



ST. MARY'S UNIVERSITY
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**ASSESEMENT OF THE USE OF SAFETY MEASURE IN
BUILDING CONSTRUCTION: IN THE CASE OF SUNSHINE
CONSTRUCTION PLC.**

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**ASSESEMENT OF THE USE OF SAFETY MATERIALS IN BUILDING
CONSTRUCTION: IN THE CASE OF SUNSHINE CONSTRUCTION PLC.**

BY

Naol Dereje

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DECLARATION

I, undersigned person, declare that this final project work entitled “Assessment of the use of Safety Materials in Building Construction: in the case of Sunshine Construction plc.” represents my own work, and it has not been previously included in any thesis, dissertation or report submitted to any university for degree, diploma or other qualification. It is conducted for the partial fulfillment of the requirement for the Degree of Masters of Arts in Project Management and submitted to School of St. Mary University.

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LIST OF ACRONYMS

OSH	Occupational Safety and Health
ILO	International Labor Office
SPSS	Statistical Package for Social Sciences
PPE	Personal Protective Equipment
FES	Fire and Emergency Services
PLC	Private Limited Company
OSHA	Occupational Safety and Health Administration
HSE	Health and Safety Executive
GDP	Gross Domestic Product
OHS	Occupational Health and Safety
HSE	Health and Safety Executive
HSC	Health and Safety Commission
MOLSA	Ministry of Labor and Social Affairs
WSHA	Workplace Safety and Health Act

ABSTRACT

This study assessed the health and safety measures that are implemented in the construction of high-rise buildings in Addis Ababa by sunshine construction plc. The study focused on health and safety issues that have been neglected by the building industry. A descriptive research design was used in this study. The research method employed in this study was a data from questionnaire. The example company distributed the questionnaires and received responses from 83.6 percent of them. The sample size for this study was 67 employees who worked at the example company. The survey data was analyzed using descriptive statistics to summarize and present the findings. The data analysis was performed using SPSS software, which allowed the researchers to export the results to Excel for further manipulation and visualization. The research revealed that construction workers on high-rise building projects in the study area lacked adequate safety and health training on how to handle risks and hazards on site. The study also found that senior managers in construction projects did not prioritize the implementation of safety training for construction workers on high-rise buildings in the study area. Furthermore, there was no effective monitoring system to ensure that safety training was conducted on construction sites. The safety training program also did not have a regular schedule as other high-rise building project activities. The researcher stated that every real estate company should implement an effective health and safety policy that covers all aspects of their operations. The policy assign roles and responsibilities to designated personnel, provide appropriate facilities and personal protective equipment (PPE) for all workers on the job site, and incorporate health and safety duties in contracts with outside contractors. The client of the project should not only focus on completing their project on time and within budget, but also on protecting their construction workers from any hazards that may cause serious injuries or fatalities.

Key words: *Construction industry, Health and Safety, Health and Safety Management, High rise Building Projects, Safety equipment*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The construction industry is vital for the nation's economy. It affects almost everyone in their daily lives and contributes significantly to the country's economic development. It provides the infrastructure facilities that are necessary for other sectors such as manufacturing, agriculture, and service to grow and prosper. Therefore, periods of high construction activity often coincide with times of national wealth. The construction industry has a major role in the growth of any economy.

The construction industry in Ethiopia plays a vital role in the country's economic development by providing infrastructure and buildings for various sectors. According to a report by Research and Markets, the construction market in Ethiopia is projected to grow at an annual average growth rate of more than 8% to 2026, driven by the government's 10-year development plan, foreign direct investment, population growth and urbanization. The main activities of the construction industry in Ethiopia include: (1) Residential buildings, such as houses, apartments and condominiums; (2) Non-residential buildings, such as factories, warehouses, office buildings, hotels, schools, hospitals and others; and (3) Other construction projects, such as roads, dams, electricity transmission lines, telephone lines and others.

The construction industry in Ethiopia is divided into two segments: the formal market, which consists of local and foreign companies that undertake large projects; and the informal market, which consists of small and medium construction companies that operate mostly in rural areas. The formal market is dominated by Chinese companies, which have been involved in several major infrastructure projects in the country. The informal market faces challenges such as lack of access to finance, skilled labor and quality materials.

The construction industry is one of the most important sectors for the economy and society, as it provides the infrastructure and facilities for various activities and services Jimoh (2012). However, it is also one of the most hazardous sectors, as it exposes workers to various risks that can affect their health and safety. According to previous studies, construction projects are responsible for a large proportion of occupational injuries and fatalities, as well as occupational

diseases such as cancer, dermatitis, back pain and hearing loss. Various construction-related activities are inherently dangerous to workers' health and safety, including working at heights, underground, in uncomfortable areas, and close to falling objects; handling loads by hand; handling hazardous materials; using machinery; dealing with noises; using plant and equipment; dealing with fire; coming into contact with live cables; and maintaining a messy work space, among other things. Previous studies in the area clearly demonstrate that building projects frequently pose a threat to the lives of workers, and that significant accidents and fatalities happen frequently in the sector. The construction industry, employing the largest labor force, has accounted for about 11% of all occupational injuries and 20% deaths resulting from occupational accidents. For instance, in Addis Ababa some 23 people died in 2015 alone in construction-related activities, said the city's Fire and Emergency Services (FES).

Risky conduct and unsafe surroundings are the main causes of most accidents in the building construction industry. These accidents not only affect the project timeline, cost, and quality, but also endanger the lives of the workers. Therefore, health and safety issues are a major and global concern that needs careful attention and research. The aim of this study is to evaluate the performance of building construction projects in Addis Ababa with respect to safety and health standards, and to suggest recommendations and corrective actions to promote safe and healthy work practices.

This research aims to assess the safety and health management practices in Sunshine Construction Plc. in Addis Ababa and to propose the best and most advanced techniques for improving project safety and health management.

1.2 Statement of the Problem

Ethiopia's building construction has seen significant growth recently, particularly in Addis Ababa city. The rising pace of urbanization has boosted demand for Addis Ababa services from residential and commercial customers, which has increased the number of construction activities. In high-rise structures in Addis Ababa, many construction workers are falling sick and dying on the job, yet health and safety concerns are not given enough attention. Although many accidents go unreported, the current state of affairs is very worrying. Construction sites do not give much attention to health and safety.

According to a study by Tadesse and Israel (2016), the prevalence of injury among building construction employees in Addis Ababa was 38.3% in the past 1 year. The main factors associated with injury were lack of personal protective equipment, work experience, and chat chewing. The study recommended that programs to mitigate the burden of construction-related injuries should focus on areas such as provision of safety training, promoting use of PPE and monitoring substance abuse in workplace.

However, there are also other critical risks that affect the performance of construction projects in Ethiopia, such as unforeseen site conditions, improper design, incomplete contract documents, inflation, lack of timely decision making, scope change, political instability, payment delay, lack of approvals, corruption, and poor contract administration (Yadeta, 2016). These risks can cause delays, cost overruns, quality defects, and disputes among project stakeholders.

Moreover, the Ethiopian building proclamation No 624/2009 states that any building shall be designed and constructed in such a way that it shall not impair the safety of people moving around, other constructions and properties. This implies that the construction industry has a legal obligation to ensure the safety of not only its workers but also the public and the environment. However, there is a gap between the legal framework and the actual practice of health and safety in construction projects in Ethiopia.

When compared to budgeted costs, planned quality, and scheduled time, health and safety management is not given priority. However, these factors are essential for the success of project management and construction projects. Delays in the project can increase costs and affect the quality of the work. One of the main causes of delays in construction is accidents, which pose a serious risk to workers (Abrahamsen and Hall, 2013). Health and safety practices should not be neglected, but rather prioritized by all stakeholders of the project. The project will achieve its objectives more effectively if health and safety are given equal importance as budget and time.

One of the challenges of ensuring health and safety on construction sites is the diversity of workers' backgrounds and awareness levels. Different workers may require different types of training and communication to understand and follow the best practices in the field. Moreover, many workers in developing countries lack the necessary skills, knowledge, experience, and technology to create a safe and healthy working environment on their sites. This leads to poor

health and safety practices that persist despite various efforts to improve them over the years (Samuel, H.et al.2012). Developing countries often fail to recognize the importance of health and safety in the construction industry for their national development (Michael Fosu, 2018).

This research aimed to address the use of safety material in construction area and to help health and safety management practices in high-rise buildings in Addis Ababa city. The motivation for this research was the personal observation and experience of the low priority given to safety management issues in the construction industry. The research suggested a solution to the safety management problems and offered practical advice and recommendations to improve the knowledge and implementation of effective safety management in construction projects.

1.3 Research Questions

- What Health and Safety Management practices are implemented during the construction phase of high-rise buildings in Addis Ababa, Ethiopia?
- When it comes to the construction of high-rise building structures, are staffs provided enough health and safety training?
- How does the policies and regulations implemented to the development of high-rise building structures in terms of health and safety?
- How the important safety and health precautions do implemented in today's high-rise building projects?
- What are the most serious safety and health hazards connected with high-rise construction?

1.4 Objectives of the Study

1.4.1 Main Objective

- The general objective of this research is to assess the safety and health practices used during the construction phase of high-rise buildings in Addis Ababa, Ethiopia.

1.4.2 Specific Objectives

- To examine if enough health and safety training is given to the staff of high rise building projects.

- To assess the implementation of health and safety laws and regulations that is employed in the construction of high-rise structures.
- To assess the implementation of the most important safety and health precautions in today's high-rise building projects.
- To identify the primary safety and health hazards related to the development of high-rise buildings in Addis Ababa

1.5 Significance of the Study

The construction sector depends on the well-being of its workers. This study aimed to show the importance of their lives. It proposed a way to make health and safety management a key concern.

This study is important because it aimed to reveal the current practices of health and safety management and identify the main problems that need to be addressed to reduce injuries and deaths in building construction projects.

The study provides valuable insights for enhancing accident prevention skills, creating a safe work environment, and ensuring the safety of construction workers during the building phase. It also offers guidance for junior scholars who want to pursue research on this topic.

1.6 Scope of the study and limitations of the study

The purpose of the study is to evaluate safety and health management procedures in building construction projects carried out by Sunshine Construction plc.

The subject of safety and health management practice of construction projects in general, the case in the Ethiopian construction industry have not been adequately researched; hence, it may take time to collect all the data necessary about all stakeholders for the research. Due to time constraints, the research only focuses on Addis Ababa-based building construction projects. It was challenging to get enough data, which led to more empirical findings that might not be representative of the construction sector as a whole.

1.7 Organization of the Study

The research paper will have five chapters. The first chapter deals with introduction. The second chapter deals with literature review in which critical review of relevant previous scholars work in

the research topic will be presented. Chapter three discusses the research methodology. Chapter four discusses the findings of the study with data analysis, presentation and interpretation. Finally, the fifth chapter includes summary of findings, conclusions, recommendation, research contribution and further studies required.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews various literature sources that relate to the theoretical and empirical framework of this research. The literature sources cover different aspects of construction site safety, such as the activities and participants involved, the process and the elements that influence it, and the challenges and best practices in different countries and contexts. The purpose of this literature review is to establish the current state of knowledge and identify the gaps that this research aims to fill.

2.2 Theoretical Review

2.2.1 Health and Safety Definition

Construction sites are among the most dangerous workplaces and environments, where workers and others face higher risks of death, illness, and injury than in other sectors. Construction activities can result in serious harm to the health and safety of workers, employees, and non-employees, such as visitors, clients, or the public. Employers and others have a legal and moral duty to ensure the well-being, safety, and health of everyone involved in or affected by construction work. Workers should not be expected to work in hazardous sites or situations where they may be injured or killed (Perry, 1).

Health is the protection of the bodies and minds of people from illness resulting from the materials, processes or procedures used in the workplace (OSHA, 2004). The ability of a body to adapt to new dangers and ailments was the definition of health given by researchers published in the Lancet in 2009. According to the study, being in excellent health refers to a person's overall welfare, which is characterized by physical wellbeing, mental tranquility, and positive social connection. Every element of our life is impacted by health. Life without health is a difficult concept to grasp.

Safety is the prevention of harm to people's physical well-being. It encompasses all the actions and policies that aim to safeguard people's health and bodily integrity in different settings. Safety can be assessed by various indicators that track the occurrence of near misses, injuries, illnesses,

and deaths in the workplace. Safety also implies that a person is aware of the benefits of behaving properly and the dangers of acting recklessly, irresponsibly, or wrongly. Situations that pose a threat to people can be managed safely, but failing to do so creates risk. As (Allan St. John, 2015) defines it, safety is a state of security and a condition free of risk. An injury is therefore an outcome of an accident but not the only possible one.

Accident is defined by the Health and safety Executive as any unplanned event that results in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity (HSE, 2003).

Risk assessment; (OSHA, 2004) define is the process to look at the conditions workers are exposed to the hazards and determine whether the hazards likely to cause any harm to the workers.

Hazard and risk means integral potential of any machine, material, or ambient factors to cause illness or injury from contact with or exposure to construction (Ethiopian Building Code Standards., 2013).

Risk can be ranked in relation to other risks or a potential level of danger. A substance, action, or process poses a risk if there is a chance it will be harmful. According to the Health and Safety Executive (HSE), risk is the likelihood, whether great or low, that a person would suffer injury as a result of the hazard. Risk, according to Hertz (1983), is the exposure to the possibility of harm or loss (a definition derived from the Random House College Dictionary).

Risk is described by (Lim, 2003) as either the probability of an unfavorable event, a mix of hazards, the unpredictability and partiality with which the actual outcome deviates from the predicted result, the uncertainty surrounding loss, or the likelihood of loss. Risk will be visible at every stage of a construction project's life cycle, including the assessment, approval, construction, and operation (Perry, 1985).

2.2.2 Construction Safety in Ethiopia

One of the industries with the fastest growth rates in Ethiopia is the building industry. According to (Adane MM et al, 2013), emerging nations like Ethiopia are working hard to improve their fundamental services by constructing roads, factories, bridges, housing complexes, hospitals,

schools, and other infrastructure. However, all of these building tasks are done at a low cost by unskilled labor forces. These workers have a high rate of occupational injuries and accidents because to factors like poverty, illiteracy, and a lack of training in health and safety as well as knowledge of the risks to their health at work. These workers are known to experience jobs that change quickly, intense competition, and attacks from unemployment.

The construction industry is a vital sector for Ethiopia's economic development, as it provides infrastructure, housing and industrial parks. However, the safety and health of the workers in this industry are often neglected and exposed to various hazards. According to a study by (Hanna et al. 2016), only few researches have been done to assess the occupational safety and health status of construction workers in Ethiopia. There is a need to address this issue and improve the working environment for the workers in this sector.

Construction workers in developing countries face more occupational health and safety hazards than those in industrial countries. These hazards also have a higher impact on them, ranging from 10 to 20 times more than in industrial countries. This is where most of the world's workforce is located, according to Dong (2005).

The poor safety practices among building construction workers in Ethiopia are because of unsafe conditions such as:

- Lack of accident prevention tags: These are signs or labels that warn employees of an existing hazard or a hazardous procedure on or around machines or equipment. They are a temporary means of protection until the hazard is eliminated or controlled. According to a study by Tadesse and Israel (2016), only 18.4% of building construction workers in Addis Ababa reported using accident prevention tags.
- Lack of personal protective equipment (PPE): This is any equipment used to eliminate or minimize a specific occupational injury by a worker. It includes items such as helmets, gloves, boots, goggles, masks, ear plugs, etc. The use of PPE is a universal legal requirement and recommended action of workers to protect themselves from injuries in their workplace. However, a study by Alemu et al. (2020) found that only 38% of building construction workers in Addis Ababa utilized at least one PPE. The main

reasons for non-utilization of PPE were unavailability of the materials and the absence of orientation on using PPE.

- Lack of safety training: This is any form of education or instruction that aims to improve the knowledge, skills and attitudes of workers regarding occupational safety and health. It covers topics such as hazard identification, risk assessment, accident prevention, emergency response, first aid, etc. Safety training is essential for raising awareness and promoting safe behaviors among workers. However, a systematic review and meta-analysis by Girma et al. (2021) found that only 35% of construction workers in Ethiopia received safety training. The lack of safety training was associated with increased risk of occupational injury.
- Lack of supervision: This is the process of monitoring and controlling the activities and performance of workers to ensure compliance with safety standards and regulations. It involves providing feedback, guidance and support to workers to prevent accidents and injuries. Supervision can be done by employers, managers, supervisors or governmental agencies. A study by Alemu et al. (2020) found that only 36% of building construction workers in Addis Ababa reported having supervision on their work sites. The presence of supervision was significantly associated with higher utilization of PPE.

The main reason for most workplace injuries is the poor working conditions in the construction industry. However, personal factors also play a significant role in increasing the risk of accidents. These factors include being young, having low education level, being inexperienced, being unhappy with the job, not exercising regularly, working long hours, working at night and not wearing personal protective equipment (Wong, 1994; Huang and Chen, 2002; Chau et al., 2004; Bresciani et al., 2012, Dong et al., 2015). Many construction workers are unaware of the importance of wearing protective equipment on the job sites. They find it inconvenient and uncomfortable to wear them while working (Griffin and Neal, 2000).

These factors contribute to the high prevalence of work-related injury among building construction workers in Ethiopia, which was estimated to be 38.7% in Gondar and 38.3% in Addis Ababa. The most common types of injuries were abrasions, cuts, fractures and burns. These injuries can have serious consequences for the workers' health, well-being and productivity, as well as for their families and society.

2.3 Empirical Review

2.3.1 The Nature of the Construction Industry

The construction industry is characteristically one in which most of its products are unique with respect to form, size, and purpose (Berger 1998). Whereas they are not unique, work operations, which are similar and repetitive, are often executed in work environments which change from hour to hour due to several factors such as weather conditions, locations, and height. Construction workers are constantly expected, therefore, to familiarize themselves with new situations that may be potentially hazardous.

One of the main features of the construction industry is its diversity and complexity. The industry comprises a wide range of sectors, such as residential building, non-residential building, infrastructure, and specialized construction. Each sector has its own specific characteristics, challenges, and opportunities. The industry also involves a large number of stakeholders, such as clients, contractors, subcontractors, suppliers, designers, engineers, consultants, and regulators. The coordination and collaboration among these stakeholders is essential for the successful delivery of construction projects (Statista 2023).

Another characteristic of the construction industry is its cyclical and volatile nature. The demand for construction output is influenced by various factors, such as economic conditions, population growth, urbanization trends, environmental issues, and government policies. The construction industry tends to follow the fluctuations of the gross domestic product (GDP) and is often affected by recessions and recoveries. The industry also faces challenges such as rising costs, skills shortages, safety risks, and sustainability concerns (ONS 2022).

One of the major challenges faced by the construction industry is the impact of natural phenomena on the working environment. Weather and climatic conditions can change rapidly and unpredictably, creating various hazards for the workers and the project. For example, heavy rain can cause flooding, landslides, and structural damage; strong winds can blow away materials and equipment; extreme heat or cold can affect the health and productivity of the workers; and earthquakes can compromise the stability and safety of the buildings.

The construction industry faces many challenges due to the involvement of various stakeholders and participants throughout the project lifecycle. One of the main challenges is fragmentation,

which leads to negative outcomes such as higher costs, lower productivity, poor communication, excessive and redundant documentation, ineffective and inefficient project management, unnecessary delays, unsatisfactory quality performance and poor safety performance. The construction industry needs to improve its health and safety culture to overcome these issues and deliver successful projects.

2.3.2 Causes of Accidents on Building Construction

One of the major challenges facing developing countries is the low level of safety in various sectors, especially in the workplace. Many of these countries lack adequate safety laws and regulations, or fail to enforce them effectively. This situation is often due to the weak authority and capacity of the institutions responsible for occupational safety and health (OSH). According to the ILO, OSH legislation is essential for creating a preventive culture and reducing occupational accidents and diseases.

The Ethiopian construction sector is growing rapidly due to the high demand for infrastructure development and urbanization. However, this growth also brings challenges and risks for the construction workers who are exposed to various hazards and injuries on the job. Therefore, it is essential to identify the factors that contribute to accidents on building construction sites and propose effective measures to prevent them.

Accidents are not inevitable events that occur randomly, but rather the result of complex interactions between human, technical, and environmental factors. According to Ridley (1986), 99 percent of accidents are caused by unsafe behavior, hazardous conditions, or a combination of both. Therefore, accidents can be prevented by eliminating or reducing these factors. Similarly, Sermolo (2014) stated that accidents in the construction industry are caused by poor working conditions and environments as well as a lack of personal protective equipment. Unsafe behavior is defined as a deviation from an accepted standard or procedure that could lead to an accident. Unsafe condition is defined as a physical state or circumstance that poses an immediate risk of an accident. Most accidents are the result of multiple contributing factors, including one or more unsafe behaviors and unsafe conditions. Various accident causation models have been developed to explain the underlying mechanisms and processes of accident occurrence and prevention (Fu et al., 2020). These models can be classified into four categories: human-based, statistics-based, energy-based, and system-based models (Wu et al., 2023). Human-based models focus on the

human factors of an accident, such as human error, violation, and accident proneness. Statistics-based models use accident statistics to study the relationship between the number and severity of accidents. Energy-based models consider accidents as the result of uncontrolled release or transfer of energy. System-based models view accidents as the emergent properties of complex socio-technical systems.

One of the goals of researchers is to understand the causes of accidents and how they can be prevented. (Murie F., 2007) suggests that accidents can be attributed to either technical or human errors. (Heinrich, 1980) proposes a theory of accident causation that identifies several factors that contribute to an accident. These factors can be classified into environmental and behavioral issues. Behavioral factors involve the attitudes, skills, and knowledge of the workers. Environmental factors include the physical and mechanical hazards and the condition of the equipment and procedures.

A common theme in the literature on construction safety is the role of environmental factors in causing injuries. For example, Taylor (2004) identified hazards at work and standards as key factors affecting safety performance. Similarly, Lubega (2001) found that construction accidents in Uganda were mainly caused by disregard for safety standards, using unskilled labor, and awareness of safety regulations. Tam (2004) also agreed with this view and argued that managers' insufficient safety awareness, lack of training, unwillingness to give resources to safety, and careless operations were the primary factors affecting safety in China.

According to a study by Dejus (2007), the main causes of fatal and serious accidents on construction sites in the Lithuanian Republic are lack of training, inexperienced workers, and a failure to comprehend risk. Similarly, Hamid et al. (2008) conducted a survey in Malaysia to determine the factors affecting safety performance on construction sites. They discovered that unsafe practices, such as faulty procedures, knowledge level, and disobedience protocols, are the most common causes of accidents on construction sites. Other common causes of accidents on construction sites include falls, being struck by objects, electrocutions, crane accidents, vehicle accidents, exposure to toxic chemicals, and fires and explosions (Wilson Kehoe Winingham LLC, 2014; Dream Civil, 2020). These findings suggest that there is a need for improving the safety awareness, training, and management of construction workers and managers in order to prevent or reduce the occurrence of accidents on construction sites.

Holt (2001) identified several secondary factors that contributed to accidents in construction projects, besides the primary ones such as human error, equipment failure, and environmental hazards (Smith et al., 1999; Jones and Lee, 2000). These secondary factors included management issues such as financial constraints, lack of commitment, insufficient policy and standards, inadequate knowledge and information, limited training and task selection, and poor quality control systems. He also mentioned other challenges that increased the risk of injuries and deaths in construction sites, such as incomplete connections, temporary facilities, limited spaces, unstable work surfaces, changing work sites, multiple tasks, and groups working close together.

2.3.3 Factors Affecting Safety on Construction Projects

One of the major challenges in improving occupational health and safety is the disparity between developed and developing countries. While developed countries have established and enforced strict safety regulations to protect workers from hazards, developing countries often lack such measures or fail to implement them effectively. According to Hinze (1997), this problem stems from the weakness of the authority in developing countries to ensure compliance with safety rules and programs. As a result, workers in developing countries face higher risks of injuries and illnesses than their counterparts in developed countries. This is supported by the data from the International Labour Organization (ILO), which shows that the fatal injury rate for workers in low-income countries is 18.4 per 100,000 workers, compared to 3.6 per 100,000 workers in high-income countries (ILO 2018).

The construction industry is one of the most important sectors in developing countries, but it also faces many challenges related to safety, health, and the environment. These challenges are more pronounced in poor countries, where these aspects are often neglected or poorly enforced on construction sites. However, as these countries are striving to improve their infrastructure and development, they need to pay more attention to the health and safety of their workers and the impact of their projects on the environment. According to (Hinze, 2005), health and safety are critical for the success of any project, not only in terms of cost, quality, and time, but also in terms of human lives and well-being. If a worker dies or becomes permanently disabled as a result of a construction accident, the project will suffer from moral, legal, and financial consequences. (Enshassi et al., 2009) also argue that improving health and safety on construction sites can bring many benefits, such as reducing accident costs, increasing productivity,

enhancing human relations, and improving the reputation of the organizations involved. Therefore, it is essential to identify and address the factors that affect the performance of construction projects in terms of safety, health, and the environment, and to adopt best practices and standards that can ensure the protection of workers and the public. Some of these factors and practices are discussed by (Boadu et al. 2020), who explored the characteristics of the construction industry in developing countries and their implications for health and safety; by ILO (2015), who provided a global overview of the hazards and risks faced by construction workers; and by (Manu et al. 2019), who edited a book on construction health and safety in developing countries with case studies from Africa, Asia, and South America.

The socio-cultural perspective explores how social groups construct meanings of risk and how social factors and experiences influence a person's understanding and perceptions of risk. The main rationale of this approach is that communication, judgment, and risk evaluation are not produced in isolation from social context. They are part of a continuous social dialogue about attitudes, information, power relations, previous experiences, and social norms. This paradigm has adopted the social theory of risk, and both individualism and constructivism are important elements. This group of people responds to risk based on their personality, knowledge, and experience (Rayner, 1992). According to this perspective, risk is not an objective property of the world, but a subjective interpretation that varies across cultures and contexts (Douglas and Wildavsky, 1982; Slovic et al., 2004). Therefore, different social groups may have different perceptions and preferences regarding risk management and policy (Kasperson et al., 1988; Renn et al., 1992).

According to Healey (2006), some of the human factors that can contribute to major accidents in various industries are:

- **Complacency:** This is the tendency to overlook or underestimate potential risks or hazards due to overconfidence, familiarity, or routine. Complacency can lead to errors of omission, such as failing to check equipment, follow procedures, or communicate effectively.
- **Violations:** These are deliberate deviations from rules, standards, or procedures that are intended to ensure safety and reliability. Violations can result from pressure, incentives, peer influence, lack of supervision, or rationalization.

- Excessive working hours: This is the situation where workers are required or choose to work beyond their normal or optimal hours, resulting in mental fatigue, reduced alertness, impaired judgments, and increased error rates.
- Inadequate procedures: These are procedures that are missing, unclear, outdated, impractical, or inconsistent with the actual work situation. Inadequate procedures can cause confusion, uncertainty, inefficiency, and non-compliance among workers.
- Communication issues: These are problems that arise from ineffective or insufficient exchange of information among workers, teams, departments, or organizations. Communication issues can cause misunderstandings, conflicts, delays, errors, and accidents.
- Pressure to meet production targets: This is the demand or expectation to achieve certain levels of output, quality, or performance within a given time frame. Pressure can motivate workers to improve their efficiency and productivity, but it can also induce stress, distraction, haste, and shortcuts that compromise safety and reliability.
- Poor management practices: These are actions or decisions by managers or leaders that adversely affect the safety culture, climate, or performance of an organization. Poor management practices can include inadequate planning, organizing, directing, controlling, monitoring, or supporting of workers and activities.
- Inadequate safety management systems: These are systems that are either missing, incomplete, ineffective, or poorly implemented to identify, assess, control, monitor, and review safety risks and hazards. Inadequate safety management systems can result in insufficient prevention, detection, mitigation, or recovery from major accidents.
- Inadequate training: This is the lack of appropriate knowledge, skills, or abilities among workers to perform their tasks safely and reliably. Inadequate training can result from insufficient resources, time, methods, content, or evaluation of training programs. Inadequate training can also include emergency response, fire and safety and maintenance errors.

These human factors can interact with each other and with technical and environmental factors to create complex and dynamic situations that increase the likelihood and severity of major accidents.

A detailed environmental impact assessment should be conducted before to the start of any project to ensure that the environment won't be harmed in any way. Assessment of risks may be made by considering the work place environment factors as stated (OSHA, 2004) state the following five factors:

- The air concentration of fumes vapor's and dust generated from the work processes;
- The effectiveness of ventilation on site to control the air contaminants;
- The likelihood of skin or eye contact with corrosive/irritating substances;
- The exposure of the workers to hazardous physical agents, e.g. noise, heat and radiation;
- The ergonomic factors, e.g. repetitive tasks and manual handling.

A comprehensive review of the existing literature on construction safety reveals that there are six main factors that influence the safety performance of construction projects. These factors are: human factors, which include the skills, attitudes, behaviors, and training of the workers and managers involved in the construction process; regulations, which refer to the laws, standards, and policies that govern the construction industry and its safety practices; technical factors, which encompass the design, materials, equipment, and methods used in the construction activities; environmental considerations, which involve the physical, social, and climatic conditions of the construction site and its surroundings; management factors, which relate to the planning, organization, coordination, communication, and control of the construction project and its safety aspects; and other concerns, which cover any additional issues that may affect the safety of the construction workers and stakeholders. These factors provide a useful framework for analyzing and improving the safety performance of construction projects.

2.3.4 The Costs and Impacts of Accidents on a Construction Site

Accident costs can be classified into two categories: direct costs and indirect costs. Direct costs, which are often covered by workmen's compensation insurance premiums, include those related to the treatment of the injury and any special compensation provided to workers as a result of being hurt (Pillay and Haupt, 2008). The primary costs associated with injuries are their direct costs, which are also known as insurable costs. Medical expenses, insurance premiums for benefits, liabilities, and property damages are examples of direct costs. In most cases, the direct expenses may be accurately calculated.

Indirect costs, which are paid for by contractors, include lost productivity for the injured worker(s) as well as the crew or workforce, clean-up costs, replacement costs, stand-by costs, overtime costs, administrative costs, replacement worker orientation, costs associated with delays, supervision costs, costs associated with rescheduling, transportation, and wages paid while the injured worker is on the unable to work list.

Accident indirect costs are more challenging to determine (Pillay and Haupt, 2008). The majority of non-insurable costs incurred as a result of an injury are considered indirect costs. The costs that are indirect are those that remain hidden and for which no past information is kept. Reduced productivity for both the team or employees and the returned workers is an example of an indirect cost. Other indirect costs include clean-up costs, replacement costs, stand-by costs, overtime costs, administrative costs, replacement worker orientation, costs associated with delays, supervision costs, costs associated with rescheduling, transportation, and wages paid while the injured worker is on rest.

According to (Heinrich, 1980), a study of several injuries was undertaken, and the results showed that the indirect costs of injuries were almost four times higher than the direct expenses. The four to one ratio that Heinrich proposed seems to have found support in the safety profession. However, the building sector does not generally accept this indirect to direct cost ratio. The researchers divided the cost of building accidents into two main categories, direct costs, and indirect costs, to better understand the literature studies mentioned above.

2.3.5 Implementation of safety management challenges in Ethiopian

The building industry is a key driver of economic growth in many countries, especially in developing ones. However, the level of mechanization in this sector varies widely across different regions, nations and sectors. Mechanization is the process of shifting from doing work mostly or entirely by hand to doing it using machines. It can offer many benefits, such as faster completion, higher quality, lower cost, less waste and safer work conditions. Some factors that influence the adoption of mechanization in the building industry are availability, suitability, uniformity, size, standardization, origin, cost and function of equipment. Some examples of mechanized equipment are earth moving, hauling and hoisting machines.

The quality and efficiency of construction projects in developing countries often leave much to be desired. Clients and taxpayers do not get the best value for their money, and the buildings do not meet the standards of modern and competitive businesses. Moreover, the construction industry in these countries suffers from a high rate of accidents and injuries, due to the absence of rigorous building and safety regulations.

Because of the large number of seasonal and migrant workers, Kartam (1998) discovered that most developing nations, like India, do not have training programmers for employees. As a result, there is no orientation for new employees or workers, no warning of potential hazards, and no safety meetings. Employees are required to gain knowledge from their own errors and encounters.

In developed countries, various safety laws and regulations are in place and enforced effectively. Trained safety officers conduct regular safety training sessions to raise awareness of potential risks. In contrast, developing nations may lack safety regulations altogether, or have ones that are inadequate, ineffective, outdated, and based on colonial-era conditions because they are merely imitations. Moreover, the regulatory authority is usually very weak in enforcing rules, and workers may not recognize work hazards or underestimate their severity (Larcher, 1999).

2.3.6 Health and Safety Management in Ethiopian Construction

Occupational health services (OSH) are essential for ensuring the well-being and productivity of workers in different sectors and regions. However, there is a huge gap in the availability and accessibility of OSH services worldwide. According to the International Labour Organization (ILO), only 15% of workers globally have access to OSH services, and this figure drops to 5% in developing countries. Ethiopia is one of the developing countries that face many challenges in providing OSH services to its workforce, especially as it transitions from an agriculture-based economy to an industrial-led one. This transition requires the development of infrastructure and standards that can protect workers and the environment from the hazards and risks associated with industrial activities. The United Nations Assembly has called for a Universal Access to OSH services for all workers, including those in the informal sector, by 2017. Ethiopia is expected to comply with this international commitment and to improve its OSH legislation based on the ILO Convention No. 161 on Occupational Health Services. The lack of OSH services can have serious consequences for workers' health and safety, as well as for the economic and social

development of the country. It is estimated that work-related injuries and diseases cost developing countries up to 10% of their GDP. Therefore, Ethiopia needs to invest in OSH services as a priority and as a means of achieving sustainable development.

According to Article 92 of Labor Proclamation No 377/06, employers have the basic duty to provide safe, healthy and hazard-free workplaces for their workers. However, the implementation of this regulation is still a challenge. One of the reasons is the lack of awareness or interest of employers or investors who prioritize profits over OSH Services. Another reason is the limited capacity of OSH inspectors in terms of hazard assessment, measurement equipment, technical skills and human resources (Kumie et al., 2016). OSH Services are services that help industries and organizations comply with OSH legislations and standards, and improve their workplace health and safety practices (AMIOSH; OSH-Med International; OSH, 2012).

2.3.7 Construction Health and Safety Responsibilities

Construction health and safety should be of primary concern to employers, employees, governments and project participants (Kheni, 2008). Thus the main parties responsible for construction health and safety are the client, main contractor, regulatory agencies and employees.

In order to assure safety and health of the working environment for workers by empowering enforcement of the standards developed under the act. For these reason, the Health and Safety at Work Act 1974 (HSW, 1974) is the basis of British health and safety law, It summaries the lawful requirements of the employers and the other people that many be included. A significant section of the act is the forming of the HSE (Health and Safety Executive) and the (Health and Safety Commission). The act created by both Health and Safety Executive and the Health and Safety Commission (HSC) to attain the intended goal.

In Kuwait the practice of health and safety is controlled by two government agencies, Kuwait Municipality (KM) and Ministry of Public Work (MPW) in addition to the High Committee for Safety and Security at the state level (Kartam and Bouz, 1998).

Unlike many countries, in Ethiopia Labor proclamation No 377/06 states that there is one comprehensive labor law that is Ministry of Labor and Social Affairs (MOLSA) the Federal Governmental Agency who's operating in order to address all aspects of ensuring labor relation to be governed with basic fundamental rights and obligation focusing on industrial peace in all

work places. The establishment of the services has the objective of preventing injuries, diseases, creating of harmonious and peaceful industrial relations where there are no strikes and industrial unrest.

2.3.8 Elements of Construction Safety Management System

The new workplace safety and health act (WSHA, 2006) lists six key obligations of contractors with regards to construction safety, Viz (MOM, 2006):

1. Ensuring that the workers are not exposed to hazards arising out of the arrangement, disposal, manipulation, organization, processing, storage, transport, working or use of things in their workplace or near their workplace under the control of the contractor;
2. Ensuring that adequate safety measures are taken in respect of any machinery, equipment, plant, article or process used by the workers;
3. Providing and maintaining a workplace that is safe, without risk to health, and adequate as regards to facilities and arrangements for the workers' welfare at work;
4. Ensuring that every work person has adequate instruction, information, training and supervision as is necessary for that person to perform the work;
5. Developing and implementing procedures for dealing with emergencies that may arise while the workers are at work; and
6. Giving the workers all necessary information about the way the activities and operations on site are conducted as might affect their safety or health while they are on site.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the study area's description, the research theory, the method used in this study and its justification, the study population and sampling techniques, the sources and collection of the study's data, and the method of data analysis. The overall process used to carry out this investigation is discussed.

3.2 Research Approach

A research approach is a way of conducting a study that follows a certain logic and methodology. It involves defining the problem, formulating the research questions, collecting and analyzing the data, and drawing conclusions. A research approach can be based on different theoretical perspectives, such as positivism and pragmatism (Creswell, 2003). According to Liu (2003), there are two main types of research approaches: qualitative and quantitative. Qualitative research focuses on exploring and understanding the meanings and experiences of people in their natural settings, while quantitative research emphasizes measurement and testing of hypotheses using numerical data. However, Creswell (2003) also proposed a third type of research approach, which he called mixed methods. This approach combines both qualitative and quantitative methods in a single study, aiming to achieve a more comprehensive and balanced understanding of the phenomenon under investigation.

3.2.1 Qualitative Research Approach

According to (Yin, 2003), the qualitative method allows the respondent to express themselves freely, which can yield valuable data that the quantitative method would miss. (Creswell ,2013) noted that qualitative data offer rich and detailed insights through direct quotes and careful descriptions of programs, situations, events, people, interactions and observed behaviors. He also added that the qualitative inquiry uses different knowledge claims, strategies of inquiry and methods of data collection and analysis. Qualitative research methods include various techniques, such as case study, content analysis, interview and observation, as well as guide theory and literature. This study chose the questionnaire survey as the qualitative technique of

inquiry for this research project, rather than the other techniques, based on the rationale that is explained in the following section.

3.2.2 Quantitative Research Approach

The quantitative research method adopts a deductive and objective view, which is characterized by tangible data such as counts, weight, mass, and other physical measures. (Creswell, 2009) states that, in the quantitative approach the researcher use survey or experiment to collect data needed to see cause and effect relationship among variables of interest. The major benefit of the quantitative approach is that it enables the researcher to utilize statistical techniques to make generalization about the population.

3.2.3 Mixed Research Approach

The mixed research approach is a combination of both quantitative and qualitative approaches to data collection, the analysis of data and other phases of the research process. The mixed method approach involves collecting both numeric and text information, either simultaneously or sequentially, so as to best understand research problems, with the final database representing both quantitative and qualitative information (Creswell and Clark, 2007). (Creswell, 2014) acknowledged that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone.

Taking into consideration the significance of applying mixed method in modern research, the researcher used qualitative approach for the reasons of achieving credibility of result, for better interpretation of result.

3.3 Research Design

The study was used descriptive research approach. Descriptive design used since it is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way and it provides a great amount of description and detail about a particular case.

3.3.1 Target Population

Hair et al., (2010) states target population as a specified group of people or object for which questions can be asked or observed to collect required data structures and information. The target population for this research will be construction workers working in 4 high rise buildings constructed by sunshine construction PLC in Addis Ababa, Ethiopia.

So Project Managers, Site Engineers, Foreman, Daily labor workers and Structural managers totally 80 peoples are a target population for the research.

3.4 Sampling technique and Sample size

A non-probability convenience sampling technique will be used for the research, in which samples from the target population will be selected based on their proximity to the researcher. Non-probability sampling refers to a sampling strategy where not every member of the population has an equal chance of taking part in the study.

The sample size is determined using the Taro Yamane technique, which was developed by Taro Yamane in 1967 to calculate the sample size from a given population.

$$n = \frac{N}{1 + N(e)^2}$$

n=the sample size is indicated by the letter.

N= denotes the research population.

e= denotes the margin error = (0.05)

N = 80(total personnel of the firm in the four projects)

$n = 80 / 80 * (1 + (0.05)^2) = 67$ in this scenario (confidence level of 95 percent)

3.5 Source of Data

This study employed a mixed-methods approach, using both primary and secondary data sources to address the research problem. Primary data were collected through questionnaires and self-observation with various stakeholders involved in the construction projects, such as daily laborers, skilled workers, foremen, engineers, and project managers. Site visits and observations were also conducted to gain a deeper understanding of the project context and challenges. Secondary data were obtained from published and unpublished literature related to the topic, such as books, journals and reports.

3.6 Data collection methods

Based on the tools and processes for acquiring data, a questionnaire with closed-ended questions will be used. In order to formulate the questions, the research questions will be employed. The information is then spread and gathered. The main research information will come from employees and will be gathered through closed-ended questionnaires. A Likert scale will be used

in the questionnaire (1=strongly disagree, 2=disagree, 3= undecided, 4=agree, and 5=strongly agree) documents related to the topic will be gathered as well.

3.7 Data analysis

Data analysis is a systematic process of extracting meaningful insights from the data collected for a specific study. The data analysis should be aligned with the research objectives and questions. In this study, the researcher employed both quantitative and qualitative data analysis methods to examine the data obtained from the questionnaire. The quantitative data from the closed-ended questions were analyzed using descriptive statistics (SPSS) to calculate the mean scores of the variables. The data collected using observation and open-ended questions of the questionnaire were analyzed using qualitative data analysis techniques together with the results of the descriptive statistics in order to supplement one by the other.

Descriptive methods were used to analyse the questionnaires that were gathered from the company's various construction skilled professionals. The outcomes of the analysis of the descriptive data will be presented as percentages, frequencies, means, and standard deviation. As a result, the data will be displayed in a table. Based on how respondents responded to the questionnaire's questions, the Relative Important Index (RII) technique was used in Excel to rank the significant safety management practices.

$$\text{Relative important index (RII)} = \frac{5 N5 + 4 N4 + 3N3 + 2N2 + 1 N1}{A * N}$$

N5= number of respondents for strongly agree;

N4= number of respondents for agree;

N3= number of respondents for neutral;

N2= number of respondents for disagree;

N1= number of respondents for strongly disagree

A=Highest weight; and

N=Total number of respondents

3.8 Validity and Reliability

To ensure the validity and reliability of the data collected from official sources, they will be verified with other secondary sources. The data will also be updated to reflect the current situation. The purpose of verification is to remove any errors or inconsistencies from the data and to increase the confidence level

of the data. This will help to produce a more accurate and trustworthy result. The internal reliability of the questionnaire will be measured by Cronbach's alpha test, which will use SPSS software and the formula to calculate the alpha value.

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}}$$

N=stands for the number of items

\bar{c} = stands for covariance between items

\bar{v} = stands for average variance.

N_Q	Variables	Cronbach Alpha Value	Number of Questions
1	Safety and Health Policy and Regulation	0.860	7
2	Safety and Health Training	0.702	7
3	Safety and Health Precautions	0.867	7
4	Safety and Health Hazard	0.790	8
5	Safety and Health Management Practices	0.822	8

Table 1: CRONBACH ALPHA RESULTS

Individual variables have a value range of 0.790 to 0.867, according to the Cronbach's Alpha values in the above table, indicating that they have internal consistency and are reliable for further investigation.

3.9 Ethical considerations

This research followed the ethical principles that guide scientific inquiry and respect human dignity. The researcher obtained informed consent from all the participants, who were free to withdraw at any time. The researcher also protected the privacy and confidentiality of the participants. The researcher minimized the potential for harm by ensuring that the research procedures were safe and comfortable for the participants. The researcher also ensured fairness and equity by selecting a diverse and representative sample of participants and avoiding any bias or discrimination. The researcher disclosed the methods and objectives of the research clearly and honestly. The researcher also acknowledged the sources of information and assistance that contributed to the research, and respected the intellectual property rights of others.

CHATER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter covers the analysis of the data gathered by questionnaires. It entails data analysis and interpretation in order to form a conclusion and provide suggestions for high-rise building safety management practices. This chapter also includes descriptive statistics which contains broad demographic traits, and educational background, and respondent's response is analyzed and presented. Quantitative research approaches were used to accomplish the stated objectives. In order to acquire the essential data and information in order to answer the study questions, questionnaires were used as a data collection instrument. SPSS is used for statistical testing and interpretation of the findings.

A total of 67 questionnaires were distributed to selected sampled employees, out of which 56 questionnaires was properly responded and collected by the researcher (response rate is 83.6%).

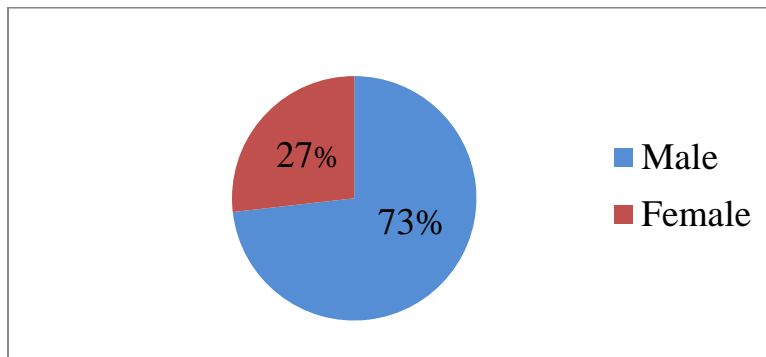
4.2 General Information of the Respondents

4.2.1 Profile of Demographics

The background information of respondents who completed the questionnaire, such as gender, age, job position and educational qualification, work experience, and employment status in the project, is shown in the figure below.

I. Gender Respondent

Figure 1 Genders of Respondents

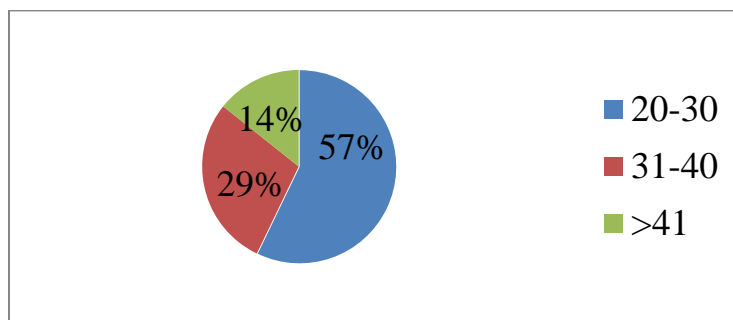


Source; own survey (2023)

According to the demographics of the respondents, 41 (73.21 percent) are male and 15 (26.79 percent) are female. This implies that gender proportion inequity in the construction sector as the numbers of female engaged in the construction sector are small as compared to number of male employees working in construction sector.

II. AGE OF RESPONDENTS

Figure 2 Ages of Respondents

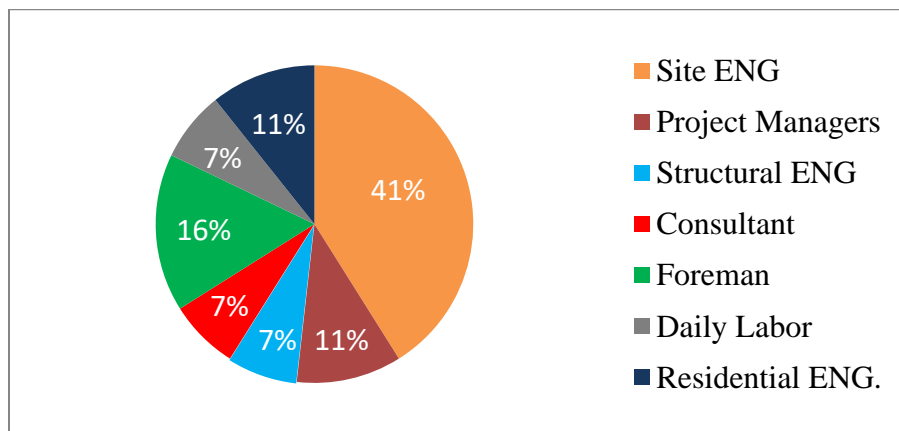


Source; own survey (2023)

32(57.14%) of the respondents were within the age group of (20-30), 16 (28.57%) of the respondents were within the age group of (31-40) and 8(14.29) of the respondents were above 41 years old. This indicates that majority of responders were young.

III. JOB POSITION OF RESPONDENTS

Figure 3 Job Positions of the Respondents

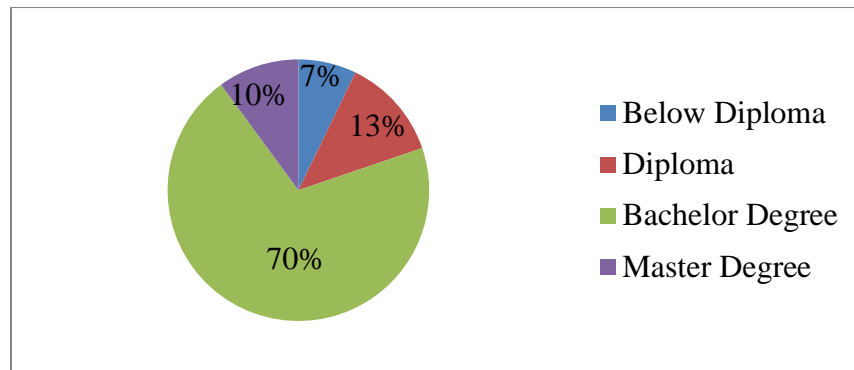


Source; own survey (2023)

Out of all respondents, 41.7%(23) were Site engineers, 16.07%(9) were Foremen, 11%(6) were Project managers and Residential engineers, 7%(4) were Structural engineers, Consultants and Daily labor workers. From this, we can analyze that, the majority of the respondents were site engineers. The researcher feels that health and safety are the responsibility of all professions involved in the study in some manner, and has attempted to engage as many as feasible.

IV. EDUCATIONAL BACKGROUND OF RESPONDENTS

Figure 4 Educational backgrounds of the Respondents

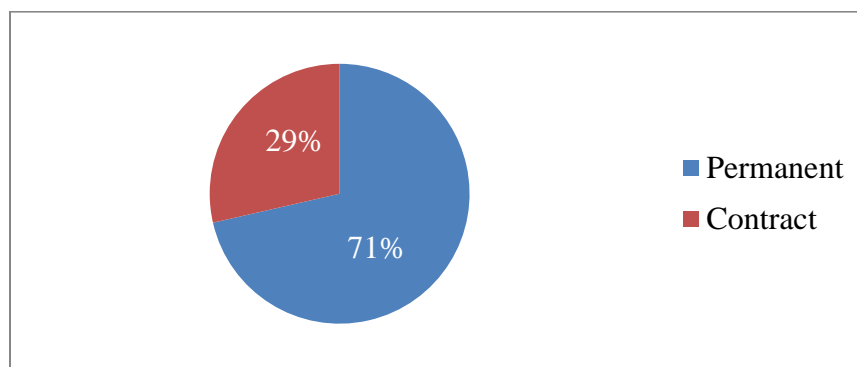


Source; own survey (2023)

As shown in the figure above, 70% of the respondents were Bachelor's Degree holders, 13% were Diploma holders, 10% were Master's Degree holders and 7% were Below Diploma. It can be seen that the construction industry has space for every education levels.

V. EMPLOYMENT STATUS OF RESPONDENTS

Figure 5 Employment's' status of the Respondents

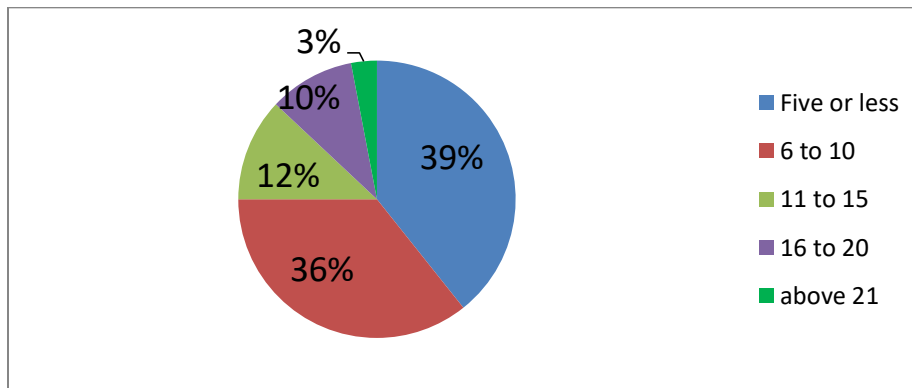


Source; own survey (2023)

From the above figure, we can understand that 71.42% of our respondents were permanent workers and 28.58% were contract workers. From this we can analyze the majority of our respondents were permanent employees.

VI. Total Work Experience of Respondent's

Figure 6 Total work experiences of the Respondents



Source; own survey (2023)

The figure above shows the work experience of the respondent's. Most of them had 5 years or less and 6-10 years of experiences which is 39% and 36% respectively, there were also respondents with 11-15 years which is 12% there were also respondents of 16-20 years experiences which is only 10% and 3% of respondents were above 21 years of experience. Those with 10 years and above helped in explaining the situations in the construction industry but 5 years or less is enough to know the current practices in the company which can represent all high rise real estate buildings since the practices are more or less similar.

4.3 Health and Safety Management Practices

On a five-point Likert Scale ranging from 1 to 5, respondents were given a series of questions about safety and health management practices.(1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree). The following assumption underpins the mean score analysis.

If the mean statistical value falls between 0 and 1.5, the respondents strongly disagreed.

If the mean statistical value is between 1.5 and 2.5, the respondents disagreed.

If the mean statistical value falls between 2.5 and 3.5, the respondents are undecided.

If the mean statistical value is in the range of 3.5 to 4.5, the respondents agreed.

If the mean statistical value is more than 4.5, the respondents strongly agreed.

4.3.1 Descriptive Analysis of Safety Policy and Regulation on Construction Site

Table 2: Mean and Standard Deviation of Safety Policy and Regulation Related Issues

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Inspections are conducted by local authorities and health and safety enforcement organization	56	4.00	1.00	5.00	3.7143	1.21677	1.481
Workers are well educated on how to properly care for and maintain personal protective equipment	56	4.00	1.00	5.00	2.3393	1.21021	1.465
There is a proper health and safety policy in place at your construction company	56	4.00	1.00	5.00	2.8036	1.18198	1.397
The safety policy and regulation are the latest up to date	56	4.00	1.00	5.00	2.5714	1.35991	1.849
The safety policy and regulation are implemented through all phases of the project	56	4.00	1.00	5.00	2.2857	1.24629	1.553
There is a specific department that manages the safety policy and regulation of the construction site	56	4.00	1.00	5.00	2.2321	1.27908	1.636
There is a strong safety policy and regulation on site	56	4.00	1.00	5.00	2.3750	1.07132	1.148

Source; own survey (2023)

Regarding Inspections conducted by local authorities and health and safety enforcement organizations, the mean value score is 3.71, which indicates that the majority of the respondents

agreed that local authorities check the health and safety performance of their construction site. Regarding Workers being well educated on how to properly care for and maintain personal protective equipment, the mean values score is 2.33, which indicates that the majority of the respondents disagreed that workers are well educated on how to manage personal protective equipment. Regarding there being a proper health and safety policy at their construction company, the mean score is 2.80, which indicates that the majority of the respondents are neutral on the existence of proper safety and health policy on their construction site. Regarding the safety policy and regulations are the latest updated form, the mean score is 2.57, which indicates the majority of the respondents are neutral in the existence of updated safety and health regulation regarding the safety policy and regulations are implemented through all phases of the project the mean score is 2.28, which indicated that they disagree on the implementation of safety policy and regulation on all stages of the project. Regarding there is a specific department that manages the safety policy and regulation of the construction site the mean score is 2.23, which indicated they disagreed on the existence of a specific department that manages the safety policy and regulation on the construction site. Regarding there is a strong safety policy and regulation on site the mean score is 2.37, which indicates they disagreed on the existence of strong safety and policy regulations on the construction site.

From the above data we can analyze the following points related to safety policy and regulation

- Authorities of health and safety enforcement conduct the necessary inspection if the necessary safety policy and regulation is implemented in the construction of high rise building but; there is a gap on the knowledge of construction workers on important safety policies and regulation that are related in constructing high rise building.
- We can analyze from the above data, there is no proper health and safety related policy in high rise building project of the study area and also the safety policy and regulations are not updated daily based on the change of the method of the construction of high- rise building from time to time.
- We can analyze from the above data that, the necessary safety policy and regulation that related to the construction of high rise building in the study area are not implemented through all life time of the high rise building projects which indicates that there is a gap

in the consistency of implementing the necessary safety policy regulation in high rise buildings.

- Lastly, we can analyze from the above data that there is no specific department or part of office system that manages the proper implementation of the important safety policy and regulation on high rise building projects. From this we can understand that there is gap in the existence of strong safety policy and regulation in high rise building projects.

Table 3: Frequency and Percentage of Respondents on Safety Policy and Regulation Related Issues

	Likert Scale											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Inspections are conducted by local authorities and health and safety enforcement organizations	1	1.8	10	17.5	15	26.3	8	14	22	38.6	56	100
Workers are well educated on the important safety policy and regulation.	13	22.8	27	47.4	5	8.8	6	10.5	5	8.8	56	100
There is a proper health and safety policy in place at your construction company	7	12.3	19	33.3	13	22.8	12	21.1	5	8.8	56	100
The safety policy and regulation are the latest upto date	13	22.8	22	38.6	4	7	10	17.5	7	12.3	56	100
The safety policy and regulation are implemented through all phases of the project	16	28.1	24	42.1	5	8.8	6	10.5	5	8.8	56	100
There is a specific department that manages the safety policy and regulation of the construction site	19	33.3	21	36.8	5	8.8	6	10.5	5	8.8	56	100
There is a strong safety policy and regulation on our site	11	19.3	26	45.6	7	12.3	11	19.3	1	1.8	56	100

Source; own survey (2023)

Now, we can use a relative important index to rank the issues that are related to safety policy and regulation to identify the most important issues related to safety policy and regulation by using the following formula.

$$\text{Relative important index (RII)} = \frac{5 N5 + 4 N4 + 3N3 + 2N2 + 1 N1}{A * N}$$

N5= number of respondents for strongly agree

N4= number of respondents for agree

N3= number of respondents for neutral

N2= number of respondents for disagree

N1= number of respondents for strongly disagree

A (highest weight)

N (total number of respondents)

Table 4: Relative Important index Result of Safety Policy and Regulation Related Issues

	Relative Important Index(RII)	Importance rank
Inspections are conducted by local authorities and health and safety enforcement organizations	0.74	1
There is a proper health and safety policy in place at your construction company	0.56	2
The safety policy and regulation are the latest up to date	0.51	3
There is a strong safety policy and regulation on our site	0.47	4
There is a strong safety policy and regulation on our site	0.46	5
The safety policy and regulation are implemented through all phases of the project	0.45	6
There is a strong safety policy and regulation on our site	0.44	7

Source; own survey (2023)

From the above Relative important index data we can analyze that the inspection by local safety authority, the existence of proper safety policy and regulation, and updating the safety policy and regulation are the top three important related issues of safety policy and regulation with Relative important index (RII), 0.74 ,0.56 and 0.51 respectively. So, giving special attention to these important issues is important in the implementation safety policy and regulation in high rise building projects.

4.3.2 Descriptive Analysis of Safety and Health Training on Construction Site

Table 5: Mean and Standard Deviation of Safety and Health Training Related Issues

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
There is an appropriate program for workers to learn about health and safety	56	4.00	1.00	5.00	2.3393	1.21021	1.465
I am well trained on safety and health-related issues.	56	4.00	1.00	5.00	2.6607	1.01403	1.028
Safety training is implemented on construction site	56	3.00	2.00	5.00	3.8036	1.10239	1.215
Top management gives emphasis on the safety training program	56	4.00	1.00	5.00	2.1786	1.30881	1.713
There is a control program for the implementation of a safety training program	56	4.00	1.00	5.00	2.5714	1.05928	1.122
An advanced safety training program is implemented	56	3.00	1.00	4.00	2.2500	1.04881	1.100
There is a schedule for safety and health training	56	4.00	1.00	5.00	2.3571	1.34067	1.797

Source; own survey (2023)

Regarding there is an appropriate program for workers to learn about health and safety the mean score is 2.33, which indicates that the majority of the respondents disagreed on the existence of an appropriate program to give knowledge about health and safety issues on their construction site. Regarding how well are they trained on safety and health-related issue the mean score is

2.66, which indicates that the majority of the respondents remain neutral on the competency of their training status. Regarding Safety and health training that was implemented on the construction site; the mean score is 3.80, which indicated the majority of the respondents agreed with the implementation of safety training on their construction site. Regarding Top management giving emphasis on the safety training program, the mean score is 2.17, which indicated the majority of the respondents disagreed with top management giving the necessary attention to their safety and health-related issue on the construction site. Regarding there is a control program for the implementation of a safety training program the mean score is 2.57, which indicates that the majority of the respondents remain neutral on the existence of a control mechanism for the implementation of a safety training program. Regarding an advanced safety training program implemented the mean score is 2.25, which indicates that the majority of the respondents remain disagreed on the existence of the latest safety and health training program on their construction site. Regarding there is a schedule for safety and health training the mean score is 2.35, which indicates that the majority of the respondents disagreed with the existence of a scheduled training program on their construction site.

From the above data, we can analyze the following points related to safety and health training on construction site

- There is no fixed plan and system for construction workers to learn the important safety and health training in high rise building projects. From this we can analyze that, there is a gap in having well trained construction workers on the important safety and health related issue.
- From the above data we can analyze that, top officials in construction projects doesn't give special attention on the implementation of safety training for construction workers in high rise buildings of the study area. Also there is gap on controlling system of, if safety training is implemented on construction site.
- From the above data we can also analyze, an advanced safety and health training program is not implemented on high rise building projects of the study area. Lastly, the above data tells us that there is no fixed schedule on safety and training to construction workers on high rise building projects.

Table 6: Frequencies and Percentage of Respondents on Safety and Health Training Related Issues

	Likert Scale											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
There is an appropriate program for workers to learn about health and Safety	13	22.8	27	47.4	5	8.8	6	10.5	5	8.8	56	100
I am well trained on safety and health-related issues.	4	7	27	47.4	11	19.3	12	21.1	2	3.5	56	100
Safety training is implemented on construction site	0	0	7	12.3	19	33.3	8	14	22	38.6	56	100
Top management gives emphasis on the safety training program	22	38.6	18	31.6	5	8.8	6	10.5	5	8.8	56	100
There is a control program for the implementation of a safety training Program	10	17.5	16	28.1	20	35.1	8	14	2	3.5	56	100
An advanced safety training program is implemented	16	28.1	19	33.3	12	21.1	9	15.8	0	0	56	100
There is a schedule for safety and health Training	18	31.6	19	33.3	6	10.5	7	12.3	6	10.5	56	100

Source; own survey (2023)

Now, we can use a relative important index to rank the issues that are related to safety and health training to identify the most important issues related to safety and health training.

$$\text{Relative important index (RII)} = \frac{5 N_5 + 4 N_4 + 3 N_3 + 2 N_2 + 1 N_1}{A * N}$$

$$A * N$$

N5= number of respondents for strongly agree

N4= number of respondents for agree

N3= number of respondents for neutral

N2= number of respondents for disagree

N1= number of respondents for strongly disagree

A (highest weight)

N (total number of respondents)

Table 7: Relative Important Index Results of Safety and Health Training Related Issues

	Relative important index	Importance rank
Safety training is implemented on construction site	0.76	1
An advanced safety training program is implemented	0.56	2
I am well trained on safety and health-related issues	0.53	3
There is a control program for the implementation of a safety training program	0.51	4
There is a schedule for safety and health training	0.47	5
There is appropriate program for workers to learn about health and safety	0.46	6
Top management gives emphasis on the safety training program	0.43	7

Source; own survey (2023)

From the above Relative important index data we can analyze that , the implementation of safety training, the existence of advanced safety training, and the training of construction workers on safety and health related issue are the top three important related issues of safety policy and regulation with Relative important index (RII), 0.76, 0.56 and 0.53 respectively. So, giving special attention to these important issues is important in the implementation safety and health training in high rise building project.

4.3.3 Descriptive Analysis of Safety and Health Precautions on Construction Site

Table 8: Mean and Standard Deviation of Safety and health Precautions Related Issues

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Safety precautions are implemented on the construction site	56	4.00	1.00	5.00	2.5536	1.27806	1.633

I wear personal protective equipment during work on the construction site.	56	4.00	1.00	5.00	3.8750	1.12916	1.275
All necessary safety materials exist on my construction site.	56	4.00	1.00	5.00	2.2679	1.25757	1.581
Our construction site includes all important safety precaution signs.	56	4.00	1.00	5.00	2.7857	1.41054	1.990
Top management gives emphasis on important safety precautions on construction sites.	56	4.00	1.00	5.00	2.1964	1.28516	1.652
There is a controlling mechanism for the implementation of all necessary precautions on the construction site.	56	4.00	1.00	5.00	2.2321	1.27908	1.636
All levels of workers in my construction site implement safety and health precautions.	56	4.00	1.00	5.00	2.3750	1.07132	1.148

Source; own survey (2023)

Regarding Safety and Health precautions implemented on the construction site, the mean score is 2.55, which indicated that the majority of the respondents remain neutral on the implementation of safety and health precaution on their construction site. Regarding if they wear personal protective equipment during work on the construction site the mean score is 3.87, which indicated that the majority of the respondents agreed that they wear personal protective equipment during work on their construction site. Regarding All necessary safety materials that exist on their construction site, the mean score is 2.26, which indicated that the majority of the respondents disagreed on the existence of all important safety materials on their construction site. Regarding construction sites including all important safety precaution signs, the mean score is 2.78, which indicated that the majority of the respondents remain neutral that their construction site gives a warning by using all important safety precaution signs. Regarding Top management giving emphasis on important safety precautions on construction sites, the mean score is 2.19, which indicated that the majority of the respondents disagreed that the top management gives all necessary attention to important safety and health precaution on their construction site. Regarding there is a controlling mechanism for the implementation of all necessary precautions

on the construction site the mean score is 2.23, which indicated that the majority of the respondents disagreed with the existence of a controlling mechanism for the implementation of all necessary precautions on their construction site. Regarding all levels of workers in construction site implement safety and health precautions, the mean score is 2.37, which indicated that the majority of the respondents disagreed in if all levels of workers implement safety and health precautions on their construction site.

From the above data we can analyze the following points related to safety and health precautions on high rise building projects

- There is a gap on implementing the important safety and health precautions on high rise building projects and the existence of all necessary safety and health materials in construction site
- From the above data we can also analyze that, top management doesn't give the necessary attention to the safety and health precaution that must be available in high rise building projects.
- We can also analyze from the above data that, the controlling mechanism for the implementation of safety and health precaution is very poor. Lastly, the data tells us that all level of workers in high rise building projects doesn't implement the needed safety and health precaution on construction site.

Table 9: Frequency and Percentage of Respondents of Safety and Health Precautions Related Issues

	Likert Scale											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Safety precautions are implemented on the construction site.	10	17.5	27	47.4	3	5.3	10	17.5	6	10.5	56	100
I wear personal protective equipment during work on the construction site.	1	1.8	7	12.3	12	21.1	14	24.6	22	38.6	56	100
All necessary safety materials exist on my construction site.	17	29.8	23	40.4	5	8.8	6	10.5	5	8.8	56	100

Our construction site includes all important safety precaution signs.	10	17.5	20	35.1	10	17.5	4	7	12	21.1	56	100
Top management gives emphasis on important safety precautions on construction sites.	20	35.1	21	36.8	4	7	6	10.5	5	8.8	56	100
There is a controlling mechanism for the implementation of all necessary precautions on the construction site.	19	33.3	21	36.8	5	8.8	6	10.5	5	8.8	56	100
All levels of workers in my construction site implement safety and health precautions.	11	19.3	26	45.6	7	12.3	11	19.3	1	1.8	56	100

Source; own survey (2023)

Now, we can use a relative important index to rank the issues that are related to safety and health precaution to identify the most important issues related to safety and health precaution.

$$\text{Relative important index (RII)} = \frac{5 N_5 + 4 N_4 + 3 N_3 + 2 N_2 + 1 N_1}{A * N}$$

$$A * N$$

N5= number of respondents for strongly agree

N4= number of respondents for agree

N3= number of respondents for neutral

N2= number of respondents for disagree

N1= number of respondents for strongly disagree

A (highest weight)

N (total number of respondents)

Table 10: Relative Important Index Result of Safety and Health Precautions Related Issues

	Relative important index	Importance rank
I wear personal protective equipment during work on the construction site.	0.77	1
Our construction site includes all important safety precaution signs	0.55	2
Safety precautions are implemented on the construction site.	0.51	3
All levels of workers in my construction site implement safety and health precautions.	0.47	4
All necessary safety materials exist on my construction site.	0.45	5
There is a controlling mechanism for the implementation of all necessary precautions on the construction site.	0.44	6
Top management gives emphasis on important safety precautions on construction sites.	0.43	7

Source; own survey (2023)

From the above Relative important index data we can analyze that, wearing personal protective equipment, the availability important safety precaution signs, and the implementation of safety precaution related issue are the top three important related issues of safety and health precaution with Relative important index (RII), 0.77, 0.55 and 0.51 respectively. So, giving special attention to these important issues is important in the implementation of safety precaution in high rise building projects.

4.3.4 Descriptive Analysis of Identification of Safety and Health Hazard That Occur Often on the Construction Site

Table 11: Mean and Standard Deviation Identification of Safety and Health Hazard That Occurs Often on the Construction Site

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Crane or hoist accidents	56	4.00	1.00	5.00	3.5536	1.24929	1.561
Falls from heights.	56	4.00	1.00	5.00	3.6786	1.28073	1.640
Falling and slipping	56	4.00	1.00	5.00	3.5179	1.38815	1.927
Gas leaks, flames, and explosions	56	4.00	1.00	5.00	2.6250	1.05421	1.111
Electricity (Electric power Accidents)	56	4.00	1.00	5.00	2.3571	1.03447	1.070
Accidents involving forklifts	56	4.00	1.00	5.00	2.5714	1.26286	1.595
Accidents involving machinery.	56	4.00	1.00	5.00	3.0893	1.50486	2.265
Repetitive motion accidents	56	4.00	1.00	5.00	3.7500	1.28275	1.645

Source; own survey (2023)

Regarding Crane or hoist accidents the mean score is 3.55; this indicates the majority of the respondents agreed that crane or hoist types of accidents occur often on their construction sites. Regarding falls from heights accidents, the mean score is 3.67; this indicates the majority of the respondents agreed that fall types accidents occur often on their construction sites. Regarding Falling and slipping accidents, the mean score is 3.51; this indicates the majority of the respondents agreed that Falling and slipping types accidents occur often on their construction sites. Regarding Gas leaks, flames, and explosions accidents, the mean score is 2.62, this indicates the majority of the respondents remain neutral that Gas leaks, flames, and explosions types of accidents occur often on their construction sites. Regarding Electric power accidents, the mean score is 2.35; this indicates the majority of the respondents disagreed that Electric power type's accidents occur often on their construction sites. Regarding Accidents involving forklifts the mean score is 2.57; this indicates the majority of the respondents remain neutral that Accidents involving forklifts types of accidents occur often on their construction sites. Regarding Accidents involving machinery the mean score is 3.08; this indicates the majority of the respondents remain neutral that Accidents involving machinery types of accidents occur often on

their construction sites. Regarding Repetitive motion accidents; the mean score is 3.75, which indicates the majority of the respondents agreed that Repetitive motion types of accidents occur often on their construction sites.

Table 12: Frequencies and Percentage of Respondents of Identification of Safety and Health Hazard That Occur Often in High Rise Buildings Related Issues

	Likert Scale											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Crane or hoist accidents	4	7	9	15.8	10	17.5	18	31.6	15	26.3	56	100
Falls from heights.	6	10.5	5	8.8	6	10.5	23	40.4	16	28.1	56	100
Falling and slipping	5	8.8	13	22.8	4	7	16	28.1	18	31.6	56	100
Gas leaks, flames, and explosions	6	10.5	25	43.9	11	19.3	12	21.1	2	3.5	56	100
Electricity (Electric power Accidents)	9	15.8	30	52.6	7	12.3	8	14	2	3.5	56	100
Accidents involving forklifts	11	19.3	22	38.6	9	15.8	8	14	6	10.5	56	100
Accidents involving machinery.	11	19.3	12	21.1	9	15.8	9	15.8	15	26.3	56	100
Repetitive motion accidents	3	5.3	7	12.3	15	26.3	7	12.3	24	42.1	56	100

Source; own survey (2023)

Now, we can use a relative important index to rank the hazard that occurs often.

$$\text{Relative important index (RII)} = \frac{5 N5 + 4 N4 + 3N3 + 2N2 + 1 N1}{A * N}$$

$$A * N$$

N5= number of respondents for strongly agree

N4= number of respondents for agree

N3= number of respondents for neutral

N2= number of respondents for disagree

N1= number of respondents for strongly disagree

A (highest weight)

N (total number of respondents)

Table 13: Relative important Index Result of Identification of Safety and Health Hazard That Occur Often in High Rise Buildings Related Issues

Hazards	Relative important index	Rank
Repetitive motion accidents	0.75	1
Falls from heights	0.73	2
Crane or hoist accidents	0.71	3
Falling and slipping	0.70	4
Accident involving machinery	0.61	5
Gas leaks, flames, and explosions	0.52	6
Electricity (Electric power Accidents)	0.47	7
Accidents involving forklifts	0.51	8

Source; own survey (2023)

From the above Relative important index table, we can analyze that Repetitive motion accidents, Falls from heights, Crane or hoist accidents and Falling and slipping are the top 4 repetitive hazards that occur in high rise building having relative importance index of 0.75, 0.73, 0.71 and 0.70.so, this identified hazards needs special attention to stop them from occurring in high rise building projects.

4.3.5 Descriptive Analysis of Safety and Health Management Practices on the Construction Site

Table 14: Mean and Standard Deviation of Safety and Health Management Practices on the Construction Site Related Issues

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
We have a site- specific health and safety strategy for our construction site	56	4.00	1.00	5.00	3.5357	1.26440	1.599

There is a Safety Officer on your building projects/sites.	56	3.00	2.00	5.00	3.3214	1.14586	1.313
To guarantee worker well-being, your company's health and safety policies are coordinated with other human resource policies.	56	4.00	1.00	5.00	2.9107	1.11644	1.246
Your company creates written circular/brochure informing employees of the risks involved with their jobs.	56	4.00	1.00	5.00	3.5179	1.38815	1.927
Before starting work in a specific location, workers get a health and safety induction	56	4.00	1.00	5.00	2.6250	1.05421	1.111
Managers promote and support staff training on health and safety.	56	4.00	1.00	5.00	2.2679	1.10357	1.218
Managers keep a close eye on their projects' health and safety performance.	56	4.00	1.00	5.00	2.5714	1.26286	1.595
Managers ensure that the budget for health and safety is sufficient.	56	4.00	1.00	5.00	2.3929	1.48543	2.206

Source; own survey (2023)

Regarding having a site-specific health and safety strategy for construction site, the mean score is 3.53; this indicates the majority of the respondents agreed that they have specific health and safety strategy in their construction sites. Regarding there is a Safety Officer in building projects/sites, the mean score is 3.32; this indicates the majority of the respondents remain neutral that they have safety officer in their construction sites. Regarding company's health and safety policies are coordinated with other human resource policies, the mean score is 2.91, and this indicates the majority of the respondents remain neutral that company's health and safety policies are coordinated with other human resource. Regarding company creates a written circular/brochure informing employees of the risks involved with their jobs, the mean score is 3.51, and this indicates the majority of the respondents agreed that, their Company creates a written circular/brochure to inform employees of the risks involved with their jobs. Regarding workers getting a health and safety induction. , the mean score is 2.6; this indicates the majority of the respondents disagreed that workers having health and safety induction. Regarding

Managers promote and support staff training on health and safety, the mean score is 2.26, this indicates the majority of the respondents disagreed that managers supporting training on health and safety. Regarding Managers keep a close eye on their projects' health and safety performance ,the mean score is 2.57, this indicates the majority of the respondents remain neutral that managers giving attention on their project health and safety performance. Regarding Managers ensure that the budget for health and safety is sufficient, the mean score is 2.39, this indicates the majority of the respondents disagreed that managers ensuring allocating enough budget for health safety in their construction site.

From the above data we can analyze the following points on safety and health management practices high rise building projects

- There is a gap in coordinating safety and health polices with other human resources polices in high rise building projects of the researchers study area. Attention is not given to the safety and health polices as other human resource polices.
- The involvement of top managers in promoting the necessary safety and health management practices to the construction workers in high rise building projects in the researchers study area is very poor.
- The controlling mechanism or system of the practice of safety and health management in high-rise buildings of the study area has gap.
- The necessary budget for safety and health management in high rise building projects in the study area is very low and it is not coordinated with other budget of the projects.
- Lastly, the general safety health management practice in high-rise building had not got the necessary attention from the concerned body.

Table 15: Frequency and Percentage of Respondents of Safety and Health Management Practices on the Construction Site Related Issues

	Likert Scale											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
We have a site-specific health and safety strategy for our construction site	1	1.8	15	26.3	12	21.1	9	15.8	19	33.3	56	100
There is a Safety Officer on your building projects/sites.	0	0	19	33.3	11	19.3	15	26.3	11	19.3	56	100

To guarantee worker well-being, your company's health and safety policies are coordinated with other human resource policies.	4	7	18	31.5	20	35.1	7	12.3	7	12.3	56	100
Your company creates a written circular/brochure informing employees of the risks involved with their jobs.	5	8.8	13	22.8	4	7	16	28.1	18	31.6	56	100
Before starting work in a specific location, workers get a health and safety induction.	8	10.5	25	43.9	11	19.3	12	21.1	2	3.5	56	100
Managers promote and support staff training on health and safety.	14	24.6	25	43.9	7	12.3	8	14	2	3.5	56	100
Managers keep a close eye on their projects' health and safety performance.	11	19.3	22	38.6	9	15.8	8	14	6	10.5	56	100
Managers ensure that the budget for health and safety is sufficient.	24	42.1	9	15.8	7	12.3	9	15.8	7	12.3	56	100

Source; own survey (2023)

Now, we can use a relative important index to rank the issues that are related to safety and health management practices to identify the most important issues related to safety and health management practices.

$$\text{Relative important index (RII)} = \frac{5 N_5 + 4 N_4 + 3N_3 + 2N_2 + 1 N_1}{A * N}$$

$$A * N$$

N5= number of respondents for strongly agree

N4= number of respondents for agree

N3= number of respondents for neutral

N2= number of respondents for disagree

N1= number of respondents for strongly disagree

A (highest weight)

N (total number of respondents)

Table 16: Relative Important Index Result of Safety and Health Management Practices on the Construction Site Related Issues

	Relative important index	Importance rank
Your company creates a written circular/brochure informing employees of the risks involved with their jobs	0.73	1
We have a site-specific health and safety strategy for our construction site	0.70	2
There is a Safety Officer on your building projects/sites	0.66	3
To guarantee worker well-being, your company's health and safety policies are coordinated with other human resource policies	0.58	4
Before starting work in a specific location, workers get a health and safety induction.	0.53	5
Managers keep a close eye on their projects' health and safety performance	0.51	6
Managers ensure that the budget for health and safety is sufficient.	0.47	7
Managers promote and support staff training on health and safety	0.45	8

Source; own survey (2023)

From Relative important index data we can analyze that, creating a written circular/brochure to inform employees of the risks involved with their jobs, having a site-specific health and safety strategy for construction site, having safety officer in building projects related issue are the top three important related issues with safety and health management practices with Relative important index (RII), 0.73, 0.70 and 0.66 respectively. So, giving special attention to these important issues is important in the implementation of good safety and health management practices.

CHAPTER FIVE

MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings, delivers the study's conclusions and suggestions based on the goals, and concludes with a suggestion for further research.

5.2 Summary of Major Findings

This study examined the health and safety practices in the high-rise building construction sector in Addis Ababa. It found that many companies lacked a proper health and safety management system, health and safety policies, health and safety personnel, health and safety awareness mechanism, welfare facilities, PPEs, and evaluation techniques. These factors increased the risk of accidents and injuries for the workers and the public. The construction of high-rise buildings is a complex process that requires careful planning and management. A high standard of safety management is essential for the successful completion of any construction project.

According to the study, construction workers on high rise building projects in the study area lack adequate safety and health training on how to handle the risks and hazards involved. The study also found that top officials in construction projects do not prioritize the implementation of safety training for construction workers on high rise buildings in the study area. Furthermore, there is no effective system to monitor and evaluate the impact of safety training on construction site performance. The safety training program does not have a regular schedule and is not aligned with other high- rise building project activities.

The study also revealed that, the construction workers and the top management of high-rise building projects in the study area are not well informed about the safety policy and regulation. The safety policy and regulation are not updated regularly to reflect the changes in the construction methods and technology of high-rise buildings. This poses a serious risk to the workers and the public, as new construction methods and technology may introduce new hazards that require specific policy and regulation to address them.

The data from the study showed that high-rise building projects in the study area lacked proper safety and health precautions. The necessary safety equipment and materials were not available

or used by the workers. The top management did not pay enough attention to the safety and health issues that were prevalent in high-rise building projects. The monitoring and enforcement of safety and health measures were very weak. As a result, most workers in high-rise building projects did not follow the required safety and health precautions on the construction site. This was especially true for low-level workers such as daily laborers who did not wear the appropriate safety gear on the site. The reports indicated that most construction-related accidents and deaths occurred among low-level workers.

The study findings also show that, the necessary budget for safety and health management in high rise building projects in the study area doesn't have specific plan and it is not coordinated with other budget of the projects. Main emphasis is given finishing the project on time and budget rather than coordinating this project goal to the safety and health of the construction workers. The controlling mechanism or system of the practice of safety and health management in high-rise buildings of the study area has gap.

The study also find that, the most common type of hazard that occurs in high-rise building projects in the study area is repetitive motion accidents, followed by falls from heights, crane or hoist accidents, and falling and slipping. These four hazards account for the majority of accidents and deaths in high-rise building projects of the study area. Therefore, construction workers and management team of high-rise building projects should pay extra attention and take preventive safety measures to avoid these hazards and their consequences.

5.3 Conclusion

According to the findings of the study, the current state of health and safety procedures in high-rise building constructions in Addis Ababa is far from satisfactory. The health and safety management systems are only formalities that are not implemented in practice. The construction workers are exposed to various hazards and risks that could endanger their lives and health. The occupational health and safety regulations and standards that exist in the country are outdated and ineffective. The government does not enforce the rules and the regulatory agencies lack the resources and capacity to monitor and inspect the construction sites. The management of health and safety on construction sites for high-rise buildings is also poor. The managers do not show enough commitment and support for health and safety issues. They do not provide adequate training, budget, or incentives for the workers to follow the health and safety procedures. They

also do not involve the workers in the decision-making process or evaluate their health and safety performance regularly. The human life is more valuable than any high-rise building. Therefore, all the stakeholders of the construction industry should pay more attention to the health and safety aspects of high-rise building projects. They should adopt the best practices and techniques that have been proven to reduce accidents and fatalities in other countries. They should also update and revise the health and safety regulations and standards to reflect the current challenges and needs of the industry. They should also strengthen the enforcement and supervision mechanisms to ensure compliance with the rules. Finally, they should foster a culture of health and safety among the managers, workers, and clients of high-rise building projects.

The safety and health management of high-rise building projects is a crucial issue that requires the attention and commitment of all stakeholders involved. High-rise construction involves high-altitude operations and deep foundation pits that pose significant risks of accidents and fatalities. Therefore, government bodies must develop a strong safety and health management law and regulation by establishing a strong control mechanism to punish people who do not respect the necessary safety and health management practices. Top management must also acquire the necessary knowledge on safety health management practices in order to create an organizational culture that fosters the necessary safety practices in high-rise building projects to avoid accidents and deaths in the projects. Some of the critical success factors for safety management of high-rise building projects are: management measures, management organization, technical and management plan, worker safety behavior, safety environment, and worker safety quality. By implementing these factors, the safety performance of high-rise building projects can be effectively enhanced.

The construction sector faces many occupational safety and health challenges that can affect not only the workers, but also other stakeholders involved in or impacted by the construction process. According to the ILO, construction health and safety illiteracy can have negative consequences for the workers' families, the clients, the contractors, the construction firms, the industry, the city and the country. Therefore, it is essential to create a culture of prevention and protection that involves everyone in the sector. This requires a legal, administrative, technical and educational framework that ensures appropriate design and implementation of safety and health measures throughout the project life cycle.

5.4 Recommendation

Suggestions for construction health and safety practices have been made in light of the findings of this study.

To the Construction Company

- For proper implementation of health and safety practices, there should be a structured Health and Safety management structure.
- A designated health and safety officer should be in charge of implementing and monitoring HS procedures because other managers may be too preoccupied with construction operations.
- Regular health and safety training is required to keep personnel aware of the importance of working in a safe and healthy manner and to remind them of the repercussions of failing to do so.
- Good health and safety facilities should be provided to employees in order to establish a positive working environment and promote employee morale, which will increase the company's production.
- Personal protective equipment (PPE) should be supplied to all workers to assist protect them from injury.

To Construction Workers

Project managers, as project leaders, must ensure that HS practices are implemented in projects under their supervision.

- Workers should be primarily accountable for their own well-being.
- At work, employees must follow the health and safety regulations and protect one another.
- Workers must report when they spot dangerous safety condition of construction site

To the government

- In the construction industry, regulatory agencies should enforce OHS policies.
- Project locations should be inspected on a regular and unexpected basis.

- To discipline construction organizations, a reward and punishment system must be implemented.

5.5 Suggestion for Future Research

- In the case of Addis Ababa or throughout the country, research may be undertaken to analyze the present system of Health and Safety performance on construction projects, taking into account all participants, builders, users, experts, government, and insurance companies.
- Engineering safety and health performance may be compared to other industries in Ethiopia, such as agriculture and manufacturing.
- Research may be undertaken in other construction sectors, such as tunnels, aviation fields, locomotives, destruction, and maintenance, to better understand the role of owners and consultants in preventing or mitigating construction project accidents.
- It is possible to conduct research to determine the level of harm (accidents and injuries) caused by the construction industry's lack of health and safety management.

References

- Adane MM, Gelaye KA, Beyera GK, Sharma HR, Yalew WW (2013). Occupational injuries among building construction workers in Gondar City, Ethiopia
- Al Haadir S. and K Panuwatwanich, (2011) Critical success factors for safety program implementation among construction companies in Saudi Arabia. *Procedia Engineering*. 14: p.148-155
- Allan St John Holt and Jim Allen, (2015) *Principles of Health and Safety at Work*
- Creswell, J. W. (2003) *Research Design. Qualitative, Quantitative and Mixed Methods Approach*, SAGE Publications
- Datta, M. (2000, November). Challenges facing the construction industry in developing countries. In *2nd International Conference on Construction in Developing Countries: Challenges Facing the Construction Industry in Developing Countries*, Gaborone, Botswana.
- Enshassi, A. *Factors Affecting Safety on Construction Projects*. IUG, Gaza Strip.
- Ethiopia Labour Inspection Audit, 2018 – ILO
- Hanna Mersha, Seid Tiku Mereta and Lamessa Dube (2016), Prevalence of occupational injuries and associated factors among construction workers in Addis Ababa, Ethiopia
- Hinze JW (1997). *Construction Safety*, New Jersey, Prentice-Hall
- Heinrich H., Petersen D. and Roos, N. (1980) *Industrial accident prevention*
- Hughes, R. G. (2008). Nurses at the “sharp end” of patient care. *Patient safety and quality: An evidence-based handbook for nurses*.
- International Labour Office (ILO) (2018). *Global estimates of fatal work related diseases and Occupational accidents*, World Bank Regions. Geneva: ILO
- Kartam N. (1998) *Fatalities and Injuries in Kuwait Construction Industry, Accident Analysis and Prevention*
- Kheni A. (2008). *Impact of Health and Safety Management on Safety Performance of Small*

and Medium-sized Construction Businesses in Ghana, Doctoral Thesis, Loughborough University, UK

Khan, S. (2008). Co-construction and model evolution in chemistry. In Model based learning and instruction in science (pp. 59-78). Springer, Dordrecht.

Murie F. (2007) Building Safety - An international Perspective. International journal of Occupational Safety, Environmental Health 13

Occupational Health and Safety Management Systems (2012) American National Standards

Institute/American Industrial Hygiene Association/American Society of Safety

Engineers, 2012

OSHA, O. S. (2004). Pocket Guide for Worker Guide Series. Washington DC: United States department of Labor.

Occupational Health and Safety Management System, (2016) Draft Standard, International Standards Organization

Singh, A., Hinze, J., & Coble, R. J. (Eds.). (1999). Implementation of Safety and health on Construction Sites. CRC Press.

Tadesse and Israel Journal of Occupational Medicine and Toxicology (2016), Occupational Injuries among Building construction workers in Addis Ababa, Ethiopia

Tam, C. M., Zeng, S.X., Deng, Z.M., (2004), Identifying elements of poor construction safety management in China. . Journal of Safety Science

Taylor G., Easter K, and Hegney R. (2004), Enhancing Occupational Safety and Health. Journal of Safety Science

YIN, R. (2003) Case Study Research, Design and Methods, Thousand Oaks: Sage

ST MARY UNIVERSITY

SCHOOL OF GRADUATE STUDIES

I am a graduate student at St Mary's University undertaking a degree of Master Project Management. I am conducting a research on the assessment of the Use of Safety Materials in Building Construction. This questionnaire is designed to collect data on the mentioned topic for academic purpose. Therefore, I kindly ask you to give me a few minutes of your time to answer the questions. The information you will provide will be treated with utmost confidentiality and will only be used for academic purposes. Thank you in advance for your cooperation.

General Instructions

- You do not need to write your name
- Use tick mark (✓) to answer the questions on the space provided

Part One: Information about the respondent, company direction. Please indicate your response by checking [✓], filling in the box, or leaving a remark, as applicable.

Part 1 Personal Information of Respondents

Gender Male Female

Age 20-30 31-40 >41

Job position Foreman Site Engineer Structural Engineer
Project Manager Daily labor worker Residential Engineer
Consultant

Education background Diploma Bachelor's Degree Master's Degree
Below Diploma Other

Work Experience 0- 5 years 6-10 years 11-15 years
16-20 years >21

Employment status Permanent Temporary/ Contract

Part Two: Information about the Research issue Please indicate your response by checking [✓], filling in the blanks under agreement level Strongly disagree (1), Disagree (2), Undecided (3), Agree (4) and Strongly agree (5).

Items	Strongly disagree (1)	Disagree (2)	Undecided (3)	Agreed (4)	Strongly agree (5)
Inspections are conducted by local authorities and health and safety enforcement organizations					
Workers are well educated on how to properly care for and maintain personal protective equipment					
There is a proper health and safety policy in place at your construction company					
The safety policy and regulation are the latest up to date					
The safety policy and regulation are implemented through all phases of the project					
There is a specific department that manages the safety policy and regulation of the construction site					
There is a strong safety policy and regulation on site					

Part 3 Safety and Health Training on the construction site related questions Choose the number and mark what you choose in the box.

Safety and health training	Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly agree (5)
There is an appropriate program for workers to learn about health and safety					
I am well trained on safety and health-related issues.					
Safety training is implemented on construction site					
Top management gives emphasis on the safety training program					
There is a control program for the implementation of a safety training program					
An advanced safety training program is implemented					
There is a schedule for safety and health training					

Part 4 Safety and Health precautions on the construction site related questions Choose the number and mark what you choose in the box.

Items	Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly agree (5)
Safety precautions are implemented on the construction site.					
I wear personal protective equipment during work on the construction site.					
All necessary safety materials exist on my construction site.					
Our construction site includes all important safety precaution signs.					

Top management gives emphasis on important safety precautions on construction sites.					
There is a controlling mechanism for the implementation of all necessary precautions on the construction site.					
All levels of workers in my construction site implement safety and health precautions.					

Part 5 Identification of safety and health hazard on the construction site related questions choose the number and mark what you choose in the box.

Description	Hazards occur often				
	Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly agree (5)
Crane or hoist accidents					
Falls from heights.					
Falling and slipping					
Gas leaks, flames, and explosions					
Electricity (Electric power Accidents)					
Accidents involving forklifts					
Accidents involving machinery.					
Repetitive motion accidents					

Part 6 Safety and Health Management practices on the construction site related questions choose the number and mark what you choose in the box

Items	Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly agree (5)
We have a site-specific health and safety strategy for our construction site					
There is a Safety Officer on your building projects/sites.					
To guarantee worker well-being, your company's health and safety policies are coordinated with other human resource policies.					
Your company creates a written circular/brochure informing employees of the risks involved with their jobs.					
Before starting work in a specific location, workers get a health and safety induction.					
Managers promote and support staff training health and safety.					
Managers keep a close eye on their projects' health and safety performance.					
Managers ensure that the budget for health and safety is sufficient.					