FACTORS AFFECTING OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PRACTICES IN THE BUILDING CONSTRUCTION INDUSTRY IN NAKURU COUNTY, KENYA

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Investigation of factors affecting occupational health and safety management practices in the Building Construction Industry in Nakuru County, Kenya

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DECLARATION

This thesis is my own work and has not been presented in any other University for award of a degree

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

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DEDICATION

This Thesis is dedicated to my beloved husband Mr. Edward Mugo and the entire family for their continued support and encouragement. God Bless you.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF PLATES

LIST OF ABREVIATIONS AND ACRONYMS

BWI Building and Wood Workers International

CBD Central Business District

CSCS Construction Skill Certificate Scheme

DOHSS Directorate of Health and Safety Services

GDP Gross Domestic Product

HSC House Safety Commission

HSE House Safety Executive

ILO International Labour Organization

MDF Medium Density Fibreboard

MoH Ministry of Health

NEMA National Environment Management Authority

NBI Nairobi

NOHSC National Occupational Health and Safety Commission

OHSA Occupational Health and Safety Administration

OSH Occupational Safety and Health

OSHA Occupational Safety and Health Act

PPE Personal protective equipment

SEWA Self Employed Women Association

SMF Synthetic Mineral Fibre

UNFPA United Nations Family Planning Association

WIEGO Women in Informal Employment: Globalizing & Organizing

KU Kenyatta university

JKUAT Jomo Kenyatta University Of Agriculture And Technology

ABSTRACT

Building construction industry is one of the fastest growing industries in Nakuru County due to rapid urbanization. It employs a large workforce to cater for the growing demand of offices and housing estates. The industry is however plagued by many health and safety problems and sometimes rated the most dangerous land based industry. The objectives of the research were to assess the safety and health risks in building construction industry, establish the preventive measures used against safety and health risks, evaluate the level of training on safety and health risks among workers and evaluate the level of compliance with laws and regulations governing that industry. Descriptive research was used where a survey was conducted and data collected using non-systematic approach using observations, questionnaires and interviews. Data was analyzed using SPSS. It was found that there was no emphasis on health and safety issues hence many accidents health problems where 70.7% of the workers had experienced accidents at work. Accidents and injuries from various causes ranged from 10% to about 56%. Protection was minimal in most cases ranging between 0% and 33%. Training levels were found to be low for instance specialized formal training ranged from 3.2% to 33%. The trade was learnt mostly through apprenticeship while documentation was poor or lacking. Compliance levels were rather low with only 25% of sites getting high compliance rating due to low monitoring averaging at 2.3 visits, and poor enforcement. It was concluded that there was need for the government to come up with sector specific policies for the building construction industry and strengthen enforcement. It is recommended that safety and health issues be given priority in development issues and building construction be treated like any other trade. Joint efforts should be made when carrying out inspections and punitive fines implemented on those found not complying with provisions of the law.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The trend in the world population is characterized by more people moving into towns and cities, steadily making the world more urban. The United Nations (UN) projects that the world's urban population will increase by more than 2 billion people by the year 2030 with half being born into poverty, and by 2050, two-thirds will live in cities and towns (UN, 2008; UNFPA, 2007). Developing countries are experiencing urban population growth at the rate of three times faster than rural population with a large proportion of the future population growth expected to be in urban areas (UN, 2008). In Africa, despite slow economic progress, cities are experiencing the fastest population growth rates, over 5% per year, and by 2030, urban population will be more than triple (UN, 2003 and 1998). The rapid urbanization rates result mainly from natural growth and net migration from rural areas (de Haan, 1997; Naylor and Falcon, 1995). The effect is strain on the capacity to provide basic services leading to problems such as poverty, unemployment, inadequate shelter, poor or non-existent sanitation, contaminated or depleted water supplies, many forms of environmental degradation, and congestion, among others. This will continuously place at risk the lives and health of the urban population especially the poor (Montgomery, 2008; UN-HABITAT, 2005; UN, 2003).

Close to three billion people, or about 40 % of the world's population by 2030 will need new housing (UN, 2008). Building construction is one of the fastest growing industries in the world and employs a very large workforce accounting for 10% of the Gross Domestic Product (GDP), which is about 180 million people or providing 7% of global employment (Murie, 2007; ILO, 2001). High urbanization leads to shortfalls in housing resulting to dilapidated state of housing and human settlement. In Kenya, the housing demand outstrips the supply by far in urban areas leading to overcrowding and spread of slums and also compromising the quality of houses (Nubi, 2008). The cost of building materials,

deficiency of housing finance arrangement, stringent loan conditions from mortgage banks and government policies amongst other problems have affected housing delivery significantly (Nubi, 2008).

1.2 Occupational Health and safety

People engaged in work or employments have their safety, health and welfare protected through Occupational Safety and Health (OSH) procedures. The aim of occupational safety and health programs is to foster safe and healthy work environment. As a multi-disciplinary activity, it targets basic aspects such as prevention and control of occupational accidents and diseases. This ensures safe work environments, improvement of workers welfare physically, mentally and socially. It also ensures that workers enjoy productive lives and contribute to sustainable development (WHO 2010). Work productivity is promoted by a safe and healthy work environment and improves worker human dignity (ILO, 2010).

1.3. Occupational Health and Safety Management Practices

Consideration of occupational safety and health practices is very important if building construction is to conducted effectively with the health of the workers safeguarded (Kiganda, 2016). It is not a common practice to carry out assessment of construction impacts on the workers and therefore fatal accidents often occur at building construction sites.

Workers are more concerned with getting the jobs than their working conditions. Mitulla and Wachira (2003), in their research found out that in Nairobi, 70% of the workers rated their working conditions from average (33%) to very poor (37%) while 27% rated working conditions as good simply because they had been in the building construction industry for long and therefore had adapted to the conditions and accepted them as unavoidable. They also found out that since workers were not in any trade union, they were not able to lobby for implementation of health and safety requirements for fear of dismissal. Most workers are employed on temporary basis and the employers tend to avoid issuing work permits or registering the workers with relevant authorities hence, the workers are not covered by any

legislation including the Trade Dispute Act (1991), Occupational Safety and Health Act (2007)-Kenya, Workman's Compensation Act (1972) which regulates labour issues (Mitulla and Wachira, 2003). It is unfortunate that persons engaged at workplaces on casual basis are not regarded as employees (Ministry of labour-Kenya, 2013).

1.4 Effects of housing demand on safety and health

The increased demand for housing facilities has led to tremendous growth in the building construction industry in developing countries which in turn has led to high demand for labour and more growth of informal settlements (Murie, 2007). She found that the industry contributed a great deal towards occupational accidents and work-related ill health and exposure of workers to hazards was common and excessive, characterized by poor or no welfare facilities provided. The wide range of risks and hazards resulted from chemicals, dust, manual handling, physical and psychosocial hazards. She noted that construction offered low-status, low paid, unregistered informal and hazardous jobs in highly fragmented industry and many workers especially rural-urban migrants, were faced with exploitative employment practices, hardships and hazards. Its problems were given little consideration and were rarely compensated or effectively treated. Unfortunately, even large construction projects had health and safety policies that were not effectively implemented. In addition, workers were not provided with basic amenities like clothing, latrines, clean drinking water, washing facilities or even first aid. Murie noted that this increases the vulnerability of the workers to health problems. A research done by Mwangi (2016) in Nairobi County found that accidents at the construction sites were caused by workers negligence, inadequate safety performance, stored materials, low tool maintenances, supervisory laxity and violations of safety procedures. In addition, foremen and site supervisors who were charged with safety at construction sites lacked capacity to handle health and safety issues. Health and safety risk assessment on the construction sites was not common and done only if required by the client. There was also low monitoring by law enforcers on occupational safety and health. Kiganda, (2016), stated that Kenya experienced challenges of unskilled draughtsmen and quack contractors resulting in

building collapses especially in Nairobi. Mainly affected were low cost residential buildings leading to loss of property and lives.

Majority of construction workers have limited training on health and safety and this training can range from two hours to two days in developed countries (Sean, 2011). Most often, workers learn their trade through apprenticeship. They lack education, information and there is no health monitoring (Mitulla and Wachira, 2003). Most employers ignore health and safety issues which is reflected in the absence of basic requirements like helmets on working sites. Construction workers are exposed to serious hazards which sometimes lead to serious accidents like loss of limbs, eye sight, hearing impairment and even death (Wachira, 2000).

Despite the importance of the building construction industry in housing the growing population and the fact that it employs a large workforce, safety and health issues are rated very low and the occupation remains very hazardous. Building construction accounts for 30-40% of the world's fatal injuries with approximately 100,000 workers killed every year (ILO, 2001). This, according to ILO, accounts for 4% of GDP in estimated cost of occupational accidents and ill health in all sectors. Occupational Safety and Health Administration (OSHA)-US, (US Department of Labour, (2005) noted that about 6.5 million people work in 252,000 construction sites each day. There are more fatal injuries reported than in any other industry. In the United Kingdom (UK), construction has been rated as the most dangerous land based work sector after fishing (Sean, 2011). He also established that the accident rate is about 13 workers per 100,000, while in the US the incidence rate is 13.3 per 100,000 employed workers and that in the year 2001, 1225 fatal occupational injuries and 481,000 non-fatal injuries and illnesses were experienced (Sean, 2011).

Accidents and occupational diseases have negative consequences, medically and socially, in developing nations like Kenya compared to the industrialized countries. This is made worse by concurrence of microbial and parasitic diseases, deficient nutrition, inadequate sanitation and hygiene, and poor housing conditions. Approximately 60% of the urban population in Kenya live in informal settlements, where their lives and health are

continually threatened by inadequate provision of clean water and sanitation, poor waste management, and inadequate health care and emergency services. A substantial percentage of informal settlement residents are casual laborers‟ in the construction sector who are the sole breadwinners in households with a high number of dependents. More often than not, there is no or little compensation to the workers in the event of accidents or disease (Rantanen, 1989).

Unfortunately in Kenya, reliable data on accident cases in construction industry is not available because most contractors do not report all accidents (DOHSS Annual Report 2011). However reports from unpublished sources provide some basic insights into the occupational hazards and risks in the building industry in Kenya. The reports indicate that fatalities and deaths have become common place in Kenya and Kenyans seem to resign to this fate (Omukubi, 2012). Newspaper reports are common such as "Ten men trapped as building collapses" reported by Amadala and Lumwamu in (2011). In Nairobi between 2006 and 2011, about four buildings were reported in the media to have collapsed such as in Kahawa Wendani, one of the Nairobi suburbs, a building under construction with some completed units housing tenants started sinking. The crumbling foundation and cracked pillars did not bother the managers which is an indication of disregard of safety in the building construction industry in a bid to maximize profits. In Embakasi another building collapsed killing and injuring people reported by Haron and Omukubi in (2012). The high demand for houses make some developers collude with authorities to contravene regulations, have poor structural plans and materials which are substandard. The collapse of buildings reflects negatively on the City council and implies corruption among developers and authorities as stated by Haron, and Omukubi in (2012). Kemei et al, (2017) in their research done in Nairobi obtained data from DOSH on "occurrence of accidents in Nairobi County" between 2010 and 2014 as indicated in Table 1

Table 1: DOSH Data on accidents in Nairobi County for the period 2010-2014

Division	Severity of accident (days off duty)					
	<3 (minor)	4-10	11-20	>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
Madaraka	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: Common Construction Site Hazards in Nairobi County, Kenya (Kemei et al, 2017).

Cole, (2003) indicated that every employer whose employees exceed five should prepare and keep updated statement of safety policy and ensure employees are aware of it. This would be an indication of commitment by the employer to safety and health of the employees. Safety and health programs at workplaces are necessary and should include risk assessment, safety and health audits, inspections among other things. In order to improve the construction industry, Kenya enacted an Act of Parliament referred to as The National Construction Authority Act, 2011. Under the act was established National Construction Authority (NCA) which is mandated "to oversee construction industry and coordinate its development". It is also expected to register contractors to ensure quality buildings (GOK, 2011).

1.5 Statement of the problem

Nakuru County is experiencing increasing demand for housing due to increasing population. Building construction industry is plagued with numerous accidents every year.

A research on construction fatalities and injuries in 2003 indicated that mining, construction and transport sectors combined contributed 41% of accidents in Kenya (Nyakang'o, 2004). Danso (2005) found that in the year 2000, 902 accident cases were recorded in construction industry where 56 cases were fatal and 846 cases were non-fatal. He also found that in Nairobi alone 124 deaths were recorded in the period 1999-2004. These increased occupational risks are an indication of safety and health issues in the building construction industry that have not been addressed, either through responsible law and/or by stakeholders concerned. These problems can be addressed if underlying causes of hazards and risks are identified and addressed, which this research seeks to do.

1.6 Justification

The numerous accidents caused by errors and problems in building construction sites can be addressed if underlying causes of hazards and risks are addressed and managed. In Kenya in the period 2000-2004, construction fatalities and injuries recorded were 1528, 1923, 1332, 1599 and 1387 cases (Nyakang'o, 2004). The same report indicated that in combination, mining, construction and transport sectors in 2003 contributed 41% of accidents in Kenya. Danso (2005) found that in the year 2000, 902 accident cases were recorded in construction industry where 56 cases were fatal and 846 cases were non-fatal. He also found that in Nairobi alone 124 deaths were recorded in the period 1999-2004. Ministry of Labour in Kenya in 2013 found that construction sector contributed 40 fatal and 383 non-fatal accidents giving a total of 423 accidents. This was second to transport and telecommunication sector. The causes include use of poor materials leading to building collapse; negligence of basic requirements like use of personal protective equipments and proper material and equipment storage. The increased occupational risks in this industry indicated that there were safety and health challenges in the building construction industry that had not been addressed, either through responsible law and/or by stakeholders concerned. This was the motivation of this research into management of safety and health in building construction sites.

1.7 Research objectives

1.7.1 General objective

The general objective of the study was to investigate factors affecting management of safety and health in building construction industry in Nakuru County.

1.7 .2 Specific objectives

The specific objectives of the study were:

1. To assess the safety and health risks in the building construction industry in Nakuru County.
2. To establish the preventive measures used against safety and health risks in the building construction industry in Nakuru County.
3. To investigate the level of training on health and safety risks among workers in the building construction industry in Nakuru County.
4. To evaluate the level of compliance with laws and regulations governing the building construction industry in Nakuru County.

1.8 Study questions

The study questions that guided the research were as follows;

1. What are the safety and health risks found in building construction industry?

2. What are the management practices used to address safety and health risks in building construction industry?

3. What are the challenges in management of safety and health risks in building construction industry?

4. To what extent are workers trained on safety and health risks in building construction industry?

5. What is the level of compliance with the laws and regulations in the building construction industry?

1.9 Scope of the study

The main focus of the research was to evaluate the factors affecting management of safety and health in building construction industry in Nakuru County in Kenya.

1.10 Significance of the Study

This study may be useful to any person interested in safety and health issues in building construction Industry in Kenya. It is also hoped that research findings will benefit various categories of people as outlined below:

1.10.1. The Government and the Policy Makers

The government and the policy makers stand to benefit from the findings of the study in that they will be able to appreciate the various safety and health risks in building construction and the impacts on the workers. The Government can then relook at the legislations to strengthen them and seal loopholes for the protection of the construction workers. This will reduce accidents and injuries as well as fatalities. This will in turn ensure a healthy and safe workforce that will be happy and reduce pressure on the economy in terms of time lost and money spent on treatment and compensation. Safe work place reduces occurrence of work related accidents, diseases and insurance claims resulting in higher productivity levels and low production costs as stated in The Kenya National Industrialization Policy Framework (2010).

1.10.2. Academic Field

The study will make contribution to the existing literature in the field of health and safety management in the building construction industry to ensure safety in Kenya. Academicians can use this research as a basis for further research.

1.10.3. Professionals within the Building Construction Industry

Professionals within the Building Construction Industry in the public institutions and private sectors can use the study to understand the best ways of reducing if not eliminating accidents and health hazards within the building construction industry to ensure safety.

1.10.4. Contractors/Employers

The research findings may enable focused intervention strategies and concerted efforts aimed at eradicating causes of accidents and hazardous practices in building construction industry. Contractors will also appreciate the importance of capacity building workers, equipping them with information and knowledge on safety and health and lay emphasis on applying preventive and protective measures at work. They will be able to appreciate importance of legal compliance.

1.10.5. Law enforcers

The officers responsible for enforcing various laws may identify gaps and weaknesses in respective legislations and their capacities in enforcement and initiate reviews.

1.10.6. Building construction workers

The workers will benefit from improved work environment and their lives will improve socio-economically. A healthy and safe worker will be a happy and more productive worker (UNCHSEO, 1995).

1.11 Limitations to the Study

The limitations experienced in the study were as follows;

Employment in building construction is of temporary nature making employees very mobile. This created a likelihood of interviewing same worker more than once.

The foremen could sometimes be supervising more than one construction site

Suspicion from the workers on the researcher making them withhold information

Construction sites initially identified during the survey could become inactive during data collection.

Distance from one site to the other could sometimes be long and covering the three towns necessitated travelling with cost implications.

1.12 Conceptual Framework

Figure 1 depicts the conceptual framework that reflects the relationships between the laws and regulations and the effects on health and safety management. Good laws and regulations with proper enforcement would have a positive effect on safety and health of the workforce. On the other hand complying with the laws and regulations would also lead to higher level of safety and health. High education levels and awareness on laws and regulations and on importance of implementing measures on safety and health would result to good management of safety and health. On the contrary, poor law enforcement would lead to laxity in compliance and this would have a negative effect on safety and health. Low awareness and limited education on safety and health would also lead to poor safety and health practices.

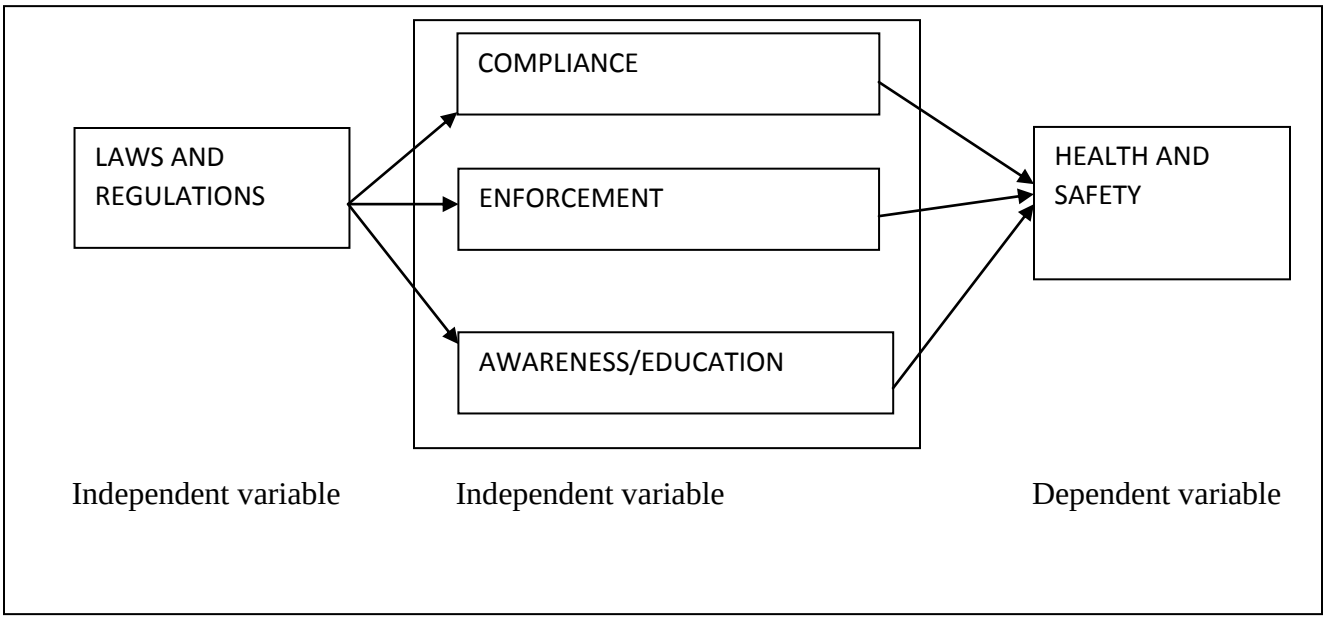

Figure 1: Conceptual Framework

1.13 Definition of terms

Health is "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity." (WHO).

Occupational health refers to the identification and control of the risks arising from physical, chemical, and other workplace hazards in order to establish and maintain a safe and healthy working environment. These hazards may include chemical agents and solvents, heavy metals such as lead and mercury, physical agents such as loud noise or vibration, and physical hazards such as electricity or dangerous machinery (MoH, 2014).

Safety: According to the business Dictionary, safety is defined as relative freedom from danger, risk, or threat of harm, injury, or loss of personnel and/or property, whether caused deliberately or by accident. Safety can also be defined as the control of recognized hazards to achieve an acceptable level of risk. For purposes of this study, safety is taken to mean freedom from danger, harm, and injury to the person involved in building construction activities.

Injury is an act that damages or hurts (Webster dictionary). Injury is also defined as a collective term for health outcomes from traumatic events (Andersson, 1999). Rejda (1992). In this study injury means hurt caused to the workers at building construction sites.

Accident is "any unplanned sudden event which causes injury to people or damage to buildings, plant, material or the environment" (MoH, 2014). Occupational accident is defined as arising out of and in the course and scope of an employee's employment, and resulting in personal injury (Ministry of Labour, 2013).

Hazard is "an inherent property of a substance, agent, source of energy or situation having the potential of causing undesirable consequences e.g. chemicals, slippery floors, work while standing on a ladder" (MoH, 2014).

Risk is defined as "the probability that damage to life, and/or the environment will occur as a result of a given hazard. Some risks can be measured or estimated in numerical terms (e.g. one chance in a hundred). The risk or probability of injury or ill-health resulting from

a hazard(s) is a factor not only of the inherent nature of the hazard, but also of the controls in place to mitigate the hazards" (MoH, 2014).

OSHA, (2007) defines risk as probability of occurrence of an adverse effect from a substance on people or the environment combined with the magnitude of the consequence of that adverse effect.

Risk Assessment can be defined as an organised process used to describe and estimate the amount of risk of adverse human health effects from exposure to a toxic chemical or other hazard (how likely or unlikely it is that the adverse effect will occur). How reliable and accurate this process is depends on the quantity and quality of the information that goes into the assessment (MoH, 2014). It is also defined as a process of making a determination of how safe a situation is and then making judgement of the acceptability of a risk (ILO, 2010).

Risk control is to determine the nature and severity of the risk, who is affected and the frequency of the risk. The risks identified are mitigated in the following ways: Elimination of the hazard, substitution of the hazard, isolations, use of engineering controls, use of administrative controls or use of PPEs (ILO, 2010).

Risk Management is "a logical and systematic method of establishing the context, identifying, analyzing, treating, monitoring and communicating risks associated with any activity, function or process in a way that will enable organizations to minimize losses and maximize opportunities".

CHAPTER TWO
LITERATURE REVIEW

2.1. Health and safety hazards and risks in building construction industry

This section identifies the types of health and safety hazards and risks that are commonly experienced in the building construction industry and their impacts on the workers.

2.1.1. Types of Hazards and risks in building construction sites

2.1.1.1 Falling from heights (particularly off roofs and heights above 1.2m high).

Poor footing and/or hand support lead to slipping and falling. Poorly set ladders or overload on ladders also lead to falls while defective and collapsing scaffolds as well as breaking harnesses cause injuries (Corney and Poustie, 2008). Scaffolds are commonly used by construction workers estimated at 2.3 million per year. Using proper scaffolds would protect about 4500 workers from injuries and prevent 50 fatalities annually (US Department of Labour, 2005). About 24,882 injuries and about 36 fatalities per year were caused by falls on stairways and ladders used in construction. Nearly half of these injuries were serious enough to require time off the job (Occupational Safety Health Administration, 2005). The HSE (2004) reported that there were 1107 major injuries as a result of falling from height in 2003/04 in the UK.

2.1.1.2 Being hit or crushed by powered mobile plants and traffic

Large construction sites are characterized by heavy machinery. Lack of warning signs at operation sites and workers erroneously working too close to powered machinery, result to accidents and fatalities. These machinery includes cranes, tractors and forklifts and if faulty cause injury. Sometimes delivery vehicles are in a hurry to deliver as much material as possible in a given time and these cause accidents to workers busy at the construction site. Inadequate equipment for lifting loads and unsafe use of cranes lead to accidents (Corney and Poustie 2008; Australian state Government, 2005). About 100 workers die annually in the US due to heavy construction equipment (Hunter, 2011).

2.1.1.3 Risk of falling objects in building construction

Objects are likely to fall onto or hit people doing construction work and even people in adjoining areas. These objects include materials, equipment, debris and tools. Tools may fall off working platforms; bricks and stones may fall while being lifted and concrete pre-cast panels may fall over (State of Queensland –Attorney General's Department, 2008). In Nairobi, it was found that falling from height and injuries from falling objects were most frequent accidents (Kemei et al, 2017).

2.1.1.4 Cuts from sharp materials, objects and tools during construction

Construction remains like wood, stone chips, nails, and metal often get strewn all over construction sites and pose risks to construction workers. Unprotected workers get injured when they step on the sharp objects or brush against them. Handling of sharp materials like iron sheets and heavy iron bars with bare hands often lead to injuries (Corney and Poustie, 2008). Different tools used, equipment and machinery used in building construction sometimes cause severe injuries and fatalities in Kenya (Kamoing, 1990).

2.1.1.5 Collapse of elements in buildings

Structural collapse and collapse of concrete elements during handling and erection lead to crush. Sometimes contractors want to make extra profit by saving on input costs. This compromises the standard of the concrete mixture and reduces the quality of the structures made. The structures collapse when being handled or erected and cause injury. Building structures have been known to collapse due to use of substandard materials leading to massive death and injuries (Corney and Poustie, 2008). In Uganda a suspended floor slab of a two-storied building which had reached roofing stage at Buziga collapsed and injured two workers (Hlubega and Kiggundu, 1997). Factors that may contribute to the likelihood of an uncontrolled collapse and injury are; a) faulty design, including the use of incorrect components or inadequate concrete strength,; b) weakness in concrete elements due to inappropriate modifications**;** c) inadequate reinforcement; d) cost cutting by the contractors; e) additional structures not in original plan; f) incorrect lifting and erection practices including the unsafe use of rigging; g) lifting before the concrete element has

reached its design strength,; h) weakness resulting from errors while prefabricating the concrete elements among a host of other reasons (Cherono, 2012). She found that these factors reflect negligence, lack of supervision, not following the approved plans and specifications. Tragic collapse of buildings under construction is an experience that is becoming common in Kenya. It is however discouraging how the authorities give a host of excuses when a building collapses. There is therefore a possibility of human error that may be responsible for loss of lives in collapsed building under construction. In 2006 in Nairobi a building collapsed and 16 people died and over 200 were injured (Beintema et al., 2010). In the recent past a number of cases of collapsed buildings have been reported in print and other media (Table 2).

Table 2: Media reports on Number of collapsed buildings in Kenya compiled in 2013

Year	Place	No. of people trapped	No. injured	No. killed
2011(July)	Ngara (NBI)		6	
2011(Jun)	Langata (NBI)Southern bypass		6	
2011(Jun)	Embakasi(NBI)	14		7
2010(Jan)	Kiambu			2
2009 (Oct)	Kiambu	35	10	16
2009(July)	Nakuru		5	1
2009 (Jan)	Kisii			3
2006(Jan)	Nbi-CBD Ronald Ngara Street		77	10
2006(Jan)	Mlolongo(NBI)	Not stated	Not stated	4

2.1.1.6 Hazardous substances in building construction

Different hazardous substances have different health effects and safe use requirements. There are many substances used in building construction sites that are hazardous and include paints, solvents, glues, chemicals etc; hazardous dusts and fibres like silica,

asbestos, wood dust, Medium Density Fibreboard (MDF), Synthetic Mineral Fibres (SMF) (Corney and Poustie, 2008). Level of exposure to these substances varies from site to site. Hand tools and motor engines produce a lot of dust and air emissions respectively (Takala and Vahapassia, 1990). About 20,000 construction workers every year suffered from respiratory diseases while skin diseases affected up to 10,000 workers in 2003-2004 (HSE, 2004). Exposure to hazardous substances results to fatigue, headache and may cause dizziness and irritation of air passages and eyes of some workers in building construction industry. This results to reduced levels of productivity and low work quality, and may lead to increased absenteeism (Takala and Vahapassia, 1990; Rantanen (1989)).

2.1.1.7 Welding fumes, gases and arc from building construction activities

Metal work in building construction industry requires welding to join up the pieces. Cases of acute and chronic poisoning due to excess exposure to welding fumes have been recorded. Acute or short term effects are mainly experienced when workers are exposed to zinc oxide fumes resulting in metal fume fever. Other components like copper, aluminium and magnesium have similar effects. The symptoms of the fever which resemble influenza occur several hours after exposure and include metallic or sweet taste, chills, thirst, fever, muscle ache, chest soreness, fatigue, gastro-intestinal pain, headache, nausea and vomiting and subside one to three days of exposure with no residual effect. Chronic effects due to long exposures to chromium, nickel and aluminium have also been noted. Chronic effects are experienced in the respiratory, nervous, cardiovascular systems and even the skin. Some types of welding gases and fumes have carcinogenic effects (NOHSC, Australia, 1990).

2.1.1.8 Manual handling of tasks, like lifting heavy objects in building construction

Construction industry entails work which is often heavy, laborious, monotonous, ergonomically inappropriate. Workers in Kenya are normally engaged for long hours in construction work under those strenuous conditions (Kamoing and Monyo, 1990**).** Manual handling of tasks leads to musculoskeletal disorders. These disorders are some of the most common forms of ill health among workers in building construction industry where as

many as 30% of workforce are affected (Queensland Government, 2009). Most affected categories are brick layers, plasterers and joiners. The injuries range from back injuries due to lifting heavy loads to wrist injuries caused by repetitive work (Queensland Department of Justice and Attorney-General, 2009).

2.1.1.9 Sanitary and hygiene levels that may lead to occupational illnesses construction

Building construction sites often lack basic facilities like water and sanitary conveniences. Workers lack water for cleaning up after work and even when taking meals. They also reuse their dirty work clothes which are sometimes worn over their street clothes and this leads to contamination of food, water and breathing space The work clothes are soiled with dirt that includes dust, paint and other contaminants. These dislodge from the clothes or diffuse and contaminate the immediate air surrounding the worker which he then breathes in). Lack of sanitary facilities makes workers use the next best available option, back streets, fences, building walls and other incomplete and abandoned building structures (Corney and Poustie, 2008).

2.1.1.10 Noise sources and levels in building construction

Noise is generated from many activities in building construction industry. Different activities exhibit differing types of noise such as background noise, idling noise, blast noise, impact noise, rotating noise, intermittent noise, howling, screeches and squeals. .Electric tools, explosive powered nail guns and vibrators used during concrete pour cause noise. Though the activities are short lived they are repetitive and their cumulative effect lead to significant exposure. Unprotected exposure for as little as two minutes per day can lead to permanent hearing loss (Queensland Department of Justice and Attoney-General, 2009). The WHO recommended noise level for industrial, commercial and traffic areas is 70db (A) for a duration not exceeding 24 hours are indicated in table 3. Construction workers on average are exposed to a range between 84-94db (Waltke et al; 2005) which is way above the recommended level.

Table 3: Noise sources and levels in building construction industry

Equipment	Sound level at operator	
	Average	**Range (dB)**
Background/earth moving:		
Front End Loader	88	85-91
Back Hoe	86.5	79-89
Bull Dozer	96	89-103
Roller	90	79-93
Scraper	96	84-102
Grader	<85	
Truck	96	89-103
Paver	101	100-102
Material Handling:		
Concrete Mixer	<85	
Concrete Pump	< 85	
Crane	100	97-102
Derrick	<85	
Power Units:		
Generators	<85	
Compressors	<85	
Impact:		
Pile Driver (diesel and pneum.)	98	82-105
Pile Driver (gravity, bored)	82.5	62-91
Pneumatic Breaker	106	94-111
Hydraulic Breaker	95.5	90-100
Pneumatic chipper	109	
Other Equipment:		
Poker Vibrator	94.5	87-98
Compressed Air Blower	104	
Power Saw	88.5	78-95
Electric Drill	102	
Air Track Drill	113	
Noise Standards		Noise Level
OSHA (at workers ear)		90 dB (A)
Day Time Community (at property line)		65 dB (A)

Source: British Columbia, "Construction Noise", Workers Compensation Board of BC

2.1.1.11 Hazards during excavation and Trenching

According to OSHA (US), excavation and trenching is the most hazardous construction operation. The US Bureau of Labour and statistics (USBLS) between 2000 and 2006 recorded 271 worker fatalities in this activity (Hunter, 2011).

2.1.1.12 Electricity risks in building construction

Workers sometimes come into contact with underground electric cables and overhead power lines and conductors that result to burns and electrocution (Huges and Ferrett, 2011). Electrical systems are supposed to be isolated and handled only by competent people (HSE).

2.1.2. Environmental factors experienced in building construction

Environmental factors increase the likelihood of an injury for persons undertaking concrete element construction work. Temperature stress, brought about by the country's hot climate, further increases the workload. The wind speed when it exceeds specifications for the safe erection of the concrete elements leads to collapse of structure. Wet weather may cause instability in the crane standing area or erection area and therefore cause accident and injury or even fatality to affected workers. Extremes in temperature may make it unsafe for those persons erecting the concrete elements, for example warm clothing or weather conditions may muffle instructions and/or block the line of sight for hand signals (Corney and Poustie, 2008, Kamoing, 1990). In Queensland, Australia, it was found that sun exposure leading to skin cancer and weather conditions like strong winds, long working durations in the open air and hot sun is common on construction sites. This exposes the workers to sun burns causing skin cancer. On the other extreme strong winds have been known to rip off structures causing injuries (Queensland Department of Justice and Attorney General, 2008).

2.2 Risk Control Measures in Building Construction

To eliminate or minimize the risks, a risk control hierarchy is designed for application to ensure that the control measure which provides the greatest level of safety is selected. It is

applied where reasonably practicable in the order a) elimination which involves removal of the specific risk entirely and adopting another way of doing the job; b) substitution which entails reducing the risk significantly by using alternative method or process; c) isolation ensures that the level of exposure of worker to the hazard is kept to a minimum; d) engineering controls whereby machinery or equipment to perform tasks are designed to protect workers from the risks and hazards; e) administrative controls which are most useful in building construction. They include implementing safety procedures and policies to minimize exposure to the risk; PPEs are used when it is simply not possible to use other methods. It can also be used together with the other controls and should always be seen as the last resort (Corney and Poustie, 2008). Environmental controls are also used to remove hazards if the substance is airborne, or to shield the source, if it is a physical hazard. Physical hazards such as noise, ultraviolet (UV) radiation from arc welding, infrared radiant (IR) heat from hot objects are shielded with some appropriate material for example plywood sheets shield IR and UV radiation, while material that absorbs and reflects sound will provide protection from noise (Queensland Government, 2009; OSHA, 2007).

As can be seen, the hazards and risks experienced by workers in the building construction industry are numerous, some of which are serious and can lead to death of the workers. It is also clear that the hazards and risks can be minimized by putting mitigation measures in place and applying the hierarchy of controls (Corney and Poustie, 2008; Queensland Department of Justice and Attorney General 2008).

2.3 Management Challenges to Safety and Health in Building Construction Industry

Much of building construction is being realized in the developing nations where urbanization rate is very high, income levels are low and workers are employed on very temporally terms. In Kenya building construction workers are not screened for health purposes before they are engaged Rantanen, 1989). Workers tend to concentrate more on getting and retaining their jobs more than worrying about their health and safety. They lack basic health facilities like drinking water, enough food, first aid and sanitary facilities. This exposes the workers to ill health and malnutrition. They are also prone to contracting

communicable diseases like dengue, tuberculosis, cholera and malaria. Lack of eating and sanitary facilities may also lead to health deterioration. Often, workers cannot wash before meals and must eat in the work zone, which means they may ingest toxic substances transferred from their hands to food or cigarettes. A lack of changing facilities at work sites may result in transmission of contaminants from the workplace to a worker's home (Murie, 2007).

Low levels of education and poor training of workers and managers is another challenge. Building construction has the bulk of the workers engaged for manual labour on daily basis. It is seen as low status, dirty and dangerous job. Most of these workers are the disadvantaged in society with little or no education. Therefore they may not grasp the importance of health and safety (Murie, 2007). On the other hand, managers who are inexperienced in health and safety systems may adopt a highly complicated system of management procedures and this could be very difficult to administer (Marshall, 2002).

Petrovic and Perry (2004) also expressed concern over the notion that training takes away workers from their job. This implies that workers are denied training on safety and health which is not seen as priority issue so as to dedicate more time to construction and therefore save time. Marshall (2002) found that in high risk trades like roofing and electrical work, few workers attended training. Most of these workers were over 57 years translating to over 15 years of work. They feel they are mature at work and are "set in their ways". They feel they do not need any further training, are hard to change and ignore health and safety principles that apply to them. The same study found out that the young people were not completing the safety and health course, implying low interest and that small subcontractors with no relationship with work cover, (South Australia) or employer bodies had low uptake of health and safety training Goldenhar et al, 2001; Mayhew et al, 1997).

Limited resources by subcontractors do not allow them to set aside resources for designing comprehensive safety and health policy. When awarding contracts, subcontractor's record of safety is not taken as a necessary factor as opposed to price and service. Some

contractors feel that work safety in associated with higher costs though some feel poor safety cost more and put contractor at a disadvantage to getting future contracts and agree that accidents affect co-workers morale. In Australia it was found that when contactors are competing for jobs they first avoid what they term as “unnecessary” costs of safe work procedures. They tend to stick to shorter time and this ends up compromising the safety at workplace. It was also found that when jobs are plenty and contractors have a choice, if a hiring company requires considerable safe-work procedural paper work, the subcontractor may opt to move on elsewhere (Petrovic and Perry, 2004). Obtaining a loan from the bank is a tedious procedure which, in some cases, takes months. This discourages the contractor who requires short term bridging finances. The higher interest rates of the lending institutions too have placed national contractors at a disadvantage to foreign counterparts who are able to get loans from their banks with undercutting rates of interest. Also many contractors do not have reasonable access to commercial borrowings and other facilities at reasonable and comparable rates as available in developed countries. The lack of credit facilities is another constraint. Short term financing sometimes is available to construction enterprises from local banks, and is expensive. Most enterprises therefore operate without access to credit facilities. Sometimes the contractor is made to use his advance payment to purchase equipment leaving little funds to finance the work due to poor cost planning and budgeting for available resources. This most often result in low quality of work done (Nayanthara et al., 2005). Storage and handling of machinery, equipment, tools and materials in building construction is a key activity. However, efficient storage and handling have no additional profit to the contractor, and therefore ignored on construction sites (HSE, 2006).

Informal set up of most projects in building construction industry is another challenge. This is because the projects are not registered hence not regulated. Workers are not protected under the appropriate laws and tend to be highly exposed. Self regulating occupational safety and health is difficult (Petrovic and Perry, 2004). The employer does not consider safety and health issues as priority issues and workers have to attend to their own welfare (Murie, 2007). The workers in this kind of set up are not in any association

and so they are not able to lobby for safety and health issues at workplace. Any attempt is met with dismissal and replacement (Mitullah and Wachira, 2003). In addition many construction workers are hired on a project basis and made redundant on project completion. As a result, the construction industry is characterized by a pool of workers who work for a variety of contractors in different types of construction (Nayanthara *et al.*, 2005).

In Australia there was low cooperation between the subcontractors, the Federal government, and workers unions on enforcement of occupational safety and health issues (Petrovic and Perry, 2004). The construction industry has been experiencing a lot of difficulties due to lack of government policies or ineffective policies to support it. For instance, in Sri Lanka government tender procedures based on low prices are sometimes inefficient. Political instability of the country created rapid changes of certain policy decisions taken by the previous governments. For instance, decisions to awarding of contracts were revised in many instances hence affecting the industry and its productivity (Nayanthara, *et al.*, 2005). According to Nayanthara (2005), there is low appreciation of legislation governing safety and health in building construction industry. The laws are not strongly enforced and some contractors are not even aware of their safety and health obligations under the laws. Regulatory bodies on the other hand have limited resources to enable them enforce the laws.

Minimal transfer of technology from foreign to local contractors is a challenge in construction industry that affects safety and health. In Sri Lanka, it was found that rapid development projects required high level of technological input which the local industry could not fully meet and so the high technology projects were left to foreigners. It was noted that there was no deliberate effort to have the local contractors participate, implying low technological transfer. There is also lack of initiatives, funds, opportunities and attitude for research and development in building construction industry. Contractors take this as government domain and research done in institutions of higher learning are not disseminated for implementation (Nayanthara,et al, 2005). Due to low profit margins contactors often intend to complete the projects with minimum supply of facilities to their

workers. This may sometimes result in unacceptable hygienic conditions within the construction site. Low education and poor attitude by some workers compromise the level of health and hygiene at construction sites (Nayanthara et al, 2005).

Sometimes specifications for levels of certain hazards are absent in existing legislation making enforcement difficult. Most harmful gases are not detected by sight or smell hence lacking basis for enforcement or prosecution. In addition penalties are too low to deter violation of laws and contractors feel they are better off in profits with no control measures (UNEP, 1999). Scarcity of data makes it impossible to characterize the conditions under which employees work. For instance, more than half of the accidents and injuries in Kenya go unreported and many enterprises are unregistered. By end of 2004, only 11387 enterprises were registered excluding 1.3 million micro and small enterprises under which building construction falls (Nyakang'o, 2004).

The challenges were summarized by Cole (2003) as follows; The occupational health and safety performance of the building and construction industry is unacceptable. The powerful competitive forces in the industry too often work against health and safety. The industries strive to complete projects on time. Too often safety is neglected. There must be a cultural and behavioural change that can come about by harnessing the competitive forces in the industry to work for occupational health and safety. A combination of government , workers and employers in large and small operations being focused on securing OHS implementation measures to lift the Australian construction industry's OHS, currently less-than- ideal record" (Cole, 2003).

2.4. Training on health and safety risks among workers in building construction industry.

There is low tendency to transfer technology from foreign to local contractors in construction industry. In Sri Lanka, it was found that rapid development projects required high level of technological input which the local industry could not fully meet and so the high technology projects were left to foreigners. It was noted that there was no deliberate effort to have the local contractors participate, implying low technological transfer. There

is also lack of initiatives, funds, opportunities and attitude for research and development in building construction industry. Contractors take this as government domain and research done in institutions of higher learning are not disseminated for implementation (Nayanthara et al, 2005).

Most workers including managers in building construction industry have low levels of education and poor training. Building construction has the bulk of the workers engaged for manual labour on daily basis. Most of these workers are the disadvantaged in society with little or no education (Murie, 2007). There is also a notion that training takes away workers from their job and this implies that workers are denied training on safety and health which is not seen as a priority issue so as to dedicate more time to construction and therefore save time (Petrovic and Perry (2004). In a research by Marshall (2002) it was found that high risk trades like roofing and electrical work had few workers who have attended training. Most of those workers were over 57 years translating to over 15 years of work. They felt they were mature at work and "set in their ways". They felt they had no need for any further training, were hard to change and ignored health and safety principles that applied to them. The same study found out that the young people were not completing the safety and health course, implying low interest and that small subcontractors with no relationship with work cover, (South Australia) or employer bodies had low uptake of health and safety training (Mayhew, 1997; Goldenhar, 2001; Marshall, 2002).

Kenya has rapid population growth rate, which is not commensurate with the infrastructure development for education and training making supply of skilled workforce in the construction industry very low (Kamoing, 1990). There is a concern that though the building construction industry is experiencing impressive growth, training of construction workers is wanting. The Universities produce large numbers of professionals in architect, quantity surveyors and engineers mandated to oversee design and construction of buildings. However these professionals act as intermediaries between the clients and builders and so evolve to become contractors, subcontractors or consultants for major construction sites (Alingo, 2011). In construction industry both skilled and unskilled workers are necessary in the construction chain of workers. Unlike in the developed

countries, Kenya has no structured working mechanism and policies. Unskilled labour is dominant in building construction ranging from form four leavers trying to utilize their free time and make some earnings; jobless old men trying to make ends meet to ordinary persons with no education at all. Groups of these will normally hang around construction sites waiting to be hired. The contractors tend to hire quacks and non-professionals in order to cut costs and widen their profit margins (Okari, 2011).

2.5. Laws and regulations governing building construction industry globally

2.5.1. The construction Laws (discus OSHA

Building construction industry is regulated by laws, regulations and even standards and codes of practice. These laws and regulations, among other issues, guide and regulate issues of safety and health in many parts of the world. Laws fall under various levels; International, national and enterprise levels and include OSH laws, Environmental laws, Physical Planning laws, County laws which are applied nationally. Kenya is a member of ILO seeks to ensure that labour standards are respected (ILO, 2007). ILO Conventions are recognized as law by Nations that have ratified those Conventions. The ILO conventions are binding upon the members and must be performed in good faith as stated in article 26 of the Vienna Convention on the Law of the Treaties (Clive, 2007). "The Safety and Health in Construction Industry" is an ILO code of practice (ILO, 1992) whose objective is to provide practical guidance on legal, administrative, technical and educational framework for safety and health in construction industry. It seeks to prevent accidents, diseases and harmful effects on workers health and to ensure implementation of appropriate designs and provide means of analyzing construction processes and operations, activities and technologies with safety and health of worker in mind (ILO, 1992). ILO also has guidelines on Occupational Safety and Health management systems (ILO-OSH, 2001) that gives guidance on establishment of national framework for OSH management systems which should be supported by national law and regulations and it also provides for integration of OSH management systems by individual organizations (ILO, 2001).

2.5.1.1 Occupational Safety and Health Act (OSHA), 2007

In Kenya the health, safety and welfare of workers was initially regulated by the factories Act Chap 514 until 2007 when this Act was repealed and replaced with Occupational Health and Safety Act (OSHA), 2007. The Act provides for the safety, health and welfare of workers and all persons lawfully present at workplaces. It also provides for the establishment of the National Council for Occupational Safety and Health. The Act is expected to: a) secure the safety, health and welfare of persons at work; b) Protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

This Act is applicable to all workplaces, whether temporarily or permanently, which includes construction sites. The responsibilities of both employer/occupier and the employees to ensure safety, health and welfare at work are stipulated in the Act.

2.5.1.2. Directorate of Occupational Safety and Health Services

The enforcement responsibility of matters concerning safety and health rest with Directorate of Occupational safety and Health Services (DOSHS) in the Ministry of Labour. Their powers are drawn from OSHA, 2007.

The Act requires every occupier to establish a safety and health committee at the workplace in accordance with regulations prescribed by the Minister for Labour. This applies to workplaces with twenty or more employees. The Director can also direct the establishment of such a committee at any other workplace where he deems necessary. The Minister may make regulations to provide for the organization, functions and activities of the safety and health committees. This may include election of safety representatives, their rights and duties, training of the members of the safety and health committees and the safety and health representatives.

2.5.2. The construction regulations

The Construction (Health, Safety and Welfare) Regulations, 1996 provides for the Health and safety executive publications which give guidelines to help builders, site managers and

site workers to operate their sites with consideration to nearby residents (House safety Executive (HSE)-UK, 1996).

In Uganda, the Factories Act Cap. 198 (1964) makes provisions for the health and safety and welfare of persons employed in factories and to building operations and works of engineering construction undertaken by or on behalf of the Government (or the Common Service Authority). Parts that are specifically relevant to sites of building construction are parts IV (General Provisions for health); V (General Provisions for safety); and VI (General Provisions for welfare) (Government of Uganda, 1964).

The OSH law ensure that workers are provided for in terms of their welfare. It provides for the protection of the worker against occupational risks arising from the workplace and provides for development of codes of practice, policies, rules and regulations with approval from the Director of Occupational Safety and Health Services. It also gives required standards to ensure that the worker is protected (GoK, 2007; Australia Federal Government, 1984; US Department of Labour, 1970). The law states that the employer is responsible for health and safety of employees at the workplace while self-employed persons are responsible for their own safety and health. Under this framework law are some regulations touching on building construction. These include**:**

The Factories (Building Operations and Works of Engineering Construction), Rules legal Notice of 1984 gives guidance in building construction, structural alteration, repair and maintenance. The rules outline precautions and actions to be taken to ensure safety and health at workplace (GOK, 1984). The Manual handling operations Regulations (1992) and provision and use of Work Equipment Regulations (1982) in the UK reflect the same law elements as the Kenyan law (UK, 1998, 1992).According to these rules, the contractor is responsible for the safety and health of workers engaged in the construction site.

The Factories and Other places of work (Safety and Health Committee) Rules, Legal Notice No. 31 of 2004 is intended to give workers a voice regarding their health and safety but is not applied in building construction industry because of the temporary nature of the workers. The same applies to the Factories and other Places of Work (Medical

Examinations) Rules, Legal Notice No. 24 of 2005 that provide for medical examination of the worker before engagement to work, periodic medical examination and end of employment examination (GOK, 2005).

The Factories and other Places of Work (Hazardous Substances) Rules, 2007 Legal Notice No. 60 are elaborate on the handling, storage and use of hazardous substances and disposal of resultant wastes. Hazardous substances used in building construction include paint, thinner and glue. Chemicals supplied should be accompanied by material safety data sheet which contains all the information about the substance including nature, usage, handling, transportation and disposal (GOK, 2007).

During construction electric cables are encountered when excavations are done or building being too near overhead electric cables. The Factories (Electric Power Special) Rules 1979 Legal Notice No. 340 regulates the use of electrical energy in any premises among other activities. It gives directions on installation and safe management of the electric power as well as precautions to be taken to prevent accidents (GOK, 1979). In the UK electrical energy is controlled through Factories Act (UK, 1961). The Factories, (First Aid) Rules 1977 Legal Notice No. 160 requires that workplaces be furnished with First Aid boxes equipped with adequate tools and equipment to attend to injury cases. A trained person should be in charge of first aid issues (UK, 1981; GOK, 1977).

2.5.3 Environmental laws and regulations applicable to building construction

Environmental laws protect the workers health by considering elements of the environment-air, water, land. Environment law ensures a clean and healthy environment for all people (GOK, 2010, 1999). In building construction, workers are entitled to clean air (Australia State government, 1978). The worker is also protected from emissions from diesel engines (Australia State government, 1996), noise (GOK, 2009, 1999; Australia State government, 1974). Environmental laws also require that before any project commences, an environmental impact assessment should be carried out (GOK, 2003, 1999). The aim is to ensure that all impacts that are negative on the environment, and

therefore the human beings, are identified and control measures suggested for implementation throughout the project cycle.

The Control of pollution Act (1974) and the Environmental Protection Act (1990) provide for protection of contractors with regard to noise, vibrations and dust which should be kept to a minimum. The laws give direction on noise zonation and type of control measures to be put in place to keep noise to a minimum or eliminate it completely. The Noise and Excessive vibrations regulation, (GOK, 2009) provides for protection of the general public from excessive noise and vibrations. A person intending to generate noise beyond the allowable levels as per the zones requires a license from National Environment Management Authority (GOK, 2009). The worker is said to be safe when the noise levels adhere to the guidelines stipulated in the regulations for maximum permissible noise levels for construction sites measured at the facility. During the day for areas around health, educational, special homes and residential facilities, the level should not exceed 60dB (A) and 35dB (A) for the night. For all other areas the noise levels should not exceed 75 dB (A) and 65 dB (A) for day and night respectively. Exposure should not exceed eight working hours.

Air pollution from a source can spread far being dispersed by wind and by diffusion into the ambient air. Control of air pollution is therefore important because it can affect a wide area from the source. Directions on air pollution from smoke generated by vehicles, machinery and from combustion are provided (GOK, 2015). The law also requires that dust should be controlled at source by use of wet methods to prevent dust formation or its spread. It also encourages giving information to neighbours in advance so as to avoid confrontations (UK, 1990 and 1974).

2.5.4 Quality Standards in building construction industry

Other than laws and regulations there are National and international standards that guide on quality of work and materials used in building construction. The aim is to protect the workers from hazards associated with construction work such as tilt up and precast concrete construction work (Australian Government, 2008, National Occupational Health

and Safety Commission (NOHSC, 2005); The national standard sets up occupational safety and health management plans and safe work method statements. In Kenya the Government is in the process of formulating standards for the building construction industry (Omukubi, 2012)

2.5.5 Codes of Practice in building construction industry

Building code means the state of how a building and its components must perform as opposed to describing how the building must be designed and constructed. This also applies to the alteration, repair, moving or demolition of buildings which are governed by regulations of a similar nature hence ensuring health, safety, and welfare of the people are maintained. They encourage and facilitate economic activities related to the construction of infrastructure and shelter and control environmental conditions and related processes within the buildings (Texas Department of licensing, 2000). The Code of Practice for Building and Construction Industry in Victoria provides for the minimum standards of acceptable practice giving a benchmark and applies to all building and construction work in which the Victoria Government has a stake (Australia Federal Government, 1999).

2.6 Compliance levels to laws and regulations governing occupational safety and health issues

The fact that building construction industry continues being dangerous implies that the level of compliance with the laid down laws is wanting and this leads to many accidents and ill health of workers. Following guidelines can protect workers, equipment and save lives. Strict legislation and frequent training of staff can reduce the number of accidents at construction sites (Sean, 2011). This is echoed by Murie (2007) who states that international standards to protect workers are in place but they are often ignored by the management. It is common to find even large construction projects with safety and health policy or prevention programme that is poorly implemented; no safety officer; no safety and health plan and no information on health and safety. Conforming to these standards could go a long way in reducing illnesses, injuries and even fatalities arising from building construction industry. Mitullah and Wachira (2003) found that projects under the informal

sector are not registered under any authority. This implies that they operate without following any law and this increases chances of exposure of workers to health hazards. Most employers ignored safety and health issues which were reflected by lack of basic requirements like helmets at working sites and in some instances there were no building plans. Workers were found to rely more on their experience of work than training for their welfare.

In the state of Victoria, Australia, the Work Safe which is a Government organization responsible for safety and health was found not to be effective in residential building industry where they turn up only after an accident has occurred. It was noted that in some instances, the organization issued up to three notices before any precaution was taken. Workers worked safe when the officers were present just to avoid being fined (Poustie and Corney, 2008). In Uganda, there was a weakness in enforcement and ignorance of the importance of safety and Health Regulations as stipulated in Factories Act, (1964) and Public Health act (1965) (Hlubega and Kiggundu, 1997).

A country report done for East Africa on Development and Harmonisation of environmental standards in East Africa found that there are difficulties in enforcing existing laws because some words and phrases are too general hence difficult to interpret and prove in court of law. Implementing and enforcement Agencies tend to implement portions of the law and leave out others sometimes due to conflict of interest. Portions of law are subjective as found in legislation to control pollution with such statements like "…if the officer is satisfied that there is a nuisance…" for which the officers' satisfaction is very subjective. There was absence of quantified standards and guidelines and penalties very low. The sectoral application of laws, lack of coordination of actions and no feedback mechanism were found to contribute to poor enforcement (UNDP, 1999).

Laxity in carrying out vigorous inspections is a major factor leading to non- compliance with existing laws. This led to work related accidents in the US in the year (2006) when 29 construction workers died compared to 18 deaths the previous year. This raised the concern of the Occupational Safety and Health Administration and Building's Department (Sewell, 2006). Many small firms that use non-union labour openly flout laws and regulations. They

do not file building permits, do not care about their workers and do not care about public safety. Their interests are to get the job done then go to the next one.

2.6.1 OSHA, 2007 Enforcement Capacity in Kenya

In Kenya, the Directorate of Occupational Safety and Health Services (DOSHS) which is a government department in Ministry of Labour is charged with the responsibility of occupational safety and health services. The department enforces OSHA, 2007 and also Work Injury Benefits Act, 2007 to ensure safety and health of workers and that in case of injuries the workers are promptly compensated. It is expected that DOSHS has a national coverage with officers in every county. However, according to National Profile on Occupational Safety and Health-Kenya compiled by the Ministry of Labour in 2013, only 29 out of 47 counties had officers who offered OSH services. The report indicated that in 2010/2011 financial year the department had only 71 professional personnel. Only 43 OSH officers were in the counties where Nakuru County had 2 officers and an additional 2 stationed in Naivasha sub- County.

The report estimated that there were about 140,000 workplaces in Kenya that qualified for inspection by DOSHS. Only 7,500 workplaces were registered under OSHA 2007, but only about half, or 4,000 got inspected per year. In 2010/2011 period, 4340 inspections were done, 6023 accidents were recorded but only 26 prosecutions were done. It is clear therefore that there is a shortage of OSH officers in Kenya to enforce OSHA, 2007.

2.7 Gaps identified

a) There was no risk assessments on health risks and hazards conducted before construction

b) Preventive and protective measures were not commonly used at building construction sites

c) Building construction workers seemed to be of low education with no formal technical training.

d) Building construction workers appeared to be ignorant of safety and health issues in the industry

e) Low implementation of legal provisions in building construction industry that implied lack of compliance on the side of contractors/employers.

f) Low awareness on legal provisions by building construction workers

g) There seemed to be laxity in law enforcement and inspections on the side of law enforcers in the building construction industry. The situation could have been made worse by low number of enforcement officers.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Study location

The study was conducted in Nakuru County which is located in the South eastern part of the Rift Valley and borders seven Counties namely; Baringo to the North, Laikipia to the North East, Nyandarua to the East, Kajiado to the South, Narok to the South West, Bomet and Kericho to the West (Fig. 2). It covers an area of 7496.5 km^2 with a population of 1,603,325 (50.2% males and 49.8% females) with an annual growth rate of 3.4% (Kenya Bureau of statistics, 2009).

Nakuru County has loam and volcanic soils. Some of the areas in the western parts are unstable with faulting and subsidence which are residual effects of volcanic activities. This is evidenced by faults that have occurred in the recent past during heavy rains. The Temperatures range from minimum of 12^0c to maximum 26^0c and the rainfall ranges from 1,800 to 2,000 mm per year with the wettest period from April to May (Gitahi, 2011).

Three towns namely; Nakuru, Gilgil and Naivasha were selected for the studies due to their rapid developmental growth. Nakuru town is 160 km North West of Nairobi, and is located between $0^0$16'59.85'' and $0^0$16'59''S and $36^0$04'00.12'' and $36^0$04'00 East at an altitude of 1859 m above sea level (ASL). Naivasha town is a market town lying 85 km North West of Nairobi along the Nairobi–Nakuru highway. It is on the shores of lake Naivasha at $0^0$44'23"S and longitudes $36^0$27'26" E (Collins Maps, 2012). It ranks 9^{th} largest town in terms of population (169,142) (Kenya Bureau of Statistics, 2009). Gilgil town is located at $0^0$29' 25" S and $36^0$21'36" E (Collins Maps, 2012). The town has a population of 35,293 people ranking 69^{th} in the country's population (CRA, 2009). All the three towns are within the marginal areas of the county and most of the people tend to settle in the towns which are all situated along the Uganda railway and the Trans African highway (generally referred to as the Northern Corridor).

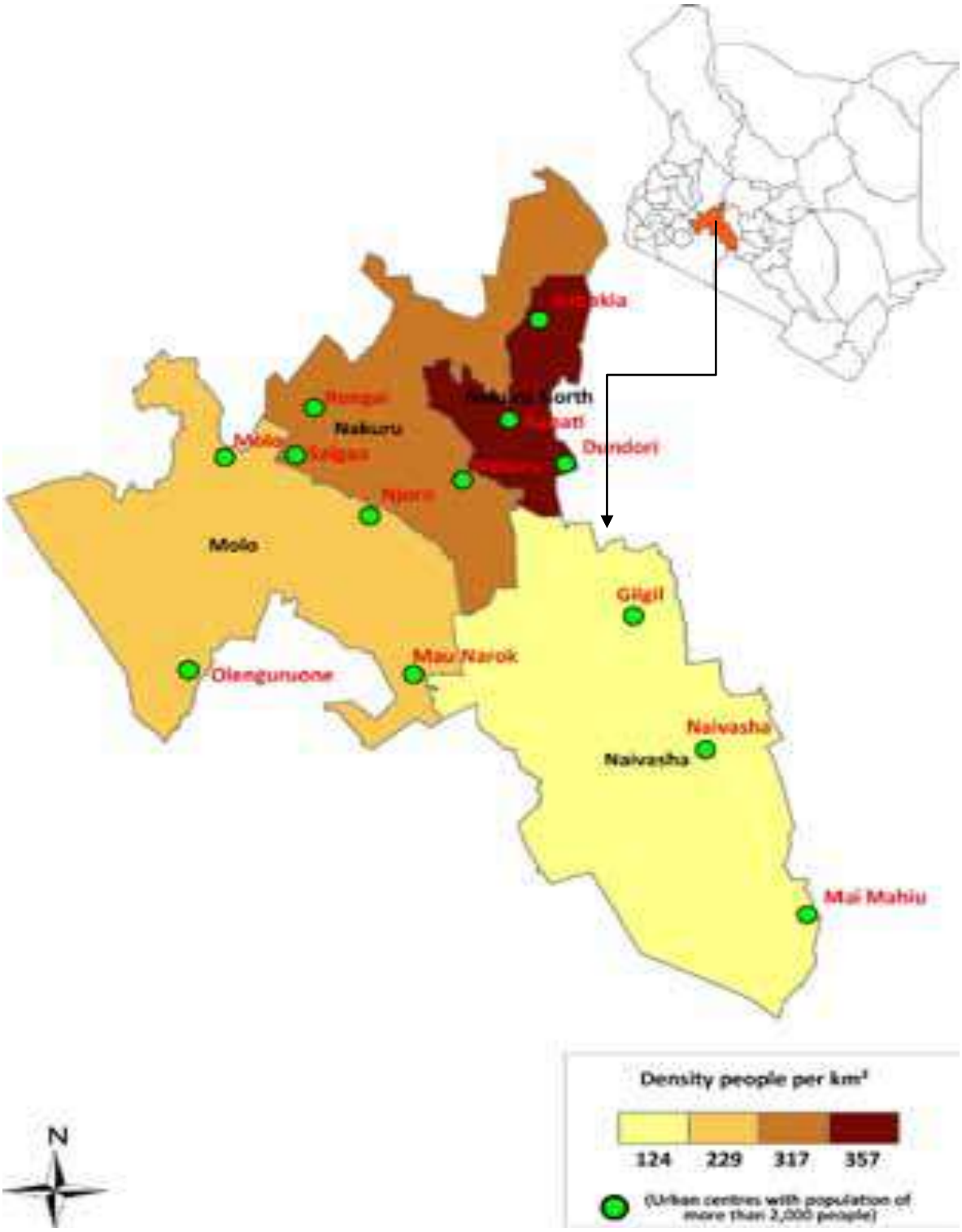

Figure 2: Map of Nakuru County (source: Kenya Mpya, 2012)

3.2 Research design

No defined statistical method could be applied, like deciding on every n^{th} site and therefore a random or non-systematic approach to locate the construction sites was used. This was because of the dynamic nature of construction industry. A preliminary survey was conducted first to identify areas of development and then transect walks across the areas done to pick out active sites. Data was collected from foremen, casual workers and permanent workers. Gender consideration was done wherever applicable whereas education levels were considered for the researcher to get a general picture of the literacy levels of the workers.

3.2.1 Research instruments

Pre designed questionnaire and observation schedule was used to collect data. The tools were designed to capture all stages of the building construction that starts from foundation to final finishing.

3.3 Sample size and sampling procedure

The study targeted general workers who were normally unskilled and hired on casual basis, supervisors and/or foremen and managers who were involved in construction of the buildings sampled. The construction sites to be sampled were obtained from the total sites registered by the Physical Planning office in Nakuru. The approved development plans for construction for the year 2013 in the county by August 2013 when data was sought were 893 spread out as follows: Nakuru 451, Gilgil 212 and Naivasha 230 (Physical Planning office, 2013) indicating that Nakuru held approximately 50.0% of the development plans and the other two shared almost equally at 24.7% and 25.3% of the plans. A preliminary survey was then conducted to establish the actual situation on the ground and to locate the construction sites. The survey found that out of the 893 approvals, only 300 sites translating to 33.6% of the sites were active. This was attributed to the following scenarios; some buildings had been completed due to their small sizes; some had stalled or suspended activities and still some registered ones had not commenced construction by the time of the survey. The sample size was therefore based on those construction sites that were active

and the required sample size for the sites as derived using the Table in appendix 2 (Krejcie and Morgan, 1970) was therefore 169.

Since building construction industry is highly dynamic the researcher devised a criteria to determine the construction sites to be used for data collection for purposes of this study as follows; the site

1. Must be authorized
2. Must have construction work ongoing
3. Must have at least 5 active workers

Criteria number one helped the researcher to keep to the recognized sites which were expected to be regulated; criteria two ensured the researcher was able to make observations for on-going processes and also had workers to participate in the research while criteria three ensured there were enough workers to participate in the interviews. Small construction sites had a bare minimum of 3 workers per site i.e. one casual worker, one semi skilled/skilled worker and the foreman or employer giving the base figure of 900 target population. This figure rose and fell depending on type of activity at the construction site. Purposeful sampling was applied in each of the three study locations; Nakuru, Naivasha and Gilgil town targeting proportions of 80, 44 and 44 sites, respectively based on the above percentages and a minimum of 260 workers as determined by the table for determining sample size from a particular given population (Appendix 2) (Krejcie and Morgan, 1970). A survey was done to identify the sites to be sampled before the actual data collection was done.

The study sites were mainly located in the Central Business Districts (CBD) and residential areas. Commercial construction sites, mixed commercial and residential as well as residential construction sites were involved. The actual numbers of construction sites per town where data was collected were 81 in Nakuru, 41 in Naivasha and 40 in Gilgil. The actual sample sizes varied from the initial target due to the fact that some building sites earlier identified in preliminary survey were inactive during the time of data collection and

there were no workers on site to be interviewed. At the same time only sites that met the above criteria were included in the research. This was taken care of by raising the number of respondents to 351 where 180, 91, and 80 in Nakuru, Gilgil and Naivasha respectively respondents participated. The numbers interviewed were influenced by the willingness to fully participate in the interview.

3.4. Data collection

Data collection started with test run for nine sites (three sites per town) to test validity and reliability of questionnaire. This was done in November 2013. The actual data collection was done from December 2013 to June 2015 where 132 sites were found active. A second round of data collection was done between July and September 2015 targeting the remaining 30 sites that had been identified but were not active during the first data collection. Periodic checks in between had to be done for sites that were near completion so that they would not be left out. Data was collected using observation schedule, face-to-face interviews and questionnaires developed by the researcher (Appendix 1) as well as reviewing any available documents at the site. The instruments were designed to capture all items on each specific occupational health and safety issue.

The researcher engaged and trained research assistants who assisted in administering the questionnaires. The workers, through their employers and supervisors, had been alerted in advance during site identification. The researcher and assistants went through the questions in the questionnaire with the interviewee .and recorded the answers from the respondents. Different stages of development for the buildings were evaluated since different stages experienced different hazards and risks and had different requirements in relation to skills, materials, machinery equipments and PPEs required. All relevant authorities were informed of the study for their support. Contractors for the earmarked buildings were informed before commencing data collection for their consent to participate and involve their workers in the study. Confidentiality and integrity was maintained during the study. Data collection was done as per the objectives. For objectives one and five, interviews, key informants in terms of foremen and observations were used; for objective two and three

interviews were used; and for objective four interviews, perusing records where available and key informants were used (Table 4).

Table 4: Methodology per objective

Objective	Operationalization	Methodology
i. Identifying the safety and health risks in the building construction industry	Various S & H risks, their management& challenges	Observations, questionnaires with face-to-face interviews were used.
ii. Establishing the preventive measures used against safety and health risks in the building industry	Availability and type of preventive measure	Observation using observation schedule, Face to-face interviews used for clarifications.
iii. Investigating the level of training on health and safety risks among workers in the building construction industry.	Level of education, training on S & H, training on equipment use, skills acquired	Questionnaires were used
Iv Evaluating the level of compliance with laws and regulations governing the industry.	Availability of legislations, availability of information, supervision, monitoring, prosecution indicators	Questionnaire, observation schedule and face-to-face interviews as well as reviewing documents available at sites.

3.5 Data analysis

Data on compliance levels, hazards and risks to health and safety and challenges of managing the health and safety hazards and risks was analyzed using Statistical Package for Social Scientists (SPSS) version 20 of 2011 and statistical tools were used to interpret the data. Chi-square used to establish any relationships of parameters used to health and safety in the building construction industry. The data was handled based on the objectives and the results were interpreted using tables, bar graphs and pie charts.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1. Introduction

The research was conducted in 162 sites and involved 351 interviewees where 30.5% were foremen; 68.4% casuals, 0.6% on contract and 0.5% were permanent employees. Of all the respondents interviewed women constituted 0.9%.

The research found that building construction industry within Nakuru County was dominated by men. This reflected the findings by ILO (1998) which also stated that traditionally building construction is a male domain in most African settings with women doing the lighter work of ferrying materials nearer to the building site and doing the thatch. Building construction requires a lot of energy and therefore undertaken by youthful adults, a fact also noted by Phoya (2012). Those below 18 years are expected to be in school while the older people shy away from the more strenuous work. Building construction is a process that ranges from ground preparation and material delivery all the way to final finishing that include painting and interior fittings and each of these stages has its issues. BWI (2006) found that people employed in construction industry were mostly low skilled, poor and vulnerable. Various skills are required at different stages of the building construction and the safety risks vary in frequency and severity.

4.2 Stages of building development of sampled sites

It was found that most buildings within the county were at the walling stage constituting 44.4 % followed by plastering with 26.5%. Metal work recorded the lowest with only 0.6%. The same trend was observed in the individual towns as shown in (Table 5). Metal work, roofing, painting and plastering are activities dependent on the completion of the walling. Foundations were almost immediately followed by walling and those factors in addition to the fact that walling was at different levels on different sites made it the most dominant activity. Metal work for doors and windows was least activity and only recorded in Nakuru town with only 1.2%. Metal structures were assembled elsewhere since the buildings under constructions lacked electricity connections for welding or owners simply

preferred to buy readymade doors and windows to be fitted into the building which took a shorter time.

Table 5: Location, number of sites, stage of building development and respondents

Location	Stage of building development (%)						
	Foundation	Wall	Roof	Metal work	Paint	Plaster	Other
Nakuru	3.7	48.1	6.2	1.2	6.2	29.6	4.9
Gilgil	10.0	45.0	5.0		7.5	22.5	10
Naivasha	14.6	36.6	2.4		2.4	24.4	19.5

Total no. of sites=162; total no. of respondents=351

4.3. Level of education

Majority of the workers were between the ages 18-35 years followed by 36-55 making a total of 99.1%. Only 0.6% of the respondents were below 18 years which was an indication of child labour while 0.3% above 55 years. 0.6% of the respondents were found to have no education at all and distributed equally in age brackets 18-35 and 36-55 years while there were 1.4% respondents with university education spread in the ratio of 1:4 in the same age brackets of 18-35 and 36-55 years. The other graduates had taken to construction as a last resort after missing out formal jobs which they still hoped for and others lost jobs and ended up in construction work. Majority of the workers had secondary education constituting 54.7% majority lying within age bracket 18-35 years. Some could not afford to continue their education while a good number had their young families or siblings they were taking care of. Table 6 shows the age brackets and the education levels for the respondents. The workers were categorised as under age (below 18 years), youthful, middle age and above 55years.

Table 6: Age versus level of education for building construction workers

Age (years)	Level of education in percentage				
	None	Primary	Secondary	Tertiary	University
Below 18	0	0	0.6	0	0
18-35	0.3	10	38.7	10	0.3
36-55	0.3	5.7	15.4	17.4	1.1
Above 55	0	0	0	0.3	0

4.4. Health and safety risks and hazards

Safety and health risks and hazards in building construction industry experienced by workers were various (Fig. 3). The results indicated that 70.7 % had experienced certain forms of accidents at work while 29.3 % recorded no accidents. None reported escaping accident narrowly. Injuries from sharp objects constituted 29.8 % of all accidents reported followed by injuries from hand tools which accounted for 27.9 % and falls and trips 23.0 %. The results indicated that there was not much emphasis on safety and health issues in the industry giving rise to accidents and health problems which agreed with a research by Weil, (2001). It was not routine for employers to discuss with workers health and safety issues when inducting them to work, their expectations being work output. It was found that the careless manner in which tools and building materials were stored on sites exposed workers to injuries such as cuts, stripping and falls, pricks and related injuries which agreed with findings of Murie, (2007). Observations showed that there was a lot of repetitive work and manual lifting of heavy weights that could easily lead to musculoskeletal disorders as found out by Phoya, (2012) and The Eastman Kodak Company, (2004) in their researches.

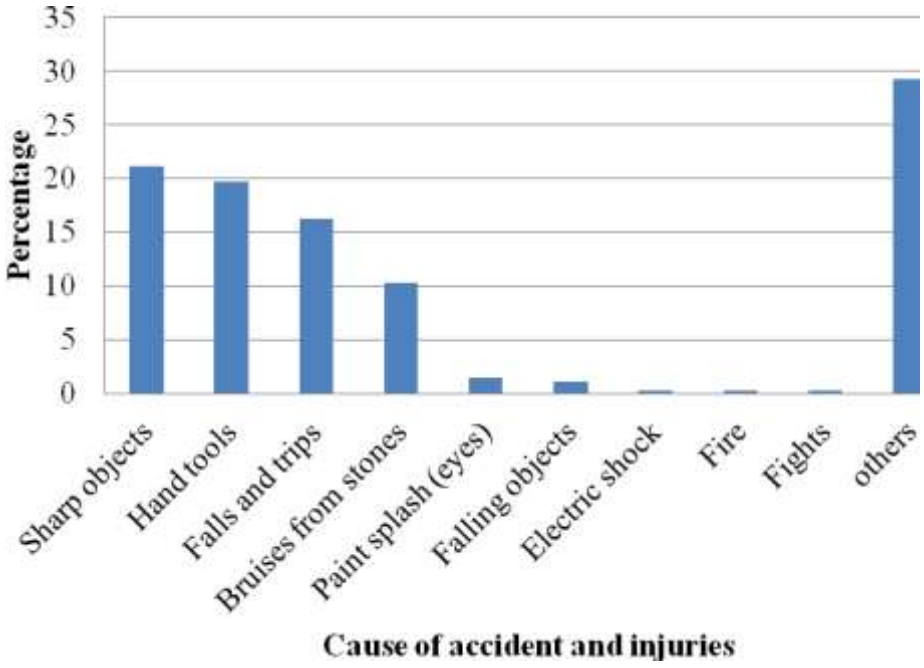

Figure 3: Common causes of accidents and injuries in building construction sites

The research found that workers who had stayed longer in the industry had experienced varied injuries and accidents indicating that work experience did not translate to reduced accidents and injuries as indicated by the analysis of the results (Table 7) showing no relationship between duration the workers had been in construction industry and accidents experienced. The following facts made this part of the research rather tricky: it was not possible to establish the exact duration workers had been on the job; injuries resulting from manual handling such as blisters and back pain were not reported as injuries because they were viewed as normal component of building construction work. Minor bruises were often ignored or forgotten since workers felt they were too minor to be reported and not even probing could make them accept they were issues; construction work being so temporary meant that workers did not work continuously throughout the duration worked and even then the work was not consistent but varied with the site and type of work available at any one particular time. Those factors contributed to the relatively low number of workers who reported involvement in accidents and a clear relationship was not possible.

Table 7: Workers involvement in accidents in relation to duration of exposure within current sites

Status	Duration of exposure	
	Short (up to 3yrs)	Long (>3 yrs)
Not Involved in accident at workplace (%)	10.9	78.4
Involved (%)	0.6	10.1

Total respondents = 348; (X^2 value-1.50; p-0.219)

(For the purpose of this research, Short duration means up to 3 years: Long from 3 years and above)

Workers who reported having been involved in accident at workplace were 89.4%. Those who reported no accidents or injuries were found to be either new employees recruited at the time of study or those who worked in concrete mix and wheeling materials on wheelbarrows.

Phoya, (2012) found that the workers perception of the risks involved was low hence the attitude. In line with Phoya's findings, workers were found to be ignorant of the health implications of the injuries yet they could lead to health problems like tetanus and other life threatening conditions. 29.8% of the workers reported being injured by sharp objects and 37.5% got injured by tripping over objects. This was reflected by the fact that sharp objects were observed to be common occurrences on construction sites with no organised storage exposing the workers to injuries which also agreed with findings of Murie, (2007). It was also clear that hand tools especially hammers, saws and stone chipping chisels frequently caused injuries. Falls were as a result of tripping over haphazardly stored building materials, slipping over wet surfaces, tipping over of items used to step on to reach heights, ladders, careless parching on walls and roofs without safety harnesses which was in line with what Maddox, (2014) and Phoya, (2012) found in their research.

It was observed that there was a lot of lifting of building materials that sometimes fell on the workers' feet hence bruising them as reported by 16.1% of the workers. At about one and half metres, the workers worked at height mostly using improvised platforms and those exposed the workers to falls a fact that was also observed by Lam and Kam, (1998). Scaffolds were poorly constructed and bound with nails and ropes with platforms that were not fully planked further exposing the workers to hazards. The workers fell when climbing up or down the stepping items and at the same time the workers got injured when they landed on sharp objects which agreed with findings of the US Department of Labour, (2009).

There were no records kept on accidents and injuries at the construction sites to be reviewed and data was purely gathered from the building construction workers an issue which was also noted by ILO, (2001). This was attributed to lack of training.

4.5. Accidents experienced at different stages of development

The research collected data on the stage of development and the type of accidents (Table 8). At the foundation stage the common accidents were injuries from hand tools accounting for 56.5% of the accidents recorded at that stage. The stage involved trenching, lying of foundation stones and slab, erecting columns and other related work. Tools used were hoes, spades, wheelbarrows, hammers and chipping chisels subjecting the hands to blistering, hammer bruises, cuts and other related injuries. The walling stage had the highest number of total accidents, 43.9% of all accidents recorded during the research. Of the accidents and injuries recorded for the walling stage, 34.6% were injuries by sharp objects and 31.5% were hand tools while 26.8% were bruises from stones. There were lots of activities at the walling stage and use of varied tools and materials as well as lifting of building stones that sometimes fell on the workers' feet hence bruising them. At about one and half metres, the masons started working at height and in some cases working from the ground with risk of falling objects (Plate 1) and in other instances stepping on improvised platforms or the wall itself (Plate 2) with injuries constituting 24.3%. Scaffolds were poorly constructed and bound with nails and ropes with platforms that were not fully planked. Plastering stage recorded 30.5% injuries from hand tools, 18.6% falls and trips

and 16.9% bruises from stones. The activity involved working at height on constructed platforms, ladders or improvised stepping items. Those painting got paint in their eyes causing discomforts.

Plate 1: A mason at work in Gilgil

Plate 2: Working at height with no scaffold in Gilgil

Plate 3: Site depicting proper preventive and protective measures.

Table 8: Percent accidents and injuries experienced at various stages of buildings under construction

Accident/injury	Stage of construction of building						
	Foundation	Walls	Roofing	Metalwork	Painting	Plastering	Others
Injuries from falls and trips	26.1	24.3	44.4	15.4	15.4	18.6	21.2
Bruises from stones	23.0	26.8	11.1	5.0	-	16.9	9.1
Injuries from hand tools	56.5	31.5	22.2	9.0	30.8	30.5	17.3
Injuries from sharp objects	4.3	34.6	33.9	15.4	1.4	11.1	39.4
Injuries from falling objects	0	4	11.1	0.9	-	10	-
Eye injuries from paint	-	-	-	-	38.5	-	-

4.6. General challenges encountered by building construction workers

The research found that there were general challenges encountered by the building construction workers in the course of their work (Table 9). Top on the list were lack of safe drinking water at the work site reported by 95.7% of the workers, lack of toilet facilities reported by 94.6% and 92.3% workers reported delayed payments. Water for drinking was obtained from the same source as the water for construction work. Workers drank water directly from the source, sometimes using their capped hands which were poorly washed. Toilet facilities were rarely provided forcing the workers to use the bush, fence and even against building walls; and where facilities were provided they were in pathetic conditions with no maintenance or basic cleaning. This also exposed the workers to health risks.

Other significant challenges experienced by the workers were non- assurance of daily work recorded by 43% of the workers and non-payment of extra work done reported by 39.65%. The low wages which were sometimes irregular with no payment of extra work done forced the workers to live in situations of very low standards. This situation also ensured that the workers were always at the mercy of the employer as found by ILO, (2001) and the non- assurance of daily work saw to it that there was no continuity or regularity of livelihood of the workers as stated by SEWA, (2011).

Lack of first aid facilities was reported by 39.3% while limited access to meals was reported by 31.6%. Poor meals or going without meals meant that the health of the worker was poorly maintained and this had a direct impact on work output and even concentration at work making the worker vulnerable to accidents and injuries. Harassment at work was reported by 7% of the workers. This mainly arose from fellow workers who used bad language or picked fights. Others felt harassed when given double work and when harsh language was used on then by supervisors if work was not completed on time. Still others cited harassment by council officers and all that. Harassment reduced workers morale making them less careful in their work. A research by Roto *et al*., (1996) found that alcoholism was common among construction workers. This was attributed to stress from lack of control over employment prospects, heavy workload and social isolation.

Workers did not think much about Issues of PPEs, training and information as a result of their ignorance as to their significance, a finding that agreed with Farooqui *et al.,* (2009). Workers felt that experience was adequate and so there was no need of getting formal technical training or seeking information. All those factors reduced the safety of the works which made them prone to accidents and injuries. 39.3% saw provision of first aid facilities as an issue meaning that many of the workers did not treat it as a issue and did not realise that contractors should provide the facilities. Many workers just let injuries pass unattended and this impacted negatively on their health.

Generally construction workers were not aware of what provisions they should get from their employers and let the situation rest as it had always been. The problems were viewed as part and parcel of construction work and the workers did their best to cope and carry on

with work. Although communication was not a problem to majority of the workers, issues of health and safety was not part of the agenda and not priority issues for the employer.

Table 9: Respondents who reported having no access to health, safety and welfare facilities

Lack of provision of facilities	(%)respondents
Safe drinking water	95.7
Toilet facilities	94.6
Paid on time	92.3
Assured of work daily	43.0
Paid for extra time worked	39.6
First aid facilities	39.3
Meals	31.6
Personal Protective Equipments	15.7
Clear channel for communicating grievances	10.8
Information and training	9.4
Personal Prot,Eqs readily and timely replaced	9.1
Harassment at workplace	2.0

4.7. Protective measures for building construction workers

Protective measures refer to the means by which workers and any other person in close proximity to the operation site are protected from harm by activities being undertaken. The measures could be at personal level e.g. personal protective equipment or at the operation site level like scaffolds, ladders, rails, etc. Data on protective measures was obtained through observations and clarified by the respondents.

4.7.1. Use of Personal Protective Clothing

Many workers did not have personal protective equipments (PPEs) and were using ordinary and old clothing, a situation which increased the exposure of the workers to the risks. Out of the 351 respondents interviewed 54.1% had some form of PPE while 45.9% had no PPEs. It was observed that 52.1% had overall suits that included old clothing, 34.5% had gloves while those with boots accounted for 33.6% and 19.1% had helmets (Fig.4). None of the workers were observed to have complete set of PPEs. The foot wear referred to as boots were mostly worn out ordinary shoes that were converted to work wear. The respirators were of the disposable type while the goggles were the simple ordinary type worn against the sun. The gloves, helmet, respirators and goggles were mostly found on commercial construction sites managed by contractors. While some workers argued that PPEs were not necessary or were cumbersome and that they were more comfortable with ordinary clothes, which was echoed in the findings of Farooquiet al., (2009), others said they were not provided and expressed the desire to have them to make them less vulnerable to injuries but the PPEs were too expensive for them to buy. Where PPEs were available supervisors were not keen to ensure that workers used them which explained why none of the workers was fully dressed in PPEs. This finding agrees with that of Phoya (2012) and Farooqui et al., (2009) who found that 90% of workers believed wearing PPEs reduced productivity and would not wear them to prevent injuries especially when time was pressing.

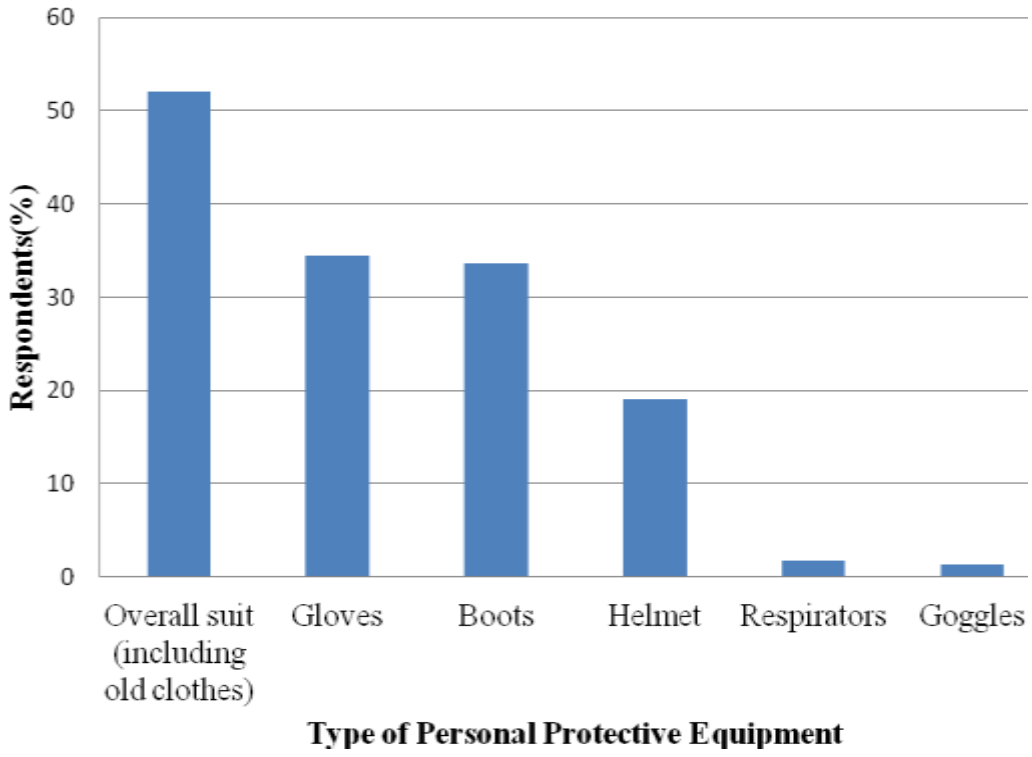

Figure 4: Personal Protective Equipment distribution by type among construction workers.

There was more use of PPEs in Nakuru town which is the County Headquarters. The law enforcement officers and their supervisors were based at the headquarters and therefore the high probability of noticing non compliance. It was also observed that use of helmets here was adopted more than in either Gilgil or Naivasha and the same applied to gloves while use of boots was far less in Gilgil (Table 10). There was no significant difference in the use of goggles, respirators and overalls in the three towns.

Table 10: Percent use of Personal Protective Equipment by respondents by town

PPE	Location				
	Nakuru	Gilgil	Naivasha	X^2	P-value
Helmet	27.8	8.8	11.3	18.23	0.00*
Gloves	42.2	25.3	27.5	9.916	0.007*
Goggles	2.2	1.1	-	2.040	0.361
Respirators	2.8	1.1	-	2.816	0.245
Overalls	55.6	49.5	47.5	1.795	0.407
Boots	37.8	20.9	38.8	8.957	0.011*

4.7.2. Preventive measures against accidents at various construction stages

It was generally observed that most of the sites had no preventive measures such as scaffolds, ladders, fences and PPEs for accidents exposing the workers further to hazards (Plate. 3 and Table 11). The preventive measures applied at various stages of construction included measures against falling from height which were recorded in 33.3% sites which were either at walling or roofing stage or were storey buildings. The measures used were ladders and/or scaffolds; there were no preventive measures against falling objects at 85.8% sites at various stages of construction other than the foundation stage. There were no measures against noise or cuts at all the sites and only 0.2% sites being plastered or painted had provided respirators while no measures were taken against welding fumes. The research showed that there was negligible preventive measure for workers involved in manual handling whereby only workers at 2.5% sites had been provided with gloves. 1.2% sites had put up a fence as preventive measure against being hit or crushed by vehicles. There were no written contract between the workers and their employers and no insurance covers and therefore the employers felt no obligation to respond to workers health needs. No medical records were found on site and therefore illnesses arising from the construction

activities are not taken into account and this could also explain why the workers overlooked some of the health problems they were coping with which was similar to what Phoya, (2012) found. Most of the workers reported that they avoided the risks by just being cautious. The research findings therefore indicated that building construction workers were highly exposed to health and safety risks.

Plate 4: Storey building under construction in Shabaab, Nakuru

Table 11: Summary of observed preventive measures applied on various stages of building construction

Risk	Preventive measure	% application	Remarks
Falling from height	Ladders, scaffolds	33.3	Walling, roofing, storey
Building collapse	Good planning before beginning to build	0.6	Walling, roofing, storey
Falling objects	Helmet, Slanted iron sheets, scaffolds	85.8	All stages except foundation
Electric shock	Switch off electricity during work	0.6	Metal work, renovations, finishing
Hazardous substances	Respirators	0.2	All stages except roofing
Welding fumes	-	-	Metal work
Noise	-	-	All sites
Hit or crushed by vehicle	Fence	1.2	All sites
Manual handling	Gloves	2.5	All sites
Cuts	-	-	All sites

All the construction sites in all the towns had no preventive measures against electric shock, noise, welding fumes and cuts (Table 12). A wider variety of preventive measures were observed in Nakuru than in Gilgil or Naivasha towns. For example there were 69.8% sites that had ladders and scaffolds as preventive measures against falls from height in

Nakuru town as opposed to 10.5% and 31.3% for Gilgil and Naivasha respectively. Nakuru also had 7.7% of sites protecting against falling objects, 1.3% against hazardous substances and4.9% of sites protecting against manual handling whereas Gilgil and Naivasha had none. Preventive measures like warning signs, good planning, gloves, scaffolds, respirators, fencing off sites were observed only in Nakuru. It was also found that these were found in large construction sites within town centre and the high class residential areas. Ladders and scaffolds were most commonly used in all the three towns. It was also observed that the measures applied were not necessarily effective in preventing accidents.

Table 12: Preventive measures (%) against risks in construction sites by town

Risk	Preventive measure	Nakuru	Gilgil	Naivasha
Fall from height	Ladders & scaffolds	69.8	10.5	31.3
Building collapse	Good planning	2.3	-	-
	Helmet	2.6	-	2.9
Falling objects	Iron sheets	7.7	-	-
	Scaffolds	2.6	-	-
Electric shock	None	100	100	100
Hazardous substances	Warning signs	1.3	-	-
	Respirators	1.3	-	-
Welding fumes	Nothing	100	100	100
Noise	Nothing	100	100	100
Hit or crushed by vehicles	Fence site	1.2	-	-
Manual handling	Gloves	4.9	-	-
Cuts from objects	Nothing	100	100	100

4.7.3. Responses towards accidents

Responses to accidents that occurred were found to be first aid (5%), workers taken to health facility (10%) or nothing done to the injured workers (85%) who were simply relieved of their duties to go home and nurse their injuries. The responses were mainly

taken up by the injured workers themselves, their fellow workers or the foreman. Workers in only 1.2% of sites reported that first aiders or management took responsibility when accidents occurred. That happened on large construction sites and only when significant accidents and injuries occurred (Fig. 5).

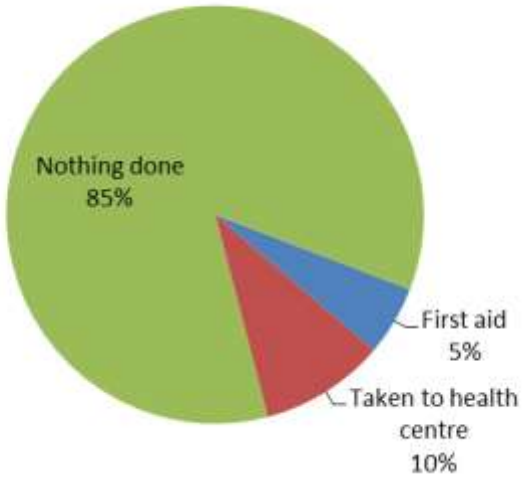

Figure 5: Action taken after the accidents at building construction sites

4.8. Training on Building Construction as a Profession

The study found that some workers had received some form of training before they started construction but a good number had no training at all (Table 13). It was also found that there were workers who got further training while on the job through apprenticeship or sought technical training to enhance their skills and get higher pay. There were also some workers who started construction without training but felt they needed training to cease from being just labourers to more marketable workers. A minimal number of workers got trained in safety and health while working in building construction industry. (Data on training status of the workers aimed at establishing if training had impact on the level of understanding of the workers on safety and health aspects. The assumption here was that a learned person would be able to read and interpret the laws, procedures codes of practice etc and relate these to his welfare at work.)

The results indicated that 55% of the workers received some training before they started work and 45.3% received training during the course of their work. Of those 55% workers who had been trained before starting work, only 38.3% received further training during the course of their work while 61.7% had no further training. The training was mainly received from fellow workers and supervisors. Only 14.8% of the respondents had received training on health and safety and this was received from the Red Cross, seminars and workshops, college and on the job. Training on safety and health was very brief and concentrated on first aid and through personal initiatives.

Table 13: Training status of building construction workers

Status of training of respondent	Respondents (%)
Trained before joining work	55.0
Not trained before joining work	45.0
Trained during the course of work	45.3
Not trained during work	54.7
Trained before joining and during work	38.3
No continued training at work	61.7
Trained in S and H in the course of work	14.8
No training in S and H in course of work	85.2

Those workers with some training on safety and health felt that it was helping them in their work to avoid accidents and know how to respond in case of an accident. 13.5% who received occupational safety and health training reported having been involved in accidents and the X^2 test showed there was no significant relationship between OSH training and involvement in accidents. This could only mean that in actual facts they were not putting their knowledge to practice or that the training did not cover the real issues, which is supported by the sources of the training as stated above.

4.8.1. Technical and On-job Training

Training entailed such courses as masonry in which most of the trained workers had undertaken, woodwork and joinery, managerial (foreman), welding, plumbing, painting and electrical work. The results showed that most of the foremen interviewed had no formal training but trained on the job (Table 14). It was also noted that some tasks like electric installations that could have far reaching effects were undertaken by workers with no formal training Electrical faults can lead to fatal accidents and serious injuries if installations are not properly done e.g. leaving naked wires exposed can lead to electrocution, Placing electrical appliances in positions they can get in contact with water eg too low can lead to short circuits. Fitting wires to sockets of low current capacity in high current consumption areas like welding, kitchen and laundry can lead to explosions.

. However the actual figures of those who reported having specialised formal training could be lower since some insisted that as long as they had gone through school they were trained. The X^2 test indicated that there was no relationship between the specialised trainings and accidents experienced except for plumbing and welding (Table 13). These results indicated that there must be other factors other than training that contributed to accidents and injuries for which further research may be necessary.

Table 14: Specialised formal and on job training received by workers

Course	Respondents (%) with Formal training	Respondents (%) with On-job training	X^2	P
Masonry	33.4	15.7	0.58	0.45
Woodwork and joinery	12.8	3.8	1.10	0.29
Foreman	8.1	15.0	1.87	0.17
Welding	5.8	3.2	0.05	0.83
Plumbing	3.8	1.5	0.01	0.92
Painting	3.5	4.1	1.08	0.3
Electrician	3.2	0.9	2.05	0.15
Casual/manual work		26.5		
Others	2.6	1.2		

It was found that there was no association between the duration the workers had been in construction industry and accidents experienced (Table 15), implying that experience had no direct impact on reduction of vulnerability as expected which was consistent with findings of Phoya et al, (2011). This can be explained by the fact that those workers who were more experienced could take things for granted and be overconfident therefore making them vulnerable to accidents which was also noted by Che et al, (2007) and Irizary, (2006).The analysis also showed that there was no association between the level of formal education for the workers and the involvement in accidents (Table 16). Analysis of the findings for the three individual towns with respect to level of training of workers indicated that Nakuru had a relatively higher level of trained construction workers than

either Gilgil or Naivasha. Level of training for workers in Naivasha ranged from moderate to low (Table 17). (Low=primary; moderate=secondary; high=post secondary education).

Table 15: Respondents involvement in accidents in relation to duration of exposure within current sites

Status	Duration of exposure	
	Short	Long
% Not involved in accident at workplace	10.9	78.4
% Involved in accident at workplace	0.6	10.1

Total respondents = 348; (X^2 value-1.50; p-0.219)

Table 16: Respondents involvement in accidents in relation to level of training

Status	Level of training (categorised)		
	Low	Moderate	High
% Involved in accident	4	5.5	1.1
% Not involved	40.2	41.4	7.8

Total respondents = 348; (X^2 value-0.733; p-0.693)

Table 17: Percent level of training of building construction workers by town

	Nakuru	Gilgil	Naivasha
Low	36.7	50.5	55.5
Moderate	52.2	40.7	41.3
High	11.1	8.8	3.8

X^2 =11.011p-value=0.026*

It was clear that majority of the workers had no technical training and learnt the job through apprenticeship, a fact which was also found by Phoya, (2012). This affected the foremen as well who worked as supervisors. The skills learnt from mentors and peers are informal and these mentors do not factor in job related safety (Lam and Kam, 1998). Those who had only formal training were also vulnerable because having formal education did not prepare the workers for the type of job they were undertaking since they had no technical knowledge on the tasks they were undertaking. This was in agreement with Phoya (2012) findings who also found that some of the trainees did not complete their apprenticeship while others did not complete their training before graduating to undertake specific tasks and stated that "low education can be a challenge to communication and the way they perceive health and safety risks".

The traditional view of construction industry as the place for the poorly learned and those with no other employment opportunities lowered the self-esteem of the construction workers such that even those with training did not do much to improve the situation. Low training on the building construction as a career does not help matters either. Most of them still hoped for better employment or acquiring enough capital to start their own construction companies while others felt doomed to the industry. There was therefore little motivation for safety and health among the workers. There were more workers with relatively good training in Nakuru since competition for job market as well as training opportunities were higher. However further research may be needed to help understand further the underlying factors contributing to the differences in education levels for the workers in the three towns bearing in mind that they share some common factors. These factors are rapid development, the three towns are within marginal areas of the county and people tend to settle in the towns; the towns are located along the railway line popularly referred to as Uganda railway line and the Northern corridor.

The low training levels and lack of formal training coupled with the general attitude towards the construction industry led to poor or lack of documentation and record keeping at sites. Data was therefore very scarce and scattered and where available in research work

gave estimates and this was also experienced by WIEGO, (2014 and ILO, (2001) in their researches.

4.9. Compliance with Laws and Regulations in Construction Industry

4.9.1. Awareness and availability of Laws governing building construction industry

It was found that 75.5% of the workers were aware that there were laws that govern the industry. The workers were aware of the Physical Planning Act, Occupational Safety and Health Act (OSHA), County bylaws, labour laws, and public health laws. Workers in Nakuru were more aware of the Physical Planning Act as reported by 48.8% of the workers. In Gilgil workers were more aware of OSHA reported by 43.7% of the workers. Across the three towns, OSHA awareness was relatively good compared to other laws. There was low awareness of Public health and labour laws in all the three towns with awareness of the public health act being reported only in Naivasha by 1.8% of the workers. Building code awareness was reported by 32.1% of the workers in Naivasha which was relatively high compared to the other two towns while awareness of EMCA was reported by more workers in Gilgil amounting to 15.5% than in Nakuru or Naivasha (Table 18). 57.4% of the sites had at least one copy of law while the rest had none.

Analysis of the findings showed no significant difference in the availability of copies of the laws in the three towns. However not all those who had the copies of law made reference to them. Most of the sites with copies had fragments of the laws, not the complete package and others regarded the plans as the law. It was noted that workers interpreted the approved plans as the laws. This was an indication of how poorly the laws were interpreted and implemented in building construction industry which was an indication of how low compliance to laws and regulations was. Wells, (2007) had similar findings.

Although approvals for constructions were obtained, meeting the legal requirements of the approvals was not complied with which was attributed to low monitoring and poor follow-ups by the enforcement officers. Some workers said they had only seen the building plans which they were not even using, either because the employer did not make them available

or they were simply not necessary. To most workers having the plans meant they had fulfilled the legal requirements. It was interesting to note that some of the foremen with knowledge of the laws had some fragments folded away in their pockets and indicated it was not easy to obtain copies of the law. Regulations provide a basis for risk assessment and provision of mitigation measures. Therefore when the provisions were not made available or enforced it meant accidents became common occurrences at building construction sites echoing the findings of Phoya (2012), Rawlinson (2008) and Khan (2007). There is no legal requirement that the contractors should have the relevant copies of the laws at the building construction site, the only legal requirements being the approvals that are mandated by the laws such as the building plans, architectural drawings, and Environmental impact assessment license. Lack of relevant legislation on site implied that the workers were not able to make any references to the law and violations of the same could easily arise.

Table 18: Respondents (%) responses on awareness of types of laws on sites by town

Law	Nakuru	Gilgil	Naivasha
Physical planning Act	48.8	12.7	10.7
OSHA	20.9	43.7	33.9
Building code	10.9	16.9	32.1
EMCA, 1999	7.8	15.5	8.9
County by-laws	5.4	7.0	3.6
Labour laws	1.6	1.4	3.6
Public Health act	-	-	1.8

4.9.2. Compliance monitoring

A good number of workers had seen enforcement officers visiting building construction sites as witnessed by 76.6% of the workers while 23.4% reported having not seen any

enforcement officer. The enforcement officers were mainly from the local authorities whom the workers were able to identify while they were not sure of the other enforcers. The main interest was to ensure construction sites had plans.

The results showed that the site visits by the law enforcers ranged from zero (0) to six (6) with most of the sites having received more than one visit and 15.4% sites not visited at all. The maximum number of visits reported was 6 experienced by 1.2% sites and 3.7% sites received visitors 5 times The mean for the visits was found to be 2.29 which were far less than the expected value of 5 for an ordinary no storey building which meant low compliance monitoring contributing to non-adherence to laws. It was also found that those sites with frequent visits had less number of warnings issued as indicated in section 4.9.3.Supervision and enforcement determined the level of compliance by the workers. There were no clear records of the visits kept on sites and since some of the communications were verbal they were not taken seriously by the workers and were soon forgotten as was also found by Gibb and Bust, (2006) and Kartam et al.(2000). Warnings were not followed by any legal actions for repeated violations which implied laxity in law enforcement and hence the high number of violations reported. This in turn contributed to continued exposure of the workers to safety and health risks. Phoya, (2012), found that law enforcement through regular inspections, penalties and issuance of compliance certificates reduced abuse on health and safety laws. Inspections were carried out separately by the various relevant inspectors meaning that one inspection could only address the specific area of interest leaving out other key areas covered by other legislations. This could lead to confusion on the side of the workers as found by (Phoya, 2012)

The results showed that most of the sites received two visits in all the three towns followed by those that received three visits (Fig.6). Sites that received 6 visits in all the three towns constituted less than 2%.

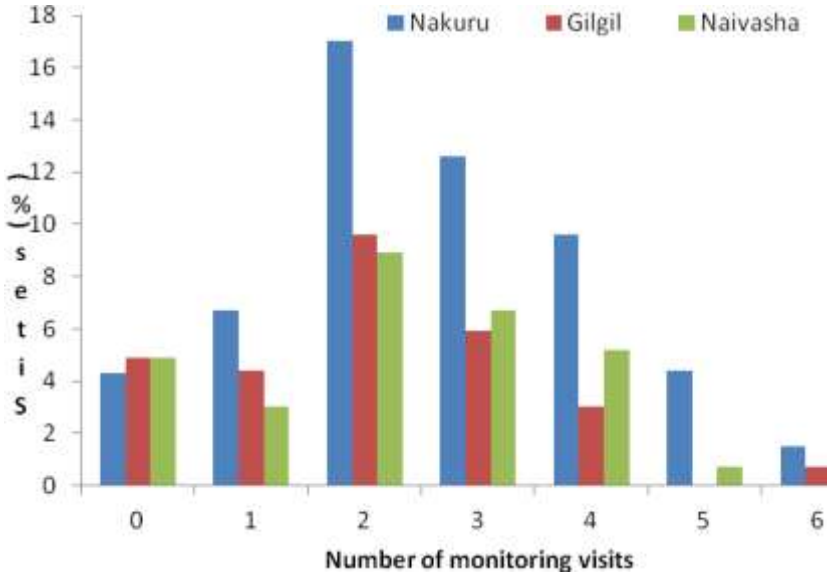

Figure 6: Monitoring of construction sites by town

4.9.3. Evaluation on the compliance level by workers

The level of compliance was determined by the violations against the provisions of various laws governing building construction industry and by compliance rating as given by respondents. Workers reported having witnessed letters of warnings issued against various laws across the three towns (Fig 7). The physical planning act had the highest violations reported by 52.4% and public health was reported by lowest number of workers (30%). Results of the analysis for each town indicated a similar trend but it was also noted that Nakuru received most warnings for violations for all the laws followed by Naivasha (Fig. 8).The sites that reported having been warned of violations as analysed for each town followed the same pattern of overall sites as shown in (Fig.8) where 61.1% of the sites were warned of violating Physical Planning Act, OSHA 2007 was violated by 32.2% of the sites, labour law by 36.5% of the sites. Supervision and enforcement determines the level of compliance meaning that with proper supervision and enforcement it is possible to reduce the number of law violations. However, the research was not able to establish the specific frequency of visits by enforcement officers for specific laws because there were no clear records of the visits kept and some of the communications were verbal. After the

warnings, no site reported any action taken against it for any repeated violation. It was found that the more the frequency of visits the less the number of warnings issued (Table 19). This implied that there was more compliance when enforcement officers carried out monitoring and laxity where monitoring was lacking.

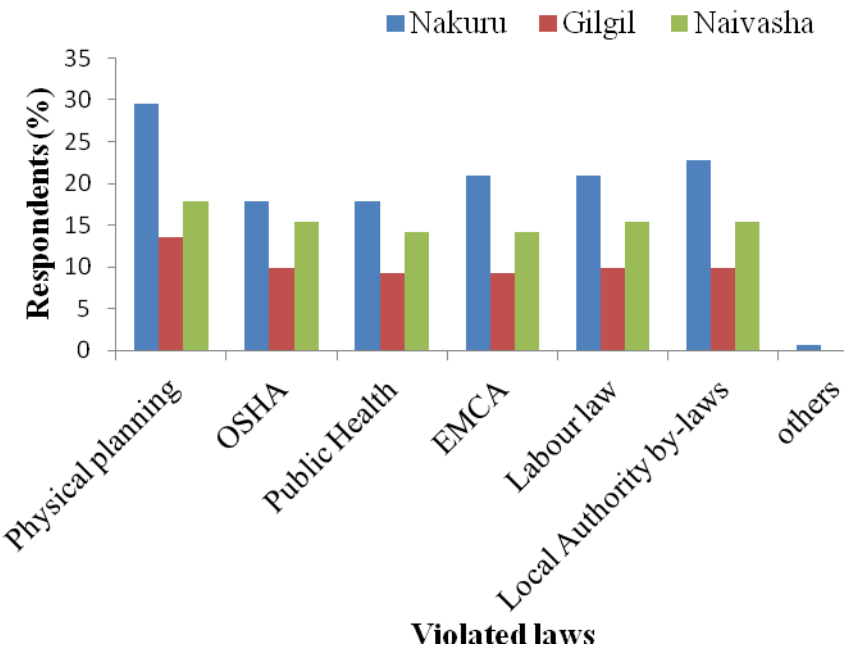

Figure 7: Warnings on law violations by town

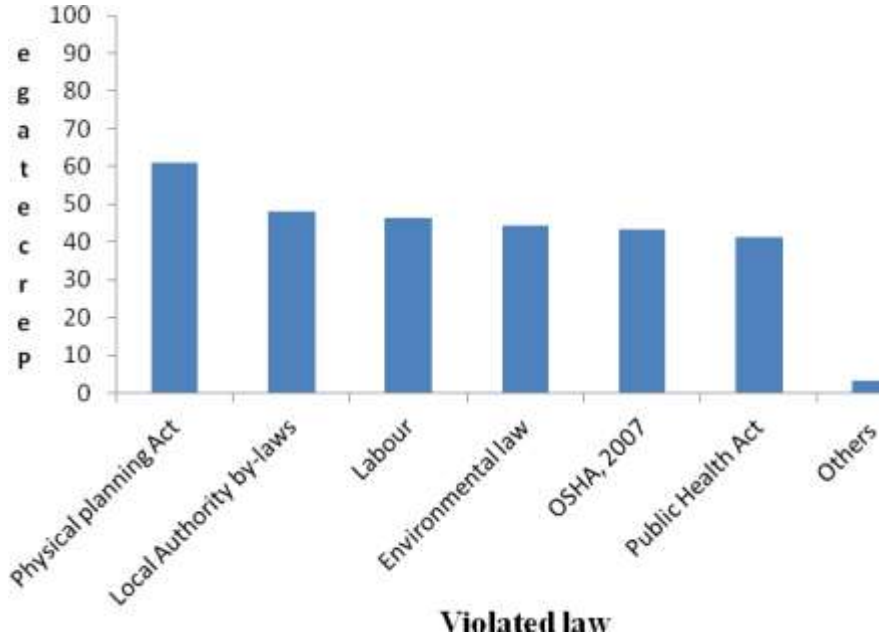

Figure 8: Warnings issued on law violations by sites

Table 19: Relationship between number of visits and warnings

No visit	Number of warnings		
	None	1-3	More than 3
	10.5	3.7	2.5
1-3 visits	20.4	13.0	29.0
More than 3 visits	6.2	3.7	11.1

X^2=12.246

The analysis showed that the warnings issued for law violations in Nakuru and Gilgil towns were almost at the same level while Naivasha received more warnings for all the laws compared to the other two towns (Table 20 and Fig 9). Nakuru being the headquarters with established offices could mean close follow-ups of warnings issued translating to higher compliance levels. Gilgil being relatively near Nakuru also received high monitoring while Naivasha being further away might have had less frequent visits that

made the workers develop laxity in compliance. Violation of Physical planning act received most warnings in all the three towns.

Table 20: Percent warnings issued to construction sites per town

	Percent warnings				
	Nakuru	Gilgil	Naivasha	X^2	p-value
Physical planning Act	59.3	55.0	70.7	2.342	0.310
OSHA	35.8	40.0	61.0	7.253	0.027*
Public health	35.8	37.5	56.1	4.949	0.084
Environmental laws	42.0	37.5	56.1	3.236	0.198
Labour laws	42.0	40.0	61.0	4.799	0.091
Local Authority	45.7	40.0	61.0	3.964	0.138
Others	1.2	0.0	9.8	8.300	0.016*

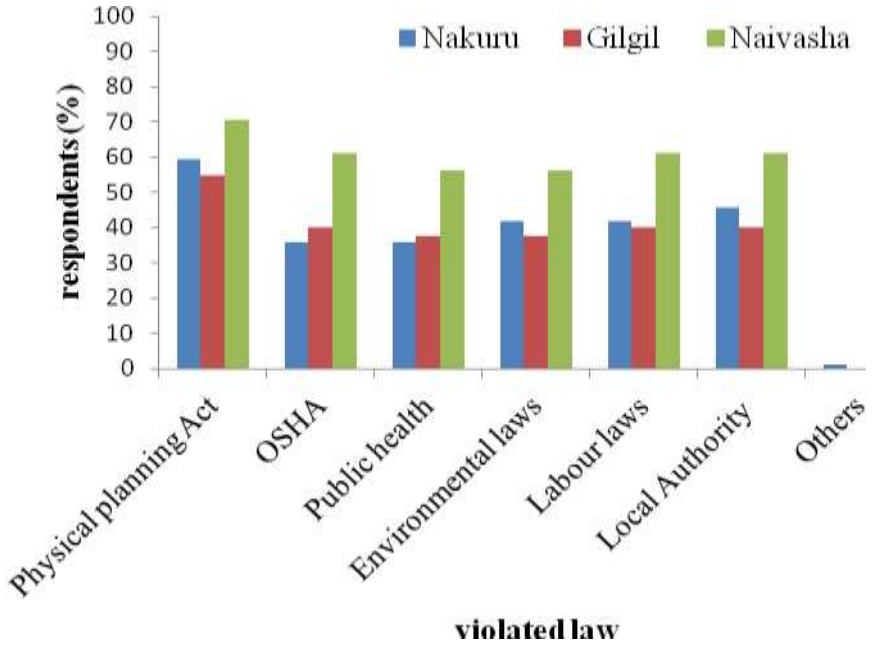

Figure 9: Warning on Law Violations by Town

4.9.3.1. Compliance rating by the workers

When asked to rate the level of compliance, 70.1% of the respondents felt that compliance was moderate, 22.5% rated high while 7.4% rated low (Fig. 10). The analysis indicated that sites that recorded moderate level of compliance were 71%, high 24.7% and low 4.3% (Fig.11) while the commitment to compliance ranging from one to ten was given a rating mean score of 7.28. The rating was subjective because the respondents gave their personal views and this reflected typical self-assessment. Rating oneself or place of work as having low level of compliance was not expected to come out truthfully even in sites where violations were obvious through observations because workers felt obligated to protect their workplace. There were no significant differences in the behaviour of building construction employers and workers because the tradition cuts across the industry.

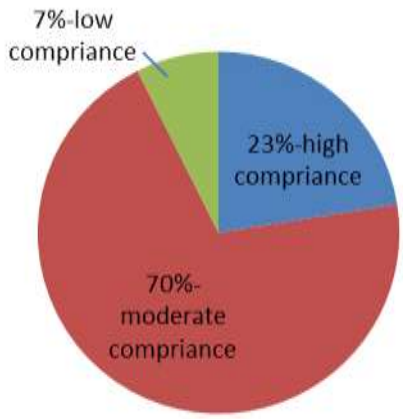

Figure 10: Level of compliance of the sites with safety and health laws

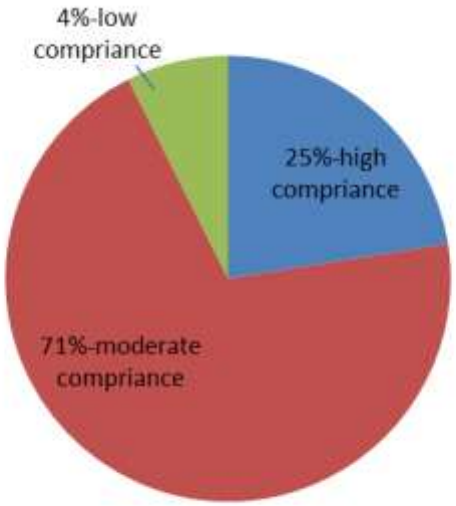

Figure 11: Site compliance rating

The analysis indicated similar trends of compliance levels by sites in all the three towns (Table 21). Most building construction sites attained a moderate level of compliance at 71.6% for Nakuru, 75.0% for Gilgil and 65.9% for Naivasha. The results showed that sites that attained high levels of compliance were relatively few in each of the three towns at 23.5%, 22.5% and 29.3% respectively. The fact that the workers were able to give some information on the compliance levels within the sites they were operating was an

indication that they were aware there was flouting of laws and regulations within the industry.

Table 21: Level of compliance (%) by building construction sites

Level	Nakuru	Gilgil	Naivasha	X^2	p-value
Low	4.9	2.5	4.9	1.131	0.889
Moderate	71.6	75.0	65.9		
High	23.5	22.5	29.3		

Naivasha town earned the highest score for compliance (Table 22). The possible reasons being that Naivasha had gained District (now Sub County) Headquarters status and the enforcement officers wished to have their presence felt in the new status. The town is smaller compared to Nakuru and covering it within a short duration is easier. It was also possible that for the officers who were still based in the then mother District headquarters they had incentives to travel for duty in Naivasha and Gilgil towns in terms of allowance. However these possible explanations need investigations for confirmation or rejection. Employers who were fully committed to implementing health and safety measures were reported by 13.5% of the total workers. Those employers that rated 8 were reported by the highest percentage of workers at 31.9% (Table 23).

Table 22: High rating scores by town

Town	Min. possible high rating score	Max. possible high rating score	Actual total high rating score	Mean score	% score
Nakuru	81	243	177	2.19	72.8
Naivasha	41	123	92	2.24	74.8
Gilgil	40	120	88	2.2	73.3

Table 23: Commitment rating by respondents to Safety and Health law implementation by employers

Rating	Percentage response
1	0.9
2	1.1
3	2.6
4	2.9
5	4.6
6	20.1
7	15.2
8	31.9
9	7.2
10	13.5

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

It was concluded from the research that building construction industry in Nakuru County was actually plagued by many health and safety issues which are normally not taken into account by the building construction employers. Workers have low perception and poor attitude towards risks and just like the employers also ignore safety and health issues. This was reflected in the poor ways of material storage, where no site provided for proper storage; poor improvised stepping items and working platforms and lack of harnesses while working on the roofs where only 33.3% sites provided means of protection and/or prevention.

A variety of accidents and injuries occur at walling stage while sharp objects caused highest number of injuries ranging from 24.3% to 34.6% occurrence. There were no available documents on construction sites about activities and issues like accidents or injuries; medical records; inspections among others. Use of injury and accident protection measures like PPEs and preventive structures were largely missing for instance ladders and scaffolds were used in only 10.5% of sites in Gilgil, 31.3% in Naivasha and 69.8% in Nakuru. Protection from falling objects was only observed in Nakuru on 7.7% sites with iron sheets and 2.6% sites with scaffolds. There was no protection against noise, welding fumes and cuts. First aid facilities, drinking water and sanitary facilities were lacking and workers who got injured were left to sort themselves out or get assisted by their fellow workers.

Kenya lacks legal guidelines or basic requirements for one to become a contractor. Atthe same time most contractors are not qualified in building construction and therefore are not sensitive to safety and health aspects. It has also been noted that construction contractors tend to be conservative and this affects the choice of building materials, research and investment. In addition, low levels of monitoring and law enforcement contributed to minimal investment in preventive and protective measures at construction sites hence

exposing the construction workers to safety and health hazards. The sectoral nature of laws and regulations which are not harmonized contributed to low compliance levels. Lack of training requirement to obtain construction jobs resulted to a workforce with low levels of education and highly limited in technical skills which were gained through apprenticeship. This in addition to the temporary nature of work meant that the building construction workers had no empowerment to speak out against violations on their safety and health entitlements and their aim was just to earn a living.

Training in health and safety was very limited. Majority of the workers were casuals representing 68.4%. Casuals are normally assembled whenever required and are not formally trained to suit the jobs they would undertake as required by OSHA (2007). Workers who indicated they had gone through formal technical training did not seem to benefit from the knowledge to safeguard themselves from accidents and injuries. This implied that the training was inadequate in addressing safety and health in practical perspective or that the elements of safety and health were not incorporated in the training. The normal education system does not cover safety and health issues and so those with high education levels remained exposed to accidents. Work experience had little impact on vulnerability reduction.

Low supervision, low monitoring and poor law enforcement contributed to repeat violation of laws while lack of legal documents on site as reference materials for employers did not help the situation. It was therefore concluded that there was no single factor adequate enough to cushion the workers against safety and health issues when applied in isolation. Application of a combination of factors is necessary to safeguard the building construction workers and the combination that can offer even the bare minimum need to be investigated and thereafter enforced to protect the workers.

5.2. Recommendations

From the research the following recommendations were made;

There is need for the government to come up with policies to specifically address building construction industry with strong enforcement procedures. It is also important that more

research be carried out in the dynamics of building construction industry in Kenya to enable safety and health issues to be given priority in development agenda and the sector to be treated like any other trade.

It is recommended that building construction workers should undergo basic technical training on building construction with an elaborate safety and health component and obtain at least a certificate in their area of preferred specialization. The Government, through the National construction Authority, should have a policy on minimum requirements to be met by construction workers and contractors. Employers in building construction should ensure that before any worker is engaged, they should have those minimum qualifications. In addition, it should be mandatory for workers to undergo induction training for specified duration before they get engaged at building construction sites. Formal education should incorporate basic safety and health component for learners to gain basic skills and to appreciate the importance of application of knowledge in real practice to safeguard them in life.

There is need to investigate why there is low law enforcement in Nakuru County. This regards ensuring employers are registered and workers organized with operational safety and health committees in place to make them more responsible in managing risks. The Government should therefore require employers to take up workers on permanent or even contractual basis and this will make the industry be structured.

Communication on risks and risk management should be established between the workers and the employers. It should be mandatory to carry out risk assessment and then design risk management procedures which should be implemented throughout the project cycle. This requires that the contractor should always have someone in charge of safety and health at the construction site to ensure implementation of procedures. The same person would be in charge of documentation of health and safety issues and be answerable for the same.

Government Agencies responsible for enforcing laws applicable to building construction industry in Nakuru County should have joint efforts when carrying out inspections on

building construction sites. Punitive fines should be implemented on contractors found not complying with provisions of the law.

There is need for investigation on the combination of factors that can offer basic protection to the workers in Nakuru County. These should then be documented and implemented.

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APPENDICES

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

APPENDIX I: QUESTIONNAIRE

I am pursuing A master's Degree in Occupational Safety and Health At Jomo Kenyatta University of Agriculture and Technology, and currently undertaking a research in line with the requirements for the award of the said Degree. Your support in filling the questionnaire will be highly appreciated.

N/B: The data collected will purely be used for research purpose only. There will be total confidentiality of information and no victimization whatsoever for any information given.

A. General Information

1. (a) Code of interviewee……

(b) Age:

Below 18 years ( )

18-35 years ( )

36-55 years ( )

Above 55 years ( )

(c) Gender:

Male: ( )

Female ( )

(d) Highest Level of education:

None ( )

Primary ( )

Secondary ( )

Tertiary ( )

University ( )

Others (specify)…….

(e) Duration in occupation……. (f) Terms of employment: casual ( ) contract ( ) permanent ( )

(g) Position…….. (h) Place of residence……

B. Project Information

2.(a) Town.....(b) estate.....(c)

street.....

(c)Type:

Type	No. of storeys
Residential	
Commercial	
Mixed commercial & residential	

(d) Maximum number of workers per day.....

C. Health and Safety risks

3. Distance from workplace……

4. Did you receive any form of training when you started this work? Yes ( ) No ( )

during the course of your work? Yes ( ) No ( )

If yes which training?.....

Where were you trained and by who?.....

If no why?.....

Have you received any training on safety and health? Yes ( ) no ( )

If yes explain how you received it?.....

Does the training help you in your work? Yes ( ) no ( ). Explain.....

In your opinion is the training adequate? Yes ( ) no ( ). Explain.....

5. Which are the common accidents at the construction site? Falls, , electric shocks, , building collapse, motor, machine, others (specify)…….

List them in order of priority.

.....

.....

.....

6. Have you been involved in any of the accident during your work? Yes ( ) N0 ( )

If yes which accident?.....

What action was taken?.....

7. Have you witnessed any accident during the course of your work?.....

If yes which one?.....

What action was taken?.....

8. Have you witnessed any deaths or disability? Yes ( ) No ( )

If yes what was the cause?.....

What action was taken?.....

In case of an accident where do you report?.....

Who pays the medical bill if incurred?.....

9. What are the common forms of injuries? Hand injury, leg injury, eye injury, head injury, others (specify)……..

10. Do you receive any first aid when injured? Yes ( ) No ( ).

If yes who administers the first aid……..

If no in your opinion why?.....

11. What are the risks you encounter at work? Rate the risks in order of seriousness.

How are they handled and by who?.....

12. What do you have in place to prevent or reduce these risks:

Falling from height……

Falling objects……..

Noise ……..

Being hit or crushed by vehicles……

Electric shock……

Hazardous substances……

Manual handling……..

Building collapse…….

Cuts……..

Welding fumes……

Any other (Specify)…….

13. At what time do you report to work? .....

At what time do you leave workplace? .....

How long is your break for lunch?.....

14. Do you have a toilet at workplace? Yes ( ) No ( ) If no what do you use?

.....

15. Do you have any source of water at the workplace? Yes ( ) No ( )

16. Do you have special clothes for work? Yes ( ) No ( )

If yes where do you change? Workplace ( ) Home ( )

If no why? .....

17. Which Personal Protective Equipments do you have? Helmet ( ) gloves ( ) goggles ( ) face shield ( ); respirators ( ) overall suit ( ); Boots ( ); others (specify) ..... none ( )

If none why……..

Are the PPEs worn at all times while working? Yes ( ) No ( ). If no why……..

18. Suggest any improvements you wish to see in the building construction industry.....

D. Training

19. Did you receive any form of training when you started this work? Yes ( ) No ( )

during the course of your work? Yes ( ) No ( )

If yes which training?.....

Where were you trained and by who?.....

If no why?.....

Have you received any training on safety and health? Yes ( ) no ( )

If yes explain how you received it?.....

Does the training help you in your work? Yes ( ) no ( ). Explain.....

In your opinion is the training adequate? Yes ( ) no ( ). Explain.....

20. (a) What is your position in this workplace?.....

(b) What are your duties?.....

(c) Skills

Duty/position	Formal training (college)		On-job training		Duration of job exposure
	Yes	No	Yes	No	
Foreman					
Masonry					
Plumbing					
Electrician					
Woodwork & joinery					
Welding					
Painting					
Casual/manual					

work					
Other (specify)					

E. Compliance

21. Are you aware of any law that you have to follow in building? Yes ( ); No ( )

If yes, which ones?.....

If no in your opinion why?.....

22. Do you have or have seen a copy (ies) of any law at this site? Yes ( ); No ( )

If yes which one?.....

Do you refer to it? Yes ( ); No ( )

If no why?.....

In your opinion are the laws and regulations adequate? Yes ( ) No ( )

If no explain……

Suggest any improvements you would wish to see done on the laws and regulations in order to protect you

better.....

Suggest any additional legislation you would wish enacted to protect you

better.....

23. Have you had a visit by any government officer in the course of this construction?

Yes ( ). How many times?..... No ( )

Have you been warned of any violation to any of these laws or regulations?

Physical planning: Yes ( ) No ( ); OSHA: Yes ( ) No ( ); Public health: Yes ( ) No ( ); Environmental: Yes ( ) No ( ); Labour: Yes ( ) No ( ); Local Authority: Yes ( ) No ( ) other (specify)……..

24 Rate the level of compliance of this site with health and safety laws:

Low ( ); Moderate ( ); High ( )

. In your opinion why the rating.....

25. How would you rate the commitment of the owner to implementing S and H? (Rate within Scale of 1-10) 1-2 very poor, 3-4 poor, 5-6 fair, 7-8 good, 9-10 very good.

26. Suggest how this commitment can be

improved.....

F. Problems

27. Do you have access to the following?

(a) Clean and safe drinking water on site? Yes ( ) No ( )

(b) Toilet facilities on site? Yes ( ) N0 ( )

(c) Information and training? Yes ( ) no ( )

(d) First aid facilities? Yes ( ) no ( )

(e) Meals? Yes ( ) no ( )

28. (a) Are you readily provided with PPEs? Yes ( ) No ( )

(b) If yes are they readily and timely replaced? Yes ( ) No ( )

29. Is the distance from your place of residence to work convenient for you? Yes ( ) no ( )

30 Are you assured of work daily at this site? Yes ( ) No ( )

31 Do you receive your pay on timely basis? Yes ( ) no ( ).Is it adequate? Yes ( ) no ( )

32. Do you receive any payment for any extra time worked? Yes ( ) No ( )

33. Do you experience any form of harassment at work? Yes ( ) no ( ).

If yes explain.....

34. Do you have a set way of communicating your grievances to your supervisors? Yes ( )

No ( ). If yes explain.....

Item or equipment	Yes		None	Stable	Not stable	Near power lines	Not near power lines	Planked fully	Not fully planked	Sign machines
	Good	Need replacement								
Safety glass										
Face shield										
Work shoes/boots										
Gloves										
Helmet										
Scaffold										
Electric safety										
Signage										
Machinery										

G. Observation Checklist

THANK YOU.

APPENDIX II: Sample Size Table* (Krejcie and Morgan, 1970)

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

APPENDIX III: Criteria for selecting building construction sites

Must be authorized

Must have construction work ongoing

Must have at least 5 active workers