to be present for any safety training to be successful; the active commitment, support and interest of management, necessary finance and organisations to provide the opportunity for learning to take place and availability of suitable expertise in the subject (Wong et al., 2000). It is recommended that more institutions should start Health and safety training and should be offered as a separate subject within Construction Management, Civil Engineering, Project Management and Architectural programs.

4.2.3 Lack of enforcement of safety regulations by DOSH

The occupational, safety and health act OSHA (2007) is an example of safety guidelines and regulation which provides legislative framework to promote and encourage high standards of safety and health at work thus the primary aim of the act is to promote safety and health awareness and to instill safety culture among all Kenyan workforces. Lack of enforcement of safety regulation by DOSH was the 3rd factor and had a mean of 3.98±0.2 out of 5 of the accidents. DOSH has inadequate staffing compared with increased workload has continued to affect the smooth running while discharge their duties (DOSHS, 2011). Work Injury Benefits processing take a lot of officers and support staff time leaving them with little time to perform other official duties as specified in their performance contracts. This has been largely attributed to the inability of the Directorate to attract and retain qualified personnel. Another challenge faced by field officers was lack of transport to cover all workplaces within their jurisdiction. This resulted in officers not reaching all areas that fall under them and in most cases inspections carried out concentrated within a small area within Nairobi’s Industrial Area.

4.2.4 Poor safety conscientiousness of workers

Successful safety programs can be achieved if the positive attitudes of employees towards safety are improved. Poor safety conscientiousness had a mean of 3.83±0.2 out of 5 of accidents in Nairobi County. Safety conscientiousness can be improved through training of personnel. Aksorn and Hadikusumo (2008) indicate that safety conscientiousness is a tendency to respond positively and/or negatively to certain persons, objects or situations. Individuals are different in their perception of risks and willingness to take risks.

4.2.5 Poor safety awareness from top leaders

Poor safety awareness among top leaders had a mean of 3.71±0.2 out of 5. Senior management leadership demonstrating attention to safety play a primary role in shaping management behaviours that in turn influenced employee behaviour (Cooper, 2010). Achievement of the other safety management objectives is largely dependent on the quality and consistency of leadership demonstrated by management and is a role model for safety exercise (Ismail et al., 2007). Leadership enables the employer to energize the employee to take OSH to the next level which leadership is all to do with people not a thing. Leadership is the quality that transforms good intentions into positive action, in turns a group of individuals into a team (Warmick, 2008).

4.2.6 Lack of Personal Protective Equipment (PPE)

From the study, it’s apparent that a number of workers in construction still lacks PPE, this factor had a mean of 3.66±0.2 in the Likert scale. The employer has to supervise employee from time to time to ensure they will always follow the rules to wear safety tools to keep their safety is always a priority when perform jobs at construction sites as shown in Figure 4.3. Frank and Ronald (1982) noted that the employer must provide protective personal equipment to the workers, especially for those that work in construction sites to reduce the death of the worker if they wear personal protective equipment (as shown in Figure 4.3). Kenya’s law, OSHA 2007 Section 101 (1) states:

> ***101.*** *(1) 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.*

Figure 4.3: Use of safety rope while working at heights in Westlands

4.2.7 Lack of organisational commitment

Lack of organizational commitment had a mean of 3.51±0.2 out of 5. The organization’s commitment to safety has a significant influence on cultivating a positive OHS culture (Ng et al., 2001), with the most influential factor driving safety performance in the construction industry being the organisational safety policy (Sawacha et al., 1999). Improvements in organisational structure, organisational importance of safety, safety responsibility and accountability, communication, management behaviour, employee involvement, and employee responses and behaviour can help improve safety performance (Erickson, 2000).

4.2.8 Reckless operation of machines

From the study, reckless operation of machines had a mean of 3.49±0.2 in the Likert scale. From the secondary data collected, accidents caused by operating machines were third (20.3%) and 31 % of fatal accidents was as a result of reckless use of machines. This factor was noted to be a contributor of accidents at the site. A planned machine safety training should be put in place to replace plant and equipment parts on a regular basis. Section 55 of Kenya law, OSHA states;

> ***55.*** *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.*

While evaluating the objective, it's noted that the main factors that contribute to the construction accidents are broadly categorised to lack of adherence to safety by management, lack of enforcement of law by regulatory body and lack of adherence to safety by construction worker. From this study it's the management commitment that is more critical. It's recommended that top management should actively lead the organization towards achievement of safety goals.

4.3 Human and environmental factors affecting safety in construction sites.

4.3.1 Gender, Age and Experience of Workers

Based on the 2010 to 2014 Nairobi County data, 97% of the 237 affected construction workers were male. Also, about 72% of reported accidents affected workers in the age category 21-40 (Figure 4.4).

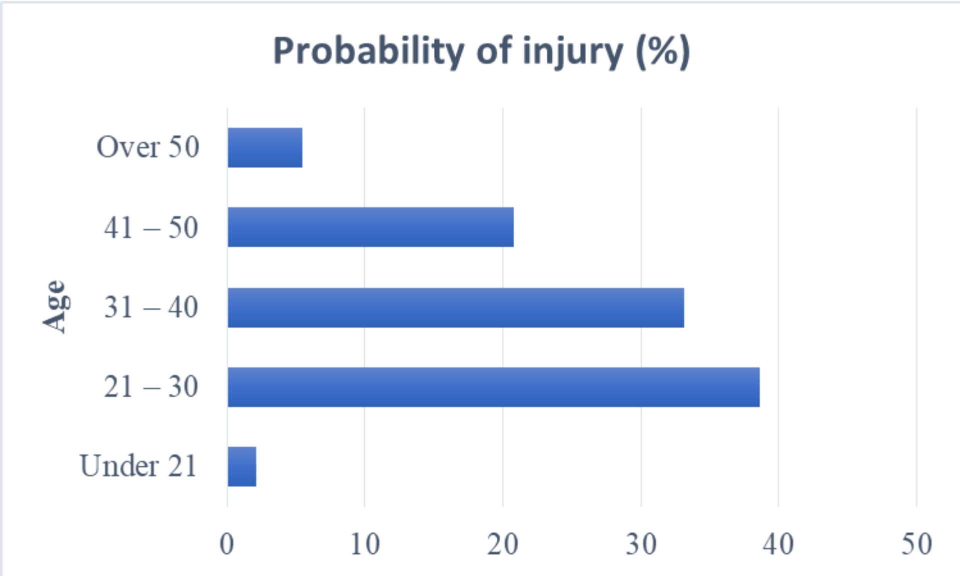

Figure 4.4: Distribution of injured workers by age

In Iran, between the years 2008 and 2012, 69% of occupational accidents occurred to workers below the age of 35 years (Alizadeh, Mortazavi & Ling, 2015). In the USA, the highest fatality occurs among workers of ages 35-44 years (Ling, Liu & Woo, 2009). This could be because this is the age group that is the most active in construction. High frequency of accidents has been reduced in the USA since, (1) workers are trained when they first hired; (2) workers receive training once a year; (3) workers receive training before being assigned to a job that requires new skills; and (4) workers are trained when deficiency is detected in their skills (Ling et al., 2009).

To reduce the frequency of accidents in Kenya, it is recommended that each construction site should have a competent safety officer to identify safety risks, check safety equipment and ensure training is provided to the workers with emphasis on the vulnerable age groups.

4.3.2 Geographical location of construction sites

Data from DOSH established that most of the construction site accidents occurred in Kasarani, Embakasi, Westlands and Kibera divisions (Table 4.3). Kasarani Division had the highest number of reported accidents while Kibera Division had the highest number of fatal accidents. Kasarani is located furthest from DOSH offices suggesting that it may be the least monitored by DOSH officers considering Nairobi covers an area of 684 square kilometres (KNBS, 2009). Secondary data from DOSH indicates that for the same period, the total number of minor accidents in the county was 21. In a typical construction site during that period, an average of about 2 accidents requiring over 4 days off duty occurred. According to DOSH, the county experienced 180 accidents requiring over 4 days off duty and 32 fatalities (Table 4.2).

Table 4.2: Construction accidents in Nairobi County between 2011-2014

DIVISION	Severity of accident (days off duty)					
	Less than 3 (Minor)	4-10	11 - 20	Over 20	Fatal	Total
KASARANI	6	24	10	16	2	58
EMBAKASI	4	12	6	15	5	42
WESTLANDS	5	12	7	14	3	41
KIBERA	2	5	8	7	10	32
NAIROBI CENTRAL	0	5	5	8	3	21
MAKADARA	3	3	1	5	2	14
PUMWANI	1	1	2	7	2	13
DAGORETI	0	3	1	3	5	12
TOTAL	**21**	**65**	**40**	**75**	**32**	**237**

Source: DOSH accident data

Inadequate staffing compared with increased workload has continued to affect the occupational safety monitoring (DOSH report, 2011). In addition to DOSH officers lacking the necessary means of transport for their work, during the 2010-11 financial year DOSH had only 36% of its staff employed (DOSH, 2011). This has contributed towards the inability of the Directorate to provide services. Various researchers have identified the link between accident severity and project location. Ling et al. (2009) reported that high-rise construction in CBD areas recorded a high number of fatal accidents. Dumrack et al. (2013) noted that projects located in the CBD and outer suburbs further from the CBD, represented largely fatal accidents than those on inner suburbs.

4.3.3 Specialization of workers as a factor affecting accidents.

Based on the number of workers injured under different specialization, this study established that the probability of injury affecting unskilled workers, masons, machine operators and carpenters was 35.4%, 21.5%, 16.9% and 11.8%, respectively (Figure 4.5). Another study by Cattledge, Schneiderman, Stanevich, Hendricks and Greenwood (2013) also found that unskilled workers were the most vulnerable group of workers in construction sites. Since unskilled workers have tasks everywhere, they tend to be exposed to every type of accident. The accidents that affect masons and carpenters include falling from heights and being hit by falling objects. Site supervisors and drivers, with 6.8% and 2.1% chance of being injured, respectively, are the least exposed to accidents.

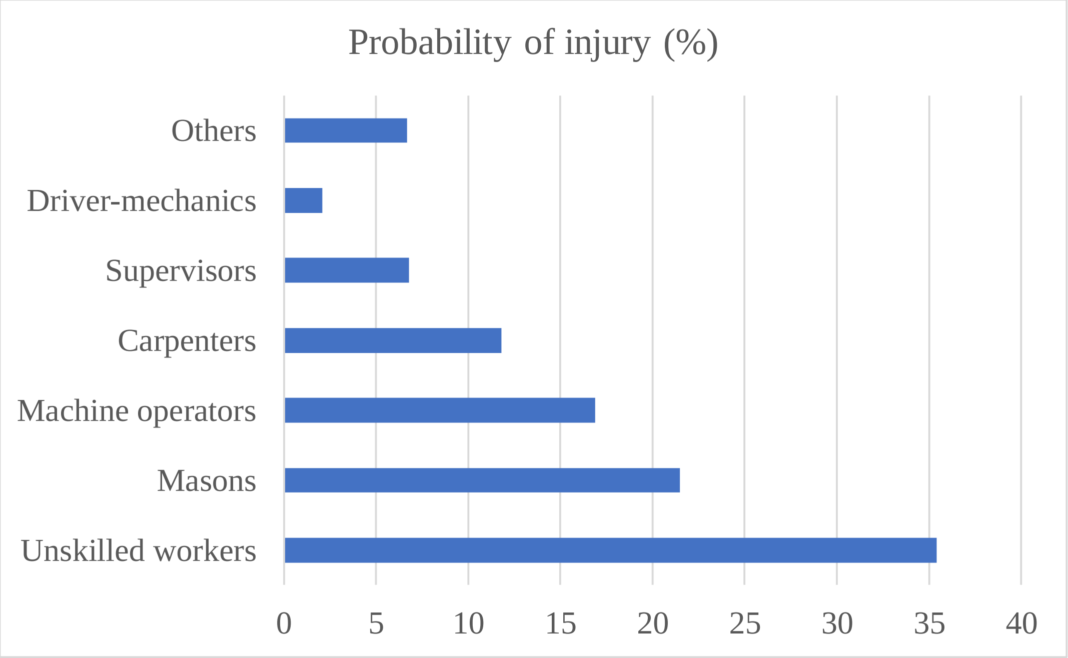

Figure 4.5: Probability of workers getting an injury in construction site

Although the contribution of supervision was not measured in this study, it has been established elsewhere that competent supervision contributes a lot towards reduced incidents of accidents Lubega et al. (2000). According to research done in China, Portugal and Thailand (Tam et al., 2004; Macedo & Silva, 2005; Aksorn & Hadikusumo, 2008), the occurrence of construction accidents depends a lot on the safety measures in place as well as the prevailing safety awareness.

4.3.4 Month of the Year and Time of the Day

Kenya's financial year starts in July and ends in June. From Figure 4.6, it's apparent that most of construction site accidents occur towards the end of the financial year. Some 10.5% and 15.2% of the reported accidents occurred in the months of June and July, respectively. During this period, it appears that workers have to deal with multiple activities, creating a situation where workers and site supervisors are overworked, leading to accidents.

To avoid rushing to complete the projects in June, It's recommended that clients could help by not specifying completion dates in May so that there will be no need to rush to complete the work in June. Experts in US recommend that safety meeting before starting work is effective and is highly recommended Ling et al. (2009).

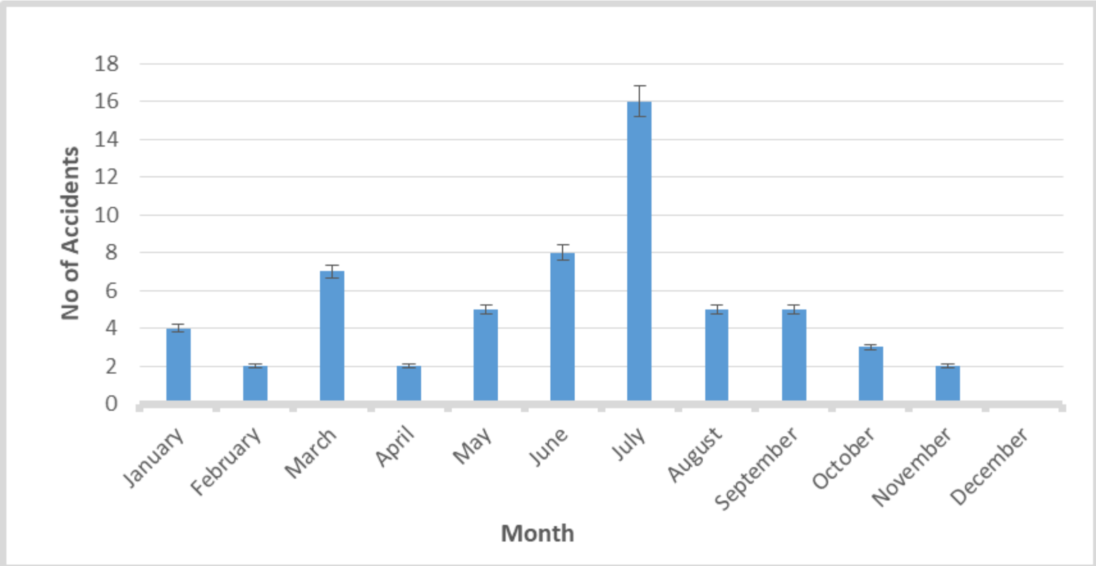

Figure 4.6: Construction accidents occurrence over months of the year

In Nairobi on a typical day, construction work takes place from 8am to 6 pm and breaks are taken at around 10 am and 1 pm (Table 4.3). From the study, the least likely time for an accident to occur is over lunch break (3.4% chance) while most accidents occurred between 10.00 am - 1.00 pm (37.6%) and 3.00 - 5.00 pm (26.1%). In Singapore, most fatal accidents occur around 9.30-11.30 am and 2.30-3.00 pm (Ling et al., 2009) while in the USA similar results show that construction accidents occur between 10.00 am-11.00 am in the morning and 1.00 pm-2.00 pm (Hinze et al., 2005).

Table 4.3: Probability (%)of accidents occurrence in a typical hour of the day

Time of day	Morning					Break	Afternoon					
	before 8 am	8-9am	9-10am	10-11 am	11 - 12 pm	12-1pm	1–2 pm	2 – 3 pm	3 – 4 pm	4-5 pm	5-6 pm	after 6 pm
Probability (%)	0.8	4.6	9.3	14.8	10.1	12.7	3.4	10.5	14.3	11.8	5.1	2.5

It's established that most accidents occur around just before the workers take lunch break and it has been called lunch time effect (Hinze et al., 2005; Ling et al., 2009). Research undertaken in Iran showed that 44.97% of accidents occurred between 9am and 1pm which is a similar trend to Nairobi County, Kenya (Alizadeh et al., 2015).

4.3.5 Safety Policy and Safety Budget Factor

Project managers have a safety responsibility to prepare project safety plan, identify potential hazards at the site, prepare a written safety plan and insist on reporting injuries, death and property damage as a result of accidents (Alizadeh et al., 2015). Perhaps because of lack of emphasis on health and safety training, 12% of the construction sites visited during this study, lacked a written safety policy. The absence of a policy document means that the most vulnerable group of workers has no protection and construction accidents.

The majority of surveyed contractors, some 61% of the studied population, managed projects valued at over KES 500 Million (5 Million US Dollars). However, 39% of the contractors had no specific budget for occupational health and safety (Figure 4.7). Another (24%) of the contractors had budgeted less than KES 0.5 Million (5,000 US Dollars) for health and safety. Only 4% of companies budgeted over KES 2 million (20,000 US dollars) per year.

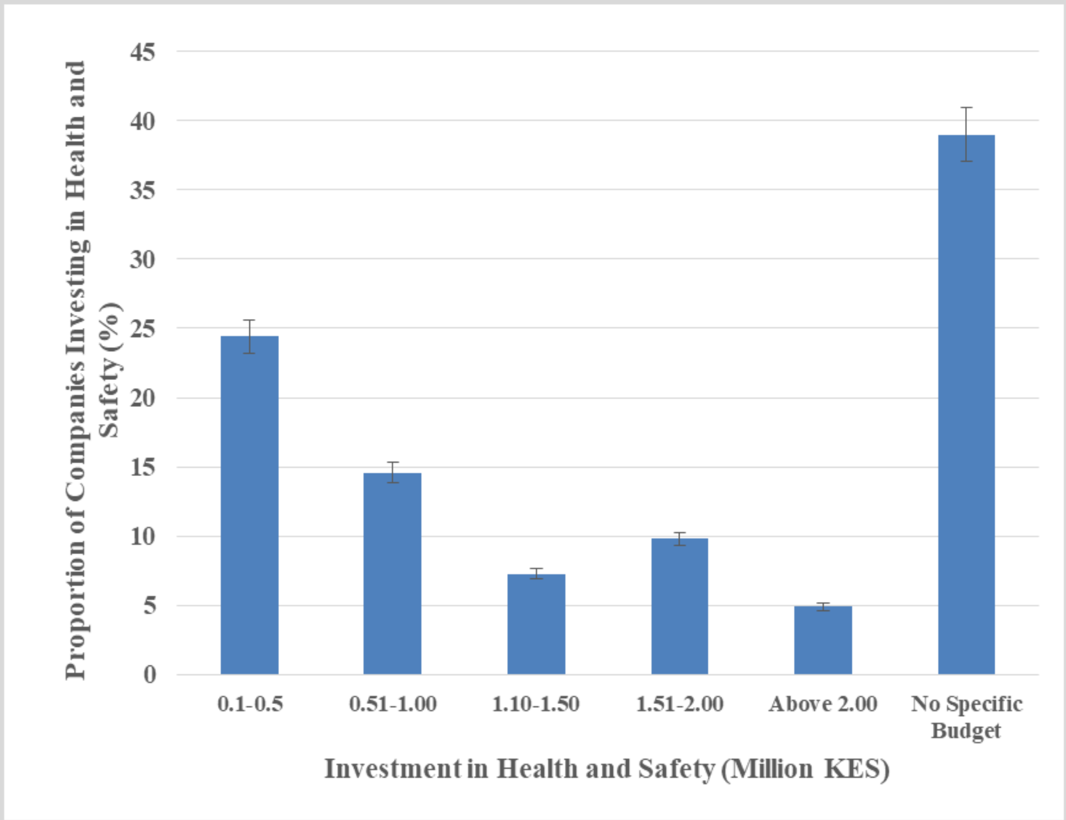

Figure 4.7: Investment in health and safety

A similar study in Kuwaiti, reported that while various players including government, project owners, and contractors may be aware of the importance of safety in construction, they do not actively pursue effective ways to achieve safety goals (Kartam et al., 2000). The study associated this lack of commitment to safety with the fact that: (1) Most contractors do not consider safety costs in their tenders unless it's recognized by contract documents; (2) Many companies look for fast profit and sell their projects to subcontractors; (3) There is lack of official safety data and records of construction accidents at sites; (4) Dependency on labour that has no union or community to defend its rights and secure the safety of workers; (5) Construction has a high labour turnover compared with other industries; (6) Many contractors are unaware of the effectiveness of safety prevention programs in reducing costs and increasing productivity; and (7) Safety is often considered to be a waste of money. Further research should be conducted to come up with models and procedures for safety cost optimization to evaluate reasonable and competitive safety budget.

In conclusion, it can be summarized that (1) Being hit by falling materials and falling from height are the two leading causes of accidents in Nairobi County (2) Reluctance to invest in safety, lack of training and safety regulations not being enforced are the major contributing factors that lead to construction accidents (3) Most accidents in Nairobi affect workers between the age of 21-40 (4) Unskilled workers, masons and machine operators are the most susceptible to cause accidents (5) Most of the accidents occur in the months of June and July (6) Most accidents occur between 10 am – 1 pm and 3 pm – 5 pm and (7) Most companies have no specific budget for health and safety.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study had three specific objectives that were defined in Chapter 1. To fulfil the objectives, the following were key findings on the achievement of the research objectives;

(a) Being hit by falling and objects falling from heights are the most frequent construction site accidents in Nairobi County.

(b) Workers less than 40 years of age are the most prone to accidents leading to injuries and death. This may be contributed by perhaps due to inadequate training in safety and lack of experience.

(c) A third of construction site accidents occur during the busiest months of the year and busiest hours of the day; the busiest months were established as June and July and during the busiest hours of the day are between 10-11 am and 3-4 pm.

(d) Lack of investment in health and safety by management, lack of training and failure to enforce laws on health and safety are the three leading causes of accidents in construction sites.

The law in Kenya requires every construction site to have safety officers to identify project risks. However, most construction firms in Nairobi have no safety policy and allocate less than 1% of project budget to health and safety, resulting in an inadequately funded safety programs. Enhanced investment in Occupational Safety and Health (OSH) and deliberate occupational safety training are recommended to benefit construction workers.

5.2 Recommendations

Based on the findings of the study, the following recommendations are made:

a. Being hit by falling objects, falling from heights contribute and operating machines recklessly constitute about 85% of all construction site accidents in Nairobi County. Therefore, in order to prevent accidents at construction sites, the following measures are recommended (1) Safety measures in sites be strictly enforced; (2) safe work practices be properly implemented and supervision be carried out thoroughly; (3) motivate, educate and train so that all stakeholders may recognize and correct hazards; (4) operate suitable inspection and audit programme to provide feedback; (5) ensure that hazard control measures forms part of supervisory training; (6) ensure compliance with OSH regulations and standards and (7) adequate provision of Personal Protective Equipment (PPE), which include safety belts, retaining belts, safety ropes, and safety harness and catch nets to prevent being hit by falling materials and falling from heights. Furthermore, workers need to be continuously trained on the importance of using PPE.

b. Most of the workers who got accidents were below 40 years. It's recommended that construction sites should have competent safety officers who will be able to identify the safety hazards inherent on the sites and remind workers on safety matters constantly laying emphasis to workers who fall below 40 years. The safety officer should also ensure that workers are trained before working and when work conditions change. The safety officer will advise management on appropriate handling of hazards and risks, establish systems that enable safety on construction sites are done appropriately. The responsibility of giving sound and competent advice rests with the safety officer but the responsibility of taking appropriate action based on advice remains with the management.

c. Safety is compromised around rest times and after lunch leading to accidents at construction sites. During this time, the workers are probably physically tired after working for long hours and they push themselves to complete the work and they lose concentration or they are pressurized by supervisors to finish the work before breaks. It's recommended that the site supervisors should allow flexible rest times and should schedule inspections 30 minutes before and after breaks. To avoid rushing to complete the projects in June and July, it's recommended that before the project commences, a safety plan must be produced to assist and contribute to the establishment of safe, healthy and environmentally sound working environment. A project safety plan should be addressed at the pre-tender stage. At this stage, risks should be identified so that they can be combated at source. The safety plan should also have timelines of the project and have control measures over speed of work where possible. The safety plan should be developed on active risk prevention based on continuous improvement.

d. Safety investment has a positive impact on performance. It's therefore recommended that during pre-tender stage, clients should plan to invest in accident prevention activities and include in the budget.

5.3 Recommendations for further study

In future study, a topic of safety costs and investments may be investigated to establish optimal levels of resources which may need to be allocated to health and safety based on the principle of marginal cost of control. Further research is required to investigate various variables of construction accidents e.g. study the different types of falls within the workforce.

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APPENDICES

Appendix I: Questionnaire

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

MSC IN CONSTRUCTION ENGINEERING AND MANAGEMENT

Questionnaire survey

<u>SECTION A–YOURPARTICULARS AND GENERAL INFORMATION</u>

Please enter your name, position and the details of your organization.

All responses will be confidential and will not be connected in any way to yourself or your organization.

Name	
Position	
Organization	
Experience (years)	
Telephone	
Postal Address	

Q1: What type of construction works does your company undertake? *(Please enter approximate percentage %).*

Type of construction work	Approximate
Civil Engineering construction	
Building construction	
Others please state	

Q2: How many employees are there in your company? *(Please enter the numbers).*

	Office staff		Site staff	
	Male	Female	Male	Female
Fulltime				
Part-time				
Total				

Q3: When was your company established? *(Please write in the box)*

Q4: What contractor classification does your company belong to? *(Please write in the box)*

Q5: What was your company's approximate value of the current contract cost ? *(Please tick)*

Contract value in Millions(Kenya Shillings)

Below 40	40 - 60	65 -130	130- 400	400 - 500		Over 500 Million

Q6: Which of the following associations does your company belong?

(Please tick all that apply)

Association of Road Contractors-Kenya	□
Building and Civil Engineering Contractors of Kenya	□
Kenya Property Developers Association	□
None	□
Others (Please specify)	

SECTIONB—HEALTH AND SAFETY PROCEDURES

Q7: Which of the following statements apply to your organization in relation to health and safety?*(Please tick or write)*

We have no specific budget for health and safety	↑		
We have a health and safety budget	↑	Please state budget amount 2013	

Q8: In your opinion, how well do your procedures meet the requirements of the following? *(Please tick)*

Requirement	Completely	In part	Not at all	Do not know
Health, safety and welfare provisions in	□	□	□	□

conditions of contract				
Occupation Safety and Health Act (OSHA), 2007	☐	☐	☐	☐
Building operations and works of Engineering Construction rules, 1984	☐	☐	☐	☐
The works injury and benefits Act, 2007.	☐	☐	☐	☐
None	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐

Q8: Please indicate whether the project has been registered with Director of Occupational Safety and Health Services *(Please tick)*

Q9: If a serious accident happens on your site which institutions will you report to? (Please tick)

Director occupational health and safety	☐
Nairobi City Council	☐
Police Motor Traffic Unit(MTU)	☐
None	☐
Other(please specify)	

The project site is registered	☐	The project sites is not registered	☐

Q10: How many accidents have occurred in your business between 2010 and the year 2013? (Please write in or tick the cells below)

Severity of injury	Figure	Do not know
Minor injuries requiring less than one day off work		↑
Injuries requiring one to three days off work		↑
Four or more days off working including strains, sprains, lacerations etc. resulting in four or more days off work		↑
Fatal injuries		↑

Q.11 Please rate the frequency of accidents in the construction site on a scale of 0 to 5 where 0= accidents did not happen and 5= Very frequent

Type of accidents:		Frequency					
		0	**1**	**2**	**3**	**4**	**5**
1	Falling from heights						
2	Electrocution						
3	Hit by falling materials						
4	Collapse of earthwork						
5	Use of heavy machine						
6	Lifting of heavy weights						
7	Toxic or suffocation						
8	Use of motor						

9	Fire and explosion						

Q12: To lower the accidents in the construction sites, management needs to put in place measures to reduce the accidents. Please rate the importance of the factors listed below in reducing the accidents in a scale of 1 to 5. Scale 1 being "least important" and 5 being "most important".

Management Factors that reduce accidents at construction sites		Frequency				
		1	2	3	4	5
1	Administrative and management commitment on safety					
2	Health and safety training					
3	Adhering to legislative codes and standards					
4	Selection of sub-contractors based on previous					
5	Recording, reporting and investigation of accidents and safety review					
6	Information training and promotion of safety					

Q13: Several factors contribute to reported accidents in the construction sites. Please rate the factors enumerated below on a scale of 1 to 5 with 1 being " the least contributing factor of construction accident " and 5 being the "most contributing factor of construction accident".

Factors contributing to construction accidents at construction sites		Frequency				
		1	2	3	4	5
1	Poor safety awareness from top leaders					
2	Lack of training					
3	Poor safety awareness of project managers					
4	Reluctance to input resources on safety					
5	Reckless operation of machines					
6	Lack of certified skilled labour					
7	Poor maintenance of equipment					
8	Lack of first aid measures					
9	Lack of rigorous enforcement of safety regulation					
10	Lack of organizational commitment					
11	Low level of education of workers					
12	Poor safety consciousness of workers					
13	Lack of personal protective equipment					
14	Ineffective operation of safety regulation					

15	Lack of technical guidance					
16	Lack of strict operational procedures					
17	Lack of experienced project managers					
18	Shortfall of safety personnel on site					
19	Lack of protection of material during transportation					
20	Lack of protection of material during storage					
21	Lack of teamwork spirit					
22	Fatigue by workers					
23	Shortage of safety management manuals					
24	Lack of innovative technology on safety measures					
25	Poor information flow					

Q14: Provision of personal protective equipment (PPE) is important in reducing injuries in case of an accident. Please rate the common PPE in the construction site in a scale of 1 to 5 with 1 being "least common" and 5 being "most common".

Personal Protective Equipment in construction on site		Frequency				
		1	2	3	4	5
1	Overall					
2	Eye goggles					
3	Face shield					

4	Safety shoes					
5	Hard hat					
6	Gloves					
7	Ear plugs					
8	Other (Specify)					

SECTION C

Q15: What difficulties do you face in the management of construction site health and safety? *(Please use a separate sheet if necessary)*

Q16: What are your suggestions for helping contractors to manage construction site health and safety more effectively to minimize the incidence of ill health and accidents on construction sites (*Please use a separate sheet if necessary*)

Thank you very much for your co-operation

Appendix II: Dosh Form

DOSH 1

REPUBLIC OF KENYA

DIRECTORATE OF OCCUPATIONAL SAFETY AND HEALTH SERVICES

NOTICE BY EMPLOYER OF AN OCCUPATIONAL ACCIDENT/DISEASE OF AN EMPLOYEE

PART 1

1. Employer/Occupier Particulars: -
   - ii. Name of Employer/Occupier……………..………………………………………….………………
   - iii. WIBA* registration No………………………….…OSHA* Registration No. …………………
   - iv. Full Address P. O. Box……………………………………Physical Location…...……….………………….……………….
   - v. E- Mail address…………………………………………….……………… Tel…………………………..…………………
   - vi. Nature of Work ………………………………………………………………..….…………….
   - vii. Name and address of Insurance Company which has insured employee against accident ……………………………………………………………………………………………… ……………………………………………………………………………..………………
2. The Injured/sick employee's particulars :-
   - i. Name……………………………………………………………………….………………
   - ii. Sex………………………………………………………………………………………
   - iii. Age………………………………………………………………..……….………
   - iv. Occupation ……………………..………………...……………………………………
   - v. Full Address………………………………………………..…………………………..
   - vi. E- Mail address……………..……………………………Tel: ……………..…………
   - vii. Identity Card No. *(Incase of fatal injury, Death Certificate No.)……………………………………………….……
   - viii. Home District: …………………… Division: …………………Location: ………………Sub-location ………………..

3. Occupational Accident
   - i. Date of Accident …………………………… Time: ………………………Fatal /Non fatal …………………...…..
   - ii. Has the worker resumed working Yes/No ……………………………..Date of resumption ……………………..…..
   - iii. Place where accident took place………………………………………………………..
   - iv. What is the injured worker's Occupation…………………………………….…….……..
   - v. What duties was the employee undertaking at the time of the accident? ……………………………………..….…..
   - vi. Length of service with the present employer……………………………………….……..
   - vii. What work is the worker employed to undertake………………………………………..…..
   - viii. Cause of Injury……………………………………………………………..……..
   - ix. Type of Injury …………………………………………………………..……..
   - x. Part of Body Injured…………………………………………………………..……..

4. Occupational Disease

Detail about the Occupational disease affecting the employee.

i. Date of diagnosis of the occupational disease ……………………………………….………
ii. Name of medical practitioner who made the diagnosis ……………..……………………
iii. Date the employer was notified of the disease by the employee or medical practitioners….……………….……………
iv. Describe the Cause of the occupational disease ……………………………..………… ……………………………………………………….…………………………………… …………………………………………………………………………………………… ………………………………………………………..

5. Total Monthly earning at the date of the Accident/disease:-

Salary/wage .. .. Sh. ………………...………………

Allowances paid regularly (including house, medical etc) ... . Sh……………..…………...………

Overtime payment or/and other special remuneration for work done whether by way of bonus otherwise if of constant character and for work habitually performed.. .. Sh. …………………..……..……..

Total earning per month .. .. .. … Sh…………………………………

Total earnings paid to the employee during the period of incapacity .. .. .. Sh…………………………………

Name of Employer or person notifying on behalf of Employer ……………………………… Signature …………………….

Designation ………………………………………………..…. Date ………………………………

Note:-

1. In the case of injury to an employee involving incapacity for work for three or more consecutive days, it is requested that the employer complete Part 1 in triplicate and then dispatch the forms immediately as hereunder:

One copy: **-** To the Occupational Health and Safety Officer in charge of the District in which the accident occurred.

2 copies: **-** To the medical practitioner attending or examining the injured/sick employee. The forms to be forwarded to the Occupational Health and Safety Officer immediately the doctor completes part II

2. Please attach any evidence detailing any payment forming part of the employee's total earning that the employee has been paid during the period of temporary disablement when he/she was out of work as a result of the injury.
3. Indicate who has paid for the medical bills
4. In the case of an occupational accident/disease causing the death of an employee, Part 1 should be completed in duplicate and then dispatched as hereunder:

One copy: **-** Immediately to the Occupational Health and Safety Officer in charge of the District in which the death occurred.

The other copy together with a copy of the death certificate:**-** to the Occupational Health and Safety Officer in charge of the District in which the death occurred.

PART 11 (for use by the Medical Practitioner)

MEDICAL REPORT

Name of employee…………………………………………………………………………………………….
Date admitted to hospital……………………………..Discharged……………………………………
In-patient No. ……………………………………………………….……………………………......
Attendance as out-patient from……………………..…..to………………………….
Out –patient No. ………………………………………………………………….…….……………
Type of injury………………………………………………………………………………………….or
Occupational disease ………………………………………………………………………………
Is there permanent incapacity?...*Yes/No
If yes please give:

a) Details and nature of permanent incapacity…………………………………………… ….
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
…………………………………………………………
b) Percentage of permanent incapacity to be indicated in both words and figures (***reference must be made to the first and second schedule of the Work Injury Benefit Act No. 13 of 2007***)………………………………………………………………………………
……………………………………………………………………………..……………
………… ……………………………………………per cent.

Temporary incapacity :-(Duration of absence from work in days, from the date of injury or acquiring occupational disease/or diagnosis of occupational disease to the time of resumption of duty or death.)………………(employee's working days)
Is a further examination required before final assessment of permanent incapacity can be given?..................If yes ;
a) which ones ....
....
when?...
b) Who paid the medical bills paid (Employee or Employer) ………………………………………
……………………………..
Name of Medical Practitioner…………………………………………………………..…KMP&DB No.…… ………………..
Signature ………………….……….Date …………………………………………
Name of Hospital/Clinic/Private Practice…………………………………………………………….

PART 111

(For use by Occupational Health and Safety Officer)

Compensation *is / is not being claimed on behalf of the employee/dependants of the deceased employee.

District and Accident Register No.…………………….………………………………..
Station……………………………………………..………..
Date…………………………………………….

Occupational Health and Safety Officer

Appendix III: Secondary data

D/Y/M	Accident	Accident code	Gender	Gender code	Time of day	Time category	Age	Age category	Occupation	Body part	Body part code	Area	Severity	Days off	Severity codes	Compensation (KES)	Compensation code
02/01/11	Being hit by falling objects	1	M	2	1620 Hrs	4	46	4	Driver-mechanic	head	4	Dagoreti	Fatal	Fatal	5	2,400,000	6
08/01/11	Falling from heights	3	M	2	0900 Hrs	2	58	5	Carpenter	head	4	Kasarani	14 days	14	2	10,176	2
12/02/11	Injuries from machine Operation	4	M	2	1800 Hrs	4	49	4	Machine operator	Leg	5	Kibera	104 days	104	4	45,000	2
07/03/11	Being hit by falling objects	1	M	2	1045 Hrs	2	38	3	Driver-mechanic	head	4	Embakasi	42 days	42	3	47,935	2
11/03/11	Being hit by falling objects	1	M	2	1030 Hrs	2	47	4	Supervisor	Leg	5	Makadara	10 days	10	2	10,000	2
26/03/11	Injuries from machine Operation	4	M	2	1600 Hrs	4	26	2	Casual labourer	Leg	5	Westlands	10 days	10	2	88,200	3
19/04/11	Being hit by falling objects	1	M	2	1000 Hrs	2	36	3	Supervisor	head	4	Embakasi	10 days	10	2	8,615	1
25/05/11	Falling from heights	3	M	2	1215 Hrs	3	29	2	Mason	head	4	Kibera	Fatal	Fatal	5	2,822,400	6
03/06/11	Being hit by falling objects	1	M	2	1445 Hrs	3	49	4	Casual labourer	hand	3	Westlands	42 days	42	3	16,200	2
09/06/11	Falling from heights	3	M	2	1200 Hrs	2	44	4	Casual labourer	head	4	Dagoreti	Fatal	Fatal	5	1,440,000	6
18/06/11	Falling from heights	3	M	2	1045 Hrs	2	23	2	Mason	chest	2	Dagoreti	Fatal	Fatal	5	1,440,000	6
18/06/11	Falling from heights	3	M	2	1545 Hrs	4	47	4	Mason	head	4	Kibera	14 days	14	2	6,087	1
22/06/11	Other forms of accidents	5	M	2	0930 Hrs	2	36	3	Casual labourer	head	4	Embakasi	Fatal	Fatal	5	998,000	5
23/06/11	Injuries from machine Operation	4	M	2	1520 Hrs	4	32	3	Machine operator	Leg	5	Kibera	20 days	20	2	106,494	4
23/06/1	Other forms of accidents	5	M	2	1200	2	2	2	Machine	hand	3	Kasarani	0	7	2	106,494	4

1					Hrs		6		operator								
24/06/1					0930		2										
1	Falling from heights	3	M	2	Hrs	2	4	2	Casual labourer	head	4	Kasarani	7 days	7	2	4,244	1
01/07/1	Injuries from machine				1320		2		Machine								
1	Operation	4	M	2	Hrs	3	4	2	operator	hand	3	Embakasi	30 days	30	2	198,750	4
04/07/1					1710		4										
1	Falling from heights	3	M	2	Hrs	4	1	4	Mason	hand	3	Westlands	42 days	42	3	33,400	2
05/07/1	Injuries from machine				1420		5		Machine					Fata		1,092,40	
1	Operation	4	M	2	Hrs	3	7	5	operator	hand	3	Westlands	Fatal	l	5	0	6
09/07/1					1120		4										
1	Being hit by falling objects	1	M	2	Hrs	2	5	4	Metal worker	hand	3	Kasarani	6 days	6	1	3,600	1
09/07/1					1630		2										
1	Other forms of accidents	5	M	2	Hrs	4	8	2	Carpenter	Leg	5	Dagoreti	30 days	30	2	18,124	2
10/07/1	Injuries from machine				1535		2		Machine								
1	Operation	4	M	2	Hrs	4	4	2	operator	hand	3	Embakasi	3 days	3	1	1,500	1
10/07/1					1800		2										
1	Being hit by falling objects	1	M	2	Hrs	4	4	2	Mason	hand	3	Embakasi	7 days	7	2	3,600	1
12/07/1					1730		3										
1	Being hit by falling objects	1	M	2	Hrs	4	7	3	Mason	head	4	Embakasi	40 days	40	3	100,240	4
18/07/1	Injuries from machine				1515		3		Machine								
1	Operation	4	M	2	Hrs	4	8	3	operator	head	4	Kasarani	10 days	10	2	4,800	1
22/07/1					1615		4						3				
1	Being hit by falling objects	1	M	2	Hrs	4	4	4	Mason	head	4	Makadara	months	90	3	54,000	3
24/07/1					1450		2										
1	Being hit by falling objects	1	M	2	Hrs	3	4	2	Casual labourer	head	4	Kibera	14 days	14	2	8,592	1
27/07/1					1600		3										
1	Being hit by falling objects	1	M	2	Hrs	4	4	3	Guard	hand	3	Westlands	15 days	15	2	4,500	1
29/07/1					1440		2										
1	Other forms of accidents	5	M	2	Hrs	3	4	2	Casual labourer	hand	3	Embakasi	10 days	10	2	3,893	1
30/07/1					0945		3										
1	Being hit by falling objects	1	M	2	Hrs	2	4	3	Casual labourer	hand	3	Dagoreti	7 days	7	2	1,938	1
01/08/1							3										
1	Other forms of accidents	5	M	2	0830 hrs	1	6	3	Casual labourer	hand	3	Pumwani	90 days	90	3	63,630	3
02/08/1							4										
1	Falling from heights	3	M	2	1430 hrs	3	2	4	Mason	Leg	5	Kibera	6 days	6	1	11,464	2
02/08/1					1610		2										
1	Falling from heights	3	M	2	Hrs	4	3	2	Casual labourer	hand	3	Kibera	14 days	14	2	8,308	1
22/08/1					1125		4							Fata		2,414,72	
1	Falling from heights	3	M	2	Hrs	2	4	4	Carpenter	head	4	Embakasi	Fatal	l	5	0	6

26/08/11	Injuries from machine Operation	4	M	2	1640 Hrs	4	44	4	Machine operator	hand	3	Embakasi	3 days	3	1	2,100	1
28/08/11	Falling from heights	3	M	2	1230 Hrs	3	44	4	Carpenter	Leg	5	Kibera	3 days	3	1	2,538	1
02/09/11	Being hit by falling objects	1	M	2	1230 hrs	3	22	2	Casual labourer	head	4	Embakasi	7 days	7	2	19,012	2
13/09/11	Injuries from machine Operation	4	M	2	1200 hrs	2	44	4	Supervisor	Leg	5	Kibera	14 days	14	2	32,455	2
17/09/11	Injuries from machine Operation	4	M	2	1215 hrs	3	40	3	Machine operator	hand	3	Pumwani	33 days	33	3	86,857	3
19/09/11	Other forms of accidents	5	M	2	1145 hrs	2	29	2	Metal worker	head	4	Westlands	3 days	3	1	1,800	1
21/09/11	Falling from heights	3	M	2	1250 hrs	3	39	3	Mason	hand	3	Kasarani	10 days	10	2	19,968	2
24/09/11	Falling from heights	3	M	2	1255 hrs	3	59	5	Mason	chest	2	Kasarani	Fatal	Fatal	5	2,016,000	6
03/10/11	Falling from heights	3	M	2	1500 hrs	3	54	5	Mason	head	4	Embakasi	8 days	8	2	6,400	1
23/10/11	Falling from heights	3	M	2	1450 Hrs	3	34	3	Casual labourer	Leg	5		9 days	9	2	4,050	1
26/10/11	Falling from heights	3	M	2	1530 Hrs	4	44	4	Casual labourer	Leg	5	Embakasi	41days	41	3	32,701	2
02/11/11	Being hit by falling objects	1	M	2	0845 Hrs	1	35	3	Mason	head	4	Nairobi Central	21 days	21	2	13,200	2
03/11/11	Falling from heights	3	M	2	1110 Hrs	2	22	2	Mason	head	4	Nairobi Central	Fatal	Fatal	5	987,360	5
07/11/11	Other forms of accidents	5	M	2	1615 Hrs	4	34	3	Mason	hand	3	Embakasi	5 days	5	1	214,080	4
22/11/11	Injuries from machine Operation	4	M	2	1525 Hrs	4	27	2	Machine operator	hand	3	Embakasi	12 days	12	2	4,800	1
25/11/11	Injuries from machine Operation	4	M	2	1600 hrs	4	39	3	Machine operator	hand	3	Kasarani	90 days	90	3	404,400	4
29/11/11	Injuries from machine Operation	4	M	2	1430 hrs	3	36	3	Machine operator	hand	3	Westlands	12 days	12	2	10,200	2
06/01/12	Being hit by falling objects	1	M	2	1120 hrs	2	23	2	Casual labourer	Leg	5	Westlands	4 days	4	1	1,300	1
06/01/12	Falling from heights	3	M	2	1530 hrs	4	39	3	Casual labourer	Leg	5	Westlands	61 days	5	1	131,040	4
08/01/1	Other forms of accidents	5	M	2	1130 hrs	2	2	2	Mason	hand	3	Kasarani	7 days	6	1	11,224	2

2							2										
15/01/12	Injuries from machine Operation	4	M	2	1500 hrs	3	49	4	Machine operator	head	4	Pumwani	Fatal	Fatal	5	1,240,000	6
31/01/12	Falling from heights	3	M	2	1450 hrs	3	36	3	Carpenter	Leg	5	Kasarani	7 days	7	2	58,228	3
12/02/12	Falling from heights	3	M	2	1020 Hrs	2	47	4	Casual labourer	Leg	5	Embakasi	60 days	60	3	26,000	2
15/02/12	Being hit by falling objects	1	M	2	1515 hrs	4	39	3	Storekeeper	hand	3	Kibera	Fatal	Fatal	5	1,113,649	6
22/02/12	Falling from heights	3	M	2	1610 Hrs	4	25	2	Mason	hand	3	Dagoreti	30 days	30	2	14,055	2
22/02/12	Being hit by falling objects	1	M	2	1715 Hrs	4	26	2	Casual labourer	Leg	5	Kasarani	12 days	12	2	4,980	1
28/02/12	Being hit by falling objects	1	M	2	1030 hrs	2	52	5	Casual labourer	head	4	Westlands	10 days	10	2	2,780	1
03/03/12	Injuries from machine Operation	4	M	2	1230 hrs	3	40	3	Machine operator	chest	2	Kibera	Fatal	Fatal	5	1,248,000	6
06/03/12	Injuries from machine Operation	4	M	2	1000 hrs	2	42	4	Machine operator	hand	3	Makadara	60 days	60	3	52,600	3
10/03/12	Falling from heights	3	M	2	0830Hrs	1	23	2	Carpenter	head	4	Embakasi	30 days	30	2	65,815	3
27/03/12	Falling from heights	3	M	2	1245 hrs	3	28	2	Mason	head	4	Embakasi	9 days	9	2	3,744	1
28/03/12	Falling from heights	3	M	2	1230 hrs	3	46	4	Mason	hand	3	Dagoreti	7 days	7	2	3,600	1
30/03/12	Falling from heights	3	M	2	1000 hrs	2	44	4	Casual labourer	head	4	Kasarani	7 days	7	2	2,400	1
31/03/12	Injuries from machine Operation	4	M	2	1615 Hrs	4	29	2	Machine operator	Leg	5	Kasarani	10 days	10	2	119,004	4
01/04/12	Being hit by falling objects	1	M	2	1000 Hrs	2	34	3	Office assistant	hand	3	Westlands	110 days	110	4	101,538	4
02/04/12	Being hit by falling objects	1	M	2	1110 Hrs	2	47	4	Casual labourer	Leg	5	Westlands	4 days	4	1	1,800	1
03/04/12	Injuries from machine Operation	4	M	2	1445 hrs	3	36	3	Mason	hand	3	Pumwani	120 days	120	4	120,000	4
04/04/12	Falling from heights	3	M	2	1520 hrs	4	19	1	Mason	Hand	3	Pumwani	42 days	42	3	48,000	2
05/04/12	Falling from heights	3	M	2	1020 hrs	2	34	3	Casual labourer	hand	3	Embakasi	15 days	15	2	46,601	2

09/04/12	Other forms of accidents	5	M	2	1245 hrs	3	27	2	Mason	hand	3	Kasarani	9 days	9	2	2,200	1
11/04/12	Other forms of accidents	5	M	2	1400 hrs	3	38	3	Casual labourer	hand	3	Makadara	12 days	12	2	31,168	2
14/04/12	Being hit by falling objects	1	M	2	1020 hrs	2	45	4	Supervisor	head	4	Embakasi	19 days	19	2	18,050	2
21/04/12	Being hit by falling objects	1	M	2	1545 hrs	4	33	3	Casual labourer	Leg	5	Nairobi Central	180 days	180	4	234,000	4
25/04/12	Injuries from machine Operation	4	M	2	1200 hrs	2	19	1	Machine operator	Leg	5	Westlands	23 days	23	2	12,880	2
25/04/12	Other forms of accidents	5	M	2	1500 hrs	3	44	4	Casual labourer	hand	3	Dagoreti	15 days	15	2	13,000	2
28/04/12	Injuries from machine Operation	4	M	2	1520 hrs	4	28	2	Machine operator	hand	3	Kasarani	20 days	20	2	35,586	2
30/04/12	Being hit by falling objects	1	M	2	1600 hrs	4	28	2	Machine operator	head	4	Kasarani	50 days	50	3	120,450	4
02/05/12	Injuries from machine Operation	4	M	2	1500 hrs	3	31	3	Casual labourer	Whole body	6	Embakasi	Fatal	Fatal	5	899,200	5
02/05/12	Falling from heights	3	M	2	1030 hrs	2	34	3	Carpenter	chest	2	Westlands	42 days	42	3	242,760	4
05/05/12	Other forms of accidents	5	M	2	1445 hrs	3	24	2	Casual labourer	Leg	5	Nairobi Central	20 days	20	2	62,954	3
06/05/12	Injuries from machine Operation	4	M	2	0920 hrs	2	44	4	Metal worker	Leg	5	Nairobi Central	10 days	10	2	24,554	2
07/05/12	Falling from heights	3	M	2	1030 hrs	2	28	2	Casual labourer	Hand	3	Westlands	4 days	4	1	1,200	1
08/05/12	Falling from heights	3	M	2	1600 hrs	4	48	4	Casual labourer	head	4	Kasarani	18 days	18	2	7,200	1
11/05/12	Being hit by falling objects	1	M	2	1520 hrs	4	22	2	Casual labourer	Leg	5	Kibera	14 days	14	2	7,260	1
13/05/12	Being hit by falling objects	1	M	2	0810 hrs	1	35	3	Driver-mechanic	Leg	5	Embakasi	42 days	42	3	133,380	4
13/05/12	Injuries from machine Operation	4	M	2	1000 hrs	2	20	1	Mason	hand	3	Kasarani	7 days	7	2	3,600	1
14/05/12	Falling from heights	3	M	2	1625 hrs	4	23	2	Mason	hand	3	Kasarani	11 days	11	2	3,300	1
18/05/12	Falling from heights	3	M	2	0900 hrs	2	30	2	Casual labourer	hand	3	Westlands	4 days	4	1	1,292	1
03/06/1	Being hit by falling objects	1	M	2	1530 hrs	4	2	2	Casual labourer	hand	3	Kibera	30 days	30	2	109,056	4

2							9										
06/06/12	Being hit by falling objects	1	M	2	1100 hrs	2	18	1	Guard	Leg	5	Westlands	42 days	42	3	12,461	2
11/06/12	Falling from heights	3	M	2	1310 hrs	3	31	3	Casual labourer	Leg	5	Westlands	30 days	30	2	110,200	4
12/06/12	Falling from heights	3	M	2	1030 hrs	2	29	2	Mason	hand	3	Embakasi	3 days	3	1	9,000	1
13/06/12	Being hit by falling objects	1	M	2	1730 hrs	4	50	4	Driver-mechanic	head	4	Westlands	15 days	15	2	72,000	3
15/06/12	Falling from heights	3	M	2	1830 hrs	4	23	2	Mason	head	4	Westlands	180 days	180	4	518,400	5
21/06/12	Other forms of accidents	5	M	2	1710 hrs	4	24	2	Casual labourer	Leg	5	Embakasi	6 days	6	1	2,646	1
22/06/12	Falling from heights	3	M	2	1040 hrs	2	27	2	Casual labourer	Leg	5	Nairobi Central	8 days	8	2	3,200	1
27/06/12	Injuries from machine Operation	4	M	2	1622 hrs	4	29	2	Machine operator	hand	3	Kasarani	45 days	45	3	91,868	3
07/07/12	Injuries from machine Operation	4	M	2	1020 hrs	2	39	3	Machine operator	hand	3	Embakasi	30 days	30	2	98,387	3
08/07/12	Falling from heights	3	M	2	1120 hrs	2	31	3	Casual labourer	head	4	Pumwani	30 days	30	2	96,000	3
12/07/12	Injuries from machine Operation	4	M	2	1230 hrs	3	26	2	Carpenter	hand	3	Kasarani	20 days	20	2	71,659	3
23/07/12	Being hit by falling objects	1	M	2	1030 hrs	2	39	3	Supervisor	head	4	Kasarani	7 days	7	2	10,769	2
23/07/12	Being hit by falling objects	1	M	2	1630 hrs	4	49	4	Supervisor	head	4	Kasarani	7 days	7	2	10,769	2
30/07/12	Falling from heights	3	M	2	1445 hrs	3	34	3	Mason	head	4	Westlands	Fatal	Fatal	5	1,747,200	6
03/08/12	Injuries from machine Operation	4	M	2	1400 hrs	3	36	3	Driver-mechanic	head	4	Kasarani	60 days	60	3	143,416	4
04/08/12	Being hit by falling objects	1	M	2	1530 hrs	4	47	4	Supervisor	head	4	Kibera	15 days	15	2	53,678	3
09/08/12	Falling from heights	3	M	2	1400 hrs	3	39	3	Mason	head	4	Embakasi	7 days	7	2	2,758	1
12/08/12	Falling from heights	3	M	2	1400 hrs	3	23	2	Casual labourer	head	4	Makadara	Fatal	Fatal	5	1,820,000	6
13/08/12	Being hit by falling objects	1	M	2	1210 hrs	3	24	2	Carpenter	head	4	Pumwani	30 days	30	2	17,307	2

16/08/12	Other forms of accidents	5	M	2	1740 hrs	4	19	1	Casual labourer	hand	3	Embakasi	10 days	10	2	31,110	2
26/08/12	Falling from heights	3	M	2	0930 hrs	2	40	3	Carpenter	hand	3	Kasarani	42 days	42	3	42,461	2
04/09/12	Other forms of accidents	5	M	2	1430 hrs	3	35	3	Casual labourer	hand	3	Westlands	10 days	10	2	22,159	2
04/09/12	Falling from heights	3	M	2	1430 hrs	3	54	5	Mason	head	4	Westlands	9 days	9	2	3,346	1
07/09/12	Being hit by falling objects	1	M	2	1045 hrs	2	47	4	Carpenter	hand	3	Kasarani	15 days	15	2	73,478	3
17/09/12	Falling from heights	3	M	2	1210 hrs	3	44	4	Mason	head	4	Nairobi Central	Fatal	Fatal	5	1,109,846	6
26/09/12	Injuries from machine Operation	4	M	2	0900 hrs	2	28	2	Machine operator	hand	3	Embakasi	15 days	15	2	7,500	1
26/09/12	Injuries from machine Operation	4	M	2	1400 hrs	3	25	2	Machine operator	hand	3	Pumwani	15 days	15	2	7,500	1
26/09/12	Falling from heights	3	M	2	1100 hrs	2	22	2	Casual labourer	hand	3	Kibera	30 days	20	2	100,966	4
02/10/12	Falling from heights	3	M	2	1600 hrs	4	24	2	Casual labourer	hand	3	Kasarani	6 days	6	1	2,769	1
03/10/12	Injuries from machine Operation	4	M	2	0930 hrs	2	25	2	Machine operator	hand	3	Nairobi Central	7 days	7	2	1,950	1
12/10/12	Other forms of accidents	5	M	2	1115 hrs	2	24	2	Casual labourer	chest	2	Nairobi Central	14 days	14	2	6,461	1
15/10/12	Injuries from machine Operation	4	M	2	0900 hrs	2	48	4	Machine operator	hand	3	Kasarani	3 days	3	1	1,650	1
17/10/12	Other forms of accidents	5	M	2	1330 hrs	3	33	3	Casual labourer	hand	3	Nairobi Central	5 days	5	1	2,403	1
18/10/12	Being hit by falling objects	1	M	2	1730 hrs	4	27	2	Mason	Leg	5	Westlands	3 days	3	1	1,200	1
30/10/12	Being hit by falling objects	1	M	2	1000 hrs	2	32	3	Supervisor	head	4	Nairobi Central	12 days	12	2	35,291	2
02/11/12	Being hit by falling objects	1	M	2	1810 hrs	4	33	3	Casual labourer	hand	3	Embakasi	12 days	12	2	31,207	2
13/11/12	Falling from heights	3	M	2	1100 hrs	2	35	3	Mason	head	4	Kasarani	34 days	34	3	20,400	2
18/11/12	Being hit by falling objects	1	M	2	0910 hrs	2	27	2	Mason	Leg	5	Makadara	3 days	3	1	1,200	1
01/12/1	Being hit by falling objects	1	M	2	1245 hrs	3	2	2	Mason	head	4	Nairobi	60 days	60	3	131,619	4

2							7					Central					
11/11/12	Being hit by falling objects	1	M	2	0850 hrs	1	41	4	Driver-mechanic	Leg	5	Kasarani	7 days	7	2	4,800	1
13/11/12	Being hit by falling objects	1	M	2	1240 hrs	3	37	3	Casual labourer	hand	3	Kasarani	4 days	4	1	1,538	1
13/11/12	Falling from heights	3	M	2	1340 hrs	3	25	2	Mason	head	4	Kasarani	34 days	34	3	20,400	2
14/11/12	Other forms of accidents	5	M	2	1600 hrs	4	24	2	Casual labourer	hand	3	Westlands	60 days	60	3	80,340	3
21/11/12	Falling from heights	3	M	2	1650 hrs	4	39	3	Mason	head	4	Kibera	100 days	100	4	299,520	4
23/11/12	Being hit by falling objects	1	M	2	1220 hrs	3	26	2	Casual labourer	Leg	5	Westlands	5 days	5	1	1,625	1
03/12/12	Injuries from machine Operation	4	M	2	1115 hrs	2	57	5	Machine operator	Leg	5	Embakasi	30 days	30	2	59,020	3
11/12/12	Being hit by falling objects	1	M	2	1130 hrs	2	44	4	Driver-mechanic	Leg	5	Kasarani	1 week	1	1	4,800	1
11/12/12	Being hit by falling objects	1	M	2	1210 hrs	3	45	4	Driver-mechanic	Leg	5	Embakasi	1 week	1	1	4,800	1
15/12/12	Other forms of accidents	5	M	2	1600 hrs	4	26	2	Casual labourer	hand	3	Kasarani	30 days	30	2	51,733	3
04/01/13	Falling from heights	3	M	2	0930 hrs	2	30	2	Mason	hand	3	Nairobi Central	60 days	60	3	180,500	4
06/01/13	Being hit by falling objects	1	M	2	1045 hrs	2	29	2	Casual labourer	Leg	5	Westlands	4 days	4	1	1,300	1
06/01/13	Falling from heights	3	M	2	0930 hrs	2	29	2	Casual labourer	Leg	5	Westlands	45 days	45	3	131,040	4
09/01/13	Falling from heights	3	M	2	1045 hrs	2	23	2	Casual labourer	abdomen	1	Kibera	6 days	6	1	2,100	1
11/01/13	Injuries from machine Operation	4	M	2	1100 hrs	2	39	3	Supervisor	hand	3	Thika road	50 days	50	3	104,284	4
11/01/13	Falling from heights	3	M	2	1245 hrs	3	64	5	Painter	hand	3	Westlands	6 weeks	6	1	15,480	2
14/01/13	Being hit by falling objects	1	M	2	1530 hrs	4	27	2	Casual labourer	head	4	Nairobi Central	15 days	15	2	5,320	1
14/01/13	Being hit by falling objects	1	M	2	1554 hrs	4	34	3	Electrician	head	4	Nairobi Central	10 days	10	2	7,000	1
23/01/13	Being hit by falling objects	1	M	2	0925 hrs	2	23	2	Casual labourer	hand	3	Makadara	3 days	3	1	3,690	1

23/01/13	Being hit by falling objects	1	M	2	1725 hrs	4	29	2	Casual labourer	hand	3	Kasarani	3 days	3	1	4,500	1
24/01/13	Falling from heights	3	M	2	1022hrs	2	35	3	Mason	hand	3	Westlands	2 days	2	1	1,300	1
10/02/13	Being hit by falling objects	1	M	2	1130 hrs	2	37	3	Carpenter	hand	3	Nairobi Central	50 days	50	3	58,752	3
10/02/13	Being hit by falling objects	1	M	2	1530 hrs	4	51	5	Carpenter	hand	3	Nairobi Central	50 days	50	3	58,752	3
10/02/13	Being hit by falling objects	1	M	2	1540 hrs	4	51	5	Carpenter	hand	3	Nairobi Central	50 days	50	3	58,752	3
14/02/13	Being hit by falling objects	1	M	2	0750 hrs	1	24	2	Casual labourer	hand	3	Embakasi	90 days	90	3	173,160	4
15/02/13	Other forms of accidents	5	M	2	1700 hrs	4	37	3	Machine operator	Leg	5	Pumwani	3 days	3	1	2,157	1
18/02/13	Injuries from machine Operation	4	M	2	1530 hrs	4	24	2	Carpenter	hand	3	Kasarani	3 days	3	1	1,500	1
20/02/13	Falling from heights	3	M	2	0900 hrs	2	41	4	Carpenter	head	4	Westlands	3 days	3	1	2,100	1
23/02/13	Other forms of accidents	5	M	2	1500 hrs	3	31	3	Casual labourer	hand	3	Nairobi Central	15 days	15	2	57,600	3
01/03/13	Falling from heights	3	M	2	1500 hrs	3	50	4	Casual labourer	Leg	5	Kibera	30 days	30	2	32,256	2
01/03/13	Falling from heights	3	M	2	1200 hrs	2	33	3	Carpenter	hand	3	Pumwani	50 days	50	3	79,400	3
20/03/13	Other forms of accidents	5	M	2	1500 hrs	3	37	3	Machine operator	hand	3	Kasarani	25 days	25	2	28,953	2
25/03/13	Falling from heights	3	M	2	1030 hrs	2	39	3	Casual labourer	Leg	5	Makadara	4 days	4	1	1,200	1
26/03/13	Being hit by falling objects	1	M	2	1640 hrs	4	24	2	Driver-mechanic	head	4	Makadara	21 days	21	2	91,804	3
27/03/13	Falling from heights	3	M	2	1010 hrs	2	23	2	Casual labourer	head	4	Westlands	fatal	Fatal	5	998,400	5
27/03/13	Being hit by falling objects	1	M	2	1430 hrs	3	41	4	Mason	hand	3	Kasarani	18 days	18	2	26,000	2
03/04/13	Falling from heights	3	M	2	1400 hrs	3	25	2	Casual labourer	hand	3	Makadara	5 days	5	1	2,495	1
05/04/13	Falling from heights	3	M	2	1115 hrs	2	32	3	Mason	Leg	5	Kasarani	180 days	180	4	544,320	5
30/04/1	Falling from heights	3	M	2	1005 hrs	2	2	2	Casual labourer	Leg	5	Kasarani	80 days	80	3	304,400	4

3							9										
03/04/13	Falling from heights	3	M	2	1830 hrs	4	35	3	Casual labourer	hand	3	Kibera	5 days	5	1	2,495	1
05/04/13	Falling from heights	3	M	2	1430 hrs	3	34	3	Mason	Leg	5	Kasarani	180 days	180	4	544,320	5
30/04/13	Other forms of accidents	5	M	2	0900 hrs	2	38	3	Casual labourer	Leg	5	Kibera	12 days	12	2	49,920	2
10/05/13	Injuries from machine Operation	4	M	2	1450 hrs	3	33	3	Carpenter	hand	3	Pumwani	20 days	20	2	60,227	3
18/05/13	Falling from heights	3	M	2	1520 hrs	4	29	2	Casual labourer	hand	3	Westlands	4 days	4	1	1,292	1
24/06/13	Falling from heights	3	M	2	1015 hrs	2	25	2	Casual labourer	Leg	5	Nairobi Central	21 days	21	2	97,674	3
02/07/13	Falling from heights	3	M	2	1200 hrs	2	26	2	Carpenter	Leg	5	Makadara	30 days	30	2	14,300	2
15/07/13	Being hit by falling objects	1	M	2	1400 hrs	3	31	3	Casual labourer	hand	3	Kasarani	70 days	70	3	152,661	4
04/08/13	Being hit by falling objects	1	M	2	1005 hrs	2	37	3	Casual labourer	Leg	5	Kasarani	18 days	18	2	53,678	3
20/08/13	Falling from heights	3	M	2	1500 hrs	3	32	3	Supervisor	head	4	Pumwani	5 days	5	1	4,000	1
04/09/13	Falling from heights	3	M	2	1100 hrs	2	28	2	Casual labourer	Leg	5	Embakasi	50 days	50	3	62,308	3
13/09/13	Falling from heights	3	M	2	1145 hrs	2	30	2	Casual labourer	hand	3	Kasarani	45 days	45	3	117,840	4
02/10/13	Being hit by falling objects	1	M	2	1200 hrs	2	23	2	Casual labourer	hand	3	Kasarani	3 days	3	1	4,500	1
02/10/13	Falling from heights	3	feM	1	1135 hrs	2	26	2	Casual labourer	Leg	5	Embakasi	47 days	47	3	19,523	2
18/10/13	Being hit by falling objects	1	M	2	0730 hrs	1	21	2	Casual labourer	Leg	5	Makadara	3 days	3	1	3,969	1
16/11/13	Falling from heights	3	M	2	0900 hrs	2	23	2	Plumber	head	4	Pumwani	fatal	Fatal	5	948,480	5
18/11/13	Injuries from machine Operation	4	M	2	1500 hrs	3	35	3	Driver-mechanic	hand	3	Kibera	fatal	Fatal	5	1,397,020	6
07/12/13	Injuries from machine Operation	4	M	2	1100 hrs	2	38	3	Metal worker	hand	3	Makadara	5 days	5	1	2,500	1
03/12/13	Other forms of accidents	5	M	2	1530 hrs	4	49	4	Mason	Hand	3	Kibera	fatal	Fatal	5	1,440,000	6

14/12/13	Falling from heights	3	M	2	0800 hrs	1	30	2	Carpenter	head	4	Dagoreti	fatal	Fatal	5	1,440,000	6
17/12/13	Other forms of accidents	5	M	2	1300 hrs	3	34	3	Carpenter	hand	3	Westlands	15 days	15	2	86,400	3
02/01/14	Falling from heights	3	M	2	1720 hrs	4	46	4	Mason	head	4	Nairobi Central	fatal	fatal	5	2,305,248	6
08/01/14	Being hit by falling objects	1	M	2	1030 hrs	2	28	2	Carpenter	head	4	Kasarani	14 days	14	2	10,176	2
15/02/14	Injuries from machine Operation	4	M	2	1650 hrs	4	39	3	Machine operator	hand	3	Kasarani	fatal	fatal	5	1,113,649	6
10/03/14	Falling from heights	3	M	2	1100 hrs	2	33	3	Carpenter	head	4	Kasarani	15 days	15	2	65,815	3
11/03/14	Being hit by falling objects	1	M	2	1400 hrs	3	44	4	Supervisor	Leg	5	Westlands	7 days	7	2	7,000	1
11/04/14	Other forms of accidents	5	M	2	1630 hrs	4	28	2	Casual labourer	hand	3	Embakasi	12 days	12	2	31,168	2
06/05/14	Injuries from machine Operation	4	M	2	1100 hrs	2	45	4	Metal worker	Leg	5	Kasarani	76 days	76	3	24,554	2
13/05/14	Injuries from machine Operation	4	M	2	0930 hrs	2	35	3	Driver-mechanic	Leg	5	Embakasi	42 days	42	3	133,380	4
03/06/14	Falling from heights	3	M	2	1500 hrs	3	29	2	Casual labourer	hand	3	Westlands	6 weeks	180	4	16200	2
09/06/14	Falling from heights	3	M	2	1345 hrs	3	44	4	Casual labourer	head	4	Kibera	fatal	fatal	5	1,440,000	6
18/06/14	Falling from heights	3	M	2	1128 hrs	2	27	2	Mason	head	4	Kibera	14 days	14	2	6861	1
18/06/14	Electric shock	2	M	2	1620 Hrs	4	33	3	Mason	chest	2	Dagoreti	Fatal	Fatal	5	2,004,000	6
22/06/14	Injuries from machine Operation	4	M	2	1000 hrs	2	36	3	Casual labourer	head	4	Embakasi	fatal	fatal	5	998,000	5
23/06/14	Injuries from machine Operation	4	M	2	1300 hrs	3	32	3	Supervisor	Leg	5	Kibera	fatal	fatal	5	1,064,948	6
23/06/14	Other forms of accidents	5	M	2	1530 hrs	4	56	5	Carpenter	hand	3	Westlands	7 days	7	2	8,076	1
24/06/14	Falling from heights	3	M	2	1430 hrs	3	21	2	Casual labourer	head	4	Kibera	7 days	7	2	4,244	1
01/07/14	Injuries from machine Operation	4	M	2	1200 hrs	2	29	2	Machine operator	hand	3	Kasarani	30 days	30	2	196,477	4
04/07/1	Falling from heights	3	M	2	1800 hrs	4	3	3	Mason	hand	3	Westlands	45 days	45	3	33,230	2

4							1										
05/07/14	Injuries from machine Operation	4	M	2	1300 hrs	3	54	5	Machine operator	head	4	Kibera	fatal	fatal	5	1,092,400	6
09/07/14	Being hit by falling objects	1	M	2	1000 hrs	2	42	4	Metal worker	Leg	5	Kasarani	6 days	6	1	3,600	1
09/07/14	Injuries from machine Operation	4	M	2	1710 hrs	4	28	2	Carpenter	Leg	5	Dagoreti	33 days	33	3	18124	2
12/07/14	Falling from heights	3	M	2	1500 hrs	3	37	3	Mason	head	4	Makadara	fatal	fatal	5	1,612,800	6
10/07/14	Being hit by falling objects	1	M	2	0820 hrs	1	29	2	Mason	hand	3	Kibera	3 days	3	1	1,524	1
10/07/14	Falling from heights	3	M	2	1050 hrs	2	28	2	Supervisor	hand	3	Westlands	7 days	7	2	3600	1
18/07/14	Injuries from machine Operation	4	M	2	1730 hrs	4	38	3	Machine operator	head	4	Embakasi	fatal	fatal	5	619,269	5
22/07/14	Being hit by falling objects	1	M	2	1600 hrs	4	44	4	Mason	head	4	Embakasi	50 days	50	3	54,000	3
24/07/14	Being hit by falling objects	1	M	2	0930 hrs	2	27	2	Casual labourer	Leg	5	Kibera	7 days	7	2	7592	1
27/07/14	Other forms of accidents	5	M	2	0945 hrs	2	39	3	Guard	hand	3	Westlands	15 days	15	2	4,500	1
29/07/14	Other forms of accidents	5	M	2	0845 hrs	1	28	2	Supervisor	hand	3	Dagoreti	9	9	2	3893	1
30/07/14	Falling from heights	3	M	2	1600 hrs	4	33	3	Casual labourer	hand	3	Kasarani	7 days	7	2	1,938	1
01/08/14	Falling from heights	3	M	2	1250 hrs	3	36	3	Casual labourer	hand	3	Embakasi	150 days	150	4	363,630	4
02/08/14	Other forms of accidents	5	M	2	1500 hrs	3	29	2	Casual labourer	hand	3	Kibera	14 days	14	2	8,308	1
22/08/14	Falling from heights	3	M	2	1000 hrs	2	48	4	Carpenter	head	4	Kibera	fatal	fatal	5	2,414,720	6
26/08/14	Other forms of accidents	5	M	2	0950 hrs	2	45	4	Electrician	hand	3	Embakasi	3 days	3	1	2,222	1
28/08/14	Falling from heights	3	M	2	1200 hrs	2	48	4	Carpenter	Leg	5	Kasarani	3 days	3	1	2,538	1
02/09/14	Being hit by falling objects	1	M	2	1040 hrs	2	29	2	Casual labourer	head	4	Embakasi	7 days	7	2	19,012	2
13/09/14	Other forms of accidents	5	M	2	830 hrs	4	45	4	Supervisor	Leg	5	Kibera	150 days	150	4	312,455	4

17/09/14	Other forms of accidents	5	M	2	0900 hrs	2	40	3	Machine operator	hand	3	Makadara	33 days	33	3	86,857	3
19/09/14	Injuries from machine Operation	4	M	2	0850 hrs	1	29	2	Machine operator	head	4	Westlands	3 days	3	1	1,800	1
03/10/14	Being hit by falling objects	1	M	2	1650 hrs	4	55	5	Mason	head	4	Embakasi	8 days	8	2	6,400	1
23/10/14	Other forms of accidents	5	M	2	1200 hrs	2	33	3	Casual labourer	Leg	5	Westlands	9 days	9	2	4,050	1
26/10/14	Falling from heights	3	M	2	0800 hrs	1	48	4	Casual labourer	Leg	5	Thika road	42 days	42	3	32,701	2
03/11/14	Falling from heights	3	M	2	1220 hrs	3	25	2	Casual labourer	head	4	Kibera	fatal	fatal	5	987,360	5
07/11/14	Injuries from machine Operation	4	M	2	1600 hrs	4	34	3	Mason	hand	3	Kibera	50 days	50	3	214,080	4