ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS SCHOOL OF COMMERCE

ASSESSEMENT OF SAFETY AND HEALTH MANAGEMENT PRACTICE IN BUILDING CONSTRUTION PROJECTS: THE CASE OF BAMACON ENGINEERING PLC.

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A Project Work Submitted to Addis Ababa University School of Graduate Studies in Partial Fulfillment of the Requirements for the Award Master of Arts Degree in Project Management

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ADDIS ABABA, ETHIOPIA

ASSESSEMENT OF SAFETY AND HEALTH MANAGEMENT PRACTICE IN BUILDING CONSTRUTION PROJECTS: THE CASE OF BAMACON ENGINEERING PLC.

DECLARATION

I, the undersigned, hereby declare that the work contained in this project work "Assessment of Safety and Health Management Practices in building Construction Projects : The case of Bamacon engineering PLC" is my own original work and all sources of materials used for the study have been acknowledged. I have conducted the study independently with the guidance and comments of the research advisor and that I have not previously in its entirety or in part submitted at any university for a degree, diploma or other qualification.

Name: Shilmat Getahun

Signature: _____

Date: _____

CERTIFICATION

This is to certify that the project work titled "ASSESSMENT OF SAFETY AND HEALTH MANAGEMENT PRACTICE IN BUILDING CONSTRUCTION PROJECTS: THE CASE OF BAMACON ENGINEERING PLC" undertaken by Shilmat Getahun in Partial fulfillment of the award of Master's degree in Project Management at Addis Ababa University School of Commerce, is an original work and not submitted earlier for any degree either at this University or any other University.

Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the project work (paper) to the department.

Advisor: Worku Mekonnen (PhD)

Signature: _____

Date: _____

Addis Ababa University

School of Graduate Studies

This is to certify that the project work prepared by Shilmat Getahun: ASSESSMENT OF SAFETY AND HEALTH MANAGEMENT PRACTICE IN BUILDING CONSTRUCTION PROJECTS: THE CASE OF BAMACON ENGINEERING PLC submitted in partial fulfillment of the requirements for the degree of Degree of Master of Arts in Project Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

The Construction industry plays a significant role in the development of a nation. Despite the role it plays the construction industry remains one of the most hazardous industries there is due to accidents and fatalities that occur each day everywhere. This is especially true for building construction projects. The aim of the research was therefore to assess the safety and health management practice of building construction projects at Bamacon engineering PLC. Descriptive design was used for the study to identify what the implementation mechanism of safety and health used were and what factors hinder the implementation practice of safety and health. The data was collected from employees of the organization who were involved in the four building construction projects collected through questionnaires and interview. Observation of the researcher was also used to gather information regarding safety and health measure that are used at the construction sites to prevent accident causation. Based on the results the researcher found that the measures that are taken to protect workers from possible accidents were not found to be satisfactory. Resource and managerial factors were found to hinder safety and health implementation practice at Bamacon engineering plc.

Keywords: Safety and health, accidents, construction projects

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Acronyms

ACSNI	Advisory Committee on the Safety of Nuclear Installation
ETB	Ethiopian Birr
GDP	Gross Domestic Product
HaSPA	Health and Safety Professionals Alliance
HSE	Health and Safety Executive
ILO	International Labour Organization
ILS	International Labour Standard
MOLSA	Ministry of Labour and Social Affairs
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PLC	Private Limited Company
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PPE	Personal Protective Equipment
RII	Relative Importance Index
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

Chapter one: INTRODUCTION

1.1 Background of the study

The construction industry is a dynamic industry contributing to the economic development of a nation. It has a very significant contribution to the sustainable economic development of a nation through the basic objective of development including output generation, employment creation, income generation and re-distribution. It also plays a significant role in satisfying basic physical and social needs through the production of shelter, infrastructure and consumer goods. (Durdyeve &Ismail, 2012)

The construction industry is a fast-growing sector for many developing nations. It is an important part of their economy and it is seen as a driver of economic growth. Typically, the construction industry contributes to 11% of gross domestic products (GDP) in most developing countries (Giang and Pheng; cited in Muiruri 2014).

Despite its importance, the construction industry has the highest accidents recorded than any other sector. The construction industry is one of the most hazardous industries there is due to accidents and fatalities that occur each day everywhere. According to ILO (2009), construction workers are three times more likely to be killed and two times more likely to be injured at work compared to workers in other occupations. (Adane et al, 2013) Starting from 2016, the construction industry had about 19% of the total industrial deaths in the United States and worldwide making the construction industry an industry with a higher fatality rate than other industries (Park et.al, 2020). These results and figures show that safety and health management issues are crucial in construction projects.

According to WHO (2001), occupational safety and health is the promotion and protection of the physical, mental and social well-being of workers by preventing and controlling occupational diseases and accidents by removing workplace factors and conditions hazardous to health and safety at work.

Safety and health management is essential in any project as the impacts of human loss and injuries are immeasurable and intolerable. Every worker need to work in an environment that they feel safe and protected in and can go back to their home in the good health they came to

work in. Inadequate or lack of occupational safety and health management practice not only affects the physical and psychological well-being of individual workers but also negatively affects the project's cost, productivity, quality, schedule, client satisfaction, and the general environment. (Smallwood, 1999)

Worldwide, around 2.3 million women and men around the world die due to work-related accidents or diseases every year; this corresponds to over 6000 deaths every single day. (ILO, 2003) And according to recent updates, the number of accidents and illnesses shows an increase in number. The estimated economic loss caused by work-related injuries and disease was equivalent to 4 % of the world's gross national product. (Fekelle et al. 2016)

In Ethiopia, similar to the case of most developing nations, the construction industry is a major economic growth driver. There is a great amount of investment in infrastructure and residential building projects which is turning the country into one of the continents highest performing economies. According to the African business information report, for the past decade, investment in infrastructure and other construction works has served as a catalyst for Ethiopia's rapid economic development. The report showed that the market value of the construction sector was estimated to be more than US$7bn and, construction activities in Ethiopia accounted for 15.9% of GDP at current prices during the 2015/16 fiscal year. (Veitch, 2018)

In Ethiopia the construction sector is characterized by having an unskilled labor force at a cheap rate. Occupational hazards among these workers are high due to illiteracy, poverty, lack of proper training and information on dangers and risks at the workplace, and other related factors. (Kassahun, 2017) And according to Mersha et al. (2016) construction workers in Ethiopia are working for long hours, with the absence of vocational training, lack of PPE and lack of workplace supervision which puts them at a higher risk of work- related injury making safety and health management crucial in construction projects.

Construction safety and health management deal with actions that managers at all levels can take to create an organizational setting in which workers will be trained and motivated to perform safe and productive construction work. Safety and health management should create a system that delineate responsibilities and accountabilities and outline procedures for eliminating hazards

and identifying potential hazards before they become the contributing factors to unfortunate accidents. (Mururui et.al, 2014)

In Addis Ababa currently, many construction projects are being undertaken. The research will, therefore, assess the safety and health management practices of one of the grade I building construction companies in the city, Bamacon engineering PLC to investigate the safety and health management practiced at the construction company.

Bamacon engineering was established in 2001 as a grade VII construction company in the city of Addis Ababa. Over the years Bamacon Engineering has grown to be a very competitive Grade I Building Contractor with a broad client base.

Currently, Bamacon engineering is undertaking different construction works in building Office, Shop, apartment and mixed-use building complexes, hotels factories and warehouses and sub-stations and power transmission network projects.

1.2 Statement of the research problem

Working in the construction sector has its own exposure to danger such as working at heights, working with power tools, working in the outdoor elements, contractual work as opposed to permanent employment, lack of standards or regulations among workers in terms of qualification and training and less regulation and enforcement than other sectors. (Tadesse et al., 2016)

These features of construction projects may cause fatalities, injuries and diseases not only to the worker but also to the environment. Occupational fatalities, injuries and disease constitute defects as they are not project requirements may cause project delays and cost overran. In a hazardous industry like construction, accidents remain a too-frequent cause of delays and a danger to workers. (Abrahamsen et al. 2013, cited in Alemu, 2020)

In several countries, many accidents occur in the construction industry which resulted in minor, major and even catastrophic injuries and illness of the workers and the general public. But the impact of occupational health and safety hazards faced by construction workers in developing countries are 10 to 20 times higher than those in industrial countries. (Dong et al 2015; cited in Tadesse and Israel 2016) The situation in developing countries regarding health and safety (H&S) could get worse if remedial actions are not taken.

In Ethiopia, where the construction sector is one of the dominant sectors contributing to the nation's GDP and employment opportunity, the issue of safety and health management is of greater importance.

In Ethiopia, there is a regulation on Occupational Safety and Health (OSH). Ethiopia is one of the countries in the world that have adopted ILO Convention No 155 of 1981 in 1991. The national-level policy on Occupational Safety and Health (OSH) has also been developed and approved in 2014 by the Central government. (Kumie et al.; 2016)

However, the number of fatalities and accidents that occur in construction sites seems to be increasing over the years instead of showing improvement. According to MOLSA, there are above 930 deaths per annual in the construction industry; and more than a minimum of 110 building construction injuries per day from low to a high level of fatalities (MOLSA 2017; cited in Leykun, 2019). And according to a cross-sectional study conducted in 15 licensed building construction companies in Addis Ababa, the capital city of Ethiopia; a total of 683 (84.7%) respondents reported occupational injuries during the past 12 months (at the time of the study) giving an overall annual prevalence rate of 847 injuries per 1000 construction workers. (Mersha et.al, 2016) These figures go to show just how serious the issue of occupational safety and health management practice is especially for construction projects.

Studies also show that a relatively higher prevalence of injury was reported among building construction employees compared to other studies. According to Kassahun (2017), most of the causes of the accident occur in building construction as workers fall from height. Falling from height is very frequently occurring in the accident history of Ethiopia.

These findings show that even though Ethiopia has adopted OSH related regulations, it is not implemented appropriately in the construction industry. In Principle safety and health is often discussed as a priority, while in reality safety and health take a low priority to budget and time issues.

Bamacon engineering PLC is one of the grade I contractors in Addis Ababa. Currently, Bamacon engineering is in charge of undertaking several building construction projects in the city for its clients. Over the years there had been workplace accidents that occurred in construction sites

which caused major and minor injuries to workers. Many of these accidents occurred in building construction projects as many hazards occur when working in height.

Therefore in assessing the safety and health management practice of one of the grade1 building construction companies in the city undertaking many building construction projects, where many of the accidents of construction projects are occurring in, will help to understand safety and health management practices, their implementation and challenges they face to make recommendation and suggestion in areas that may need improvement for better performance of building construction projects in this field of area.

1.3 Research objective

The research aims to achieve the following general and specific objectives:

1.3.1 General objective

The main objective of this paper is to assess the safety and health management practices of building construction projects at Bamacon engineering PLC.

1.3.2 Specific objectives

The research paper has the following specific objectives.

- To examine the implementation mechanism of safety and health regulation in building construction projects at Bamacon engineering PLC.
- To identify factors that hinder the proper implementation of health and safety regulations in building construction projects at Bamacon engineering PLC.

1.4 Research questions

To achieve the main objective of the research, the researcher formulated the following research questions:

- What is the implementation mechanism of safety and health regulation in building construction projects at Bamacon engineering PLC?
- What are the factors that hinder the implementation of health and safety regulations in building construction projects at Bamacon engineering PLC?

1.5 Significance of the study

Safety and health management is a very relevant subject that should be the priority of every organization especially that of a construction one. The study of health and safety management practice can help identify critical errors and mistakes that occur in building construction projects that should be avoided, which otherwise can result in disaster.

The study investigated the reality regarding safety and health regulation adopted to prevent workers from facing workplace accidents and illness, the extent to which these regulations are implemented and factors that hinder the implementation of such practices; which will help raise important concerns for all parties involved by identifying areas of health and safety management practice deficiencies in building construction projects.

For management of the organization, looking at the results of the finding will give them a clear view of areas that need work and improvement in safety and health management practices in their organization. This will help to improve the overall performance of the company and enhance the safety and health record of the country as a whole.

The study can also be used as a reference and starting point for future research in this field of study. Future researchers may use the paper to identify gaps and get valuable information which will be a starting point for further study.

1.6 Scope of the study

The study focused on safety and health management practices at Bamacon engineering PLC. This is a construction company that has been operating in Addis Ababa for over a decade and is now one of the grade I construction companies in city. This study will find out how safety and health management is practiced on building construction projects undertaken in the organization.

The study focused on four building construction projects in the city of Addis Ababa. Addis Ababa city is selected for two reasons. The first one is due to its accessibility to the researcher. Secondly, Addis Ababa is where most of the biggest buildings are currently being built. And since the study will focus on building construction projects where most of the accidents are occurring in the country, Addis Ababa is the better choice for this particular study.

Methodologically, the research used descriptive design to assess the current health and safety practices at the organization. The target populations of the study were project managers and employees with engineering and construction work-related expertise who are engaged in building construction of the projects. (Project managers, site engineers, office engineers, safety engineers, logistic engineers, consulting engineers, foremen and gang chiefs)

1.7 Limitation of the study

The research only addressed building construction projects. The reason behind this is, as previously mentioned most construction-related accidents occur in building construction projects. However, this is not to mean that the issue of safety and health is not crucial in other construction projects as well. But due to the limited time available to conduct the research, the study only focused on selected building construction projects as that was the area where the majority of the problem was observed.

Another limitation of the study were some of the target respondents were not be able to participate in the study due to the tight schedule they are facing in their work.

1.8 Definition of terms

Safety: Safety is a measure of the degree of freedom from the risk or conditions that can cause death, injury, illness, damage to or loss of equipment, property, and time. (Vincoli, 2000)

Health: health is a state in which an individual's and/or group's mental, physical, physiological, and social conditions are within normal limits. (Vincoli, 2000)

Occupational health and safety: According to WHO (2001), Occupational health deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards. It is the protection, promotion, and enhancement of the physical, social, and mental well-being of workers by eliminating occupational factors and conditions hazardous to health and safety at work, to enable workers to conduct socially and economically productive lives which help contribute positively to sustainable development.

Occupational accident: occupational accident is an unwanted or undesired occurrence or event in the course of work that may result in fatal and/or non-fatal occupational injury. (Hamailaian, 2010)

1.9 Organization of the paper

The study is structured into five chapters.

Chapter one, which is the introduction part of the paper contains the background of the study, statement of the research problem, research questions, research objectives, the significance of the research, research scope, definition of terms, and limitation of the study.

Chapter two contains the literature review part of the paper which is comprised of definitions, theoretical review, and empirical analysis.

Chapter three contains the detailed research methodology which is comprised of the research design, study area, research population, sampling design, and data collection methods.

Chapter four contains the data presentation, analysis, and interpretation section of the study which shows the data collected, its analysis, and interpreted results in detail.

Lastly, Chapter five highlights the summary of the study draws a conclusion based on the findings and make recommendations.

Chapter two: LITERATURE REVIEW

2.1 introduction

This chapter discusses the previous works of different authors and scholars regarding health and safety management. Key concepts in the field of study, theoretical and practical works of different scholars and authors in safety and health management in general and safety and health management in construction projects, in particular, are discussed in this chapter.

2.2 Theoretical review

2.2.1 Safety and health definition

Before going to discuss the different aspects in safety and health management first it should be clearly understood what safety and health is in the first place and what it is all about.

The joint committee of ILO/WHO on occupational health gave the following definition on occupational health and safety. According to ILO/WHO occupational health and safety has the objective of:

i. Maintaining and promoting workers' health and working capacity;
ii. Improving the working environment and the work itself to become conducive to safety and health; and
iii. Developing work organizations and working cultures in a way that supports health and safety at work; promotes a positive social climate and smooth operation, and enhances the productivity of the undertakings. (ILO/WHO, cited in Alli 2008)

The protection of workers against sickness, disease, and injury related to the working environment is one of the critical issues in ILO laws and regulations. The scope of occupational safety and health has evolved gradually and continuously in response to social, political, technological, and economic changes. (Alli 2008)

The main focus of health and safety is on preventing people from being harmed at work, by taking the right precautions and by providing a satisfactory working environment. Providing workers a healthy and safe working environment prevents them from getting injured at work. In addition to that, it is also said to increase worker's productivity, reduce staff turnover, and lower staff leave of absence due to sickness. (Hughes and Hughes, 2008)

2.2.2 Importance of health and safety management

Occupational Safety and health management has been defined above. Now the reason behind the study of safety and health management needs to be made clear. Why do we study occupational health and safety management?

It is believed that as a result of accidents that occur in the workplace millions of people get injured permanently and temporally and some even die as a result of these accidents. According to the International Labor Organization statistics, 250 million workers around the world are exposed to accidents each year due to problems in securing the work environment. (ILO, 2016)

The occurrence of these sorts of accidents, an unsafe act or condition indicates that something went wrong in the management system and the management system was not able to prevent accidents.

It is through safety and health management the cause of accidents can be identified. Safety and health management not only determine the causes of an accident but also underlines sets of circumstances that might have a more severe impact. Underlining and understanding such circumstances help categorize them based on the frequency and severity of the accidents that they might cause so that they can be controlled appropriately by directing the required resource to help prevent such accidents. (Reese, 2017)

Many consequences occur due to negligence of health and safety issue in any organization. International Labour Organization (ILO) has outlined the direct and indirect costs associated with ineffective health and safety management system as:

- The cost of treatment of the injured.
- Decrease in the number of working days
- Low productivity
- Compensation costs
- Training and re-training costs
- Repairing the equipment damages costs (ILO, 2016)

It can be seen that negligence of safety and health issues in an organization will have consequences as it causes human loss and injury (which is the severe impact) and will have a negative impact on organizational productivity as a result of direct and indirect costs listed

above. Therefore, to avoid all the above-mentioned direct and indirect costs of occupational hazard the application of safety and health management system with the commitment of all parties involved is essential.

2.2.3 Key elements for successful health and safety implementation

Hughes and ferret (2007) in their book on *introduction to construction health and safety management* identified key elements an organization needs to have for a positive health and safety performance. These key elements are policy, organization, safety plan, performance measurement, and performance review. Each element is discussed below.

A clear health and safety policy

According to Hughes and Ferret (2007), one of the key elements for the success of safety and health management is having a clear health and safety policy.

A clearly laid down health and safety policy sets out a general approach to health and safety. It clearly describes how an employer is supposed to manage health and safety in an organization by laying down who does what, when, and how. (HSE, 2020)

Therefore having a sound, well-thought-out policy contributes to business efficiency and continuous improvement throughout the operation.

A health and safety organization

The control of occupational hazards and diseases requires adequate organizational measures. One of the most important elements in safety and health management is having a shared understanding of an organization's values and beliefs, at all levels of the company (Hughes and ferret, 2007)

There is no perfect model for an organizational structure that fits all. Management in an organization has to make a choice regarding which organizational structure is the most appropriate one and works best for that specific organization by weighing up the anticipated merits and disadvantages of various systems.

A clear health and safety plan

Safety and health plans are an organized and detailed means of scoping, defining, and controlling potential workplace health and safety hazards, especially in an uncontrolled environment. (Sawyer et al 2000; cited in Gochfeld 2006)

For a safety plan to work effectively there should be measures and performance standards set. (Hughes and ferret, 2007) Setting measures and procedures to be taken gives direction and awareness to all level employees in an organization regarding possible occupational hazards and ways they can be avoided while performance standards help to inform if these measures are being properly implemented and targets are being met.

The measurement of health and safety performance

Measurement is one of the key steps in a management process that can be used as a base for improvement. Health and safety performance measurement includes active and reactive monitoring to see how effectively the health and safety measures are being implemented. Active monitoring is preventive monitoring that is used to prevent the occurrence of injuries and work-related ill health before it occurs. Reactive monitoring on the other hand as the name indicates is designed to measure failures in risk control to provide opportunities for organizations to check their performance and to improve their shortcomings. (HSE, 2001)

The audit and review of health and safety performance

Auditing is used by organizations to define a range of measuring activities which includes physical condition checks as well as management systems. (Gay, 1999) The outputs from monitoring and audits are then systematically reviewed by the required party to check whether the management system is achieving the right result or not so that remedial actions can be taken if shortcomings are observed.

For positive health and safety performance, an organization needs to have a clear health and safety policy that is communicated clearly in the organization, with a clear plan to achieve safety measures and an active and reactive monitoring system to measure performance and review the records to take corrective actions in relation to health and safety issues.

2.2.4 Health and safety culture

Safety culture in an organization is a pool of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment, the ability, and ways in which an organization manages health and safety. (ACSNI, 1993, cited in HSE 2005)

According to Alli (2008), the protection of workers from occupational accidents and diseases is primarily a management responsibility. When management tries to encourage safety and health

practices through policies, procedures, and financial incentives, then supervisors and workers will be motivated to respond by ensuring that work is performed safely throughout the enterprise.

However, positive health and safety culture not only concerns senior management but the whole workforce as it requires each party's commitment for its success. Workers have the right and responsibility to participate in fundamental worker's rights and duty issues. As employers are obligated to provide a safe and healthy workplace, workers are also obligated to cooperate to enable their employer to fulfill those obligations. (Alli, 2008)

According to Hughes and Ferret (2007), the most important components of a positive health and safety culture are:

- Leadership and commitment to health and safety at all levels of the organization;
- Setting high standards of health and safety accepting it as achievable long-term strategy formulated by the organization;
- A detailed assessment of health and safety associated risks and the development of appropriate control and monitoring systems in an organization;
- A clear health and safety policy, code of practices, and standards that sheds light on short and long-term health and safety objectives.
- Employee training programs, communication and consultation procedures;
- Systems for monitoring equipment, processes, and procedures and the prompt restructuring of any defects that may occur; and
- Investigation of all incidents and accidents promptly and reports made detailing any necessary remedial actions.

For an organization to be able to manage health and safety effectively it needs to have positive safety and health culture. The above-mentioned components are the most important components that contribute to a positive safety and health culture in an organization

2.2.5 OSH legal frameworks

The International Labour Organization (ILO) OSH standards

The ILO develops International Labour Standards that mainly deal with employment policy, working time, wages, social security, migrant workers, OSH, special categories of workers (IOE fact sheet for business)

The International Labour Conference also develops ILS Conventions and recommendations. ILS conventions are legally binding standards and a country that decides to ratify them is expected to enforce them. Recommendations on the other hand are guidelines that are derived from the convention but are not legally binding. (IOE fact sheet for business)

ILO standards on OSH are critical tools for all parties involved in OSH practice i.e. the government, employers, and workers to establish sound prevention, reporting, and inspection practices for safety and health at work.

ILO Safety and Heath convention and code of practice for construction workers

ILO convention has laid down safety and health laws designed specifically for construction works. The ILO's Code of Practice on Health and Safety on Construction Site (ILO, 1992) provides guidelines in the implementation of the Health and Safety practice on construction sites for all workers.

The objective of this code was to provide practical guidance on a legal, administrative, technical and educational framework for safety and health in construction to prevent accidents and diseases and harmful effects on the health of workers arising from employment in construction. (ILO, 1992)

The document extensively outlines the steps that have to be taken, such as the provision of sufficient welfare facilities, use of scaffolds and ladders, measures to be taken when working at height, personal protective equipment appropriate for a job, and maintenance of a safe working environment for all workers on site. (Dadzie, 2013, cited in Zelalem, 2015)

OSH Legal frameworks in Ethiopia

The ILO convention and labor proclamation

Ethiopia is one of the countries in the world that have adopted ILO Convention No 155 of 1981 in 1991 which resulted in the adoption of Labor Proclamation No. 377/2006.

According to, Seblework (2006), In Ethiopia, labor proclamation No 377/06 is a comprehensive labor law that is operating in order to address all aspects of ensuring labor relation to be governed with basic fundamental rights and obligation. The Labour proclamation No 377/06 is put into place to guarantee and maintain all fundamentals rights at work and to define the powers

and duties of the organ charged with enforcing the implementation of the ideals of the law which is similar to the labor inspectorates.

The national-level policy on Occupational Safety and Health (OSH) has also been developed and approved in 2014 by the Central government. (Abera et al. 2016) There are also other policies such as the Economic Policy of 1992 and the national health policy of 1993 which have some relevant aspects about OSH. (Seblework, 2006)

However, in Ethiopia, there is no OSH policy designed or adopted specifically for construction workers so far. The labor proclamation, as it deals with all sectors, is the legal framework working as occupational health and safety standard for construction workers in Ethiopia.

2.2.6 Safety and health in Project management

For a project to be considered as successful, the project should not only finish on time and budget but also should integrate safety issues as a measure of its success. Project managers should incorporate safety plans in their project charter as a project that finishes on time and under budget should not be considered successful if one or more workers is/are injured while performing the required task. (Terrell, 2000)

According to PMBOK® Guide safety first should be integrated into all aspects of the project work. Project managers are responsible for making sure a detailed safety plan is put in place and that safety plan is being implemented and enforced by each teammate and worker. (Terrell, 2000)

The project manager should also communicate to all workers safety and health issues are to take priority over time and budget issues. If workers feel less pressure regarding schedule issues there are likely to make a fewer bad decisions which will result in higher quality and fewer delays from rework. Therefore the project manager should communicate the message that safety will not be compromised for any reason.

2.2.7. Characteristics of a construction project

The construction industry is very wide in scope, the most common activities being general building works (domestic, commercial or industrial) and these building works made of new or extension, refurbishment, maintenance of the existing building. The construction industry consists of various sectors such as the building and residential development sector, civil

engineering sector, professional services sector, and self-building sector. (Hughes and Ferret 2007)

The construction industry is also one of the main sectors in which accidents are occurring. Therefore it should be understood what makes the construction industry a hazardous one where many accidents are occurring in.

Boadu et al (2020) has laid down some important characteristics of the construction sector in developing nations that contributes to its performance in relation to OSH. These characteristics are summarized as follows.

Unskilled and uneducated labor force

Construction has the ability to "absorb the excluded" (de Souza, 2000, cited in ILO, 2001). The construction sector offers employment opportunities for people with little education or skill, the majority of whom are from the poorer sections of society. These workers, therefore, lack the educational background, skillsets, and training required to perform construction activities that are considered hazardous causing construction site accidents.

Labor intensive

The construction industry is a labor-intensive industry. There are a large number of people who are unemployed in developing nations who are willing to work at a comparatively cheap rate. This makes the adoption of labor-based methods a more economic option than equipment-intensive or capital-intensive methods. This contributes to low quality of work as workers lack the required expertise and training whilst exposing them to accidents.

A large number of small contractors

The construction industry in developing nation is often characterized as having a multiplicity of small firms as barriers to entry is small. These allow for individual and business entities with inadequate resources, people, and qualifications to enter and operate in the sector. These small contractors generally do not manage health and safety risks as effectively as larger contractors do and therefore are more prone to higher accidents (Holmes et al 1999; cited in Boadu et al, 2020).

Complicated and fragmented

The construction industry involves many stakeholders such as clients, the design team and the construction team, etc. Typically, fragmentation is inherent in the traditional procurement system

where the design and construction of projects are executed by various parties and are therefore separate. (Boadu et al 2020)

This fragment in construction projects may cause a lack of a sense of identity, coordination, and feedback loop which often will have negative project outcomes during the construction phase such as increased project complexity, rework, cost and time overruns, and safety issues.

A large number of informal contractors

In developing countries, there is a large proportion of employment and output generation in the informal sector. (Schneider et al. 2010; cited in Monroy et al. 2014)

Informal sectors or informal contractors work on labor-only bases with the primary objective of providing employment to an individual involved. Informal sectors in most cases lack the understanding of OSH laws and regulations or are not considered a priority making it difficult to implement such laws. In informal sectors the contract between parties is verbal. This also contributes to the poor performance of OSH in these sectors as OSH laws will not be implemented and enforced.

The constant change in the working environment

Workers at construction sites face constant change in the nature of the work, the location they work in, and the people they work with making it difficult for them to familiarize themselves and get comfortable in. These characteristics of the construction industry make it prone to a higher level of risk due to the constant change in the working environment compared to others.

In Ethiopia, the construction sector shares the above characteristics. It employs a large number of the workforce where the majority of them lack the educational background and skillset. There are also a large number of small contractors and informal contractors operating in the country.

Therefore these characteristics of a construction sector greatly affect the performance of construction projects in relation to health and safety management in Ethiopia as the above-explained characteristics of construction projects in developing countries also apply to our nation.

2.2.8 Safety measures in building construction projects

Building construction has long been considered a risky industry. It involves a number of dangerous and difficult tasks such as lifting operations and working at height, etc. The accident rate is used to measure construction safety performance. (Yiu et al 2019) Therefore some measures should be taken by all parties involved to prevent such accidents. The safety measures that are widely used to protect workers from accidents are briefly discussed based on the works of different authors concerning ILO conventions.

Safety policy

A health and safety policy lays out a general approach to manage health and safety issues. A safety policy lays out how an employer will manage health and safety in an organization by clearly stating who does what, when, and how. (HSE, 2020)

Construction safety policy, therefore, is a very important element that must be developed by site managers and operating companies prior to starting any construction job. It should state the responsibility of each party involved and who has authority to allocate responsibilities to management and supervisors at all levels and to see they are carried out. (Mulinge & Muirur, 2014)

Site planning and layout

Adequate site layout and planning is one of the most important management functions in a construction project. In many cases, site and project managers tend to focus on considerations such as optimizing productivity without adequately taking into account the health and safety implications making a badly planned and messy site one of the underlying causes of construction accidents (Anumba and Bishop, 1997). Safety needs to be integrated into site layout and organization at the earliest possible stages of a project.

Use of PPE

Personal protective equipment (PPE) is provided by an employer to protect workers from accidents depending on the potential hazard of the work. These personal clothing and safety equipment include a face shield, earplug, safety shoes, gloves, hard hat and eye goggles.

Employers are obligated to provide such equipment with the proper instruction and training on how to use it for all employers. Employees on the construction site must be supervised by a

qualified H&S supervisor to ensure that the employees follow the safety instruction to wear protective clothing to keep workers safer. (Zin and Ismali 2012; cited in Saeed 2017)

Safety inspection/Audit

A regular safety inspection of works is also one of the important measures to prevent accidents in construction projects. The result of the inspection shall be documented accordingly and readily available for review on the project site. According to the University of Michigan (2010), the general contractor/construction manager will immediately correct any hazardous or otherwise noncompliant conditions identified and maintain documentation of the corrective action. In addition to these inspections, a documented audit conducted by corporate or regional safety representatives shall be done at least once a month.

Fall protection

Protecting workers against falls is also one of the measures that should be implemented by the employer/manager. A construction manager can reduce the safety risk associated with the performance of elevated work by enforcing an effective fall protection program. According to ILO (1992), where work cannot safely be done on or from the ground or part of a building or other permanent structure, a safe and suitable scaffold, ladder, and similar appliances must be provided.

Also in situations where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, preventive measures shall be taken in order to avoid accidents such as stepping on or falling through the fragile materials. (ILO, 1992)

Health and safety warning sign

The use of safety signs and signals is one of the common means of communicating health and safety information. This includes the use of well-lit signs, hand and sound signals such as fire alarms), spoken communication, and the marking of pipework containing dangerous substances. (Mulinge & Muirur, 2014)

First-aid kits and accident reporting

Because construction sites are dangerous places, and first aid and rescue equipment should always be available. (Mulinge & Muirur, 2014) According to the ILO convention for construction workers, the employer is responsible for ensuring that first aid kits and a trained

person to performs first aid task is available at all times and for the removal for medical attention of workers who have suffered an accident or sudden illness. (ILO 1992)

If an accident occurs at work and the responsible person must notify the enforcing authority without delay by the quickest practicable means.

Safety and health information and training

Construction workers are exposed to many hazardous. Therefore workers must be adequately informed and instructed of potential hazards to which they may be exposed to and trained in the measures available for the prevention and control of, and protection against, those hazards.

Training in safety and health consist of instruction in hazard recognition and control measures, learning safe work practices and proper use of personal protective equipment, and acquiring knowledge of emergency procedures and preventive action. (Mulinge & Muirur, 2014)

2.3 Empirical review

2.3.1 Safety and health in construction projects

Occupational health and safety is important in any industry because any worker employed in any kind of business needs to feel safe in his/her work environment even if the level of risk associated varies based on the characteristics of the industry he/she is in.

The construction industry is a large industry that employs many workers worldwide. However, the accident and ill-health records of this sector are very high in most countries.

Construction has accounted for about 11% of all occupational injuries and 20% of deaths resulting from occupational accidents. Based on ILO estimation at least 60,000 fatalities occur at construction sites around the world every year. This result shows that every ten minutes at least one fatal accident is occurring in the sector. (Fekelle et al. 2016)

2.3.2 Factors hindering safety and health implementation of construction projects

There are different researches carried out in different nations to determine the factors that affect the health and safety implementation practice in construction projects focusing on developing countries.

Research by Durdyev (2017) on key factors affecting construction safety performance in developing Countries was also carried out. The researcher categorized and ranked factors that

affect the performance of health and safety in construction projects as management and organization, resource (people, material, machinery, money, and method), site management; cosmetic (factors beyond the contractor's influence or control such as current safety policies, legislation codes and standards; poor weather conditions and lack of worker compensation insurance); and workforce (reckless operation) respectively.

There are also studies conducted to find out factors that affect the health and safety performance of construction projects in Ethiopia. Wubshet (2020) carried out research to study the practices and challenges of health and safety standard implementation in building construction projects in Addis Ababa. The researcher's finding showed that the major challenge that hinders the application of safety and health standards in building construction projects in Addis Ababa was lack of integration of OSH issues in the planning and execution of the projects, lack of commitment of top management, absence of participation of workers in accident identification and planning, timely evaluation and planning system and absence of inspection of health and safety.

The main factors that affect the safety and health performance of construction projects can be summarized as:

2.3.2..1 Management

It has been said above that one of the key elements in safety and health management is the commitment and attitude of top management towards health and safety programs. Management is responsible to put in place communication and information procedures, ensuring health and safety reporting procedures, and providing workers with the appropriate training programs. The managerial factors hindering safety and health management can therefore be listed as:

Level of management commitment to safety: Management commitment and attitude towards safety and health can be defined as the extent to which management is expected to place a high priority, communicate and act on safety issues successfully. (Neal and Griffin, 2014 cited in; Cheng et al 2018)

According to Usukhbayar and colleagues (2020), a low level of perceptions on safety leads to a poor safety management plan and failure to implement proper safety activities.

Frequency of safety inspection: The regular inspection of safety performance is one of the responsibilities of management. According to the study conducted by Usukhbayar and colleagues (2020), to identify factors affecting the implementation of safety and health through factor analysis the frequency of safety inspection by management was found to be the third personal-related safety factor in safety and health implementation. The lower the amount of inspection the lower the safety and health implementation.

Communication and information procedure: Communications allow employees to behave safely by providing them with the information they need to work safely. Regular feedback on safety performance can be communicated to employees through posted charts and a review of behavioral data at safety meetings. According to Coyle, safety communication significantly influences accident attributions. (Keffane, 2014)

Availability of training programs: Management is one of the determinants to ensure the success of work- place safety programs through establishing safety rules and enforcing these safety policies and standards. Providing employees with training programs is also one of the tasks of management. (Cheng et al 2018) according to Usukhbayar and colleagues (2020), one of the important factors that influence the implementation of safety and health was found to be Training.

2.3.2.2 Resource

Resources are both the tangible and intangible asset which an organization employs to choose and implement strategies. (Kamasak, 2017) These resources include all the human, financial, and physical resources that are used to achieve goals and implement strategies. In construction projects, these resources may be educated labor, machinery equipment, money, methods used, and time available to perform a task. In safety and health management of construction projects experience project management, availability of personal protective equipment, education, and experience of workers, and budget constraints were found to have an impact on health and safety management practice. (Durdyev et al, 2017)

Availability of safety equipment: Safety machinery and facilities are important to maintain the health and safety of workers. The lack of proper safety equipment is one of the main causes of

construction accidents. According to Hashem et al (2013), it was one of the main factors affecting the implementation of safety and health management of workers.

Project cost and schedule: Safety and health issues usually take the back burners when facing tight schedules and cost overrun. According to Toole (2002) and colleagues, one of the major problems faced by construction companies is the cost budget for their employee's safety was comparatively low. This led to high expenditure on hiring new workers and training given to them. (Hashem et al. 2013)

Education and skill level of construction workers: As it was previously said, the construction industry employs unskilled labor, which had contributed to its negative image of having a poor H&S record. One key barrier to H&S management is the difficulty in training illiterate workers. (Koehn et al, cited in Boadu et al 2020)

Level of commitment of workers and attitude: The level of commitment of workers and attitude towards occupational health and safety determines the effectiveness of the practice within a firm. (Dessler, 2014; cited in Wubshet 2020) In a study conducted by Usukhbayat and colleagues (2020) failure of workers to wear personal protective equipment was found to have the most critical impact on safety performance.

2.4 Research gap

In the Ethiopian context, there are different studies carried out by different researchers regarding health and safety management in construction projects. These studies have been carried out on road construction projects, high-rise construction projects, and building construction projects.

Gedon (2020) carried out an empirical investigation on the health and safety management practice of Addis Ababa City Road Construction Projects. The study aimed at assessing health and safety management issues in relation to the contribution of different stakeholders (clients consultants and contractors) of the project; and major causes of accidents in the project.

Alemu (2020), also carried out research on assessment of Health and Safety in the construction of high rise buildings in Addis Ababa, Ethiopia with the aim of investigating health and safety policies and regulations used in the construction of high rise real estate buildings; assessing whether or not health and safety training are given to workers; and evaluating the health and

safety facilities, tools and evaluation techniques used during the construction of building projects.

There are also related studies conducted to study safety and health management practices in road and building construction projects. However, there is still a gap for research in this field of study. To the researcher's knowledge in Ethiopia, there had not been research conducted to study the safety and health implementation practice of building construction projects by outlining factors that put a hamper in the implementation practices and identify these factors based on their importance. Therefore this particular study will try to fill this gap.

Chapter three: RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a way researchers try to systematically solve the research problem identified. It is a science that studies how research is done scientifically to solve problems. (Kothari, 2004)

This chapter discusses in detail the methodological choice and process that was used in the study to collect and analyze data. The research design and approach, research population and sampling techniques, data collection method, data analysis method, ethical considerations, and validity and reliability issues are discussed. In addition to discussing how the work was carried out in order to meet the study's aims and objectives, justification for each methodological choice used in the study is also discussed.

3.2 Research design

A research design is a plan, structure, and strategy of an investigation conducted to answer a research question. The research design is used to set the procedure on the required data, the methods that are going to be applied to collect and analyze this data, and how all of this is going to answer the research question. (Grey, 2014, cited in Lelissa, 2018)

In other words, a research design is a blueprint or detailed plan for how the study is to be conducted. (Thyer 1993; cited in Kumar 2011)

For this study, a descriptive research design was used to assess the safety and health management practices of the organization. Descriptive study is used to give a picture of a situation, person, or event or show how these things are related to one another as it naturally occurs without answering why (Blumberg et al 2005 ; cited in Lelissa, 2018). It focuses on answering the how, what, when, and where questions of a research problem and question without answering why.

Since the study focuses on what implementation mechanisms of safety and health are used and what factors hinder the implementation practice of safety and health, a descriptive study was used. The study answers what questions without answering why.

3.3 Research approach

There are three research approaches or methods in undertaking research. These are qualitative research approach, quantitative approach, and mixed (qualitative and quantitative) research approach.

In this study, mixed methods were used. In a mixed research approach, both quantitative and/or qualitative data are collected and analyzed in a single study in which the data are collected at the same time or successively, and involve the integration of the data at one or more stages in the research process. Using this approach to gather and evaluate data helps to increase the validity and reliability of the research. (Kabir, 2016)

In this research quantitative data collected through a survey questionnaire was the main instrument of data collection. The quantitative approach was used to generate data from which quantitative analysis was used to interpret the results and reach the appropriate conclusion.

In addition to the quantitative analysis, qualitative data collected from interview and researcher's observations were also used. The qualitative data was expected to provide the researcher a means of understanding the safety and health management practice at Bamacon engineering PLC.

3.4 Research population and sampling procedure and sample size

Study Population

The populations of the study were employees of the company who are engaged in the building construction projects such as project managers, safety engineers, office engineers, site engineers, logistic engineers, consulting engineers, foreman, etc.

The study looked at four of the biggest building construction projects that are currently being undertaken by the organization under study.

The total number of population for the study is 43 employees of Bamacon construction who are involved in building construction of the four projects. (Project managers, office engineers, site engineers, safety engineers, general foreman, etc.).

Sampling technique

Since the total population is relatively small, it was found appropriate to use a census (complete enumeration of the population), which provides a true measure of the population and it provides detailed information about the population.

3.5 Data collection

According to Kabir (2016) data collection involves the gathering and measuring of information on a subject of interest in an established and systematic way to capture evidence that translates to a meaningful data analysis and allows for the answering and solving of the research question and research problem identified.

3.5.1 Data source

Kabir (2016) gave a definition for primary and secondary data. Primary data is data that has been collected from the first-hand experience is known as primary data. Primary data has not been published before and it is gathered by the researcher himself/herself to provide information that is more reliable, accurate, and objective. Primary data has not been changed or altered by human beings; therefore its validity is greater than secondary data.

Secondary data unlike the primary one is collected from a source that has already been published before. The review of related works of different authors and researchers in any research is based on secondary data. Secondary data is collected by someone else for some other purpose but may be used by another researcher for another purpose.

For this study primary data was collected from employees of Bamacon engineering to get first-hand information from the target population in relation to the research question to be answered by this study. Observation of the researcher was also used to gather information regarding safety and health measures that are being implemented by the organization.

3.5.2 Data collection method

There are several methods of collecting primary data. For this research questionnaire was the main data collection method.

A questionnaire is a form containing a set of questions, addressed to a statistically significant number of subjects and used to collect statistical information or opinions about people. Questionnaire is a popular method of data collection in many pieces of research.

The questionnaire contained a number of close-ended and open-ended questions which were personally delivered to respondents by the researcher. Close-ended questions are relatively easy to handle, simple to understand, and quick and inexpensive to analyze.

In addition to questionnaire interview with the project managers and site managers and observation of the researcher was also used.

Observation is a scientific tool and the method of data collection in which the information needed is gathered through the investigator's own direct observation without asking for information from the respondent. (Kothari, 2008) For this research, the researcher looked at construction sites to get a good look at safety measures, availability, and use of protective equipment and write a report after each visit.

3.6 Data analysis

Once all the required data for the research is collected the next step is analyzing the data to discover useful information in relation to the objective the research is trying to achieve.

The primary data collected through questionnaires were analyzed by using quantitative descriptive statistics such as percentages, tables, and charts with the help of Statistical Package for Social Sciences (SPSS) computer software (version 20). The data gathered through interview and the researcher's observation notes were also incorporated in the analysis and discussion when needed.

Relative importance indexes (RII) were then calculated to rank factors hindering the health and safety implementation practice of construction projects at Bamacon engineering PLC. The contribution of each of the factors to hampering safety and health implementation was examined and the ranking of the attributes in terms of their criticality as perceived by the respondents was done by use of Relative Importance Index (RII).

The relative importance index RII is a statistical method to determine the ranking of different factors. (Hossen et al, 2015). Relative Importance Index or weight is a type of relative importance analysis researchers use to determine the contribution of factors identified based on their impact on the subject under study. Relative importance index analysis allows identifying

most of the important factors based on participants' replies and it is also an appropriate tool to prioritize indicators rated on Likert-type scales. (Rooshdi et al, 2018)

RII can be used to highlight the relative significance of safety factors as perceived by respondents. (Tam, Zeng, and Deng 2004; Ng, Cheng, and Skitmore 2005; Teo and Ling 2006; Doloi et al. 2012; cited in Usukhbayar, 2020) RII enables one to look at each factor's significance. The factor with the highest RII or rank 1 has a maximum impact on safety implementation performance and vice versa

RII was calculated using the formula:

Relative Importance Index = $\sum W / AN$, where:

W is the weight given to each factor by the respondents and ranges from 1 to 5

A is the maximum weight given to each factor: and

N is the total number of participants. Source: Rajgor et al (2016)

Based on the analysis and interpretation, the researcher made conclusion and recommendations.

3.7 Validity and reliability

Reliability refers to the extent to which results are consistent over time. (Kabir, 2016) Cronbach's alpha test was used to measure the reliability of the results of the questionnaire.

Table 3.1 Reliability Statistics

Cronbach's Alpha	N of Items
.730	27

Source: own survey (2021)

The closer the coefficient of the cronbach's alpha is to 1.0, the greater is the internal consistency of the items in the scale. The coefficient 0.730 is within the acceptable level. A general accepted rule is that a coefficient of the cronbach's of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level. However, values higher than 0.95 are not necessarily good, since they might be an indication of redundancy. (Hulin et al, 2001; cited in Ursachi et al. 2013)

Validity determines the extent to which the measuring instrument has measured what it has set out to measure. Before collecting data the advisor of the researcher and other selected professionals from the construction sector approved and comment on the designed questionnaire.

3.8 Ethical consideration

As with most professions, conducting research also has its own overall code of ethics. There are considerations that must be taken into account. The researcher first obtained the respondent's informed consent by justifying the relevance and usefulness of the research. The researcher also maintained the confidentiality of the participant responses by keeping them anonymous. The researcher also tried to avoid any bias that may arise from deliberately attempting to hide what the researcher has found or highlighting something disproportionately to its true existence in research.

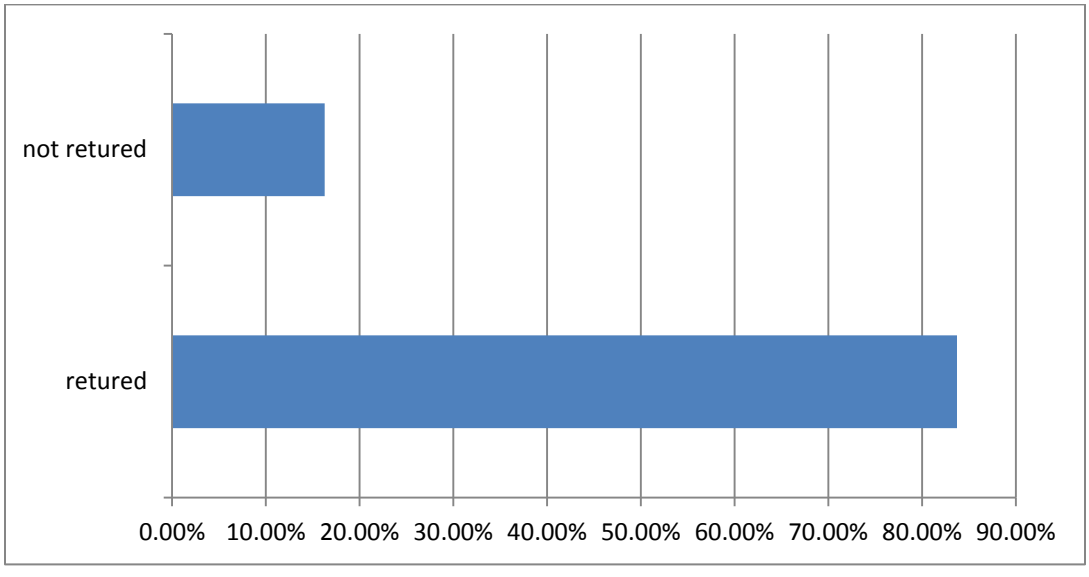
Chapter four: PRESENTATION OF FINDINGS, ANALYSIS, AND INTERPRETATION

This chapter covers the analysis and interpretation of the data collected as per the objectives of the study. The primary data collected through the questionnaire were analyzed using SPSS (version 20) and MS excel. In addition to analysis and interpretation of data collected through questionnaire, findings of the researcher from the interview with the site managers and from own observation of construction sites are also discussed when applicable. The findings, analysis, and discussion of the research were then used to make a conclusion and recommendation of the research.

4.1 Response rate

This section discusses the response rate for the distributed questionnaires. As it was discussed in the methodology section of the paper the study population included 43 employees of Bamacon engineering PLC who were involved in building construction projects. (Project managers, site engineers, safety engineers, logistic engineers, consulting engineers, foremen and gang chiefs) Out of the 43 questionnaires distributed 36 (83.23%) questionnaire were filled out by employees and returned to the researcher on time. While the remaining 16.27% were not filled out and returned to the researcher on time.

Figure 4.1 response rate of distributed questionnaire



Source: own survey 2021

4.2 Background information of the respondents

Background information of the respondents discusses the current position of the respondents, their educational background, and years of experience at the organization. Table 4.1 summarizes the background of the respondents computed using frequency and percentage.

Table 4.1 Background information of respondents

No		Frequency	Percentage
1	**Position of respondents**		
	a) Project manager	3	8.3%
	b) Site engineer	8	22.2%
	c) Office engineer	4	11.1%
	d) Safety engineer	3	8.3%
	e) Other	18	50.0%
	Total	**36**	**100%**
2	**Education level of respondents**		
	a) Diploma	2	5.6%
	b) BSC/BA	27	75.0%
	c) MSC/MA	7	19.4%
	Total	**36**	**100%**
3	**Years of experience at the organization**		
	b) 1-5 years	27	75.0%
	c) 6-10 years	8	22.2%
	d) Above 10 years	1	2.8%
	Total	**36**	**100%**

Source: own computation (2021)

As it can be seen from table 4.1, 8.3% of the respondents were project managers, while 22.2% were site engineers, 11.1% office engineers 8.3% safety engineers and the remaining 50 percent where other (consulting engineers, logistic engineers, foremen, gang chiefs).

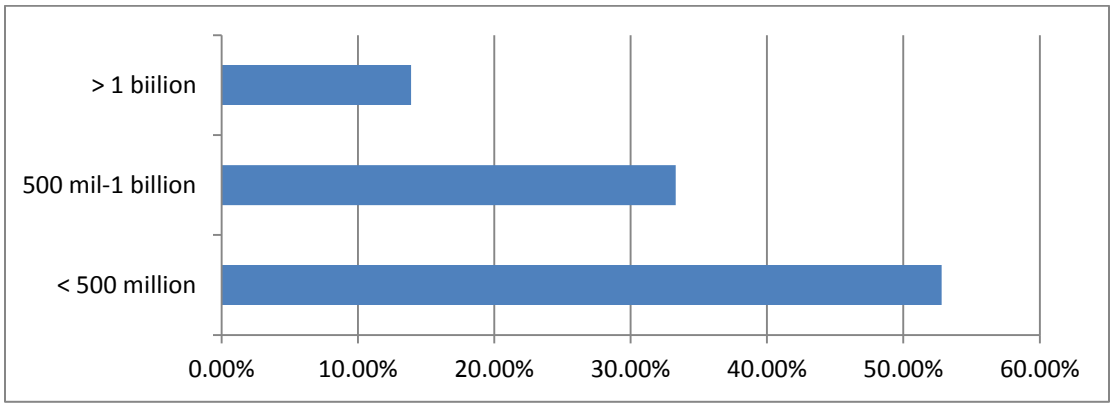
When it comes to the educational background of the respondents, 75 percent of the respondents had completed their BSC/BA degree while the remaining 19.4 percent had completed their MSC/MA degree and the other 5.6% have diploma. All the respondents were competent enough to respond to the distributed questionnaire.

With regard to the years of experience of the respondent on the other hand, 75% had worked in the organization for 1 to 5 years while 22.1% had 6 to 10 years of experience and 2.8% had above 10 years of experience. This shows that all the respondents were qualified to answer the questions asked in the questionnaire since all of them had a reasonable amount of experience in the subject matter.

4.3 Information about the project the respondent is currently working on

This section discusses the estimated cost of the project the respondent is currently working on n and the estimated average number employees involved in the project.

Figure 4.2 estimated project cost (ETB) of the project respondent is working on



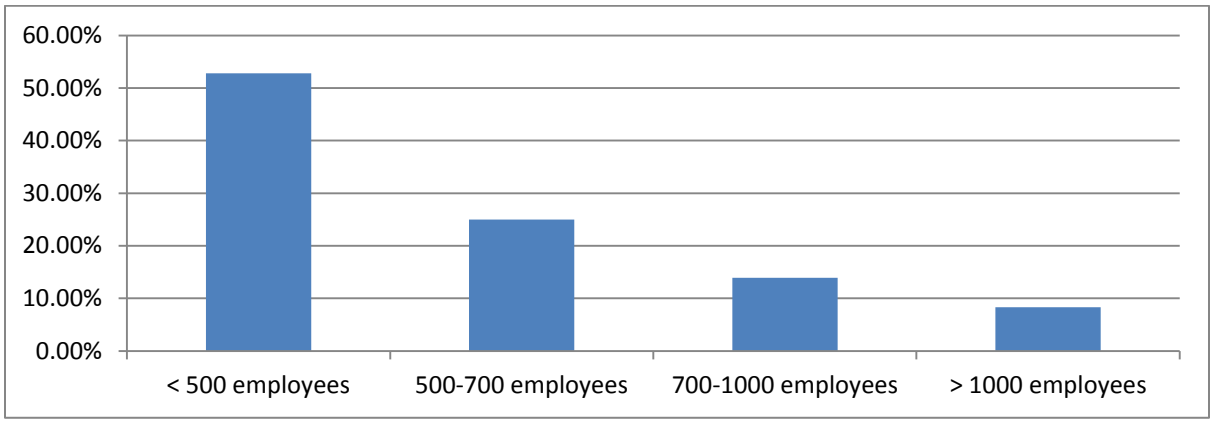
Source: own survey (2021)

When asked about the estimated total cost of the project the respondents are currently working on 52.80% of the respondents answered <500 million ETB. The other 33.30% responded that the total cost of the projects was estimated to be between 500 million-1 billion ETB; while the remaining 13.9% responded with greater than one billion ETB.

Regarding the number of employees involved in the project 52.8% of the respondent answered less than 500 employees while the remaining 25% answered between 500 to 700 employees,

13.9% answered between 700 to 1000 and 8.3% answered greater than 1000. There is a large amount of labor force that is engaged in building construction projects.

Figure 4.3 Number of employees involved in the project



Source: own survey (2021)

4.4. Accident records at project sites

This section discusses the results found in relation to accident records at the construction sites. The questionnaire asked the respondents if there had been any kind of accident that occurred.

4.4.1 The occurrence of accidents at the construction sites

Table 4.2 accident recorded at the construction site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	35	**97.2**	**97.2**	97.2
	not sure	1	2.8	2.8	100.0
	Total	36	100.0	100.0	

Source: own survey (2021)

The above table shows the frequency and percentage computed for the question regarding whether or not there had been an accident recorded at the construction site. 97.2% of the respondent replied yes while 2.8% of the respondent was not sure if there had been an accident

or not. This shows there had been accident records at the construction sites and that accidents are recurrent occurrences in building construction projects.

4.4.2 Result of accidents that occurred

Table 4.3 result of the accident

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	permanent disability	16	**44.4**	**45.7**	45.7
	temporary disability	15	41.7	42.9	88.6
	loss of and damage to equipment	4	11.1	11.4	100.0
	Total	35	97.2	100.0	
Missing	System	1	2.8		
Total		36	100.0		

Source: own survey (2021)

Based on the above table it can be seen that the result of the accidents had been permanent disability, temporary disability, and loss and damage to equipment. Permanent disability holds the greatest number regarding the result of accidents that occurred (44.4%) followed by temporary disablement (41.7%) and loss of and damage to equipment (11.1%) respectively. The result also shows that up until the time of data collection there had not been a death recorded at the project sites. Although death had not been recorded yet, the above figure shows how serious building construction site accidents are, permanent disability being the most serious one followed by temporary injury and loss of and damage to equipment.

4.5 Safety and health implementation

Investigating how management implements safety and health regulations for construction projects at Bamacon engineering PLC was one of the research objectives. This question was discussed by first identifying the key elements for the successful implementation of safety policy and investigating how the company performs with regard to these key elements identified. In the literature review of the paper key elements were identified which the researcher broadly categorized as safety policy, plan and guidelines; safety measures taken; performance

measurement, and auditing of the result. The performance of the construction company with regard to the implementation of these elements is discussed below.

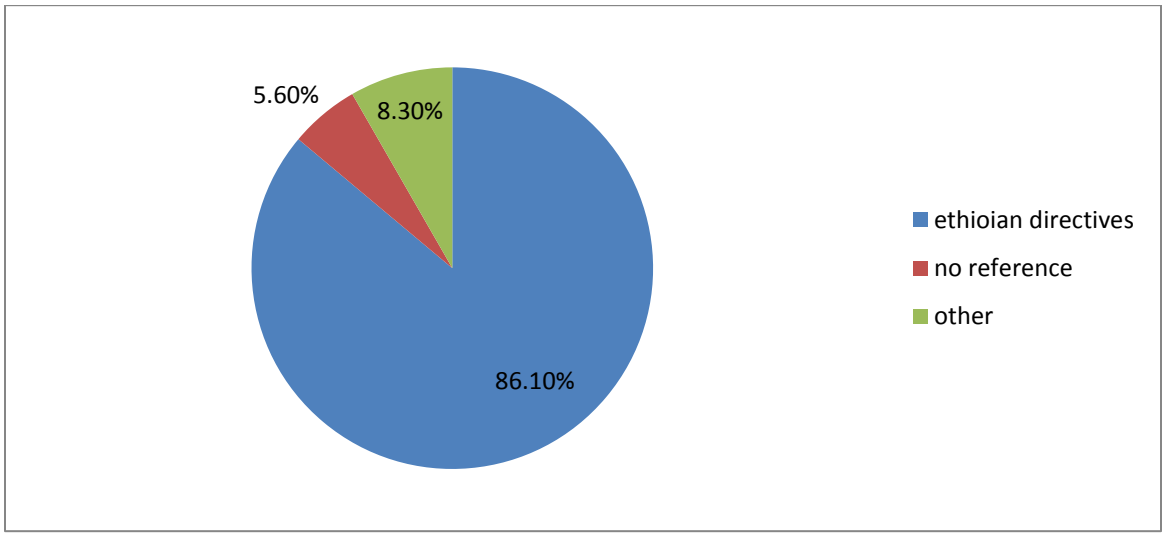
4.5.1 Safety and health policy, plan, and guidelines

This section discusses safety and health policy, plans, and guidelines used to manage health and safety at Bamacon engineering PLC. As it was discussed in the literature review, safety policy, plan, and guidelines are one of the key components for the successful implementation of safety and health management. The opinions of the respondents with regard to safety policy, plan, and guideline for each statement under this section was rated using Likert-scale and the results are discussed in this section

4.5.1.1 Safety and health policy reference

The respondents were asked which OSH framework the organization uses to design its safety and health policy plan and guidelines. The majority of the respondents (86.1%) answered that the company uses Ethiopian directives to formulate its safety policy, plan and guidelines. The remaining 8.3% answered other references while 5.6% of the respondents replied no reference. However, none of the respondents answered ILO guidelines as the reference the company uses to formulate its safety policy, plan, and guideline.

Figure 4.4 references for safety policy, plan and guidelines



Source: own survey (2021)

The questionnaire asked the respondents safety and health policy, plan and guide related questions, and respondents were asked to give their answer based on the Likert scale and the results are shown in the following table. The percentage computed for the response of each element under safety policy, plan, and guideline is summarized in table 4.4.

Table 4.4 Percentage of responses under safety and health policy, plan and guideline

	Strongly Disagree	Disagree	Neutral	agree	Strongly Agree
Statement	Percentage	percentage	percentage	percentage	Percentage
There is a clear safety policy	-	11.1%	19.4%	47.2%	22.2%
There are Site-specific safety plan	-	**33.3%**	30.6%	22.2%	13.9
Formally written safety guideline available to all worker	-	41.6%	36.1%	16.7%	5.6%
Safety policy, plan and guideline communication	-	13.9%	30.6%	**41.7%**	13.8%
Adequate hazard assessment when formulating plan	-	30.6%	**41.6%**	16.7%	11.1%

Source: own survey (2021)

Clear safety and health policy

From the total number of the respondents, 47.2% agreed that their organization had a clear safety and health policy that lays out how safety and health are managed in construction projects. While 22.2 % of them strongly agreed, 19.4% were neutral and the remaining 11.1% disagreed. When we look at the overall result the majority of the respondents 69.4% (those who strongly agreed and agreed) agreed to the statement that there is a clear safety and health policy at the organization. The interview conducted with the project manager also confirmed this result as they said that organization had a companywide safety policy to be implemented by every worker.

Site-specific safety plan

The next question in the questionnaire asked the respondents if there was a site-specific health and safety plan for building construction projects. Again the respondents gave their response based on Likert scale ranging from strongly disagree to strongly agree.

As it was shown in table 4.4, 33.3% of the respondents disagreed with the statement that there was a site-specific health and safety plan for the projects. 30.6 % were neutral while the remaining 22.2 % and 13.9% agreed and strongly agreed respectively. The response that got the highest rating was however disagree, meaning that those who replied disagree believe that there is no site-specific health and safety plan for the projects.

Project managers also said that there are no site-specific plans for the construction projects and companywide safety policies are applied as special kinds of hazards are not expected to occur on the projects. But if a project was expected to have a "dangerous activity" such as working on a confined tunnel a safety plan would be designed on how the job would be executed safely and the precautions to be taken.

Formally written guideline

The respondents were asked if there were and formally written safety guidelines that were readily available to employees at each project site. To this question, the majority of the respondents disagreed or were neutral, 41.6% and 36.1 % respectively. 19.7% of them on the other hand agreed while the remaining 5.6% strongly agreed to the statement. However, the response that got the most rating was disagreeing.

From the interview it was found that there were general guidelines in the form of safety signboards for construction workers; however detailed formally written guidelines were not available at the construction sites.

Safety policy and plan guideline communication

This section discusses if the respondents believe that safety policy, plan and guideline is communicated to employees at all level of the organization. The majority of the respondents either agreed or were neutral to the statement. However, the response with the most percentage was found to be "agree" meaning that the majority of them agreed that there was clear communication of safety policy and plans within employees of the organization.

From the interview, it was found that even though there are no detailed formally written guidelines they try to communicate orally with workers on how workers should perform their task in relation to their safety and health and how to use the safety equipment provided for them appropriately.

Assessment of potential hazard

The last statement regarding safety and health policy, plan, and guidelines was if an adequate assessment of potential hazard was done when formulating safety and health plan and guidelines. As shown in table 4.4, 41.7% of the respondents rated it "neutral" while 30.6% of the respondents disagreed. 16.7% of the respondents agreed while only 11.1% strongly agreed. Project managers said that the safety policy and plans were mainly general plans adopted from Ethiopian directives taking the most common potential hazard into consideration.

As it was discussed in the literature review section of the paper, for a successful safety and health implementation in an organization one of the key elements was having a clear safety policy, plan, and guidelines. Respondents gave their rating for each factor under this category which was shown in detail above.

The average (mean) value for each factor under safety and health policy, plan, and guidelines was then computed using descriptive statistics and the results were interpreted using Likert scale adopted to interpret the mean from previous authors. These results can show which elements under this section were the highest-rated and the lowest rated under this category to show in which areas the company is performing well or which area needs more work. The values of the standard deviation on the other hand measure how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation.

Table 4.5 safety policy, plan and guideline Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
there is clear safety policy	36	2	5	3.81	.920
there is site specific plan	36	2	5	3.17	1.056
there is formally written guidelines	36	2	5	2.86	.899
safety plan is communicated at all level	36	2	5	3.56	.909
adequate hazard assessment	36	2	5	3.08	.967
Valid N (listwise)	36				

Source: own survey (2021)

Table 4.5 shows the mean, std. deviation, maximum and minimum values of the factors under safety and health policy, plan and guideline.

Table 4.6 Categories of likert scale used to interpret mean results

Mean	Likert description
From 1 to 1.80	Strongly disagree
1.81 to 2.60	Do not agree
2.61-3.40	true to some extent (slightly agree)
3.41 -4.20	Agree
4.21-5	Strongly agree

Source: Mohammed (2016)

Based on the tables above the result of the mean can be interpreted as the respondents agree that there is a clear safety policy at their organization (mean 3.81= agree). For the statement that there is a site-specific health and safety plan, the respondents slightly agree (true to some extent). The respondents also slightly agrees that there is a written safety guideline that is available to employees. The respondents agreed that safety plans are communicated to employees, while they slightly agreed (true to some extent) that adequate hazard assessment is done when formulating safety and health policy and plans. Based on table 4.5, the lowest rated elements show areas that need the most work in relation to safety and health policy, plan, and guidelines, in this case, were the availability of formally written safety guidelines followed by adequate hazard assessment and availability of site-specific plans.

4.5.2 Safety and health measures

Another key element for a successful implementation of safety and health in an organization is the organizational measures that are taken based on safety policy of the organization. This section discusses results regarding safety and health measures used by the organization to protect workers from accidents that occur at building construction sites. The factors under safety and health measure were rated using Likert scale ranging from strongly disagree to strongly agree. The percentage for each statement under safety and health measure is summarized in the table below.

Table 4.7 Percentage of response for elements under safety and health measure

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Statement	percentage	percentage	Percentage	Percentage	Percentage
adequate site layout is performed before any construction work begins	-	-	30.6%	**52.8%**	16.7%
There are adequate PPE	2.8%	**36.1%**	25%	25%	11.1%
Fall protection are provided to workers when working in height	-	2.8%	13.9%	**63.9%**	19.4%
Safety and health warning sign are used	-	22.2%	30.6%	**36.1%**	11.1%
Proper instructions and training are given to workers based on potential hazard	-	**41.7%**	33.3%	16.7%	8.3%
First-aid kits and a trained person available construction sites		**47.2%**	19.4%	25%	8.3%

Source: own survey (2021)

Adequate site layout planning

Whether or not adequate site layout planning is done before any construction work begins was one of the questions asked under this section. According to table 4.7 the majority of the respondents, 69.5% either strongly agreed or agreed to the statement. None of the respondents disagreed with the statement.

Adequate PPE

The next question under safety and health measures asked the respondents if there were adequate personal protective equipment such as face shields, earplugs, safety shoes, gloves, hats, and eye goggles available for construction workers.

As it can be seen from the above table the 36% of the respondent, which was the highest-rated response, disagreed that there are not enough PPE available for the workers, while 25% were neural and another 25% agreed to the statement.

The researcher also conducted own observation regarding the availability of PPE. The researcher observed that workers were wearing hard hats and a colored vest when working however they did not have earplugs, face shields, and eye goggles on them at the time of the visits.

Fall protection appliances

Table 4.7 also shows the result of findings for the question on whether or not fall protection appliances are provided to workers when working in height. From the frequency table below, it can be seen that 63.9% of the respondent believe that the company provides fall protection appliances when workers are working at height.

The result from the observation of the researcher found that to protect workers safety as they work at heights, ladders (which are supplements provided to workers to complete any kind of task at height) and scaffolds or staging (which is a temporary structure used to support workers) were available and provided to workers.

Warning signs

Safety and health warning signs are signals that are used to notify workers of potential hazards that might cause accidents if the appropriate precautions are not taken. For whether or not warning signs are used to notify workers about potential hazards, 36.1% of the respondent agreed while 30.6% were neutral and 22.2% disagreed.

From observation of construction sites, the researcher was able to see that the more hazardous places where workers and other visitors are prone to fall were taped using colored ropes signaling these were the hazardous place that people should cross with caution.

Training and instruction

Another organizational measure discussed to protect worker's safety and health was training and instruction given to workers. Table 4.5 shows the result of the finding computed using the percentage of the response.

The result shows that 41.7% of the respondents disagreed with the statement that proper instructions and training are given to workers based on the potential hazards that might occur at the construction sites. 33.3% of the respondents were neutral while the remaining 25% either "agreed" or "strongly agreed". Interview results also found that there was no formal training given to workers before any operation begins. The reason behind this was said to be due to the

large number of employees involved in the construction site it was not practical to give formal training for workers. However general instruction is given to the workers on how safety measures should be taken like instructing workers to wear safety gears provided.

First-aids

Table 4.5 shows the result of the finding for the question on whether or not first-aid kits and trained personnel to perform first-aid to an injured person was available or not at the construction sites.

According to the above table, 47.2% of the respondent disagreed, while 25% agreed and 19.4% were neutral.

From the observation of the researcher, it was found that first-aid kits along with a trained person meant to treat injured workers were not found at the construction site. However one of the construction sites had a first-aid kit only.

In addition to the above safety and health measures discussed above, respondents were also asked if any other safety and health measures were used to protect their workers from accidents.

The interview question found that in addition to the safety measures mentioned above safety belts and safety nets (a safety net is a net to protect people from injury after falling from heights by limiting the distance they fall and deflecting to dissipate the impact energy) were also provided to workers to protect them from potential accidents.

Table 4.8 Descriptive statistics for the factors under safety and health measures

	N	Minimum	Maximum	Mean	Std. Deviation
Adequate site layout planning is done	36	3	5	3.86	.683
There is adequate PPE	36	1	5	3.06	1.094
Fall protection appliances are provided when working at height	36	2	5	4.00	.676

Proper instruction and training are given to workers	36	2	5	2.92	.967
First-aid kits and trained person is available	36	2	5	2.94	1.040
warning signs are used	36	2	5	3.36	.961
Valid N (listwise)	36				

Source: own survey (2021)

The results of the mean can be interpreted as respondents agreed that adequate site layout planning is done before any construction work begins. Respondents slightly agreed that there is adequate PPE while they agreed that fall protection applies are provided to workers when working at height. They also slightly agreed (not fully agreed) that proper instruction and training are given to workers and first-aids kits along with trained people are available at the construction site. Respondents also slightly agreed that warning signs are used to notify workers of potential hazards. N.B Results of mean were interpreted based on table 4.6

The elements with the lowest mean, training and instruction provided to workers followed by availability of first aid at construction sites, are the aspects that require the most improvement regarding the safety and health measures taken.

4.5.3 Performance measurement and audit

As discussed in the literature review another key element in safety and health management is measuring safety and health performance and auditing the findings so that the concerned party can review the results and take corrective action. For this category, the researcher asked respondents performance measurement and audit-related questions and the result of their response is discussed below.

Table 4.9 Percentage of response for elements under safety and health performance measurement and audit

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Statement	percentage	Percentage	Percentage	percentage	Percentage
There is a safety and health officer at the	13.9%	**58.3%**	-	25%	2.9%

construction site					
There is a regular monitoring of safety and health performance of projects	2.8%	**33.3%**	**33.3%**	25%	5.6%
A regular inspection of protective equipment and appliances is done on construction projects	-	11.1%	13.9%	**52.8%**	22.2%
Accidents are reported to the required local authorities as soon as it occurs	-	22.2%	16.7%	**38.9%**	22.2%
Causes of accidents are thoroughly investigated whenever it occurs	-	11.1%	22.2%	**44.4%**	22.2%
Results from inspections and investigation are recorded and are readily available for managers (office and site)	-	22.2%	**41.7%**	25%	11.1%
Management regularly reviews accident reports to take corrective actions	-	11.1%	22.2%	**38.9%**	27.8

Source: own survey (2021)

Safety officer

Table 4.9 gives the result of the responses regarding the presence of safety officers at construction sites. The majority of the respondents disagreed with this with 58% of the respondents disagreeing and 13% strongly disagreeing. The majority of the respondent answered that there were no safety officers to oversee the safety and health performance of projects at the construction sites. When asked about this, site managers said that safety officers were supposed to be assigned to the project sites however they were still not assigned to each construction site only one of the sites had a safety officer assigned.

Regular monitoring of safety performance

For the statement asking if there was regular monitoring of safety and health performance of projects by management of the company, 36.1% of the respondent either strongly disagreed or disagreed while 33.3% of the respondents were neutral and 25% of the respondents agreed.

Inspection of safety equipment

The next part of the questionnaire then asked the respondents if there was a regular inspection of equipment done on safety equipment. From the total number of respondents, 52.8% agreed that

protective equipment was regularly inspected for any defect that might have happened. 22% strongly agreed while 13.9% were neutral.

Accident reporting

Another important factor in safety and health performance measurement and audit was whether or not accidents are reported to the required local authorities' whenever it occurs, the majority of the respondent agreed (61.1%, who either agreed or strongly agreed) while 22.2% of the respondent agreed.

Accident investigation

Table 4.9 shows the result of the frequency computed regarding accident investigation. When respondents were asked if causes of accidents were thoroughly investigated whenever it occurs, the majority of the respondents (66.6%) either strongly agreed or agreed. While 22.2% were neutral.

Recording of results

Regarding whether or not results from the inspection are recorded appropriately and are readily available for the manager either at the office or site, 41.7% of the respondent were neutral while 25% agreed and 22.2% disagreed.

Management review of records

Regular management review of accident reports to take corrective action is one of the elements under performance measurement and recording. Table 4.9 shows the result of the percentage computed for the element. 38.9 % agreed while 27.8% strongly agreed and the remaining disagreed or were neutral. The majority of the respondents believed that regular management review of accident reports was done on construction projects.

The result from interview questions found that top management does monitor safety performance of the construction sites although not regularly, to check if any accidents had occurred on sites, what the cause of the accident was and how remedial action can be taken to prevent a similar occurrence in the future. From the literature review section of the paper, it can be recalled that this type of performance monitoring is reactive monitoring where management uses accident reports to investigate the area of concern and take remedial action.

Again mean results were computed for the factors under performance measurement and audit to look at the performance of the company with regard to safety and health performance measurement and audit which is one of the key elements in the safety and health implementation of an organization.

Table 4.10 Descriptive Statistics of factors under safety and health performance measurement and reporting

	N	Minimum	Maximum	Mean	Std. Deviation
There is a safety officer at the construction site	36	1	5	2.44	1.107
There is regular monitoring of safety performance	36	1	5	2.97	.971
There is regular inspection of equipment	36	2	5	3.86	.899
Accidents are reported to local authorities immediately	36	2	5	3.61	1.076
Accidents are thoroughly investigated	36	2	5	3.78	.929
Result from inspection is recorded and available	36	2	5	3.25	.937
Management regularly reviews accident report	36	2	5	3.83	.971
Valid N (listwise)	36				

Source: own survey (2021)

For the above elements under safety health performance measurement and recording, respondents did not agree that is a safety officer at project sites. Respondents slightly agreed that there is a regular health and safety monitoring of projects. When we come to regular inspection of equipment, respondents agreed that there is regular inspection of equipment. Respondents also agreed that accidents are reported to the required local authority immediately. They also agreed that causes of accidents are thoroughly investigated. When we come to result in recording, respondent slightly agreed that result from inspections is recorded and readily available to managers both office and site. Lastly, respondents agreed that management regularly reviews accident report to take corrective action. N.B Results of mean were interpreted based on table 4.6

From the above table, we can also see the highest and lowest rated aspects under safety and health performance measurement and audit. The element that was rated the lowest were availability of safety officer at the construction site and regular monitoring of safety performance with a mean value of 2.44 and 2.97 respectively. These were the areas in which the construction company is not performing as well as the others with respect to safety and health performance measurement and audit.

4.6 Factors hindering safety and health implementation practice

This section analyses and discusses factors that have a hampering effect on safety and health implementation at the construction sites of the organization. As it was mentioned in the literature review the factors were broadly sub-divided as managerial factors and resource factors. The findings for these factors are discussed below.

4.6.1 Managerial factors

Managerial factors that hinder the health and safety performance of the organization were sub-categorized into four factors in the questionnaire distributed. The findings for each sub-factor are discussed below. Table 4.11 shows the finding of the researcher based on the response of respondents regarding managerial factors affecting (hindering) safety and health implementation.

Table 4.11 Percentage for managerial factors hampering safety and health implementation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Factor	percentage	Percentage	percentage	Percentage	Percentage
Level of priority and attention are given to health and safety	-	2.8%	30.6%	44.4%	22.2%
Frequency of inspection	-	16.7%	55.6%	25%	2.8%
Having clear communication and information procedure	-	41.7%	44.4%	5(13.9%)	-
Availability of Training programs	2.8%	8.3%	25%	50%	13.9%

Source: own survey (2021)

Level of priority

The researcher asked the respondents their opinion regarding whether or not the level of priority and attention that management gives to health and safety hinders the implementation of health and safety regulations of the construction projects of their organization.

From the table, it can be seen that the majority of the respondents either agreed or strongly agreed with that statement (66.6%), i.e. level of priority and attention that managers give to safety and health issues hinders the safety and health implementation at the organization. Therefore it can be said that the level of that safety and health level of priority and attention that managers give to safety and health issues hinders the safety and health implementation practice of construction projects at Bamacon engineering PLC which shows that there is negligence of safety and health issues by management.

Health and safety inspection

The research also asked the respondents their opinion regarding whether or not the frequency level of health and safety inspection has a hindering effect on safety and health implementation at their organization. The majority of the respondents were neutral (55.6%) while 25% of the respondents agreed and 16.7% disagreed that the frequency level of inspection hinders the health and safety implementation practice at the organization. This means that as the frequency of inspection of safety and health becomes less, workers will start to lose the incentive to perform better with regard to safety and health.

Clear communication and information procedure

The level of availability of clear communication and information procedure at an organization was one of the factors identified as having a hampering effect on safety and health implementation. The researcher asked respondents if the level of availability of clear communication and information procedure has a hampering effect on the safety and health implementation of the construction projects undertaken by the organization and as we can see from the above table, 44.4% of the respondents were neutral, 41.7% disagreed and only 13.9% of the respondents agreed.

Training programs

The availability of facilitating training programs to workers (training programs not being available to workers) was also another factor said to hamper the successful implementation of

safety and health implementation of an organization in the literature review. Table 4.11 shows the result of respondents' answers as 50% agreed, 13.9% disagreed while 25% were neutral.

Ranking of the factors under managerial factors

After discussing the results for each factor identified, the researcher then ranked the factors that have a hampering effect on safety and health implementation of the organization to identify which identified element had the highest rank and which was with the lowest rank. Relative importance indexes (RII) were calculated to rank the factors that are said to supplement the health and safety implementation practice of construction projects at Bamacon engineering PLC. RII was calculated using the formula:

Relative Importance Index = $\sum W / AN$, where:

W is the weight given to each factor by the respondents and ranges from 1 to 5

A is the maximum weight given to each factor: and

N is the total number of participants.

Source: Rajgor et al (2016)

Table 4.12 Ranking of managerial factors

	N	Minimum	Maximum	Mean	Likert scale to interpret mean	RII	Rank
Level of priority given by top management	36	2	5	**3.86**	**Agree**	**0.772**	**1**
Frequency of inspection	36	2	5	**3.14**	**Slightly agree (true to some extent**	**0.627**	**3**
Availability of communication and information procedure	36	2	4	**2.74**	**Slightly Agree**	**0.54**	**4**
Availability of training programs	36	1	5	**3.64**	**Agree**	**0.77**	**2**
Valid N (listwise)	36						

Source: own survey (2021)

All the managerial factors above were found to have some level of impact on health and safety implementation practice at Bamacon engineering PLC with their degree of impact varying based on the RII and mean value given to them. As it was shown in table 4.12, the highest-ranked managerial factor that is said to hinder safety and health implementation practice was the level of priority managers give to safety and health issues of construction projects at Bamacon engineering which had an RII value of 0.772. The second-highest ranked managerial factor was the availability of training programs within the organization with and 0.77 RII.

The frequency of safety inspection was the third-highest managerial factor ranked as hindering safety and health implementation practice of construction projects which was given RII of 0.62. The availability of a communication channel between employees at all levels employees, so information can flow smoothly, was the fourth-ranked managerial factor hindering safety and health implementation practice at Bamacon engineering PLC with 0.54 RII.

4.6.2 Resource factors

In addition to managerial factors, there were also resource factors that were said to affect the safety and health implementation of an organization in the literature review. The results for each identified factor under resource are discussed next.

Table 4.13 Percentage for resource factors hindering safety and health implementation

	Strongly Disagree	disagree	Neutral	Agree	Strongly Agree
Factor	percentage	percentage	percentage	percentage	Percentage
Educated and experience labour force	5.6%	27.8%	30.6%	33.3%	2.8%
Attitudes and commitment of workers to safety and health	-	2.8%	11.1%	36.1%	50%
Financial resource (project budget)	-	2.8%	36.1%	36.1%	25%
Availability of safety equipment	-	8.3%	16.7%	50%	25%
Time available to complete the task (project schedule)	-	8.3%	38.9%	25%	27.8%

Source: own survey (2021)

Educated labor force

The researcher asked the respondents if the availability of an educated and experienced workforce (uneducated and inexperienced labor force) hinders an organization's safety and health implementation practice. 33.3% of the respondent said that they agree with the statement while 30.6 were neutral and 27.8% disagreed.

Attitude and commitment of workers

The attitude workers have and commitment to safety and health was another resource factor that hinders the safety and health implementation practice of an organization in prior literature reviewed. According to table 4.15, 50% of the respondents strongly agreed, 36% agreed while 11.1% were neutral. From this finding, we can see that the majority of the respondent agreed to the statement that worker attitude and commitment to safety and health hinder safety implementation of construction projects of their organization. This shows that workers also show negligence to safety and health issues and this contributes to the unsatisfactory level of health and safety regulation implementation of the construction projects.

Project budget (financial resource)

The budget allocated for projects (financial resource) was also said to obstruct the safety and health implementation of an organization in the literature review section. The result for this question showed that 36.1% of respondents agreed, another 36.1% were neutral and 25% of respondents agreed. When we look at the majority of the response, respondents agree (61%) that project budget affects safety and health performance at Bamacon engineering PLC.

Safety equipment

The researcher asked the respondents whether or not the availability of safety equipment has a hindering effect on safety and health implementation on projects of Bamacon engineering PLC. 50% agreed, 16.7% were neural and 25% strongly agreed. However the majority agreed that the availability of safety equipment hinders safety and health management at their organization.

Project schedule (time available)

Project schedule, which is the time available to complete a task was another factor identified in the literature review as one of the resource factors hampering safety and health implementation practice of construction projects. 38.9% of the respondents were neutral, while 25% of respondents agreed and another 27.8% strongly agreed. Overall 52.8 % of respondents agreed

that project schedule (amount of time available) hinders safety and health implementation of construction projects at Bamacon engineering PLC.

Ranking of the factors under resource factors

After discussing the results for each factor identified, the researcher then ranked the factors that are said to put a hamper on the safety and health implementation of the organization to identify which identified element had the highest rank and which was with the lowest rank.

Table 4.14 Ranking Resource factors

	N	Minimum	Maximum	Mean	Likert scale to interpret mean	RII	Rank
availability of educated and experience labour force	36	1	5	3.00	Slightly agree	**0.6**	5
worker attitude and commitment	36	2	5	4.33	Agree	**0.866**	1
project budget	36	2	5	3.83	Agree	**0.766**	3
availability of safety equipment	36	2	5	3.92	Agree	**0.8**	2
time available (project schedule)	36	2	5	3.72	Agree	**0.75**	4
Valid N (listwise)	36						

Source: own survey (2021)

All the resource factors were found to have an effect on safety and health management practice of building construction projects at Bamacon engineering PLC but with their level of impact varying based on the mean and RII value computed above. As it was shown on table 4.14, the highest ranked resource factor hindering safety and health implementation construction projects at Bamacon engineering PLC was workers attitude and commitment to safety and health with

and RII of 0.86. The second highest ranked resource factor was the availability of safety equipment with RII of 0.8.

The amount of budget allocated to projects (financial resource) was the third highest resource factor with RII value of 0.766. Availability of educated and experience labor force and project schedule were the lowest and second lowest resource factors putting a hindering impact on safety and health implementation practice of construction projects at Bamacon engineering PLC, with RII of 0.60 for educated and experienced level 0.75 RII for project schedule respectively.

Chapter Five: SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION

This chapter includes a brief summary of the findings and conclusion made based on the findings as well as recommendations made by the researcher for the organization and future researches who wish to study the area of safety and health management practice further.

5.1 Summary of findings

The researcher tried to investigate the safety and health management practice of building construction projects at Bamacon engineering. The researcher formulated research questions and prepared a questionnaire that was meant to be answered by employees of the organization who were involved in building construction projects. In addition to the questionnaire, the researcher had an unstructured interview with the project managers of the sites and also made personal site visits to investigate areas of the research question that could be observed by the researcher. The collected data was then analyzed using descriptive statics on SPSS and the results have been presented using graphs and tables in a manner that enables to answer the research questions. The summary of the findings is discussed below.

- The respondents were employees of the organization that were involved in the four construction projects chosen for the study. These respondents were project managers, site engineers, office engineers, consultant engineers, safety engineers, logistic engineers, and general foremen with different levels of educational background and years of experience.
- There had been an accident recorded at all four project sites with 97.2% of the respondent replied yes to the occurrence of accidents.
- The results of the accidents vary from loss of and damage to equipment to a permanent disability of workers, the latter being the most serious result of accidents at the construction sites with 44.4% followed by temporary injury with 41.7%.

To investigating the safety and health implementation mechanism of building construction projects at Bamacon engineering PLC, respondents were asked to answer the questions with a five-point Likert scale from 1 – 5 that ranges from strongly disagree to strongly agree. The results were then analyzed using percentage frequency and mean values. The mean values were interpreted as 1 to 1.80 “Strongly disagree”; “1.81 to 2.60” do not agree; 2.61-3.40 “true to some extent (slightly agree)”; 3.41 -4.20 “agree” 4.21-5 “Strongly agree”.

- Regarding safety policy plans and guidelines, respondents agreed that there is a clear safety policy at their organization and that safety plans are communicated to employees. On the other hand, the availability of a site-specific health and safety plan; availability of written safety guidelines, and adequacy of hazard assessment in safety policy and plan formulation were found to be true to some extent.
- With regard to safety and health measures taken by the organization for building construction workers, the respondents agreed that adequate site layout planning is performed before any construction work begins and fall protection appliances (ladders and scaffolds) are provided to workers when working at height. However respondents did not fully agree (slightly agree) that there is adequate PPE, warning signs are used to notify of potential hazards; proper instruction and is given to workers and first-aids kits along with trained personnel are available at a construction site. from observation it was found that hard hats, vests, scaffols, ladders and warning signs are used and are available at construction site.
- For safety and health performance measurement and audit, the researcher found that respondents did not agree that is a safety officer at project sites. Respondents also did not fully agree that regular health and safety monitoring of projects is performed; while respondents agreed that inspection of equipment is performed, regarding accident recording and investigation, respondents agreed that accidents are reported to the required local authority immediately and causes of accidents are thoroughly investigated. When we come to result from recording, respondents slightly agreed that results from inspections are recorded and readily available to managers both office and site. Last but not least, respondents agreed that management regularly reviews accident reports to take corrective action.

To identify factors that are said to hinder the health and safety implementation practice of construction projects at Bamacon engineering PLC, Relative importance indexes (RII) were calculated to each factor to identify and then rank factors based on the effect they have on the organization.

- The level of priority managers give to safety and health issues of construction projects was the highest-ranked managerial factor hindering safety and health with RII of 0.772.

- The second-highest ranked managerial factor hindering safety and health implementation was the level of availability of training programs in the organization with 0.77 RII.
- Frequency of safety inspection was the third-highest managerial factor ranked as having a hampering effect on safety and health implementation practice of construction projects with RII of 0.62.
- The availability of a clear communication procedure was the lowest-rated factor among managerial factors hindering safety and health implementation practice of construction projects at Bamacon engineering PLC with 0.54 RII.

- All the resource factors identified were also found to have a hindering impact on safety and health management practice at Bamacon engineering PLC but their level of impact varies based on RII value computed above.
- The highest-ranked resource factor affecting safety and health implementation construction projects at Bamacon engineering was workers attitude and commitment to safety and health which was given a RII of 0.86
- The second-highest ranked resource factor was the availability of safety equipment with RII of 0.80.
- The third resource factor hindering safety and health implementation was the project budget (financial resource) which had RII value of 0.766.
- The fourth-ranked factor affecting safety and health was project schedule with 0.75 RII.
- Availability of an educated and experienced labor force was the lowest resource factor affecting safety and health implementation practice of construction projects at Bamacon engineering PLC with RII of 0.60.

5.2 Conclusion

Construction projects especially that of building construction projects are hazardous places for workers. Accidents at building construction projects are very common to see. The aim of the study was to investigate the safety and health management practice of one of the biggest construction companies in Addis Ababa, Bamacon engineering PLC, through research questions formulated by the researcher. Based on the findings of the study the researcher concluded that:

- The successful implementation of safety and health regulation requires not only drawing a companywide safety policy but also designing a detailed safety plan and guideline that

clearly states how workers shall conduct their respective task; taking preventive safety measures to protect workers and monitoring of safety performance of projects before and after an accident has occurred. Even though there is a safety policy for safety and health management at Bamacon engineering PLC, the measures that are taken to protect workers from possible accidents are not satisfactory. The monitoring of the performance of projects with regard to safety and health is found to be reactive monitoring meant to take corrective action after an accident has occurred instead of applying both active and reactive monitoring.

- Managerial and resource factors have a hindering effect on safety and health implementation practice at Bamacon engineering PLC. These managerial and resource factors, based on their respective rank, are the main area of priority or focus for the organization to improve the performance of projects with regard to safety and health. These managerial factors are the level of priority managers give to safety and health, the availability of training programs provided by management, frequency of safety inspection, and the level of availability of safety and health communication procedures respectively. The resource factors on the other hand are worker attitude and commitment, level of availability of PPE's, project budget, project schedule, and level of availability of experienced and educated labor force respectively.

For projects to be successful not only should it finishes on time and budget but also worker should not be injured when performing their work. From the study conducted to assess the safety management practice of building construction projects of Bamacon engineering PLC, it was found that safety and health management issue should be given a higher priority by both management and workers of the organization by especially focusing on factors that were found to have the most effect on safety and health implementation practice.

5.3 Recommendation

Based on the findings of the research the following recommendations are made to management, workers of the organization the government of the country, and future researchers who wish to study this field of area further.

Managers:

- Management of the organization should not only put in place safety policies but also design detailed safety plans and guidelines that outline how workers can do their work safely depending on the nature of the construction site and the type of projects.
- Training programs should also be provided to workers by taking into account the possible hazard worker might face and how to overcome them as having a better understanding of these could improve the attitude workers have towards safety and health.
- Managers should make sure all the necessary protective equipment are provided to every worker and inspect the equipment of their functionality.
- Management should also perform both active and reactive health and safety performance monitoring of projects. Active monitoring can be used to regularly check if safety and health standards are being met so that remedial action can be taken if shortcomings are observed before any accident has occurred. If an accident then occurs reactive monitoring should then be used to respond to the accident record and take correction action in the area that has shown a gap.
- An adequate budget should also be put aside for safety and health implementation as the direct and indirect cost of accidents is higher than the cost of proper safety and health implementation.

Construction workers:

- Construction workers in any project site should give high priority to the health and well-being of themselves. Safety and health should be of their highest priority since it's their life and health that is on the line.
- They should also appropriately use the safety equipment provided for them and take the utmost precautions when working in hazardous situations and ask their immediate supervisors and managers for such equipment if it is not provided for them.

Government:

- The government should also play its role in making sure the safety and health of workers are protected. The government should put on strict safety and health standards and oversee their implementation through regular and surprise site visits and inspections.
- It should also collaborate with construction organizations to provide workers with safety information and training.

Future researchers: Since the study was conducted with a limited amount of time it only tried to assess safety and health management practice at one construction Company. The safety and health management practice of other construction companies should also be studied to get a better view of safety and health management practices as it is a critical issue for the successful completion of projects.

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Annex

Questionnaire for employees of Bamacon engineering PLC

Addis Ababa University School of commerce,

Department of project management

Dear respondent,

You are kindly requested to fill this research questionnaire honestly and carefully. This research is being conducted as a partial fulfillment for my master's degree in project management at Addis Ababa University, school of commerce for my final research paper titled "Assessment of safety and health management practice in building construction projects: the case of Bamacon engineering plc." The purpose of this questionnaire is to study safety and health management practice in building construction projects. And so, your responses are very much important for the success of the study. The information you provide will only be used for academic purpose and it will be confidential. Therefore, you are kindly requested to fill the questionnaire honestly and carefully on the spaces provided.

If you have any questions please feel free to forward them.

Shilmat Getahun

Email: shilmatgetahun0@gmail.com

General instruction

Please read each question carefully and tick on the option you think best suits you or give short description where necessary

PART I: Personal information

1. Position of the respondent

1) Project Manager ☐ 2) Site engineer ☐ 3) office engineer ☐

4) Safety engineer ☐ 4) other (please specify).....

2. Education level of respondent

1) Diploma ☐ 2) BSC/BA ☐ 3) MSC/MA ☐ 4) PHD ☐ 5) other ☐

3. Job experiences (service year) in the organization

1) < 1 year ☐ 2) 1- 5 years ☐ 3) 6 – 10 year ☐ 4) above 10 years ☐

Part two: question about the projects the respondent is currently working on

4. What is the average estimated construction Cost of the project (ETB)

1) <500 Million ☐ 2) 500 Million-1 Billon ☐ 3) > 1 billion ☐

5. Average number of employees in the project

1) <500 ☐ 2) 500-700 ☐ 3) 700-1000 ☐ 4) >1000 ☐

6. Had there has been an accident recorded in construction sites?

1) Yes ☐ 2) No ☐ 3) Not sure ☐

7. If you answered yes for the above question, what was the result of accident caused?

1) Death ☐ 2) permanent disability ☐ 3) Temporary injury ☐
4) Loss of and damage to equipment ☐ 5) other please specify.....

Part three: Questions related to health and safety management practice

8. What reference does your company use for occupational safety and health management?

1) Ethiopian standard ☐ 2) ILO guidelines ☐

3) No reference ☐ 5) other (please specify) ☐

For the following questions there are rating points according to the degree of agreement to the statement. Tick appropriately according to the level of agreement based on the reality of Bamacon engineering plc.

1 = strongly disagree, 2 = Disagree, 3= Neutral, 4= Agree, 5=strongly agree

	Statement	Rating point				
		1	2	3	4	5
	Safety policy, plan and guidelines					
	There is a clear safety and health policy that lays out how health and safety is managed on construction project					
	There are site specific health and safety plans for building construction projects					
	There is a formally written safety guideline that is readily available to employees at project sites					
	Safety policies, plan and guidelines are communicated to employees at all level on building construction projects					
	Adequate assessment of potential hazard is done when formulating safety and health plan and guidelines					

1 = strongly disagree, 2 = Disagree, 3= Neutral, 4= Agree, 5=strongly agree

	Statement	Rating point				
		1	2	3	4	5
	Safety and health measures to prevent accident					
	An adequate site layout planning is performed before any construction work begins					
	There are adequate PPE (personal protective equipment) such as face shield, earplug, safety shoes, gloves, hard hat and eye goggles available for building construction workers					
	Fall protection appliances (scaffolds and ladders) are provided to workers when working in height					
	Safety and health warning sign (hand and sound signal, well-lit sign, fire alarms...) are used to notify workers when working with dangerous substance					
	Proper instructions and training are given to workers based on potential hazard that might occur at construction site					
	First-aid kits and a trained person to perform first aid are readily available at building construction sites					

What other measures are used to prevent building construction site accidents?.....
.....

1 = strongly disagree, 2 = Disagree, 3= Neutral, 4= Agree, 5=strongly agree

	Statement	Rating point				
		1	2	3	4	5
	Performance measurement and auditing					
23	There is a safety and health officer at the construction site					
24	There is a regular monitoring of safety and health performance of projects					
25	A regular inspection of protective equipment and appliances is done on construction projects					
26	Accidents are reported to the required local authorities as soon as it occurs					
27	Causes of accidents are thoroughly investigated whenever it occurs					
28	Results from inspections and investigation are recorded ad readily available for managers (office and site)					
29	Management regularly reviews accident reports to take corrective actions					

Factors affecting (hindering) safety and health management practice

1 = strongly disagree, 2 = Disagree, 3= Neutral, 4= Agree, 5=strongly agree

	Statement	Rating point				
		1	2	3	4	5
	Management					
	Level of priority and attention given to health and safety by top management affects (hampers) health and safety management practice of building construction projects					
	The level of frequency of safety and health inspection affects (hinders) health and safety implementation practice of building construction projects					
	The level of availability of clear communication and information procedure affects (hampers) health and safety implementation of building construction projects					
	The level of availability of training programs provided by management to workers affects health and safety implementation of building construction projects					
	Resource					
	The availability of educated and experience labour force affects (hampers) health and safety management practice of building construction projects					
	Attitudes and commitment of workers to safety and health affects (hampers) health and safety implementation of building construction projects					
	Financial resource (project budget) affects health and safety management practice of building construction projects					
	The availability of safety equipment affects health and safety implementation practice building construction projects					
	The amount of time available to complete task (project schedule) affects health and safety implementation practice in your organization					

What other factors affects (hinders) the safety and health management practice in building construction projects at your organization.....
.....

In your opinion what can be done to improve safety and health management practice of building construction project at Bamacon engineering plc?

.....

.....

Thank you for your participation

Interview questions for project managers or site manager

1. What are the major causes of accidents at building construction sites?
2. What measures are taken at construction sites to prevent workers from accidents?
3. Are there safety policy and site specific plans designed to protected workers from accidents at building construction sites?
4. Does your site have a formally written safety guidelines construction workers should follow while performing their task?
5. Are workers provided with training programs and instruction related to safety and health issues?
6. Does the construction site have a safety officer? If not what do you thing is the reason behind it?
7. How is safety performance monitored for the construction project?
8. In your opinion what should be the responsibility of each party at your organization to ensure safety and health of its worker?