Assessment of Safety Management Practice in Building Construction Projects in Addis Ababa

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A Thesis Submitted to Addis Ababa University School of Commerce for the Partial Fulfillment of the Requirements for Master of Arts Degree in Project Management

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Assessment of Safety Management Practice in Building Construction Projects in Addis Ababa

A Project Work Submitted to the School of Graduate Studies of AAU in Partial Fulfillment of the Requirement for the Degree of Master of Arts in Project Management

By: Nahusenai Tsedalu

Approval Board Committee:

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External Examiner	Signature	Date

Declaration

I, the undersigned, declare that the research entitled "**Assessment of Safety Management Practice in Building Construction Projects in Addis Ababa"** is the result of my own effort and study that all sources of materials used for the study have been acknowledged. I have conducted the study independently with the guidance and comments of the research advisor.

This study has not been submitted for any degree in any university. It is conducted for the partial fulfillment of the Master of Arts Degree in Project Management.

_____ _____

Nahusenai Tsedalu Date

Letter of Certificate

This is to certify that Nahusenai Tsedalu has conducted this project work entitled "**Assessment of Safety Management Practice in Building Construction Projects in Addis Ababa:** the case of grade one contractors in Addis Ababa City" is under my supervision.

This project work is original and suitable for the submission in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management.

Approval Board Committee:

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External Examiner	Signature	Date

Acknowledgement

My first and foremost thanks go to God Almighty, the foundation of life and the fountain of all knowledge: indeed, he has been gracious to me throughout my life, and I am incredibly grateful to Him.

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Abstract

In construction work, many of the accidents and hazards are obvious. Meanwhile, the rate of serious injuries and fatalities in the construction sites has been increasing as the industry is growing tremendously. The construction site workers are also forced to go workplace despite the existence of obvious COVID-19 threat due to the nature of the work where physical distancing in almost impossible for most daily labors. Therefore, the objective of this research is to assess safety management practice in Addis Ababa City building construction projects which are constructed by grade I contractors. The study focuses in identifying the root cause of accident, frequently occurring accidents and the safety measures taken for prevention of COVID-19 pandemic in construction sites. The approach used for the research was a survey research which utilized a questionnaire as a means of obtaining primary data. In this research a total of 51 questionnaires were distributed to grade I building and general contracts and 46 responses were collected for analysis. The contractors are found in sic sub city of Addis Ababa. The collected data was analyzed quantitatively using descriptive statics method in Microsoft Excel-13 spreadsheet. Overall, the finding of the study revealed that most of the contractors have poor status in implementing safety management system and they are not well organized in considering the effect of COVID-19 pandemic in their safety management list. Based on the responses obtained from the contractors, the root causes of accident in construction site are Carelessness /Ignorance and Poor working conditions where most accidents are fallings from scaffolds, ladders, working heights during the Finishing works like plastering, painting.

Keywords: *Safety management practice, hazards and injuries, construction sites*

Acronyms and Abbreviations

BC	Building Contractor
CDC	Center for disease Control
COVID-19	A disease caused by coronavirus in 2019 (‘CO’ stands for Corona, ‘VI’ for virus ‘D’ for disease. 19 is the year)
GC	General Contractor
GDP	Gross Domestic product
ICD	International classification of diseases
ICED	Infrastructure and cites for economic development
ILO	International Labor Organization
OHS	Occupational health and safety
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
SMS	safety management system
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

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CHAPTER 1. INTRODUCTION

1.1 Background of the Study

In most countries, the construction industry is one of the most significant and largest employers. According to the International Labour Organization (ILO, 2015), the construction sector, which includes building renovation, maintenance, and destruction, employed over 273 million people globally in 2014. This consists of an estimated 8.6% of the full global employment. In 2014, ICED indicated that construction sector to represent more than 13% of world GDP and this is often expected to extend to 14.7% by 2030. Because the sector is so vital to the growth, its operations are also critical to the attainment of socio-economic development goals such as basic needs, infrastructure, and employment.

In Ethiopia, construction industry is contributing a vast amount for the development of the nation and there is a boom of construction industry in every corner of the country. There are many construction projects ranges from simple residential to high rising, from asphalt to concrete highway, from small sanitary way to high RCC dam like the great renascence dam being constructed which is financed by the government and the private sector.

Ethiopia targeted to be one among lower middle-income countries by 2025G.C (GTP2, 2016-2020). It is planned to achieve through industrial transformation. Construction industry which takes 8.5% share of GDP registered remarkable average growth rate of 28.7% in the first growth and transformation plan implementation years (GTP1, 2010-2015 national planning commission Ethiopia).

Previous research has shown that the construction industry is one of the most dangerous. It reduces productivity, quality, and time, as well as having a negative impact on the environment, all of which raise construction costs Mohammed (2003).

Safety management strategies enable companies in improving employee working conditions and positively influencing employees' attitudes, perspectives, and behaviors with regard to safety, resulting in fewer workplace incidents (Vinodkumar & Bhasi, 2010)

Due to the nature of the work, many construction activities are inherently exposed to health problems and safety risks. Among the current construction site health problem issues, the effect

of COVID-19 is the major one. Hence, ILO provided a practical method to assist employers, workers, and the self-employed in preventing and mitigating COVID-19 pandemic transmission in construction activity. According to the ILO's check list, the coronavirus pandemic has caused economic hardship, as well as disease and death in every corner of the globe. Aside from the threat to public health, the economic and social dislocation has put millions of workers' lives and well-being in jeopardy, particularly those in the construction industry. COVID-19 has been declared a public health emergency. Everyone should assess and manage the hazards of COVID-19, but employers in particular must evaluate the dangers to their employees and visitors, particularly in construction organizations where physical separation is nearly impossible.

The Guide to the Project Management Body of Knowledge recognizes safety management as an essential skill in project management (PMBOK Guide, 2017). The guide states that additional knowledge areas (other than the ten Knowledge Areas), may require safety and health management particularly in industries such as construction.

1.2 Statement of the Problem

According to ILO estimates, at least 60,000 fatal incidents occur each year on construction sites around the world. Construction sites account for 25 percent to 40 percent of work-related mortality in several countries, even though the sector employs only 6 percent to 10% of the total (ILO website). Construction is frequently categorized as a high-risk sector since it has historically been plagued by greater accident rates than other sectors. (Adane, Gelaye, et al., 2013). Assegid (2018) Ethiopia loses 3,787,430.76 ETB for medical care and 11,466 workdays due to absent injured employees due to safety and health issues.

And currently, since COVID-19 is shaking the world, many professionals are forced to work remotely from their home. But in the case of construction work it is merely impossible to do the actual site work remotely. As a result, construction site workers are also forced to go workplace despite obvious COVID-19 health threat due to the work condition of the industry where physical distancing in almost impossible for the daily labors which are working in the sites. Therefore, construction workers are being affected by the pandemic.

Even though Ethiopia has a number of laws, rules, regulations, and work standards relating to workplace safety, their practical application is minimal. From construction site working

experience and personal observation most contractors have less knowhow and practice on this basic SMS elements. The absence of this SMS makes construction sites more dangerous to the workers.

1.3 Research Questions

In this research paper the research questions have been addressed as general and specific. The general question

1.3.1 General research question

- The general research question is What is the status/level of safety management practice in Addis Ababa City building construction projects?

1.3.2 Specific research question

- What are frequently occurring construction site accidents?
- What are the main root causes of accidents?
- Which stage of the project life life cycle is involved with most accidents?
- What type of prevention methods are implementing in construction site to protect workers from COVID-19?
- At what level does OSHAcademy's eight elements of an effective safety Management System are implemented in construction site?

1.4 Objective

1.4.1 General Objective

The general objective of the study is to assess the *safety management practice of building construction projects in Addis Ababa* by specifically investigate the methods implemented for safety management. Major issues that are addressed in designing, planning, and managing of building regarding to safety.

1.4.2 Specific Objective

The specific objectives of this research are:

- To assess the type of accident which is frequently occurring in construction site
- To assess the root causes of accidents in construction site

- To determining the stage of building project life life cycle where most accident occurs.
- To assess types of prevention methods which are implemented in construction place to protect workers from COVID-19
- To assess the implementation of OSHAcademy's eight elements of an effective safety Management System

1.5 Significance of proposed research

This research has a significant impact on the private and public sectors in terms of ensuring the safety of the most vulnerable workers on construction sites and acquiring an understanding of the types of accidents that can occur and their root causes. In addition, the research will provide an insight for Ethiopia government and nongovernment bodies in showing COVID-19 prevention methods in construction sites.

Finally, the research can be used as a reference to show how Ethiopian construction industry implement safety management strategies in constructing buildings and to recommend some measures that should be taken to correct the gap and draw back of the safety management system. This research, if implemented successfully will improve the work environment of construction site workers and increase their productivity.

1.6 Scope of the study

Geographical scope: This research focused on assessing safety management practices in building construction projects located in Addis Ababa, Ethiopia. The selection of Addis Ababa is based on the availability of suitable data and convenience to the researcher.

Conceptual scope: The study focuses on the evaluation and implementation of safety management. Even though workplace safety management is a broad topic, this study focuses solely on construction site safety management with respect to the standard requirements.

Methodological scope: The target population of the study contains only Grade 1 Building and General contractors. questionnaire is used to gather primary data and the respondents are employees which are professional site engineers & foreman that are working in Grade 1 Building and General contractor company.

Temporal scope: It examines the difficulties that project managers face during COVID 19 pandemic in implementing safety management practices on construction sites.

1.7 Limitations of the study

The limitation of the research is that the data is collected only from construction companies who have grade I building and general contractors license and the result may not represent as a general representation in the construction industry. The reason is, compare to other construction grades (grade II - X) they are believed to have more safer work environment. The other is due to COVID 19 pandemic some of the construction safety measures may decrease or increase which affect the result of the research output from normal condition.

During data collection even if there were around 93 grade 1 contractors working in Addis Ababa most of them were not active and the rest who were active were close due to material shortage and price escalation (i.e., the cost of cement was doubled) therefore to resolve this limitation the researcher try to take samples from different site of same construction companies.

1.8 Organization of the Study

This research will have five major stages which are categorized in five chapters. These are: The research proposal or the introduction part in the first chapter which majorly contains the research question, objective of the study, significance, scope, and limitation of the research. The second chapter presents review of related literatures which help the researcher to know more about the subject issue and to assess another peer reviewed research. Research methodology in the third chapter contains the design, sampling, and data collection methods. The fourth chapter presents data analysis and discussion and finally final research writing (conclusion and recommendation) in the fifth chapter.

The references used for the research are listed at the end of the paper followed by the appendix part which contains interview guide and questionnaire filled by the respondent with the overall questionnaire response.

CHAPTER 2. REVIEW OF RELATED LITERATURE

2.1 Introduction

In this section the researcher will present review of related literature which focuses on safety management system. To begin with, the researcher revises the basic definition of safety regarding to construction and explore the importance of the subject and its implications on the construction sector. The researchers examine the current conditions and practices being implemented with regards to construction safety. Furthermore, information related to construction safety and accidents in the construction industry are presented. Other literature which pertains to the topic and shows empirical results are also revied and considered as a source of evidence and for checking reliability of the findings of this research.

2.2 Theoretical Review

2.2.1 Safety, Safety management and Accident

Safety is concerned with external threats, and the perception of being sheltered from threats. According to the business Dictionary, safety is defined as a relative freedom from danger, risk, or threat of harm, injury, or loss of personnel and/or property, whether caused deliberately or by accident. According to Lingard (2005) safety is defined as absence of danger & a state of protection and condition not involving risk

Safety in construction site means freedom from danger, harm, and injury to the person who is involved in construction activities & taking precautions measures to protect the lives of the workers against fatal injuries and death. Pouliakas and Theodossiou (2010) stressed the increased rivalry connected with the globalization age and modernization, the dominance of service-oriented industries, and the rising job insecurity connected with labor market flexibility all emphasize the necessity of safety.

Safety Management is the management functions connected with the carrying on of an industrial undertaking that relate to the safety of personnel in the duty, including planning, organizing, and implementing safety policy; and the measuring, auditing/ reviewing of the performance of those functions.

Todd (2004) summarizes that characteristic of successful safety management are similar to characteristics of successful quality management. Top management commitment, workers involvement, training and education, and communication were perceived as the most effective characteristics of safety and quality management.

Safety management system is a system which provides safety management in an industrial or construction undertaking. To have better quality of safety management system there should be some tools to measure safety within organization and understand the impact according to safety performance and since measuring qualitative component is complex, so comparison between tools and methods of measurement should be implemented to get efficient safety management system (Elyas, 2017).

The safety management system (SMS) was introduced in the construction sector to mitigate the workplaces hazards, minimize property damage, and reduce the risk of injuries. Law accident rates and accident costs, increased safety audit ratings, and improved organization framework were identified as basic benefits of implementing the SMS (Nicole, et al., 2018).

Rejda (1992) defined an **accident** as a “sudden, unforeseen and unintentional" event, which can result in physical harm to someone and/or damage to a property. The use of the term “accident” in this research is relies on an event which cause physical harm or damage to the body resulting from an exchange, usually acute, of mechanical, chemical, physical, or other environmental energy that exceeds the persons tolerance.

2.2.2 General Principles of Safety

To manage and implement all the key aspects that make up national OHS systems so that both employees and the environment are protected, a wide range of arrangements such as skills, knowledge, and analytical capabilities are required. Measures and procedures for preventing, controlling, reducing, or eliminating occupational hazards and risks are constantly being developed and implemented continuously over the years to stay pace with technological and economic changes (Alli, 2008).

Occupational safety is a vast multidisciplinary topic that usually touches on topics related to medical and other scientific subjects such as engineering, law, technology, economics, and

industry-specific concerns. Despite the diversity of events certain basic principles are identified including the following (ILO, 2001):

Table 1: General Principles of Safety from ILO

	General Principles of Safety
1)	All employees are entitled to certain rights. Workers, companies, and governments all have a responsibility to ensure that these rights are safeguarded and that fair working conditions are promoted.
2)	Policies for occupational health and safety must be adopted.These policies must be implemented at both the government and business levels. They must be clearly communicated to all or any relevant parties.
3)	Consultation with social partners, such as employers, workers, and other stakeholders, is required. This could be done throughout policy formulation, implementation, and review.
4)	Occupational health and safety initiatives must focus on prevention and protection. Primary prevention efforts in the workplace must be prioritized. Safe and healthy workplaces and environments should be planned and designed.
5)	For the formulation and implementation of effective programs and policies, information is extremely vital. It is critical to gather and disseminate correct information on hazardous substances, conduct workplace surveillance, and monitor compliance with regulations and good practices.
6)	The most important aspect of occupational health and safety practice is health promotion. Efforts must be taken to improve the physical, mental, and social well-being of employees.
7)	Employees who suffer from workplace accidents, injuries, or diseases must be provided with compensation, rehabilitation, and curative treatment.

	Occupational dangers should be avoided as much as possible.
8)	Education and training are essential components of a safe and productive workplace. Employees and employers must recognize the value of developing safe working processes and how to do.
9)	Certain responsibilities and obligations apply to employees, employers, and competent authorities. Workers must follow defined processes, companies must offer a safe working environment, and authorities must advise, communicate, and audit health and safety policies.
10)	To ensure compliance with occupational health and safety policies, policies must be enforced and a system of inspection must be in place.

Source: Own Summary from ILO

2.2.2.1 General Safety Rules for Construction

Table 2: general safety rules recommended by different safety manuals

NO	**Safety rules**
1)	Always store material in a secure location. If applicable, secure or support piles to prevent them from toppling, rolling, or moving.
2.	Allowing shavings, dust fragments, oil, or grease is not a good practice. housekeeping shall be a part of the work. Waste & trash piles should be removed as quick as possible.
3)	Remove or bend over any nails that have been used or removed from a Structure, as well as any loose materials from stairwells, walkways, ramps, platforms, and other areas.
4)	Avoid shortcuts by using ramps, stairs, walkways, ladders, etc. Do not close ways to aisles, traffic lanes, fire exits, gangways, or steps. All floor holes must have standard guardrails installed, and excavations must be

	walled.
5)	Do not remove or destroy any warning banner, danger sign, or interfere with any form of protective device or practice provided for your use or other workers.
6)	To avoid injury to yourself or material damage, get assistance with weighty or bulky materials.
7)	Keep all tools away from platforms, scaffolding, shaft openings, and other sharp edges. And only use tools for the function they were designed for.
8)	Use hand and power tools correctly and avoid using tools with split, broken, or loose handles. Make sure using the right tool for the job.
9)	Know where to find fire extinguishing equipment in case of an emergency and how to activate a fire alarm. Flammable liquids must be utilized in modest quantities on the job site and in the presence of qualified safety officers.
10)	Before using any power tool, proper protection or shields must be provided. All extension cords and power tools must be properly insulated and grounded. Cords that have been damaged must be removed and replaced. Do not use or approach any power tool or equipment unless you have been taught to do so.

Source: Own Summary from ILO and OSH safety manuals

2.2.3 Safety management practice in Ethiopia construction

Construction in developing countries, such as Ethiopia, requires more labor than construction in developed countries. Many of the employees are low wage & unskilled. In Ethiopia, there is little discernible difference between large and small contractors in safety, and practically most of them lack a proper safety program. (Adane et al., 2013)

Most contractors, on the other hand, are preoccupied with increasing their profit margins.

On both large and small construction sites, unsafe conditions exist, and personnel are exposed to a variety of construction dangers. There are no training programs for staff and workers on many

sites, therefore there is no orientation for new employees or workers, no dangers are identified, and no safety briefings are held. Employees are expected to learn from their own experiences and failures. There are also a shortage of medical services, adequate restrooms, and poor cleanliness. While at work, workers face a risk, and the following issues are common:

1. When excavating in deep trenches, there is no suitable shoring or bracing.

2. Concreting is primarily done by laborers, and cement burns are widespread due to a lack of personal protective equipment (PPE) (protective gloves and boots are common).

3. Workers fall from great heights due to faulty scaffolding and a lack of safety belts.

4. Due to a lack of personal protective equipment, workers experience injuries to their heads, fingers, eyes, feet, and faces.

Construction workers in Ethiopia are subjected to poor working conditions. This is primarily due to poor working relationships and a lack of safety precautions. Because most safety controls are absent on construction sites, workers are subject to a variety of work-related accidents. Due to triangular employment agreements between the building contractors and subcontractors, which blur lines of accountability, the majority of the injured workers did not get compensation. (Limenih, 2010).

2.2.4 Accidents in the Construction Industry

Any avoidable action by workers or failure of apparatus, tools, or other devices that interrupts production and has the potential to injure people or damage property is referred to as an accident. Construction projects are a major source of workplace accidents in many nations. The construction industry has a reputation for being a high-risk environment for accidents. (Oglesby et al. 1989).

Because of the open space, exposure to weather, involving many unskilled labors, tight schedule of short targeted public project duration, workers turn over due to market discrepancy, and working at height, in confined space, and psychologically and physically vulnerable working environment, the nature of construction projects themselves has potential hazards and accidents. (Imriyas et al., 2007).

Falling from scaffolds and ladders, falls from working height, and other falling of construction accidents are among the most common. Falling into a manhole and excavation as a result of being struck by falling objects, falling from machines, stumbling or crashing against things Excavation collapse (crush injuries), receiving injuries from hand tools, electric contact Fires and Explosions, Exposure to dangerous substances (chemical and biological), Moving heavy loads, Bad working positions, often in confined spaces, struck or crushed by a workplace vehicle and Structural Failure on Construction Site (Fasil, 2017).

Construction Site Falls: Scaffolding falls, roof related falls, falls arising from gaps in flooring, crane falls, shaft falls, and falling objects are all common construction site falls.

Crane Accidents: Deaths from crane accidents can be caused by a variety of circumstances, including lightning, high winds, malfunctioning cranes, electrocution, and other hazards involved with building at heights.

Scaffolding Accidents: Scaffolding is a temporary framework used to support people and materials during the construction or maintenance of big structures such as buildings. 65 percent of the construction sector is believed to work on scaffolds on a regular basis. Scaffolding is a requirement in the construction sector. Scaffolds were used to construct some of the most spectacular constructions ever constructed by humans. Many construction workers who were hurt in scaffolding accidents blamed the incident on planking or support faults that allowed them to slip or be struck by a falling object.

Run Over by Operating Equipment: Construction sites are extremely active work environments, with a constant flow of cars and personnel. Construction workers are run over or hurt by working machinery in the past. Accidents like these can happen at any site, but the hazards are amplified while operating with heavy equipment on highways or near busy roads.

Electrical Accidents on Construction Sites: According to the Occupational Safety and Health Administration (OSHA), over 350 construction workers are killed in electrical accidents each year. Electric shock, power line contact, and steam accidents are some of the causes of these fatalities. The dangers of these hazards are amplified for people who work on scaffolding or in cranes near power lines.

Trench or Excavation Collapses: Building trenches is a crucial operation during underground construction. A trench is a long & narrow with a depth that is greater than its width. When trenches are built, measures must be in place to protect employees from falling into the trench if it collapses.

Fires and Explosions in Construction Site: According to the Occupational Safety and Health Administration, workplace fires and explosions kill over 200 people each year and injure over 5,000 more.

Structural Failure on Construction Site: A structural failure occurs when a building or other structure fails in such a way that it can no longer handle the same amount of weight as it did before it failed. Structure failures can be devastating, resulting in serious damage and even death. These kinds of accidents happen when the public's safety is jeopardized for financial gain, or when bad design leads to building failure. The designer and the contractor should be held accountable for their job.

According to the studied literature, the building and construction business has a higher rate of work accidents than other industries. Falls from height, from roofs, scaffolding, or ladders are the most prevalent accidents in the building and construction sector.

Many fall injuries and accidents involve heavy lifting and tools. Safety is a crucial aspect of construction work, and it is a major contractual obligation for those in charge of and doing it. Effective contractor safety programs support this goal by supporting contractors in methodically identifying and evaluating potential dangers so that controls may be established in advance and accidents can be avoided. Interactions established through these programs also bring plenty of other advantages, including higher safety awareness, better communication, better recordkeeping, and cost savings.

The construction and housing business has a high incidence of attrition and numerous major workplace accidents. To prevent job-related accidents and other health concerns among employees, it is critical that both employers and employees work together to ensure the safety of their workplace. The employer is responsible for the overall working environment, but employees also have a role to play, such as following employer instructions and using the employer's non-public protective equipment.

2.2.5 Safety measures and action checklist for COVID-19 in the construction industry

Both the ILO and the CDC have developed a practical measure checklist to assist employers, workers, and self-employed individuals in the construction industry in working safely on site and therefore preventing and mitigating the spread of COVID-19 at work.

COVID-19 is a public health emergency, and everyone should assess and manage the pandemic's life, economic, and social hazards. Those in the construction industry, in particular, should think about the hazards to their employees and visitors. Despite having a legal obligation to safeguard workers and others from harm to their health and safety, businesses frequently fail to conduct a risk assessment that takes COVID-19 into account or processing a risk assessment but failing to put in place sufficient measures to manage the risk of COVID-19 which constitute a breach of health and safety issues.

Employers must also take proactive measures to decrease workplace risk to the lowest degree reasonably possible. Employers must also collaborate with any other employers or contractors who share the workplace to preserve everyone's health and safety while also limiting the rate of transmission. This involves preserving their health and safety in the framework of COVID-19.

The checklist below can assist construction workers safeguard themselves, their coworkers, and their communities while also slowing the spread of COVID-19. The checklist is summered in the table below

Table 3: Construction checklist for COVID-19

No	Checklists	Description
1	Monitoring and Screening process before entering the site	❖ Cough, shortness of breath, fever, chills, muscle discomfort, sore throat, or new loss of taste or smell are all signs of (COVID-19). ❖ If you have any of the symptoms listed above, don't go to work. ❖ If you have COVID-19 or suspect you have COVID-19, isolate (distance yourself from others).

2	Regularly clean, disinfect and sanitize hand tool	❖ Hand hygiene, respiratory hygiene, and disinfection should all be practiced. ❖ Frequently handled materials, items, and surfaces, such as shared tools, machinery, cars, and other equipment, handrails, ladders, doorknobs, and portable toilets, should be cleaned and disinfected. ❖ Workers should be provided with soap, water, and paper towels, and they should wash their hands often with soap, water, and paper towels provided by the company (at least 20 seconds). Visitors must also wash their hands, and regular and proper handwashing is encouraged.
3	Avoid sharing tools, objects, and equipment with other employees	❖ When at all practicable, avoid sharing construction hand tools and equipment with other workers.
4	Providing education, training, and communication for workers on COVID-19 policies and procedures	❖ Employees should be educated and trained on the hazards of worker exposure to the virus and the symptoms of COVID-19, as well as when and how they might be exposed in the workplace and how to avoid the spread of COVID-19 at work. ❖ During COVID-19, communicate about how to manage workplace fatigue. Remind employees about workplace flexibility, such as remote work and sick leave.
5	Promoting Social distancing and face mask	❖ Maintain a minimum of six feet (about two arms' length) between employees whenever possible. ❖ Face masks should be used at work, especially when maintaining social distance is difficult. ❖ Avoid enclosed spaces such as trailers and cramped spaces; do not contact your eyes, nose, or mouth when removing your mask; and wash your hands

		immediately after removing your mask unless they have recently been washed.
6	Mental health and wellbeing consideration	❖ Observe and guide changes in employee behavior. Take time away from work to exercise or speak with a helpful crew member. ❖ Spend time outside, either physically active or relaxing; understand the risk; and share accurate information with others you care about.

Source: Own Summary from ILO and CDC Construction workers COVID-19checklist

On the other side, OSHA is working on a guideline to safeguard American construction workers against COVID-19 at work. Physical separation is required, as is providing employees with face masks (coverings), forbidding workers from sharing tools and equipment, and ensuring that tools are cleaned and disinfected on a regular basis.

2.2.6 List of OSHAcademy's safety Management System

According to the Occupational Safety and Health Act, every employer has a legal obligation to provide a workplace free of known dangers that could result in serious injury or death. OSHAcademy specifies eight components of a good safety management system that make a workplace less prone to accidents and hazards. Organizational and safety Academy has defined eight elements of an effective safety Management System which makes construction place to be safer and help workers to recognize safety measures (OSHAcademy Course 700 study Guide Introduction to Safety Management, 2020). The elements are as follows:

2.2.6.1 Commitment and leadership

Managerial commitment to safety: Management recognizes the good impact and benefits of their efforts. Understanding the advantages will instill a strong desire to improve the safety culture of the firm. The firm vision and mission statement, objectives, policies, and programs reveal the top managers' commitment and capacity to guide. The way things happen in the workplace is largely influenced by the leadership style, which is why managers' commitment is required. Committed managers are more likely to take proactive rather than reactive safety measures.

Construction accidents and hazards can be reduced when senior management and committed leaders pay close attention and are devoted to safety and improvement, as well as following strong safety and health policies. (Shibani, et al., 2012). Tam and Fung (1998) study on effectiveness of management strategies on safety performance concluded that safety management measures such as post-accident investigation, safety rewards, safety training, and the employment of more directly engaged labor were found to be successful in reducing accidents.

2.2.6.2 Accountability

After management commitment and leadership, worker accountability is the second safety management method. Accountability is described as legally obligated or subjected to account for or explain one's own actions. Accountability depicts how individuals conduct themselves in the workplace. Even if senior managers impose all types of safety measures, the appropriateness of their implementation is determined by the workplace's accountability culture.

OSHO guidelines sets six elements of accountability namely, Formal standards of employers' performance, Adequate Resources and Psychosocial support, A system of Performance \measurement, Application of effective Consequences such as positive and negative reinforcement, Appropriate \Application of consequences and finally Continuous evaluation of the Accountability system.

2.2.6.3 Safety Involvement

Employee involvement in workplace safety will be discussed under the safety involvement part. Employee involvement refers to the involvement of employees at all levels. Companies should design and develop safety appreciation programs to encourage employees to achieve their best in terms of safety.

2.2.6.4 Effective Communications

The goal of boosting worker involvement in safety requires effective communication.Leadership at all levels will benefit from skilled safety communication. A sender, message, channel or medium, and receiver make up a basic mode of communication.

2.2.6.5 Hazard identification & control

Hazards in construction refer to the possibility for adverse events that are linked to a condition that, if left untreated, can result in injury or sickness. Chemical, physical, biological, and social hazards are the four types of hazards found on construction sites. (Weeks and James L, 2011).

- **Chemical hazards** which are frequently airborne and can manifest as dusts, fumes, vapors, or gases; inhalation is the most common method of exposure.
- **Physical hazards** Every building project contains physical risks. Noise, heat and cold, radiation, vibration, and barometric pressure are all potential hazards. Construction work is frequently performed in extreme heat or cold, as well as in windy, rainy, snowy, foggy, or nighttime conditions. Ionizing and nonionizing radiation, as well as extremes in barometric pressure, are experienced.
- **Biological hazards** Exposure to pathogenic microorganisms, harmful compounds of biological origin, or animal attacks are all examples of biological hazards. A common soil fungus, for example, can cause histoplasmosis infection of the lungs in some excavation workers.
- **Social hazards** the social organization of the industry causes social hazards. Construction labor has characteristics that are linked to higher stress in other industries, such as a high workload, limited control, and a lack of social support. In some way, all construction workers are exposed to these dangers. (Weeks and James L, 2011).

Generally, hazard identification and control mechanism contain Identification, analyzation and controlling of hazard.

2.2.6.6 Accident investigation

Accident investigation is a task that is carried out when an accident occurs on the construction site. OSHA (Occupational Safety and Health Administration, 2002) establishes a fundamental guideline for accident investigation.

- The goal of an investigation is to determine the reason of an incident or accident so that it can be avoided in the future, not to assign blame. To acquire objective results, an unbiased methodology is required.
- Visit the situation as quickly as possible, while the facts are still fresh in the minds of witnesses. If possible, do an on-the-spot interview with the wounded worker. Make sure you do not do the same thing that caused the injury.
- All interviews should be held in a private setting if possible. One by one, interview witnesses. Speak with anyone who has information about the occurrence, even if they were not present at the time. In circumstances when the facts are uncertain or there is a level of debate, consider taking the signed statements.
- Graph the incident's specifics, including the location, tools, and equipment. As needed, use sketches, diagrams, and photos, and take measurements as needed.
- Concentrate on the causes and dangers. Create a report that explains what happened, how it happened, and how it may have been avoided. Not simply the injury, but the occurrence itself should be investigated.
- What steps will you take to avoid similar events in the future? An action plan should be included in every investigation.
- Save any evidence if the incident was caused by a third party or a defective product. It could be crucial to recouping the costs of the claim.

2.2.6.7 Education and Training

The learning process can be thought in three basic components: **Safety instruction** on which the education process begins by transferring **knowledge** to workers, Then **Training** are integrated on then knowledge since knowledge is transferred employees starts to practice it. The last on is our practice become **experience** and over time and will be improve our ability over time.

2.2.6.8 Continuous improvement

Continuous improvement (CI) happens where workers and management work together to collect and evaluate data in order to determine systemic causes of observed at-risk behaviors and conditions, and then execute corrective actions to address the causes (Michael , Joyce& Michael Coplen, 2013). The results of the hazard identification and investigation should then be used to

create a standard operating procedure for employees. To establish a safer work method, the improvement includes actions such as planning, doing, studying, and acting.

2.3 Empirical Review

The findings of Vinodkumar and Bhasi's (2010) study can help researchers and practitioners figure out how to improve workplace safety by identifying mechanisms. According to their findings, safety training is the most important safety management strategy that predicts the outcomes of safety knowledge, compliance, motivation, and involvement.

Construction work, according to Helander (1991), is significantly more dangerous than most other vocations. Most accidents involve people falling from roofs, scaffolds, or ladders. Several people have died because of building collapsing and falling materials. Many of these mishaps can be avoided by establishing procedures and rules to improve safety. Construction workers frequently ignore the dangers they face on the site. This has an impact on employee incentive to follow safe work practices. Helander (1991) further states that the cost of construction accidents amounts to about 6% of the total construction costs. As a result, strong monetary incentives should be used in the building industry. As a result, monitoring safety and health is beneficial not just for the sake of safety but also for financial reasons. Ignoring safety can lead to accidents and illnesses, which not only lower revenues but can ultimately bring the organization to its knees.

Similarly, Rozario (1996) states that a consistent high standard of performance in the construction business is necessary to boost efficiency and prevent accidents, which benefits not only individual contractors but the entire nation.

Most available studies were undertaken in wealthy countries; nonetheless, their conclusions will apply to most cases in poor countries as well. Helander (1991) investigated the causes of 739 fatal construction incidents in the United Kingdom. He discovered that falls from rooftops, scaffolds, and ladders were responsible for 52 percent of them. Falling objects and materials were responsible for 19.4% of the deaths, while transportation equipment (such as excavators and dumpers) was responsible for 18.5 percent. Hollander (1991) also found that excavation labor accounts for 5% of all construction accidents.

Management commitment, employee involvement, communication, audits/observations, goal-setting, and a good safety culture were all demonstrated to reduce injuries in construction safety

study (Hinze and Wilson, 2000) The expenditures involved with employee training and enforcement were the most significant barriers to safety (Todd, 2004)

Falling material and objects, electrical risks, transportation, and mobile plants, and other were the categories utilized to classify fatal accidents. Most fall-related accidents happen while working on roofs, scaffolds, or ladders. A substantial percentage of fatalities are caused by structural collapses and falling materials. Many of the safety hazards are unique to trades, and construction employees frequently underestimate the risks in their own work, which reduces motivation to follow safe work rules. Establishing and enforcing safety standards and regulations can help to avert a huge number of these mishaps (Helander, 1991).

Helander (1991) finally suggested that top managers can contribute to reducing the number of accidents if they:

- Take note of all their field managers' safety records and give them the same emphasis as productivity and total cost.
- Ensure the effective use of safety departments by communicating safety issues, as well as cost and timing challenges, to employees.
- Develop procedures for distributing safety expenses and ensuring safety through better planning and the use of safe equipment and materials.
- Make safety awards and provide new hires with safety training.

The research conducted in UK by Manu, Ankrah, et. al. (2010) on the causal factors in construction accidents by collecting data from 100 construction companies found that:

- Problems arising from worker actions or behavior, as well as worker capabilities, were shown to be responsible for more than two-thirds (70%) of the accidents. This indicates a lack of education, training, and supervision.
- Equipment shortcomings flaws, including personal protective equipment (PPE), were found in more than half of the cases (56 %).

A local research in Addis Ababa City construction projects by (Fasil, 2017) found that The majority of health and safety (HS) practice indicates an average value of greater than 60% for Chinese international contractors and less than 50% for local grade one contractors, implying that projects constructed by international Chinese contractors have better HS management

practices than projects constructed by local grade one contractors. similarly (Betelehem, 2019) founds that Accidents that respondents identified as frequently occurring in Addis Ababa Road construction projects include falling into an excavated pit, falling into hot asphalt (leg or hand burn), falling from scaffolding, nail piercing, car/truck overturning, being hit by equipment/machinery, rock/soil slide, and machinery accidents in loading and unloading.

To assist the researcher in answering the research question, the above examined literatures describe the knowledge field of safety management. The following are the conclusions of the researcher's review of several safety management literatures: construction building safety legislation, construction hazards and injuries, empirical findings on frequent accidents, and accident root causes. Accordingly, it has been observed that most of the articles focus on different construction accidents.

2.4. Research Gaps

In general, past research has not investigated the safety management practices used during the COVID-19 pandemic season. The other identified gap is that most research on Addis Ababa construction site safety management lacks an assessment in determining at which stage of the construction project most accidents occur, and most research on Addis Ababa construction site safety management does not consider the implementation of OSHAcademy safety management.

Most workplace safety research, which has been undertaken across disciplines in medical, public health, engineering, psychology, and business, has not taken a multilevel theoretical viewpoint that integrates theoretical challenges and findings from many disciplines. Integration of multidiscipline (health matter and engineering controls) is the key gap that exists unconsidered in research areas Kassu &Daniel (2013).

2.5 Conceptual Framework

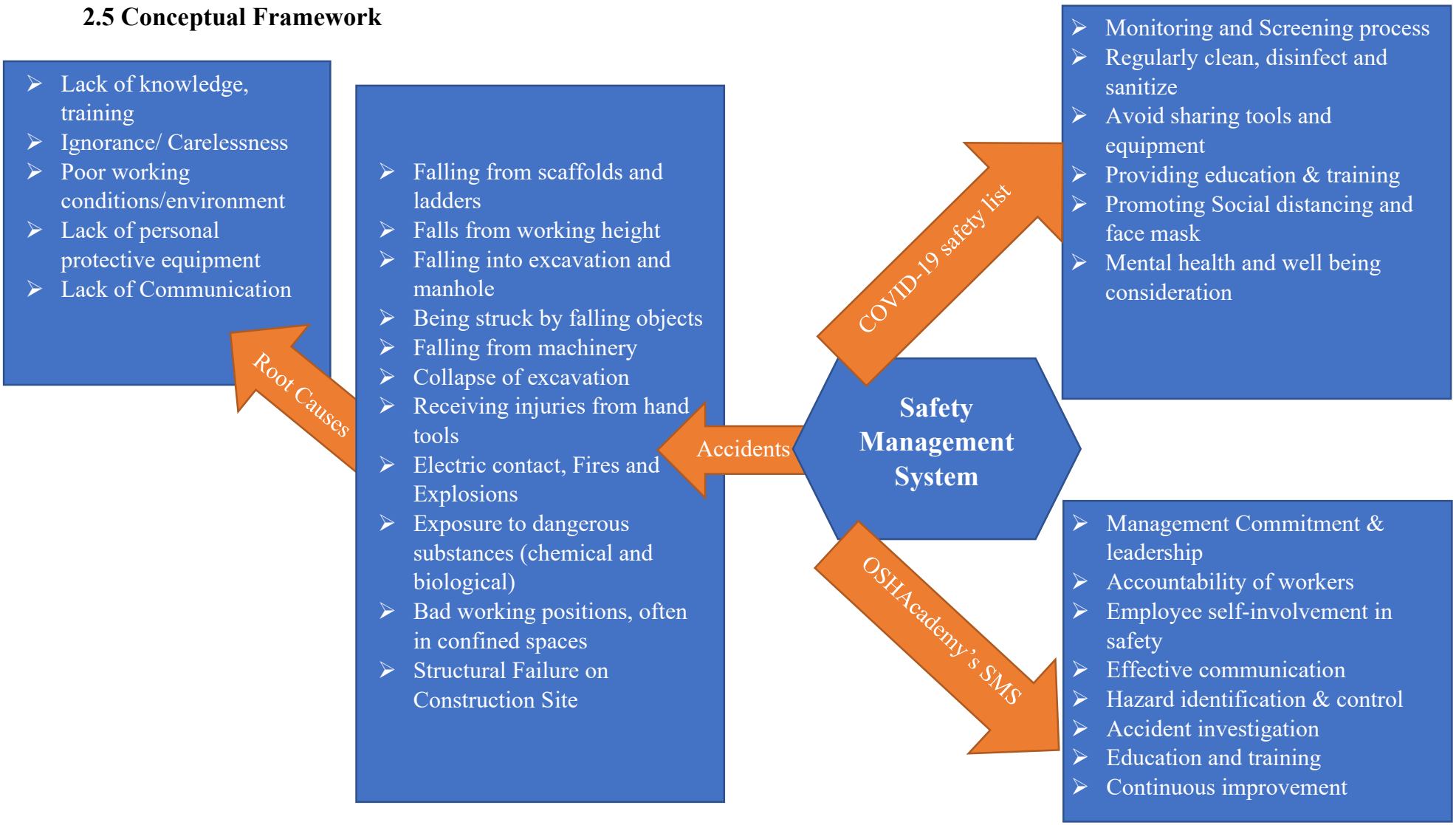


Figure 1 Conceptual framework

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design, population and sampling approach, methods, and Procedure of Data Collection, while stress on the target population and issues related to sampling technique, sample size determination, and analysis of the collected data.

3.2 Research Design

In this research a descriptive design was used to present the finding of the collected data. The reason descriptive study being used was because little knowledge exists about safety related problem characteristics and nature. Besides, observation of the safety management system and description of the practical existing gap could be favorable by this design.

Descriptive statistics are used to describe the collected data from the research sample. The data from the research sample is described using descriptive statistics. Before examining a study's key hypotheses, descriptive analyses are commonly used to summarize a study sample. This provides information regarding the sample's representativeness, as well as the information required for other researchers to duplicate the study. (Geoffrey Marczyk, David DeMatteo, and David Festinger, 2005) In addition, for questionnaire survey, on site visit and Informal interview used as a source of primary data which help the researcher to know beyond the reviewed literature and to fill the gap of the questionnaire.

3.2.1 Research Approach

The research follows a quantitative approach by analyzing the data that are collected from the respondents as a form of questionnaire. The information found from site visit and the informal interview with some respondent was used as a guideline for the recommendation.

3.3 Population and Sampling

3.3.1 Target Population

According to Ethiopia Ministry of House and urban development “Ministry of construction: Construction professionals’ company and construction machinery industry development and

regulatory bureau assessment and competency certification bureau list of registered contractors for 2012/2013 budget year" There are 106 grade I registered general and building contractors. But from this construction firms only 91 Contractors are registered in Addis Ababa City Administration. Therefore, the researcher incorporated mainly grade one construction companies.

3.3.2 Sample Design

This study used the random selection of respondents from different sub city of Addis Ababa which are convenient for the researcher sampling method.

3.3.3 Sampling size

One way of determining sample size of population is to rely on published tables. During the sampling process there are some given set of criteria that would be essential for given combination of precision, confidence level and variability. Therefor for the sampling of the population Glenn (1992), provided 2 tables where Table 1, presents samples for population of 500 - >100,000 and Table 2, presents sample size of a population 100- 450. Since the total population is 91 which is nearer to 100 the sample size would be 51.

Table 4: sample size determination for

Table 2. Sample Size for ±5% and ±10% Precision Levels where Confidence Level is 95% and p=0.5.

Size of Population	Sample Size (n) for Precision (e) of:	
	±5%	±10%
100	81	51
125	96	56
150	110	61
200	134	67
250	154	72
300	172	76
350	187	78
400	201	81
450	212	82

Source: Glenn, 1992

There for Since this research project is given a short period of time to collect more data for high precision and since most of the contractors are not working due to cement and other construction

material price escalation the researcher will use a sample size of 51 with confidence level of 95% and p=0.5. From personal observation most of construction sites are nearly the same in implementing safety measures so this sample can represent the population. The samples were chosen randomly from different construction grade and location.

3.3.4 Study Area

The study area was different construction sites in Addis Ababa. The samples were chosen randomly from different grade I contractors and different location. Due to the minimum no of grade I contractors the researcher selects random areas where there are concentrated amount of grade I contractors found i.e. Mexico, Gerji, Ayat, CMC, Bole, Piyasa, Lideta and Yeka.

3.4 Research Instrument and Data Collection

3.4.1 Procedure of Data Collection

One of the ways the researcher plan to obtain some information for the research is by visiting sites and giving forms which will be completed and returned by respondents (**Questionnaires).** The other is making direct observation and investigation in different construction firms and observing the method of safety management practice in building construction sites. The researcher also planned on conducting on site interviews to get some information on the current safety management practice which would help the researcher gauge the safety management.

3.4.2 Questionnaire Design

The questionnaire was designed based on the reviewed literature to answer the research question effectively and to meet the objective of the research. The questionnaire had two sections where the first section focuses on the respondent and the company profile, and the second section directly focus on the objective of the research. Some of the research question has been adopted from previous research by (Fasil, 2017)

3.5 Method of Data Analysis

After conducting on site observation and collecting the questionnaire from different construction firms, the researcher had decode the collected data to Excel and analyze the data based on

different data analyzing methods which include statistical and verbal description. Since the questionary contained majorly Likert scale questions, the data will be analyzed in frequency and mean of each factor. To analyze the collected data, the researcher used MS Excel-2013 and IBM SPSS STATISTICS 20.

3.6 Scale Reliability and Validity

To test the reliability and ensure the validity of the research. Proper due attention was given in sampling and data collection, careful consideration was given to the arrangement of the study questionnaire and research design. A detailed literature analysis was conducted both from international journals and from safety guides created by international institutes in order to assess the safety management practices used. The outcomes of the research were compared to earlier results once the data was analyzed, and they were determined to be in line. In addition, the researcher mentioned the need for preparing criteria for the questionnaire design. Most of the research questions in the research questionnaire uses Likert scale.

3.7 Ethical Considerations

The researcher reduces bias in this study by employing a standard data collection tool and scale based on previous research and literature. Before handing over the questionnaire to the participant (respondent), the research participants were asked to fill it out completely. Confidentiality of the research participant were respected by giving code for all questionnaire and all the source for this research were greatly acknowledged and the researcher rephrase other prior literatures to avoid direct quotation. Therefore, the researcher considers all the ethical perspectives.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter compiles, discusses, and analyzes the data collected from the respondents in order to achieve the research's objectives.The results of the questionnaire and site visit will be interpreted as well. The chapter contains response rate, general information of the contractor and the respondents who participated in this study, description of the collected data based on the methods of data presenting tools such as frequency, averages, and percentages. And, tables and charts that are used to present the organized data, as they provide easier understanding and clear picture of information to be disseminate. Besides, the chapter presents a summary of findings were all the measures safety related accident compared and relate with each other. The analysis of the questionnaire is made using Microsoft Excel Worksheet 2013 and checked with IBM SPSS - Statistics 20 software.

4.2 Response Rate of Respondents

This research has focused on building and general contractors who have a construction license of grade one. And this questionnaire was distributed to randomly selected firms in Different parts of the city to get representative result. Since the sample size identified for this research was 51 the researcher with the data collectors distributes 51 questionnaire and collected 46 responses. This is more than 90% response rate.

Table 5: Questionnaire survey response rate

No	Respondents	population	Number of sample size	Response	Response Rate (percentage)
	Contractors	91	51	46	90.2 %

Source: Own Survey, 2021

Before starting the data encoding, the questionnaires were checked for their reliability and completeness. All of them are found complete; hence all the 46 questionnaires from the different contactor will be used for data analysis.

4.3 General Information of the Projects and the Respondent

Section 1 of the research questionnaire contains general information about the construction firm category, license grade, construction site location, average number of employees in the site and the respondent job position with work experience in years.

Table 6: Construction Category of the Contractor

Contractor Category	**Number**	**Percentage**
BC	21	45.65%
GC	25	54.36%
Total	46	100%

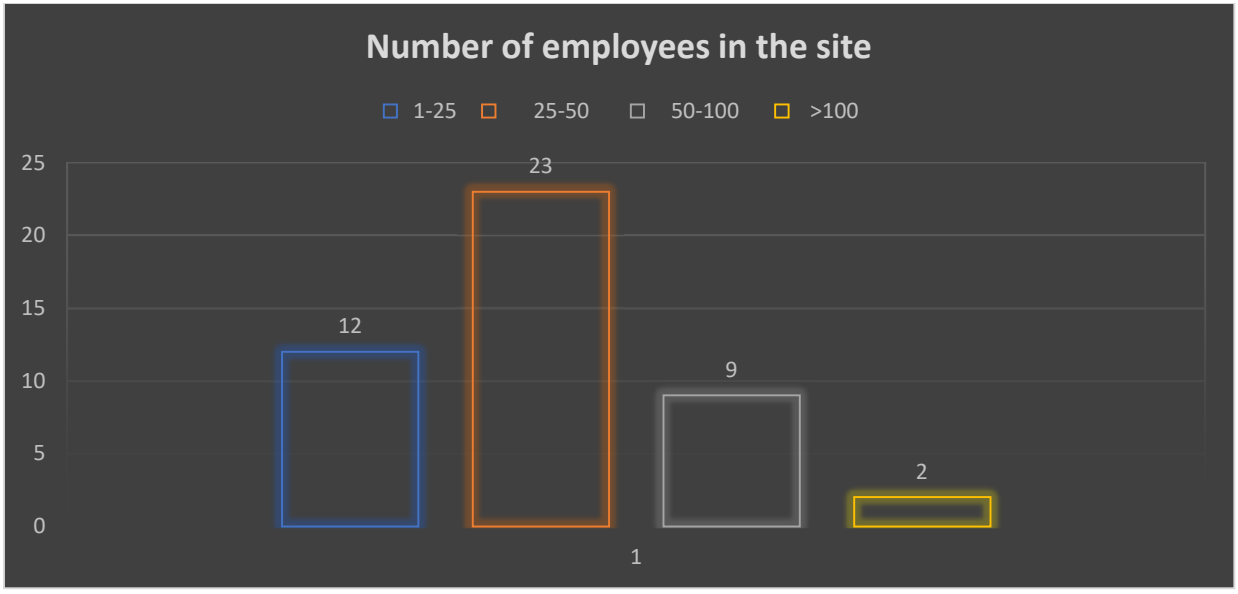
Source: Own Survey, 2021

Table 7: Construction Grade of the Contractor

Construction Grade	Number	Percentage
1	44	95.6%
3	2	4.4%
Total	46	100%

Source: Own Survey, 2021

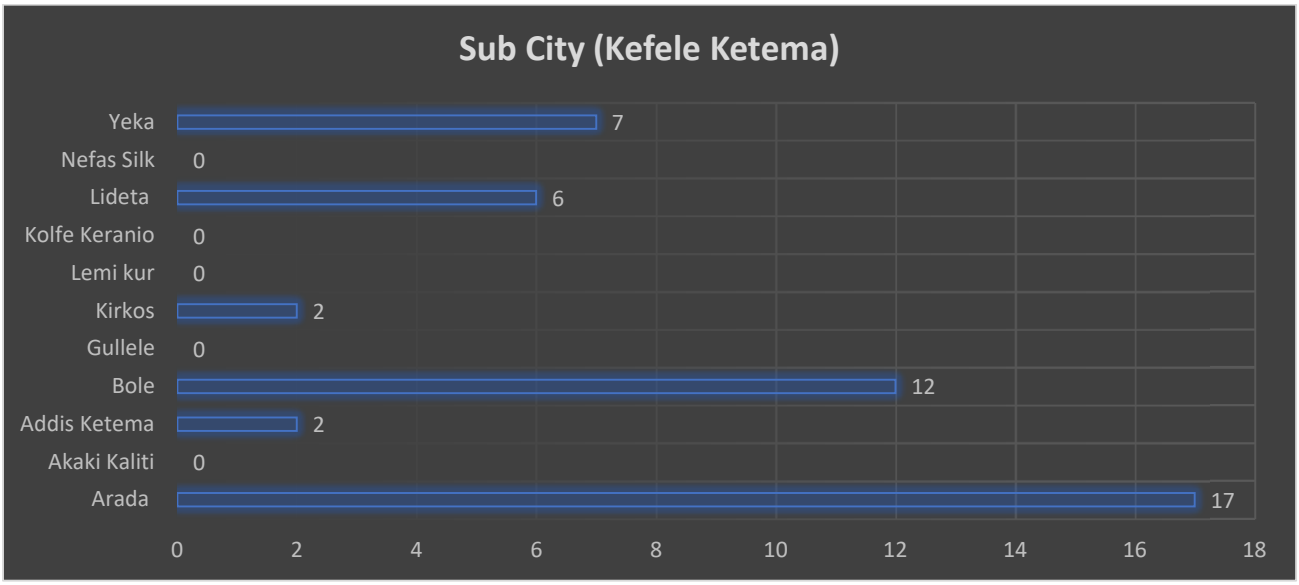
Figure 2: Number of employees in the site



Source: Own Survey, 2021

From the collected data it is found that most construction site have between 25-50 workers in the site and only few construction sites that have more than 100 workers involved.

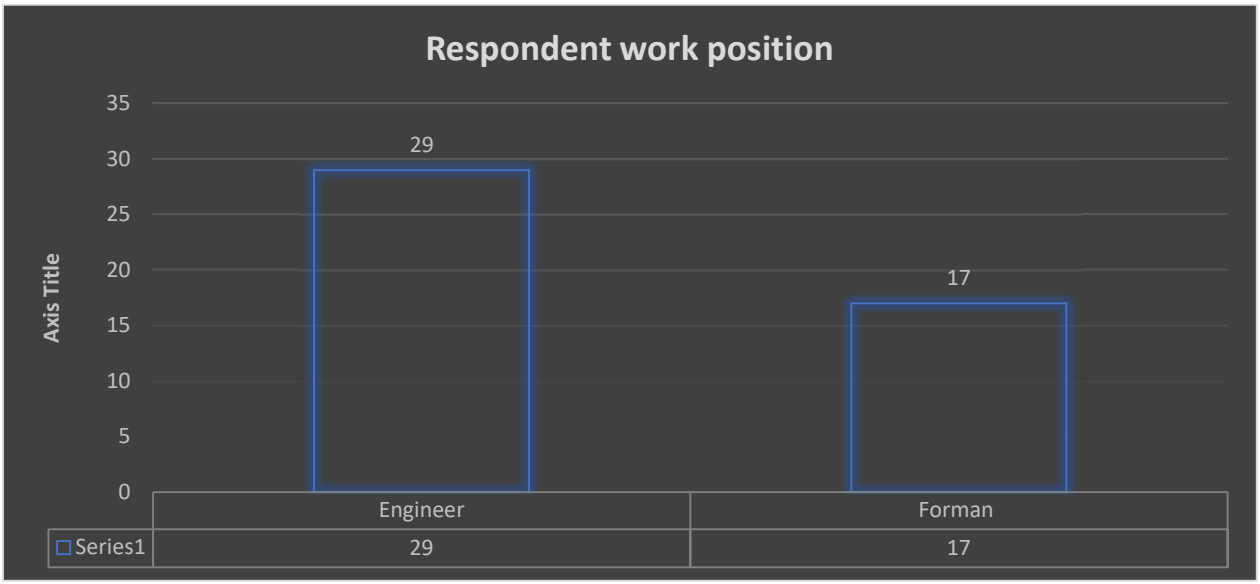
Figure 3: Location of the construction site



Source: Own Survey, 2021

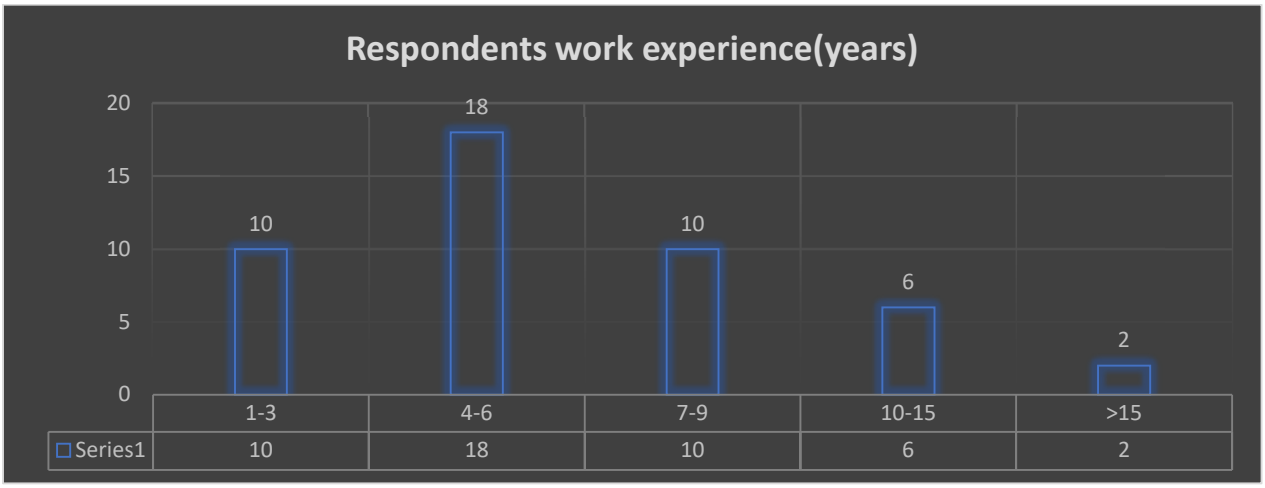
Addis Ababa city has 11 sub-cities (kefele ketema) including the new emerging sub-city (Lemi Kura). From these 11 sub city data were randomly collected from 6 sub city which is more than half of the sub cities. Out of the 6 Sub Cities higher number of data are collected from Arada and Bole Sub City where higher government and private construction work takes place.

Figure 4: Respondent work position



Source: Own Survey, 2021

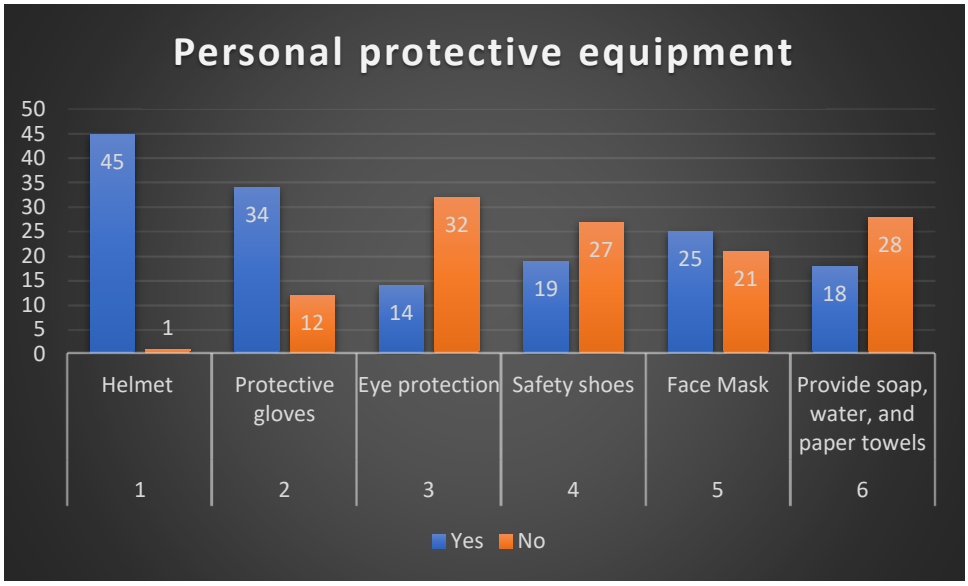
Figure 5: Respondents work experience(years)



Source: Own Survey, 2021

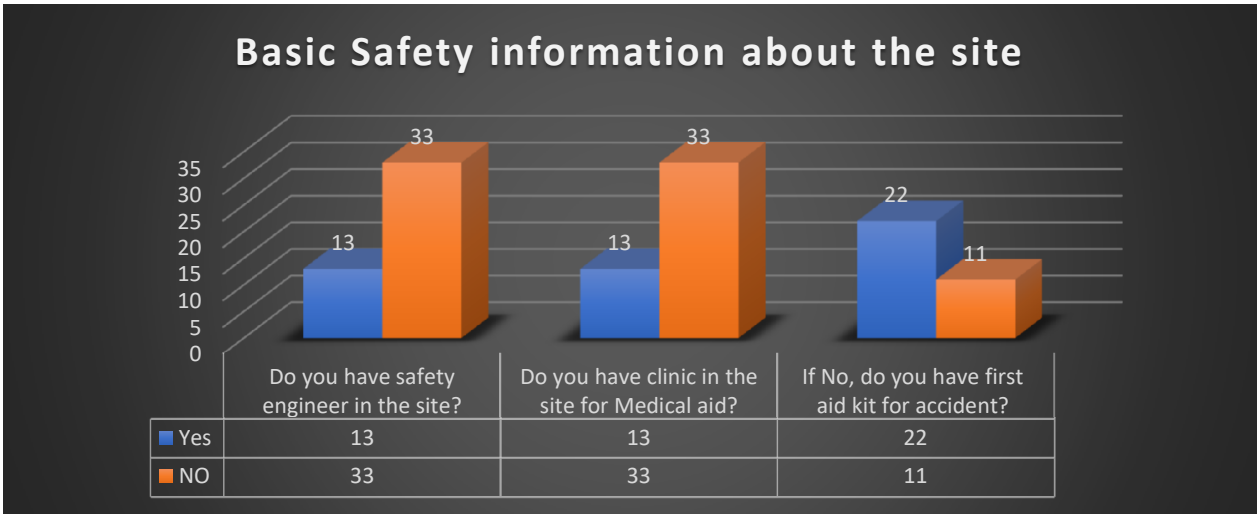
It is obvious that research questionnaire is highly influenced by the respondent, so the researcher tried to maintain the number of Engineers (Starting to junior to Site project manager) with Forman. From 46 questionnaire 29 of them were filled by engineers and the rest 17 by Forman's who has good experience and able to understand the research questionnaire.

Figure 6: provide Personal protective equipment freely



Source: Own Survey, 2021

Figure 7: Basic Safety information about the site



Source: Own Survey, 2021

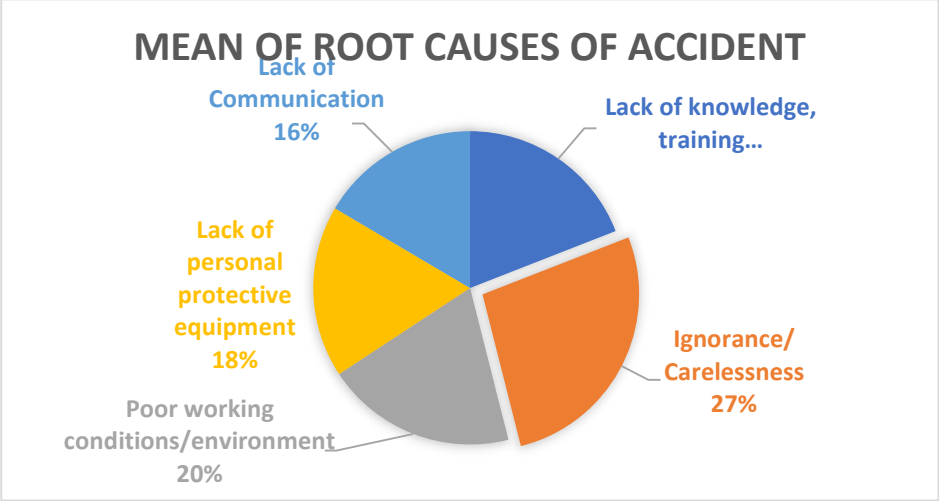
From the basic safety information data in the site, it has been found that more than half of the construction company (71.7 %) have no safety engineer in the site and 71.7 % contractors do not have clinic in the site. And from those who do not have clinic in the site 33.3 % (eleven from thirty-three) even do not have firs aid kit.

4.4 Findings

Section 2 of the research questionnaire contains Likert scale questions which can answer the research question and help to meet the objective of this research. Hence, findings about root causes of accident, stages in construction project where most accident occurs, frequently occurring accidents, construction COVID-19 checklist and Safety management system are analyzed and discussed below.

4.4.1 Root causes of accident

Figure 8: Root cause of accident



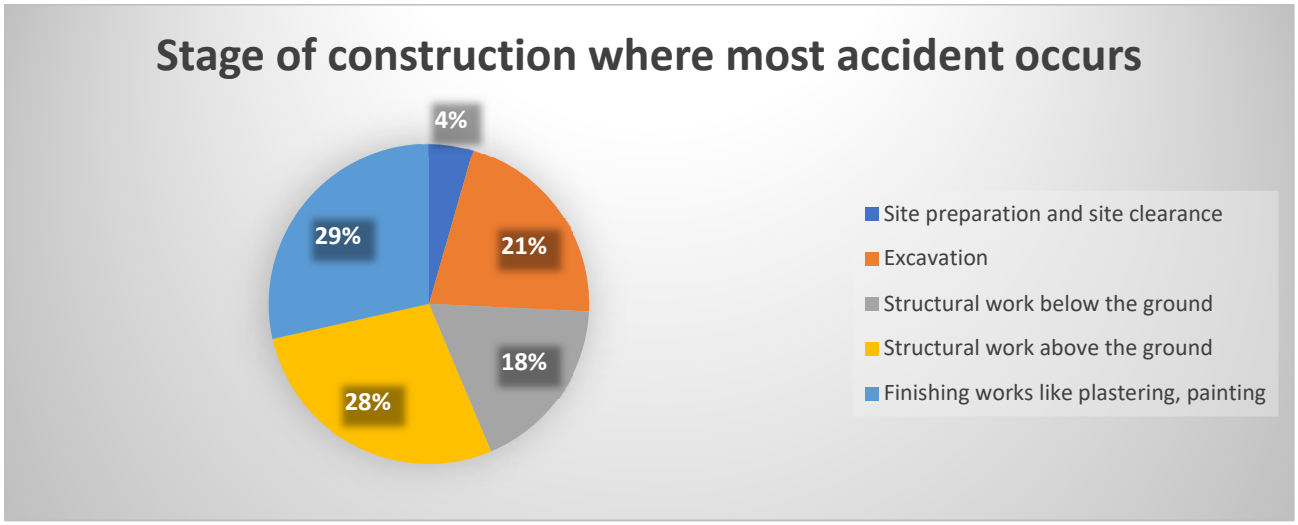
Source: Own Survey, 2021

From the questionnaire response it is found that Carelessness /Ignorance is the major root cause of accident (27%) followed by Poor working conditions/environment (20%), Lack of knowledge, training (19%), Lack of personal protective equipment (18%) and finally Lack of Communication (16%).

Low quality material & safety budget cost also suggested by one engineer as cause of accident.

4.4.2 Stages of construction

Figure 9: Stage of construction where most accident occurs

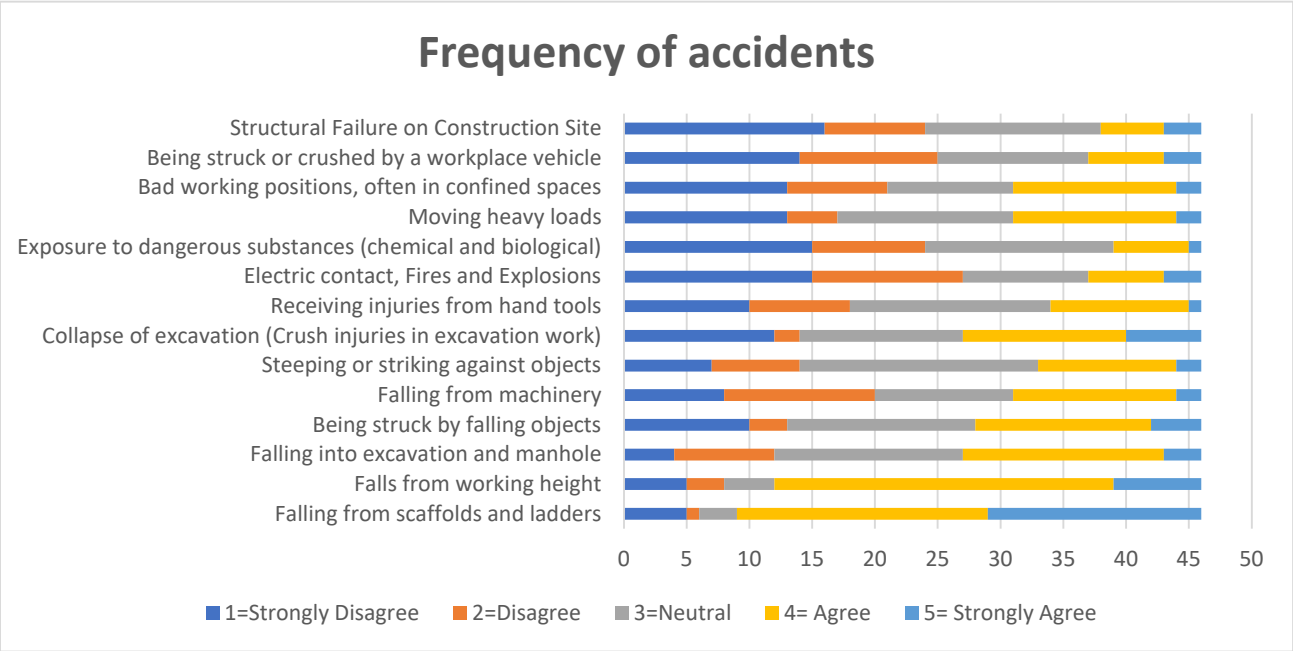


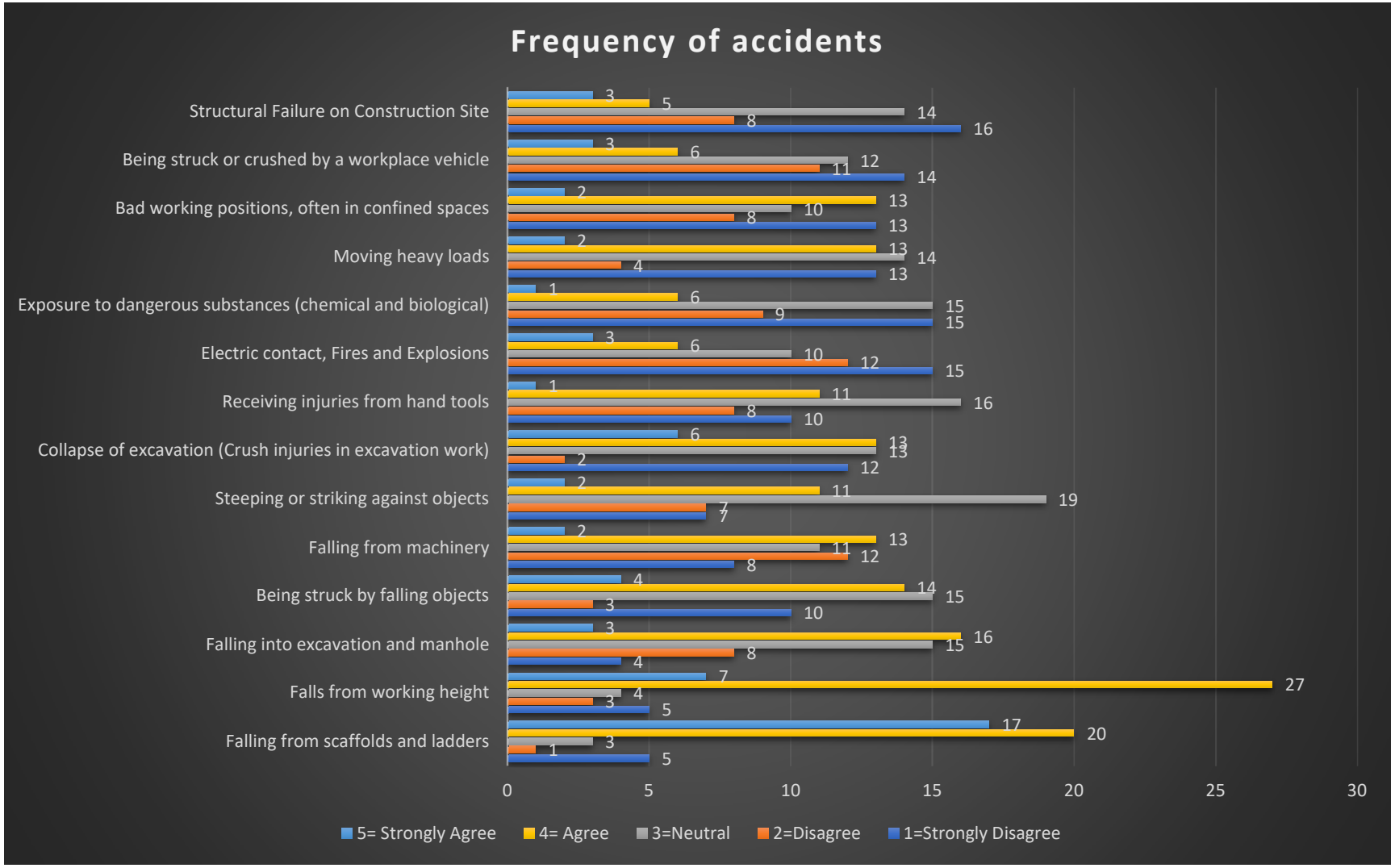
Source: Own Survey, 2021

Building Construction has different stages of development from site preparation to finishing work. Since all the stage are involved with human and machinery construction accident is expected. From the response of the questionnaire most accident and safety concerns are raised in Finishing works like plastering, painting (29%) of the accident occurs during this stage / process, Structural work above and below the ground (28%& 18%) also plays a big role in accidents. In the first stage (Site preparation and site clearance) there are only few accidents.

4.4.3 Frequency of accidents

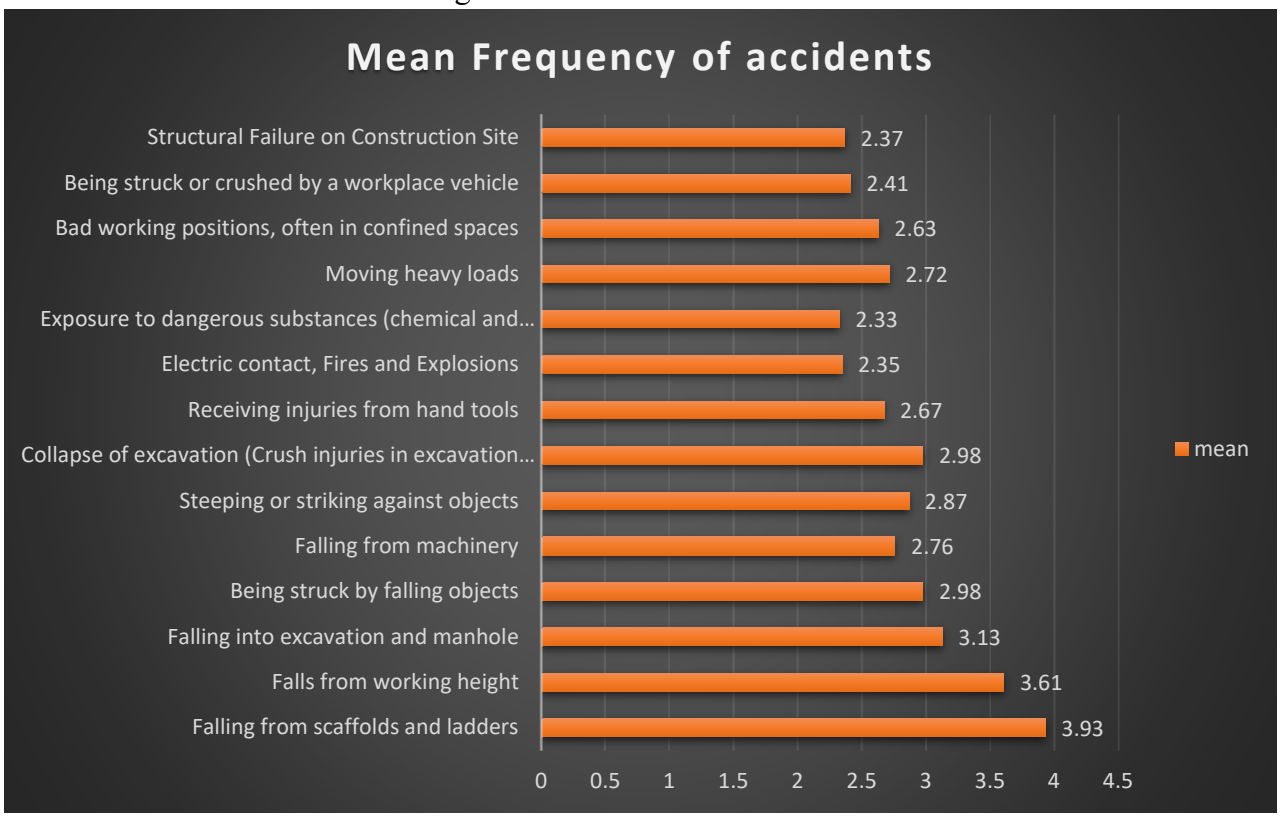
Figure 10: Root cause of accident





Source: Own Survey, 2021

Figure 11: Root cause of accident



Source: Own Survey, 2021

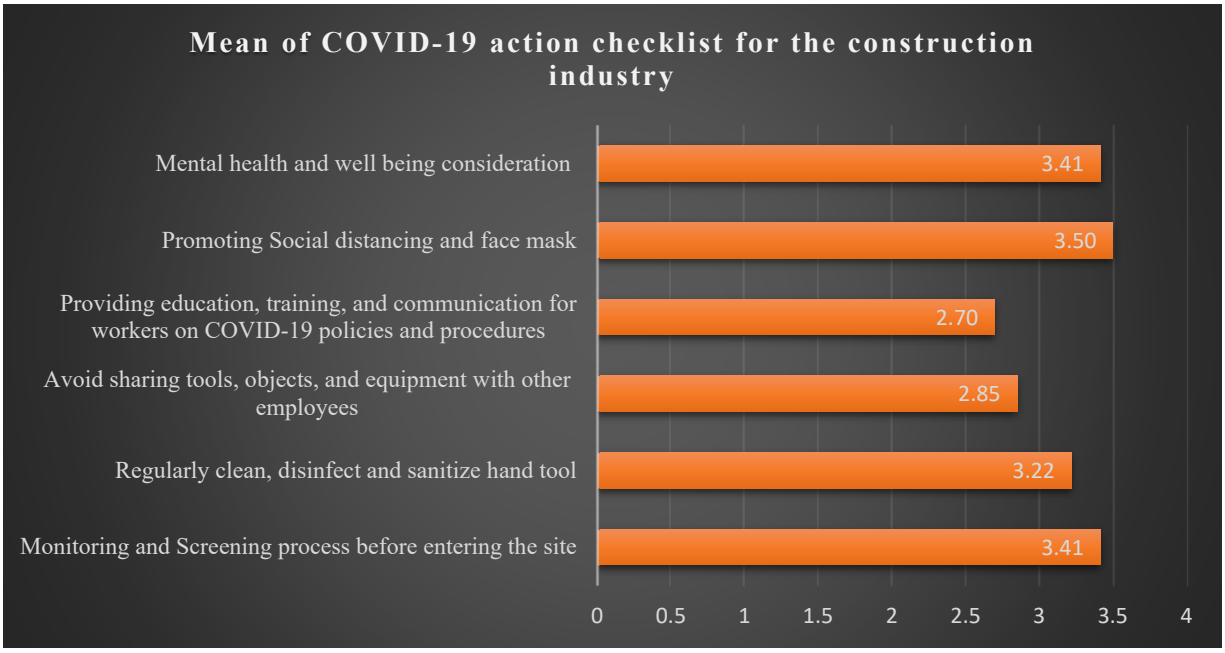
The above figure shows the mean distribution of the accidents which are frequently occurring the sites due to various reasons. Based on their mean distribution the frequently occurring accidents are from the figure above we can see the response accidents which happens frequently are

1. Falling from scaffolds and ladders (3.93) 2. Falls from working height (3.61) 3. Falling into excavation and manhole (3.13) this figure shows that in construction site many of the accidents are fallings. Next to those most frequent accidents are 4. Collapse of excavation (Crush injuries in excavation work) and being struck by falling objects, 5. Steeping or striking against objects 6. Receiving injuries from hand tools 7. Falling from machinery 8. Bad working positions often in confined spaces

The list frequent occurring three accidents are Exposure to dangerous substances (chemical and biological) (2.33) Electric contact, Fires and Explosions (2.35) Structural Failure on Construction Site (2.37) and being struck or crushed by a workplace vehicle (2.41).

4.4.4 COVID-19 action checklist

Figure 12: COVID-19 action checklist for the construction industry



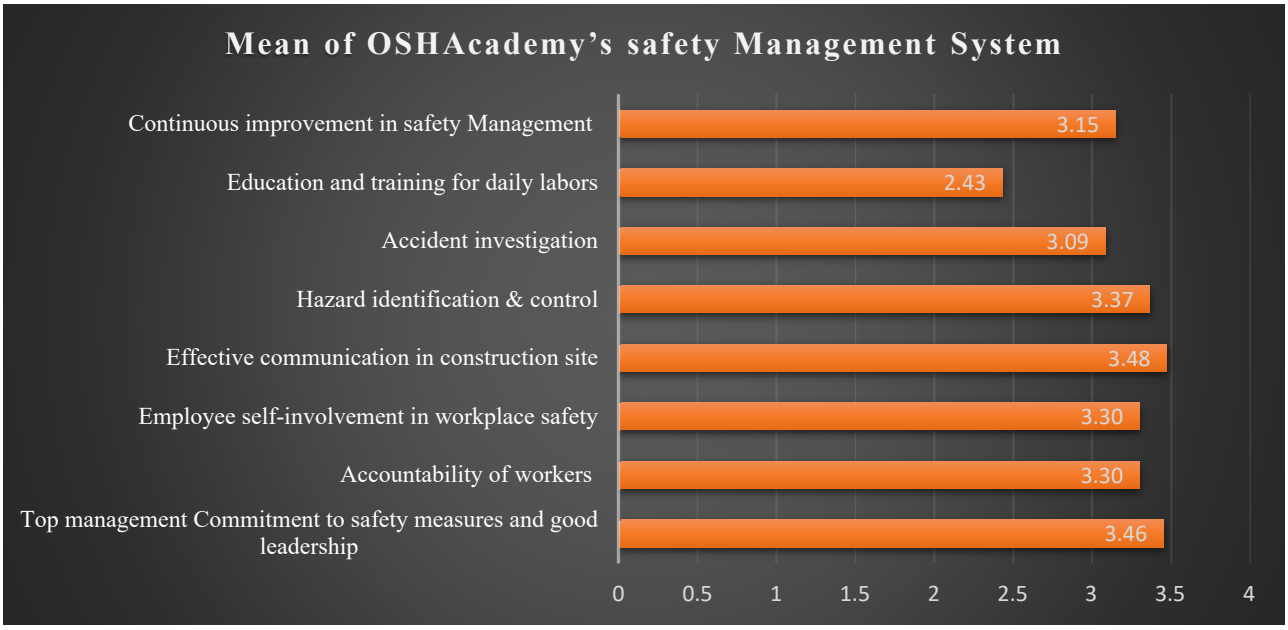
Source: Own Survey, 2021

From the questionnaire response the researcher finds that there is still a problem in Providing education, training, and communication for workers on COVID-19 policies and procedures and Avoid sharing of tools, objects, and equipment with other employees. And from site visit the researcher has observed that most of COVID-19 safety measures by ILO and CDC are not implemented in the construction site. In the contrary the response shows that in most construction site workers Promote Social distancing and face mask with Monitoring and Screening process before entering the site.

4.4.5 OSHAcademy's safety Management System

From the figure shown below the response on the eight basic OSHAcademy's safety Management System it has been found that Education and training for daily labors are almost non existed and the rest seven systems are not existed and implemented in proper way. The site visit and the informal interview also shows most of the construction workers even do not have knowledge in this body of knowledge but perform some of them in informal way.

Figure 13: Existence of OSHAcademy's safety Management System in the construction industry



Source: Own Survey, 2021

4.5 Sites Observation Results

During collection of data the researcher also make site study and made informal interview with Engineers to substantiate the results obtained using questionnaire. The results of site visit and informal interview showed the following:

- Most daily laborers do not wear face masks since they are unpleasant while working, and because most of the work takes physical energy, they will be exhausted if they do not have good air in and out.
- Social distance is almost impossible due to the nature of the work and most of the hand tools are shared between a group of crews.
- The Forman and other office Workers do not push them to use proper use PPE (e.g. Helmet, Gloves, etc...) and In most of the construction sites, it was difficult to see a worker with the proper PPE.

The pictures below were taken during the questionnaire survey in construction sites located in Addis Ababa .

Figure 14: photos taken from construction site who guides workers in preventing COVID-19

Source: Own Survey, 2021

4.6 Interpretation and Discussion

The study findings from the questionnaire survey and site observation are summarized and interpreted in this section. Safety management systems in grade 1 construction enterprises are interpreted and discussed based on the response. From the interpreted and analyzed data the objective of this research is meet and every research question is answered. The findings from the research questionnaire can be an important first step toward closing the existing gap between practice and theory concerning safety management system.

The root causes of accident are Carelessness /Ignorance of the worker, Poor working conditions/environment and Lack of knowledge, training with respect to safety protection. Low quality material & lower safety budget also suggested as a root cause of accident. The Finishing works like plastering and painting are the main stage where most of the accident occurs. Following that most accident and safety concerns are raised structural work above and below the ground. the first construction stage (Site preparation and site clearance) has only few accidents.

It is found from the survey that major accidents in construction are due to fallings from scaffolds, ladders, working height and into excavation and manhole. The findings shows that in construction site many of the accidents are fallings. This is majorly due to there are few provisions of safe working platforms and impracticable wearing of a safety belt. Next to falling most frequently occurring accidents are collapse of excavation (Crush injuries in excavation work) and being struck by falling objects, Steeping/striking against objects, receiving injuries from hand tools, falling from machinery and bad working positions often in confined spaces are the most frequent occurring types of accidents in the construction industry. Where the list frequent occurring, accidents are Exposure to dangerous substances (chemical and biological), Electric contact, Fires and Explosions, Structural Failure on Construction Site and being struck or crushed by a workplace vehicle.

With respect to COVID-19 safety measures checklist there is a gap in Providing education, training, and communication for workers on COVID-19 policies and procedure. Also, it is indicated that elimination of sharing of tools, objects, and equipment with other employees is not implemented since the nature of the construction worker requires sharing of tools to perform different task. And from site visit the researcher has observed that most of COVID-19 safety measures by ILO and CDC are not implemented in the construction site.

The response on the eight basic OSHAcademy's safety Management System shows that most of the systems are not existed in the construction industry and it has been found that there is no education and training for daily labors about safety and other issues. The rest seven systems are not existed and implemented in planed way. The site visit and the informal interview shows that top managements are not that much Committed to safety measures since they are always running with schedule, cost, design changes and progress report. That is why safety engineers are required to be part of the construction team. Accident investigation, Hazard identification & control are also in lowest level of existence. In most site they only take reactive measurement for existed accidents. From the informal interview with site engineers most of the workers have a little knowledge in OSHAcademy's safety Management System.

CHAPTER 5: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This last chapter of the research presents the summery of the findings which are obtained from the response of the research questionnaire. The conclusion drawn from the findings and the site visit with respect to the research question and the recommendation for the existing safety gap are listed with future study suggestion.

5.2 Summary of findings

This research assesses the safety management issues in building constructions which are found in Addis Ababa. The study is conducted through literatures, direct on-site observation by preparing checklist and through giving questionnaire which will be collected and measured quantitatively to contracting firms with considering the country conditions and laws.

From the collected response the researcher has observed that safety management implementation of foreign chines contractors is far better than local grade one contractors. The findings shows that 99% of the contractors provide safety helmet and protective gloves. Meanwhile more than half of them does not provide soap, paper towels and face mask for regarding the COVID-19 protection.

As per the data gathered on the construction site, over three quarters of the construction companies (71.7 percent) do not have a safety engineer on the site. This demonstrates that most of the organization does not pay enough attention to worker safety. According to Reese (2003), projects that employed safety engineers (officers) who conduct safety inspections on the working site had a reduced rate of injury. And 71.7 % contractors do not have clinic in the site from which 33.3 % (eleven from thirty-three) even do not have firs aid kit. This demonstrates how construction sites disregard and fail to adopt safety measures.

The table which is found below illustrate the summery of findings of the collected data.

Table 8: Summary of finding

Stages of construction	Mean	Root causes of accident	Mean	Frequently of accidents	Mean
Finishing works like plastering, painting	**1.80**	Ignorance/ Carelessness	**4.09**	Falling from scaffolds and ladders	**3.93**
Structural work above the ground	**1.76**	Poor working conditions/environment	**2.98**	Falls from working height	**3.61**
Excavation	**1.35**	Lack of knowledge, training	**2.89**	Falling into excavation and manhole	**3.13**
Structural work below the ground	**1.13**	Lack of personal protective equipment	**2.70**	Being struck by falling objects	**2.98**
Site preparation and site clearance	**0.28**	Lack of Communication	**2.50**	Collapse of excavation (Crush injuries in excavation work)	**2.98**
OSHAcademy's safety Management System	**Mean**	**COVID-19 action checklist**	**Mean**	Steeping or striking against objects	**2.87**
Effective communication in construction site	3.48	Promoting Social distancing and face mask	3.50	Falling from machinery	**2.76**
Top management Commitment to safety measures and good leadership	3.46	Monitoring and Screening process before entering the site	3.41	Moving heavy loads	**2.72**
Hazard identification & control	3.37	Mental health and wellbeing consideration	3.41	Receiving injuries from hand tools	**2.67**
Accountability of workers	3.30	Regularly clean, disinfect and sanitize hand tool	3.22	Bad working positions, often in confined spaces	**2.63**
Employee self-involvement in workplace safety	3.30	Avoid sharing tools, objects, and equipment with other employees	2.85	Being struck or crushed by a workplace vehicle	**2.41**
Continuous improvement in safety Management	3.15	Providing education, training, and communication for workers on COVID-19 policies and procedures	2.70	Structural Failure on Construction Site	**2.37**
Accident investigation	3.09			Electric contact, Fires and Explosions	**2.35**
Education and training for daily labors	2.43			Exposure to dangerous substances (chemical and biological)	**2.33**

Source: Own Survey, 2021

5.3 Conclusion

From discussion of findings, results of this research and review of related literature the status /level of safety management practice in Addis Ababa construction site was investigated. The site visit with the response of the questionary helped to answer each research questionary and meet the general and specific objective which are stated under section 1.4 of the introduction part of the research.

The data gathered on the construction site shows that 71.7 % contractors do not have safety engineer and clinic in the site. This demonstrates that most of the organization does not pay enough attention to worker safety. The root causes of accident in construction site are Carelessness /Ignorance, Poor working conditions/environment and Lack of knowledge, training. This three are the principal causes of accidents at construction sites. This shows that most of the causes of accident can be mitigate by using proper safety measures both by the construction company and the individual workers. From the construction development section Finishing works like plastering, painting contributes a lot of factors where most accident occurs. In this stage most of the major accidents are fallings from scaffolds, ladders, working heights. From the response of the questionnaire, it is concluded that most of the accidents in construction site are fallings.

With respect to COVID-19 construction workers safety measures most of the construction companies are not implementing the procedures. There is still a problem in Providing education, training, and communication for workers on COVID-19 policies and procedures and daily labors are sharing tools, objects, and equipment with others. This makes the construction site more unsafe to the worker special for lower level of workers like daily labor, plasterer, mixer …And generally from site visit most of COVID-19 safety measures by ILO and CDC are not implemented in the construction site.

Based on an evaluation of the OSHAcademy's basic safety management system. In the building sector, the majority of SMS components do not exist structurally. The level of safety training and orientation provided to employees was essentially non-existent. Accident investigation, Hazard identification & control are also in lowest level of existence. Also, top managements and project managers are not committed to safety measures since they are always running with schedule,

cost, design changes and progress report. Some companies are missing construction site essentials including safety signs and safety policies. In construction sites most site engineers have a little knowledge in OSHAcademy's safety Management System. This, however, does not represent the complete set of construction industry some companies go well beyond the standards and implement high degree of safety by implementing all safety management measures and providing safety shoes, protective glasses, belts, and other PPE.

5.4 Recommendations

Based on the findings of this research and site observation, the following recommendations are made to help construction companies implement safety measures and decrees accident.

- The government or the client shall require contractors to supply personal protective equipment. This helps to reduce the risk while also improving the workers' working conditions and giving them the satisfaction that they deserve from working in a safe workplace.
- Because most construction site accidents are caused by workers' carelessness or ignorance, there should be a provision for training and orientation of workers in terms of safety, and top management should take action against workers who do not follow the rules.
- By allocating a proper safety budget to the job site, the contractors should increase worker safety. This is majorly dependent on the client because if the client forces the contractor to consider safety issues in the contract this safety issues can be improved.
- The researcher studies the stage of construction where most accidents occur so that contractors can take this information into consideration and adopt stronger safety measures in those stages and sections of projects where the majority of accidents occur.
- Since top managements and project managers are busy with schedule, cost, design changes and progress report and are not committed to safety measures every contractor should have at list 1 safety engineer or nurse with small site clinic. But as a baseline first aid kit with proper trained Forman or site engineer should be present on the site.

5.5 Suggestion for further study

- Research can be carried out on how the safety related problems are affecting the cost, schedule, and quality performance of construction project.
- Since safety management system is a broad area other researcher can be conducted to other construction sectors such as highways, dams.
- Research can be conducted to all grade construction contractors with government support since the research will consider thousands of contractors.

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Appendix A: Questionnaire

QUESTIONNAIRE FOR CONTRACTOR

ADDIS ABABA UNIVERSITY

School of Commerce

Department of Project Management

QUESTIONNAIRE

IN PARTIAL FULFILMENT OF THE REQUIRMENT FOR Degree of Master of Arts in Project Management

Assessment of Safety Management Practice in Building Construction Projects

This M.A thesis research questionnaire is designed to assess the practice of safety management in building construction projects in Addis Ababa. The objective of the study paper is to **assess the *safety management practice of building construction projects*** *in Addis Ababa* by specifically investigate the methods implemented for safety management.

To achieve this objective the study requires the gathering of data related to safety management in medium and large construction firms in Addis Ababa. The data collected will be used for academic purpose; all information and feedbacks will be kept strictly confidential.

I, therefore, kindly requesting your valuable feedback, thanking you in advance for giving me time from your busy schedule. Please complete the questionnaire by giving details or ticking boxes as appropriate.

Thank you,

Nahusenai Tsedalu

Email: nahu3j@gmail.com

SECTION I. General Information

A) Code ----------

Name of the company _____

Contractor Category BC ☐ GC ☐

Construction grade 1 ☐ 2 ☐ 3 ☐

Average Number of employees in the site 1-25 ☐ 25-50 ☐ 50-100 ☐ >100 ☐

Address: Addis Ababa Sub city (Kefele Ketema) _____

Respondent position (Work status) Engineer ☐ Forman ☐

Respondents work experience(years) 1 -3 ☐ 4-6 ☐ 7-9 ☐ 10-15 ☐ >15 ☐

Do you have safety engineer in the site? Yes ☐ NO ☐

Do you have clinic in the site for Medical aid? Yes ☐ NO ☐

If No, do you have first aid kit for accident? Yes ☐ NO ☐

SECTION II. Questions related to safety

1. Which one of the following **root causes of accident** contributes more for the accidents to occur? Please list and rank other cause which you feel are left out.

Rank the list on next table from 1 to 5

(where 1=Never, 2=Rarely, 3=Sometimes, 4= Often and 5= Always)

Please list other cause which you feel are left out.

No	**Root causes of accident**	1	2	3	4	5
1	Lack of knowledge, training					
2	Ignorance/ Carelessness					
3	Poor working conditions/environment					
4	Lack of personal protective equipment					
5	Lack of Communication					

2. In which **stage** of construction do you think most accident occurs due to lack of safety? Please list and rank other cause which you feel are left out. Rank the list on next table from 0 to 3 (where 3= contributes more for accident)

Legend: 0 = No accident, 1 = Minor Impact, 2 = Moderate Impact, 3 = High Impact

Stages of construction	0	1	2	3
Site preparation and site clearance				
Excavation				
Structural work below the ground				
Structural work above the ground				
Finishing works like plastering, painting				

3. Does your company provide **Personal protective equipment** freely for the employees?

Personal protective equipment	**Yes**	**No**
Helmet		
Protective gloves		
Eye protection		
Safety shoes		
Face Mask		
Provide soap, water, and paper towels		

4. Rank the listed possible causes of accidents which happens **frequently** from 1 to 5 (where 5=major cause of accident). Please list and rank other cause which you feel are left out. 1=Never, 2=Rarely, 3=Sometimes, 4= Often and 5= Always

	Frequency of accidents	1	2	3	4	5
1	Falling from scaffolds and ladders					
2	Falls from working height					
3	Falling into excavation and manhole					
4	Being struck by falling objects					
5	Falling from machinery					
6	Steeping or striking against objects					
7	Collapse of excavation (Crush injuries in excavation work)					
8	Receiving injuries from hand tools					
9	Electric contact, Fires and Explosions					
10	Exposure to dangerous substances (chemical and biological)					
11	Moving heavy loads					

12	Bad working positions, often in confined spaces					
13	Being struck or crushed by a workplace vehicle					
14	Structural Failure on Construction Site					

5. Which of the following **safety measures by ILO and CDC** are implemented in your construction site to protect workers **from COVID-19?**

   1=Never, 2=Rarely, 3=Sometimes, 4= Often and 5= Always

SN	COVID-19 action checklist for the construction industry	1	2	3	4	5
1	Monitoring and Screening process before entering the site					
2	Regularly clean, disinfect and sanitize hand tool					
3	Avoid sharing tools, objects, and equipment with other employees					
4	Providing education, training, and communication for workers on COVID-19 policies and procedures					
5	Promoting Social distancing and face mask					
6	Mental health and well being consideration					

6. Which of the following **Safety Management Systems** are **existed and implemented** in your construction site? Sign'×' mark on the option that you agree on the space provided

   1=Never, 2=Rarely, 3=Sometimes, 4= Often and 5= Always

SN	List of OSHAcademy's safety Management System	1	2	3	4	5
1	Top management Commitment to safety measures and good leadership					
2	Accountability of workers					
3	Employee self-involvement in workplace safety					
4	Effective communication in construction site					
5	Hazard identification & control					
6	Accident investigation					
7	Education and training for daily labors					
8	Continuous improvement in safety Management					

Appendix B: Questionnaire Response

													TOTAL SUM
Category	BC	21	GC	25									46
Construction grade	1	44	2		3	2							46
Number of employees in the site	1-25	12	25-50	23	50-100	9	>100	2					46

Sub city (Kefele Ketema)	Arada	Akaki Kaliti	Addis Ketema	Bole	Gullele	Kirkos	Lemi kur	Kolfe Keranio	Lideta	Nefas Silk	Yeka	
	17	0	2	12	0	2	0	0	6	0	7	46

Respondent position (Work status)		Engineer	29	Forman	17								46
Respondents work experience(years)	1-3	10	4-6	18	7-9	10	10-15	6	>15	2			46

Basic Safety information about the site		Yes		NO		
Do you have safety engineer in the site?	Yes	13	NO	33		46
Do you have clinic in the site for Medical aid?	Yes	13	NO	33		46
If No, do you have first aid kit for accident?	Yes	22	NO	11		33

1

SN	Root causes of accident	1=Never	2=Rarely	3=Sometimes	4= Often	5= Always	TOTAL SUM	Mean
1	Lack of knowledge, training	10	9	10	10	7	46	2.89
2	Ignorance/ Carelessness	2	1	7	17	19	46	4.09
3	Poor working conditions/environment	10	5	13	12	6	46	2.98
4	Lack of personal protective equipment	15	6	10	8	7	46	2.70
5	Lack of Communication	10	17	6	12	1	46	2.50

2

SN	Stages of construction	0 = No accident	1 = Minor Impact	2 = Moderate Impact	3 = High Impact			
1	Site preparation and site clearance	35	9	2	0		46	0.28
2	Excavation	17	7	11	11		46	1.35
3	Structural work below the ground	16	15	8	7		46	1.13
4	Structural work above the ground	5	15	12	14		46	1.76
5	Finishing works like plastering, painting	13	5	6	22		46	1.80

3

SN	Personal protective equipment	Yes	No	TOTAL SUM
1	Helmet	45	1	46
2	Protective gloves	34	12	46
3	Eye protection	14	32	46
4	Safety shoes	19	27	46
5	Face Mask	25	21	46
6	Provide soap, water, and paper towels	18	28	46

4

SN	Frequency of accidents	1=Never	2=Rarely	3=Sometimes	4= Often	5= Always	TOTAL SUM	Mean
1	Falling from scaffolds and ladders	5	1	3	20	17	46	3.93
2	Falls from working height	5	3	4	27	7	46	3.61
3	Falling into excavation and manhole	4	8	15	16	3	46	3.13
4	Being struck by falling objects	10	3	15	14	4	46	2.98
5	Falling from machinery	8	12	11	13	2	46	2.76
6	Steeping or striking against objects	7	7	19	11	2	46	2.87
7	Collapse of excavation (Crush injuries in excavation work)	12	2	13	13	6	46	2.98
8	Receiving injuries from hand tools	10	8	16	11	1	46	2.67
9	Electric contact, Fires and Explosions	15	12	10	6	3	46	2.35

10	Exposure to dangerous substances (chemical and biological)	15	9	15	6	1	46	2.33
11	Moving heavy loads	13	4	14	13	2	46	2.72
12	Bad working positions, often in confined spaces	13	8	10	13	2	46	2.63
13	Being struck or crushed by a workplace vehicle	14	11	12	6	3	46	2.41
14	Structural Failure on Construction Site	16	8	14	5	3	46	2.37

5

SN	COVID-19 action checklist	1=Never	2=Rarely	3=Sometimes	4= Often	5= Always	TOTAL SUM	Mean
1	Monitoring and Screening process before entering the site	5	6	12	11	12	46	3.41
2	Regularly clean, disinfect and sanitize hand tool	6	4	18	10	8	46	3.22
3	Avoid sharing tools, objects, and equipment with other employees	6	13	15	6	6	46	2.85
4	Providing education, training, and communication for workers on COVID-19 policies and procedures	7	17	10	7	5	46	2.70
5	Promoting Social distancing and face mask	2	8	10	17	9	46	3.50
6	Mental health and well-being consideration	4	11	8	8	15	46	3.41

6

SN	OSHAcademy's safety Management System	1=Never	2=Rarely	3=Sometimes	4= Often	5= Always	TOTAL SUM	Mean
1	Top management Commitment to safety measures and good leadership	2	9	12	12	11	46	3.46
2	Accountability of workers	3	14	6	12	11	46	3.30
3	Employee self-involvement in workplace safety	4	8	12	14	8	46	3.30
4	Effective communication in construction site	4	5	12	15	10	46	3.48
5	Hazard identification & control	2	13	7	14	10	46	3.37
6	Accident investigation	8	7	13	9	9	46	3.09
7	Education and training for daily labors	10	17	10	7	2	46	2.43
8	Continuous improvement in safety Management	4	11	13	10	8	46	3.15