AN ASSESSMENT OF HEALTH AND SAFETY STANDARDS IMPLEMENTATION ON BUILDING CONSTRUCTION SITES IN ZAMBIA

By

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A dissertation submitted to the University of Zambia in fulfilment of the requirements for the Degree of Master of Engineering in Construction Management

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DECLARATION

I, **John Phiri** hereby declare that the work presented in this thesis is the result of my research work and that it has not previously been submitted for a degree, diploma or other qualification at this or another University.

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Signature **Date**

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CERTIFICATE OF APPROVAL

This dissertation by **John Phiri** entitled "An Assessment of Health and Safety Standards Implementation in Building Construction Sites in Zambia**"** has been approved as partially fulfilling the requirements for the award of the degree of Master of Engineering in Construction Management of the University of Zambia.

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ABSTRACT

Over the last decade, construction in Zambia has become one of the fastest growing industry. This is evident by funds allocated to the industry in the national budget since 2010 averaging 18 % per annum. Despite this fact, the health and safety level on the construction sites lags behind and the industry is known to be among the most dangerous to work in. The aim of the study was to develop an OHS Framework that would enhance effective implementation of health and safety standards on building construction sites in Zambia.

This was achieved by assessing the health and safety of workers on building construction sites of the randomly selected projects and also by reviewing the government institutions and regulators mandated with the responsibilities of enforcing of health and safety standards. Purposive sampling techniques was used to obtained appropriate respondents in government institutions and regulators from were in - depth information was collected by using semi - structured interview. Questionnaires surveys was prepared and administered to workers on construction sites. Data collected was analyzed using descriptive statistics and other appropriate social statistical methods.

The study identified: inadequacy of health and safety standards, which included failure by construction companies to prepare company safety policies, failure to constitute safety committees and to conduct health and safety inspections and training. It was also established that there is weakness in legislation and regulations, duplication in OHS Acts, and overlapping in institutional functions. The study further, revealed that Zambia had not formulated a Comprehensive National Policy on OHS in spite of the matter being a cross – cutting issue. Also lack of adequate funding and inadequate manpower in the field of OHS was revealed.

The findings from the research was analyzed and interpreted and an OHS Framework was developed that suite Zambia scenario to enhance effective implementation of health and safety standards of workers on building construction sites in Zambia. The research proposed the finalization of the preparation of the Comprehensive OHS Policy and as long term measure, the research proposed for the establishment of the National OHS Authority to oversee the management and implementation of OHS programs in Zambia.

Keywords: Building, Construction, Health, Safety, Standards

DEDICATION

This thesis is dedicated to my father Mr. Abel Phiri for having scarified so much for the family. It is also dedicated to my late mother, Susan Phiri, Emaria Ngwenyama my wife, Mrs. Precious Matimba Phiri, my siblings, my daughter Felistus Phiri and my sons Pontino Phiri, John Phiri Jnr., and Joseph Phiri. May this work bring joy to you.

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Last but not least, I would like to thank all who have given assistance in obtaining the information and data related to this work especially the people who took time from their busy schedule to fill my questionnaires.

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ABBREVIATIONS

ACSCCS	American Chemical Society Committee on Chemical Safety
ASCE	American Society of Civil Engineers
ASSE	American Society of Safety Engineers
BS	British Standard
BSI	British Standard Institute
CDM	Construction (Design and Management)
CITB	Construction Industry Training Board
CPWR	Centre to Protect Workers' Right
CR	Construction Regulations
DOL	Department of Labor
EIZ	Engineering Institute of Zambia
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
ILO	International labor Organization
HSA	Health and Safety Authority
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HSS	Health and Safety Standards
HSWA	Health and Safety at Work Act
MHID	Ministry of Housing and Infrastructure Development
MLSS – (OSHSD)	Ministry of Labour and Social Service - Occupational Safety and Health Service Department
NIOSH	National Institute of Safety and Health
OHS	Occupational Health and Safety
OHSA	Occupational Health and Safety Administration
OHSAS	Occupational Health and Safety Assessment Series

OSHSD	Occupational Safety and Health Service Department
PPE	Personal Protective Equipment
RMP	Risk Management Process
UK	United Kingdom
UN	United Nations
USA	United State of America
SAC	Safety Audit Cycle
SANS	South African National Standards
SHW	Safety, Health and Welfare
WHO	World Health Organization
ZABS	Zambia Bureau of Standards
ZCSO	Zambia Central Statistical Office
ZESCO	Zambia Electricity Supply Company
ZIA	Zambia Institute of Architecture

CHAPTER ONE: INTRODUCTION

1.1 Background

Construction industry contributes significantly in terms of scale and share in the development process for both developed and developing countries (Ofori, Amponsah and Mensah, 2012). The industry products provide the necessary public infrastructure and private physical structures for many productive activities such as services, commerce, utilities and other industries. The industry also employs a large number of people (directly and indirectly) and therefore has an effect on the economy of a country during the actual construction process (Betlejewsk, Renata and Stasiak, 2015).

According to the analysis of Zambia's Building Construction Market System (2014), the Zambian construction sector has been recording steady growth, mainly due to the building of residential housing, health and education infrastructure, investments in the mines, road construction and other civil works. Further, the price of cement, the main building material had reduced after Dangote Industries Zambia commenced the manufacturing of the commodity and offload it on the Zambian market in 2015 (Daily Mail, 29th June, 2015).

The industry in Zambia has been given a priority in the last decade (National Assembly of Zambia, 2014). This is evidence to the amount of funds allocated to the infrastructure sector from 2014 to 2016, as illustrated in the Table 1.1.

Table 1.1: Summary of Infrastructure Expenditure Allocation, 2014 -2016, (National Assembly of Zambia, 2015).

s/n	Year	Total Budget (Million Kwacha)	Infrastructure Budget (Million Kwacha)	Infrastructure Percentage Allocation
1	2014	42,682.00	8,453.90	19.81
2	2015	46,666.56	9,035.98	19.36
3	2016	53,135.82	8,446.17	15.89
		142,484.38	25,936.06	18.20

As tabulated in Table 1.1, from 2014 to 2016, an average of 18.2 percent of the approved Zambian National Budget was channeled towards infrastructure sector, an indication that there are numerous construction projects which have been under taken in the Country (Central Statistical Office, 2016). The flourishing of the construction industry in the country has resulted in the large number of people been employed. According to the highlights of the 2014 Labour force survey in Zambian, 188,000 people were employed in the construction sector representing 3.4 % of the total labor force in 2014 (Central Statistical Office, 2014).

The increase of employment in the Zambian Construction Industry has brought with its accompanying health and safety issues giving a bad image to the socio – economic importance of construction industry. For instance, the Report of the Auditor General on the management of Occupational Safety and Health for the fifth session of eleventh National Assembly 2015 (Auditor General, 2015), revealed that the total recorded number of fatalities in construction industry from 2011 to 2014 was 52 and non - fatal occupational injuries was 333. The detailed statistics in the period under review is shown in the Table 1.2.

Table 1.2: Number of Fatalities and Non – Fatalities, 2011 to 2014, (Auditor General, 2015).

s/n	Year	Fatalities	Non - Fatalities	Total Accidents	Percentage
1	2011	5	25	30	7.80
2	2012	18	36	54	14.02
3	2013	11	142	153	39.74
4	2014	18	130	148	38.44
Total		52	333	385	100

An analysis of the data from Workers Compensation Funds Control Board (WCFCB) from 2011 to 2014, presented by the Auditor General on fatalities and non – fatalities in 22 various industries in the county, revealed that construction industry recorded the total of 52 fatalities from the total of 385 representing 13.5 %. In addition, the industry recorded 333 non – fatalities from the total of 2,672 representing 12.5 %. In the four

years under review from 2011 to 2014, the industry recorded the second highest in fatalities, with the first been Mining and Quarrying industries. And the industry was third in non- fatalities record with the first been Mining and Quarrying and second was Iron and steel industries (Auditor General, 2015).

According to the International Labor Organization (ILO, 2012) report titled "Decent Work Country Profile Zambia", it was established that the biggest challenge to maintaining a safe work environment in Zambia lay in the inadequacies of the institutions. The institutions are failing to adequately enforce legislation and standards due to numerous problems ranging from poor funding to luck of qualified personnel in the field of Occupation Health and Safety (OHS).

1.2 Statement of Problem

The flourishing of the construction industry in Zambia has brought with its accompanying health and safety issues. There had been public outcry from Zambia citizens on the OHS in construction sites, the practical examples were the death of two workers engaged by China Chongqing International Construction Corporation (CICO) to dig a four meter deep trench which collapsed and buried them in Livingstone (Times of Zambia, 15th May, 2014). The curving and burring of two workers engaged by Flames Construction Limited to construct Nkana Shopping Mall in Kitwe (Times of Zambia, 6th May, 2013). The other OHS accidents includes the BGRIMM explosion in Chambeshi which claimed forty – five lives in 2013, report of the Auditor General on the Management of OHS for the fifth session of the eleventh Assembly (Auditor General, 2015).

Several times workers on building construction sites have "down tools" demanding for improved Health and Safety Standards (HSS), example is the striking of workers at Sino Hydro State Company constructing the 120 MW Itezhi – Tezhi Hydropower Plant, demanding among others the improving of OHS standards on site (Time of Zambia, 29th December, 2014). Also the striking of workers at Dangote Cement Plant demanding for improving of safety conditions (Daily Nation, Jun 9, 2016). The accidents and striking of

workers demanding improved OHS standards results in loss of working hours and delays in the completion of projects.

To improve the current situation, there is need to critically assess the Health and Safety Standards implementation in building construction in Zambia. Hence, the study to develop a framework that will enhance effective application of OHS standards of workers on building construction sites in Zambia.

1.3 Aim of Study

The aim of the study was to assess construction OHS standards implementation and to develop a framework that would enhance effective Implementation of OHS standards on building construction sites in Zambia.

1.4 Objectives of Study

The study will be shaped by the following objectives.

- to determine the construction OHS standards available in Zambia's construction industry;
- to evaluate the implementation of OHS standards on building construction sites in Zambia;
- to assess National Policies, Legislation and Implementation Frameworks in place to facilitate management of OHS standards in building construction;
- to determine factors that inhibits the implementation of OHS standards in the construction industry in Zambia; and
- to develop an OHS Framework that will enhance effective application of OHS standards in Zambian construction industry.

1.5 Research Questions

- To what extent does the current institutions and legislations framework promote effective implementation of OHS standards in building construction in Zambia?

- Are the current OHS standards adequate in the building construction industry in Zambia?

1.6 Significance of the study

The construction industry is an accident prone industry with construction sites being acknowledged as dangerous places to work Mutwale, Lushinga and Akakandelwa, (2017) and from 2011 to 2014, the industry in Zambia recorded the second highest in fatalities and third in non – fatalities accidents (Auditor General, 2015). The dangerous nature of the industry could be verified by the frequency of fatalities and non – fatalities accidents (Table 1.2). According to literature reviewed on OHS studies in Zambia, no research has been done on "Assessment of Health and Safety Standards Implementation in Building Construction Sites in Zambia".

The researches done in the discipline of OHS in Zambia are listed below:

- '**Safety and Health in the Construction Industry in Zambia."** by Prisca Tente. The aim of the research was to study the status of health and safety in the construction industry in Zambia. The objectives were to analyze the effectiveness of the Factories Act of 1994 in relation to the workers" safety and investigating the types and common causes of accidents and ill-health and its impact on the industry. The main objective of the study was to Develop a Health and Safety Model:
- **"An Evaluation of the Effectiveness of Health and Safety Induction Practices in the Zambian Construction Industry."** by Josephine Mutwale – Ziko, Nonde Lushinga, Inonge Akakandelwa. The study discusses the effectiveness of Health and Safety Induction practices on construction sites against the background of the Zambian construction industry experience;
- **"An investigation into Cost of Construction Accidents in Zambia."** By Tamara Namonje, (2017), unpublished MENG degree thesis, University of Zambia. The aim of the study was to evaluate the cost construction accidents on construction sites in Zambia.

- **"An evaluation of the Provisions of Workers Welfare Facilitates and its Effects on Productivity in Zambia Construction Industry."** by Chisumbe S., (2017), unpublished MENG degree thesis, University of Zambia. The study evaluated the type of workers welfare provided on sites and their effective effect of the production.
- **"The Impact of Organization Safety Culture on the Management of Safety, Health and Environment (SHE) in the Electrical Distribution of Zambia**." By Mambwa M., (2017), unpublished MENG degree thesis, University of Zambia. The study focused on the Organizational Safety Culture and impact on Safety, Health and Environment (SHE).
- **"Occupational Health and Safety and Environment for Municipal Waste Workers in Southern Province of Zambia."** By Banda K. W., (2017), unpublished MENG degree thesis, University of Zambia. The study analyzed the application of Occupational Health Safety and Environment to the municipality waste workers.

The research assessed an overview of the insight into the OHS Standards in the construction industry in Zambia. Furthermore, the study gives baseline information for further researches to be carried out in the field of OHS. The study unveils current challenges in OHS standards implementation in the building construction in Zambia, which includes failure by most construction companies to provide PPE, First Aid and instituting Health and Safety Committees, Investigating, Recording and Reporting Accidents. Most companies also failed in conducting Health and Safety Training and preparation of Health and Safety Policy. The proposed OHS Framework developed in this study would be used in the construction industry in Zambia, therefore help to prevent construction accidents and incidents, thereby protecting the workers in the industry.

1.7 Assumption of the study

The assumptions of the study were that the construction companies employs workers on site from which sampling were to be done. It was further assumed that the current Zambian institutions and legislations framework do not promote effective application of

OHS standards in building construction. Lastly it was assumed the selected construction sites surveyed had similar traits to other sites in the country.

1.8 Limitation of the Study

The study was limited to building constructions and contractors registered in Grade 1-6, category B or C as classified by the NCC in Zambia. The research was also limited to Regulation Agencies and Ministries involved in the monitoring and evaluation of the application of OHS standards and legislation in the country.

1.8 Chapters Synthesis

The chapter's synthesis of the Dissertation report will adopt the following structure breakdown:

Chapter 1: **Introduction**: Introduces the research question and outlines the path the dissertation takes to reach its conclusion. This is done by outlining the Background, research questions, aim and objectives of the study.

Chapter 3: Literature Review: Reviews the body of knowledge developed during previous researches in OHS in construction industries.

Chapter 3: Research Methodology: Explains the methods used in this research to collect and analyses data to achieve the aim and objectives of this study.

Chapter 4: Results and Discussion: Comprises the results of applying the research methods adopted in the last chapter.

Chapter 5: Conclusions and Recommendations: An action plan is derived to improve the OHS standards and application on building construction industry in Zambia. Conclusions are gathered from the data analysis and the recommendations made are based on these conclusions. Further research areas are also suggested.

1.9 Summary

The introduction of the study including the research background and goals, the outlining methodology and the guild to the study has been presented. The next chapter introduces a critical literature review on the OHS in the construction industry.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

A literature review is an evaluative report of studies found in the literature related to the selected area; it goes beyond the research for information and includes the identification of gaps in knowledge between the literature and the field of research (Bhattacherjee, 2012). This chapter presents detailed literature review on the concept of OHS in the construction industry. The chapter also reviews literature on international legislations and standards on the application and management of OHS on construction sites.

2.2 OHS in Developing Countries

A developing country has been identified as one in which the majority of the population makes less income and has significantly weaker indicators than in highly income (World Bank, 2013). Further, developing country lives on far less money and often lacks basic public service than in developed countries (World Bank 2013). Construction industry in any country is very important because of the general outputs and outcomes of its activities. It contributes to the national socio – economic development by providing the buildings which are used in production of all goods and services like health and education in the economy of the country (Ofori, Amponsah and Mensah, 2012). Studies have highlighted that construction contributes between 5 and 10 percent of Gross Domestic Product (GDP) in all developing countries, employs up to 10 percent of the working population, and is responsible for about half of the gross fixed capital formation (Lopes, 2012).

Construction processes in developing countries shares similar characteristics in terms of the adoption of technology, construction methods, cultural environments and regulations (Ofori, Amponsah and Mensah, 2012). Unfortunately, there is a wide variation in economic structures, occupational structures, working conditions, work environment, and the health status of workers in different regions of the world, in different countries and different sectors of the economy (Alhajeri, 2014).

The construction industry in developing countries demonstrates poor performance in respect of health and safety due to the absence of any stringent safety and construction laws and lack of effective enforcement of the legislations (Alhajeri, 2014). Mrema et al. (2015) highlighted that developing countries faces the listed challenges in promoting and provision of OHS service:

- fast technological development, globalization, and expanding economy;
- inadequate effective institutional framework to enhance OHS;
- low OHS skills among health care providers;
- lack of resources (human, technical, and financial;
- low awareness of OHS matters among the general public, workers, and employers;
- low compliance to OHS standards;
- poor work environment in the informal sector;
- inadequate OHS training and skills development;
- lack of financial commitment by government;
- lack of social partners to enhance safety and health activities
- government officers who are not fully committed to enforce health and safety law;
- corruption;
- lack of employer interest in providing a safety working environment; and
- inadequate OHS information.

In developing countries construction workers face numerous health risks, such as exposure to dust, and three to six times likely than other workers to die from occupational accidents (Jahan et al., 2015). This is due in part of lack of safety measures and failure of enforcement of the law (Jahan et al., 2015). The ILO attributes the poor health and safety records in the sector within developing countries mainly to lack of compliance to the OHS standards, lack of legislation enforcement and lack of OHS training to both employers and employees (ILO, 2013).

2.3 International legislations and Standards Framework

Legislation is the preparation and enacting of laws by a legislative body while law is define as the set of rules of conduct of binding legal forces and effect, prescribed, recognized and enforced by regulatory body (Legal Dictionary, 2016). Regulations are basically the way the legislation is enforced, therefore, there should be regulators, usually government bodies, to examine the law passed and work out the details that need to be enforced so that they are followed (Alhajeri, 2014). Standards are document that provides requirements, specifications' guidelines or characteristics that can be used to ensure that products and services are fit for their purpose (Yesi, 2012). Figure 2.1 illustrate the legislation Hierarchy from the enacting the law to the local rules, guidelines and instructions Manual.

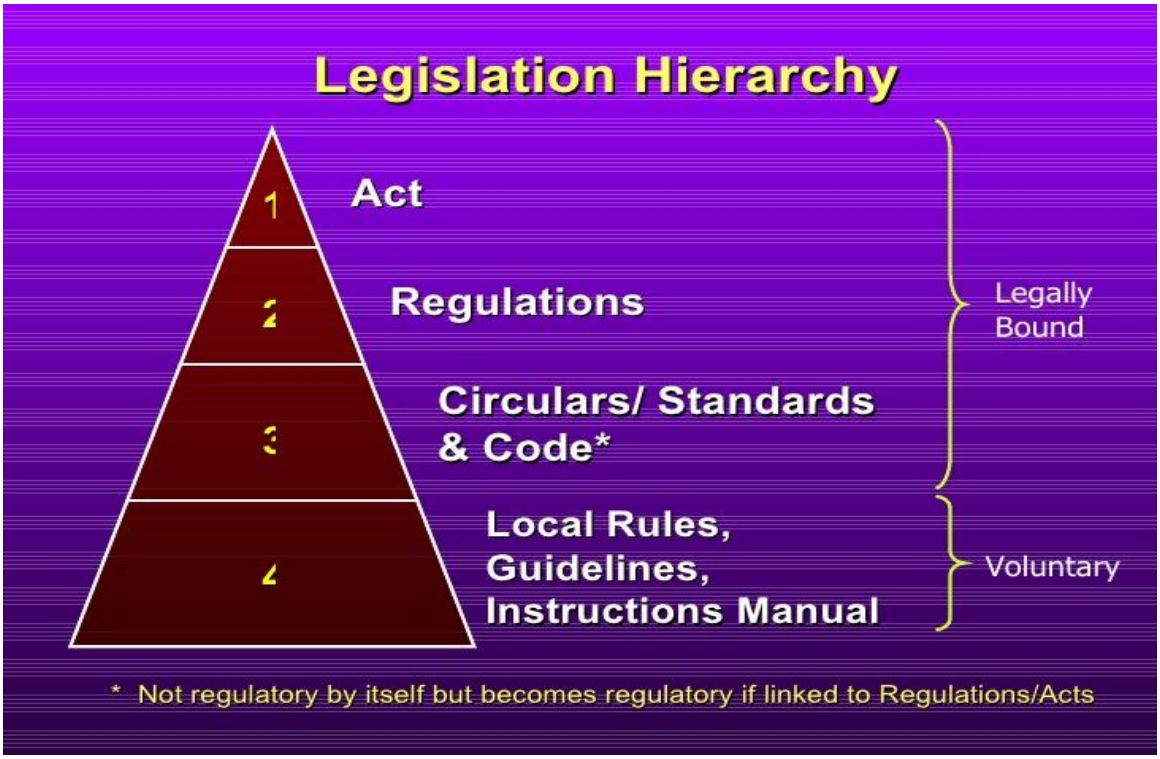

Figure 2.1: Typical example of the Legislation hierarchy (Health Department, Malasyia, 2012).

Governments internationally maintain an on-going commitment towards creations of construction working environment free of injury and disease (Shibani and Aljehari, 2013).

Different countries have enacted laws, regulations and standards on how health and safety in the building construction industries should be control (Muiruri and Cornelius, 2014). The commitment is reflected by the establishment of performance based construction sites Health and Safety legislation which sets generalized performance objectives and provide a system of clearly stated responsibilities to encourage greater regulation in the industry (Puplampu and Quartey, 2014).

The Health and Safety Executive (HSE), (2013) stated that the company top management have a legal duty to put in place suitable standards arrangement to effectively monitor and manage health and safety on construction sites. The responsibility of the employer therefore is expected to formulate and monitor programs for safe working conditions for employees on sites (Shibani and Aljehari, 2013).

From the time of inception in 1919, OHS has been at the heart of the ILO's work, including its standards – setting activities. The ILO's Code of practice on health and safety on construction sites (1992), provided guidelines in the implementation of health and safety practice on sites for all the workers (Sparer, 2015). The objective of the code is to provide practical guidance on legal, administrative, technical and education framework for safety and health in construction sector to prevent accidents and incident (ILO, 2016).

Internationally, as far as OHS guideline, standards and legislation are concern, Occupational Health Safety Assessment Series (OHSAS) 18000 framework is useful and has been in use since 1990 (United Kingdom National Standard Body, 2015). The OHSAS 18000 is an internationally applied British Standards for OHS management system specification (ILO, 2016). The series consisted of two specifications, OHSAS 18001 and OHSAS 18002, it further encompasses a number of other publications (ILO, 2016).

For the record, the following documents, amongst others, were used in the creation process of OHSAS (ILO, 2016):

- BS8800:1996 Guide to OHS management systems;

- DNV Standard for Certification of Occupational Health and Safety Management Systems (OHSMS):1997;
- technical Report NPR 5001: 1997 Guide to an OHS management system;
- draft LRQA SMS 8800 Health & safety management systems assessment criteria;
- SGS & ISMOL ISA 2000:1997 Requirements for Safety and Health Management Systems;
- BVQI Safety Cert: Occupational Safety and Health Management Standard;
- draft AS/NZ 4801 OHS management systems Specification with guidance for use;
- draft BSI PAS 088 OHS management systems;
- UNE 81900 series of pre-standards on the Prevention of occupational risks; and
- draft NSAI SR 320 Recommendations for an OHS Management System.

OHSAS 18001 is an Occupation Health and Safety Assessment Series for health and safety management systems. It was published to help organizations to identify, assess and control OHS risks. It was developed in response to widespread demand for a recognized standard against which to be certified and assessed (Aras, 2013). OHSAS 18002 was created to provide guidance for establishing, implementing or improving a management system which is based on OHSAS 18001 and demonstrating successful implementation of OHSAS 18001 (British Standards Groups, 2014).

2.4 International Legislation

The following countries were selected for literature review on their enacted laws and regulators which promote health and safety in the construction industry. The countries were selected because they have already enacted the legislations and are enforced in their construction industry.

2.4.1 United Kingdom

In the United Kingdom (UK), the Health and Safety at Work Act (1974), also referred to as the HSW Act 1974, is the primary piece of legislation covering OHS in Great Britain. The HSE, with local authorities and other enforcing authorities are responsible for enforcing the Act and a number of other Acts and Statutory Instruments relevant to the

working environment (HSE, 2015). The principal purpose of HSWA includes protecting people other than those at work from risks to their health and safety arising out of or in connection with the activities of persons at work (Legislation.gov.uk, 2016). The Act outlines the general duties of employers to their employees as far as health and safety is concern. A significant section of the Act (Part 1, section 10 – 1) is the establishment of two corporate bodies called the Health and Safety Commission (HSC) referred to as the Commission and the Health Safety Executive (HSE) referred to as the Executive.

The Commission consisted of a chairman and between six and nine other people, appointed by the appropriate Secretary of State, latterly the Secretary of State for Work and Pensions, after consultation. The main functions of HSC are to assist and encourage persons concerned with matters relevant to the operation of the objectives of the HSWA and make arrangements for and encourage research and publication, training and information in connection with its work (HSWA, 1974).

HSE consist of three persons of whom one is appointed by the Commission with the approval of the Secretary to the State to be the director of the Executive. The Executive is responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare, and for research into OHS risks in United Kingdom (HSE, 2015).

United Kingdom also applies the Construction (Design and Management) CDM Regulations 2015 to improve health and safety in the construction industry. HSE has published Legal Series guidance that supports CDM 2015 and explains it in more detail (CDM, 2015). The principal aims of the Construction (Design and Management) are:

- sensibly plan the work so the risks involved are managed from start to finish;
- have the right people for the right job at the right time;
- cooperate and coordinate your work with others;
- have the right information about the risks and how they are being managed;
- communicate this information effectively to those who need to know; and
- consult and engage with workers about the risks and how they are being managed.

Further, United Kingdom has currently three Industry Training Boards (ITBs) in operation, namely Construction Industry Board (CITB), the Engineering Construction Training Board (ECITB) and Film Industry Training Board (FITB) (United Kingdom Department of Business Innovation and Skills, 2015). Of the three boards, CITB's scope covers most construction training activities, which also include health and safety issues.

2.4.2 United State of America

In United State of America (USA), the Occupational Safety and Health Act of 1970 (OSH Act 1970) amended in 2004, assures health and safe working conditions for working men and women (Department of Labour, 2016). The Occupational Health and Safety Administration (OSHA) which was derived from the OSH Act 1970, is tasked with the responsible of enforcing health and safety, labour regulations and delegating enforcement powers to 21 states in USA, Puerto Rico, and the Virgin Islands (Mwanaumo, Thwala and Pretorious, 2014). The OSHA is headed by the Assistant Secretary of Labour under Department of Labour (DOL).

Employers must comply with all applicable OSHA standards and with the General Duty Clause of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards, USA (Department of Labor 2016). OSHA encourages contractors to undertake voluntary protection procedures. It provides programs and service to educate construction workers and to provide further resources for high – risk or remotely located construction works, (Mwanaumo, Thwala and Pretorious, 2014). Further, OSHA conducts site inspection and check whether contractors are complying with the HSS and regulations (OSHA Safety Training, 2016). The administration also inspect whether the equipment used by workers on sites are protective or not.

Mwanaumo, Thwala and Pretorious, (2014) stressed that OSHA regulations and standards are silent regarding the role of the client compared to the other regulation like CDM (2015) in the case of United Kingdom. To cover up the gap, the American Society of Civil Engineers (ASCE), thought Policy Statement 350 – Construction Site Safety (CSS) approved by Construction Institute, Public Policy Committee and adopted by

Board of Directors in 2012, outlined the responsibilities of the Owner of the project, Contractor, Designer and Educators. The responsibilities are tabulated in Table 2.1.

Table 2.1: Responsibilities of the Client, Design, Contractor and Educators, (ASCE, 2012).

S/N	The Party	Responsibility
1	Client (Owner)	▪ assigning overall project safety responsibility and authority to a specific organization or individual**,** (or specifically retaining that responsibility); ▪ designating an individual or organization to develop a coordinated project safety plan and monitor safety performance during construction; ▪ designating responsibility for the final approval of shop drawings and details through contract documents; and ▪ including prior safety performance as a criterion for contractor selection
2	Design engineers	▪ recognizing that safety and constructability are important considerations when preparing construction plans and specifications; and ▪ providing through the specifications that the design or details of critical elements of temporary construction, erection and lifting schemes, complicated form work and scaffolding be prepared by a professional engineer.
3	Contractors	▪ developing and implementing a coordinated project specific safety plan, as per American National Standards Institute (ANSI) A10.33 and ANSI A10.38; and ▪ maintaining the safety of their employees and of all other persons in the work area or on the worksite.
4	Educators	▪ incorporate project site safety and constructability concepts in design and construction curricula; ▪ emphasize engineer's role in providing a safe and healthy environment to personnel engaged in project activities through proper planning and design; and ▪ conduct basic and applied research to advance the knowledge and practice of safe design and construction.

2.4.3 South Africa

In South Africa, The Occupational Health and Safety Act, 1993 (OHS Act, 1993) is supported by subordinate legislation, Regulations and Codes of Practice, which give practical guidelines on how to manage health and safety issues (Department of Labour, 2015). Under the Act, all players have obligations to comply with the Act. There are twenty one (21) sets of regulations that form an inseparable part of the OHS Act. The regulations provide specifications and requirements towards the area that they govern (South Africa Labour Guide, 2016).

In the construction industry in the Republic of South Africa, the Construction Regulations, 2014 (CR 2014) was enacted by the Minister of Labour, the key objective of the CR 2014 is to formalize and strengthen the over inspection and responsibility between the parties involved in construction projects. This includes closer supervision by the client and a more involved approach by the Department of Labor (DOL), with severe penalties for non-compliance, (Department of Labor, 2015). Table 2.2 shows the Construction Regulations, 2014:

Table 2.2: Construction Regulations, 2014 (Republic of South Africa, 2014).

Health Regulation	**Scope of Application**	**Regulation**
Construction Regulations, 2014	These regulations apply to all persons involved in construction work. Regulations 1 and 3 are not applicable where the construction work carried out is in relation to a single storey dwelling for a client who intends to reside in such dwelling upon completion thereof.	1. Application for Construction Work Permit. 2. Application for a permit to perform. construction work. 3. Duties of client. 4. Duties of Designer. 5. Duties of Principal Contractor and Contractor. 6. Management and Supervision of Construction. Work. 7. Risk Assessment for Construction Work. 8. Fall Protection. 9. Structures. 10. Temporary works. 11. Excavation. 12. Demolition work. 13. Tunnelling.

		14. Scaffolding. 15. Suspended platforms. 16. Rope Access Work. 17. Material hoists. 18. Bulk mixing plant. 19. Explosive Actuated Fastening Device. 20. Cranes. 21. Construction vehicles and mobile plant. 22. Electrical installations and machinery on construction sites. 23. Use and temporary storage of flammable liquids on construction sites. 24. Water environments 25. Housekeeping and general safeguarding on construction sites. 26. Stacking and storage on construction sites. 27. Fire precautions on construction sites. 28. Construction employees' facilities. 29. Construction health and safety technical committee.

2.4.4 Nigeria

As a member of United Nations, Nigeria has adopted the conventions and reccommendations of the ILO (Idubor, Oisamoje and Umeokofar, 2013). In addition, a number of legislations on OHS exist in Nigeria. These includes; Labour Act of 1974 which was later modified to Labour Acts in 1990, and updated to Cap L1, Laws of the Federation of Nigeria (LFN), 2004 (Okoye and Okolie, 2016). Others are the factories Act of 1987 which became effective in 1990, later updated to Factories Act, Cap. F1, LFN, 2004 (Umeokafor et al., 2014). There also exist the Workman's Compensation Act of 1990 modfied to Employee's Compensation Act No. 13, 2010 of the laws of Federation of Nigeria, and the insurance Act of 2003. The last ones been the Labour, Safety, Health and Welfare Bill of 2012 including the National Building Code Enforcement Bill which has suffered huge political setback over the years, and is yet to be enacted into law by the National Assembly (Okoye and Okolie, 2016).

The Federal Ministry of Labour and Employment is mandeted to enforce the Factories Act and Employee's Compensation Act, while the Labour, Safety, Health and Welfare (LSHW) Bill of 2012 empowers the National Council for Occupational Safety and Health of Nigeria

to administer the proceeding regulations on its behalf (Umeokafor et al., 2014). The (LSHW) Bill enable state to charge construction companies top management of criminal offenses where firms action has results in fatality or loss of properties (Idubor, Oisamoje and Umeokofar, 2013). The bill mandate state to jail employers who fail to ensure health and safety of their employees with a minimum of one year (Agwu, 2012).

2.4.5 Ghana

In Ghana, legislations and standards promoting OHS are the Labour Act No. 651 of 2003, Factories, Offices and Shop Act of 1970 and the Workmen's Compensation Act of 1987. Part XV of the Labour Act, 2003 (Act 651) relates to Occupational Health, Safety and Environment of workplaces. Under the same Part XV of the Act, the General health and safety conditions 118. (1), state that *"It is the duty of an employer to ensure that every worker employed by him or her works under satisfactory, safe and healthy conditions".* Which imples that the employer should provide and maintain construction sites free from hazards and without risk to the health of all the workers (Dadzie, 2013).

The Factories, Offices and Shop Act 1970 promote health and safety in general, in all occupational including construction (Dadzie, 2013). In the Act, the Minister of Manpower, Development and Labor is mandated to make regulations in the construction industry to address specific hazards (Ofori, Amponsah and Mensah, 2012). The Workmen's Compensation Act, 1963 (Amendement) Decree, 1966 (N.L.C.D. 86), which was amendated by substituting a new section 15 for the old section 15. The Act impores employer to pay compensation to accident victims arising out of and in the course of their employment (Laryea et al, 2010).

2.4.6 Tanzania

Tanzania has a number of laws and regulations that govern OHS protections for workers (Phoya, 2012). In Tanzania, the earliest legislation is the Factories Ordinance Cap. 297, which was promulgated in 1950 and came into operation in 1952, (Museru et al., 2013). The Workman's Compensation Ordinance (WCO) of 1949 covered the health and safety of all workers, regardless of the type of employment and duration (Mrema et al., 2015).

To cover for the limitation in the above mentioned legislations, Tanzania enacted the OHS Act No.5 of 2003. The Act provides for protection of persons other than persons at work against hazards and safety arising out of or in connection with activities of persons at work (Occupational Health and Safety Act, 2003). In addition to the above legislation, Tanzania Employment and Labor Relation Act No. 6 of 2004 contain provisions for OHS, although it is concern with industrial relations matters rather than workers safety (Museru et al., 2013).

The Government of Tanzania has given responsibilities to five ministries to ensure that the OHS standards are maintained in the construction industry, the ministries are: the Ministry of Health, the Ministry of Works and Infrastructure, the Ministry of Labor and Employment, the Ministry of Environment and the Ministry of Local Government (Phoya, 2012). Figure 2.2 illustrate the administration of health and safety management in Tanzania.

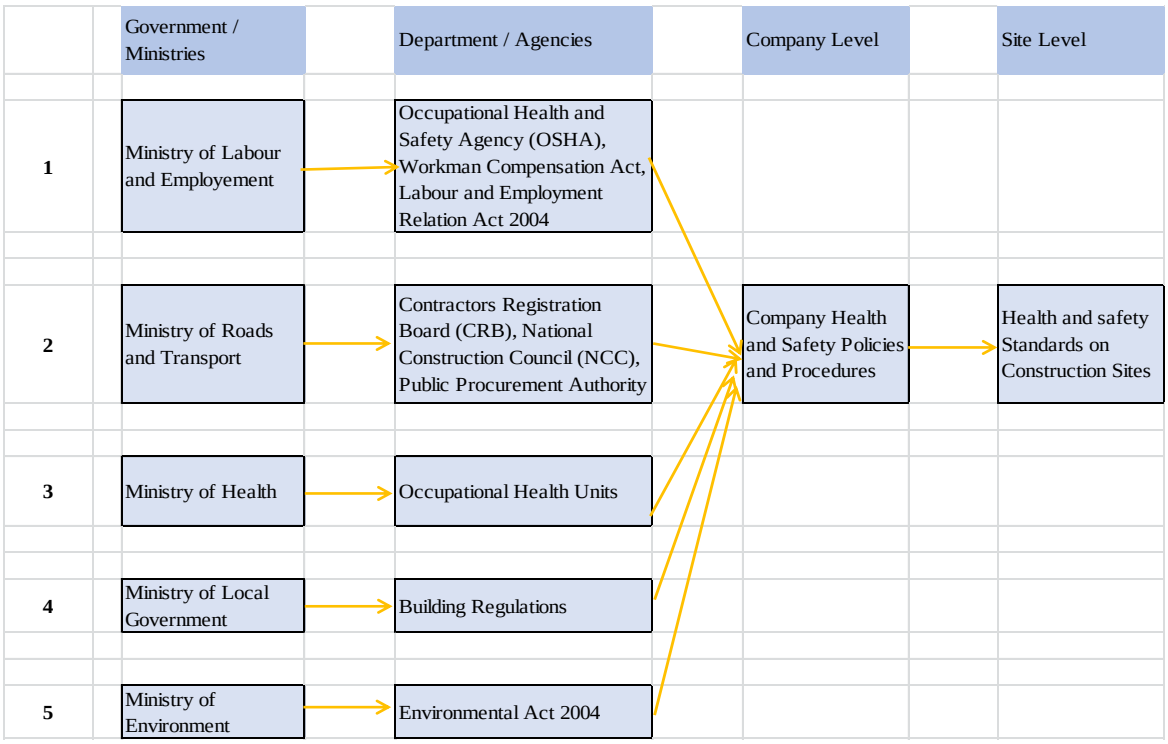

Figure 2.2: Administrations of Health and Safety Management in Tanzania (Phoya, 2012).

2.5 International Standards

Different Countries have formulated different HSS to be applied in various fields of activities and organizations. Standards are define as the written definition, limit, or rule, approved and monitored for compliance by an authority or agency instituted by law of the country as a minimum acceptable benchmark (Business Dictionary, 2016). Therefore, HSS are written minimum rules prescribed by Government or a regulatory body that must be adhered to ensure products, services and events are safe and not dangerous to human.
There are numerous HSS in the construction industry, for this study only literature on the following will be reviewed; Protective Personal Equipment (PPE), Training and Accidents, First Aid, Health and Safety Committee.

2.5.1 United Kingdom

In the United Kingdom, OHSAS 18001, Occupational Health and Safety Assessment Series, officially BS OHSAS is an internally applied British Standard for OHS management system.

The Protective Personal Equipment Directive (89/686/EEC) sets out requirements and standards relating to the design, manufacture and supply of PPE (HSE, 2015). In the United Kingdom (UK), the directive is implemented by the Personal PPE Regulations and Standards 2002 (SI2002/1144). The regulations and standards are enforced by Trading Standards Officers (TSO). The employers have a duty to ensure that any PPE provided to their employees meets the requirements of the Personal Protective Equipment (PPE) Regulation 2002.

The construction industry in the United Kingdom has PPE Standards that are separated into broad categories, depending on the type of protection intended, in the industry the following are mostly considered, head protection, foot protection, eye and face protection, hearing protection and respiratory protection (HSE, 2013).

Eye and Face Protection - The British Standards, BS EN 166: 2002 specifies functional requirements for various types of personal eye-protectors and incorporates general

considerations such as designation; classification; basic requirements applicable to all eye-protectors; various particular and optional requirements; allocation of requirements, testing and application, marking and information for users (HSE, 2015).

The standards applies to all types of personal eye-protectors used against various hazards, as encountered in industry, laboratories, educational establishments, which are likely to damage the eye or impair vision, with the exception of nuclear radiation, X-rays, laser beams and low temperature infrared (IR) radiation emitted by low temperature sources (The PPE Regulations, 2002).

Head Protection - Head protection on construction sites means provisions of an industrial safety helmet and hard hats conforming to British Standard BS EN397:1995, British Standards BS EN 166:2002 or equivalent. The Construction (head Protection) Regulation, 1989, ensures that the hat has passed the relevant tests for adjustment, performance, impact, penetration, flame retardance, leakage and ageing.

Hard hats that comply with BS EN397:1995 are tested to withstand impact from pointed load weights that are dropped onto the top of the hat. To help protect the skull from impact, beneath the hard outer shell of the helmet, a skull cradle is suspended that should adjust to fit snugly to different head shapes and sizes. Between the helmet and the cradle is a 12mm air gap. The rule is that the falling object should not penetrate the outer shell, and any dent the falling object makes should not exceed the gap between the outer shell and the skull cradle.

Hard hats come in a variety of styles to suit different applications and personal preference. Variations of the standards of the hard hats available are presented in Table 2.3.

Table 2.3: Variations of Standards of Hard Hats (OHSAS 18000, 2014).

1. A full peak for shielding the eyes from solar glare.	2. A reduced peak when the worker is required to look up (for instance when climbing ladders).
3. A rain gutter for protection against bad weather.	4. Ventilation holes to help keep the wearer cool in hot weather.
5. Replaceable sweat bands on the inside of the helmet.	6. A chin guard and visor to protect against potentially hazardous materials flying upwards.
7. Built-in eye protection in the form of safety goggles or a half-face visor.	8. Integrated hearing defenders - helmet-mounted earmuffs are suitable for users wearing more than one type of PPE.
9. Chemical and heat resistance, higher levels of electrical insulation and additional cold weather.	

Foot Protection - Safety boots and safety footwear has different levels of protection. It is important to ensure the correct level of protection depending on the potential hazards involved to ensure maximum protection (Z'gambo, 2015).

European Sstandard BS EN ISO 13287:2012, incorporate the British Standards (BS), European Norm (EN) and International Standards (ISO) is the latest standards on the footwear for professional use - Specification Superseded the EN ISO 20345:2004. The basic requirements and standards of safety footwear must have a 200J toecap (HSE, 2013). Other properties may not all apply to some designs of footwear with the consideration of the activities on which the footwear will be worn. The standards are listed in table 2.4.

Table 2.4: Standards of Safety Boots and Safety Footwear (HSE, 2013).

1. Penetration resistance.	2. Conductive.
3. Antistatic.	4. Insulating against heat
5. Insulating against cold.	6. Energy absorbing seat region.
7. Uppers resistant to water penetration / absorption.	8. Outsole resistant to hot contact.

Hand Protection - Hands are protected on construction sites by provisions of gloves which should be worn when handling, hazardous materials, toxic chemicals, corrosive materials and materials with sharp or rough edges, further when handling very hot or very cold materials. In United Kingdom, the standard EN420:2003 defines the general requirements for glove design and construction, comfort and efficiency, marking and information applicable to all protective gloves. Gloves are marked and manufactured according the risk assessed and uses. The table 2.5 summarized the gloves Standards, description and type of hazards to protected against.

Table 2.5: Standards on the Gloves, (European Norms, 2014).

S/N	Standard	Descriptive Recommendation	Type of Hazard
1	EN388:2004	Protection from mechanical risks.	Abrasion, blade cut, puncture and tearing.
2	EN374:2003	Protection from chemicals and micro-organisms.	Allergens / biological agents.
3	EN407:2004	Protection from thermal hazards (heat / fire).	Heat, Fire.
4	EN511:2006	Protection from thermal hazards (cold)	Cold objects below -50 degrees
5	EN421:2010	Protection from radioactive contamination and ionizing radiation.	Radioactive and radiation.

2.5.2 United State of America

American National Standards Institute (ANSI) has been preparing safety standards since the 1920s, when the first safety standard was approved to protect the heads and eyes of industrial workers (OSHA, 2015). In United State of America it is mandatory that PPE meet the standards developed by the ANSI (Department of Labour, 2015). The following ANSI standards are applicable in the construction industry in USA.

Eye and Face Protection - ANSI issued an edition of ANSI Z87.1-2003 American National Standard Practice for Occupational and Educational Personal Eye and Face Protective Devices, replacing Z87.1-1989. OSHA had adopted the revised standards and advised and allowed the industry and employees to use them. OSHA specified the standards of the eye and face PPE as tabulated in Table 2.6.

Table 2.6: Standards for the Eye and Face Protection (OSHA, 2013)

1. Have the Manufactures identity clearly marked.	2. Be reasonably comfortable.
3. Fit properly.	4. Be durable.
5. Be capable of being cleared and disinfected.	6. Be in good condition.
7. Be easily cleared and disinfected.	8. Be able to suit a particular activity.

Head Protection – American National Standards Institute issued the standard ANSI Z89.1-1986 for head protection. The employer shall ensure employees wears a protective helmet when working in areas where there are potential for injury to the head from falling objects. Further, a protective helmet designed to reduce electrical shock hazard should be worn by employees exposed to electrical conductors which could contact the head (Department of Labour, 2015). Head protection must comply with any of the following consensus standards (Department of Labour and OSHA, 2015):

- American National Standards Institute (ANSI) Z89.1-2009, American National Standard for Industrial Head Protection;
- American National Standards Institute (ANSI) Z89.1-2003, American National Standard for Industrial Head Protection;
- American National Standards Institute (ANSI) Z89.1-1997, American National Standard for Personnel Protection-Protective Headwear for Industrial Workers-Requirements; and
- head protection devices that the employer demonstrates are at least as effective as head protection devices that are constructed in accordance with one of the above consensus standards will be deemed to be in compliance with the requirements of this section.

Foot Protection - PPE 1910.136(a) Foot Protection General Requirements, "stated that the employer shall ensure that each affected employee uses protective footwear when

working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electric hazard" (OSHA, 2015).

Two new ASTM International standards, F 2412, Test Methods for Foot Protection, and F 2413, Specification for Performance Requirements for Protective Footwear, had replaced the former ANSI Z41 standard in 2005 (North Carolina Department of Labor Occupational Safety and Health Division, 2010). ANSI Z41.1 – ASTM Standards give minimal requirement of footwear on the following: Protective Footwear, ASTM F2412-05 – Standard Test Methods for Foot Protection and ASTM F2413-05 – Standard Specification for Performance Requirements for Foot Protection.

Hand Protection - Where the employee could receive splinters, cuts, abrasions, exposures to high and low temperature, chemicals, and exposures to vibrations, hand protection had to be provided by the contractor. Hand Protection – Regulatory requirement 29 CFR 1910.138, OSHA, (2012) outlined the following standards, Gloves should fit snugly and right gloves for the job as tabulated in Table 2.7.

Table 2.7: Standards for the type of Gloves (ANSI, 2012)

S/N	Hazard	Standards of type of Gloves
1	Contact with biological or chemicals other than oils, solvents corrosives or toxic material.	Impervious disposable gloves: Disposable gloves usually made of lightweight rubber, latex.
2	Contact with oils, solvents, corrosives, or toxic material.	Chemical-resistant utility gloves: Chemical resistant gloves may be made of rubber, nitrile, neoprene, polyvinyl alcohol, or vinyl, etc. These gloves protect hands from corrosives, oils, and solvents.
3	Laceration.	Cut-resistant material: Metal mesh gloves are used to protect hands from accidental cuts and scratches.
4	Abrasion, cut or punctures.	Canvas or leather work gloves: (1) Fabric gloves are made of cotton or fabric blends and are generally used to improve grip when handling slippery objects. They also help insulate hands from mild heat or cold. (2) Leather gloves are used to guard against injuries from sparks.
6	Contact with hot or cold objects.	Welders', aluminized, insulated, cryo, and freezer gloves are a few of the types of gloves used to insulate hands from intense heat or cold.

Hearing Protection - Exposure to high noise levels may cause damage to the ear, resulting in temporary or permanent hearing loss (Dunlap, 2012). To reduce the potential for hearing loss, all employees whose noise exposure equals or exceeds an eight hour time-weighted average (TWA) of 90 decibels (dBA), ear protective devices should be provided and used (Weber, 2015). The use and care of hearing protection should be in compliance with OSHA standard 29 CFR 1926.52, Occupational noise exposure (OSHA, 2015).

Respiratory Protection - Respiratory protection regulatory requirement and standards are contained in 29 CFR 1910.134. If engineering safety controls do not effectively reduce respiratory exposures to permissible OSHA levels, personal protective should be required as needed to properly protect employees from respiratory exposures (Dunlap, 2012).

2.5.3 South Africa

The National Standardization Authority and the South African Bureau of Standards (SABS) are responsible for maintaining South Africa's database of national standards, developing new standards and revising, amending or withdrawing existing standards as required. SABS is a South African statutory body that was established in terms of the Standards Act No. 24 of 1945 and continues to operate in terms of the latest edition of the Standards Act No. 29 of 2008 as the national institution for the promotion and maintenance of standardization and quality in connection with commodities and the rendering of services. Further, SABS provides a range of standards covering OHS in Building & Construction industry, from quality OHS management systems to test and approving of PPE. These help industry to enhance provisions and application of OHS, meet regulatory, safety and reliability requirements, and ensure protection of personnel.

In South Africa, it is mandatory according to OHS Act 1993 for employer to ensure that all information, instruction and training on the usage of PPE are communicated to all the employees prior to its use. PPE must be made in accordance with prescribed specifications standard and manufacturer to receive a certificate of compliance from South Africa National Standards (SANS).

Eye Protection - In construction industry, eye protection must be constructed to protect against impact, harmful liquids and dust. According to the SANS two standards had been produced for eyes protections namely SANS 1404 which specifies the characteristics of personal eye – protection for industrial and non –industrial use. The other one is SANS 1400. Equipment include colors for the eye, face and neck protection against non-ionizing radiation arising during welding and similar operations – welding helmets, hand shields, goggles and welding spectacles.

Face Protection – different types of standards are specified for different type of faces protection shields. In South African construction industry, the common ones are Acid / Alkaline Protection (SANS 1404) which specifies standards for protection against acid, alkaline and hazardous biological substances. The second one is LV Switching which

protect against electrical burns and Arch Flashes Protection and others are face protection for cutting and grinding, welding helmet hard hat assembled, welding helmet filter arc welding and gas welding.

Head Protection - Head protection on site is usually by provisos of helmets and hard hut to the workers. SANS 1397:2003 specifies the standards for physical and performance requirements, methods of test and making requirements for industry safety helmets.

Foot Protection - The minimum standards specification for foot protection are Safety boots, both standards size and wide size marked SABS SANS 20345:2008 and safety shoe both standard size and wide size also marked SABS SANS 20345:2008. The other specified standards by SABS on foot protection for construction industry are gumboots made of solid rubber with low abrasion materials to comply with SANS 20245.

Hand Protection - The hands and arms are protected during the construction process by wearing right and approved gloves by SABS. SANS 1228:2012 specified the requirements for the design, construction, materials, dimensions and service related properties. The common standards of gloves used in the industry are SABS IEC for electrical insulation and SABS 412:2012 for protecting workers from a wide range of chemical. Others are SABS 15614:2008 for welding.

Hearing Protection – The SABS 083 is the code of Practice for the measurement and assessment of occupational noise for hearing conservation purposes. SABS 083 was published by the SABS. No employer or self-employed person shall require or permit any person to enter any workplace under his or her control where such person will be exposed to noise at or above the 85 dBA noise rating limit, (OHS Act, 1993) - Regulations, (2003).

Respiratory Protection - The SANS 10220:2010, specifies the standards for selection, use and maintenance of respiratory protection equipment. The standard covers equipment for the protection of the body against harmful substances that may enter the body through

respiratory. The other standard is SANS 51825:2004 / EN 1827:1999, specifies the respiratory protection devise – half masks without inhalation valves and with separate filters to protect against gases and particles (SABS, 2016).

2.6 Health and Safety Policy

A Health and Safety Policy (HSP) sets out the general approach and commitment on how management of the construction company will manage the health and safety on sites (HSE, 2015). In most countries, United Kingdom, Northern Iceland, United State of America, South Africa, it's mandatory, for any company not to commerce construction work without submission and approval of the HSP to the relevant authority (European Agency for Safety and Health at Work, 2014). In addition, CDM Section 25(2) (j) of the regulations requires employers with more than 5 employees to prepare a HSP and review the program and sign the policy at least once a year and set up a program to implement the policy, (CDM, 2015).

The HSP should be a straightforward statement of senior management's commitment to workplace safety and health (South African National Standard, 2012). It should be broad enough to cover all aspects of the company's activities, and should suits the particular company and views on health and safety (Helen, 2015). The standard HSP should contain the key commitment by Management to address the health and safety on site, as elaborated in Table 2.8 (HSE, 2015).

Table 2.8: Health and Safety Policy Management Commitment and Description (HSE, 2015)

S/No.	Management Commitment	Description
1	Awareness.	The company management should demonstrate that all the employees and stakeholders have an awareness and understanding of health and safety hazards and risks that might affect them on site.
2	Competence.	The company management should demonstrate that all the workers and stakeholders have the competence to undertake their work with minimum risks to health and safety.
3	Compliance.	Construction companies should proof that all work activities achieve compliance with legislations and standards, and workers are empowered to take action to minimise health and safety risks.
4	Excellence.	The recognition of the construction company for excellence in the way they manage health and safety.

2.7 Health and Safety Committee

Safety Committee is a joint forum of contractor and employees which improve the health and safety conditions on sites (Mohmmed, 2014 and Sabhani, 2010). The committee provides a forum for employees and management to work together to solve health and safety problems (Sabhani, 2010). An effective committee can help prevent injury and illness on sites by increase awareness of health and safety issues among employees, supervisors, and managers and develop strategies to make the work environment safe and healthy (Mohmmed, 2014 and Occupational Health and Safety Act, 2010). Regulations relating to health and safety representatives also include obligations regarding the establishment and operation of Health and Safety Committees at the workplace (Cudjoe, 2011). The overall objective of constituting a safety committee is to promote co-operation and coordination between employers and employees in investigating, developing and carrying out measures to ensure the health and safety of the employees on construction site is enhanced, HSE, (2016). The main functions of Health and Safety Committees are as listed below (Cudjoe, 2011):

- studying trends in accidents, with the view to making suggestions for corrective actions;

- examining safety reports and making proposals for avoiding future accidents;
- examining and discussing reports from safety representatives;
- making proposals for new or revised safety procedures;
- acting as a link between the organization and the enforcement agency (the health and safety inspectorate; and
- monitoring and evaluating the organization's safety policies, and making proposals for changes, if necessary.

Employees frequently participate in safety planning through safety committees, often composed of workers from a variety of levels and departments (Agbenorku et al., 2014). A safety committee generally meets at regular scheduled times and has specific responsibilities for conducting safety reviews, and makes recommendations for changes necessary to avoid future accidents (OSHA, 2015).

2.8 Health and Safety Inspection

The Health and Safety Inspection is conducted to find out whether the arrangements which the local Health and Safety Policy required are actually in place (HSE, 2015). The inspection also reveals whether the workers and top management in the company are doing what the policy requires of them. In most cases, safety inspections involve a checklist, which helps inspectors thoroughly assess each area or potential hazard and pinpoint specific instances that may cause safety issues (Muiruri and Cornelius, 2014). Site safety inspection should not only be left to the safety inspectors from Government Agencies or Authority but also to the owner's representative (Depace, 2010).

The difference between safety audit and safety inspection is that, safety audit is a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which the safety set standards are fulfilled. On other hand, safety inspection is similar to an audit, but focusing on a single item or process and based usually on "yes and no" answers (Dias, 2010). Audits are more detailed and look at the entire process in depth compared to safety inspection (Eshetu, 2011).

Inspection visits to construction sites by Health and Safety Inspectors should take a proactive approach and use a systematic process. This proactive approach places responsibility for the OHS measures mainly on those on the construction site of responsibility (Depace, 2010). The authorities may require the owner/client to prepare and submit Safety Health Plan, (SHP) and Safety Health File, (SHF) documents involved in the construction process before commencement of the implementation of the project (Dias, 2010). Health and Safety Inspectorate should analyze the SHP and SHF to decide whether or not an inspection should be performed. In view of this, requiring these documents for all construction projects is not at all recommended (ILO, 2015).

Based on Safety Health Plan and Safety Health File, the safety inspectors may prepare the inspection of each of the construction sites following the process based on checklists and on the evaluation methods (Muiruri and Cornelius, 2014).

2.8.1 Inspection Process

For the Health and Safety Inspections, a coordinator of the safety inspection is appointed who prepares and conducts all activities before, during and after the inspection process (ILO, 2010, HSE, 2015 and Dias, 2010). The process constitute of three main steps namely, preparation of the inspection, performing the inspection and reporting on the inspection as illustrated and described in Table 2.9.

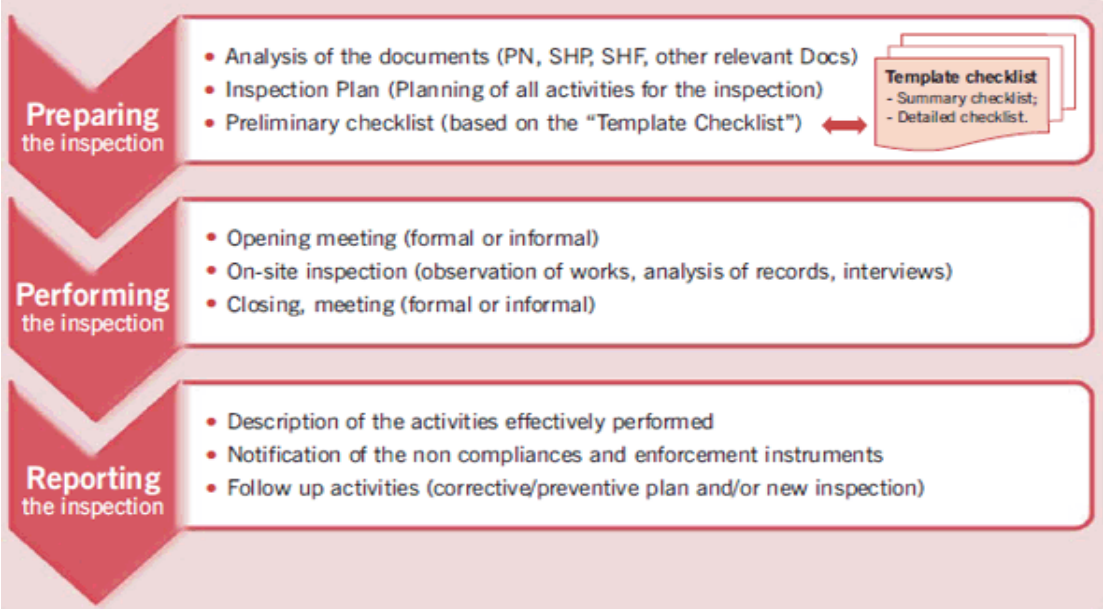

Figure 2.2: Main steps of the inspection process of a construction site (ILO, 2010)

2.9 Safety Audit Performance

Audit is a systematic and, wherever possible, independent comprehensive examination of the company's safety performance (Kanchana, Karunasena and Jayasuriya, 2013). American Chemical Society Committee on Chemical Safety (2010) defined an audit as a systematic review of operations and practices to ensure that relevant requirements are met. An audit is conducted to determine whether activities and related results conform to planned arrangements and whether the arrangements are implemented effectively and are suitable to achieve the organization's policy and objectives (BS8800: 1996 Guide to OHS management systems). Safety Audit is not intended to cause confrontation or blame (American Society of Safety Engineers, 2014).

The health and safety management audit members adopted a structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective action (Jones, 2013). Auditing examines each stage in the health and safety management system by measuring compliance with the controls the organization has developed, with the ultimate aim of assessing their effectiveness and their validity for the future (HSE, 2016).

2.9.1 Types of Safety Audit

HSE had summed up seven types of audit which are related to health and safety on construction sites. The seven types of audit are listed as follows (HSE, 2016):

- Health and Safety Audits;
- Audit of Health and Safety Plan;
- Walk Around Audit;
- Health and Safety Management Audit;
- Project Health, Safety & Environmental (HSE) Auditing;
- Process Safety Audit; and
- Product Safety Audit.

The seven types of Health and Safety Audit are briefly explained in Table 2.9.

Table 2.9: Description of the Types of Safety Audit (European Construction Institute, 2010).

S/No.	Types of Safety Audit	Description
1	Health and Safety Audits	To inform the company on how well it is performing in health and safety and meeting the standards which the company had set itself.
2	Audit of a Health and Safety Plan	The review of the plan at the end of the year.
3	Walk Around Audit	Determine whether the health and safety policies of the company are being properly implemented and to identify areas in which policy effectiveness needs to be improved.
4	Health and Safety Management Audit	Focuses on the entirely management of the health and safety.
5	Project Health, Safety and Environmental Auditing.	Provides the method for monitoring and controlling HSE activities and procedures throughout the life of the project
6	Process Safety Audits	Determine the program's implementation and effectiveness by following up on their application to one or more selected processes.
7	Product Safety Audit	Ensures that the company had adequately protected the user of a product from hazards that it did not know existed.

2.9.2 Health and Safety Audit Cycle

The Safety Audit Cycle (SAC) is the cyclic process used by management to systematic review operations and practices to ensure that relevant requirements are met (ACSCCS, 2010). SAC has five main stages namely, setting standards, measuring current practice, comparing results of practice standards set, reflecting plan change and implement change and lastly, re – auditing. The Safety Audit Cycle is illustrated in Figure 2.4.

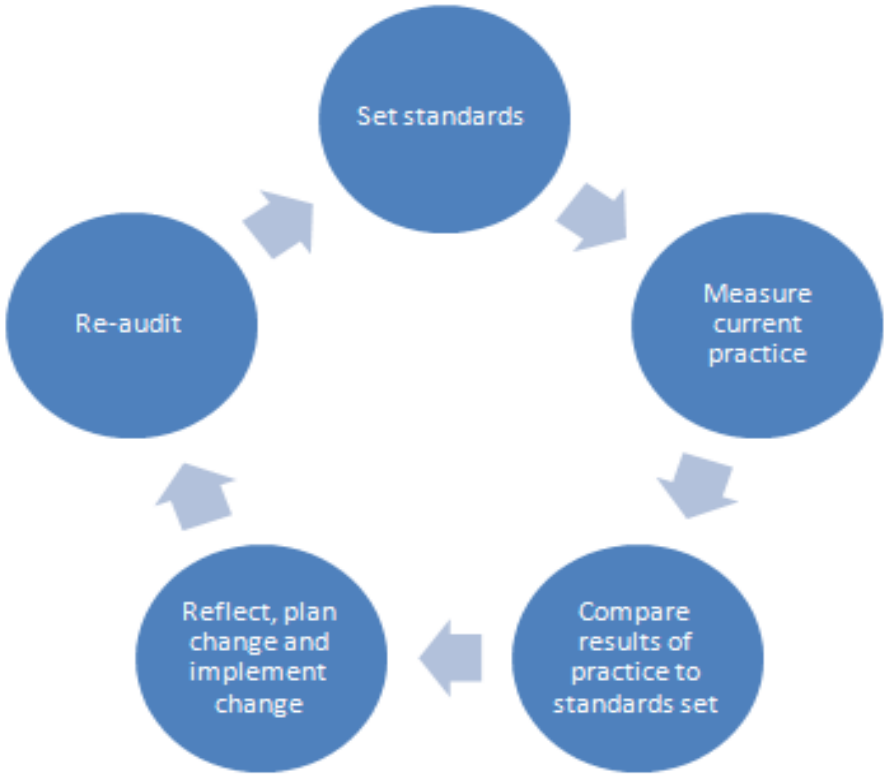

Figure 2.4: Relationship between the five stages of SAC (HSE, 2016)

Sets Standards - The first stage involves the construction company setting out HSS to be achieved after a stipulated time (HSE, 2015). In addition, the indicators to be measured against are also formulated (Dias, 2010).

Measure Current Practice - The current safety practice of the company are measured and the findings are recorded and compare with the set standards (European Construction Institutes, 2010). The measured practices are used as the input in the next stage of the SAC process (ILO, 2016).

Compare Results of Practice to Standards Set -The stage is conducted to determine whether measured and recorded results conform to standards set in first stage of the safety audit process. The company has to establish whether the standards were met or not and if not what was the reason (HSE, 2015).

Reflect Plan, Change and Implement -The findings from the last stage are presented and discussed with the workers and stakeholders of the construction company (ILO, 2016). The results should be developed in an action plan, specifying what to be done, how to do it and who should do it (Jones, 2013).

Re – Audit - This determines whether the actions taken have been effective, or whether further improvements are needed, it involves repeating the audit (ASSE, 2014).

2.10 Construction Accident

2.10.1 Occupational Accident

An Occupational Accident is an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death (ASSE, 2014). HSE defined accident as any unplanned event that results in injury or ill health of people, or damage or loss to property, plant, materials or the environment (HSE, 2013). Accidents not only result in considerable pain and suffering but marginalize productivity, quality, and time and negatively affect the environment and consequently add to the cost of construction (Muiruri and Cornelius, 2014). An Injury is define as any injury or ill-health which has arisen out of, or in connection with the work activity while near miss is defines as any incident that could have resulted in injury, damage or loss but did not on this occasion but could in the future (Warwickshire County Council, 2012). Muiruri and Cornelius (2014) defined an incident as a fire, fight among workers, or any activity not directly a result of construction activities.

Construction projects usually involve working in complex work environments that make it riskier with regards to worker health and safety (National Institute of Safety and Health, 2012). Occupational accidents on construction sites should be recorded and reported to the management of the company for investigation and action taken, this will prompt management to establish framework in places to avoid or minimise future occurrences (Hallowell et al., 2010).

2.10.2 Accident Reporting

Internationally, different countries have different legislations on the reporting of accidents, incidents, illness and near-misses on construction sites (HSE, 2012). The contractor's Project Safety and Health Plan submitted to the employer before the commencement of the project should describe accident notification procedures in an event of the accident on site (NIOSH, 2012). The procedure and process of reporting should be in accordance of the country's legislation and Standards. All the workers on construction sites must be aware of the importance of reporting all accidents and job-related illnesses to their supervisors (Hallowell et al., 2010).

In United Kingdom, the reporting system called RIDDOR standing for Reporting of Injuries, Diseases and Dangerous Occurrence Regulation 2013 is used (Wai, 2007 and HSE, 2013). RIDDOR is the law that requires employers, and other people in charge of work premises, to report and keep records of work-related accidents which cause deaths, certain serious injuries, diagnosed cases of certain industrial diseases and dangerous occurrences. The regulation stipulates employers to have a legal duty to report to HSE any injuries to workers resulting in an absence from normal work for more than three days (HSE, 2013).

In most developing countries accident reporting system is similar, South Africa, Nigeria, Ghana, Tanzania etc, the legislation mandate the Ministry of Labour to receive and record accidents on sites. In most countries, accidents happing on construction site are not effective and exactly reported as indicated by Mwanaumo, Thwala and Pretorious

(2013) that not all the companies report on actual statistics, such as Disability Injury Frequency (DIFR) and Lost Time Injury Frequency Rate (LTIFR).

2.10.3 Accident Recording

Accident recording and keeping of site accident data is very important as they ensure that the company collect sufficient information to allow the management of the health and safety risks (Dias, 2010). The collected data is valuable as it forms management tool that can be used to aid risk assessment and help to develop solution to potential risks (RIDDOR, 2013). Records help to prevent injuries and ill health, and control costs and ensure projects are executed with time frame.

2.10.4 Accident Investigation

All sites accidents and incidents must be investigated irrespective of the nature and severity of the accident, near-miss or dangerous occurrence (USA Medical Research Council, 2016). The purpose of any accident or incident investigation is to establish fact, determine the cause and take action to prevent re-occurrence. The investigation is not done to allocate blame. For the investigation to be effective it is essential that every accident, whether damage or injury is sustained or not, is recorded and investigated. The level of investigation will be proportionate to the injury, serious nature and the likelihood of it occurring again, (Wai, 2007 and HSE, 2013).

2.11 Provision of First Aid

First Aid is the immediate treatment or care given to a worker suffering from an injury or illness until more advanced care is provided or the person recovers (Safe Work Australia, 2014). It is the Employers' legal duties to provide Health, Safety and Welfare to employees on construction sites. First-Aid Regulations, (1981) require employers to provide adequate and appropriate equipment, facilities and personnel to ensure their employees receive immediate attention if they are injured or taken ill at work. Health Safety Executive stated that the regulations apply to all workplaces including those with less than five employees and to the self-employed (HSE, 2013).

First Aid requirements will vary from one construction sites to the next, depending on the scope of the project, the type of hazards, the workplace size and location, as well as the number of workers on site (ILO, 2015). The factors to be considered when deciding what first aid arrangements need to be provided are illustrated below (HSE, First Aid Guidance, 2013):

The nature of the work and site hazards - Certain construction sites have greater risks of injury and illness due to the nature of the project being carried out and the nature of the hazards sites (Red Cross, 2014). For example, the site with various earth moving machines and motor vehicle workshops has a greater risk of injury that would require immediate medical treatment than office engineer. The two scenarios will therefore require different first aid arrangements.

Size and location of the site - In relation to the size and location of the site, First Aider should take into account the distance between different work sites and the response times for emergency services (ILO, 2015). Further, the distance of the workplace from ambulance services, hospital and medical centres should be taken into account when determining your first aid requirements, (Safe Work Australia, 2014).

The number of workers and stakeholders – in this case, when considering the size of your workforce, all stakeholders include any contractors, subcontractors, and volunteers engaged on the project (Safe Work Australia, 2014). The size of the project workforce may vary over time. For the purposes of deciding who requires access to first aid, the considering should be for the maximum number of workers that may be engaged at any one time (HSE, 2014).

2.12 Health and Safety Training

Training is planned effort to enable employees to learn job-related knowledge, skills, and behavior (Noe et al., 2011). Training helps workers to learn how to do work. Training is not just about formal ‘classroom’ courses (HSE, 2015). Health and Safety Training in construction sites consist of instruction in hazard recognition and control measures, learning safe work practices and proper use of PPE, and acquiring knowledge of

emergency procedures and preventive actions (Muiruri and Cornelius, 2014). In the UK, The Health and Safety at Work Act (1974), requires every employer to provide whatever information, instruction, training and supervision as is necessary to ensure the health and safety of all workers on construction sites.

Employees must therefore be given health and safety induction training when they start work. Training should cover basics such as first aid, PPE usage and fire safety (Al-kilani, 2011). There should also be job specific Health and Safety Training. Training must also be provided if risks change, and refresher training when skills are not frequently used (Muirui and Cornelius, 2014).

It is important to provide health and safety information and training as it helps to ensure that workers working on sites know how to work safely and without risks to their health (ILO, 2014). Training also develops a positive health and safety culture, where safe and healthy working becomes second nature to everyone (OSHA, 2016). This will ensure the companies meet their legal duty to protect the health and safety of all the employees (HSE, 2015).

2.12.1 Steps of OHS Training

The HSE, Health and Safety Training Leaflet (HSE, 2015) outline five steps followed for the effective safety training of construction workers on construction sites. It is important to consult the employees or their representatives on the planning and organization of the training and make sure that the training is properly prioritized and planned (Noe et al., 2011).

Training Organization Needs - The management in consultation with the workers should identify the skills and knowledge needed for workers to do their job in a safe and healthy way, (OSHA, 2014). Compare these against workers' current skills and knowledge and identify the gaps, (HSE, 2015). Review the company experience of injuries, near misses or cases of ill health. The company should also consider awareness training needs for everyone, including directors, managers and supervisor.

Training Priorities - The first training consideration is the ones which are mandatory to all the construction company according to legislation and standards of the particular country (Al Kilani, Jupp and Sawhney, 2011). The other priorities include, were the largest numbers of staff will benefit, new recruits or workers new to the working environment, people changing jobs, working practices or taking on new responsibilities, people using new equipment, (OSHA, 2014).

Training Methods and Resources - There are many 'in – house' and external training methods used to training workers and top management of the construction company in health and safety. The USA, Department of Labour highlighted that of the two methods, in – house is more effective (DOL, 2015). In – house training methods includes, giving information or instruction, coaching or on-the-job training, training in the classroom, open and distance learning, in groups or individually and computer-based or interactive learning (Noe et al., 2011).

External training methods includes, national Occupational Standards, trade unions or trade associations, further education colleges, private training organizations, independent health and safety consultants, employer bodies, and qualification awarding bodies (HSE, 2014).

Conducting the Training - The organizers of the training should engage a qualified and competent person in OHS to conduct the training and make sure he had enough time to prepare the materials are easy to understand (HSE, 2011).

Checking Training Effectiveness - The process should be monitored to make sure the training was effective and the employees had understood the training materials. This can be done by getting feedback from line managers and the workers trained (Noe et al., 2011).

The steps for conducting the OHS Training program is illustrated in Figure 2.5, **Note** the Monitoring and Evaluation is incorporated to monitor and evaluate each and every step is the process.

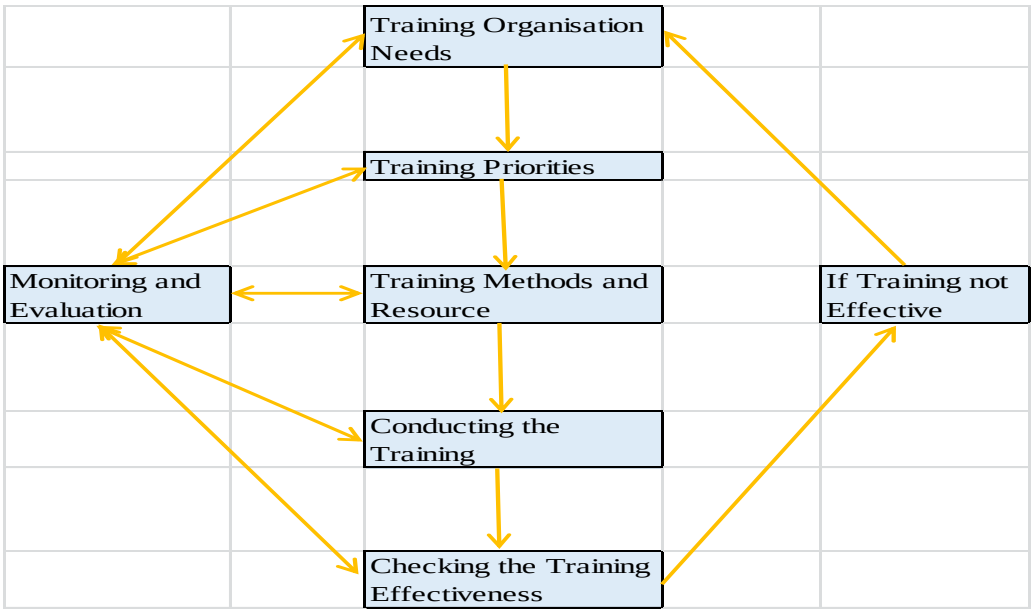

Figure 2.5: Steps in Conducting the OHS Training (HSE, 2014)

2.12.2 OHS Training in Construction Industry

In the construction sector, there are manly three types of OHS training namely, formal training, job specific and new job training. Training is defined as a planned effort to enable employees of a specific institution to learn job-related knowledge, skills, and behavior (Noe et al., 2011). The ILO (2011) stressed the importance of involving all the persons in the construction industry to possess adequate safety knowledge and have a high degree of safety awareness so that they are able to:

- recognize the importance of safety and assign sufficient resources to handle it;
- give proper consideration to safety during planning and design stages to eliminate/reduce safety problems during later stages of the projects;
- take into account potential safety problem during preparation/vetting of method statements;
- avoid performing unsafe acts and creating unsafe conditions; and

- identify unsafe acts/conditions and ask for rectification.

Formal Training - Formal training is defined as the process by which education is imparted on an individual through strict regimentations and scheduled learning sessions. Formal training is defined as learning through a systematic, well organized education model which is controlled, structured and administered according to a given set of laws and norms, presenting a rather rigid curriculum as regards to objectives, content and methodology, (John, 2012). From the definition of formal training it is easily concluded that the disadvantage of formal training is that it is expensive and hinder production as certain employees will be absence from sites during training, (Noe et al, 2011).

Job Specific Training - Job specific training is the training of employees on the specific roles, job groups and functions. This can be manual handling training provided to employees to ensure that they are completing work role safely and within recommend and approved safety guidelines (United Nation Economic Commission for Europe, 2013).

Induction Training – This involves training of new employees on health and safety matters, it intends to provide basic health and safety information to the new employees to follow and observe during their operations. HSE (2015) stated that it is the responsibility of the employers to ensure that all new employees go under induction safety training.

2.13 Summary

This chapter has reviewed the literature on health and safety in the construction industry. In the literature review, workers health and safety in developing countries were analyzed after which the legislation and standards were critically analyzed. These were followed by review on safety audit, construction accidents. Finally measures put in places on sites to avoid accidents were reviewed these are PPE, safety training and conducting of site inspection. Similar studies conducted in Zambia were, Safety and Health in the Construction Industry in Zambia' Tente, (2016) which was too general and the other one was 'An investigation into Cost of Construction Accidents in Zambia' Namonje, (2017) which was specific on construction accidents. Despite two studies done on the OHS in

the construction industry in Zambia, no research has been commissioned on the health and safety Standards Implementation in Building Construction Sites in Zambia.

Next chapter, Methodology, explains the undertaken methodology of the thesis including clarifications on research approach, research design and data capture method. An in-depth discussion about health and safety in construction industry as the chosen case study of the research is provided comprising social, economic and political aspects. And, research strategy, data collection methods and data analysis methods are explained.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Chapter two provided analysis and understanding of the literature on health and safety legislation and standards in construction industry. This chapter presents the research strategy used in this study. It starts by reviewing the basic research approaches available, which include the quantitative, qualitative and mixed methods approach. Thereafter, the chapter discusses the methods opted in this study and its justification. Individual interviews, questionnaires, focus group, and observations methods were used in this study to collect qualitative data. The chapter ends with a discussion of the validity and reliability issues relating to case studies and how they were taken care of.

3.2 Research Methods

There is no universal definition of the word research, different scholars have defined the word differently. Research is a structured inquiry that utilized acceptable scientific methodology to solve problems and creates new knowledge that is generally applicable (Kumar, 2014). Bhattacherjee (2012) defined, research as the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusion.

There are wide range of research methods used in social science research in the world today. The methods vary by the sources of information that are drawn on, how that information is sampled, and the types of instruments that are used in data collection. Methods also vary by whether they collect qualitative data, quantitative data or both. Data Collection techniques can be broadly divided into two, namely primary and secondary (Kaliba, 2010).

3.2.1 Primary Technique

The primary technique is used to collect the original data or information for a specific research. The researcher is the first to collect the information (Kaliba, 2010). There

various techniques employed to collect primary data includes, case study, focus group, interview, observations and questionnaire (Kumar, 2014).

Focus Group - Focus Groups are a form of technique in qualitative research in which attitudes, opinions or perceptions towards an issue, product, service of program are explored through a free and open discussion between members of a group and researcher (Bhattacherjee, 2012).

Case Study - Case studies usually involve the detailed study of a particular case (a person or small group). The researchers may be interested in a particular phenomenon for example research on health and safety of named site (Bhattacherjee, 2012). The advantage of case studies is that a very narrow focus which results in detailed descriptive data which is unique to the case studied (Kumar, 2014). Nevertheless, it can be useful in clinical settings and may even challenge existing theories and practices in other domains.

Observation - Observation techniques involve the observing people in an organization. The technique can be divided into two main categories, namely participant observation and non-participant observation (Kaliba, 2010).

Participant Observation - In participant observation studies, the researcher becomes (or is already) part of the group to be observed. This involves fitting in, gaining the trust of members of the group and at the same time remaining sufficiently detached as to be able to carry out the observation research (Kelly, 2016). The observations made might be based on what people do, the explanations they give for what they do, the roles they have, relationships amongst them and features of the situation in which they find themselves. The researcher should be open about what s/he is doing, give the participants in the study the chance to see the results and comment on them, and take their comments seriously (Kumar, 2011).

Non – Participant Observation - In non-participant observation studies, the researcher is not part of the group being studied. The researcher decides in advance precisely what kind of behavior is relevant to the study and can be realistically and ethically observed

(Kelly, 2016). The observation can be carried out in a few different ways. For example, it could be continuous over a set period of time or regularly for shorter periods of time or on a random basis (Bhattacherjee, 2012).

Interviewing - Interviewing is a commonly used method of collecting information from people. Interview is defined as any person to person interaction, either face to face or otherwise, between two or more individuals with a specific purpose in mind (Kumar, 2014). This includes research methods such as observations, interviews and administrating of questionnaires to the interviewee. This method has its own advantages and disadvantages, (Kaliba, 2010).

Its advantages being:

- incorporates illiterate respondents;
- permits clarification of issues; and: and
- gives a higher response rate than written questionnaires.

Disadvantages of the method include:

- the presence of the interviewer may influence responses;
- reports of events may not be as complete as in the case of observation;
- personal interviews are costly in terms of time and money; and
- a danger of serious disparities is likely if more than one interviewer is used.

Interviewing method is classified into three different categories namely structured interview, semi-structured interview and unstructured interview.

Unstructured Interview - The researcher has almost complete freedom on how to provide in terms of content and structure of questions in unstructured interviews. The interviewer is free to order the interview in whatever sequence he wishes and also in terms of wording uses and the way he explains questions to the respondents (Bhattacherjee, 2012).

Structured Interview - In a structured interview the researcher asks a predetermined set of questions, using the same wording and order of questions as specified in the interview schedule. An interview schedule is a written list of questions, open ended or closed, prepared for use by an interviewer in person to person interaction (Acharya, 2010).

Semi – Structured Interview - contains components of both, structured and unstructured interviews. In semi-structured interviews interviewer prepares a set of same questions to be answered by all interviewees, however, additional questions might be asked during interviews to clarify and/or further expand certain issues (Powell and Connaway, 2010).

Questionnaire - A questionnaire is a written list of questions on the particular research topic, the answers to which are recorded by respondents. In a questionnaire respondents read the questions, interpret what is expected and then write down the answers Kumar (2014). The only difference between an interview schedule and a questionnaire is that in the former it is the interviewer who asks the questions and records the respondent's replies on an interview schedule and in the latter replies is recorded by the respondents themselves (Powell and Connaway, 2010).

Questionnaire as the method of primary data collection had its advantages and disadvantages (Powell and Connaway, 2010). Advantages of questionnaires include:

- increased speed of data collection;
- low or no cost requirements; and
- higher levels of objectivity compared to many alternative methods of primary data collection.

However, questionnaires have certain disadvantages as well, such as:

- selection of random answer choices by respondents without properly reading the question;
- absence of possibility for researchers to express their additional thoughts about the matter due to the absence of relevant questions: and

- low response rates may result as some respondents may decide to put the questionnaire in the rubbish bins as opposed to completing it.

Questionnaires can be classified as both, quantitative and qualitative method depending on the way questions are structured. Specifically, answers obtained through closed-ended questions with multiple choice answer options are analyzed using quantitative methods and they may involve pie-charts, bar-charts and percentages. Whereas answers obtained to open-ended questions are analyzed using qualitative methods and they involve discussions and critical analyses without use of numbers and calculations (Powell and Connaway, 2010).

Open – ended Questions are questions that allow the respondents to give a free-form answer. The respondent is not given possible answers to choose from, (Kaliba, 2010). Open ended questions usually ask how, what, when, where or why, and require the respondent to answer in their own words. Responses tend to be qualitative and are used during exploratory research, when statistics are not the ultimate objective (Powell and Connaway, 2010).

The advantages of open – ended are:

- respondents can answer in detail and can qualify and clarify responses;
- unanticipated findings can be discovered;
- they permit creativity, self-expression, and richness of detail; and
- they reveal a respondents logic, thinking process, and frame of reference.

Disadvantages of open –ended questions are:

- different respondents give different degrees of detail in answers;
- responses may be irrelevant or buried in useless detail;
- comparisons and statistical analysis become difficult;
- coding responses is difficult· articulate and highly literate respondents have an advantage; and
- a greater amount of respondent time, thought, and effort is necessary.

Closed – Ended Questions - In the closed – ended questions, the possible answers are set out in the questionnaire or schedule and the respondent or the investigator ticks the category that best describes the respondent's answer (Kumar, 2014).

Advantages of closed ended questions

- it is easier and quicker for respondents to answer;
- the answers of different respondents are easier to compare, code and statistically analyze;
- respondents are more likely to answer about sensitive topics; and
- less articulate or less literate respondents are not at a disadvantage.

Disadvantages of closed ended questions

- they can suggest ideas that the respondent would not otherwise have;
- respondents can be frustrated because their desired answer is not a choice;
- they force respondents to give simplistic responses to complex issues; and
- they force people to make choices they would not make in the real world.

3.2.2 Secondary Technique

This technique involves the use of available information that was collected by someone else for some other purpose (Kelly, 2016). The data is reused for another researcher for another purpose. The researcher in this case is the secondary user of the information. An example of such a technique is literature review. Secondary technique has some advantages and disadvantages as well (Kaliba 2010).

Some advantages of using secondary techniques:

- inexpensive in that the data is already in existence, therefore no hassles of data collection;
- permits the analysis of trends such as traffic or population growth trends; and
- less time is involved in searching secondary source than primary data.

Some disadvantages of using secondary techniques:

- ethical issues of confidentiality for instance in the case of on-going government projects might make the information not to be availed to the researcher;
- information may be incomplete and imprecise – this relates to issues of the methods employed; and
- information from personal diaries, newspapers and magazines may have the problem of personal bias as writers are likely to exhibit less rigorousness and objectivity than one would expect in research reports.

3.3 Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose (Kelly, 2016). Acceding to Kumar (2011) a research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research problems.

This research was designed to answer the problems identified in Section 1.1 and achieve the objectives outlined in Section 1.4 of the introduction. It was considered essential to obtain a full understanding of the study by setting out the various elements in a logical sequence, so as to avoid misunderstanding at any point in the research. For this reason, problem statement, aims and objectives of the research were stated in the first chapter of the study. For the purpose of data acquisition, the guiding principle was to assess HSS implementation in building construction sites in Zambia. Data was collected through administering of questionnaire with both open - ended and closed – ended questions. The first one was directed at the Government Institutions and Regulators tasked and mandated with the management of OHS in Zambia, while the other one was for acquisition of data from the contractors, consultants and construction workers on sites.

3.3.1 Literature Review

To fully understand the OHS in the Zambian construction industry, reviews of the body of knowledge developed during previous researches was done. The method was employed based on the fact that it is easier and cheaper to lay foundation of the research and build it up on what has been established by others (Kaliba, 2010). A literature review

is simply a comprehensive review of the published work from secondary sources in an area of specific interest to the researcher (Cavendish University Zambia, 2010). According to Cavendish University Zambia, (2010), literature review ensures that:

- it places the research work in context by drawing on other disciplines;
- it provides a background by which the researcher is able to review the work of previous authors and explain their relevance to your project;
- important variables that are likely to influence the problem situation are not left out of the study;
- important concepts, ideas and their implications are identified;
- a clearer idea emerges as to what variables/s would be most important to consider, why they would be considered important and how they could be investigated to solve the problem;
- the researcher does not run the risk of 'reinventing the wheel' and, in doing so, waste efforts on trying to rediscover something that is already known; and
- the researcher narrow down the research question/problem to a specific form suitable for academic research.

Literature Sources

Undertaking a search of available literature demands a considerable amount of time and effort on the part of the researcher and as such is a daunting prospect for most people (Kelly, 2016). For purpose of the study of the application of OHS Standards in building construction in Zambia, the following sources of information were considered:

Journals are also known as 'periodical' 'serials' and 'magazines' and are published on a regular basis. Journals are a vital literature source for any research. They are well covered by tertiary literature, and good selection can be accessed from most university libraries.

Books and monographs are written for specific audiences. Some are aimed at the academic, with a theoretical slant. Others, aimed at practicing professionals, may be more applied in their content. The material in books is usually presented in a more ordered and accessible manner than in journals, polling together a wider range of topics, they are

therefore, practically useful as introductory sources to help clarify research question(s) and objectives or research methods intended to used.

Newspapers are good source of topical events, developments within business and government, as well as recent statistical information such as share prices; they also sometimes review recent research report. Care should be taken when using newspaper by researcher, as newspaper may contain bias in their coverage.

Reports include OHS research reports such as those produced by American Society of Civil Engineer and other academic reports. It is not easy to get access to those reports as they are not as widely available as books. It is important to try to assess the authority of the author, and to beware of personal bias.

Conference proceedings sometimes referred to as symposia, as often published as unique titles within journals or as books. Most conferences have a theme that is very specific, but some have a wide-range overview. Many conferences have associated web pages providing abstract and occasionally the full papers presented at the conference.

Theses and dissertations are unique and so far a major research project can be a good source of further references. Unfortunately, they can be difficult to locate and, when found, difficult to access as there may be only one copy at the awarding institution

The Internet is the fastest-growing source of information, soft copies of e-books, e-journals, e-conference papers and e-researches papers can easily obtained. It is impossible to characterize the information available but there are some hints about using electronic sources: it should be borne in mind that anyone can post information on the internet so the quality may not be reliable.

3.3.2 Population and Sample

Population is define as all the elements in a well - defined collection or set of values while a sample is any subset of the values from the population (Bhattacherjee, 2012). While, a complete enumeration of all the items in the ‘population’ is known as a census inquiry (Kelly, 2016). Census inquiry involves a great deal of time, money and energy

and is not possible in practice under many circumstances (Powell and Connaway, 2010). If the entire population is not studied, it is important to use an appropriate sampling technique to obtain a truly representative sample (Bhattacherjee, 2012). Representativeness of the sample is critical to survey research; otherwise, reliable inferences about the target population cannot be made from the sample. Other important attributes of good quality survey research are the relevance of information collected to the research questions (Kelly, 2016).

For the first stage of the study, the targeted sample of 15 respondents was considered for the collection of detailed in - depth information on OHS Standards in the Zambia Construction Industry, from which after analyses, 10 were used for the study. For the sample to be reliable and accurately represent the study, Government Institutions and Regulators tasked with responsibilities of ensuring the enforcement and management of OHS standards in the country were target.

In the second stage of the research, the total population of the study was the 2,884 construction and consultant companies registered with the NCC in Grade 1 – 6 and in categories 'B' or 'C' as of November, 2016. In this study, the total controlled sample of 70 companies was selected from the population of 2,884 registered companies. The total of 150 respondents were targeted from the 70 selected companies. A crucial decision was made when selecting samples so as to truly represent the population to which the findings would be generalized.

Following the NCC grading system of construction companies in Zambia, Contractors are graded from Grade 1 to 6, with grade 6 being the entry grade for beginners in the industry and grade 1 as the most experienced companies. In the research companies registered in Grade 1 to 6 and Categories 'B' for Buildings and 'C' for civil works were considered and used. Further, the construction companies were grouped as follows:

- group 1 - for Grade 1 and 2 in categories B and C;
- group 2 - for Grade 3 and 4 in categories B and C; and
- group 3 - for Grade 5 and 6 in categories B and C.

The total numbers of the Questionnaires administered, Retrieved and used in the study are summarized in Table 3.1.

Table 3.1: Numbers of Questionnaires Administered, Retrieved (field Survey, 2016).

S/N	Total Questionnaires Administered		Questionnaire Retrieved	Questionnaires used in Study
1	Interview survey	15	10	10
2	Questionnaire survey	150	135	130
	Total	**165**	**145**	**140**

Sampling Techniques - Purposive samples was used to obtained appropriate respondents from were in - depth information was collected by using semi - structured interview. For quantitative information, cluster sampling was used first to select representative samples from contractors and consultants, and then random sampling was used for selecting samples within the group of consultants and contractors.

3.3.3 Data Collection

Data was collected through interviews and administering of questionnaires.

Interviews

The primary data was collected through the semi - structured interviews with senior officers from MLSS - OSHSD, Ministry of Hosing and Infrastructure Development (MHID), NCC, Zambia Bureau of Standards (ZABS), Engineering Institute of Zambia (EIZ) and Zambia Institute of Architecture (ZIA). Interviews were conducted prior to the preparation and administering of the questionnaires, the process was conducted to obtain preliminary data that enhanced the questionnaire survey as such the targeted population was limited to 15 participants of which only 10 interviews were conducted and data used in the study.

Questionnaire Survey

The self-administered questionnaire survey was adopted as the main research instrument based on the advantages that a representative sample would be realized with little time or

costs. The method was employed considering the busy nature of the construction industry and therefore, allowed more respondents to participate. The respondents were assured of anonymity which in turn helped them to be honest in their answers, to this effect only the company name was indicated on the questionnaires and not the respondent name. To avoid bias due to personal characteristics of the interviewer, no interview was used. This measure was important in the study as the respondents might have tried to impress the interviewer if present, thereby portraying a picture that their organization is applying HSS on construction sites. This method also allowed respondents to have adequate time to consult where they were not sure, thereby answering the questions more appropriately. These factors made this method more advantageous compared to the other methods available.

Questionnaire Design - The questionnaire was designed to meet the research aim and objectives outlined in the introduction of this study. The designed questionnaire had the following components, research title, introduction, response instructions, demographics information, questions and gratitude. A letter of reference was prepared and signed by the Head of Department, Civil and Environmental Engineering, School of Engineering, University of Zambia (UNZA). In the letter, the Head of Department committed the school to have the information strictly for education research purpose only and to keep confidential within UNZA itself.

- the introduction outlined the title and research topic as "An Assessment of Health and Safety Standards Implementation in Building Construction Sites in Zambia",
- the response instructions specify the modes (s) of completion of the questionnaire. Respondents were specifically instructed to tick in the boxes provided after each question;
- demographics information - Demographical information refers to personal data of the respondents, which is required for analysis, and interpretation of the data. The information asked in the questionnaires were, Gender, Age, professional, type of organization the respondents working for, position held, how long the respondent had worked in the company and construction industry; and

- the questions deal with the substantive content of the research. The questions were structured logically in line with the formulated aim and the objections of the study, starting with section A. on application of HSS, Section B. assessing the application of health and safety and lastly section C. on analyzing the National Policy and legislation framework. The gratitude section ends the questionnaire. It is essential to recognize that the respondent is under no obligation to complete the questionnaire and is doing the researcher a favor. This was done by ending with a statement of thanks to the respondent for taking time and effort to complete the questionnaire.

Administer and Collection of Questionnaires - The modes of administering questionnaires to respondents may be categorized into three, namely: Mailing, personal delivery with collection on the spot, and personal delivery with collection after a time internal. For this study, mostly two modes were used namely, personal delivery with collection on sport and personal delivery with collection after a sometime.

Personal administration with on-the-spot collection – Using these modes, the questionnaires were delivered in personnel and by three of my research assistants. I took advantage of my day to day operation at work of supervising and monitoring of construction projects under the Ministry of Home Affairs to deliver, wait and collect the questionnaires back. This mode guarantees a hundred per cent delivery and return. The other advantage of the mode was that it provided opportunity for clarifying questions ask by respondents and for explanations to be asked by the researcher. Ambiguities were thus kept to a minimum. Care was taken to avoid influencing the respondents to fake responses or put them under psychological tension to avoid the validity of the responses was reduced.

Personal delivery with collection after a time interval – The questionnaires were delivered in person and return to collect them after a period of time. The advantages of this mode over on-the-spot collection were that respondents were afforded time to look up information and were more relaxed while completing the questionnaire in the absence of the researcher. This mode was preferred when documents and other sources need to be

consulted in order to respond appropriately. Unfortunately, the some respondents were not available when returns to collect the completed questionnaire and other were found not to have filled the questionnaire.

Internet - The questionnaires were delivered through emails and the respondents were expected to complete and return by post. High response and return rate was encouraged though the engaging fellow government offices in the construction sector like the Provincial Buildings Engineers Offices in the provinces.

A total of 150 structured questionnaires were administered to workers in the construction and consultancies firms in the Construction Industry. 135 responses were retrieved, out of which 5 were rejected; therefore 130 questionnaires were used for quantitative survey in the study.

3.4 Data Analysis

The data collected from the field survey exercise was analyzed using both quantitative and qualitative methods and presented accordingly. The quantitative method was used to analyze data collected from the 135 employees in the construction industry. For quantitative data, descriptive and inferential statistics were used and analyzed using SPSS software, percentage was used as the method is easier to use and to interpret the data. The combination of Qualitative and quantitative methods was used for data collected from the government institutions and regulators. The research used the thematic analysis methods to analyze the qualitative data. The method was adopted because the extent of application of management principles is very difficult to measure quantitatively as the major variables are theories and subjective. As supported by Shakeri (2012) in his research on Leadership effectiveness in Organization, there are no defined quantitative models of measuring management principles in studies today.

3.5 Summary

The chapter has highlighted the methods of data collection. The primary data was collected from interviews and questionnaires. The secondary data was collected from books, journals, internet, reports, newspapers and conference proceedings. The sampling

methods employed in the study are stratified and purposive sampling. The collected data was analyzed using excel and SPSS and presented in percentages. The chapter further, justifies the use of both qualitative and quantitative methods of analysis.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

The chapter present the research findings and discussion of the survey conducted. The results and discussion are devised in five parts in line with the main objectives of this research as follows:

- to determine the construction OHS standards available in Zambia's construction industry;
- to evaluate the implementation of OHS of workers on building construction sites in Zambia's construction industry;
- to assess National Policies, Legislation and Implementation Frameworks in place to facilitate management of OHS Standards in building construction;
- to determine factors that inhibits the implementation of OHS standards in the construction industry in Zambia; and
- to develop an OHS Framework that will enhance effective implementation of OHS standards in Zambian construction industry.

In this study, data presentation was done chronologically following the order of objectives set in the first chapter of the research. The total of 140 respondents were used in the study as indicated in Table 4.1.

Table 4.1: Total number of respondents used in the research (field Survey, 2016)

Research Method	**Frequency**	**Percentage (%)**
Questionnaire Survey	130	92.9
Interview Survey	10	7.1
Total	**140**	**100**

4.2 Presentation of Interview Results

The interviews were conducted to obtain preliminary in - depth data on the management and implementation of OHS in the construction industry in Zambia. The collected data was analyzed and used in the preparation of questionnaires used for quantitative data collection. The data was collected through the semi - structured interviews, the first part of the interview for demographics data collection contained closed ended questions while second part had both opened ended and closed ended questions. Interviews were conducted with officers from MLSS - OSHSD, MHID, NCC, ZABS, EIZ and ZIA. The process was conducted to obtain preliminary data that enhanced the questionnaire survey as such the target population was limited to 15 top and middle managers. The five respondents were not interviewed as they were not available despite several attempts. The institutions and number of respondents are tabulated in Table 4.2.

Table 4.2: Total No. of respondents with respective institutions (field Surveyor, 2016)

S/N	Institution	Number of Respondent	Category of institute
1	MLSS - OSHSD	3	Government
2	ZABS	2	Regulator
3	EIZ	1	Contractor
4	MHID	1	Government
5	ZIA	1	Statutory body
6	NCC	2	Statutory body
Total		**10**	

4.2.1 Gender of Interviewees

The interviewees were requested to indicate their gender by ticking the appropriate box they belonged. The purpose was to find out the number of males and females who participated in the study. Table 4.3 shows that out of the 10 respondents who participated in the survey, the majority 9 of the respondents representing 90% were males, while 1 respondent representing 10% being female.

Table 4.3: Gender of Interviewees (field Surveyor, 2016)

Gender	**Frequency**	**Percentage (%)**
Male	9	90
Female	1	10
Total	**10**	**100**

4.2.2 Age of Interviewees

Table 4.4 depicts the age distribution of interviewees who participated in the study. The purpose was to find out the average age of the officers who are actively involved in the management of OHS in Zambia. The findings were tabulated in Table 4.4.

Table 4.4: Age of Interviewees (field Surveyor, 2016)

Age (Years)	**Frequency**	**Percentage (%)**
≤20 years	0	0
20 - 29 years	1	10
30 - 39 years	5	50
40 - 49 years	4	40
≥50 years	0	0
Total	**10**	**100**

4.2.3 Speciality of Interviewees

The interviewees were asked to indicate their speciality. The purpose was to find out their area of operation and speciality in their occupation. Table 4.5 shows responses distribution of the interviewee's speciality.

Table 4.5: Speciality of interviewees (field Surveyor, 2016)

Professional	Frequency	Percentage (%)
Architecture	1	10
Social Science	3	30
Environmental Engineering	2	20
Civil Engineering	2	20
Health, Safety and Environmental	2	20
Total	**10**	**100**

4.2.4 Position Held

Table 4.6 depicts the position held by interviewees; the information obtained are tabulated in Table 4.6.

Table 4.6: Position Held by the Interviewees (field Surveyor, 2016)

Position Held	Frequency	Percentage (%)
Top Management	7	70
Middle Management	3	30
Total	**10**	**100**

4.2.5 Working Experience in the Organization

Table 4.7 depicts the working experience of officers in their current organization who participated in the interview. The objective was to determine how long employees had worked in the organization. The findings were tabulated in Table 4.7.

Table 4.7: Working Experience in Organization (field Surveyor, 2016)

Period	Frequency	Percentage (%)
≤5 years	4	40
6 - 10 years	2	20
11 - 15 years	3	30
16 - 20 years	2	20
≥21 years	0	0
Total	**10**	**100**

4.2.6 Application of OHS in Construction Industry

The interview survey was carried out from MLSS – OSHSD, ZABS, EIZ, MHID, ZIA and NCC on the application and implementation of OHS of workers in the construction industry. The findings were as follows:

- **Provision of PPE** - All the 10 interviewees stressed the importance of provision of appropriate PPE to all the workers and visitors on the construction sites. Furthermore, the interviewees indicated that instructions should be given to the workers on the correct use of the PPE;
- **Provision of First Aid** - 9 of the 10 interviewees stated that construction and consultancy companies need to provide and maintained First Aid Box on site so as to readily accessible by workers and to be in charge of responsible qualified person;
- **Formation of Health and Safety Committees** - 7 out of 10 interviewees explained that Health and Safety Committees should be formed and management of the companies should monitor there effectiveness as far OHS management on site is concern;
- **Preparation of Health and Safety Policy** - 5 out of 10 interviewees explained that Health and Safety Policy should be prepared and submitted to Health and Safety Inspection team. Furthermore, the policy should be made available to all the employees on the construction sites;

- **Conducting of Health and Safety Training** - 8 of the 10 interviewees indicated the importance of construction and consultancy companies to conduct health and safety Training to the employees especially when they are exposed to new hazards. New employees should also be provided with OHS information before been permitted to commence work on sites; and
- **Conducting of Health and Safety Inspections** - 9 out of 10 interviewees stressed that institutions mandated with the responsibility of conducting Health and safety Inspection on sites should regularly visit and carry out inspections.

4.2.7 OSH National Policy, Legislation and Framework

The study assessed the adequacy of the OHS National Policy, current legislations and the institutional framework in Zambia, 10 senior officers were interviewed and the findings are illustrated in Table 4.8.

Table 4.8: OHS National Policy, Legislation and Framework (field Surveyor, 2016).

S/No.	Statement (Legislation, National Polices and Frameworks)	Adequate		Moderate		Not adequate		Total	
		N	%	N	%	N	%	N	%
1	In your opinion, are the following adequate in the Zambia Construction Industry?								
	a. Current Health and Safety Legislation;	4	40	3	30	3	30	10	100
	b. National Policies on Health and Safety; and	1	10	2	20	7	70	10	100
	c. Implementation framework of Health and Safety.	3	30	3	30	4	40	10	100

Table 4.8 indicated that 3 interviewees representing 30% said that the current health and safety legislation were not adequate. 3 representing 30% stated that they are moderate, while 4 respondents representing 40% agreed that the legislation were adequate. The interviewees were also investigated on their opinion on the adequacy of the National Policies on health and safety, 7 representing 70% indicated that the National Polices were not adequate, 2 representing 20% said that they are moderate and 1 representing 10% demonstrated that the polices are adequate. Furthermore, Table 487 illustrated that 4 interviewees representing 40% declined that the implementation framework are not

adequate while 3 interviewees representing 30% accepted that the implementation framework were moderate and the remaining 3 representing 30 % indicated the framework to be adequate.

4.2.8 Health and Safety Standards (HSS)

Interview was carried out with senior officers from MLSS – OSHSD, ZABS, EIZ, MHID, ZIA and NCC on the implementation of HSS in the construction industry in Zambia. The findings from the interview were that ZABS was instituted and mandated with the responsibilities of developing standards in various sectors including building and construction industry.

Zambia Country Profile on Occupational Safety and Health (2012) highlighted that (ZABS), a Statutory National Standards Body established by an Act of Parliament (Chapter 416 of the Laws of Zambia) had developed several technical standards that are related to OHS. Some of the OHS-related ZABS standards stipulate specifications regarding the design, manufacture and performance of PPE including industrial safety footwear, industrial safety belts and harnesses, industrial safety helmets, industrial safety gloves, boiler suits, protective coats, lifejackets and buoyancy aids. According to the field information gathered through semi - structured interview from senior Government and Regulations officers, it was clearly established that there is very little awareness regarding technical standards developed by ZABS in the construction industry.

The key ZABS technical standards related to OHS are shown in Table 4.9. It can be noted from the Table that there are few HSS developed specifically for the building construction industry as of the time of data collection.

Table 4.9: Key technical Standards Developed by ZABS in OHS (field Surveyor, 2016)

Standards No.	**Standard Name**	**Provisions of Standard**
ZS 402: 2006	Classification of Hazardous Locations and the Selection of Apparatus for Use in such Locations - Code of Practice	Classifies locations in which fires or explosions may occur owing to the presence of flammable gases, vapors, dusts, or fibrous material in the air.

ZS 418, Part 1: 2005	Electrical Safety Code - Code of Practice	Outlines rules for practical safeguarding of persons, domestic animals, property and the environment from the hazards of electrical practices employed by a system during and after construction, installation and commissioning.
ZS 418, Part 2: 2003	Electrical Safety Code - Code of Practice	Provides guidance on safety in the operations and maintenance of electrical systems. It covers the basic provisions for safeguarding of persons, domestic animals, property and the environment from hazards from the installation, operations or maintenance of electrical equipment.
ZS 604,Part 1: 2006	The Petroleum Industry - Code of Practice	Provides guidance on the fire precautions and fire prevention in the oil refineries and bulk storage capacity exceeding 10,000 m^3
ZS 604,Part 2: 2006	The Petroleum Industry - Code of Practice	Stipulates the precautions to be observed during the cleaning of fixed bulk storage tanks operating at near atmospheric pressure, of the types commonly encountered in petroleum refineries, installations, depots and terminals.
ZS 604,Part 3: 2006	The Petroleum Industry - Code of Practice	It is for the guidance of users of equipment operating over a wide range of pressure and temperature, together with their associated protective safety device
ZS 604,Part 4: 2006	The Petroleum Industry - Code of Practice	Provides basic examination and test procedures based on petroleum industry practices that, through operating experience, have proved to be both necessary and beneficial for safe and economic operation as well as for protection of the environment.
ZS 604,Part 5: 2006	The Petroleum Industry - Code of Practice	It defines procedures for the monitoring of permanently installed protective instrumentation to ensure that its fitness for the purpose is maintained.
ZS 604,Part 6: 2006	The Petroleum Industry - Code of Practice	Provides occupational health guidance for the petroleum industry.

4.2.9 Factors Inhibiting the Health and Safety Implementation

It was established that the regulators and government institutions responsible for inspecting and enforcing the HSS were not adequate. In this research, an in-depth

assessment of factors inhibiting the effective implementation of HSS in construction industry was carried out by semi - structured interview targeting senior officers from OHS regulators and government institutions. From the research findings it was established that only MLSS – OSHSD and NCC visited and carried out Health and Safety Inspections on construction sites. The following were highlighted as the main factors inhibiting the implementation of HSS in the construction industry:

i. Inadequate Qualified Manpower

The comparison of the establishments and the actual staff revealed that the NCC and MLSS - (OSHSD) put together had inadequate staff to carry out inspections of OHS in building construction throughout the country. Despite that the total staff establishment for MLSS – (OSHSD) was increased in 2013, 2014 and 2015 by thirteen (13) inspectors from twenty seven (27) to forty (40), the actual number of inspectors was still below the approved establishment. In the case of NCC, the number of inspectors had been constant from 2014 with the total of 8 inspectors. The approved establishment and actual staff for MLSS – (OSHSD) and NCC are shown in Table 4.10

Table 4.10: Approved and Actual Establishment at OSHSD and NCC (field Surveyor, 2016)

Institution	Approved Establishment	Actual No. of Inspectors		Approved Establishment	Actual No. of Inspectors		Approved Establishment	Actual No. of Inspectors	
	for 2011/2012	2011	2012	for 2013/2014	2013	2014	for 2015/2016	2015	2016
OSHSD	27	12	12	40	14	14	54	15	15
NCC		8	8		8	8		8	8
	27	**20**	**20**	**40**	**22**	**22**	**54**	**23**	**23**

ii. Inadequate and Underfunding of OHS Activities

The research findings revealed that during the period under review, (2011 - 2015), the two organizations implementing and enforcing OHS on construction sites were underfunded, further, the allocated budget was not released in totality. Table 4.11 illustrates the approved budget, actual releases and expenditure for MLSS – (OSHSD) and NCC.

Table 4.11: Budget, Release and Expenditure by OSHSD and NCC (field Surveyor, 2016).

Year	Institution	Budget Amount (K)	Actual Released Amount (K)	Actual Expenditure Amount (K)	Percetage (%) Actual Released	Percetage (%) Actual Expenditure	Variance Amount (K)
	OSHSD						
2011		2,749,126.00	2,742,807.00	2,479,795.00	99.77	90.20	6,319.00
2012		2,842,731.00	1,927,068.00	1,506,356.00	67.79	52.99	915,663.00
2013		3,661,508.00	1,049,842.00	870,736.00	28.67	23.78	2,611,666.00
2014		3,560,850.00	2,645,900.00	2,476,590.00	74.31	69.55	914,950.00
2015		4,144,497.00	3,375,000.00	2,957,432.00	81.43	71.36	769,497.00
TOTALS		**16,958,712.00**	**11,740,617.00**	**10,290,909.00**	69.23	60.68	**5,218,095.00**
	NCC						
2011		2,679,900.00	2,678,950.00	2,350,750.00	99.96	87.72	950.00
2012		2,777,408.33	2,345,890.00	1,645,509.00	84.46	59.25	431,518.33
2013		3,661,508.00	2,745,087.00	1,909,605.00	74.97	52.15	916,421.00
2014		3,500,000.00	2,557,650.00	2,508,055.00	73.08	71.66	942,350.00
2015		3,500,000.00	3,152,550.00	3,005,679.00	90.07	85.88	347,450.00
TOTALS		**16,118,816.33**	**13,480,127.00**	**11,419,598.00**	83.63	70.85	**2,638,689.33**
GRAND	**TOTAL**	**33,077,528.33**	**25,220,744.00**	**21,710,507.00**			**7,856,784.33**

Table 4.11 indicated that the MLSS – (OSHSD) received 99.77% of its funding in 2011. The Department received 67.8% in 2012 with the worse situation in 2013 were only 28.7% was released. In the past four years, the total of K 16,958,712.00 was allocated to MLSS – (OSHSD) for the inspection and implementation of health and safety programs of which K 11,740,617.00 was released representing 69.23%. The total of K10,290,909.00 was expended on, representing 60.68% of the budgeted amount.

Furthermore, Table 4.11 indicated the budgetary funding, actual released and expenditure for NCC. It is worth stating that the tabulation of funding profile under the NCC were not specifically for the inspections of OHS on site, but the whole operations in the specified years. Therefore, the actual allocation to the inspections and enforcing of OHS were much lower than the tabulated amounts.

iii. Weakness in Legislations and Regulations on OHS

The research established that there are overlaps in the institutions functions due to the multiple laws. The functions of the two institutions mandated with the responsibility of enforcing OHS laws on sites were found to be overlapping. There was also duplication in OHS legislations, inspections and other activities. In addition, there are other specific weaknesses in the OHS legislations in the country.

Overlapping in Institutional Functions - The two institutions identified to carry out Health and Safety Inspection on construction sites are the NCC and MLSS - (OSHSD). The OSHSD is responsible for the enforcement of the Factories Act, Chapter 441 of the Laws of Zambia. The department had two mandates namely, to administer and enforce the Factories Act in order to protect workers and to some extent the general public from occupational hazards; and to promote OHS in the country (Zambia Country Profile on Occupational Safety and Health, 2012).

The National Council for Construction Act, 2003 (Act No. 13 of 2003) had the Statutory Instrument No. 119 of 2008, called the National Council for Construction (Contractors) (Code of Conduct) Regulations, 2008. In the SI, the NCC had been mandated to promote OHS in the construction industry by ensuring that the contractors do not expose their employees to unsafe working environment and provide appropriate PPE to the employees.

Further, the Ministry of Health had been mandated by Occupational Health and Safety Act, 2010, to ensure that health, Safety and Welfare of employees at work place are provided by employers. The duties of the employers and employees outlined in OHS Act, 2010 are the same as those stated in the Factories Act, Chapter 441and the NCC Act, 2003 (SI No. 119 of 2008. This situation has resulted in the overlapping of the institutions functions and operations in the management of OHS in the country.

Duplication in Occupational Health and Safety Acts - A thorough analysis of the available OHS Acts in Zambia and the in – depth information gathered from the semi – interviews, revealed that there is duplication in the Health and Safety Acts which results in duplication of inspections and other activates conducted by the regulatory bodies. Table 4.12, highlighted the duplication.

Table 4.12: Duplication in OHS Acts (field Surveyor, 2016)

S/N	Legislation	Main Function in line with OHS	Duties of Employer in line with OHS
1	Factory Act - Chapter 441.	Provides for the regulation of safety, health and welfare in factories and other places.	1. To provide and maintain first Aid box on site. 2. Provisions of PPE to workers. 3. Provision of adequate sanitation facilities, washing facilities, accommodation and changing rooms.
2	National Council for Construction Act, 2003 - SI, 2008.	Regulation of Health and Environmental Safety.	1. Ensure that the employees are not expose to unsafe working environmental 2. Provide and Maintain First Aid Box. 3. Provisions of PPE to workers. 4. Provision of adequate sanitation facilities and safe drinking water for employees
3	OHS Act, 2010.	Establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work.	1. Ensure the health, safety and welfare of employees. 2. Provide plant and system of work that are safe and without any risk. 3. Provide adequate welfare facilities for employees.

Table 4.12 shows that there was duplication in the three legislations, namely the Factories Act, Chapter 441, the NCC Act, 2003, Statutory Instrument, 2008, and the Occupational health and Safety Acts, 2010. The duplication in the legislations had resulted in waste of resources, especially financial resources as there was duplication of inspections conducted by the regulatory institutions. The responses from the 10 officers from the regulatory bodies and government institutions mandated to enforce OHS in the industry confirmed the duplications of the inspections.

Weaknesses in the OHS legislation - The Factories Act, Chapter 441 partially covered the Health and Safety in the construction industry due to limited interpretation of factory. It was discovered during field study, that employees in the industry believe that the Factories Act was meant for Manufacturing Factories and not construction industry. Further, it was established that the construction companies do not register with the Registrar of Factories, therefore, little consideration is given to industry by the MLSS.

Occupational Safety and Health Act No. 36 of 2010, provides for the following, the establishment of the Occupational Health and Safety Institute (OHSI) and its functions; establishment of Health and Safety Committees at workplaces and for the health, safety and welfare of persons at work; the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work; and related matters.

The Act does not support the health and safety in the construction industry as evidence on the constitution of the Occupation Health and Safety Board. According to Part II, Section 7, the board had no representation from the Ministry of Works and Supply, NCC or any institution involved in construction industry. Part II of the Act, section 6, titled 'the functions of the Occupational, Health and Safety Institute', The Act, focuses more on research and aftermath of the occurrence of accidents and injuries than on the identification and control of the health and safety hazards.

4.2.10 Adequacy of Government Regulators in OHS Management

The research question sought whether the current government institutions (regulators) were adequate in inspecting and enforcing the health and safety legislation and HSS in Zambia. The findings were as tabulated in Table 4.13, it was established that 6 interviewees representing 60% indicated the current government institutions were not adequate in inspecting and enforcing the health and safety legislation. 3 representing 30% stated that the institutions were moderate while 1 representing 10% accepted that they were adequate. Furthermore, the interview was conducted on whether the current government institutions (regulators) were adequate in inspecting and enforcing the HSS. It was established that the 5 interviewees representing 50% said that the institutions were not adequate while 2 representing 20% indicated that they were moderate and 3 representing 30% accepted that they were adequate.

4.13: Adequacy of Government Regulators in OHS Management (field Survey, 2016).

S/No.	Statement (Legislation and Health and safety Standards)	Adequate		Moderate		Not adequate		Total	
		N	%	N	%	N	%	N	%
1	In your opinion, how adequate are the current Government Institutions in inspecting and enforcing the following?								
	a. Health and Safety Legislation; and	1	10	3	30	6	60	10	100
	b. Health and Safety Standards.	3	30	2	20	5	50	10	100

4.3 Presentation of Questionnaire Survey Results

The semi – structured interview conducted with the 10 senior officers from the government and regulatory institutions were used to collect preliminary data on HSS in the construction industry in Zambia. The collected information, together with the literature review carried out in chapter 2 of this research, provided information that guided the preparation of the structured questionnaires containing definite and concrete questions.

The first part of this section presented and analysed the preliminary data obtained from the study as presented in the questionnaire. It involves the demographic information of the respondents. The variables involved are gender of respondents, age, professional, type of organization, position held and the number of years they have worked in the organization or construction industry. Data obtained have been presented in Tables below.

4.3.1 Gender of Respondents

The respondents were requested to indicate their gender by ticking the appropriate box they belonged. The purpose was to find out the number of males and females who participated in the study. Table 4.14 shows that out of the 130 respondents who participated in the survey, the majority 119 of the respondents representing 91.5% were males, while the remaining 11 respondents representing 8.5% being females. The survey ratio of men to women was in line with Zambia Labour Force Survey Report (2014)

which indicated that construction industry in 2014; employed 182,806 of which 177,372 were male represented 97.02% as compared to 5,434 female who represented 2.98 % only. The information is summarised in Table 4.14.

Table 4.14: Gender of Respondents (field Survey, 2016)

Gender	**Frequency**	**Percentage (%)**
Male	119	91.5
Female	11	8.5
Total	**130**	**100**

4.3.2 Age of Respondents

Table 4.15 depicts the age distribution of respondents who participated in the study. The purpose was to find out the average age of the employees who are actively involved in the construction industry in Zambia. The age groups were as follows; below 20 years, 20–29 years, 30–39 years, 40–49 years and those above 50 years. The tabulation of the findings shows that 4 respondents representing 3.1% were less than 20 years. 27 representing 20.8% fall within the age brackets of 20-29 years; 42 representing 32.3% fall within the age brackets of 30-39 years. 30 respondents representing 23.1% fall within 40-49 years old, while 27 respondents representing 20.8% were above 50 years old. The data shows that majority of the employees in the construction industry fall within 30-39 years. The information is summarised in Table 4.15.

Table 4.15: Age of Respondents (field Survey, 2016)

Age (Years)	**Frequency**	**Percentage (%)**
≤20 years	4	3.1
20 - 29 years	27	20.8
30 - 39 years	42	32.3
40 - 49 years	30	23.1
≥50 years	27	20,8
Total	**130**	**100**

4.3.3 Speciality of Respondents

The respondents were asked to indicate their speciality. The purpose was to find out their area of operation and speciality in their occupation. Table 4.16 shows responses distribution of the respondent's speciality.

Table 4.16: Speciality of Respondents (field Survey, 2016)

Professional	Frequency	Percentage (%)
Construction Management	16	12.3
Architecture	1	0.8
Quantity Surveying	4	3.1
Mechanical Engineering	5	3.8
Production Management	3	2.3
Natural Science	5	3.8
Environmental Engineering	1	0.8
Civil Engineering	10	7.7
Electrical Engineer	3	2.3
Health, Safety and Environmental	6	4.6
Craft Certificate	56	43.1
General Work	20	15.4
Total	**130**	**100**

4.3.4 Types of Organization

The respondents were also requested to indicate the type of organization or institution they were working with. The data was tabulated and Table 4.17 depicts the findings of the study.

Table 4.17: Type of Organization (field Survey, 2016)

Organization / Institution	Frequency	Percentage (%)
Contractor	103	79.2
Consultant	20	15.4
General Sub – Contractor	7	5.4
Total	**130**	**100**

4.3.5 Position Held

Respondents were requested to indicate the position held in the organization. Table 4.18 depicts the position held by respondents.

Table 4.18: Position Held by the Respondent (field Survey, 2016)

Position Held	Frequency	Percentage (%)
Top Management	16	12.3
Middle Management	38	29.2
Artisans	56	43.1
General Workers	20	15.4
Total	**130**	**100**

4.3.6 Working Experience in Construction Industry

Table 4.19 depicts the working experience of employees who participated in the study. The objective was to determine the period employees had worked in the construction industry. The data gathered shows that 36 respondents representing 27.7% had worked for less or equals to 5 years in the industry representing the majority. 37 respondents representing 28.5% had worked between 6-10 years in the industry. 21 representing 16.2% had worked between 11-15 years in the construction industry while 13 representing 10.0% had worked between 16-20 years. Lastly, 23 representing 17.7% had worked for more than 21 years. The findings are illustrated in Table 4.19.

Table 4.19: Working Experience in Construction Industry (field Survey, 2016)

Period	Frequency	Percentage (%)
≤5 years	36	27.7
6 - 10 years	37	28.5
11 - 15 years	21	16.2
16 - 20 years	13	10.0
≥21 years	23	17.7
Total	**130**	**100**

4.3.7 Working Experience in the Organization

Table 4.20 depicts the working experience of employees in their current organization who participated in the study. The objective was to determine how long employees had worked in the organization. The data gathered shows that 71 respondents representing 54.6% had worked in their respective organization for less or equals to 5 years representing the majority. 40 respondents representing 30.8% had worked between 6-10 years in their organizations; 7 representing 5.4% had worked between 11-15 years in their respective organization while 6 representing 4.6 % had worked between 16-20 years. Lastly, 6 representing 4.6% had worked for more than 21 years. The available data shows that majority (53.6%) of the employees have been working for less than five years. Zambia's Building Construction Market system (2014) stated that most construction contractors failure to secure frequent contracts, they generally hire temporary workers on demand and pay them on a piece rate basis. The Table 4.20 shows the findings of the experience of respondents in their respective organization.

Table 4.20: Work Experience of Respondents (field Survey, 2016)

Period	**Frequency**	**Percentage (%)**
≤5 years	71	54.6
6 - 10 years	40	30.8
11 - 15 years	17	5.4
16 - 20 years	6	4.6
≥21years	6	4.6
Total	**130**	**100**

4.3.8 Knowledge about Occupational Health and Safety

After gathering demographic information, the research established how knowledgeable the respondents were in the field of OHS. The respondents were asked to indicate "Yes" or "No". The research findings illustrated that out of 130 respondents, 113 representing 86.9% had knowledge about OHS while 17 had no knowledge about the topic representing 13.1% respectively. The respondent's knowledge on OHS is shown in Table. 4.21.

Table 4.21: Respondent's knowledge on OHS (field Survey, 2016)

Response	Frequency	Percentage (%)
Yes	113	87.9
No	17	12.1
Total	**130**	**100**

4.3.9 Grading of the Companies

The research adopted the grading system employed by the NCC. Contractors are graded from Grade 1 to 6, with grade 6 being the entry grade for beginners in the industry. The findings revealed that, of the 70 construction and consultancy companies considered in the research, 12 were in Grade 1and 2 representing 17.1% while, 27 companies representing 38.6% were in Grade 3 and 4. The majority (31) were in Grade 5 and 6, representing 44.3%. The tabulation of the grading is presented in Table 4.22.

Table 4.22: Grading of Companies (field Survey, 2016)

Group	NCC – Grade	Frequency	Percentage (%)
1	1-2	12	17.1
2	3-4	27	38.6
3	5-6	31	44.3
Total		**70**	**100**

4.3.10 Availability of Health and Safety Standards

Standards set out a common technical specification to ensure products, services and processes are safe and consistent. They are used in all areas of construction and engineering (British Standards Institution, 2016). The objective of the research was to find out the availability, adequacy and factors inhibiting effective implementation of HSS in the construction industry in Zambia. The views of the 130 respondents from the building construction sites had been presented in Table 4.23.

Table 4.23: Health and Safety Standards (field Survey, 2016)

S/ N	Statement (Health and Safety Standards)	Adequate		Not Adequate		Total	
		N	(%)	N	(%)	N	(%)
1	Adequacy of Health and Safety Standards in the Zambia Construction Industry?	17	13.1	113	86.9	130	100
2	Adequacy of implementation of health and safety standards	31	23.8	99	76.2	130	100
3	Adequacy of Regulators in inspection and enforcing of Health and Safety Standards	29	22.3	101	77.7	130	100
	Statement (Policy Statement)	**Yes**		**No**			
4	Does the company prepare a Health and Safety Policy Statement	28	21.5	102	78.5	130	100
5	If yes, is the company's written Health and Safety Policy or Program made available to all employees?	8	28.6	20	71.4	28	100
	Statement (Training)	**Yes**		**No**			
6	Does the company undertake formal Health and Safety Training programmers for your employees?	38	29.2	92	70.8	130	100
7	Does the company undertake induction Health and Safety Training Program to new employees?	44	33.8	86	66.2	130	100
8	Does the company undertake job - specific Health and Safety Training to employees prior to starting a new work?	33	25.4	97	74.6	130	100
9	How effective is the flow of Health and Safety information between sites Manager / health and safety officer to site workers?	27	20,8	103	79.2	130	100
	Statement (Accidents)	**Yes**		**No**			
10	Are you aware of any accident that had occurred on construction site?	69	53.1	61	46.9	130	100
	Statement (Accidents, Safety Committee and Inspection)	**Yes**		**No**			
11	Does the company investigate Occupational Health and Safety accidents on sites?	34	49.3	35	50.7	69	100
12	Does the company have procedures for employees to report pains, sickness and accidents in relating to job process?	10	7.7	120	92.3	130	100
13	Does the company have an accident book or similar accident record system on site?	17	13.1	103	86.9	130	100
14	Does the company provide First Aid Box or Clinic on construction sites for the workers?	58	44.6	72	55.4	130	100
15	Is there a trained staff in First Aid on construction sites in the Company?	49	37.7	81	62.3	130	100
16	Does the company have a Health and Safety Committee on site?	22	16.9	108	83.1	130	100
17	If yes, how effective is the Health and Safety Committee in addressing Health and Safety issues on site.	12	54.5	10	45.4	22	100
18	Has any Health and Safety Inspector, visited and inspected the construction site?	41	31.5	89	68.5	130	100
19	If yes, how often was your construction site inspected?	**12 Months**		**1-2 years**			
		18	43.9	23	56.1	41	100
20	If yes, from which institution were the health and safety inspectors?	**NCC**		**Labor**			
		36	87.8	5	12.2	41	100

i. Assessment of Health and Safety Standards

It can be observed from Table 4.23 that the majority (113) of the respondents representing 86.9% indicated that the HSS in the construction industry in Zambia were not adequate, while 17 representing 13.1% accepted that the HSS were adequate.

In terms of implementation framework and adequacy of regulators in inspection and enforcing of standards in the industry, research information revealed that 99 and 101 respondents representing 76.2% and 77.7% indicated that the implementation framework and regulators were not adequate respectively. The Table also indicated that 31 employees representing 23.8% indicated that the implementation frame work was adequate. It can further, be seen from the Table 4.23 that 29 employees representing 22.3% indicated that the government institutional and regulators were adequate in inspection and enforcing HSS.

ii. Health and Safety Policy Statement

The research question sought whether the construction and consultancy companies prepares a Health and Safety Policy Statement and made available to the employees. From the research findings as tabulated in Table 4.23, it was established that only 28 respondents representing 21.5% prepared Health and Safety Policy Statement and the majority 102 representing 78.5% did not prepare the policy statement. Of the 28 companies that prepared Health and Safety Policy statement, 20 representing 71.4% indicated that the policy statement was made available to the employees, while 8 representing 28.6% indicated that the policy statement was not made available to the employees.

The Occupational Health and Safety Act, 2010, Section 32, mandate the Director to direct any employer in writing and any category of employees, by notice in the Gazette, to prepare a Health and Safety Policy concerning the protection of the health and safety of the employees. An employer shall prominently display a copy of the policy signed by the chief executive officer on site where the employees normally execute work. This contradict with the findings of the research, were the majority 78.5% of the companies do

not prepare and avail the Health and Safety Policy to the workers in the construction industry.

From the field study, the majority of the top management of the construction and consultancy companies stated that they do not prepare and made available the Health and Safety Policy statement to their workers as they is no national health policy mandating them to do so. The findings is line with the fact that, Auditor General on the Management of Occupational Safety and Health (June, 2015), stated that currently Zambia does not have a national policy covertly OHS. The only available policy talking about the OHS policy is the National Employment and Labour Market Policy (NELMP) which was prepared by MLSS and lunched in 2005. Further, the study visit to the MLSS - OSHSD conducted in October, 2016, revealed that the department was still in the process of preparing the National Health and Safety Policy.

iii. Provisions of Health and Safety Training

As shown in Table 4.23, the majority (92) of the respondents representing 70.8% indicated that their companies do not undertake formal Health and Safety Training programs to the workers while 29.2% accepted that the formal training are provided. The field study established that the majority of the companies were not providing formal Health and Safety Training because of the high level of casualization in the construction industry. This can also be supported by Table 4.1.7, which indicated that the majority (71) of the employees representing 54.6% had worked less than five years. Further, the majority of the top managers of the companies indicated that it's costly to provide formal training especially with the fact that there were no pricing provisions to cater for formal training in the contract agreements signed in the construction industry.

It can be shown from Table 4.23 that majority (86) of the respondents representing 66.2% declined that the company do not undertake induction Health and Safety Training programs to new employees, while the 44 representing 33.8% said that induction training on health and safety was provided to the workers. The similar trend was observed in the provisions of job - specific training, majority (97) of the respondents representing 74.6% indicated that the company do not undertake job - specific Health and Safety Training

programs compared to 33 representing 25.4% who said that the company provided job – specific Health and Safety Training on sites.

The interviewers were also requested to indicate how effective is the flow of health and safety information between sites managers or health and safety Officer to site workers. The research findings revealed that 103 respondents representing 79.2% stated that the flow of information is not effective while 27 representing 20.8% indicated that the flow of information was effective.

iv. OHS Accidents

As shown and tabulated in Table 4.2.1 majority (69) respondents representing 53.1% opined that they were aware of accidents that occurred on the construction sites for the past 12 months, however, 61 representing 46.9% said that they were not aware of accidents that occurred on the construction site in the stated period. From the sixty nine (69) respondents who opined that there were aware of accidents that occurred on sites, thirty four (34) representing 49.3% said that their companies investigated the accidents, ninety (35) representing 50.7% said the accidents were not investigated.

One hundred and twenty (120) respondents representing 92.3% intimated that the companies had no procedures for employees for reporting pains or other diseases in relation to the site works. Ten (10) representing 7.7% accepted that their companies had procedures for reporting accident, pains, and sickness on sites.

The tabulated results shown in Table 4.23, illustrate that the majority (103) representing 86.9% indicated that the construction companies have no accident recording book or similar accident recording system on sites, while 17 representing 13.1% said the accident books are provided.

v. Provisions of First Aid

The majority (72) respondents representing 55.4% said that their companies were not providing First Aid Box or Clinic on construction sites for workers while 58 representing 44.6% indicated that the facilities were provided. Further, 81 representing 62.3% said that

there was no trained staff in first aid on construction sites for the company and 49 representing 37.7% indicated that their companies had engaged the qualified staff in First Aid on sites.

The Occupational Health and Safety Act, (2010) under section 16, Duties of employers to employees and subsection (h), state that, it is the duty of the employer to provide for measures to deal with emergencies and accidents, including adequate first-aid arrangements at work place including construction sites.

In addition, the Factory Act**,** Chapter 441, states that there shall be provided and maintained so as to be readily accessible a first aid box or cupboard containing such equipment as maybe prescribed. The first aid box or cupboard shall be under the charge of a responsible person who shall, in case of a factory where more than fifty (50) employees or such similar number as may be prescribed, are employed, be trained in the first aid treatment. The person in charge shall always be readily available during working hours.

vi. Formation of Health and Safety Committee

The Table 4.23, illustrate that the majority (108) representing 83.1% said that there were no Health and Safety Committees on their sites, while 22 representing 16.9% intimated that the companies had constituted a Health and Safety Committee. Of the 22 respondents who elected that the Health and Safety Committee were constituted on the sites, 12 representing 54.5% said the safety committees were effective while 10 representing 45.5% intimated that the Health and Safety Committee were not effective.

The duties of the employer as spelt out in Part III of the Occupational Safety and Health Act No. 36 of 2010, the employer shall establish a Health and Safety Committee where he/she employs ten (10) or more persons. In the Zambia construction industry, the formation of Health and Safety Committee was poorly adhered to, as evidence from the research findings were the majority (108) respondents 83.1% intimated that they had not constituted Health and Safety Committees yet most construction companies employs more than 10 employees on their sites.

vii. Health and Safety Inspection

The respondents were requested to indicate whether any Health and Safety Inspector inspected their sites, Table 4.23 showed that 89 respondents representing 68.5% said the sites had not been visited and inspected while 41 representing 31.5% indicated their sites had been visited and inspected. Of the 41 respondents who said that the sites had been visited, 18 representing 43.9% had inspected the construction sites within 12 Months, 23 representing 56.1% had visited the sites between 1 to 2 years. The research further, revealed that the 36 representing 87.8% of the respondents indicated that the inspectors were from NCC while 5 representing 12.2% intimated that the they were from MLSS - OSHSD.

According to the Factory Act, (1987) the MLSS – OSHSD is responsible for regulating and inspecting occupational safety, health and hygiene in factories, including construction sites in Zambia. The research findings revealed that they was poor Health and Safety Inspection on the construction sites by the department as only 41 representing 31.5% were conducted of which only 5 representing 12.2% were from MLSS - OSHSD.

The findings also revealed that of the 41 that inspected the sites, the majority (36) representing 87.7% were from the NCC, according to the Statutory Instrument No. 119 of 2008, National Council for Construction (Contractors) (Code of Conduct) Regulations, 2008, the contractor shall provide health and environmental safety for workers, which include PPE, first aid kit on site. It was worrying from the findings that both the NCC and Labour Inspectors had only inspected 41 sites represent 31.5%.

4.3.11 Application of Health and Safety

To evaluate the application of health and safety of workers on building construction sites in Zambia's construction industry, the questionnaire was structured to assess the provisions of PPE on construction sites. Further, the respondents were requested to indicate the types of PPE provided by their companies. The findings were as tabulated in Table 4.24.

Table 4.24: Application of Health and Safety (field Survey, 2016)

S/No.	Statement (Application of Health and Safety)	Yes		No		Total	
		N	%	No	%	N	%
1	Does the company provide all the required Personnel Protective Equipment to workers?	33	25.4	97	74.6	130	100
	Statement (Types of PPE))						
	Statement (Providing of PPE))	**Yes**		**No**			
2	If provided, tick the types of Personnel Protective Equipment provided to employees by the company?						
	a. Working Suite	101	77.7	29	22.3	130	100
	b. Safety footwear	72	55.4	58	44.6	130	100
	c. safety gaggles	61	46.9	69	53.1	130	100
	d. Safety belts	41	31.5	89	68.5	130	100
	e. Hard hat	99	76.2	31	23.8	130	100
	f. face shields	34	26.2	96	73.8	130	100
	g. Hearing Protection	28	21.5	102	78.5	130	100
	h. Respiratory Protection and Protective Cloth	32	24.6	98	75.4	130	100
3	Are you aware that Personnel Protective Equipment (PPE) is provided according to:						
	a. The specific work site,	121	93.1	9	6.9	130	100
	b. Project activities and	109	83.8	21	16.2	130	100
	c. Weather conditions?	112	86.2	18	13.8	130	100

i. Provisions of Personal Protective Equipment (PPE)

Table 4.24 established that 97 respondents representing 74.6% indicated that their construction companies were not providing all the required PPE while 33 representing 25.4% intimated that the company provided all the necessary required PPE. The respondents were further, requested to indicate the types of PPE provided by their companies, the research revealed that the working suite are the most provided working PPE as shown in the Table 4.24, in total 101 respondents representing 77.7% said that working suite are provided to them, the second most provided personnel equipment is the hard hat accounting for 99 respondent representing 76.2%. The third on the hierarchy is safety footwear, 72 respondent representing 55.4%, followed by safety gaggles where 61 representing 46.9% had accepted that the PPE are provided.

The last on the PPE provided list, are hearing protection with 28 respondents, representing 21.5%, respiratory PPE with 32 respondents, representing 24.6%. The face shields 34 respondents representing 26.2%.

Table 4.3.1, farther shows the findings on the provisions of the PPE been provided according to the specific works on site, project activities and weather conditions. It was established that 121 respondents representing 93.1% indicated that they were aware that the PPE are provided according to the specific work sites while 112 representing 86.2% accepted to be aware that PPE are provided according to weather conditions and lastly 109 respondents representing 83.8% elected that PPE are provided according to project activities.

The research findings, established that most of the construction companies in Zambia especially those in Grade 6 and 5 on the NCC grading system, do not provide respiratory PPE, hearing protection and face shields. The only PPE's they were providing are of includes the working suite, hard hat, and footwear and safety gaggles. According to the Statutory Instrument No. 119 of 2008, National Council for Construction (Contractors) (Code of Conduct) Regulations, 2008, employs the contractor to provide appropriate PPE's to the employees on the construction sites.

In Addition, the Occupational Health and Safety Act, 2010 of Zambia, state that, the employer will provide all appropriate PPE to be used on sites by employees, who in the course of employment, are likely to be exposed to the risk of bodily injuries, and adequate instructions in the use of such PPE. Further, the Act state that the provisions of the PPE will be at the employer's expense (OHS Act, 2010).

4.3.12 National Policies, Legislation and Implementation Frameworks

A policy is a statement of intent to achieve certain goals by a local, regional or national governments of a country, it is documented in legislation or other official documents, (CDM – Executive Board, 2015). The government Institutions or regulators are setup and mandated to enforce and penalize the defaulters. Legislation is the preparation and

enacting of laws by a legislative body e.g. parliament (National Assembly of Zambia, 2014).

According to the Report by Auditor General on the Management of Occupational Safety and Health (June, 2015), ILO Convention state that each member shall, in the light of national conditions and practice, and in consultation with the most representative organizations of employers and workers, formulate, implement and periodically review a Coherent National Policy on occupational safety, occupational health and the working environment. Despite Zambia been a member of the ILO, the National Occupational Health and Safety Policy had not yet been formulated and implemented as of October, 2016.

Table 4.25: National Policy, Legislation and Framework (field Survey, 201).

S/No.	Statement (Legislation, National Polices and Frameworks)	Adequate		Not adequate		Total	
		N	%	N	%	N	%
1	In your opinion, are the following adequate in the Zambia Construction Industry?						
	a. Current Health and Safety Legislation;	21	16.2	109	83.8	130	100
	b. National Policies on health and safety; and	17	13.1	113	86.9	130	100
	c. Implementation frame work of health and safety.	14	10.8	116	89.2	130	100
2	In your opinion, How adequate are the current Government institutions (regulators) in inspection and enforcing the Health and Safety Legislation	16	12.3	114	87.7	130	100

To assess the adequacy of the National Policies and Legislations on health and safety in the construction industry, the study researched on the adequacy of the implementation framework and the government institutions (regulators) in inspection and enforcing the health and safety legislation. The findings are illustrated above in Table. 4.25.

It can be observed from Table 4.25 that 109 respondents representing 83.8% said that the current health and safety legislation in the construction industry were not adequate while 21 respondents representing 16.2% agreed that the legislation on health and safety were adequate. The respondents were also investigated on their opinion on the adequacy of the

National Policies on health and safety, 113 representing 86.9% indicated that the National Polices were not adequate and 17 representing 13.1% demonstrated that the polices were adequate.

For any legislation to be effective and save the intended purpose there is need to enforce it and penalize the defaulters by the regulators or government institutions. A regulator is subsystem or independent institution that determines and maintains the operating parameters of a system, usually within certain prescribed or preset limits (Lodge, 2016). The study, investigated the adequacy of the current regulators, government institutions and implementation framework in enforcing OHS in Zambia construction industry.

A look at Table 4.25 depicted that the majority (116) respondents representing 89.2% declined that the implementation framework of health and safety were not adequate while 14 representing 10.8% accept implementation framework was adequate. It can also be seen from the Table 4.25, that the majority (114) representing 87.7% said that the current government institutions (regulators) were not adequate in inspection and enforcing the health and safety legislation while only 16 representing 12.3% accepted that the institutions were adequate in enforcing the legislation.

4.4 Summary

The chapter presented the results and discussion of the collected data. This was achieved by first presenting the preliminary data gathered through the semi – structured interview with senior officers from regulatory bodies and government institutions in Zambia. This was followed by analyzing data from the construction sites collected using structured questionnaires. In both cases, the results obtained through semi – structured interviews were similar to those from the questionnaire survey. The general findings revealed that the building construction industry was not adequately safe and health as a result of most construction companies failing in the implementation of HSS. Furthermore, failure by regulators and government institutions mandated with the management of OHS to carry out their duties due to inadequate and lack of findings and outdated legislations. The next chapter explains and outlined the development of the OHS Framework basing on the research findings.

CHAPTER FIVE: DEVELOPMENT OF THE OHS FRAMEWORK

5.1 Introduction

The previous chapter presented the findings of the field study. The results of the study were presented after an analysis of data collected using semi - structured interviews and structured questionnaires. The findings revealed that the building construction industry was not adequately health and safety because of the OHS stakeholders failing in the management and implementation of HSS. This chapter presents the development of an OHS Framework that would enhance effective implementation of OHS standards in Zambian construction industry by abating the identified challenges. To ensure effective coordination on the management of OHS matters in the country among the various stakeholders, the research proposed the quick finalization of the Comprehensive National OHS Policy and establishment of a National OHS Authority as a long term measure. For the effective of implementation of workers HSS on the construction sites in Zambia, the research proposed the OHS Framework illustrated in Figure 5.1, giving detailed of managing OHS at three phases of the construction cycle, namely pre – construction, construction and post – construction.

5.2 Existing OHS Challenges

The study had five objectives which were formulated in Chapter one, of the five, the main objective of this study was to develop an OHS Framework that will enhance effective implementation of OHS standards in Zambian construction industry. From the results of the field study conducted on management of OHS in Zambian construction industry, it was revealed that there are different institutions mandate by different respective legislations to manage OHS in Zambia. As explained in the preceding Chapter, the existing OHS situation in the country revealed to lack coordination among OHS institutions with some pieces of legislation experiencing overlaps and subsequent institutional duplication of efforts in the execution of functions resulting in waste of resources. It was also established that most of the pieces of legislation have limited coverage and application in the management of OHS. Furthermore, the institutions mandated with responsibilities of managing OHS lack qualified manpower and were

inadequately funded. The research also revealed that the institutions were underfunded to carry out OHS activities.

The failure by government institutions and regulators in the management, inspections and enforcing of laws on the OHS activities in construction industry in Zambia has resulted in most contractors take advantages of the situation. This is evident from the findings of the questionnaire survey, which revealed that most contractors were failing in the provision of appropriate PPE and First Aid to their employees, formation of Health and Safety Committees and preparation of Health and Safety Policy. There was also failure in conducting Health and Safety Training and routing health and safety sites inspections by contractor's management.

5.3 Proposed OHS Framework

The OHS implementation framework was formulated and proposed after the analyses of the research findings and an in – depth literature review. The framework was developed to answers to the challenges outlined in the previous Chapter. For the proposed framework to be effective in implementing OHS on construction sites, all the stakeholders had to be carried on board. The proposed OHS Framework is illustrated in Figure 5.1 below.

5.3.1 Construction Project Phases.

The management and implementation of OHS on construction sites should be instituted from inception to the handover of the project, therefore the importance of understanding the phases of the construction project cannot be overemphasised (Tregenza, 2004; Saifullah and Ismail, 2011; Tente, 2016). The stakeholders need to know the players and activities carried out at every phase of the project to effectively implement HSS. In general, construction project has three phases namely pre – construction, construction and post – construction phases. The three phases are explained below:

i. Pre – construction phase

Defined as any period of time during which design or preparatory work is carried out for a project and may continue during the construction phase depending on the type and size of the project. The phase is also called initiation and planning phase. During pre – construction phase, the objective and feasibility, designing and tendering of the project are carried out and determined. This is a crucial stage of the whole process, since it can indicate whether the project is a good opportunity or not. The project initiation document provides the groundwork for the construction plan and is one of the most vital artifacts in project management. The documents produced in this phase are used for monitoring, evaluating and auditing the project.

ii. Construction phase

Also referred to as execution phase, defined as the period of time beginning when construction project management plan is put to work. The phase starts and ending when construction work in that project is completed. This phase is divided in two main processes: the executing and the monitoring and controlling. The project team makes sure that the required tasks are being performed and at the same time, progress is monitored and changes are made accordingly.

iii. Post – construction phase

This is the final stage of the project representing its official completion and commissioning. The project manager and his team carry out an evaluation on what went

well and refers to any potential failures. In the end, the team conducts a project report, calculates the final budget and offer information about any uncompleted tasks. The project report in combination with the analysis of the potential failures will be valuable feedback for future construction projects.

5.3.2 Description of OHS Framework

The proposed OHS Framework starts with the formulation and enacted of national legislations and policies before discussing the three constructions phases. The entire framework is cyclic in nature as illustrated in Figure 5.1. The framework will be discussed from left to right.

5.3.3 National Legislation and Policies

The research proposed the finalization of the preparation of the comprehensive OHS policy, preparation of HSS for the construction industry and re – visiting and enacted of OHS legislation as the short term measure. The research also proposed the formation of the National OHS Authority to oversee the management and implementation of OHS programs in Zambia. For, the proposed legislations and policies to be effective, government has to consult widely and encompasses of the relevant stakeholders during the formulation stage as OHS is a cross cutting issue applied in deferent sectors of the economy of the country. Therefore, to have comprehensive legislations, standards and policies in the field all the necessary stakeholders should be bring on board.

i. National OHS Policy

The country need to preparation and put to operation a comprehensive OHS policy as matter of urgency. Occupational accidents, incidents and diseases result in human suffering and loss of life as well as loss of infrastructure, all of which lead to economic losses at both enterprise and national level (Tente, 2016). This OHS policy envisages the continuous development of sustainable national as well as enterprise OHS systems and programmes aimed at preventing and mitigating such losses. It also seeks to establish effective, preventative and rehabilitative health services while at the same time offering compensation to those who suffer physical injuries and contract occupational diseases. It

covers all workers and employers in all sectors of the Zambia economy and all forms of employment.

The Policy to be formulated should be inclusive to address all the current challenges and future development of OHS systems and programmes in Zambia. As a matter of priority, the policy seeks to foster effective coordination among OHS institutions and stakeholders. The policy will also seek to promote a preventative safety and health culture. In addition, the policy will also ensure the alignment of Zambian national Laws and regulations with SADC Regional Protocols, ILO Conventions and other necessary international instruments, and best practices in the world of work as well as the promotion of continuous improvement of OHS. In facilitating implementation, the Policy will promote research, monitoring, risk assessment and capacity building. The policy will also promote mechanisms for resource mobilization for the implementation of national OHS programs and activities with effective monitoring and evaluation structures.

As a member of ILO, Zambia should follow and implement the ratified conventions, Article 4 of ILO Convention 155 requires that each Member State, in consultation with the most representative organizations of employers and workers formulates implements and periodically reviews a coherent national policy on OHS and the working environment. Further, Article 3 of ILO Convention 187 requires each member to promote a safe and healthy working environment by formulating a national policy. Having ratified these Conventions, Zambia has an obligation to fulfil this requirement. The Government of the Republic of Zambia should therefore consequently develop this national OHS Policy to be guiding tool for all stakeholders to promote OHS.

Zambia as a member of ILO should follow the organization OHS guidelines which give guidance on national policy formulation and enactment. ILO recommends that a national OHS system should consider the following for:

- legislation and other relevant OHS instrument which covers all workers and employers in all sectors of the economy;

- one or more authorities or bodies responsible for OHS;
- regulatory compliance mechanisms including systems of inspection;
- a national tripartite advisory mechanism to address OHS issues;
- arrangements to promote at the enterprise level, cooperation between employers and workers;
- OHS information and advisory services;
- research on OHS;
- a mechanism for the collection and analysis of data on occupational injuries and diseases;
- provisions for collaborations with relevant insurance or social security schemes covering occupational injuries and diseases; and
- support mechanism for a progressive improvement of OHS conditions in micro, small and medium-sized enterprise and in the informal economy (ILO Construction OHS).

ii. OHS Legal and Institutional Framework

There is no clear and comprehensive legal and regulatory framework for OHS in Zambia. The prevention and control of workplace risks is governed by the Factory Act - Chapter 441 and partially Occupational Health and Safety Act 36 of 2010. However, there are other regulations promulgated under difference laws which also administer OHS in specific sectors. International best practice shows that, there is a general trend towards a single national OHS statute covering all sectors of the economy. These statutes define the responsibilities of employer to provide a healthy and safe workplace, set out the rights and duties of workers, provide for worker participation and establish the enforcement powers of the inspectorate.

The management of OHS falls under the jurisdiction of the Ministry responsible for Labor and Social Services matters through the OSHSD for protecting the labor force and working environment. Due to, mainly, non-compliance of ILO basic Conventions and limited scope of the Factory Act – Chapter 441, together with its obsolete provisions and all-encompassing new legislation i.e. Occupational Health and Safety Act , 2010 has

widened the scope of understanding, coverage and recognition of roles played by the responsibilities of other public and private institutions.

This, in turn, should ensure compliance licenses issued to all business enterprises prior to commencing operation according to requirements of laws and regulations as being complemented by other legislative instruments of other line ministries and their agencies. The compliance licenses should be extended to other sectors like construction, agriculture so that they can be fully carted for in the management and inspections of OHS. The analyses of the available legislations in the management of OHS in Zambia, and the responses from the questionnaires, indicated that there are duplications in Acts in terms of functioning and administering of the legislations. To abate the legislations challenges, government should review and enforce the relevant OHS legislation which includes the following:

- The Factories Act CAP 441 of the Laws of Zambia;
- The Mines and Minerals Development Act;
- The Occupational Health and Safety Act of 2010;
- The Zambia Environmental Management Act;
- The Standards Act;
- The Public Health Act;
- The Energy Regulation Act;
- The Explosives Act;
- The Non-Ionising Radiation Act; and
- The Workers Compensation Fund Control Board Act CAP 271.

iii. Health and Safety Standards

ZABS in consultation with the all appropriate OHS stakeholders should review the existing standards so as to formulate standards which will save the intended purpose and acceptable by the public. Furthermore, ZABS should also withdraw the defected standards

from the system. In the formulation of HSS for the construction industry, appropriate institutions like ZIA, EIZ, SIA, ZEMA and ministries should be consulted.

iv. Establishment of a National OHS Authority

As a long term measure, the government through relevant legal framework should establish OHS Authority with the aim of improving the health and safety of workers at all workplaces through enforcement and promotion of OHS practices. Improvement of health and safety at work reduces accidents and occupational diseases, which ultimately achieves better productivity. Furthermore, this will ensure effective coordination on the management of OHS matters in the country among the various stakeholders. The establishment of a National OHS Authority would oversee the following:

- Coordination of the activities of the various Authorities and Institutions managing OHS in the Zambia. Therefore reducing or eliminating duplication in OHS legislations, inspections and other activities.
- Establishment and sustenance of effective communication mechanisms between the proposed Authority and the various stakeholders; and
- Establishment of systematic collaboration mechanisms for all stakeholders, both in the public and private sectors on OHS matters.
- To encourage Education and research in the field of OHS in Universities and colleges, and also encouraging conducting of OHS awareness in all the sector of the economy.
- Lead the implementation of the National OHS Policy with the collaboration of competent OHS institutions. This will be done by establishment of a system of managing OHS in every enterprise with clearly defined structure and responsibilities

Figure 5.2 illustrate the proposed establishment of the National OHS Authority and its functions.

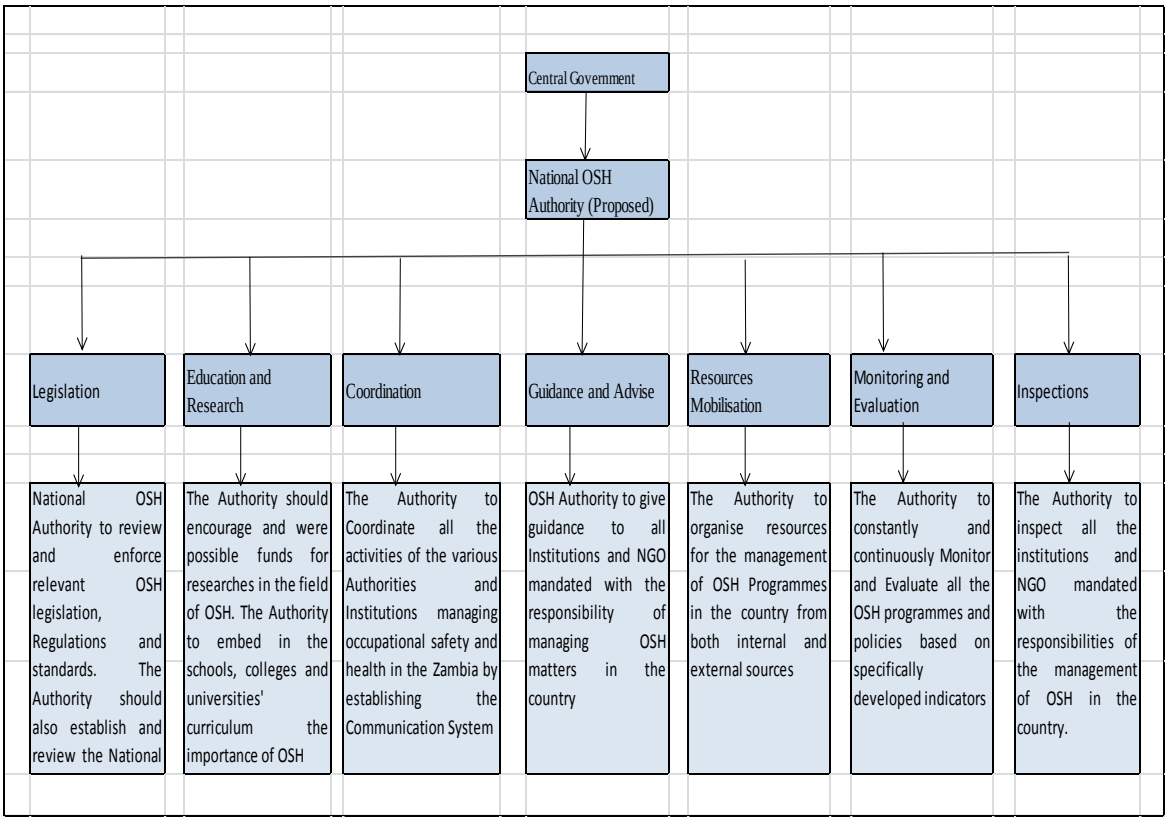

Figure 5.2: Proposed Functions of National OHs Authority (field Survey, 2016)

5.3.4 Pre – Construction Phase

The phase – construction phase is the beginning phase for the construction project management. It is widely recognized that effective planning can play a major role in the success of the project (CDM, 2015). This phase covers inception and feasibility, design and tendering. The OHS considerations should be taken care at each of the stated activities. It is important to consider the OHS challenges identified in the previous Chapter in the pre – construction phase so that they can be planned for in this early stage.

i. Inception and Feasibility Stage

This stage was more on the client's requirement and being described as pre – construction (Tente, 2016). The client has to clearly define the objectives of the project, proof of the acquisition of land, project organization structure and carry out the detailed feasibility study. Many common OHS problems encounter during construction and post-construction could be avoided if due consideration and effort were invested during the

project brief and design phase. From the field survey, it was established that most companies were failing to engage an experience and competent officer in the field of OHS. The findings also outlined a number of OHS challenges been faced in the construction industry in Zambia. It is therefore important that a detailed feasibility reported is prepared at this stage outline how the OHS will be managed during the construction and post-construction.

In Zambia, depending on the size of the project, the client may also be required to prepare the Environmental Impact Assessment (EIZ) and submit to Zambia Environmental Management Agency (ZEMA) for approve. ZEMA was established under the Environmental Management Act 2011. The role of the agency is, amongst other things, to advise on policy formulation and make recommendations of sustainable management of the environmental, ensure the integration of the environmental concerns in overall national planning through co-ordination with appropriate authorities. ZEMA also review Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) reports submitted by developers. The protection of the environment ensures the abating health and safety challenges especially during construction, post – construction and abandoning of the project

ii. Design

The designer will use the feasibility report and other requirements and needs from the client to produce designs. The term ‘design’ includes drawings, design details, specifications, bills of quantity and calculations prepared for the purpose of a design. Designers include architects, architectural technologists, consulting engineers, quantity surveyors, interior designers, temporary work engineers, chartered surveyors, technicians or anyone who specifies or alters a design. A designer has a strong influence during the pre-construction stage of a project. The earliest decisions can fundamentally affect the health and safety of those who will carry out the construction and eventually during post-construction and demolish a building. The health and safety of those who use a building as an accommodation or workplace may also be affected.

To enhance effective implementation of OHS on construction sites, the designer when preparing or modifying designs must take account of the general principles of prevention, and the pre-construction information should be provided, with the aim, as far as reasonably practicable, of eliminating foreseeable risks. Where this is not possible they must take reasonably practicable steps to reduce the risks or control them through the design process, and provide information about the remaining risks to other duty holders. Furthermore, the designer must provide all the necessary information to other members of the project team to help them fulfil their duties and plan of how health and safety issues will be incorporated in the project. In the Zambian construction industry, the health and safety is not incorporated in the Bill of Quantities (BOQs) for construction projects. Therefore, the need to use relevant legislations to allow the quantity surveyors to include the costing of management of health and safety issues in the Bill of Quantities (BOQs).

iii. Company Registration and Tendering Processes

It's mandatorily for the construction and consultancy companies to be registered with NCC before participating in any tender processes in Zambia.

Company Registration - In Zambia, contractors and consultants shall not undertake any construction works awarded in competitive tender unless the company is registered under the NCC Act No. 13 of 2003. The companies should acquire and submit some documents to NCC before registering and awarding them with a certificate. The certificates are renewed yearly. The required documents are the Patents and Companies Registration Agency (PACRA) certificate, NAPSA Registration, bank statement, Certificate of Incorporation/ Registration, Zambia Revenue Authority (ZRA) tax clearance or Value Added Tax (VAT) certification and certificates and CVs for Technical Staff (NCC, 2016).

From the requirements stated above for NCC to register the company to operate as construction or consultancy in Zambia, there is no document required on health and safety. The only hope as far as health and safety is the provision of clues in the NCC Act, 2003 to protect workers on sites which includes;

- a contractor shall not expose the contractor's employees to an unsafe working environment;
- a contractor shall provide appropriate safety clothing to the contractor's employees;
- a contractor shall provide a first aid kit on site;
- a contractor shall station a competent first aider on site on a construction site;
- a contractor shall provide hoarding to all building construction sites;
- a contractor shall provide adequate sanitation facilities and safe drinking waste for the employees.
- a contractor shall ensure that the construction operations are compliant with the Environmental Protection and Pollution Control Act;
- a contractor shall observe and implement all the requirements in the malaria and HIV/AIDS clause in the contract document; and
- a contractor shall observe and implement malaria prevention and control methods on a camping site.

The findings from the field study revealed that HSS was not effectively implemented on construction sites in Zambia and they were lack of awareness of the available appropriate legislations. To this effect, NCC should sell the NCC Act as part of the completion of registering of companies for them to understand the health and safety clauses in the Act. NCC should also liaise MLSS – (OSHSD) to available the Factory Act to the contractors and consultants during registration or renewal the companies.

Tendering Processes - The tender process starts with the adverting of the contract to awarding of the contract to the successful bidder. The parties that are to be involved with the tendering out of contract have to play their parts in embracing health and safety. The client of the project should be advised to include the costing of health and safety. After the completion of the tender process the contractor is awarded the contract. It is therefore, important that all the health and safety matters are included at this stage, as it will be difficult to request the contractor to done activities which were not incorporated in the tender documents. The bidders should be requested to prepare and submit their Health

and Safety Policy Statement outlining how the contract will manage OHS on site. The policy statement should be a requirement and part of the document for tender evaluation criteria. Furthermore, the technical qualification and experience (CV) of the health and safety personnel should be considered as part of the requirements for responsive bids and award of contracts. Government of Republic of Zambia should liaise with appropriate institutions, like Zambia Public Procurement Authority (ZPPA) to effect the proposals.

iv. Site Handover

This marks the commencement of the construction phase, its therefore prudent to take note of the stage before analysing the construction phase as illustrated in Figure 5.1. The contractor should be requested to submit the organization structure which was prepared under the inception and feasibility stage. The project team should also discuss and agree upon on the line of communications and co-ordination during the construction and post – construction phases, including the health and safety matters. This will eliminate duplication functions and other confusions during implementation of the project.

After all the health and safety requirement are satisfied under pre-construction phase, the project goes into construction phase as illustrated in the proposed OHS Framework in Figure 5.1.

5.3.5 Construction Phase

The construction phase is divided into two activities, the first one under the responsibilities of the contractors / consultant and the other one under the government and regulators. The contractor is mandated to submit Health and Safety Policy, formation of the Health and Safety Committee, conducting of Health and Safety Training and provisions of PPE and First Aid to workers on site. The government and regulators are mandated by appropriate legislations to conduct Health and Safety Inspections and enforcement of the HSS and laws.

i. Companies Responsibilities

The constructors and consultants are required to submit the Health and Safety Policy Statement to the project team before the commencement of the construction phase. The policy statement should give details on how health and safety will be managed therefore demonstrating the company's commitment to health and safety on site. The policy should outlines the health and safety arrangements, site rules and specific measures concerning any work involving the particular risks. From the field survey, most companies were failing to prepare and submit Health and Safety Policy to regulators and project team. The government should make it mandatory for the companies to prepare and submit a Health and Safety Policy to the regulatory institutions and project team. The regulatory institutions should inspect and ensure that the companies submitted policies are been implemented during the construction phase.

Formation of Health and Safety Committees - according to the Occupational Health and Safety Act 2010, Part iii, it is the mandatory for an employer of ten or more persons at any workplace to establish a health and safety committee. The committee should consist of an equal number of members, not less than two on each side, representing the employer and the employees. Furthermore, the representatives of the employees shall be chosen by the employees or designated by a trade union. In Zambia, the OSH Act 2010 is administered by the Ministry of Health who from the findings of the study, do not visit and inspect health and safety on construction sites. The Factory Act and the NCC Act of 2003 has no provisions for the formation of the Health and Safety Committees at work place. From the findings, it was only MLSS – (OSHSD) and NCC who inspected OHS on construction sites. The two institutions cannot inspect and enforce the formation of the Health and Safety Committees on sites as they were not mandated by any legislation.

The NCC and the MLSS – (OSHSD) should be mandated to ensure that companies were forming Health and Safety Committees on construction sites as they visit and inspect construction sites compared to the Ministry of Health. NCC should also educts the contractors and consultants on the importance of the formation of Health and Safety committees on construction sites. The Ministry of Health should assign respective

institutions to implement specific clause in the OHS Act 2010, like in the case of formation of Health and Safety Committees on construction sites to be assigned to NCC.

Conducting of Health and Safety training - this is the practice of providing OHS information to parties exposed to construction works. The contactor should train all new entrants and visitors to the site or existing workers on a construction site, before engaging them in actual work to help them settle and become familiar with the work environment. The training should also be extended to existing workers when assigned new works which expose them to new hazards. The information provided through training includes information about the site, work methods, proper use of plant, equipment, welfare facilities, emergency procedures, environmental issues, (PPE), reporting of accidents and near misses and providing awareness on regulations relating to health and safety. This assists to help reduce the occurrence of accidents on construction sites.

The contractor should ensure that no person must work at any dangerous machine or in any dangerous process on site unless he has been fully trained and instructed by trained person or is under adequate supervision. The OHS Framework proposed MLSS – (OSHSD) and NCC to be helping in Health and Safety Training to companies especially for companies awarded large project with the completion period of more than 1 year.

Provisions of PPE and First Aid – the contractors and consultants should at their own cost provide all the appropriate PPE and First Aid to all the works. Both the NCC Act 2003, SI (2008) and Factory Act mandates the employers to provide PPE to their employers. As illustrated in Figure 5.1 the provisions of PPE and First Aid to the employers should be a sole responsibility of the employer. The legislation mandating the employers to provide PPE and First Aid are available in Zambia, what might be lacking is the enforcement.

ii. Regulators and Government Institutions

The two responsibilities of the regulators are to carry out health and safety inspections and enforce HSS and laws. The responsibilities of the contractor of constituting of health

and safety committees, training and provisions of PPE and First Aid will be relaxed without constant health inspections and enforcement of legislations. Therefore, NCC should conduct health and safety inspections and enforce NCC Act, 2003, SI No. 119 of 2008, the National Council for Construction (Contractors) (Code of Conduct) Regulations on construction sites. The MLSS-(OSHS) should also enforce Factories Act and health and safety guidelines upon the commencement of the construction phase. Inspections should focus on the safety and health committee the company formulated and submitted at the start of the construction phase. The study revealed that both institutions (NCC and MLSS –(OSHSD)) had shortage of inspectors at which contributed to the poor enforcement of their respective legislations. The two institutions should consider employing more to effectively carry their mandates of inspections and enforcement of the laws. The findings also revealed that NCC and MLSS – (OSHSD) were underfunded and inadequately funded to carry out their functions, government should therefore, consider increasing funding to the two institutions.

The OHS Framework proposes the MLSS – (OSHSD) and NCC to constantly carry out inspections and checking that legislations are enforced. Contractor should be mandated to submit the Health and Safety Policy Statement to NCC. NCC should ensure that what was outlined in the policy are implemented by the contractor them during the construction period. NCC and MLSS – (OSHSD) should be proactive and not reactive when conducting Health and Safety Inspections.

5.3.6 Post – Construction Phase

Post – construction phase is the phase after the completion of execution of the project and after the final inspection is conducted. The objective of the post-construction phase is to maintain building performance throughout the useful life of the facility. Activities involved in the phase, including management, control and operations and maintenance of the structure in a standardized manner. These activities might cause health and safety challenges to both the workers and occupants of the structure. Every project has a deadline, and in trying to beat the work targets and the pressure of handover, unsafe and unhealthy practices become common.

During commissioning and handover of the completed building, the contractor should submit final designs as built to the client and consultant. Furthermore, detailed user manuals should be prepared and submitted to the client explaining and guiding on the use of the every fittings of the building. The contractor should inform client of the defect liability period and advise to report any defects develop to the consultant who in turn would instruct the contractor to attend to them. This would safe guard the occupants of the building as working on defect may pose health and safety issues the users.

5.3.7 Health and Safety Audit

Audit is a systematic and, wherever possible, independent comprehensive examination of the company's safety performance (Kanchana, Karunasena and Jayasuriya, 2013). An audit is conducted to determine whether OHS activities and related results conform to planned arrangements and whether the arrangements are implemented effectively and are suitable to achieve the organization's policy and objectives.

To this NCC and MLSS – (OSHSD) members should adopted a structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective action. As illustrated in Figure 5.1, all the activities in construction and post – construction phases must be audited for health and safety issues.

5.3.8 Monitoring and Evaluation

To assess the effectiveness of the whole OHS Framework, the monitoring and evaluation process had to be carried out as illustrated in Figure 5.1. Therefore, NCC and MLSS – (OSHSD) should periodically assess the framework based on specifically developed indicators of the extent to which the set goals and objectives will have been achieved. This will involve routine data collection and analysis on progress made in the implementation of the project, and would inform future planning especially in resource allocation for various programmes.

5.4 Summary

The Chapter presented the proposed OHS Framework for effective implementation of workers health and safety standards in the construction industry in Zambia. The framework proposed the urgent need of the preparation of OHS Policy and the formation of the National OHS Authority as a long term measure. The OHS Framework also outlined on how the health and safety matters should be managed at three phases of the construction project namely, pre-construction, construction and post – construction phases. The proposed framework furthermore incorporated the health and safety audit and the monitoring and evaluation for control measures. The next Chapter presents the limitations, conclusion and recommendations of the study.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the salient points raised in the study. This was done by critically evaluating the research questions that were formulated in first chapter of the study. The research findings are then presented to draw conclusion and make recommendations on measures for policy consideration. Lastly, the future research in the field of Health and Safety are suggested.

6.2 Overview of Study

The research was conducted in the construction industry to assess the OHS implementation in building construction sites in Zambia. Due to the vast nature of the construction sector, only building construction was considered for study. A total of 10 interviews were conducted from the targeted 15, the information from the 10 were used to prepare 150 questionnaires. The questionnaires were prepared and administered to employees in the industry of which only 135 questionnaires were retrieved and analysed. From the total analysed questionnaires, 130 were used for the quantitative research.

The study proposed to determine the construction HSS available in Zambia's construction industry. It also evaluated the application of health and safety of workers on building construction sites in Zambia's construction industry. Further, the study assessed the National Policies, Legislation and Implementation Frameworks in place to facilitate management of health and safety in building construction. Additionally, it proposed to determine factors that inhibit the implementation of HSS. Descriptive research design was used to conduct the study. The targeted population consisted of consultants, contractors, employees and top managers in the selected government and regulatory institutions.

Simple random sampling technique was used to select the respondents whiles purposive sampling technique was used to select top managers from government and regulatory institutions. Questionnaires and semi - structured interviews were designed and used to

collect data for the study. The items were administered personally by the researcher. The research instruments were designed with the assistance of the supervisor. Data collection lasted for four months from August to December, 2016. The data collection took longer, than scheduled because a number of contractors demobilised from sites due to non-honouring of their payment certificates by the Zambian Government during the period of research. The data were edited, coded, presented and analysed using statistical parameters such as percentages, frequency tables, and the results were presented in the form of tables for discussion which aided in answering the research questions.

6.3 Limitation and Future Study

The field of OHS is very broad and obviously cannot be exhaustively discussed in a single research paper of this nature due to time and financial limitations. This is so because the study was carried out during the course of the university calendar, a situation that resulted in exerting pressure on the time devoted to the study. For future research, the following recommendations are made:

- expand questionnaire to cover more construction companies, especially companies in Grade 5 and 6 as they are the ones who seem to be paying less attention to OHS issues on sites;
- researches to be conducted in other sector like roads construction, mining and agriculture, as this research was limited to the building construction only; and
- researches to be conducted on the assessment of the OHS legislation framework in the country as legislation will form the backbone of achieving the effective management of the OHS issue.

6.4 Conclusion

Based on the findings, it can be concluded that the HSS implementation in building construction sites in Zambia are not effectively applied and monitored. This is evident enough from the many challenges in implementation of health and safety issues in the construction industry by the key stakeholders. The current health and safety legislations were established to be ineffective as only 16.2% elected in favour of the effectiveness of

the legislations. From the study it was, also deduced that the National Health and Safety Policy in the construction industry is not effective, 86.9% indicted of it ineffective. Further, the survey findings from OSHSD revealed that currently, Zambia does not have a comprehensive National Policy on OHS. As of time of data collection, October, 2016, the formulation and preparation process of the OHS policy was still at consultative stage.

It can also be concluded that the majority (89.2%) indicated that the implementation framework of the Health and Safety is not adequate. In addition it was established that only two institutions carried out OHS inspection on construction sites namely NCC and MLSS – (OSHSD). The research findings also discovered that of the 31.5% sites inspected, NCC had inspected more sites (87.8%) compared to (12.2%) by the OSHSD.

Contrary, to the Occupational Health and Safety Act of Zambia, 2010, Section 32(1), mandating the employers to preparation and avail the Health and Safety Policy to their workers, only (21.5%) of the companies prepared the policy of which only (28.6%) availed it to their workers.

In the last 2 years, the total of 53.1% of the companies had experienced accidents and minor injuries on sites; the situation is not pleasing as most of the construction companies do not have a system and procedure for reporting pains, sickness and accidents. It can further be concluded from the findings that the majority (55.4%) of the companies do not have First Aid Box on site and fails to employee qualified and trained staff in first aid, as only 37.7% of the companies had employed a First Aider on their sites.

On the formation and functioning of the Health and Safety Committee in line with Part lll of the Occupational Health and Safety Act of Zambia, No. 36 of 2010, were the employer is supposed to form the Health and Safety Committee. In contrary, only 16.9% of the construction companies had Health and Safety Committee.

The findings of the study have also shown that more 66% of the construction companies do not provide formal Health and Safety Training, job – specific Health and Safety Training, and health and safety induction training to their employees.

It can also be deduced that the two (2) institutions that were administering Occupational Safety and Health had inadequate staff, funding and equipment to conduct effective monitoring of OHS on construction sites. For instance, the total number of inspectors as per approved staff establishments for OSHSD in 2016 was fifty four (54) inspectors. However, only fifteen (15) inspectors were employed and available representing 27.8%. This poses a challenge to the inspectors to cover the ever growing number of registered construction companies in the country which, according to NCC database stood at 5,171 as of November, 2016. The same number of inspectors has to inspect OHS in other industry sectors like agriculture, manufacturing and other factories in the country. The total number of inspectors under NCC had been constant at 8 since 2011. The total budgetary allocation for OSHSD and NCC for the past five (5) years was K33,077,528.33 of which only K25,220,744.00 was released and K21,710,507.00 was expended.

Furthermore, it was established that there was lack of coordination among the institutions managing OHS in the country. In addition, all the regulating institutions lacked a centralized and systematic system for reporting and recording OHS matters resulting in inconsistencies in the reporting.

6.5 Recommendations

Several recommendations are suggested based on the research findings. The recommendations made are based on the role of each party involved in building construction projects, including the government and regulation agencies and contractors can play in managing OHS.

6.5.1 Government

- the government should vigorously follow up the health and safety applications in the construction sites by visiting the sites and evaluating the safety application during the construction period;
- the government should complete the formulating and preparing of the comprehensive National OHS policy. The policy should clearly address the key roles of the main institutions in the management of OHS in the country so as to

avoid duplicating and overlapping of functions. If necessary, the policy should merge some functions;

- the government should establish the National OHS Authority to be mandated with task of enforcement, supervision, promotions and implementation of OHS in the country;
- the government should consider increasing funding to the MLSS – OSHSD and NCC for them to effectively inspect HSS on construction sites;

- review existing OHS legislation to streamline the overlaps and duplications on the management of OHS in Zambia. Where need arises new laws could be developed to deal with OHS issues. The legislations should have adequate regulations that contractors should follow and abide to;
- government should ensure that players in the construction industry comply with the laid down legislations and regulations. Where possible, punitive measures should be instituted stringently to ensure adherence to set regulations;
- government in collaboration with contractor and NCC, conduct sensitisation to employees on the importance of adhering to OHS standards. The sensitisation should include top management (employers) in construction industry on the management of OHS;
- the government through relevant Ministries should consider embedding in the schools, colleges and universities' curriculum the importance of OHS to instil safety and health awareness at an early age in would be employees and employers and also Promote workplace-based training and awareness on OHS;
- the government should consider reviewing the civil works tender document to including the costing and formation of the Health and Safety Committee for the big projects which have a contract period of more than 1 years. The committee to be head by MLSS – OSHSD as they are mandated by law to administered Factory Act;
- the government to fill the vacancies establishment of the OSHSD, if possible to increase the human resources capacity to effectively monitoring and evaluate the health and safety programs on sites;

- the government to establish an effective National Recording and Notification System (NRNS) for accidents, diseases and dangerous occurrences; and
- the government with construction stakeholders such as contractors, (MLSS-OSHSD), NCC, ZIA, SIZ, EIZ and relevant government ministries should conduct workshops, symposia to sensitize on the importance of safety and health.

6.5.2 Contractors

- The contractors should conduct OHS training to the employees, promote the safety culture to employees and educate them on how to use the equipment properly in the construction site.
- The contractors should always employ qualified First Aider who should prepare regular safety meeting during the work in the construction site.
- The contractor should make sure that all the workers wear the personal protection equipment (PPE) and punish the workers who fail to adhere to.
- Contractors to form safety committee on construction sites and periodically checking that the committees are effective.

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Appendix No. 1

Semi - structured Interview Questions

Dear respondent,

This questionnaire is meant to collect data for a Master of Engineering in Construction Management research study entitles "**An Assessment of Health and Safety Standards Implementation in Building Construction Sites in Zambia"**. You have been identified as one of the respondents for this research. You are kindly requested to be honest and exhaustive in filling the questionnaire. Please note that the information given is purely for research purposes. The research is meant to develop accepted Health and Safety standards in construction industry in Zambia.

Instruction: Please fill in the spaces provided or tick inside the boxes as appropriate.

PART 1.
DEMOGRAPHICS

1 Gender

Male ☐

Female ☐

2 Professional

Construction Manager	☐	Architect	☐	Quantity Surveyor	☐
Mechanical Engineer	☐	Production	☐	Artisans	☐
Environmental Engineer	☐	Civil Engineer	☐	Electrical Engineer	☐
Health, Safety and Environmental			☐	Natural Scientist	☐

3 Type of Organization

Consultant	☐	Contractor	☐	Authority	☐
Civil Service	☐	Regulators	☐		

4 Position Held

Top Management	☐			Middle Management	☐
Support Staff	☐			Artisans	☐

5 How long have you worked in construction industry

0 - 5 years	☐	6 - 10 years	☐	11 - 15 years	☐
16 - 20 years	☐	≥ 21 years	☐		

6 How long have you worked with the company

0 - 5 years	☐	6 - 10 years	☐	11 - 15 years	☐
16 - 20 years	☐	≥ 21 years	☐		

PART 2 Interviews

1. What do you understand by occupational Health and Safety?

   ……
   ……
   ……

2. In your opinion, how would you describe how Health and Safety of workers on construction sites is applied in the industry?

   ……
   ……
   ……

3. In your opinion, how adequate are the following in the Zambia Construction Industry?

   a. Current Health and Safety legislation,

      1 - Adequate 2 - Moderate 3 - Not ☐
      Adequate……...

b. National Policies on Health and Safety and

1 - Adequate 2 - Moderate 3 - Not ☐

Adequate……

c. Implementation frame work of Health and Safety.

1- Adequate 2- Moderate 3 - Not ☐

Adequate…….

4. Which specific Health and Safety Standards are you aware of being applicable to construction sites?

……
……
……
……

5. What factors would you say influence application of Health and Safety Standards in Zambia's Construction Industry?

……
……
……
……

6. In your opinion, How adequate are the current Government institutions (regulators) in inspection and enforcing the following:

a The Health and Safety legislation?

1 Adequate 2 Moderate 3 Not ☐

Adequate……..

b The Health and Safety Standards?

1 Adequate 2 Moderate 3 Not ☐

Adequate……..

THANK YOU

Appendix No. 2

Questionnaire

Dear respondent,

This questionnaire is meant to collect data for a Master of Engineering in Construction Management research study entitle "**An Assessment of Health and Safety Standards Implementation in Building Construction Sites in Zambia"**. You have been identified as one of the respondents for this research. You are kindly requested to be honest and exhaustive in filling the questionnaire. Please note that the information given is purely for research purposes. The research is meant to develop accepted Health and Safety Standards in construction industry in Zambia.

Instruction: Please fill in the spaces provided or tick inside the boxes as appropriate.

PART 1.
DEMOGRAPHICS

1 Gender

Male ☐

Female ☐

2 Professional

Construction Manager	☐	Architect	☐	Quantity Surveyor	☐
Mechanical Engineer	☐	Production	☐	Artisans	☐
Environmental Engineer	☐	Civil Engineer	☐	Electrical Engineer	☐
Health, Safety and Environmental			☐	Natural Scientist	☐

3 Type of Organization

Consultant	☐	Contractor	☐	Authority	☐
Civil Service	☐	Regulators	☐		

4 Position Held

Top Management	☐	Middle Management	☐
Support Staff	☐	Artisans	☐

5 How long have you worked in construction industry

0 - 5 years	☐	6 - 10 years	☐	11 - 15 years	☐
16 - 20 years	☐	≥ 21 years	☐		

6 How long have you worked with the company

0 - 5 years	☐	6 - 10 years	☐	11 - 15 years	☐
16 - 20 years	☐	≥ 21 years	☐		

PART 2 Quantitative Questionnaire Questions

S/No	Statement (Health and Safety Standards)	Adequate	Not Adequate
1	Adequacy of Health and Safety Standards in the Zambian Construction Industry?		
2	Adequacy of implementation of Health and Safety Standards		
3	Adequacy of Regulators in inspection and enforcing of Health and Safety Standards		
	Statement (Policy Statement)	**Yes**	**No**
4	Does the company prepare a Health and Safety policy statement		
5	If yes, is the company's written Health and Safety policy or programme made available to all employees?		
	Statement (Training)	**Yes**	**No**
6	Does the company undertake formal Health and Safety training programmes for employees?		
7	Does the company undertake induction Health and Safety training programme to new employees?		
8	Does the company undertake job - specific Health and Safety training to employees prior to starting a new work?		
9	How effective is the flow of Health and Safety information between sites Manager / Health and Safety officer to site workers?		
	Statement (Accidents)	**Yes**	**No**
10	Are you aware of any accident that had occurred on construction site?		
	Statement (Accidents, Safety Committee and Inspection)	**Yes**	**No**
11	Does the company investigation OHS accidents on sites?		
12	Does the company have procedure for employees for reporting pains, sickness and accidents in relating to job process?		
13	Does the company have an accident book or similar accident record system on site?		
14	Does the company provide First Aid Box or Clinic on construction sites for the workers?		
15	Are there trained staffs in First Aid on construction sites in the company?		
16	Does the company have a Health and Safety Committee on site?		
17	If yes, how effective is the Health and Safety Committee in addressing Health and Safety issues on site.		
18	Has any Health and Safety inspector, visited and inspected the construction site?		
19	If yes, how often was your construction site inspected?	**12 Months**	**1-2 years**
20	If yes, from which institution were the Health and Safety inspectors?	**NCC**	**Labour**

B. Application of Health and Safety

S/No.	Statement (Application of Health and Safety)	Yes	No
1	Does the company provide all the required PPE to workers?		
	Statement (Types of PPE))		
	Statement (Providing of PPE))	**Yes**	**No**
2	If provided, tick the types of PPE provided to employees by the company?		
	a. Working Suite		
	b. Safety footwear		
	c. safety gaggles		
	d. Safety belts		
	e. Hard hat		
	f. face shields		
	g. Hearing Protection		
	h. Respiratory PPE		
3	Are you aware that PPE is provided according to:		
	a. The specific work site,		
	b. Project activities and		
	c. Weather conditions?		

C National Policy, and Legislation and Frameworks

S/No	Statement (National Polices, Legislation and Frameworks)	Adequate	Not adequate
1	In your opinion, are the following adequate in the Zambian Construction Industry?		
	a. Current Health and Safety legislation,		
	b. National Policies on Health and Safety and		
	c. Implementation frame work of Health and Safety.		
2	In your opinion, How adequate are the current Government institutions (regulators) in inspection and enforcing the Health and Safety legislation		