ADDIS COLLEGE

SCHOOL OF POSTGRADUATE STUDIES

ASSESSMENT OF SAFETY MANAGEMENT PRACTICE ON ROAD CONSTRUCTION PROJECTS OF ADDIS ABABA CITY ROAD AUTHORITY

BY

BISRAT TEREFE

A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Advisor: Amlaku Melese

SEPTEMBER, 2025

ADDIS ABABA, ETHIOPIA

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DECLARATION

I, Bisrat Terefe, hereby declare that this thesis entitled: "Assessment of Safety Management Practice on Road Construction Projects of Addis Ababa City Road Authority" is my original work and has not been submitted for a degree or diploma in any other university or institution. All sources of materials used in the preparation of this thesis have been properly acknowledged and cited.

This research is submitted in partial fulfillment of the requirements for the award of the Master of Science (MSc) Degree in Construction Technology and Management at Addis College.
I affirm that the work presented in this thesis is the result of my own independent investigation and research.

Bisrat Terefe Kumsa _____ _____
(Researcher) Signature Date

STATEMENT OF CERTIFICATION

This is to certify that this thesis prepared by Student Name entitled "Assessment of safety management practice on road projects of Addis Ababa city road authority", has been submitted to Addis College School of graduate studies for examination with my approval as the college advisor.

Amlaku Melese _____ _____
(Advisor) Signature Date

APPROVAL SHEET

SCHOOL OF POSTGRADUATE STUDIES

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

This is to certify that the thesis entitled: "Assessment of Safety Management Practice on Road Construction Projects of Addis Ababa City Road Authority" submitted by Bisrat Terefe in partial fulfillment of the requirements for the degree of Master of Science in Construction Technology and Management, has been carefully examined and duly approved by the undersigned members of the Board of Examiners.

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Abstract

Ensuring safety in road construction projects is a critical component of project success and worker well-being. Despite Ethiopia's growing investment in infrastructure, safety management practices often remain inadequate, especially in urban road projects. This study assesses the effectiveness of safety management practices in road construction projects undertaken by the Addis Ababa City Road Authority (AACRA). A mixed-methods research design was employed, combining quantitative data from structured questionnaires with qualitative insights from interviews. Data were collected from 80 respondents, including project managers, resident engineers, safety officers, and site workers across the ongoing AACRA projects. Key focus areas included safety policy and planning, training and awareness, supervision and compliance, use of personal protective equipment (PPE), risk identification, and safety culture. The findings reveal significant gaps in safety training, PPE availability, and management commitment to enforcing safety policies. While some procedural frameworks exist, their implementation is inconsistent across projects. The study identified major challenges such as lack of awareness, inadequate supervision, poor communication, and limited resources allocated for safety. Based on the results, the study recommends strengthening safety regulations, enhancing regular training programs, improving supervision mechanisms, and promoting a proactive safety culture within AACRA. The research contributes to the understanding of practical safety management gaps and offers actionable solutions for safer road construction project delivery in Addis Ababa.

Keywords: Safety Management, Occupational Health and Safety, Road Construction, AACRA, PPE, Safety Culture.

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List of Acronyms and Abbreviations

AACRA	Addis Ababa City Road Authority
GDP	Growth Domestic Product
ILO	International Labor Organization
OSHA	Occupational Safety and Health Authority
OSH	Occupational Safety and Health
MOLSA	Ministry of Labor and Social Affairs
INSPQ	Quebec National Institute of Public Health
WHO	World Health Organization
PTSD	Post-Traumatic Stress Disorder
FHWA	Federal Highway Administration
NIOSH	National Institute for Occupational Safety and Health
CDC	Centers for Disease Control and Prevention
PPE	Personal Protective Equipment
SMS	Safety Management System
BIM	Building Information Modeling
OHSAS	Occupational Health and Safety Assessment Series
ISO	International Organization for Standardization
OSHMS	Occupational Safety and Health management System
SPSS	Statistical Package for Social Sciences

1. INTRODUCTION

1.1 Background of the study

The Construction industry contributes significantly to economic development, accounting for approximately 13% of global GDP, with similar proportions observed in many individual countries, particularly those experiencing rapid urbanization and infrastructure development, Barbosa, Woetzel (2017). It is especially crucial for the economies of rising countries. In many developing countries, such as Ethiopia, big construction projects account for more than half of wealth invested in fixed assets, 10% of GDP, and nearly 80% of all capital assets. Despite making a significant economic contribution to emerging economies, the construction sector continues to underperform overall, Chitkara (2011).

Both developed and developing countries certainly benefit from the construction industry in terms of scale and share in the development process. The industry is important not only because of its finished product, but also because it employs a huge number of people (directly and indirectly) and so has an impact on a county's or region's economy during the construction phase, Wibowo (2009).

The International Labor Organization(ILO) reposts, Siok and Lin(2014) that 270 million workplace accidents occur yearly, resulting in 2 million deaths. The projected economic loss caused by work-related accidents and diseases was equivalent to 5.8% of the global gross domestic product, Takala, Hämäläinen (2024).

Ethiopia, like many developing countries, has comparable safety issue in the construction industry, especially when it's comes to road infrastructure projects. Road construction is an important area for urban growth, especially in fast-growing cities such as Addis Ababa. In recent years, the city has seen tremendous urbanization and population expansion, creating an increased demand for efficient and safe transportation infrastructure, Fantaye and Assesfa (2022).

The Addis Ababa City Road Authority was established on March 15, 1998, under regulation no. 7/1998 as an autonomous body. Its mandate includes planning, designing, constructing, administering, and maintaining the city's road network, AACRA (2025). AACRA significantly expanded the city's road network from about 1300 km at its inception to over 6500 km by 2025.

Major milestone include the construction of 2510 km of asphalt roads by 2013/14 and continued large-scale projects under the city road development program, AACRA (2025). As one of the key bodies in charge of supervising road construction projects, the Addis Ababa City Road Authority plays an important role in guaranteeing the safety, quality, and sustainability of these projects. Thus, it's critical to assess the effectiveness of AACRA's strategies.

In road construction projects, safety management is critical to project success. It includes identifying, assessing, and mitigating construction-related risks to workers, road users, and the surrounding environment. Despite their importance, safety management practice in many developing countries, including Ethiopia, are sometimes hampered by weak rules, a lack of training, limited implementation of safety standards, and insufficient resources, Yure and Deyganto (2024).

The road construction sector in Addis Ababa is no exception, with frequent reports of accidents, injuries, and project delays attributed to poor safety management practices. These issues not only jeopardize the well-being of workers and the public but also lead to increased costs and reduced efficiency in project delivery. Furthermore, the lack of systematic assessment and continuous improvement of safety management practices exacerbates the problem, leaving many projects vulnerable to recurring risks, Abebe (2022).

This study seeks to assess the safety management practices implemented in road construction projects under AACRA. By identifying the strengths and weaknesses of current practices, the study aims to provide valuable insights for enhancing safety performance. It also explores the role of regulatory frameworks, contractor compliance, and stakeholder collaboration in fostering a culture of safety. Ultimately, the findings will contribute to the development of effective strategies to minimize risks, improve safety outcomes, and insure the sustainable growth of Addis Ababa's road infrastructure.

1.2 Statement of the Problem

Ensuring workplace safety is a shared duty that calls for dedication from management and employees. Construction workers must work together to insure a safe and healthy working environment. In poor nations, health and safety are not prioritized in construction projects, and introducing safety precautions during construction is perceived as a burden, Mbuya and Lema,

(2004) Kumie, Amera et al. (2016). This perception discourages the adoption of preventive measures, increasing the risk of accidents, injuries, and fatalities among construction workers. Additionally, a lack of knowledge and expertise hinders interventions to improve construction workers' health and safety, Belachew (2020). Without adequate skills and awareness, safety initiatives remain poorly implemented, leading to recurring hazards and unsafe working environments.

Effective management health and safety principles have been a tough battle and a plague for most contractors as they do the initial planning on paper and win contracts, but integrating this comprehensive management health and safety principles into the construction process becomes difficult due to tradition, Okae Adow (2013). This creates a gap between safety policies and site practices, exposing workers to avoidable risks and weakening overall safety culture.

The road construction industry in Addis Ababa is a key driver of the city's urbanization and economic progress. However, safety management standards in this industry continue to be a difficulty, with frequent reports of accidents, injuries, and fatalities on construction sites. These events not only harm workers and the general public, but they also cause project delays, higher expenses, and lower efficiency, inhibiting the effective completion of infrastructure projects, Abebe (2022).

The Addis Ababa City Roads Authority is responsible for supervising and constructing road construction projects, confronts major hurdles in developing and enforcing good safety management procedures. The importance of safety management, many projects lack systematic procedures for risk identification, assessment, and mitigation, making them prone to reoccurring dangers, AACRA Occupational Safety Monitoring Team (2024). The absence of structured procedures leaves projects vulnerable to recurring danger, compromising both worker welfare and project success.

Furthermore, the luck of a structured monitoring, review and continuous improvement strategy for safety management worsens the problem. This weakness prevents lessons from past incidents from being applied, resulting in repeated accidents, wasted resources, and stagnation in safety performance. According to AACRA occupational safety office data, from July 2023 to January 2025 alone, there were 74 injuries on road projects, AACRA Occupational Safety Monitoring

Team (2024). These occupational work place accidents are an indication of the gap between safety regulations and their actual execution on the job site reveals a lack of policy-practice integration. This not only jeopardizes the success of present initiatives, but also poses a long-term threat to the city's infrastructure growth and the workers remain unprotected.

While a considerable number of studies have explored the occupational work place accidents within the building construction sector, there is a distinct lack of research focusing on similar incidents in road construction projects, particularly within Addis Ababa road projects. Despites the rapid expansion and inherent risks associated with road construction, this area has received relatively little scholarly attention. In contrast to building construction, road construction sites present unique hazards and operational challenges that warrant dedicated investigation. Therefore, this study seeks to address this research gap by examining occupational work place accidents specific to road construction in Addis Ababa city road projects, thereby contributing valuable insights to the broader field of construction safety management.

1.3. Objective of the study

1.3.1. General objective

This study aims to assess safety management practices in Addis Ababa city road authority road construction projects run by AACRA.

1.3.2. Specific objectives

- To assess the current safety management practices used in road construction projects.
- To assess the level of safety awareness and training offered to workers and stakeholders.
- To identify the challenges in managing occupational safety and health management implementation.

1.4. Research Questions

- What is the existing safety management practices employed in AACRA road construction projects?
- What is the level of safety awareness and training among workers and stakeholders?
- What are the challenges to manage occupational safety and health management implementation?

1.5. Significance of the Study

This study focuses on the safety management methods in road construction projects under the control of the Addis Ababa City Roads Authority. It aims to identify gaps and obstacles in current safety management practices, providing insights for improving safety standards and reducing accidents, injuries, and fatalities. The findings will also help in policy development and strengthening within the AACRA, enhancing safety protocols, enforcement mechanisms, and ensuring consistency with international best practices.

The study will emphasize the importance of effective safety training programs and raising safety awareness among workers and stakeholders, fostering a safety-conscious culture on construction sites. It will serve as a reference tool for key stakeholders in the road construction sector, providing evidence-based suggestions for improving safety standards.

The findings will help prevent delays, accidents, and project cost overruns due to inadequate safety management, thereby increasing project efficiency and preventing avoidable financial losses.

The findings will also boost public confidence in the AACRA's road development activities, ensuring high safety standards, and boosting its reputation as an agency committed to worker and public safety. Overall, this study is crucial in developing a safety culture within the Addis Ababa road construction industry, contributing to the cities successful and sustainable infrastructure development. Furthermore, academics, researchers, and scholars will be able to refer to this in the future as there is a lack of literature on projects involving such tailored businesses.

1.6. Scope of the Study

This study is delimited in terms of its thematic, spatial, temporal, and methodological boundaries as described below:

1.6.1 Thematic scope

The study primarily focuses on assessing the safety management practices implemented in road construction projects. Although this research uses the broader term 'Safety Management' it's also gives dedicated attention to occupational safety and health practices with in road construction projects. It examines specific themes such as the existence and enforcement of

safety policies, safety training and awareness programs, investigates the challenges in managing occupational safety and health issues, and the overall compliance of safety practice.

1.6.2 Spatial scope

This study limited to safety management practices in Bole Arabssa Condominium road construction projects managed by the Addis Ababa City Roads Authority. The research will be conducted in Addis Ababa, Ethiopia, focusing on ongoing project and the study will examine safety management practice implemented by AACRA and its contractors, not covering other construction sectors.

1.6.3 Temporal scope

The study focused on ongoing road construction project which is managed and construct by the Addis Ababa city road authority during the period from 2024 to date. The selected time frame ensures that the data collected reflects current and active safety management practices. By concentrating on project that are still under implementation, the study aims to provide up to date insight in to the effectiveness and challenges of safety practice as they are being applied in real time.

1.6.4 Methodological scope

Methodologically, the study adopts a mixed methods approach, combining both quantitative and qualitative data. Primary data will be collect through structured questionnaires distributed to project manager, engineers, safety officer, site supervisors, builders, labors, along with semi-structured interviews for project manager and key stakeholders. Secondary data, including safety manual, progress reports, and incident records will also review.

1.7 Limitation of the study

Despite efforts to ensure accuracy and comprehensiveness, the study faces some limitations. These include time constraints during data collection, limited access to some internal project records due to confidentiality, and potential bias in self-reported data from respondents. Additionally, since the study focuses only on AACRA projects, the findings may not be generalizable to other regions or authorities.

1.8 Organization of the document

This study report has five chapters. The first chapter covers general background information, problem statement, study objectives, scope, limitations, and importance. The second chapter reviews the literature from both a theoretical and empirical perspective. The third chapter covers study design, methodology, population, sample size, data sources, collections, and analytic systems. The fourth chapter offers the general results and comments. The last chapter includes a summary of the investigation, conclusion, and suggestions.

2. LITERATURE REVIEW

2.1 Introduction

Academic writing requires thorough review and citation of relevant material, including essays, thesis, research reports, dissertations, and articles, Arsyad & Adila (2018). This chapter explores several literatures on the topic to give theoretical input for the investigation. The construction industry is dynamic, complicated, and distinctive, with global safety and health concerns. The literature reviewed here includes case studies from many nations to acquire a comprehensive understanding of the process.

2.1.1 History of Safety

"We must seek to understand the hazard we encounter." E.I. du Pont may have issued the first documented safety statement while establishing his gunpowder plant in the United States in 1802. It included the first safety safeguards considered during the building's design and construction, Klein (2009). However, it was a one-time action by the employer, not a rule or regulation.

An important transition from agrarian economies to industrialized civilizations was brought about by the Industrial Revolution, which started in the late 18th century. Despite increasing productivity, this shift exposed workers to previously unheard-of risks due to the introduction of machinery and factory processes, Gunningham and Democracy (2008). Accidents were frequent, and long-term exposure to dangerous substances led to the rise in occupational diseases. Numerous injuries and fatalities resulted from the absence of safety procedures, underscoring the urgent need for regulatory control, Rosner and Markowitz (2020).

Legislation to improve working conditions was introduced in the late 19th and early 20th century in response to the growing number of workplace injuries. To guarantee safer working conditions, the United States passed the historic Occupational Safety and Health Act of 1970 (Occupational Safety and Health Administration). As a result of this act, the Occupational Safety and Health Administration (OSHA) were established in 1971 with the responsibility of establishing and implementing safety regulations in a variety of industries.

Workplace safety was advanced in large part by people like Alice Hamilton. Hamilton's research on industrial toxins, including lead and other poisons, resulted in important reforms at the beginning of the 20th century. Because of her work with the Illinois Commission on Occupational Diseases, workers' compensation legislation requiring companies to put safety measures in place to safeguard workers were passed in a number of states, Sellers (1997).

Workplace safety is still a dynamic field with new issues despite tremendous progress. According to Quinlan, Bohle (2010), technological developments provide new risks, and the international economy highlights a variety of labor patterns. In order to keep worker safety as a top priority, ongoing efforts are required to modify safety procedures in response to new threats.

The continuous conflict between industrial advancement and the need to safeguard employees is demonstrated by the history of workplace safety. The journey emphasizes the significance of awareness, lobbying, and ongoing development in protecting the labor, from the dangerous conditions of early factories to the organized regulations of today.

Ethiopia's path to build and improve safety management systems has taken several decades, demonstrating the country's dedication to protecting is personnel in a variety of areas.

The basis for occupational safety and health (OSH) in Ethiopia was built in the 1940s with the implementation of basic worker-protection rules. A key milestone was the passing of the Labour Standards Proclamation No. 232/1964, which, for the first time, specified the powers and tasks of the labor inspection agency, indicating an organized approach to OSH in the nation, Seblework and Affair (2006).

In 1991, Ethiopia adopted the International Labor Organization's (ILO) Occupational Safety and Health Convention, 1981 (No. 155), demonstrating its commitment to harmonizing with global labor standards. This ratification resulted in the issuance of crucial laws, most notably Labour Proclamations No. 377/2003 and No. 515/2007, which established comprehensive frameworks for occupational safety and health in both the commercial and governmental sectors, Kumie, Amera et al. (2016).

The Ministry of Labor and Social Affairs (MOLSA) has been in charge of regulating workplace safety and health in Ethiopia. MOLSA, with an organizational structure that includes regional

networks, has played a critical role in implementing OSH standards across the country. A notable development was the approval of a national OSH policy in July 2014, which provided a strategic direction for workplace safety and health initiatives, Kumie, Amera, et.al. (2016).

According to surveys, many construction companies, particularly Grade I contractors in Addis Ababa, do not adopt good safety management standards, resulting in numerous on-site accidents. According to research, the root causes of these incidents are frequently associated with weak safety standards and managerial supervision, Samuel Wagaye (2022).

In the aviation business, Ethiopian Airlines has been recognized for incorporating safety management systems (SMS) into its corporate culture, demonstrating a commitment to addressing safety threats and maintaining an acceptable degree of safety. This strategy is consistent with worldwide aviation safety regulations and illustrates the airline's proactive attitude to safety management, Asbe Dagnachew Fisiha (2022).

Overall, Ethiopia's safety management practice has followed a progressive path, highlighted by early legislative measures, alignment with international standards, and sector-specific initiatives. Continuous development and enforcement of safety management standards are critical as the country works to improve worker safety across all industries.

2.2 Theoretical review

2.2.1 Safety and Health Definition of Basic Terms

This research presents basic definitions of commonly used terminology to provide a clear grasp of the subject matter and situation discussed in subsequent chapters. This section will briefly address the regulatory frameworks for safety in construction areas (work zones).

Safety

According to Merriam Webster Safety is described as the absence of harm, injury, or loss. It includes strategies and procedures for protecting people from damage and managing risks in a variety of settings.

In the context of occupational health and safety, safety is defined as the state in which dangers and situations that might cause physical, psychological, or material harm are regulated in order to protect the health and well-being of individuals and the community (INSPQ, Quebec National

Institute of Public Health). This includes putting in place safety standards, offering adequate training, and cultivating working culture that prioritizes preventing accidents and injuries.

The notion of safety goes beyond the workplace, embracing public safety measures, product safety regulations, and personal safety habits. It is a necessary resource in everyday life, allowing people and societies to achieve their goals without undue risk.

To summarize, safety is a multidimensional concept that includes proactive actions to safeguard persons and groups from danger, resulting in a safe and healthy environment.

Health

Health is a multidimensional term that extends beyond the absence of sickness. The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity".

The definition of true health includes physical well-being, mental well-being, and social well-being.

Physical well-being: refers to a healthy body free of disease or injury,

Mental well-being: refers to the ability to cope with stress and work productively.

Social well-being: refers to the ability to form satisfying relationships and adapt to social situations.

In 1986, the WHO underlined that health is "a resource for everyday life, not the objective of living," emphasizing its importance as a basis for a full existence.

Achieving and sustaining good health requires a careful mix of genetics, lifestyle choices, environmental effects, and access to treatment. It's a dynamic condition that necessitates continuous work and adaptability to changing situations.

In summary, health is a comprehensive state of well-being that includes physical, mental, and social components and serves as an essential resource for everyday life.

Welfare

Welfare is a broad phrase that relates to the well-being and prosperity of individuals or groups. Merriam-Webster defines welfare as “the state of doing well, especially in respect to good fortune, happiness, well-being, or prosperity”.

The concept of welfare also includes the well-being of animals, emphasizing the significance of good care and compassionate treatment. Overall, welfare refers to a wide range of initiatives aimed at guaranteeing the health, happiness, and prosperity of individuals and communities.

Hazards

A hazard is defined as any source or scenario that has the potential to cause harm, such as personal injury or illness, property damage, environmental damage, or a combination of these.

Hazards can be classed according to their nature:

Physical hazards: are external variables that can affect the body such as radiation, excessive low or high temperatures, and noise, falls, slips.

Chemical hazards: are substances that can cause harm owing to their chemical properties, such as poisons, corrosives, and combustible compounds.

Biological hazards: are biological agents that can harm people’s health, such as bacteria, viruses, fungus.

Ergonomic hazards: which arise from the design of workstations and jobs, can result in musculoskeletal injuries.

Psychosocial hazards: refer to factors that can have a negative impact on mental health, such as occupational stress or harassment.

Incident

An incident is defined as any event or occurrence, whether planned or unplanned, that has the potential to cause harm or damage or causes actual harm, injury, damage, or loss. Incidents can occur in a variety of settings, including workplaces, residences, highways, and even digital

surroundings. Understanding the many types of occurrences is critical for safety management, risk assessment, and accident avoidance.

Accidents

An accident is an unforeseen and unplanned incident that causes harm, injury, damage, or loss. Accidents, as opposed to occurrences, which can refer to any remarkable event (whether or not it causes harm), are defined by unforeseen repercussions that result in undesirable outcomes. Accidents may occur in a variety of circumstances, including the office, on the road, at home, and even during recreation activities. While accidents are not always avoidable, knowing their causes and consequences can help design methods to reduce their incidence. Accidents may be decreased by taking proactive safety measures, receiving sufficient training, and managing risks, all of which contribute to a safer environment for individuals and communities.

2.2.2 Occupational Health and Safety (OHS)

Occupational Health and Safety (OHS) is a field that focuses on protecting and promoting employees' health, safety, and well-being in the workplace. It entails identifying, assessing, and managing occupational hazards to avoid accidents, injuries, diseases, and fatalities. OHS strives to protect workers from avoidable dangers as they execute their duties.

The primary goals of occupational health and safety (OHS) are to avoid work-related injuries and illnesses by identifying and managing risks. OHS encourages worker well-being by addressing both physical and mental health concerns, acknowledging that psychological difficulties can have an influence on performance and safety. It also assures legal compliance with health and safety requirements in order to safeguard workers. Furthermore, OHS strives to provide a safe work environment by adopting safety measures such as training, suitable equipment, and emergency protocols, hence promoting total employee welfare.

The field of occupational "health and safety" is focused on creating, promoting, and maintaining the work environment, policies, and programs that guarantee employees' mental, physical, and emotional health as well as keeping the workplace environment largely free of potential or actual hazards that could cause harm to workers, Nyirendaavwil, Chinniah (2015).

2.2.3 Construction sites and Accidents

One of the most dangerous locations to work is a construction site, where employees are subjected to a variety of dangers that might cause major accidents, injuries, or even death.

Because of its nature, construction work entails a number of high-risk tasks, including handling hazardous products, operating heavy machinery, working at heights, and being exposed to environmental risks. Construction is one of the most hazardous industries, according to the Occupational Safety and Health Administration (OSHA), because of these causes. According to OSHA employers must put in place efficient safety measures to safeguard employees since construction-related incidents make up a sizable portion of workplace deaths annually, Usmen (1994).

Human mistake, poor working conditions, and noncompliance with safety rules are frequently blamed for the high accident rate in the construction industry. Physically taxing duties are usually performed by workers in difficult settings like scaffolds, trenches, or close to electrical risks. Other factors that might lead to risky work practices include inadequate training, a lack of appropriate safety equipment, and pressure to complete projects on time. Additionally, the probability of accidents might be raised by inadequate monitoring and a failure to implement safety procedures, Opfer and Shields (2011).

Accidents on construction sites have repercussions that go beyond the immediate harm and death of victims. Companies may be subject to heavy financial pressures since they have to pay for medical bills, worker compensation, possible legal fees, and project delays. Additionally, worker morale can be affected by construction accidents, which can result in a bad work environment and decreased productivity. Psychological stress, such as anxiety and post-traumatic stress disorder (PTSD), can impact an employee's general performance and well-being if they see or experience an accident, (Gómez-Salgado, Camacho-Vega. (2023).

Workers on construction sites face particular and serious dangers; therefore preventing accidents requires a proactive strategy. Construction organizations may drastically lower the frequency of workplace accidents by implementing industry rules, providing enough training, and enforcing safety measures. In addition to protecting employees, maintaining a safe workplace raises morale among coworkers, increases productivity, and lowers financial losses. Employers are not the

only ones responsible for workplace safety; employees also have a responsibility to be watchful and follow best practices in order to protect their own and their coworkers' health, OSHA (2015).

2.2.4 Causes of Construction Accidents

Given the high frequency of workplace accidents and fatalities, construction sites are among the most dangerous places to work. Heavy machinery, heights, exposure to dangerous materials, and physically taxing jobs are all part of the essence of construction labor. Serious injuries, monetary losses, and legal obligations are all possible outcomes of accidents in the construction sector. Developing efficient safety measures and reducing risks require an understanding of the main causes of construction accidents.

- ✓ Falls
- ✓ Struck-by occurrences
- ✓ Electrocution
- ✓ Caught-in-between risks
- ✓ Lack of training and
- ✓ Hazardous working conditions
- ✓ Un safe act
- ✓ Un safe conditions, are the main causes of construction accidents, Davis, Tynan et al. (2023), Occupational Safety and Health Administration, (2023).

Construction organizations must emphasize safety training, implement stringent safety standards, provide appropriate protective equipment, and perform routine site inspections in order to prevent accidents. Preventing construction accidents and guaranteeing worker well-being requires a strong safety culture, proactive risk assessment, and leadership commitment.

2.2.5 Safety Management in Diverse Construction Environments

While numerous studies have explored construction safety in general terms, it is essential to distinguish between the management of building construction safety and that of road construction. Understanding the difference between building and road construction safety management is essential for improving health and safety outcomes in Ethiopia's expanding urban infrastructure projects. Although these two types of construction are frequently carried out side

by side, they require different safety strategies due to differences in the work environment, exposure to external factors, and logistical complexity. Safety management is a critical component of construction project success, especially in environments that present varying degrees of risk.

Construction of buildings usually takes place in confined, fixed spaces where access can be tightly controlled. Common risks connected to construction projects include accidents involving construction equipment, falls from a height, scaffolding collapses, and lifting injuries, Huang and Hinze (2006) states that the main components of building site safety management are the identification of structural hazards, the use of personal protective equipment (PPE), and ongoing site monitoring. In these situations, physical barriers can be put in place, safety briefings can be held centrally, and everyone on the site perimeter can be closely watched for behavior. Predictability also improves safety in building construction because it makes it easier to schedule and manage the flow of work and keeps jobs and supplies mostly stationary.

On the other hand road construction creates a dynamic and unpredictable work environment because roads are linear in shape and frequently cross over into current traffic or public path ways; there is a greater chance that workers will be exposed to moving cars and unapproved public entrance. This greatly increases the risk of road building, especially in urban or peri-urban regions. Poor traffic control measures, inadequate signage, and limited worker visibility are often associated with roadwork fatalities, according to the Federal Highway Administration, Daniel, Elahi (2017), FHWA (2017). Workers in road construction are particularly susceptible to problems associated with both construction and traffic since road construction may cross over into residential neighborhoods that are still under development. The safety strategy must include the use of mobile safety signage, high-visibility apparel, lagging activities, and coordinated public safety communication.

The way emergency responses are handled represents yet another significant distinction. The more concentrated arrangement of construction sites enables emergency personnel to get to accident victims faster. However, emergency access may be delayed during road building, especially on sections that may be isolated or interrupted by existing urban infrastructure. Decentralized emergency planning is crucial for road improvements, according to Zou (2017),

who also suggest using mobile communications, setting up local emergency response liaisons, and periodically deploying first-aid kits.

Table 2.1: Road construction v/s Building construction safety management

Aspect	Building Construction Safety Management	Road construction Safety Management
Work Environment	Controlled site (often fenced and isolated)	Open, linear, and often in public spaces
Traffic Exposure	Minimal; mainly internal site vehicles	High; interaction with live traffic is common
Hazards	Falls from heights, scaffolding, structural collapses	Moving vehicles, equipment near traffic, uneven terrain
Access Control	Easier to manage (gates, site security)	Harder to control due to public access and long stretches
PPE (Personal Protective Equipment)	Standard PPE like helmets, harnesses, boots	Additional high-visibility gear due to traffic risks
Signage and Barricades	Focused on site-specific risks	Extensive use of road signs, cones, and barriers to protect workers and warn drivers
Emergency Response	Centralized site makes emergency handling faster	Remote or scattered locations can delay response times
Night Work	Less common, better lighting available	Common on roads; requires special lighting and visibility measures
Public Interaction	Limited	Frequent; need for public safety planning and communication

Source: Compiled by the researcher based on literature review.

In conclusion, even though the broad safety objectives of road construction and building construction are similar-such as reducing injuries, guaranteeing standard compliance, and

protecting worker health-their operational distinctions call for customized methods to safety management. While road construction necessitates excellent traffic management, visibility, and public hazard reduction, building construction places a higher priority on interior control, equipment safety, and fall avoidance.

2.2.6 Road construction Site Hazards

There are many hazards associated with road construction sites that can seriously endanger pedestrians, cars, and employees. These hazards have the potential to cause project delays, injuries, and fatalities. Here are a few typical risks associated with road construction sites.

Traffic Hazards: Construction sites are frequently located close to moving traffic, which increases the possibility of car crashes and struck-by situations. If appropriate traffic control measures, like warning signs, cones, and barriers, are not in place, workers and drivers could be in danger, Davis, Tynan (2023), Occupational Safety and Health Administration (2023).

Heavy Machinery and Equipment: If workers or operators are not adequately trained or if the equipment is not maintained, large construction equipment like excavators, bulldozers, and pavers can result in entrapments, struck-by incidents, and crush injuries, Themann, Masterson et al. (2023), National Institute for Occupational Safety and Health, NIOSH (2022).

Falls and Slips: Open trenches, damp or muddy conditions, and uneven surfaces raise the possibility of trips, falls, and slips. Falls from heights, such those from bridges or scaffolds, can cause fatalities or serious injuries danger, Davis, Tynan (2023), OSHA (2023).

Trenching and Excavation Hazards: Workers may be buried in dirt and debris due to collapse risks associated with trenches and excavations. Trench boxes, shoring, and slope are among the protective measures mandated by OSHA regulations to prevent cave-ins, Davis, Tynan (2023), OSHA (2023).

Electrical Hazards: Potential hazards for electrocution or burns include overhead power line, underground utilities, and temporary electrical installations. Using tools or running machinery can expose workers to live wires, Themann, Masterson (2023), NIOSH (2022).

Exposure to Hazardous Substances: Construction workers may be exposed to silica dust, asphalt fumes, and concrete dust, among other dangerous substances that can cause long-term

health consequences and respiratory problems, Dang, Rajendran (2024), (Centers for Disease Control and Prevention, CDC (2021).

Extreme Weather Conditions: Extreme weather conditions are common occurrence at road construction sites. If appropriate precautions are not taken, workers may be at risk for health problems from heat stress, cold stress, and storms, Themann, Masterson (2023), NIOSH (2021).

Poor Visibility and Lighting: Nighttime working conditions, fog, dust, and inadequate lighting can all make it harder for drivers and employees to see, which raises the risk of accidents, Davis, Tynan (2023), OSHA (2023).

Fatigue and Human Error: Extended workdays and physically taxing jobs can cause employee exhaustion, which affects judgment and reaction times and raises the possibility of mishaps or increases the risk of accidents, Dang, Rajendran (2024), CDC (2021).

Hazards of Noise and Vibration: Long-term exposure to loud construction equipment noise can result in hearing loss, and heavy machinery vibrations can develop hand-arm vibration syndrome, Themann, Masterson (2023), NIOSH (2022).

To mitigate these hazards, construction companies must implement strict safety measures, including worker training, personal protective equipment (PPE), site inspections, and traffic control plans. Compliance with OSHA and NIOSH regulations can help reduce accidents and improve workplace safety.

2.2.6.1 Hazard Assessment

In order to protect workers' safety and wellbeing, hazard assessment is a methodical procedure used to detect, assess, and manage any dangers in the workplace. In order to minimize workplace accidents and comply with legal requirements, it is essential to occupational health and safety management systems. Through proactive hazard assessment, companies may avert diseases, injuries, and property damage, eventually creating a safer workplace.

Hazards at work can come from a variety of sources, such as equipment, chemicals, people, the environment, and organizational procedures. Accidents, injuries, and even fatalities might result from these hazards being undiscovered in the absence of a competent hazard assessment. Both short-term threats and long-term hazards that might eventually compromise employees' health

can be found with the aid of a well-organized hazard assessment procedure. Additionally, it lessens the possibility of legal and financial consequences for firms by guaranteeing adherence to occupational safety laws, such as those established by the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA).

2.2.6.2 Crucial Phases in Hazard Assessment

Hazard Identification: Identifying possible risks at work is the first stage in the hazard assessment process. This entails examining tolls, supplies, machines, work procedures, and the workplace as a whole. Physical risks (such as falls, noise, and heat), chemical risks (such as poisonous vapors and spills), biological risks (such as bacteria and viruses), ergonomic risks (such as bad posture and repetitive strain), and psychosocial risks (such as workplace stress and violence) are examples of common dangers, Davis, Tynan (2023), OSHA (2023).

Risk Evaluation: Employers utilize risk matrices and assessment tools to classify risks as low, moderate, or high. This process helps prioritize hazards that need immediate intervention while making sure minor risks are still adequately addressed. The next step after identifying hazards is to evaluate their severity and likelihood of causing harm, Themann, Masterson (2023), NIOSH (2022).

Implementation of Control Measures: Following hazard assessment, organizations need to put in place the proper controls to reduce or eliminate risks. The hierarchy of controls offers an organized method.

Elimination: Completely removing the hazard (e.g., stopping the use of hazardous chemicals); **Substitution:** Changing hazardous materials or processes with safer alternatives (e.g., using non-toxic cleaning agents).

Engineering Controls: Changing workspaces, ventilation, or equipment to reduce exposure (e.g, installing guardrails or soundproofing).

Administrative Controls: Creating policies, procedures, and training programs to minimize risk (e.g., rotating shifts to reduce fatigue).

Personal Protective Equipment (PPE): Giving workers protective gear, such as gloves, helmets, goggles, and respirators, as a last resort, Dang, Rajendran (2024), CDC (2021).

Monitoring and Review: Rather than being a one-time assessment, hazard assessments ought to be a continuous procedure. The effectiveness of control mechanisms is maintained by routine inspections, staff input, and incident investigations. Reassessment is required to handle developing risks whenever new hazards emerge as a result of modifications to work procedures, tools, or persons, Davis, Tynan (2023), OSHA (2023).

2.2.6.3 Benefits of Hazard Assessment

There are several advantages to a thorough danger assessment procedure, such as:

- **Reduces Workplace Accidents and Injuries**: Proactively identifying hazards minimizes the risk of workplace incidents.
- **Ensures Regulatory Compliance**: Adhering to OSHA and NIOSH guidelines helps businesses comply with safety laws and avoid penalties.
- **Enhances Worker Safety and Productivity**: A safe work environment leads to fewer injuries, improved morale, and higher productivity, Themann, Masterson (2023), NIOSH (2022).
- **Prevents Financial Losses**: Workplace accidents can lead to legal liabilities, compensation claims, and downtime; hazard assessments help mitigate these risks.

2.2.6.4 Importance of safety in the workplace

A key component of every organization is workplace safety, which guarantees that workers are working in a risk-free environment. Strong safety cultures improve productivity, lower workplace accidents, and foster a positive work atmosphere. Organizations that put safety first not only meet legal requirements but also enjoy higher employee satisfaction, lower losses, and more effective operations. Businesses can reduce diseases, injuries, and deaths while fostering a culture of responsibility and well-being by putting in place efficient safety measures, Davis, Tynan (2023), OSHA (2023).

Organizations may make workplaces safer and more productive by preventing accidents, adhering to regulatory requirements, improving employee morale, and lowering costs. In addition to protecting workers, a strong commitment to workplace safety supports the organization’s long-term viability and success. To adjust to changing workplace hazards and

protect the health of their employees, employers must constantly assess and enhance safety protocols.

2.2.7 Safety management practices

To provide a safe and healthy working environment for employees, safety management is a methodical approach to risk identification, assessment, and mitigation. It includes guidelines, protocols, and methods intended to stop accidents, injuries, and occupational diseases. Complying with legal and regulatory standards, minimizing financial losses, raising employee morale, and increasing overall productivity all depend on effective safety management. Companies can prevent workplace accidents and promote a safety culture by putting in place a structured safety management system (SMS), OSHA (2023). The foundation of safety management lies in identifying workplace hazards and assessing associated risks.

Organizations can put in place efficient control measures by conducting a thorough risk assessment, which determines the seriousness and probability of hazards causing injury, Themann, Masterson (2023), National Institute for Occupational Safety and Health, NIOSH (2022).

Safety policies and procedures must be created and implemented by organizations in accordance with industry standards and laws. These rules insure that safety procedures are continuously followed by acting as guides for management and staff. A systematic approach to accident prevention and response is facilitated by well-documented safety regulation, Davis, Tynan (2023), OSHA (2023).

Maintaining occupational safety requires proper training. Workers must get training on identifying risks, adhering to safety procedures, and handling crises. Effective training programs include new employee orientation, job-specific training, regular safety drills and workshops. Continuous safety education ensures employees remain aware of evolving hazards and understand their role in maintaining a safe workplace, Dang, Rajendran (2024), Centers for Disease Control and Prevention, CDC (2021).

Reporting and looking into occurrences at work are important parts of safety management. For workers to report mishaps, near misses, and hazardous situations, organizations need to maintain a transparent mechanism. Investigating events helps in determining the underlying reasons and

averting such mishaps in the future. Usually, the procedure entails documenting the incident, identifying causes, and implementing corrective actions. An organized reporting system increases responsibility and motivates staff to take part in safety improvement initiatives, Themann, Masterson (2023), NIOSH (2022).

The effectiveness of workplace safety measures is maintained by periodic safety audits and inspections. While inspections find possible risks before they become dangerous, audits assist companies in assessing adherence to safety regulations. The audit procedure consists of reviewing safety policies and procedures, evaluating workplace conditions, assessing employee compliance. Organizations can find flaws in their safety management systems and address them before accidents happen with the use of proactive safety audits, Davis, Tynan (2023), OSHA (2023).

A proactive attitude to hazard prevention is encouraged by a strong safety culture. Employers that place a high priority on safety urge staff members to be accountable for their own and their colleagues' health. Techniques for creating a culture of safety that is favorable include:

Leadership Commitment: Supervisors and managers need to set a good example and take an active part in safety-related projects,

Open Communication: Encouraging staff members to report dangerous situations and raise concerns without worrying about reprisals.

Recognition and Incentives: Rewarding employees who demonstrate exceptional commitment to workplace safety.

Strong safety cultures at work lead to fewer mishaps, more worker involvement, and better job satisfaction, Dang, Rajendran (2024), CDC (2021).

2.2.7.1 Factors affecting safety management practices in construction

The success of safety programs and procedures is determined by a number of elements that impact safety management performance in the construction sector. Heavy machinery, working at heights, exposure to dangerous materials, and complicated work situations make construction sites intrinsically dangerous. Reducing workplace accidents, sustaining productivity, and guaranteeing legal compliance all depend on effective safety management. The effectiveness of

safety management in construction is influenced by a number of internal and external factors. Organizations can improve safety performance and provide safer work environments by being aware of these aspects, OSHA (2023).

Leadership and Management Commitment: A construction company's safety culture is greatly influenced by the dedication of its senior management. Employees are more likely to follow safety rules when managers proactively promote safety projects, assign resources, and enforce standards. Commitment to leadership consists of: defining precise safety goals and guidelines, supplying equipment and financial and human resources for safety training, promoting candid dialogue on safety issues, holding employees and managers responsible for their safety performance.

Strong leadership participation in safety initiatives has been demonstrated to dramatically lower workplace incidents, NIOSH (2022).

Worker Training and Competency: To guarantee that employees comprehend safety procedures and danger reduction techniques, proper training is crucial. Inadequate training might result in more accidents since the construction sector involves a variety of duties that call for specific abilities. Important elements of employee training consist of: orientation programs for new employees, task-specific safety training (e.g., working at heights, handling hazardous materials), emergency response and first aid training, regular refresher courses and safety drills.

Employees with proper training are more likely to recognize possible risks and adhere to safety protocols, which enhances overall performance in safety management, Dang, Rajendran (2024), CDC (2021).

Workplace Safety Culture: A proactive attitude to hazard prevention is encouraged by a strong safety culture. It represents the common beliefs, dispositions, and actions of workers with regard to workplace safety. A positive safety culture is influenced by the following factors: encouraging employees to disclose risks without worrying about reprisals, praising and rewarding safe conduct, Leadership setting an example by prioritizing safety, Conduction regular safety meetings and discussions.

Positive safety cultures reduce occurrences because employees take personal responsibility for keeping the workplace safe, Davis, Tynan (2023), OSHA (2023).

Communication and Worker Engagement: For workers to receive safety procedures and hazard alerts, effective communication is essential. Misunderstandings, risky behaviors, and an elevated risk of accidents can arise from inadequate communication. The following are some best practices for enhancing communication: provide easily understood safety information in several languages, if required, delivering safety briefings ever day prior to work starting, encouraging employees to voice their safety concerns in a two-way manner, delivering real-time hazard notifications via technology (such as digital signs and smartphone applications).

Worker engagement also plays a key role in safety management. Employees who actively participate in safety programs are more likely to adhere to protocols and contribute to a safer work environment, Themann, Masterson (2023), (NIOSH, 2022).

Regulatory Compliance and Legal Requirements: Occupational safety laws must be followed by construction companies in order to safeguard workers and stay out of trouble with the law. Standards are established by regulations issued by agencies such as OSHA, NIOSH, and local labor departments for: personal protective equipment (PPE) usage, all protection measures, equipment safety and maintenance, and record-keeping of workplace injuries and incidents.

There may be penalties, legal action, and reputational harm for breaking these rules. Companies enhance their safety performance and prevent expensive infractions by incorporating compliance into their safety management strategy, Davis, Tynan (2023), (OSHA, 2023).

Availability of Safety Resources and Equipment: Safety performance may suffer from a shortage of safety resources, such as personal protective equipment (PPE), safety tools, and emergency response kits. Construction companies need to guarantee that employees have access to:

- ✓ High-quality helmets, gloves, safety goggles, and protective clothing.
- ✓ Fall arrest systems and scaffolding for working at heights.
- ✓ Fire extinguishers and first aid stations.
- ✓ Well-maintained machinery and tools.

A company's commitment to worker will-being is demonstrated by allocating sufficient resources for safety measures, which also improves adherence to safety regulations, Dang, Rajendran (2024), (CDC, 2021).

Worksite Conditions and Environmental Factors: Construction sites frequently offer difficult working circumstances, such as: uneven terrain and slippery surfaces, exposure to extreme weather conditions (heat, cold, rain, and wind), poor lighting in confined spaces, high noise levels from machinery.

To reduce hazards, adaptive safety measures should be put in place and environmental conditions should be evaluated on a regular basis. Precautionary steps are necessary for weather-related dangers, such as providing cooling stations to reduce heat stress or postponing work during storms, Themann, Masterson (2023), (NIOSH, 2022).

Worker Fatigue and Mental Health: Construction safety performance is greatly impacted by worker stress and weariness. Shift work, long hours, and tight deadlines all lead to fatigue and diminished focus, which raises the possibility of mishaps. Companies may increase worker safety by: implementing reasonable work schedules with adequate breaks, promoting mental health awareness and stress management programs, encouraging workers to report fatigue related concerns.

Overall safety and productivity are increased when worker weariness and mental health concerns are addressed, Dang, Rajendran (2024), (CDC, 2021).

Safety Audits and Continuous Improvement: Frequent safety audits and inspections offer chances for improvement and assist in identifying flaws in safety management systems. Workplace mishaps are lower for organizations that regularly assess their safety procedures and take remedial action. A proactive safety strategy consists of: conducting routine site inspections to identity hazards, reviewing accident reports to determine root causes, updating safety policies based on new risks and regulatory changes, seeking worker feedback to improve safety programs.

Safety measures are continuously assessed and improved to guarantee their long-term efficacy and conformity with changing industry requirements, Davis, Tynan (2023), OSHA 2023). In

general numerous elements, including as resource availability, worker training, communication, leadership commitment, and regulatory compliance, affect safety management success in the construction sector. Reducing workplace accidents and guaranteeing a safe working environment are made possible by a strong safety culture, efficient hazard identification, and ongoing improvement initiatives. Construction businesses may improve safety performance, adhere to regulatory standards, and safeguard their employees from occupational dangers by addressing these concerns.

2.2.8 Safety Training and Awareness

Safety training and awareness are essential components of safety management practices, particularly in developing countries like Ethiopia, where industrialization is rapidly increasing. Work-related injuries and accidents are prevalent in sectors like construction, manufacturing, and small-scale industries, largely due to limited safety awareness, inadequate training, and poor enforcement of safety regulations, Kumie, Amera, et.al (2016).

Safety training and awareness programs aim to employees with the necessary knowledge and skills to identify hazards, use personal protective equipment, and adhere to safety protocols. Globally, study has demonstrated that structured training reduces workplace accidents, enhance workers knowledge, and foster a culture of safety, Wang, Zhang, & Li, (2023).

In Ethiopia, researches indicate that the implementation of safety training programs remains inconsistent, with many workers reporting low exposure to formal safety instruction, Tadesse, S., & Israel, D. (2016). Factors such as limited resources, literacy level, and organizational culture influence the effectiveness of these programs, Aliyi, A. A., Hashim, M. A., & Abdurebi, M. J. (2024).

2.2.8.1 Types of safety training and awareness

Safety training and awareness programs can be categorized into several types, depending on the method of delivery, content, and target audience:

Formal Classroom Training: Traditional classroom-based instruction involves lectures, presentations, and written material. It focuses on theoretical knowledge about workplace hazards, safety regulations, and proper use of personal protective equipment's. While widely used, studies

suggest that classroom training alone may have limited impact on behavior if not reinforced through practical application, Cohen & Colligan (1998).

On-the-job Training: Involves direct instruction at the workplace, where employees learn by performing tasks under supervision. This method helps workers apply safety knowledge in real-world scenarios and is particularly effective in Ethiopian construction and manufacturing sectors, where practical skills are essential, Aliyi, A. Hashim, M. & Abdurebi, M. J. (2024).

E-Learning and Digital Platforms: With advancement in technology, e-learning platforms provide flexible, self-paced safety training modules. These platforms can include videos, and interactives simulations. In Ethiopia is still emerging but offers potential for expanding access to safety training, especially in urban industrial centers, Mengsah.Y, Dagnew.Z, & Aderaw.Z (2022).

Immersive Training: Virtual Reality (VR) and (Augmented Reality (AR) provide immersive environments where employees can safely experience hazardous scenarios. Studies globally show that these methods enhance engagement, knowledge retention, and risk perception, Sacks, Perlman, & Barak (2013). While still limited in Ethiopia, such methods could be valuable in high-risk industries.

Safety Awareness Campaigns: Awareness campaigns include posters, workshops, toolbox, and group discussions to reinforce safety knowledge and promote safe behavior. In Ethiopia, these are often used alongside training to improve PPE usage and hazard recognition, particularly among construction and industrial workers, Alemu.A, Yitayew.M, & Azazeh.A (2020).

Specialized Training Programs: Certain industries require specialized safety training, such as chemical handling, electrical safety, or radiation protection. An Ethiopian study indicates that targeted training significantly improves compliance and reduces sector-specific hazards, Geletu, Abiko, & Sahlu (2019).

2.2.9 Challenges to Manage Occupational Safety and Health in the Construction Industry

Because the construction industry is extremely dangerous, occupational safety and health (OSH) management is still a major problem. The absence of a robust safety culture is among the biggest

obstacles. Safety is not ingrained in the organizational culture in many construction organizations, particularly those where cost effectiveness and productivity are given top priority. This leads to the normalization of risky behavior including working without personal protective equipment (PPE), ignoring hazard signals, or circumventing conventional procedures. Employees may not take safety precautions seriously if management does not set an example or enforce them, Al-Bayati, A., et al. (2024).

Managing Occupational safety and Health (OSH) in the construction industry presents multiple challenges. These challenges common issues include.

OSH Challenges in Construction industry:

Unskilled Labor: The extensive employment of unskilled labor in construction poses a substantial challenge to occupational safety and health (OSH). Many workers arrive on the job site without proper training or experience, making them more vulnerable to accidents. These workers are frequently unaware of site-specific hazards and are unfamiliar with proper tool and machinery handling techniques. As a result, individuals are more prone to engage in unsafe behavior or be exposed to hazardous conditions. According to the International Labour Organization (2015), inadequate labor skill levels are a major cause to the construction industry's high accident rate. Improved training and certification are critical for mitigating these hazards, Costa, Matias (2021).

Lack of PPE (Personal Protective Equipment): The construction sector faces significant injuries and fatalities due to inadequate personal protective equipment (PPE). Workers are vulnerable to hazards like falling objects, sharp tools, and hazardous substances. Employers often fail to provide adequate PPE due to cost-cutting or ignorance. The International Labor Organization (ILO) states that inadequate PPE is a persistent issue in low- and middle-income countries, threatening workers' health and safety.

Lack of Technical Guides or Training: One major obstacle to efficient OSH management in the construction industry is the lack of consistent safety training and technical assistance. Untrained workers frequently don't know how to handle equipment safely or what hazards are unique to a given place. This makes it more difficult for them to adhere to safety protocols or react correctly in an emergency. Inadequate training is directly associated with higher accident

rates in construction settings Workers are exposed to avoidable risks in the absence of ongoing training and clear technical instructions. To promote safer workplaces, it is imperative to invest in organized safety training, Estudillo, Forteza (2025)

Ineffectiveness of Safety and Health Policies: Outdated legislation, ambiguous procedures, and insufficient enforcement mechanisms are frequently the cause of ineffective safety and health measures in the construction industry. These flaws raise the possibility of workplace accidents by causing non-compliance at different organizational levels. According to recent study, obstacles including conflicting safety protocols and a lack of ongoing oversight make it difficult to apply efficient safety measures in building projects. To address these problems and improve workplace safety and health outcomes, thorough, current regulations and strong enforcement tactics must be developed, Sarvari, Edwards (2025).

Lack of Management Commitment: Top management's lack of commitment is a major obstacle to efficient occupational safety and health (OSH) management in the construction industry. Employee incentive to follow safety procedures is decreased when leadership fails to emphasize safety, sending the message that it is not a top priority. According to a recent study conducted in Ethiopia, a significant health and safety issue in building construction projects is a lack of management commitment, which has an effect on workers' safety performance and well-being. This emphasizes how leadership must actively participate in and give priority to safety measures in order to promote a safety culture inside construction companies, Alemayeh and Ayalew (2024).

Lack of Adequate Inspection by Supervisors: Supervisor's inadequate safety inspections may result in hidden dangers, raising the possibility of mishaps on building sites. Inadequate supervision is a major contributor to hazardous working conditions, according to a study that examined 176 serious construction accidents and discovered a substantial correlation between risk management and prompt supervision. The study highlights the necessity of thorough and frequent inspections in order to efficiently detect and reduce possible hazards. To improve occupational safety and health outcomes in construction projects, supervisory inspections must be conducted more frequently and with higher quality, Winge, Albrechtsen (2019).

Insufficient Safety Budgets: Effective occupational health and safety (OHS) measures are difficult to execute in the construction industry due to inadequate safety expenditures. According to a recent study, a lack of funding makes it difficult to hire qualified safety personnel, provide training programs, and buy necessary safety equipment. Construction sites' overall safety performance is compromised by this underfunding, which raises the possibility of mishaps and injuries. In order to guarantee through safety management and adherence to OHS regulations, the study highlights the necessity of allocating a sufficient budget, Zeibak-Shini, Malka (2024).

Reluctance to Invest in Safety Resources: Some contractors in the construction sector believe that safety expenditures are unnecessary, especially in low-bid or profit-driven project settings. The need to cut expenses and increase profits frequently causes this hesitancy, which results in underinvestment in safety precautions. Despite the possibility of long-term cost saving and enhanced safety results, a recent study shows that construction businesses are frequently reluctant to devote resources to preventive efforts. Increased accidents, project delays, and greater overall expenses as a result of events and fines from the government can all be caused by this underinvestment. Therefore, improving occupational health and safety in the construction industry requires acknowledging safety investments as essential to project success, Shohet, Luzi. (2018).

Excessive Working Hours: Workers in the construction industry who work long hours become fatigued, which impairs their ability to make decisions, respond quickly, and remain awake. Over 745,000 fatalities from ischemic heart disease and stroke were attributed to working 55 hours or more per week in 2016, according to a comprehensive review conducted by the World Health Organization and the International Labour Organization. This emphasizes the serous health hazards linked to extended work hours. Occupational safety and health outcomes in the construction industry can be improved by putting regulations in place the restrict working hours and encourage enough rest, Pega, Náfrádi (2021).

Poor Performance of Machinery: On construction sites, the danger of accidents is greatly increased by poorly kept or broken machinery. Inadequate maintenance was shown to be the main cause of occurrences in a systematic analysis of heavy machinery-related workplace accidents, highlighting the importance of routine inspections and adherence to maintenance procedures. To reduce mechanical risks and improve overall safety in construction projects, it is

essential to make sure that equipment is properly maintained and managed by qualified staff, Duarte, Marques (2021).

Lack of Signals or Safety Barriers: Open excavations, roadwork, or hazardous zones without adequate warning signs or physical barriers significantly increase the risk of falls, collisions, and other accidents on construction sites. A recent study highlights that traditional passive protection methods, such as traffic cones and safety beacons, are often insufficient in preventing accidents. The research emphasizes the need for active protection systems, including acoustic and visual warning signals, to enhance worker safety. Implementing such systems can effectively alert workers to approaching hazards, thereby reducing the likelihood of accidents in high-risk areas, Ni, Perera (2023)**.**

Work Overlap (Multiple Tasks at Once): Simultaneous construction activities in close proximity can lead to congestion, confusion, and coordination issues, heightening the risk of accidents. A recent study introduced a Building Information Modeling (BIM)-based approach to assess the increased hazards resulting from overlapping tasks. By analyzing data from OSHA and NIOSH fatal accident reports, the study identified specific activity combinations that escalate risk when performed concurrently. The findings underscore the importance of proactive planning and coordination to mitigate safety risks associated with overlapping construction activities, Rashidi Nasab, Malekitabar (2023).

Job Dissatisfaction: Construction workers who are dissatisfied with their jobs are more likely to take needless risks and to disregard safety procedures. The association between safety-related stressors and safety behaviors is considerably mediated by job satisfaction, according to a study by Wang and Xu (2022), suggesting that disgruntled employees are less likely to follow safety protocols. Enhancing safety compliance and lowering workplace accidents can be achieved by improving job satisfaction through improved communication, well-defined roles, and encouraging management, Rashidi Nasab, Malekitabar (2023).

Worker Fatigue (Physical and Mental): Construction workers who are physically and mentally exhausted are much less able to identify risks, make wise judgments, and maintain coordination, which raises the possibility of accidents. According to a recent study, weariness has a negative impact on workers' cognitive abilities, which lowers their situational awareness and safety

performance. The study highlights the need to improve occupational safety in the construction industry by putting fatigue management techniques into practice, such as sufficient rest intervals and workload modifications, Rashidi Nasab, Malekitabar (2023).

2.2.9.1 Improvement of Safety Performance

Reducing workplace dangers, averting accidents, and guaranteeing adherence to occupational safety standards are the goals of the ongoing process of improving safety performance. Reduced injuries, higher output, and happier workers are all results of effective safety performance. Leadership commitment, danger identification, safety training, safety control installation, and ongoing monitoring are all ways that organizations may enhance their safety performance. Maintaining long-term gains in safety management requires a proactive strategy, Occupational Safety and Health Administration (2023).

In general, negative measures like accident frequency, days lost, injury rates, and accident cost are frequently used to assess safety performance. By establishing safety goals and targets, it is crucial to assess safety performance in order to determine how well construction companies' management avoid accidents, Permana (2007).

2.2.9.2 Key Strategies for Improving Safety Performance

The well- being of employees, regulatory compliance, and organizational success all depend on safety performance. A positive work environment, increased productivity, and fewer incidents can all be achieved with the aid of effective safety measures. The following are the key strategies for enhancing safety performances.

- ✓ Leadership Commitment and Safety Culture
- ✓ Hazard Identification and Risk Assessment
- ✓ Safety Training and Employee Competency Development
- ✓ Implementation of Safety Controls
- ✓ Use of Technology and Data-Driven Safety Measures
- ✓ Safety Audits, Inspections, and Continuous Improvement
- ✓ Worker Engagement and Participation

2.3 Empirical review

In their 2017 study, Idris Jeelani, Alex Albert, and Jhon Gambatese investigate why construction hazards often remain unrecognized at the work interface, Jeelani, Albert et al. (2017). Several important elements that contributed to this problem were found by the researchers:

Findings: Because workers may believe that prior experiences would predict future safety, familiarity and complacency might result in a decreased sense of risk awareness. Tight project timelines can also cause time pressures and hasty evaluations, which can lead to hurried risk assessments. Members of the team who don't communicate well may misunderstand risk or fail to adequately warn of possible angers. The report suggests better communication procedures, more Hazard Recognition Training, and a proactive safety-conscious culture as solutions to these issues. These tactics can limit workplace accidents, lessen the possibility of unknown dangers, and enhance overall safety performance in construction organizations. By putting these tactics into practice, workplace accidents may be decreased and overall safety performance can be enhanced.

In the study of T.Niskanen The significance of organizational elements in lowering accidents and enhancing safety performance was highlighted, Niskanen and Prevention (1994).

Findings: Strong management commitment to safety was shown to be essential for preserving a safe workplace because it promoted more proactive risk management and adherence to safety procedures. On the other hand, safety compliance decreased and accident rates increased when management prioritized cost-cutting or productivity. Workplace safety was greatly enhanced by employee participation in safety decision-making, risk assessments, and training initiatives. Employees were more willing to report dangers, follow protocols, and assume personal responsibility for on-site safety if they felt empowered and participating in safety conversations. Construction a robust safety atmosphere required an open communication culture.

Due to the high-risk nature of road maintenance labour, ongoing safety awareness and training were also crucial in lowering workplace dangers. Workers were kept alert and ready for unforeseen dangers thanks to proper training.

Accident rates were far lower in organizations with a strong safety atmosphere than in those where safety was viewed as a secondary issue. Injury rates and safety breaches were greater in companies with a poor safety culture, little training, and lax enforcement of regulations.
Strengthening leadership commitment, fostering employee involvement in safety planning, improving safety training initiatives, and advancing a good safety culture are some suggestions for improvement. By emphasizing organizational elements like training, leadership, and communication, Niskanen's study showed how important a robust safety atmosphere is to lowering accidents and protecting the health of road maintenance personnel.

Yure and Deyganto (2024) Organizations with strong safety climates are more aware of dangers, take fewer risks, and follow procedures more rigorously. Positive safety climates also lead to fewer accidents and injuries. Strengthening leadership commitment, promoting employee participation and communication, conducting frequent safety training and monitoring, and rewarding staff for safe behaviors and near-miss reporting are some suggestions for enhancing the safety atmosphere.

Findings: According to the study, a number of factors affect the safety management procedures used in road construction projects in the Sidama Region. It highlights the significance of PPE use, equipment maintenance, traffic control, and safety training. Inadequate training raises the risk of accidents and inefficiency. Accident risks are decreased by effective traffic management, which includes speed restrictions and signs. While irregular maintenance procedures raise the danger, routine equipment maintenance reduces the likelihood of accident involving machinery. Although using PPE correctly is essential, enforcement is still difficult. Accident rates are also decreased when employees, managers, and supervisors communicate well. Project efficiency may be increased by putting these strategies into practice.

In a related study, Wongel Gedeon (2020) explored health and safety management practices across 18 city road construction projects in Addis Ababa. The research evaluated the performance of foreign and local contractors based on six health and safety indicators.

Findings: The study concluded that while foreign contractors had relatively better safety management practices, local contractors performed poorly in terms of training, supervision, hazard mitigation, and environmental safety, Gedeon (2020). Frequent injuries were linked to

lack of awareness, exposure to dust and noise, and unguarded excavations. The study emphasized the importance of awareness creation, consistent use of PPE, and stronger collaboration between contractors and government agencies.

Looking beyond Addis Ababa, Abinet Desalegn (2022) focused on road construction projects under the Ethiopian Roads Administration (ERA) in the Central Region, Desalegn (2022). The study used a descriptive research design and gathered data through structured questionnaires administered to ERA staff and contractors.

Findings: The results showed that safety was treated as a secondary concern. There was limited safety-related training, no formal safety management systems, and minimal documentation of hazards and near misses. The findings underscored a reliance of PPE rather than proactive hazards prevention and risk planning. The study recommended institutionalizing safety management through formal guidelines, training programs, and stronger monitoring mechanisms.

Another relevant study by Yehualashet Menalekulet (2024) investigated risk management practices in road projects under the Ethiopian Roads Authority (ERA), Menalekulet (2024). While not limited solely to safety, the study identified safety-related risks among the top concerns in project execution. Using a mixed-method approach and data from engineers and project managers, the research listed 28 risk factors, including worker injury, machinery malfunction, and environmental hazards.

Findings: The study found that contractors lacked formal risk identification procedures and often managed hazards reactively. It recommended establishing dedicated risk management units and integrating safety into broader project risk frameworks.

In a more project-specific context, the Final Environmental and Social Impact Assessment (ESIA) for the Shekhusen-Mechara Road Project, UNICONE (2022) included a dedicated assessment of safety practices. The report documented on-site risks such as unsafe handling of explosives, absence of first-aid facilities, and lack of emergency response planning.

Findings: It recommended several mitigation strategies including the use of trained occupational safety officers, safety signage, and improved health infrastructure for workers. Although not an

academic thesis, the ESIA provides crucial insights into real-time project conditions in Ethiopia's regional areas.

Table 2.2: Summary of Empirical Findings

Study	Focus Area	Key Findings	Recommendation
Idris Jeelani, Alex Albert, Jhon Gambatese	Construction hazards	Lack of communication	Communication procedures, Hazard recognition training
T.Niskanen	Organizational element	Lack of strong management	Strong communication, strengthening leadership commitment
Yure and Deyganto	Sidama region road construction	Lack of safety training, PPE use	Strengthening leadership commitment, employee participation and communication
Gedeon (2020)	Local vs. foreign contractor safety	Local contractors underperform; frequent worker injuries	Awareness campaigns, better coordination
Desalegn (2022)	Central Region ERA projects	Safety treated as secondary; lack of formal systems	Develop institutional safety management policies
Menalekulet (2024)	ERA-wide risk management	28 major risks identified; safety poorly managed	Integrate safety into broader risk planning
UNICONE (2022)	Shekhusen-Mechara ESIA	Unsafe practices in remote road works	Hire safety officers, emergency planning

Source: Compiled by the researcher based on literature review (2025).

2.3.1 Identified research gaps

Despite a growing body of literature on occupational safety in the construction sector, some critical gaps exist, notably in the context of road construction projects in Ethiopia, and more specifically, those under the Addis Ababa City Road Authority.

The major gap is Scarcity of Research on AACRA Projects, although various studies have looked into national-level projects (for example, those run by the Ethiopian Roads Administration), there has been little study on AACRA-led road projects. Given AACRA's critical position in the city's infrastructure development, this represents a significant research gap.

2.3.2 Conceptual Framework

This study's conceptual framework aims to show how safety management procedures and road building projects' safety performance relate to one another at the Addis Ababa city road authority. Based on the fundamentals of occupational safety and health management systems (OSHMS), the framework provides a basis for comprehending how different aspects of safety management help to reduce risks, preventing accidents, and promoting safe work environment.

This framework's independent variables include management commitment, worker participation, safety policy and planning, hazard identification and risk assessment, safety training and awareness, and safety communication. According to guidelines like OHSAS 18001 and ISO 45001, these elements presents the fundamental procedures often present in successful safety management systems, Fernández-Muñiz (2007).

The dependent variable is safety performance, which is reflected in indicators such as the frequency and severity of accidents, the level of compliance with safety regulations, and workers' perceptions of site safety. The mediating factors include safety culture, supervisory control, and resource allocation, which influence how safety practices are implemented on site.

This framework assumes that well-planned and consistently implemented safety management practices will lead to improved safety outcomes by fostering a proactive approach to hazard control and risk mitigation. Effective implementation of safety policies, regular training programs, and active worker participation create a culture where safety is prioritized at all organizational levels. These practices ensure that risks are identified early, appropriate control

measures are put in place, and workers are adequately equipped and informed to handle potential dangers on site.

Conversely, inadequate safety practices such as outdated safety policies, infrequent training, and poor communication are likely to create confusion, lower morale, and reduce compliance with safety protocols. A lack of visible commitment from management can demotivate workers and signal that safety is not a core organizational value, thereby increasing the likelihood of unsafe behaviors and preventable incidents. Furthermore, when safety responsibilities are not clearly defined or when resources such as protective equipment and supervision are insufficient, the working environment becomes vulnerable to both minor injuries and major accidents. Therefore, the framework emphasizes the interconnectedness of strategic planning, human behavior, and resource support in achieving desired safety performance outcomes in road construction projects. The figure below illustrates the conceptual framework of the study

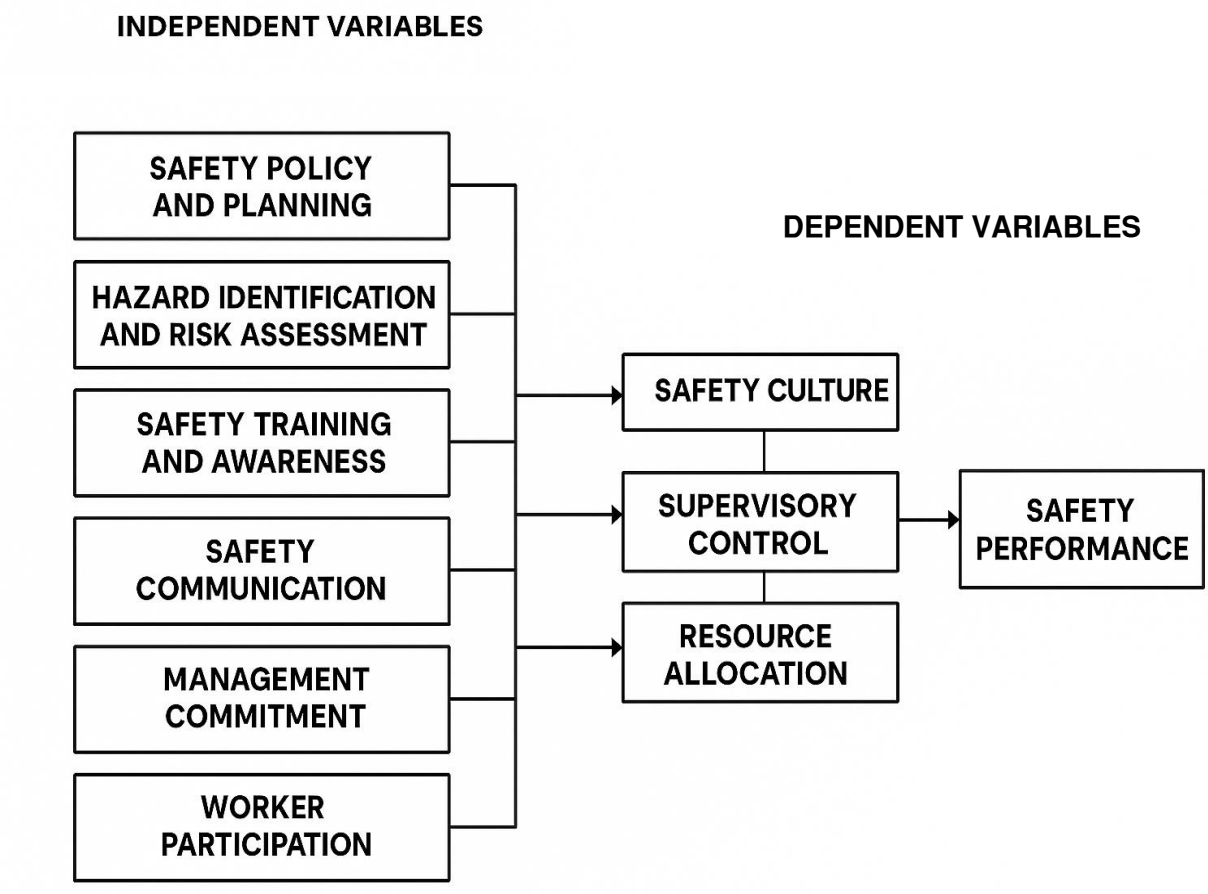

Figure 2.1: Illustrative conceptual framework, Source: Compiled by the researcher based on literature review (2025).

3. RESEARCH METHODOLOGY

3.1 Introduction

The study's methodology is presented in this chapter. The study design, data type and source, sample design, sampling methodology, data collection tools, population, data analysis and presentation method, data validity and reliability, and, lastly, ethical considerations of the project activity are all thoroughly covered in this chapter.

3.2 Research Design

The study employed a descriptive survey research design. The design was chosen because it is appropriate for studies that seek to describe existing condition, practices, and perceptions without manipulating variable, Kothari (2004). Specifically the survey design allowed the researcher to collect both quantitative data through structured questionnaires distributed to project staff and quantitative data through semi-structured interviews with key informants.

The design facilitated data collection from a larger and diverse group of participants within Addis Ababa City Road Authority road projects at a reasonable cost and time. The combination provided both breadth and depth of information regarding safety and health management practice.

3.3 Research Approach

The research uses a mixed-methods approach, combining quantitative and qualitative methods to analyze data from respondents through questionnaires and interviews. Quantitative data is primarily obtained through structured questionnaires, which provide a broad understanding of the research topic. In-depth interviews provide richer, nuanced insights into participant's experiences, opinions, and behaviors. The qualitative data from the interviews fills gaps in the questionnaire data, providing deeper context and understanding of respondents' perspectives. The findings from the interviews also serve as a foundation for formulating recommendations, highlighting specific issues or challenges that may not be fully addressed by the survey alone. This approach provides a more comprehensive and well-rounded analysis of the data, allowing for a deeper understanding of the research question and more robust, informed recommendations.

3.4 Sample Techniques

Stratified random sampling methods were used to ensure a diverse group of respondents across different role. This method was selected because it increases the precision of results by dividing the population into distinct subgroups (strata) based on relevant characteristics and then sampling from each subgroup proportionally. By ensuring that all key segments of the respondents are adequately represented, stratified sampling reduces sampling error and provides a more accurate reflection of the entire respondent's perspectives.

3.5 Sample Size

According to Foreman (1991), a population is a distinct or collection of components, people, events, and services, groups of homes, or products that are under inquiry. To investigate the management practices now in place to address the safety and health issues faced by road construction workers, a research was carried out on a construction site.

A systematic questionnaire was created to accomplish the study's goals, which included learning more about the safety and health management procedures now in use in road construction, evaluating the reasons behind accidents, and identifying strategies for enhancing safety and health performance during construction projects. The questionnaire was developed by reviewing and understanding pertinent literature in the field of safety practices in road construction. Therefore, the study's population will consist of the managers, project managers, and supervisors, safety officers, involved in these initiatives.

The sample size will be calculated using Kothari's formula for finite population. More precisely, a traditional strategy that involves 95% of confidence level and 0.05 sampling error (level of precaution).

Table 3.1: Sample size

project	Employer	PM and RE	Eng.	Safety Officer	Surveyor	Foreman	Labor	Builder	Total
Bole Arabsa road project	Contractor	1	13	1	3	5	51	28	102
	Consultant	1	8	0	1	0	0	0	10
Total population									**112**

Source: Company Profile (2025).

$$n = \frac{\mathrm{z}^2.p.q.N}{e^2(\mathrm{N}-1)+z^2.\mathrm{p.q}}$$

Where

- n = Sample size
- N = total population
- z = standard normal variate (1.96 for 95% confidence level)
- p = estimated proportion of attribute present in the population (0.5)
- q = 1 – p
- e = acceptable margin of error (0.05)

$$n = \frac{1.96^2 * 0.5 * 0.5 * 112}{0.05^2(112-1)+1.96^2 * 0.5 * 0.5} = 87$$

The study population was divided into distinct strata based on their work position. The sample size for each stratum was determined using an expression proportional to the size of the stratum. The allocation for each stratum was calculated as follows.

$$n_i = \frac{N_i}{N} * n$$

Where

n_i = sample size for stratum *i* N_i = population size of stratum *i*

N = total population size (112) n = total sample size (87)

Apply the formula for each group

Final sample allocation of the above sample size with different stratum.

Table 3.2: Sample allocation with different stratum

Stratum	**Sample size**
Project Manager and RE	2
Engineers	16
Safety Officer	1
Surveyor	3
Foreman	4

Labor	40
Builder	21
Total	87

Source: Own (2025)

3.6 Data Collection Methods

Self-administered questionnaires were used to gather quantitative data from the construction parties (primary data sources) for this study in order to address the goals and research issues. In addition to primary data, secondary data were collected through a review of relevant documents such as AACRA site inspection records, and national occupational health and safety (OHS) regulations.

3.6.1 Questionnaire

The study used primary data gathered from various respondents who had a direct connection to the construction work's execution through questionnaires. To ensure clarity comprehension, the questionnaire was prepared in both Amharic and English language. This bilingual approach was adopted to accommodate respondents who are more comfortable with their native language and to minimize language related misunderstandings. There are closed-ended questions in the distributed questionnaire, which was based on the study question. To make the inquiry simpler as well as a Likert 5-scale to gauge employees' levels of agreement, which ranges from "strongly agree" to "strongly disagree," in order to obtain a broader variety of answers.

3.6.2 Interview

A semi-structured interview was conducted with key informants, such as project managers and resident engineers, to gather qualitative data. Interview participants were selected using purposive sampling based on their expertise, professional roles, and direct involvement in construction safety. The interviews were conducted face-to-face and recorded with participant consent.

3.7 Data Analysis Techniques

Following the collection of primary data from this study, the researcher used Microsoft Excel and SPSS version 26 to analyze the data. Frequencies, percentages, and tables were employed to address the research objectives and summarize survey responses, triangulate the data collected

from the survey, interviews, and observations were analyzed and compared to ensure their accuracy and credibility.

3.8 Validity and Reliability

According to Roberta (2019), the degree to which a technique properly assesses what it is supposed to measure is known as its validity.

The capacity of a research instrument to yield the same result under different situations is known as reliability, and it is used to gauge the consistency of research instruments (Field, 2013). Cronbach's Alpha was used to test for reliability and evaluate in internal consistency of the survey questions.

Table 3.3: Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.907	.910	84

Source: Own survey (2025) SPSS version 26

3.9 Ethical Consideration

Before being invited to reply, respondents and the chosen working site organizations were informed in detail of the study's goals and their willingness to participate. Through confidentiality, obtaining informed permission from all participants, and utilizing data only for scholarly reasons, this study will comply with ethical standards. Before data collection starts, ethical permission from the appropriate institutional review board will be requested.

4. RESULT AND DISCUSSION

4.1 Demographic Characteristics of Respondents

Understanding the demographic profile of respondents is very important to contextualize their perspectives on safety management practices. The section presents background information such as, gender, age, level of education, work experience, job position, and worksite location of the participants involved in the study. These characteristics help assess whether factors such as, experience level or job role influence safety awareness and compliance on road construction projects.

The data were collected from a total number of 87 respondents who were selected from the total population size. Out of this 80 respondents successfully completed and returned the questionnaires, resulting in a response rate of approximately 92%. This high response rate enhances the reliability and representativeness of the data. The demographic characteristics of the respondents are summarized in the following sub-sections.

4.1.1 Gender of Respondents

The distribution of respondents by gender is shown in 4.1. The majority of participants were male, which reflects the gender composition typically found in the construction industry.

Table 4.1: Gender of respondents

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	46	54.8	57.5	57.5
	Female	34	40.5	42.5	100.0
	Total	80	95.2	100.0	
Missing	System	4	4.8		
Total		84	100.0		

Source: SPSS version 26 Own survey (2025)

4.1.2 Age of Respondents

Respondents were grouped by age ranges to understand the experience level and maturity of the workforce.

Table 4.2: Age of respondents

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	26 - 30	8	9.5	10.0	10.0
	31 - 35	22	26.2	27.5	37.5
	36 - 40	31	36.9	38.8	76.3
	41 - 45	12	14.3	15.0	91.3
	46 & above	7	8.3	8.8	100.0
	Total	80	95.2	100.0	
Missing	System	4	4.8		
Total		84	100.0		

Source: SPSS version 26 Own survey (2025)

4.1.3 Educational Background

The respondents' level of education provides insight into their ability to understand and apply safety regulations.

Table 4.3: Educational background of respondents

Educational Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Masters	11	13.1	13.8	13.8
	Degree	16	19.0	20.0	33.8
	Diploma	8	9.5	10.0	43.8
	Level 4	9	10.7	11.3	55.0
	Level 3	10	11.9	12.5	67.5
	Others	26	31.0	32.5	100.0
	Total	80	95.2	100.0	
Missing	System	4	4.8		
Total		84	100.0		

Source: SPSS version 26 Own survey (2025)

4.1.4 Work Experience

Work experience was assessed to evaluate how long respondents have been involved in the construction industry, particularly in roles related to safety management.

Table 4.4: Work experience of respondents

Work Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 5	6	7.1	7.5	7.5
	6 - 10	41	48.8	51.2	58.8
	11 - 15	18	21.4	22.5	81.3
	16 & above	15	17.9	18.8	100.0
	Total	80	95.2	100.0	
Missing	System	4	4.8		
Total		84	100.0		

Source: SPSS version 26 Own survey (2025)

4.1.5 Job Position

The study captured a range of job roles, from top level management to operational staff, to ensure diverse viewpoints on safety management practices.

Table 4.5: Job position of respondents

Job position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Project Manager	1	1.2	1.3	1.3
	Resident Engineer	1	1.2	1.3	2.5
	Engineer	15	17.9	18.8	21.3
	Safety officer	1	1.2	1.3	22.5
	Supervisor(Foreman)	4	4.8	5.0	27.5
	Surveyor	3	3.6	3.8	31.3
	Builder (Mason, Carpenter, Operator, Bar bender….)	18	21.4	22.5	53.8
	Labor	37	44.0	46.3	100.0
	Total	80	95.2	100.0	
Missing	System	4	4.8		
Total		84	100.0		

Source: SPSS version 26 Own survey (2025)

4.2 Safety Management Practices (Specific Objective 1)

In this section, safety management practices within AACRA construction projects were assessed using seven key thematic areas. These include: Safety Policy and Planning, Safety Supervision and Compliance, Use of Personal Protective Equipment (PPE), Risk Identification and Hazard Control, Adaptation of Safety Measures Based on Project-Specific Risks, and Safety Culture and Employee Involvement. Each area was evaluated through specific questions aimed at examining the effectiveness and consistency of current safety practices across these critical dimensions.

4.2.1 Safety Policy and Planning

Eight questionnaire items were used to evaluate the subject "Safety Policy and Planning" in order to determine how well safety policies were understood, applied, and aligned with the road construction projects for the Bole Arabssa road projects. The answers differed greatly from one thing to another.

The first question evaluated whether the project has a well-defined and documented safety policy. There was modest knowledge or presence of safety policy documents, as shown by the study, 43.8% of respondents who agreed and 5% of respondents who strongly agreed. But 15% disagreed and 11.3% strongly disagreed, indicating that it was applied inconsistently among projects.

The second question highlighted a concerning result, with a majority 67.5% respondents disagreeing and 12.5% of respondents strongly disagreed that management is committed to enforcing safety policies. Only 16.3% of respondents agreed and 1.25% of respondents strongly agreed, suggesting a perceived lack of managerial involvement and commitment, which is critical for effective safety enforcement.

The third question showed a similar pattern, with 62.5% of respondents disagreed and 16.3% of respondents strongly disagreed that safety objectives are not clearly communicated. This suggests that even if objectives exist, communication remains a major gap, potentially weakening overall safety performance.

The forth, the absence of a dedicated budget was evident. A significant 58.8% of respondents disagreed and 27.5% of respondents strongly disagreed with the presence of a budget for safety, these points to a major organizational and financial shortcoming in prioritizing safety planning.

Question 5 dealt with the review and updating of policies. While 21.25% of respondents supported this practice, 65% indicated otherwise, which reveals that the projects do not systematically update or revise their safety documents, undermining relevance to current risks and standards.

Interestingly, question 6 had a relatively balanced response, with 48.75% of respondents agreeing that safety planning is integrated into project execution. However, 45% of respondents disagreed, indicating variability in practice across sites.

Question 7 painted a concerning picture, where 90% of respondents did not believe there was a dedicated team or personnel responsible for safety planning. This reflects a serious structural gap in safety management.

Lastly question 8 had the most positive outcome: 75% of respondents agreed that safety policy is aligned with national standards, suggesting at least a foundational compliance with regulatory.

In general the findings clearly show several deficiencies in the area of safety policy and planning. Most notably, the lack of managerial commitment, inadequate budget allocation, and absence of a dedicated safety team raise serious concerns. While there are signs of policy alignment with national regulations, the effectiveness is questionable due to poor implementation and communication. These results suggest the need for stronger leadership engagement, financial commitment, and organizational restructuring to enhance safety management on-site.

Table 4.6: Responses of respondents on the safety policy and planning

Safety Policy and Planning	**St. agree**		**Agree**		**Neutral**		**Disagree**		**St. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
The project has a well-defined and documented safety policy.	5	4	43.8	35	25	20	15	12	11.3	9
Management is committed to enforcing safety policies.	1.25	1	16.3	13	2.5	2	67.5	54	12.5	10

Safety objectives and targets are clearly set and communicated.	2.5	2	15	12	3.75	3	62.5	50	16.3	13
There is a dedicated budget for safety management.	0	0	10	8	3.75	3	58.8	47	27.5	22
The safety policies are regularly reviewed and updated.	6.25	5	15	12	13.8	11	46.3	37	18.8	15
Safety planning is an integral part of project planning and execution.	1.25	1	47.5	38	6.25	5	43.8	35	1.25	1
There is a dedicated team or personnel responsible for safety planning.	7.5	6	1.25	1	1.25	1	65	52	25	20
Safety policy is aligned with national safety regulations and standards.	2.5	2	72.5	58	3.75	3	18.8	15	2.5	2

Source: Own survey (2025).

4.2.2 Safety Supervision and Compliance

This section assessed the role of supervisors, enforcement mechanisms, and compliance strategies related to occupational safety within the construction projects. The results indicate significant gaps in safety supervision and enforcement.

First, the data shows that only 20% of respondents (1.25% strongly agree, 18.75% agree) believed that supervisors are well-trained in enforcing occupational safety regulations. In contrast, 63.75% (55% disagree and 8.75% strongly disagree) disagreed, suggesting that most supervisors may lack adequate knowledge or training to effectively oversee safety practices on-site.

Second, when asked if supervisors have clearly assigned responsibilities regarding safety enforcement, only 18.75% agreed, while a large majority 63.75% disagreed and 8.75% strongly disagreed. This reflects a structural problem where supervisory roles related to safety may be undefined or poorly communicated, reducing accountability.

Third, the presence of safety supervisors or officers on-site at all times was critically lacking, with 91.25% of respondents (77.5% disagree and 13.75% strongly disagree) denying consistent supervisory presence. This absence severely limits the ability to monitor safety compliance in real time.

Fourth, only 10% of respondents agreed that regular safety inspections are conducted, while 68.75% of respondents disagreed and 16.25% of respondents strongly disagreed. The lack of routine inspections undermines the identification and mitigation of potential hazards, thereby increasing likelihood of incidents.

Fifth, workers were asked if they are encouraged to report unsafe practices without fear of punishment. Only 11.25% agreed, whereas 52.5% disagreed and 21.25% strongly disagreed. This indicates a workplace culture where fear of retaliation discourages open communication about safety concerns, which is counterproductive to maintaining a safe working environment.

Sixth, only 15% of the respondents agreed that employees are informed about the consequences of violating safety rules. In contrast, 58.75% disagreed and 16.25% strongly disagreed. This lack of awareness could result in non-compliance due to ignorance rather than deliberate misconduct.

Seventh, only 6.25% of participants agreed that non-compliance leads to corrective action or penalties. Meanwhile, 58.75% disagreed and 20% strongly disagreed, showing that enforcement is weak and consequences are rarely applied, reducing the deterrent effect of safety policies.

Eighth, regarding follow-up systems to insure identified safety issues are addressed, only 8.75% of respondents agreed, while 62.5% disagreed and 13.75% strongly disagreed. This indicates that even when issues are identified; they are not adequately monitored or resolved, reducing the impact of safety audits and inspections.

Ninth and finally, only 3.75% of workers felt that safety supervisors actively encourage and support safe behavior. A substantial 57.5% disagreed and 21.25% strongly disagreed, suggesting that supervisors may not be promoting a safety-first culture among workers.

In summary, the findings point to serious shortcomings in supervision, enforcement, and compliance mechanisms. Supervisors are often untrained, rules are unclear, inspections are rare, and follow-ups are lacking. The absence of effective enforcement and the lack of supportive

supervision significantly weaken safety performance. To improve outcomes, it is essential to train supervisors, define clear safety roles, ensure continuous presence on-site, and enforce corrective measures for non-compliance. Moreover, fostering a safety culture where workers feel safe to report issues without fear of punishment is critical for proactive safety management.

Table 4.7: Responses of respondents on the safety supervision and compliance

Safety Supervision and Compliance	St. agree		Agree		Neutral		Disagree		St. Dis	
	%	F	%	F	%	F	%	F	%	F
Supervisors are well-trained in enforcing occupational safety regulations.	1.25	1	18.8	15	16.3	13	55	44	8.75	7
There are clearly responsibilities assigned to supervisors regarding safety enforcement.	0	0	18.8	15	8.75	7	63.8	51	8.75	7
Safety officers or supervisors are present on-site at all times.	0	0	0	0	8.75	7	77.5	62	13.8	11
Regular safety inspections are conducted.	0	0	10	8	5	4	68.8	55	16.3	13
Workers are encouraged to report unsafe practices without fear of punishment.	0	0	11.3	9	15	12	52.5	42	21.3	17
Employs are informed of the consequences of non-compliance with rules.	1.25	1	13.8	11	10	8	58.8	47	16.3	13
Non-compliance with safety rules results in corrective actions or penalties.	0	0	6.25	5	15	12	58.8	47	20	16
There is a follow-up system to insure that safety issues identified during inspections are resolved.	0	0	8.75	7	15	12	62.5	50	13.8	11
Safety supervisors encourage and support safe behavior among workers.	0	0	3.75	3	17.5	14	57.5	46	21.3	17

Source: Own survey (2025).

4.2.3 Use of Personal Protective Equipment (PPE)

This section examines the provision, quality, usage, and enforcement of Personal Protective Equipment (PPE) on construction sites. The responses indicate major gaps in both availability and consistent usage of PPE.

First, the question regarding whether PPE such as helmets, gloves, and vests is provided to all workers showed mixed response. While 43.75% (10% strongly agree, 33.75% agree) confirmed that PPE is provided, 56.25% (36.25% disagree, 20% strongly disagree) disagreed. This suggests that although some workers receive PPE, a significant portion does not, revealing inequality or inconsistency in provision.

Second, the quality and suitability of PPE were questioned. Only 3.75% of respondents agreed that the equipment provided is appropriate for the tasks performed, whereas an overwhelming 88.75% (67.5% disagree, 21.25% strongly disagree) disagreed. This raises concerns not only about provision but also about whether the equipment is actually fit for protecting workers in their specific work environments.

Third, regarding training on proper PPE usage and maintenance, just 21.25% agreed, while 50% disagreed and 18.75% strongly disagreed. This indicates that many workers may be using PPE incorrectly or not maintaining it, which reduces its effectiveness and lifespan.

Fourth, when asked whether employees understand the importance of using PPE at the work site, 35% agreed, and 23.75% were neutral. Although this suggests some level of awareness, the remaining 41.25% (33.75% disagreed and 7.5% strongly disagreed), pointing to a lack of full understanding and potentially poor safety culture.

Fifth, only 13.75% of respondents agreed that damaged or worn-out PPE is replaced promptly, whereas 58.75% disagreed and 22.5% strongly disagreed. This implies that workers may continue using ineffective PPE for extended periods, increasing their exposure to risk.

Sixth, just 7.5% of participants agreed that PPE usage is regularly monitored and recorded. In contrast, 76.25% disagreed and 5% strongly disagreed, showing a major oversight in enforcement and accountability mechanism related to PPE compliance.

Seventh, the question about consistent PPE use revealed that only 7.5% agreed workers always wear their equipment. Meanwhile, 71.25% of respondents' disagreed and 10% of strongly disagreed, suggesting that PPE is not consistently used even when provided.

Eighth and finally, only 1.25% agreed that supervisors ensure PPE compliance, while 67.5% disagreed and 17.5% strongly disagreed. This reflects a major lack of supervisory oversight in enforcing basic protective measures, which undermines the entire safety framework.

In general, the results show significant deficiencies in both the management and enforcement of PPE use in the studied construction projects. While a portion of the workforce receives equipment, issues remain regarding its quality, the lack of training, inconsistent usage, and poor monitoring. These shortcomings point to a reactive approach to safety ad a weak safety culture. Improvement requires ensuring adequate and task-appropriate PPE provision, training workers, replacing damaged equipment promptly, and enforcing strict supervisory oversight to insure consistent PPE use.

Table 4.8: Responses of respondents on the use of personal protective equipment's

Use of Personal Protective Equipment (PPE)	**St. agree**		**Agree**		**Neutral**		**Disagree**		**St. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
PPE (helmets, gloves, reflective vests, etc.) is provided to all workers.	10	8	33.8	27	0	0	36.3	29	20	16
PPE provide is of good quality and suitable for the type of work being performed.	0	0	3.75	3	7.5	6	67.5	54	21.3	17
Employees are trained on how to properly use and maintain PPE.	2.5	2	18.8	15	10	8	50	40	18.8	15
Employees understand the importance of using PPE at the works site.	0	0	35	28	23.8	19	33.8	27	7.5	6
Replacement of damaged or worn-out PPE is done promptly.	0	0	13.8	11	5	4	58.8	47	22.5	18
PPE usage is regularly monitored and recorded.	0	0	7.5	6	11.3	9	76.3	61	5	4
Workers consistently wear PPE while on-site.	1.25	1	6.25	5	11.3	9	71.3	57	10	8
Supervisors ensure compliance with PPE usage.	1.25	1	0	0	13.8	11	67.5	54	17.5	14

Source: Own survey (2025).

4.2.4 Risk Identification and Hazard Control

This section explores how effectively risks and hazards are identified, communicated, and controlled in construction sites. The data highlights widespread gaps in both planning and implementation of risk management procedures.

First, regarding whether risk assessments are conducted before starting major construction activities, only 12.5% of respondents agreed, while a significant 63.75% (55% disagree, 8.75% strongly disagree) reported that such assessments are not conducted. This indicates that risk assessment is often neglected prior to commencing critical site activities, leaving workers vulnerable to unanticipated hazards.

Second, when asked whether risk assessments are updated in response to changing site conditions or work processes, only 12.5% agreed, while 50% disagreed and 10% strongly disagreed. This suggests a reactive approach to risk management, with limited adjustments to evolving hazards.

Third, the use of signage and barricades to warn workers and the public of potential dangers was rated poorly. Only 1.25% of respondents agreed and 3.75% strongly agreed that such controls are in place, while 66.25% disagreed and 27.5% strongly disagreed. This lack of visible hazard warnings increases the risk of accidental exposure or injury.

Fourth, respondents were asked whether hazards are identified and mitigated before work begins. Only 3.75% agreed, compared to 60.25% who disagreed and 30% strongly disagreed. This strongly indicates that hazard identification is either superficial or completely overlooked during pre-task planning.

Fifth, the clarity of hazard communication was questioned. Just 1.25% of respondents agreed that identified hazards are clearly communicated to all workers, while 63.75% disagreed and 26.25% strongly disagreed. Poor communication undermines even well-conducted risk assessments and may leave workers uninformed about site-specific dangers.

Sixth, only 10% of respondents agreed that appropriate control measures (such as elimination, substitution, or engineering controls) are applied. Meanwhile, 52.5% disagreed and 18.75%

strongly disagreed. This suggests that even when hazards are recognized, appropriate interventions are either not selected or not properly implemented.

Seventh, when asked about the use of Job Hazard Analysis (JHA) as a routine safety tool, only 5% agreed. A combined 53.75% disagreed and 11.25% strongly disagreed, indicating that proactive planning tools are either not in use or poorly understood in the organization.

Eighth and finally, only 8.75% of respondents agreed that follow-up mechanisms are in place to ensure hazard control measures are effective, while 60% disagreed and 16.25% strongly disagreed. This suggests that even when hazards are addressed, the process often lacks evaluation and verification of effectiveness.

In general, the findings reveal serious deficiencies in risk assessment, hazard control, and communication processes on construction sites. The low implementation of Job Hazard Analyses, minimal use of signage, and absence of follow-up mechanisms reflect a largely reactive and informal safety culture. Improvement will require instituting structured and periodic risk assessments, regular updates as conditions change, clear hazard communication, and robust follow-up to verify that controls are working as intended.

Table 4.9: Responses of respondents on the risk identification and hazard control

Risk Identification and Hazard Control	**St. agree**		**Agree**		**Neutral**		**Disagree**		**St. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Risk assessments are conducted before starting major construction activities.	0	0	12.5	10	23.8	19	55	44	8.75	7
Risk assessments are updated whenever there are changes in site conditions or work processes.	0	0	12.5	10	27.5	22	50	40	10	8
Proper signage and barricades are used to warn workers and the public of dangers.	1.25	1	3.75	3	1.25	1	66.3	53	27.5	22
Hazards are identified and mitigated before work begins.	0	0	3.75	3	5	4	61.3	49	30	24
Identified hazards are communicated clearly to all workers.	0	0	1.25	1	8.75	7	63.8	51	26.3	21
The appropriate control measures (elimination, substitution, engineering, administrative, PPE) are applied.	0	0	10	8	18.8	15	52.5	42	18.8	15

Job hazard analysis (JHA) is regularly used in the organization.	0	0	5	4	30	24	53.8	43	11.3	9
There is follow-up ensure that hazard control measures are effective.	0	0	8.75	7	15	12	60	48	16.3	13

Source: Own survey (2025).

4.2.5 Safety measures are adjusted based on project-specific risks.

This section evaluates the preparedness of construction sites to respond effectively to emergencies such as accidents, fire, or medical incidents. The data reveals major shortcomings in preparedness, training, and availability of emergency resources.

First, the item that assessed whether the project has emergency preparedness and response showed that only 16.25% of respondents agreed, while 47.5% disagreed and 10% strongly disagreed. The remaining 26.25% were neutral. This suggests that safety practices are often generic and do not reflect the unique hazards of each project, which reduces their effectiveness.

Second, respondents were asked whether emergency response plans are in place and well-documented. Here, 43.75% agreed, while the 35% of respondent disagreed, indicating a relatively good presence of documented plans. However, without proper implementation and communication, their impact may be limited.

Third, the question about training workers on emergency response procedures yielded concerning results: only 7.5% of respondents agreed, while 65% disagreed and 13.75% strongly disagreed. This implies that although plans may exist, most workers are not adequately trained to execute them, compromising their usefulness during actual emergencies.

Fourth, the availability of first aid kits and medical assistance on-site was rated poorly. Only 12.5% of respondents agreed with this statement, while 75% disagreed and 12.5% strongly disagreed. The absence of immediate medical support increases the risk of fatalities or complications in the event of injury.

Fifth and finally, respondents were asked whether firefighting equipment is present and regularly inspected. Only 5% agreed or strongly agreed, while a large majority 80% disagreed and 7.5% strongly disagreed. This suggests that fire safety, which is critical on construction sites, is being largely overlooked.

In summary, while there is some evidence of documented emergency response plans, the data reveals that emergency preparedness is critically underdeveloped in practice. Most workers are not trained, essential equipment like first aid kits and firefighting tools is missing or not maintained, and project-specific emergency adjustments are rarely made. These findings point to a reactive and incomplete approach to emergency management. For significant improvement, organizations must ensure on-site resources are available, workers are trained, plans are tested through drills, and safety measures are customized based on site-specific risks.

Table 4.10: Responses of respondents on the safety measures

Safety measures are adjusted based on project-specific risks.	**SA**		**A**		**N**		**D**		**SD**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Emergency Preparedness and Response.	0	0	16.3	13	26.3	21	47.5	38	10	8
Emergency response plans are in place and well-documented.	0	0	43.8	35	21.3	17	35	28	0	0
Workers are trained on emergency response procedures.	0	0	7.5	6	13.8	11	65	52	13.8	11
First aid kits and medical assistance are readily available on-site.	0	0	12.5	10	0	0	75	60	12.5	10
Firefighting equipment is present and regularly inspected.	0	0	5	4	7.5	6	80	64	7.5	6

Source: Own survey (2025).

4.2.6 Safety Culture and Employee Involvement

This section evaluates the prevailing safety culture within the organization and the level of employee involvement in safety-related activities and decision-making. The results reveal substantial shortcomings in building a participatory, transparent, and proactive safety environment.

First, the question assessing whether safety is considered a shared responsibility among workers and management yielded mixed response. While 35% of respondents agreed, a significant 62.5% (46.25% disagree and 16.25% strongly disagree) indicated otherwise. This shows that a considerable number of workers perceive safety as being top down rather than a collaborative effort.

Second, when asked if management actively promotes a culture of safety, only 27.5% responded positively. Meanwhile, 51.25% disagreed and 18.75% strongly disagreed. This reflects a lack of visible leadership or commitment to fostering a strong safety culture.

Third, only 17.5% of respondents agreed that workers are involved in safety discussions and decision-making, while 58.75% disagreed and 15% strongly disagreed. This suggests that safety-related decisions are largely made without consulting the workforce, potentially ignoring valuable input from those most exposed to risks.

Fourth, open communication between workers and management regarding safety concerns appears to be very weak. Only 8.75% agreed that such communication exists, while 63.75% disagreed and 11.25% strongly disagreed. A lack of communication channels can lead to underreporting of hazards and missed opportunities to address issues early.

Fifth, when asked whether safety incentives or rewards are provided to workers who follow safety protocols, only 3.75% agreed, while a significant 63.75% disagreed and 21.25% strongly disagreed. This indicates that motivation for safe behavior through positive reinforcement is largely absent in the organization.

The Sixth questions, regarding whether workers can report unsafe conditions without fear of punishment, only 2.5% of respondents agreed, while 68.75% disagreed and 22.5% strongly disagreed. This suggests a culture of fear or blame, which severely discourages transparency and hinders the reporting of potential hazards.

Seventh, only 8.75% agreed that management listens and responds to workers' safety concerns, while 68.75% disagreed. This shows a gap in leadership accountability and responsiveness to frontline safety issues.

Eighth and finally, a relatively better response was recorded for the use of lessons from past incidents to improve safety. Here, 38.75% of respondents agreed, while 56.25% disagreed. This suggests that while some learning from previous events is occurring, it is not yet systematic or consistent.

The project manager and resident engineers advocate important actions to improve safety culture on the AACRA road construction project.

- **Strengthening Management Commitment and Leadership:** Senior management must priorities safety by establishing clear objectives, allocating adequate resources, and promoting a safety-first mind-set throughout the organization.
- **Implementing comprehensive and On-going Safety Training:** Regular, practical training sessions, such as toolbox lectures, emergency preparation drills, and the use of personal protective equipment, should be implemented to improve workers' safety awareness and competence.
- **Improve Communication and Worker Participation:** Establish open and transparent communication channels to engage workers in safety conversations, identify hazards, and make decisions. This fosters a sense of shared responsibility for safety results.
- **Create Clear and Enforceable Safety Policies:** Documents and implement project-specific safety laws and procedures through regular inspections and audits to assure compliance and responsibility.
- **Providing Adequate Safety Resources:** Budgeting for safety equipment and personal protective equipment is essential for safe working conditions.
- **Promoting Behavioral Safety interventions:** Implementing programs that reinforce positive safety behaviors and discourage dangerous actions helps foster a proactive safety culture.
- **Implementing Effective Monitoring and Feedback Systems:** Regular safety inspections and audits, along with constructive feedback, may detect potential dangers and promote continuous improvement.
- **Fostering Accountability at All Organizational Levels:** Clearly outlining safety duties and responsibilities, as well as enforcing accountability, ensures that everyone, from management to site workers, contributes to ensuring a safe workplace.

The project managers and resident engineers suggest essential initiatives to enhance the safety culture on site. These include increasing management commitment, offering continuous and practical safety training, and strengthening communication to include workers in safety decisions. Clear safety regulations, accessible resources, and behavioral safety initiatives are prioritized. Building a proactive and accountable safety culture requires constant monitoring and feedback mechanisms, as well as defined duties at all levels.

In summary, the results point to a weak safety culture characterized by poor communication, minimal employee involvement, and limited leadership engagement. Workers feel excluded from safety decisions and may hesitate to raise concerns due to fear of retaliation. To improve the situation, there needs to be a cultural shift toward shared responsibility, greater transparency, regular two-way communication, and incentives for safe behavior, supported by leadership at all levels.

Table 4.11: Responses of respondents on the safety culture and employee involvement

Safety Culture and Employee Involvement	**St. agree**		**Agree**		**Neutral**		**Disagree**		**S. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Safety is considered a shared responsibility among all workers and management.	0	0	35	28	2.5	2	46.3	37	16.3	13
Management actively promotes a culture of safety.	1.25	1	26.3	21	2.5	2	51.3	41	18.8	15
Workers are involved in safety discussions and decision-making.	0	0	17.5	14	8.75	7	58.8	47	15	12
There is open communication between workers and management regarding safety concerns.	0	0	8.75	7	16.3	13	63.8	51	11.3	9
Safety incentives or rewards are provided to workers who follow safety protocols.	0	0	3.75	3	11.3	9	63.8	51	21.3	17
Workers are free to report unsafe conditions without fear of punishment.	0	0	2.5	2	6.25	5	68.8	55	22.5	18
Management listens and responds to safety concerns raised by workers.	0	0	8.75	7	22.5	18	55	44	13.8	11
Lessons from past safety incidents are used to improve safety practices.	1.25	1	37.5	30	5	4	46.3	37	10	8

Source: Own survey (2025).

Project managers and resident engineers recommend measures to increase management support for on-site safety practices:

- **Demonstrate Visible and Active Leadership:** Management should actively participate in safety activities and explain the significance of safety, setting the tone for the whole workforce.

- **Budget for Safety**: Effective safety implementation requires enough budget allocation for equipment, training, and staff.
- **Establish Clear Safety regulations and Procedures:** Management should create, disseminate, and implement safety regulations suited to project-specific dangers.
- **Continuous Training and Capacity Building:** Providing continuing education and practical training ensures that workers and supervisors are informed and competent in safe work practices.
- **Promote Open Communication and Reporting:** Encouraging workers to report risks or risky behaviors without fear of repercussions promotes proactive risk management.
- **Conduct regular site inspection:** conduct regular site inspections and safety audits with timely feedback to promote excellent practices and correct faults.
- **Recognize and Reward Safe Behavior:** Recognition programs can encourage personnel to follow safety rules by incentivizing compliance and creating a safety culture.

In general the project managers and resident engineers emphasize the need of visible leadership and active participation in safety measures to improve support for safety. It is vital to allocate appropriate funding for safety equipment and training. Clear safety policies must be established and seriously implemented. Continuous training keeps all people knowledgeable in safe procedures. Management should promote open communication and encourage employees to report dangers without fear. Regular safety inspections and audits provide helpful criticism to maintain standards and recognizing and rewarding safe behavior encourages workers to follow safety rules.

4.3 Safety Training and Awareness (Specific Objective 2)

The evaluation of safety training and awareness was based on ten key items. The results highlight several deficiencies in how safety training is implemented and communicated on construction sites.

The first question assessed whether workers receive regular safety training. Only 27.5% of respondents (8.75% strongly agree and 18.75% agree) confirmed receiving regular training, while a significant 70% (51 disagree and 5 strongly disagree) reported otherwise. This indicates that regular safety training is not widely practiced, posing a potential risk to worker preparedness and site safety.

Secondly, respondents were asked whether toolbox meetings are conducted before starting work. An overwhelming majority of 72.5% disagreed and 11.25% strongly disagreed, suggesting that these important daily safety briefings are either neglected or inconsistently applied.

Third, the results showed that only 8.75% of respondents agreed and 1.25% of respondents strongly agreed that new employees receive safety orientation before engaging in construction activities, while 71.3% of respondents disagreed and 13.8% of respondents strongly disagreed. This lack of onboarding training increases the vulnerability of new workers to site hazards due to insufficient knowledge and preparation.

Fourth, when asked whether there are awareness programs to educate workers on safety hazards and precautions, 25% of respondents agreed and 7.5% strongly agreed, while 38.8% of respondents disagreed and 10% of respondents strongly disagreed. This indicates that although some programs may exist, they are not effectively reaching or engaging the majority of workers.

Fifth, regarding training that covers site-specific hazards and procedures, responses were mixed. While 36.25% agreed, 33.75% remained neutral, and 30% disagreed. This variation suggests inconsistency in how hazard-specific training is implemented across projects.

Sixth, respondents were asked whether safety training sessions are easy to understand and relevant to their job. Half of the participants 38.8% disagreed and 11.3% disagreed, and only 18.75% agreed. This implies that training content may not be tailored to the workers' actual tasks, reducing its practical value.

Seventh, the evaluation of training effectiveness by the organization received largely negative feedback. Only 11.25% agreed and 10% strongly agreed that effectiveness is assessed, while 68.75% disagreed. This lack of evaluation may hinder continuous improvement of safety programs.

Eighth, the majority of respondents (73.75%) felt that they were not encouraged to ask questions or express concerns during training sessions. This lack of engagement may limit worker's understanding and reduce opportunities for clarification and feedback.

Ninth, when asked about the provision of refresher training, 40% of the respondents disagreed and 15% of respondents strongly disagreed that such training is conducted periodically, although

31.25% acknowledged that it occurs. This suggests an absence of consistent follow-up training to reinforce safety knowledge.

Tenth and finally, access to training materials and resources such as manuals and signs was reported as poor. Only 16.25% agreed that such materials are easily accessible, whereas 67.5% disagreed and 13.75% strongly disagreed. This highlights a significant gap in providing practical tools for continuous learning on-site.

Interviewees said that there is a lack of consistent and systematic safety training programs, making it difficult to thoroughly evaluate workers' attitudes towards it. Toolbox meetings, emergency response exercises, personal protective equipment (PPE), and first aid protocols are rarely or non-existent.

Respondents emphasized the importance of consistent and high-quality safety training in fostering workplace collaboration. Without these necessary trainings and clear direction, it is difficult to expect proactive involvement or full compliance from employees. Interviewees found that providing enough assistance, equipment, and knowledge leads to positive worker behavior and cooperation with safety measures. Additionally worker resistance is not the main issue, but rather a lack of systematic training and managerial support that prevents workers from completely implementing safety standards.

In summary, the findings reveal serous limitations in the planning, delivery, and follow-up of safety training practices in the construction projects studied. There is a lack of structures orientation, limited daily communication of risks, minimal worker engagement, and poor accessibility of materials. These gaps may contribute to increased exposure to hazards and reduced compliance with safety protocols. Strengthening these areas through consistent training schedules, active worker involvement, accessible materials, and regular program evaluation is essential for improving overall safety performance on construction sites.

Table 4.12: Responses of respondents on the safety training and awareness

Safety Training and Awareness	**St. agree**		**Agree**		**Neutral**		**Disagree**		**St. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Workers receive regular safety training on construction site hazards.	8.75	7	18.8	15	2.5	2	63.8	51	6.25	5

Toolbox meetings are conducted before starting work.	0	0	7.5	6	8.75	7	72.5	58	11.3	9
New employees undergo safety orientation before engaging in construction activities.	1.25	1	8.75	7	5	4	71.3	57	13.8	11
There are awareness programs to educate workers on safety hazards and precautions.	7.5	6	25	20	18.8	15	38.8	31	10	8
Training covers site specific hazards and procedure.	0	0	36.3	29	33.8	27	30	24	0	0
Safety training sessions are easy to understand and relevant to the job.	0	0	18.8	15	31.3	25	38.8	31	11.3	9
The organization evaluates the effectiveness of safety training programs.	10	8	11.3	9	10	8	42.5	34	26.3	21
Employees are encouraged to ask questions and discuss safety concerns during training.	0	0	8.75	7	17.5	14	52.5	42	21.3	17
Refresher safety training is conducted periodically.	0	0	31.3	25	3.75	3	50	40	15	12
Training materials and resources (e.g. manuals signs) are easily accessible to workers.	0	0	16.3	13	2.5	2	67.5	54	13.8	11

Source: Own survey (2025).

4.4 Challenges of OSH Management Implementation (Specific Objective 3)

The implementation of effective Occupational Safety and Health (OSH) management on construction sites faces significant barriers, as reflected in the responses. These challenges stem from a combination of organizational, technical, and human factors.

4.4.1 Challenges

This section summarizes the key challenges that hinder the effective implementation of safety and health practices in construction projects, based on respondents' feedback. The responses indicate the presence of multiple, interrelated obstacles that compromise safety performance.

First, the issue of unskilled labor was recognized by a majority, with 80% (21.25% strongly agree, 58.75% agree) of respondents identifying it as a major challenge. This suggests that many workers may not have the necessary training or knowledge to perform tasks safely.

Second, lack of personal protective equipment (PPE) was reported by 61.25% of participants agreed and 12.5% strongly agreed, while only 21.25% disagreed and 5% of respondent were neutral. This indicates a widespread issue in the availability and provision of essential safety gear.

Third, lack of technical guidance or training was agreed upon by 82.5% of respondents. This reveals a significant gap in knowledge transfer, skill development, and orientation for safe work procedures.

Forth, 56.25% of the respondents agreed that there is ineffectiveness in safety and health policy implementation, though 36% disagreed and 13.75% were neutral. This suggests inconsistency in policy enforcement across the sites or projects.

Fifth, lack of management commitment was confirmed by 75% of respondents. This shows that leadership is not adequately prioritizing safety, which negatively affects the culture and effectiveness of health and safety programs.

Sixth, 22.5% strongly agreed and 63.75% agreed that there is a lack of adequate safety inspection by supervisors. Inadequate oversight may lead to unchecked hazards and increased accident risk.

Seventh, insufficient safety budgets were cited by 88.75% of respondents. This highlights how financial constraints directly affect the procurement of equipment, training, and other safety-related investments.

Eighth, reluctance to allocate resources for safety was seen as a problem by 82.5% of respondents. This suggests a general undervaluing of safety compared to other project priorities, such as cost and time.

Ninth, excessive working hours were reported by 65%, which may lead to physical and mental fatigue, increasing the likelihood of accidents and poor performance.

Tenth, poor machinery performance was also highlighted by 82.5% of respondents. Faulty or poorly maintained equipment is a major source of occupational risk.

Eleventh, a striking 96.25% of participants noted the absence of safety signals or barriers in hazardous or excavated areas. This significantly raises the risk of falls, vehicle collisions, and other incidents.

Twelfth, work overlap, where multiple tasks occur simultaneously in the same area, was identified by 88.75% of respondents. This can cause confusion and unsafe work environments due to congestion and lack of coordination.

Thirteenth, job dissatisfaction was considered a contributing challenge by 88.75%, which may negatively affect worker morale and motivation to comply with safety rules.

Fourteenth and finally, physical fatigue was recognized by 56.25% as a safety issue. Tough not the most strongly agreed-upon challenge, it still represents a substantial concern, especially in environments where rest periods and ergonomics are overlooked.

Respondents noted the challenges to implementing effectively safety measures on the project site. The most often reported issues are:

- ✓ Lack of awareness and training
- ✓ Inadequate management commitment
- ✓ Resource constraints
- ✓ Inadequate safety planning and monitoring
- ✓ Cultural and behavioral factors

Interviews with project managers and resident engineers highlighted several persistent challenges in the effective implementation of safety policies on construction sites:

- **Communication and Technological Limitations:** Poor communication among stakeholders and insufficient integration of new technology hinder effective coordination and consistent execution of safety standards.
- **Lack of Top Management Commitment:** Insufficient leadership and engagement from top management can deprioritize safety, leading to weaker implementation and enforcement of rules on-site.
- **Resource Constraints:** Financial constraints typically impede the deployment of critical safety equipment, training efforts, and the establishment of a strong occupational health and safety infrastructure.
- **Inadequate Safety Planning and Monitoring Mechanisms:** Safety concerns are not consistently integrated into project planning, and there is a lack of frequent monitoring and follow-up to verify policy compliance throughout execution.

- **Cultural and Behavioral Barriers:** Workers may view safety procedures as optional or obtrusive. These views create substantial barriers to developing a good safety culture.
- **Inadequate Awareness and Training:** Many workers and supervisors lack adequate information and practical training on workplace safety. This gap hinders employees' capacity to understand, execute, and follow safety regulations.

In summary, the findings indicate that challenges in safety implementation are both systemic and multifaceted ranging from human resource issue (unskilled labor, fatigue) to managerial shortcomings (lack of inspection, low budget allocation), and operational hazards (poor equipment, missing safety signs). Addressing these challenges requires a coordinated effort involving policy enforcement, workforce development, leadership accountability, and adequate resource allocation.

Table 4.13: Responses of respondents on the challenges of OSH management implementation

Challenges	St. agree		Agree		Neutral		Disagree		St. Dis	
	%	F	%	F	%	F	%	F	%	F
Unskilled labor	21.3	17	58.8	47	2.5	2	17.5	14	0	0
Lack of PPE	12.5	10	61.3	49	5	4	15	12	6.25	5
Lack of technical guide or Trainings	13.8	11	68.8	55	3.75	3	13.8	11	0	0
Ineffectiveness of safety and health safety policy	17.5	14	38.8	31	13.8	11	20	16	10	8
Lack of management commitment on safety and health practices	15	12	60	48	10	8	15	12	0	0
Lack of adequate inspection by the supervisor	22.5	18	63.8	51	2.5	2	11.3	9	0	0
Insufficient safety Budgets	17.5	14	71.3	57	1.25	1	10	8	0	0
Reluctance to input resources for safety	33.8	27	48.8	39	8.75	7	8.75	7	0	0
Excessive working hours	16.3	13	48.8	39	18.8	15	16.3	13	0	0
Poor performance of machineries	35	28	47.5	38	5	4	12.5	10	0	0

No signals or safety barriers on excavated or on construction roads	40	32	56.3	45	2.5	2	1.25	1	0	0
Work over lap	25	20	63.8	51	2.5	2	8.75	7	0	0
Job dissatisfaction	21.3	17	67.5	54	11.3	9	0	0	0	0
Workers physical fatigue	2.5	2	53.8	43	23.8	19	20	16	0	0

Source: Own survey (2025).

4.4.2 Causes of Construction Accident

This section explores the perceived causes of construction-related accidents based on workers' responses. The data indicates that both unsafe practices and systemic shortcomings contribute to accidents in the construction environment.

First, falls were unanimously identified as a primary cause of accidents, with 100% of respondents (37.5% strongly agree and 62.5% agree) acknowledging this risk. Falls are commonly associated with working at heights, slippery or uneven surfaces, open excavations and trenches, unprotected edges, or lack of fall protection systems, working near moving equipment, poor lighting conditions and are among the most fatal construction incidents globally.

Second, struck-by occurrences were recognized by 85% of respondents, with only 15% disagreeing. This type of incident often results from moving machinery, falling objects, or flying debris and highlights a lack of perimeter control and equipment awareness.

Third, electrocution was identified by 61.25% of the respondents, though 33.75% disagreed, indicating some division in perception. This suggests inconsistent exposure to electrical hazards or possibly underreporting and insufficient visibility of such risks.

Fourth, caught-in-between risks such as being trapped between equipment or collapsing materials were acknowledged by 88.75% of participants. These events point to inadequate machinery clearance, improper excavation safety measures, or poor task coordination.

Fifth, lack of training was a commonly cited cause, with 88.75% of respondents in agreement. This emphasizes the critical role of ongoing and job-specific safety training in accident prevention.

Sixth, hazardous working conditions were affirmed by 83.75% of the respondents. Conditions such as poor lighting, slippery surfaces, and environmental hazards can escalate accident likelihood if not properly controlled.

Seventh, unsafe acts (e.g., bypassing safety protocols, using equipment incorrectly) were seen as major contributors, with 96.25% agreement. This underscores the need for behavioral interventions, supervision, and accountability systems.

Eighth, unsafe conditions (e.g., poor housekeeping, equipment left unsecured) were agreed upon by 96.25% as well. This result aligns closely with the earlier emphasis on environmental safety and supervisory oversight.

Ninth, failure to use proper PPE was recognized by 85% of respondents as a contributing factor to accidents. This result further supports previous findings under the PPE section where usage and enforcement were shown to be weak.

Tenth, inadequate safety training and awareness was almost unanimously agreed upon, with 93.75% acknowledging it as a major cause. This reinforces the need for continuous and comprehensive safety education across all project phases.

Eleventh, equipment failure received less agreement, with only 43.75% citing it as a cause, while 46.25% disagreed. This variation may reflect differing levels of equipment maintenance and quality across sites.

Twelfth, improper use of tools was affirmed by 68.75% of respondents, suggesting the need for better instruction and tool-specific safety measures.

Thirteenth and finally, communication breakdown among workers was seen as a serious factor by 95% of the respondents. Effective communication is crucial in dynamic environments like construction sites, where poor coordination can directly lead to accidents.

In general, the responses reflect a combination of organizational, financial, and behavioral factors that together undermine the effective implementation of safety measures.

In summary, the results clearly show that construction accidents are caused by a combination of unsafe actions, unsafe conditions, lack of training, poor communication, and equipment related issues. Addressing these root causes requires a comprehensive safety strategy, including better training, proactive supervision, regular safety audits, communication protocols, and strict adherence to PPE and equipment standards.

Table 4.14: Responses of respondents on the causes of construction accidents

Causes of construction accident	S. agree		Agree		Neutral		Disagree		S. Dis	
	%	F	%	F	%	F	%	F	%	F
Falls	37.5	30	62.5	50	0	0	0	0	0	0
Struck-by occurrences	26.3	21	58.8	47	0	0	15	12	0	0
Electrocution	15	12	46.3	37	5	4	33.8	27	0	0
Caught-in-between risks	15	12	73.8	59	1.25	1	10	8	0	0
Lack of training	17.5	14	71.3	57	1.25	1	10	8	0	0
Hazardous working conditions	30	24	53.8	43	10	8	6.25	5	0	0
Un safe act	26.3	21	70	56	3.75	3	0	0	0	0
Un safe conditions	32.5	26	63.8	51	1.25	1	2.5	2	0	0
Failure to use proper PPE	30	24	55	44	2.5	2	12.5	10	0	0
Inadequate safety training and awareness.	36.3	29	57.5	46	0	0	6.25	5	0	0
Equipment failure.	16.3	13	27.5	22	10	8	46.3	37	0	0
Improper use of tools	33.8	27	35	28	18.8	15	12.5	10	0	0
Communication breakdown among worker.	46.3	37	48.8	39	3.75	3	1.25	1	0	0

Source: Own survey (2025).

4.5 Overall Safety Management Effectiveness

The findings reveal a deeply concerning perception of safety management effectiveness within the construction project.

Only 11 respondents (13.75%) expressed agreement with the notion that safety management is effective, and none strongly agreed highlighting a widespread lack of confidence in the current system. In stark contrast, an overwhelming 70% of respondents disagreed and 16.25% of respondent strongly disagreed, indicating that the vast majority view the safety management practices as inadequate or poorly executed. This overall sentiment aligns with earlier data that pointed to significant shortcomings in key areas such as worker training, supervision, PPE usage, control, emergency preparedness, and communication hazard between workers and management.

The consensus of dissatisfaction suggests that safety management on these is not just underperforming in isolated aspects, but is systemically weak. This reflects a failure of leadership to prioritize and enforce consistent, comprehensive safety protocols. Without immediate and strategic interventions such as enhancing management accountability, increasing investment in safety training and resources, and fostering stronger worker involvement the likelihood of accidents and regulatory non-compliance will remain high. Therefore, the current state of safety management requires urgent reassessment and restructuring to protect workers and insure legal and ethical standards are upheld.

Table 4.15: Responses of respondents on the overall safety management effectiveness

Overall safety management effectiveness	**St. agree**		**Agree**		**Neutral**		**Disagree**		**St. Dis**	
	%	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Overall, how would you rate the effectiveness of safety management in your project?	0	0	13.8	11	0	0	70	56	16.3	13

Source: Own survey (2025).

4.6 Summary of Key Findings

In conclusion, the chapter demonstrates a complete failure of AACRA's construction safety management system in all critical areas: planning, training, supervision, equipment use, hazard control, emergency response, and organizational culture.

Without strategic reform, Strong leadership, enough resources, and a shift towards participatory and proactive safety management, workplace incidents will continue to be unacceptably high. These findings provide as a solid foundation for the recommendations and policy implications presented in the next chapter.

5. CONCLUSION AND RECOMENDATION

5.1 Introduction

This chapter gives conclusions and recommendations based on the data mentioned in previous chapter. The goal is to summarise the study's principal findings in respect to the research goals and to provide actionable steps that can improve safety management procedures on Bole Arabssa road construction projects. The recommendations are aimed at key players such as the Addis Ababa City Roads Authority (AACRA), contractors, project managers, and policymakers. The chapter concludes by recommending future study topics that might help to better understand and enhance occupational safety in construction environments.

5.2 Conclusion

The assessment of safety management practices on the road construction project of Addis Ababa city road authority indicated severe gaps in the implementation and monitoring of occupational health and safety procedures. The investigation discovered that safety policy and planning were ineffective and poorly enforced, resulting in a lack of systematic guidelines for assuring worker safety on-site.

Safety training and awareness initiatives were found to be insufficient, inconsistent, and, in many cases, non-existent. This was reflected in workers' poor understanding of workplace hazards, as well as their rights and obligations in terms of safety. The lack of periodic toolbox presentations and new staff orientation further compounded the problem.

Furthermore, the use and supply of personal protective equipment (PPE) were shown to be grossly insufficient. This demonstrates a major failure to provide workers with necessary protective equipment, and the lack of adequate monitoring or enforcement of PPE usage increased the risk exposure on-site.

The study also identified some important challenges to the effective adoption of safety management practices. These included lack of awareness and training, poor management commitment, inadequate PPE supply and enforcement, limited supervision and safety staffing etc. all of these problems indicate to a systemic failure for integrating safety management practice into the construction project's basic management framework. Without deliberate actions

at both the organizational and operational levels, these challenges will continue to jeopardise worker safety and project outcomes.

Overall, the study indicates that present safety management techniques are ineffective and endanger the health and well-being of construction workers. To address these difficulties, all parties engaged in road construction project planning, implementation, and oversight must work together in a systematic and persistent manner.

5.3 Recommendation

Based on the research findings, the following recommendations are made to enhance safety management practices:

- **Strengthen safety policies and enforcement mechanisms:**
  - ✓ AACRA and contractors should create and rigidly enforce detailed safety regulations specific to each project.
  - ✓ Clear norms and accountability procedures must be set for both management and employees.
- **Enhance safety training and awareness programs:**
  - ✓ Regular safety training sessions, including toolbox discussions and emergency exercises, should become institutionalised. Before starting, all new workers must complete a mandated safety orientation.
- **Strengthen management commitment and leadership:**
  - ✓ Project managers need to demonstrate visible leadership and commitment to safety by devoting time and resources to safety planning and enforcement.
  - ✓ Appointing full-time safety offices on-site can assist in monitoring everyday operations and ensuring compliance.
- **Ensure adequate and proper use of PPE**:
  - ✓ Contractors must provide all appropriate PPE to workers and ensure consistent use through frequent inspections
  - ✓ Supervisors should be educated to monitor compliance and offer remedial criticism.
- **Implement proactive risk assessment practices:**
  - ✓ Conduct frequent site-specific risk assessments to identify possible risks and devise mitigation strategies.

- ✓ Encourage employee engagement in danger identification and reporting.

❖ **Promote a Positive Culture:**

- ✓ Encourage open communication between employees and managers about safety concerns.
- ✓ Recognise and reward safe behaviour to increase compliance and engagement.

5.4 Suggestions for Further Study

While this study gives useful insights on the safety management practices of the Bole Arabssa condominium road construction projects, it also opens up various opportunities for further research:

❖ **Application of Technology in Construction Safety Management:** The use of digital tools and technologies, such as mobile safety reporting applications, wearable safety devices, and AI-powered hazard identification, should be investigated as possible facilitators of proactive and real-time safety management.

❖ **Economic evaluation of safety practices:** Further research might quantify the cost-benefit link between safety measures and lower accident rates, productivity losses, or legal liabilities, providing empirical support for increased investment in workplace health and safety.

❖ **Longitudinal Studies on Safety Interventions:** There is a need for longitudinal research that assesses the long-term effectiveness of specific safety initiatives, such as the effects of frequent toolbox meetings, safety training programs, or the deployment of full-time safety officers, on workplace accidents and compliance.

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Appendix I: Research Questionnaires

Addis College

MSC research questionnaire

Assessment of Safety Management Practices in Addis Ababa City Road Authority Road Projects

Dear Sir/Madam

The objective of this survey is to obtain data for the specified study being conducted as a partial fulfillment of MSC Degree in Construction Technology and Management at Addis College. The questionnaire is developed to obtain professional opinion on issues of the Safety management Practices in Addis Ababa city Road Authority Road Construction Projects. The aim of this study is to assess the safety and health practices, the causes and effects of road construction accidents in Addis Ababa road construction projects, factors that challenges on the implementation of safety and health practices. In order to identify areas of safety shortcomings in road construction projects and suggest potential corrective methods to mitigate them, it aims to evaluate the safety management practice and raise awareness among the various project stakeholders. This questionnaire's contents will all be kept completely private and used only for scholarly study.

I genuinely thank you for your cooperation in advance.

Regards, Bisrat Terefe

G-mail: bisrat21t@gmail.com

Tel: 0912 950395, 0985 453821

SECTION 1: RESPONDENTS GENERAL INFORMATION

1. Gender

Male ☐ Female ☐

2. Age

25-30 ☐ 36-40 ☐

31-35 ☐ 41 and above ☐

3. Education Level

Ph.D. ☐ Degree ☐

Masters ☐ Diploma ☐

Level 4 ☐ Level 3 ☐ Other_____

4. Your work experience in road construction projects

1-5 years ☐ 11-15 years ☐

6-10 years ☐ >15 years ☐

5. Your Position

Project manager ☐ Surveyor ☐

Resident engineer ☐ Supervisor (Foreman) ☐

Engineer ☐ Builder ☐

Safety officer ☐ Labor ☐

Other _____

6. Which side of the construction parties are you working on?

Contractor ☐ Consultant ☐

Client ☐ Other ☐

SECTION 2: SAFETY MANAGEMENT PRACTICES

A	Safety Policy and Planning	Strongly agree	Agree	Neutral	Dis agree	Strongly Disagree
1	The project has a well-defined and documented safety policy.					
2	Management is committed to enforcing safety policies.					
3	Safety objectives and targets are clearly set and communicated.					
4	There is a dedicated budget for safety management.					
5	The safety policies are regularly reviewed and updated.					
6	Safety planning is an integral part of project planning and execution.					
7	There is a dedicated team or personnel responsible for safety planning.					
8	Safety policy is aligned with national safety regulations and standards.					

B	Safety Training and Awareness	Strongly agree	Agree	Neutral	Dis agree	Strongly Disagree
1	Workers receive regular safety training.					
2	Toolbox meetings are conducted before starting work.					
3	New employees undergo safety orientation before engaging in construction activities.					
4	There are awareness programs to educate workers on safety hazards and precautions.					
5	Training covers site specific hazards and procedure.					
6	Safety training sessions are easy to understand and relevant to the job.					
7	The organization evaluates the effectiveness of safety training programs.					
8	Employees are encouraged to ask questions and discuss safety concerns during training.					
9	Refresher safety training is conducted periodically.					

10	Training materials and resources (e.g. manuals signs) are easily accessible to workers.					

C	**Safety Supervision and Compliance**	**Strongly agree**	**Agree**	**Neutral**	**Dis agree**	**Strongly Disagree**
1	Supervisors are well-trained in enforcing occupational safety regulations.					
2	There are clearly responsibilities assigned to supervisors regarding safety enforcement.					
3	Safety officers or supervisors are present on-site at all times.					
4	Regular safety inspections are conducted.					
5	Workers are encouraged to report unsafe practices without fear of punishment.					
6	Employs are informed of the consequences of non-compliance with rules.					
7	Non-compliance with safety rules results in corrective actions or penalties.					
8	There is a follow-up system to insure that safety issues identified during inspections are resolved.					
9	Safety supervisors encourage and support safe behavior among workers.					

D	**Use of Personal Protective Equipment (PPE)**	**Strongly agree**	**Agree**	**Neutral**	**Dis agree**	**Strongly Disagree**
1	PPE (helmets, gloves, reflective vests, etc.) is provided to all workers.					
2	PPE provide is of good quality and suitable for the type of work being performed.					
3	Employees are trained on how to properly use and maintain PPE.					
4	Employees understand the importance of using PPE at the works site.					
5	Replacement of damaged or worn-out PPE is done promptly.					
6	PPE usage is regularly monitored and recorded.					

7	Workers consistently wear PPE while on-site.					
8	Supervisors ensure compliance with PPE usage.					

E	**Risk Identification and Hazard Control**	**Strongly agree**	**Agree**	**Neutral**	**Dis agree**	**Strongly Disagree**
1	Risk assessments are conducted before starting major construction activities.					
2	Risk assessments are updated whenever there are changes in site conditions or work processes.					
3	Proper signage and barricades are used to warn workers and the public of dangers.					
4	Hazards are identified and mitigated before work begins.					
5	Identified hazards are communicated clearly to all workers.					
6	The appropriate control measures (elimination, substitution, engineering, administrative, PPE) are applied.					
7	Job hazard analysis (JHA) is regularly used in the organization.					
8	There is follow-up ensure that hazard control measures are effective.					

F	**Safety measures are adjusted based on project-specific risks.**	**Strongly agree**	**Agree**	**Neutral**	**Dis agree**	**Strongly Disagree**
1	Emergency Preparedness and Response.					
2	Emergency response plans are in place and well-documented.					
3	Workers are trained on emergency response procedures.					
4	First aid kits and medical assistance are readily available on-site.					
5	Firefighting equipment is present and regularly inspected.					

G	Safety Culture and Employee Involvement	Strongly agree	Agree	Neutral	Dis agree	Strongly Disagree
1	Safety is considered a shared responsibility among all workers and management.					
2	Management actively promotes a culture of safety.					
3	Workers are involved in safety discussions and decision-making.					
4	There is open communication between workers and management regarding safety concerns.					
5	Safety incentives or rewards are provided to workers who follow safety protocols.					
6	Workers are free to report unsafe conditions without fear of punishment.					
7	Management listens and responds to safety concerns raised by workers.					
8	Lessons from past safety incidents are used to improve safety practices.					

SECTION 3:- Challenges of Occupational safety and health management implementation

A	Challenges	Strongly agree	Agree	Neutral	Dis agree	Strongly Disagree
1	Unskilled labor					
2	Lack of PPE					
3	Lack of technical guide or Trainings					
4	Ineffectiveness of safety and health policy					
5	Lack of management commitment on safety and health practices					
6	Lack of adequate inspection by the supervisor					
7	Insufficient safety Budgets					
8	Reluctance to input resources for safety					
9	Excessive working hours					
10	Poor performance of machineries					
11	No signals or safety barriers on excavated or on construction roads					
12	Work over lap					

13	Job dissatisfaction					
14	Workers physical fatigue					

B	**Causes of construction accident**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	Falls					
2	Struck-by occurrences					
3	Electrocution					
4	Caught-in-between risks					
5	Lack of training					
6	Hazardous working conditions					
7	Un safe act					
8	Un safe conditions					
9	Failure to use proper PPE					
10	Inadequate safety training and awareness.					
11	Equipment failure.					
12	Improper use of tools					
13	Communication breakdown among worker.					

SECTION 4: OVERALL SAFETY MANAGEMENT EFFECTIVENESS

No.	Overall safety management effectiveness	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
1	Overall, how would you rate the effectiveness of safety management in your project?					

2. What are the biggest challenges in implementing safety measures in your project?

(Open-ended)

_____

_____

_____

_____

_____

3. What recommendations do you have for improving safety management in road construction projects? (Open-ended)

_____

_____

_____

_____

_____

Appendix II: Interview Question

Interview question

1. In your experience, what specific challenges do you face when trying to implement safety policies on-site?
2. How do workers respond to safety training and instructions? Are they cooperative or resistant? Why?
3. What changes would you suggest to improve the safety culture in your organization or project site?
4. How do you think management can better support safety practices on the ground?

Appendix III: Accident Reports

በኢንሹራንስ ቡድን በ2017 በጀት ዓመት የሩጥ ...ች /ከሃምሌ 1/2016 - ታህሳስ16/20ቋ17/ የተሞሉ የስ... አደጋ ማሳወቂያ ዝርዝር

ተ.ቁ	አደጋ የደረሰበት ሠራተኛ ስም	ጾታ	የሚሰሩበት ክፍል	የቅጥር ሁኔታ	ጉዳቱ የደረሰበት ቀን	የስራ መደብ መጠሪያ	የአደጋው ምክንያት	ለጉዳቱ የወጣው ወጪ	የጉዳቱ ዓይነት	ለመድን ያሳወቅንበት ቀን	ምርመራ
1	ምሳዩ ማሞ	ሴት	ግንባታ ሱት 1	ኮንትራት	21/09/2016	ጉልበት ሰራተኛ	በስራ ላ ይ ድንጋይ በመጫን ላይ ሳለች መውደቅ		የቀኝ እጅ ጣት መሰበር	10/17/2016	በሂደት ላይ
2	ብሩክ ተረፈ	ወንድ	ግንባታ ሱት 3	ቋሚ	4/1/2017	ፕሮጀክት መሀንዲስ	ድንገት ተንሸራቶ መውደቅ	129,869.43	የልብ ችግር	23/01/2017	በፋይናንስ የተከፈለ
3	ደስታ ደባ	ሴት	መ/ግ ሱት 2	ኮንትራት	26/12/20116	ጉልበት ሰራተኛ	ድንገት ተንሸራቶ መውደቅ		የጭንቅላት ጉዳት	14/01/2017	በሂደት ላይ
4	አየሽምህረት	ወንድ	ግብአት	ቋሚ	29/12/2016	ከባድ መኪና ሹፌር	የብረት ፖሊ ወድቶ እግር መሰበታት		የቀኝ እግሩ መሰበር	5/13/2016	በሂደት ላይ
5	ሲራጅ እንድሪስ	ወንድ	ሊድ ሰው ሀብት አስተዳደር ኦፊሰር	ቋሚ	22/12/2016	ሊድ ሰው ሀብት አስተዳደር	የመኪና አደጋ	9,908.80	የእግር መሰበር	30/12/2016	በፋይናንስ የተከፈለ
6	ቶፊቶ በዛብህ	ወንድ	ራ/ሳ/መ/ሞ/ና ም/ሪጅን	ኮንትራት	30/11/2016	ጉልበት ሰራተኛ	ብረት ተደናግሮ አደን መምታት		የአይን ጉዳት	15/12/2016	በሂደት ላይ
7	ዳምዕ ደሴ	ወንድ	ግብአት	ኮንትራት	16/11/2016	ጉልበት ሰራተኛ	በስራ ላይ እያሉ የማሽን ዘር ተከፍቶ የእጅ መመታት		የግራ እጅ 3 ጣቶች መሰበር	14/12/2016	በሂደት ላይ
8	ገት ደሪባ	ሴት	ግንባታ ሱት 3	ኮንትራት	25/11/2016	ጉልበት ሰራተኛ	መውደቅ		የእግር ጉዳት	9/12/2016	በሂደት ላይ
9	አሸናፊ መኮንን	ወንድ	ግብአት	ኮንትራት	7/12/2016	ጉልበት ሰራተኛ	ከከራቸር መውደቅ		የግራ ሁለት ጣት የአጥንት ስብራት	13/12/2016	በሂደት ላይ
10	መ-ሀመድ ሁሴን አሊ	ወንድ	ግብአት	ቋሚ	24/10/2016	ግሪሰ ጽዳት	ከደረጃ ላይ መውደቅ አደን ብረት መመታት	20,000.00	የጎደን ጉዳት	3/12/2016	በመድን የተከፈለ
11	ኑዲስ አለም	ወንድ	ሰሜን/አ/አ/መ/ን/አ/ዳ	ኮንትራት	24/10/2016	ጽዳት	መውደቅ		የወገብ ጉዳት	5/11/2016	በሂደት ላይ
12	ዳንኤል ተሰፋዬ	ወንድ	ኮብል ስቶን	ቋሚ	19/10/2016	ጉልበት ሰራተኛ	መውደቅ		የቀኝ እግር የአጥንት መሰበር	24/10/2016	በሂደት ላይ
13	መስፍን መሰለ መኩሪያ	ወንድ	ግብአት	ኮንትራት	30/02/2017	አናጺ	መውደቅ		የእግር ስብራት	3/3/2017	በሂደት ላይ
14	ናሳለኘ ማቴዎስ	ወንድ	ሳብራቶሪ	ቋሚ	9/3/2017	ላብራቶሪ ቴክኒሽያን	መውደቅ		የወገብ ጉዳት	12/3/2017	በሂደት ላይ
15	ማዘንግያ ደንቀ	ሴት	ግንባታ ሱት 1	ኮንትራት	12/2/2017	ጉልበት ሰራተኛ	መውደቅ		የአጥንት ጉዳት	19/03/2017	በሂደት ላይ
16	ሰናይት ሽፈራው	ሴት	ጥገና ሱት 1	ኮንትራት	23/3/2017	ጉልበት ሰራተኛ	ሱኖር መደ ጋላ ሲመሰስ መጠነኛ ቅጥቅጥ		የቀኝ እግር መሰበር ጉዳት	25/03/2017	በሂደት ላይ
17	ሙሶ ዘኪ	ሴት	ግንባታ ሱት 5	ኮንትራት	28/03/2017	ጉልበት ሰራተኛ	እይኗ ውስጥ አርማታ መግባት		የአይን ጉዳት	11/4/2017	በሂደት ላይ
18	አስናቀ ተፈራ ፈይሳ	ወንድ	ግንባታ ሱት 3	ኮንትራት	7/4/2017	ፈራቹ	ግራይንደር ስራ ላይ እያሉ ፍንጣሪው አይን ውስጥ ፍንጣሪ መግባት		የአይን ጉዳት	11/4/2017	በሂደት ላይ
19	ዳንኤል ወርቅነህ	ወንድ	ጥገና ሱት 1	ቋሚ	9/4/2017	ሹፌር	መውደቅ		የፊት ጥርስ መውደቅ	16/04/2017	በሂደት ላይ

ቁን የሞላው ሰራተኛ
ስም ...
ፊርማ ...
ቁ...

የስራ ሀላፊው
ስም ...
ፊርማ ...
ቁ...

[illegible] በ2016 በጀት ዓመት (ከሐምሌ 1/2015 - ሰኔ 30/2016/ የተሞሉ የስራ ላይ አደጋ ማሳወቂያ ዝርዝር

ተ.ቁ	አደጋ የደረሰበት ሠራተኛ ስም	ፆታ	የሚሰሩበት ክፍል	የቅጥር ሁኔታ	የስራ መደብ መጠሪያ	ጉዳቱ የደረሰበት ቀን	የአደጋው ምክንያት	የጉዳቱ አይነት	ለመድን ያሳወቅንበት ቀን	የጉዳት ዓይነት	ምርመራ
1	ሻወል አወቀ	ወ	ሎት 4	ኮንትራት	አናፂ	2/11/2015	የዕቃ መውደቅ	የእግር ጉዳት	6/11/2015	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
2	ሄለን አምባቸው	ሴ	ሎት 3	ኮንትራት	ጉልበት ሰራተኛ	8/11/2015	የመኪና ግጭት	የእግር ጉዳት	27/11/2015	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
3	ሰለሞን ፀጋዬ	ወ	እንክሰሬ	ቋሚ	ኤሌክትሪሽን	4/11/2015	መውደቅ	የጥርስ ስብራት	21/11/2015	ቋሚ	በሂደት ላይ
4	ቢሆንልኝ አሻግሬ	ወ	ሎት 3	ኮንትራት	አናፂ	3/11/2015	እንጨት ወድቆ ✓	የወገብ ጉዳት	26/11/2015	ቋሚ	በመድህን የተከፈለ
5	አብርሀም አንበሴ	ወ	ሎት 1 ጥገና	ኮንትራት	ግንበኛ	25/11/2015	ፍንጣሪ	የአይን ጉዳት	26/12/2015	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
6	የውብዳር ምትኩ	ሴ	ሎት 1 ጥገና	ኮንትራት	ጉልበት ሰራተኛ	25/10/2015	መውደቅ	የእጅ ስብራት	15/12/2015	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
7	ፀጋዬ ቢራሁን	ወ	ሎት 3	ኮንትራት	ግንበኛ	24/11/2015	በሚሽከረከር መወጋት	የእጅ ጉዳት	2/12/2015	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
8	ሙሉ አራጌ	ሴ	ሎት 3	ኮንትራት	ጉልበት ሰራተኛ	4/13/2015	መውደቅ	የእጅ እና እግር	7/1/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
9	ውቤ ካሳ	ወ	ሎት 4	ኮንትራት	ጉልበት ሰራተኛ	6/1/2016	እንጨት ወድቆ	በአይንና በጥርስ	9/1/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
10	ጌቱ ገብሬ	ወ	እንክሰሬ	ቋሚ	ኤሌክትሪሽን	6/13/2015	አስፓልት ፈንድቶ	የእጅ ጉዳት	9/1/2016	ጊዜያዊ	በፋይናንስ የተከፈለ(18,700)
11	ማሙሽ ክፈለኝ	ወ	ሎት 2 ግንባታ	ኮንትራት	አናፂ	16/12/2015	መውደቅ	የጥርስ ጉዳት	17/12/2015	ቋሚ	በሂደት ላይ
12	ወልዴ ቱምሳ	ወ	ሎት 1 ግንባታ	ኮንትራት	ጉልበት ሰራተኛ	24/10/2015	በብረት መመታት	የእጅ ጣት	ሪፖርት ያልተደረገ	ጊዜያዊ(ቀላል ጉዳት)	በሂደት ላይ
13	ካሳዬ ግርማ	ወ	ሎት 4	ኮንትራት	ፊራቶ	24/10/2015	ግንብ ወድቆ ✓	እጅና እግር	28/1/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
14	ታምራት አለምነህ	ወ	ግብአት	ኮንትራት	ፊንጅ አቅላይ	24/01/2016	ፊንጅ መፍሰስ	እግር	5/2/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
15	ክበቢ ሻንቆ	ሴ	ሎት 4 ግንባታ	ኮንትራት	ጉልበት ሰራተኛ	13/01/2016	በብረት መመታት	እጅ ላይ	8/2/2016	የቦርድ ውሳኔ የተሰጠበት	የቦርድ ውሳኔ የሚጠብቅ
16	አበበች ዱላሞ	ሴ	ሎት 1 ግንባታ	ኮንትራት	ጉልበት ሰራተኛ	2/2/2016	መውደቅ	የቀኝ እጅ	22/2/2016	የቦርድ ውሳኔ የተሰጠበት	የቦርድ ውሳኔ የሚጠብቅ
17	እናውጋው ምንዳዬ	ወ	ሎት 2 ግንባታ	ኮንትራት	ግንበኛ	12/2/2016	በሚሽከረከር መወጋት	የግራ እጅ	22/2/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
18	ታን በየን	ወ	ሎት 2 ጥገና	ቋሚ	ፎርማን	4/2/2016	የድምፅ ምት	ጆሮ	22/2/2016	የቦርድ ውሳኔ የተሰጠበት	በህክምና ላይ
19	ታዬ ተክሌ	ወ	ግብአት	ኮንትራት	ጉልበት ሰራተኛ	28/12/2015	በድንጋይ መመታት	የእጅ ጣት	26/2/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
20	ሙሴ አየለ	ወ	ሎት 2 ጥገና	ኮንትራት	ጉልበት ሰራተኛ	2/3/2016	የመኪና ግጭት	የእግር ጉዳት	7/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
21	ተሾመ ሀብተሀንስ	ወ	ግብአት	ኮንትራት	አናፂ	20/2/2016	መውደቅ	የከንፈር እና ደረት	7/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
22	ተስፋዬ ዋሌ	ወ	መሳሪያዎች	ኮንትራት	መካኒክ	2/3/2016	በብረት መመታት	ጭንቅላት	13/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
23	ጌታቸው ታደሰ	ወ	ቆርኬ	ኮንትራት	ግንበኛ	28/2/2016	መውደቅ	የወገብ ጉዳት	5/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
24	ዮሀንስ ሀብታሙ	ወ	ግብአት	ኮንትራት	ጉልበት ሰራተኛ	19/2/2016	በብረት መመታት	የእግር ጉዳት	7/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
25	አብዶ ብርሀኑ	ወ	ሎት 2 ግንባታ	ኮንትራት	ፌራዮ	19/3/2016	በቱቦ መመታት	የእጅ ጉዳት	21/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
6	በዳዳ ወርቁ	ወ	ሎት 2 ግንባታ	ኮንትራት	ግንበኛ	18/3/2016	የዕቃ መውደቅ	የእጅ ጉዳት	21/3/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
7	ተሾመ መርጋ	ወ	ሎት 1 ጥገና	ኮንትራት	ግንበኛ	26/3/2016	ፍንጣሪ	የአይን ጉዳት	9/4/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
9	ሉሜ ንጉሴ	ወ	ሎት 1 ጥገና	ኮንትራት	ግንበኛ	15/3/2016	በድንጋይ መመታት	የእግር የግራ ጣት	5/4/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
	ቴዎድሮስ አሰፋ	ወ	ሎት 3 ግንባታ	ቋሚ	ፎርማን	21/2/2016	የኮንክሬት ፍንጣሪ ✓	የቀኝ አይን	5/4/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
	አበሊሉ ወልዴ	ወ	ሎት 3 ግንባታ	ኮንትራት	አናፂ	15/4/2016	መውደቅ	የወገብ ጉዳት	17/4/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
	ሰራጅ ሙደሲር	ወ	ግብአት	ኮንትራት	ጉልበት ሰራተኛ	14/4/2016	መውደቅ	የእግር ስብራት	30/4/2016	የቦርድ ውሳኔ ያልተሰጠበት	በህክምና ላይ
	አለምነሽ ክበደ	ሴ	ፋሲሊቲ	ኮንትራት	ዕፃት	8/2/2016	መውደቅ	የእጅ ጉዳት	18/6/2016		በህክምና ላይ
	ዘሁ መስፍን	ወ	ሎት 3 ግንባታ	ቋሚ	ፎርማን	23[illegible]2016	የድማሚት ድምፅ	የጆሮ ጉዳት	18/6/2016	የቦርድ ውሳኔ የተሰጠበት	በህክምና ላይ

						19/4/2016	በድንጋይ መመታት	ጥርስ	20/6/2016		
35	አሙ ከንታሳ	ወ	ሎት 2 ግንባታ	ኮንትራት	ጥበቃ	_/6/2016	መውደቅ	የቀኝ እጅ ስብራት	ሪፖርት ያልተደረገ	ጊዜያዊ(ቀላል ጉዳት)	በህክምና ላይ
36	አሸቱ ሞላ	ወ	ሎት 3 ግንባታ	ኮንትራት	ግንበኛ	17/6/2016	በብረት መመታት	ጥርስ	20/6/2016		በህክምና ላይ
37	አበራ ዋንን	ወ	ሎት 2 ግንባታ	ቋሚ	የጥበቃ መሪ	10/5/2016	በሰው መመታት	ጭንቅላት	2/8/2016		በህክምና ላይ
38	መኮንን ኒጋሽ	ወ	ሎት 3 ግንባታ	ኮንትራት	ግንበኛ	23/6/2016	በብረት መመታት	የግራ ጣት ጉዳት	28/6/2016		በህክምና ላይ
39	ዶልቃል አስራ	ወ	ሎት 3 ግንባታ	ኮንትራት	ግንበኛ	21/6/2016	ተንሸራቶ መውደቅ	የወገብ ጉዳት	2/6/2016		በህክምና ላይ
40	መንግስት አበበው	ወ	ሎት 4 ግንባታ	ኮንትራት	ጥበቃ	24/6/2016	ድብደባ	የአካል ጉዳት	5/7/2016		በህክምና ላይ
41	አየለ ካሳሁን	ወ	መሳሪያዎች	ቋሚ	በያጅ	25/6/2016	ከድልድይ መውደቅ	የወገብ ጉዳት	21/7/2016		በህክምና ላይ
42	እጅግሰማሁ በቀለ	ሴ	ሎት 2 ጥገና	ኮንትራት	ድሬኔጅ ዕዳት	4/7/2016	የመኪና በር ምት	የግራ እጅ ጉዳት	25/7/2016		በህክምና ላይ
43	አሸብር ፀጋዬ	ወ	ሎት 2 ጥገና	ኮንትራት	የጉልበት ሰራተኛ	6/7/2016	በብረት መመታት	የጥርስ ጉዳት	12/7/2016		በህክምና ላይ
44	በረሁን ሞገስ ኒጋሽ	ወ	መሳሪያዎች	ቋሚ	መካኒክ	5/7/2016	የብረት ምት	የቀኝ ክንድ	24/7/2016		በህክምና ላይ
45	ደጀኔ ካብትይመር	ወ	ግብአት	ቋሚ	ኦፕሬተር	29/3/2016	በኤሌክትሪክ መያዝ	ሁለቱም የእጅ ጣት	25/7/2016	የቦርድ ውሳኔ የተጠየቀበት	በህክምና ላይ
46	በላይነህ ዳኛቸው	ወ	ግብአት	ቋሚ	ፎርማን	24/7/2016	የብረት ምት	የአይን ቅንድብ	ሪፖርት ያልተደረገ	ጊዜያዊ(ቀላል ጉዳት)	በህክምና ላይ
47	በውዱ ደደግ	ወ	ግብአት	ኮንትራት	ጉልበት ሰራተኛ	18/7/2016	የእንጨት መውደቅ	የቀኝ እግር ጉዳት	9/8/2016		በህክምና ላይ
48	አብርሃም በየን	ወ	ሎት 1 ጥገና	ቋሚ	ዳታ ኢንኮደር	28/7/2016	በሰው መደብደብ	የጥርስ መውለቅ	19/8/2016		በህክምና ላይ
49	ሻወል አወቀ በዩ	ወ	ሎት 4 ግንባታ	ኮንትራት	እናሚ	10/5/2016	ከባድ እቃ ማንሳት	የወገብ ጉዳት	22/8/2016		በህክምና ላይ
50	አ/ር ገ/ገብርኤል አሰፋ	ወ	ምህንድስና	ቋሚ	ስራ አስኪያጅ	6/9/2016	መውደቅ	የጭንቅላት ጉዳት	13/9/2016		በህክምና ላይ
51	ዳንኤል ደምሴ	ወ	ሎት 1 ጥገና	ቋሚ	ሹፌር	12/8/2016	መውደቅ	የጣት ስብራት	9/9/2016		በህክምና ላይ
52	አብይ ብርሀኑ	ወ	ሎት 2 ግንባታ	ቋሚ	ፈረቶ	16/9/2016	መውደቅ	የቀኝ እግር ጉዳት	21/9/2016		በህክምና ላይ
53	ሳሙኤል ኩማ	ወ	አንስለሪ	ኮንትራት	ግንበኛ	1/9/2016	መሰራት ስራ ላይ	ኤሌክትሪክ መያዝ	28/9/2016		በህክምና ላይ
54	ዋ.ግዜ እንግዳወርቅ	ወ	ሎት 3 ግንባታ	ቋሚ	ፎርማን	20/9/2016	በህመም	መውደቅ	ሪፖርት ያልተደረገ	ጊዜያዊ(ቀላል ጉዳት)	በህክምና ላይ
55	ወ/ምርያም	ሴ	ክሊኒክ	ኮንትራት	ዕዳት	19/7/2016	መውደቅ	የወገብ ጉዳት	ሪፖርት ያልተደረገ	ጊዜያዊ(ቀላል ጉዳት)	በህክምና ላይ

ማስታወሻ፡ ጉዳት የደረሰበት ሰራተኛ ህክምናውን ጨርሶ የቦርድ ውሳኔ ከሆስፒታል ካላመጣ ጉዳቱ ቋሚ ወይም ጊዜያዊ መሆኑን ማወቅ አይቻልም

ቅፁን የሞላው ሰራተኛ

ስም ......

ፊርማ ......

ቀን 17/10/16

የስራ ሀላፊው

ስም ......

ፊርማ ......

ቀን ......

Appendix IV: Site Pictures

Photos

Workers were engaged in manual cleaning of drainage manholes without essential personal protective equipment (PPE) such as masks, gloves, or proper helmets. This exposes them to hazardous gases, biohazards, and risk of injury due to inadequate safety measures.

Source: (Bole Arabssa road project, own survey)

The image shows workers engaged in carpentry, asphalt placement, and concrete casting activities without essential personal protective equipment (PPE) such as safety shoes, gloves, helmet, and reflective vests. The absences of proper PPE significantly increase the risk of injury from sharp tools, hot materials, and heavy machinery, highlighting gaps in on-site safety enforcement.

Source: (Bole Arabssa road project, own survey)

At night, workers are exposed to danger without proper safety equipment. They wear no high reflective vests to ensure visibility in the dark. Protective jackets to shield them from extreme cold air are absent. They also lack crucial safety shoes, helmets, and gloves, leaving the vulnerable to injuries. This unsafe practice significantly increases their risk on site.

Source: (Bole Arabssa road projects, own survey)

Workers are being unsafely transported with construction material on the loader machine. This hazardous & unsafe practice exposes them to serious risks like falling, crushing, or being struck during movement. It reflects a severe violation of safe transport procedures on site.

Source: (Bole Arabssa road project, own source)