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Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa

A project work submitted to Addis Ababa University, School of commerce, graduate studies in partial fulfillment of the requirements for Degree of Master of Arts in Project Management

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June, 2022

Addis Ababa

Declaration

I, the undersigned declare that the project entitled “*Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa*” is my original work and has not be presented for a degree in any other university and that all sources of material used for the project have been Acknowledged accordingly.

Menale Demlie

Name

Signature

Certification

This is to certify that Menale Demlie has properly completed his research work entitled *“Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa”* under my supervision. In my opinion, his project work is appropriate to be submitted as a fulfillment requirement for the award Degree of Masters of Arts in Project Management.

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Approval page

Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa

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Acronyms and abbreviations

ETB: Ethiopia birr

ILO: International labor organization

PPE: Personal protective equipment

SPSS: Software Package for Statistical Analysis

WHO: World health organization

OSMS: Occupational Safety Management Systems

GCC: General Condition of Contract

SCC: Special Condition of contract

OSM: Occupational Safety Management

Abstract

Introduction: Electricity is essential to modern life of human beings in many aspects such as for health care at hospitals and clinics, construction places, transports, and communications, households, commercial, offices, spaces, mining areas and others. Despite its importance unsafe use electricity results injuries and fatalities. Those who are involved in electrical job they should be alert for each and every second. Mistakes or failure will not have any excuses. However, most of the studies were indicate that accidents occurred due to electricity is considered as one of the factors among several. And as any mistake has no excuse on electrical works, limited availability of the studies, unsafe working with electricity is construction sites and the magnitude of its severity is not well studied in Ethiopia. Hence, the researcher inspired to investigate the *assessing electrical works occupational safety management practice: the case of selected building projects in Addis Ababa*.

Objective: The aim of this study was *assessing electrical works occupational safety management practice: the case of selected building projects in Addis Ababa*.

Methods: Descriptive statistics study was used to analyze the data in selected building construction projects in Addis Ababa. A mixture of convenience and snowball sampling methods was used for sampling purposes. The collected data were coded, entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26 software.

Findings: The results of the present study have demonstrated the electrical works occupational safety management practice in selected building project sites in Addis Ababa. From the study, it was showed that users of electricity and other workers at site are not well informed or aware about electricity hazards and safety measures, there is no training at project sites, no well-organized safety policy, involvement, and commitment of the company/management to wards safety is poor, there is no budget allocated for safety, no provision of PPE resources. Furthermore, there is no mechanism for reporting injuries and record data.

Conclusion: From the result, the researcher concluded that electrical works occupational safety management practice in construction sites is very poor. Thus, documented and well-organized safety policies, regulation and procedures consisting of occupational safety requirements, at

every construction project is essential for the safe working environment at construction sites especially for electrical works as any mistake or failure will have no any excuses on electrical accidents.

Chapter One

Introduction

This chapter explained the general overview and insight of the background around which it becomes a topical area requiring research. It contains several aspects, namely: background of the study, problem statement, and research questions, general and specific objectives of the research, significance and scope of the research. In addition, this chapter also presents the structural layout of the entire proposal.

1.1. Background of the study

Safety management at workplace involves the functions of identifying problem areas, coordinating, controlling, and directing the safety activities at the work site, all aimed at the prevention of accidents and ill health. According to Wubshet (2020), practices and challenges of occupational health and safety standards implementation in building construction projects in Addis Ababa were assessed. The obtained results showed that nearly 50% of the participating firms in this study knew about the availability of standards. Among them many of firms never practiced the standards. Lack of budget, absence of planning and pre and un identification of hazards are some of the additional findings.

Lucy F. (2015) studied health and safety practices of building construction in Addis Ababa and found out the practical situations of health and safety considerations are evaluated and the results ranging from low to medium. Binding of safety and health policies to contract documents and allocation of budget and time are proposed in this study.

Electricity is essential to modern life of human beings in many aspects. Such as for health care at hospitals, construction places, transports and communications, households, commercial, offices, spaces, mining areas and others. However, unsafe use of electricity results injuries and fatalities. Identifying electrical hazards can help improve awareness of the risks, their severity and how can they harm workers. Overhead power lines, damaged/ faulty equipment, inadequate wiring, over loaded circuits, improper grounding, damaged installation, and wet conditions are some of the electrical hazards. (OSHA Academy, occupational safety, and health training, 2020). Any

mistake or failure will have no excuses. “We can assume that working with an electrical system is similar to that of working in a war field” (Basak R. , 2015).

“Electrical safety is more important, because we could not realize that what amount of current a simple cable or a bare conductor carrying or briefly, we could not ascertain whether a conductor is live or dead. This harmless appearance misguides us. And this is the main root cause of most electrical accidents (Basak R. , 2015).”

Many buildings ranging from small residential to high rise commercial and residential apartment buildings are constructed in Addis Ababa. Workers with different levels of educational and practical backgrounds participating in electrical work activities, Electrical safety could be ensured by proper installation, working with trained workers, working with proper tools, good earthing system and adopting adequate protection and control mechanisms. But inadequate training, lack of experience, and failure to recognize potential hazards will result in electric shock, burns, or death and this affects not only to the electricity worker but also to others (Trevor, L., 2007).

Therefore, working electricity in unsafe condition is a rescuing problem to all stakeholders and the society which results injury, electrical shock, death, reduction in quality of the work, decrease in performance of the workers, run out schedule and budget of the project. In particular, this paper was aimed to assess the practices of occupational safety practice, employees' involvement towards electrical occupational safety management system, the companies'/management's commitment on risk reductions practices and identify the challenges of implementing occupational electrical safety standards in building projects. I argue that there is the need to assess the practice of occupational safety on electrical works of the building projects, because knowing and understanding of the practices of the project helped to us to offer alternative solutions to the problem of the research questions. In the case of building projects in Addis Ababa determining the occupational practices of electrical safety as well as identifying the factors that causes the electrical faults was the first step in addressing the problem.

1.2. Statement of the Problem

The ILO estimates that some 2.3 million workers around the world succumb to work related accidents or diseases every year; this corresponds to over 600 million deaths every single day.

Worldwide, there are around 340 million occupational accidents and 160 million victims of work related illnesses annually (World Statistics International labore organization, 2022). And the joint repot of ILO and WHO showed that 1.9 million deaths were recorded in 2016 due to work related diseases and injuries (ILO/WHO, 2017). This shows that the rate of accidents and death occurrence increases from time to time.

The availability and ability of occupational safety and health law in Ethiopia has checked and too much laws endorsed in Ethiopia but not practical to resolve the problem as expected ((Tilahun, 2020). According to Mengesha (2021), occupatinal accidents in construction projects occurred due to failure of management to develop and enforce work place safety. And damage of plants, equipment, raise of project budget due to insurance primium, settlemrnt of death claims and medical insurances are some of the finding incidents occurred as a consequence of accidents. And the causes of injuries in condominium projects in Addis Ababa found to be lack of skilled employers, poor working condotions, lack of safety awareness, communication problems, lack of use of safety resources and personel protective equipment (PPE) (Leyikun, 2019).

The severity of electrical accidents in construction industry in spain studied by (Jerbi S. B., 2017) and the results obtained was the fatality consequences in electrical accidents was almost five times higher than th average. Several variables including age, occupation, company size, preventive mesures, physical activity, body part injured, accident locations etc are related to the severity of electrical accidents..

In general, different studies were conducted on health and safety occupational practices in building projects in Addis Ababa. Electrical occuapational safety practices were included as a general health and safety prtices. The other sudies that are conducted regarding electrical issues in Ethiopia are: The Ethiopian Electric utility has not followed formal and structured framework for outsourcing process and these decisions were not supported by proper analysis (Yimenu, 2020). Mesele, Y. (2018) according to Supplier's compliance with terms and conditions of the contracts, technical capabilities of suppliers and close monitoring of procurement contracts during implementation were positively affect project management to project success and project management is dependent on these variables.

There are several accident factors in building projects such as falling from height, collide with falling/moving objects, excavated related injuries, electrocution, fire/explosion, failure of

temporary structure, lightning strike and deficiency of oxygen in confined spaces (Mengesha, 2021). However, there are several studies conducted in health and safety practices as well as lots of developed guidelines on safety of electrical works, but there are little available research studies on the practice of occupational safety on electrical works and the challenges of implementing safety regulation enforcement mechanisms in building construction projects in Ethiopia in detail. Most of the studies as we read above, accidents occurred due to electrical accidents is considered to be one of the factors among several factors and the magnitude of its severity is not well studied in Ethiopia, Addis Ababa. Hence, we argue that there is a need to assess the occupational safety practices on electrical safety management. As the lack of occupational safety practices affects all stakeholders (clients, contractors, consultants, and end users) of the project.

Therefore, this research deal with the assessment of current occupational practices of safety considerations and challenges implementation of electrical safety enforcement mechanism regulations and standards in building projects in Addis Ababa.

1.3. Basic Research Questions

- What are the practices of construction companies in implementing electrical occupational safety in building projects?
- What is the employees' involvement towards electrical occupational safety management practices?
- What are the companies'/ management's commitment on risk reductions practices?
- What are the challenges of implementing electrical occupational safety standards in building projects?

1.4. Objectives

1.4.1. General objectives

The main objective of this study was *Assessing Electrical Works Occupational Safety Management Practices* in building project sites in Addis Ababa.

1.4.2. Specific objectives

The specific objectives of this study were:

- To assess the practices of construction companies in implementing electrical occupational safety management in building projects.
- To assess the employees' involvement towards electrical occupational safety management practices
- To assess the companies' / management's commitment on electrical occupational safety management practices
- To identify the challenges of implementing electrical occupational safety standards in building projects.

1.4.3. Definition of terms/concepts/constructs

Definition and basic concepts of terminologies

To clarify the basic concepts and terminologies used in the study the definitions of technical, conceptual and operational terminologies are essential (Mengesha, 2021). Accordingly, the definition of technical and operational terminologies of this study provided as follows:

Safety: Safety is defined as reduction of risk to a level that is as low as reasonable as practicable (Basak R. , 2015).

Electrical safety: refers to any safety precautions taken against electricity.

Ground: an electrical connection to the earth.

An electric shock; is a physical reaction to electrical currents passing through the body.

Lightening arrestor: A device used to protect an electrical component from over voltage.

Source: (<https://www.brightridge.com/resources/electric-learning/electricity-terms, 2022>).

Occupation: work related matters and work concerned activities.

Risk: Is chance of something happening that will have an impact and could be counted by its consequence and likelihood (Basak R. , 2015).

Electrical Hazards: a dangerous condition where worker could make electric contact with energized equipment or a conductor.

Electric arc: the form of the electric discharge with the highest current density.

Electrocution: Death or sever injury by electric shock, electric current passing through the body.

1.5. Significance of the study

According to (Leyikun, 2019) the results of the study found are, there is no project safety plan, well organized safety policy, no involvement of top management levels and concerned bodies from government side. In addition, there is no accident reporting mechanisms and recording the accident data. Lack of training, supervision of workers and low creation of safety and health awareness are also other results obtained from the research. Hence, the researcher believes that this study can be used:

- The findings of this research will be used as an additional input by regulatory bodies, standard developers and policy makers for the requirements and enforcement mechanisms of standards in the industry.
- To aware stakeholders towards implementation of safety regulations and standard requirements.
- It comes up with possible recommendation that contribute to the practice of OSM in the understudy or other same industries.
- It can be used as a reference for further research to others in similar research.

1.6. Scope of the study

This study focused on the assessment of the practices of occupational safety management, employees' involvement towards electrical occupational safety management system, the companies'/ management's commitment on risk reductions practices and identify the challenges of implementing occupational electrical safety standards in building projects on occupational safety management of electrical works in Addis Ababa building projects.

1.7. Organization of the study

This proposal is organized in five chapters. Chapter one presents introduction of the study; background of the study, statement of problem, research questions, objective of the study, significance and scope of the research and chapter two the literature review the practice of occupational safety management on electrical works as reduction of risk. Chapter three contains the research design and methodologies of the study: includes sources of data, the data collection instruments, the procedures of data collection.

Chapter four deals with analysis of data gathered by means of data collection methods & instruments. The last chapter presents conclusion and recommendations.

Chapter two

2. Literature review

2.1 Introduction

This section reviews and scrutinizes the exiting research /literature and publications in related to the topic *Assessing Electrical Works Occupational Safety Management Practice*.

According to Ezennaya, S., O., et. Al (2017), electricity is essential to modern life, both at home and at work place. Engineers, electricians, electronic technicians, and power line workers work with electricity directly and others like office workers, sales personnel, human resource, and accountants etc. work with it indirectly. Electrical safety needs urgent and careful attention. Working with electricity with inadequate training, lack of experience, and failure to recognize potential hazards will result in electric shock, burns, death or severely injure people and cause damage to property. Harmless appearance of electricity is the root cause of electrical accidents (Basak R. , 2015).

2.2 Theoretical Review

2.2.1 Definition of electrical works Occupational Safety management practice

“Electrical safety is a general practice of workers who are exposed to handling and maintaining electrically powered equipment”. It is a set of guidelines that workers have to follow to mitigate electrical hazards and prevents the dangerous effects caused in case of an accident. Electrical safety can be maximized by knowing electrical safety precautions and using /wearing of electrical safety equipment. Source: (safetyculture.com/topics/electrical-hazards, 2022).

2.2.2 Causes of accident in construction site

Generally, unsafe acts and unsafe conditions are the primary causes of accidents, as they appear directly at the movement accidents encountered (Mengesha, 2021). According to Holt cited in, (Mengesha, 2021) the failure of the management system, lack of training, maintenance, adequate job planning and instructions are considered to be secondary causes.

2.2.3 Theories of accident causation

There are several theories of accident causation have been developed in order to indicate occurrence of accidents. One of them is human factor theory. In human factors theory such as overburdened, unsuitable response, and inappropriate act argued human error contributes to accident causation which leads up in chain of events leading to an accident (Mengesha, 2021).

2.2.4 Electrical hazards

An electrical hazard is defined as a dangerous condition where a person could make electrical contact with energized equipment or a conductor (IHSA.com). According to Ezennaya, S., O., et. Al (2017), electricity is recognized as a serious work place hazard, which is exposing employees to electric shock, electrocution, burns, fires, death or severely injure, causes to damage to property and explosions.

Electrical hazards can be categorized in to different categories (the electrical work regulation, 1989), such as electrical shock, electrical burns, electrical explosion or arcing and ire or explosion indicated by electric.

2.2.4.1 Electrical Shock

When human body become part of the electric circuit, it is said to be electrical shock is occurred. “The severity of injury from electrical shock depends on the amount of electrical current and the length of time the current passes through the body”. According to Ezennaya, S., O., et. Al (2017), electrical shocks can happen in three ways; a person may come in contact with both conductors in a circuit; a person may provide a path between an ungrounded conductor and the ground and a person may provide a path between the ground and a conducting material that is in contact with an ungrounded conductor (Ezennaya, 2017).

2.2.4.2 Electrical burns

Electrical burns can be resulted when a person touches bare electrical wire which is energized or equipment that is in use in contact with electric current or maintained improperly equipment. Burns caused by electricity are electrical burns, arc burns and thermal contact burns.

2.2.4.3 Electrical fires

Electricity is one of the most common causes of fires and thermal burns in homes and workplaces caused by in contact of a conductor with energized part and defective equipment.

2.2.6 Electrical safety work practices

Every employer and organization have to establish work practices, procedures and process that ensures the safety of employees working with electrical tools and equipment, employees working with a machine that generates an electric current and also to others that can be affected by electrical accidents. De-energized of equipment, lockout, tag out, procedures, establishing shock protection and arc flash boundaries, labeling equipment and wearing the appropriate personal protective equipment (PPE) are all aspects of good practices for reducing the risks of electrical hazards. Source (<https://safetyculture.com/topics/electrical-hazards>).

To avoid electrical accidents, the electric worker, the organization and employer must recognize of hazards, evaluate and assess the risk and control hazards.

a) Recognize hazards

The first part of the safety is recognizing the hazards around us to avoid or control hazards. Exposed to electrical parts, in adequate wiring, overhead power lines, defective insulation, improper grounding, overloaded circuits, wet conditions, damage tools and improper PPE are lists of some electrical hazards. And over voltage, short circuit, over current, corrosion, heating of conducting and insulating etc. are causes of electrical hazards. Source: (<http://healthsafetyupdates.blogspot.in, 2022>).

b) Evaluate hazards

After we recognize the hazard, our next step is to evaluate the risks from the hazard. When we are evaluating hazards, it is best to identify all possible hazards first, and then evaluate the risks of injury from each hazard. We can't say the risk is low until we evaluate the hazard.

c) Control hazards

Once electrical hazards have been recognized and evaluated, they can be controlled. Electrical hazards can be controlled by creating a safe work environment and using safe work practices. Safety electrical precautions are control measures implemented to remove electrical hazards. Controlling the electrical hazards reduces the risk of electrical accidents.

2.2.7 Control the risks/protective measures of hazards

Once hazards have been identified and the risks are assessed, appropriate control measures must be taken. Generally, electrical safety depends on appropriate training, work planning, and correct testing procedures and techniques. The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. The main ways of controlling risks are:

Elimination: the most effective control measure is to remove the hazard or hazardous work practice.

Substitution: replacing a hazardous process or material with one that is less hazardous will reduce the hazard and hence the risk.

Isolation: preventing workers from coming in to contact with the source of the electrical hazard will reduce the relevant risks and others.

2.2.8 Ethiopian standard for occupational safety

Ethiopia used standard requirements for guidance for use (ES ISO 45001: 2018) originally developed by ISO (Tilahun, 2020). The aim and intended outcomes of the OH&S management system are to prevent workers from work-related injury and to provide safe workplaces and it is important to the organization to eliminate hazards and minimize OH&S risks by taking effective preventive and protective measures (ISO, 2018). In Ethiopia, working conditions of construction sites are found to be very poor mainly due to a lack of safety measures so that workers are exposed to work-related accidents (Tilahun, 2020).

2.2.9 Electrical rescue techniques

According to Ezennaya, S., O., et. Al (2017), the electrical rescue technique/procedures when approaching the accident in contact with energized conductors: never rush in to an accident situation, call the medical team, get the aid of trained electrical personnel if possible and

approach the accident scene cautiously. During examining the accident scene do not touch the victim or conductive surfaces while they are recognized. The electric power will come from by plugging portable electrical equipment or fixed electrical equipment. Then to de-energized unplug portable electrical equipment to remove power or open a disconnecting device or circuit breaker in case of fixed electrical equipment.

2.2.10 First aid training, equipment and procedures

OHS regulation (2001) prescribed that first aid is important and to be placed in the right location in every work place. First aid provides immediate help to a person suffering from an injury at work.

2.3 Empirical review

Construction industry is considered to be the most dangerous sector globally in terms occupational safety and health. Research conducted to figure out the electrical works occupational safety practice is very limited. In this study related researches will be reviewed in relation to the topic of “*Assessing Electrical Works Occupational Safety Management Practice*” around the world and in focus of Ethiopia, Addis Ababa.

The WHO/ILO (2006-2021), joint estimates are produced at national, regional, and global level and disaggregated by sex and age group and provide the most comprehensive set of official estimates of work-related burden of disease produced to date. Ezennaya, S., O., et.al (2017) studied on electrical hazards and safety and the finding of the study reveals that many users of electricity are not well informed or aware about electricity hazards and safety measures witnessed by electricity accidents occurred at homes and workplaces. Spread the awareness of electrical hazards and safety to others at work place and at homes avoids such kind of accidents. And also electricity users should be well sensitized by government, NGO's, electrical power providers, and manufacturers of electrical products on hazards are some recommendations suggested by the researchers.

A study was conducted on the title of “The severity of electrical occupations accidents in the primary, secondary and tertiary sectors” has be assessed on electrical accidents which occurred

in Spain between 2003 and 2012 by (J. Castillo-Rosa, 2017). The results obtained are the fatality consequences in electrical accidents were almost five times higher than the average. Similarly, the severity of electricity accidents in the construction industry in Spain has evaluated on statistics (M. Suarez-Cebador, 2014) and found out variables including age, occupation, company size, preventive measures, physical activity, body part injured, accident location etc. are related to the severity of electrical accidents in Spain.

“Assessing safety beliefs of electrical workers in Australia” has investigated using a qualitative methodology. The researcher conducted interviews and focused groups with 46 licensed electrical workers to classify their beliefs in to advantages, disadvantages, referents, barriers and facilitators (K. M. White, 2016), the results showed that the identified beliefs can inform about the principal factors influencing safe work decision.

According to Boubaker, S & Jerbi, S., (2017), the “electrical safety beliefs and practices in Haill regions, Saudi Arabia, have assessed”, the researchers prepared a questionnaire composed of 36 questions (10 for the respondents’ information, 16 for the home safety culture and 10 for the electrical devices purchasing culture) has been devised and distributed to residents 228 responses have collected and analyzed using a scale similar to the one adopted for a university student GPA calculation, the electrical safety level (ESL) in Haill region has been found to be 0.76 (in a scale of 4 points), which is very low score and indicates a poor electrical safety culture. Researchers’ recommendations are new rules and sanctions have to be included and applied to organizations, safety culture (including the electrical safety) has to be developed during the primary and secondary schools by specialized courses/trainings and the resident should be provided with free training on safety awareness.

A study was conducted on the tile of “Assessment of safety and health laws and enforcement practice in Ethiopia construction industry” using descriptive and inferential statistics analysis method were deployed to assess the availability and ability of occupational safety and health law in Ethiopia has checked and too much laws indorsed in Ethiopia but not practical to resolve the problems as expected (Tilahun, 2020), he tried to assess to the roles and responsibilities of different stakeholders (the clients, consultants, contractors, employees) in regard to occupational health and safety, in this study the gap of the stakeholders are investigated and several recommendations suggested.

A statistical or qualitative analysis was used to analyze the data collected through questionnaire to the study conducted on the title of “Effect of occupational safety and health on project performance “ by (Mengesha, 2021). According to Mengesha, (2021), occupational accidents in construction projects occurred due to failure of management to develop and enforce work place safety. And a damage of plants, equipment, raise of project budget due to insurance premium, settlement of death claims and medical insurances are some of the finding incidents occurred as consequences of accidents. Similarly, the study conducted on building construction occupational safety and health assessment in condominium projects in Addis Ababa and the obtained results showed that causes of injuries are lack of use of safety resources and personnel protective equipment (PPE) (Leyikun, 2019). In addition, injuries are significantly associated with age, gender, educational level, experience and the type of occupation of the works. The researcher recommended that organized hierarchy department structure for occupational health and safety is essential to reduce the prevalence of injuries.

Wondimeneh, (2021) studied on the title of “Assessment of occupational injury and associated factors among building construction workers in Addis Ababa”. He was analyzing the data using cross-sectional method and a face to face interview was conducted with 220 participants. Out of 220 participants 88(40%) workers reported occupational injury during the past 12 months and the main causes of injury are stuck by an object 24(27.2%) and falling at ground level 23(26.1%). Workers who worked greater than 48hours per week 2.3 times more injured than workers worked less than 48 hours per week. So that according to the researcher high occupational injuries are occurred due to lack of work experience and prolonged working hours per week. The recommendations provided in this study are occupational health training and limiting working hours less than 48 hours per week reduce occupational injuries in work places.

2.4 Conceptual frame work

In this paper conceptual research framework was developed based on theoretical and empirical literature reviews.

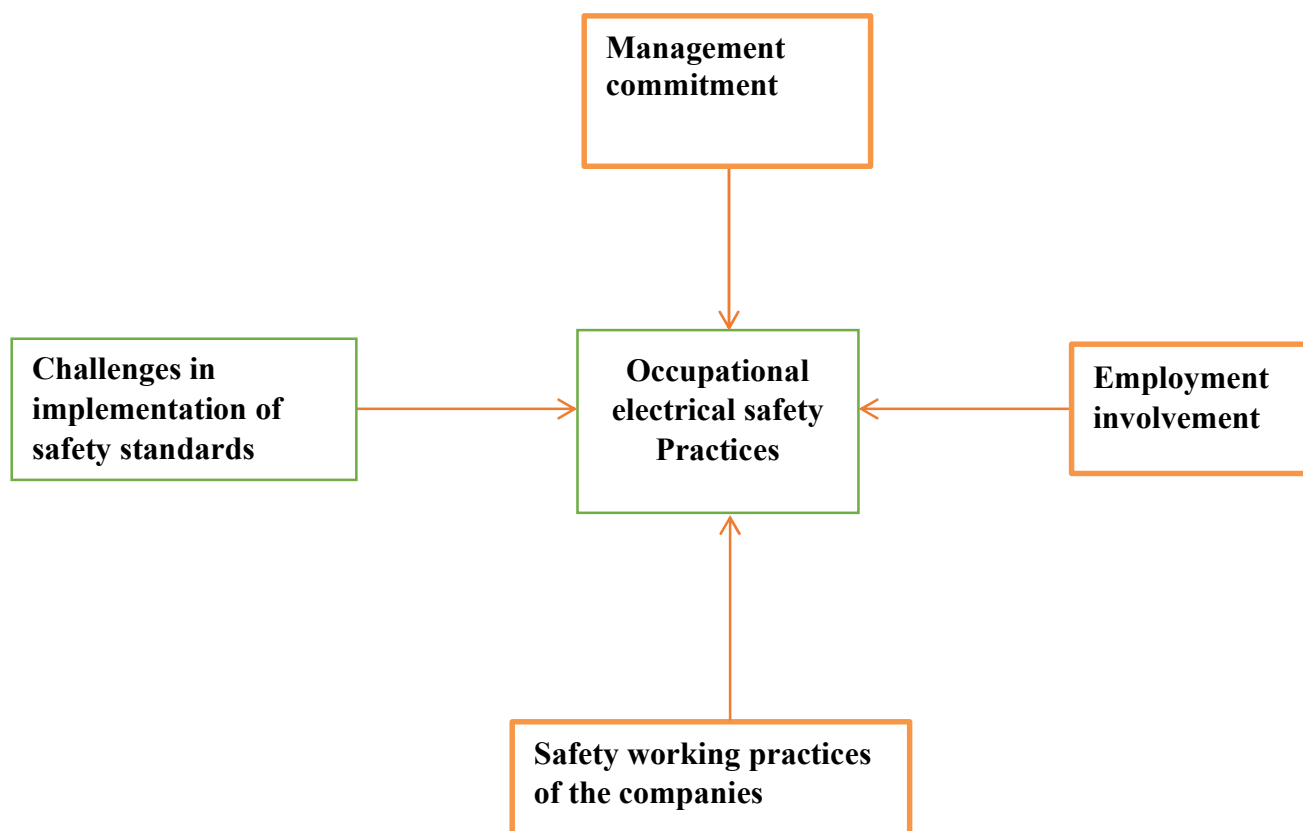
According to Leyikun, (2019), injuries are significantly associated with age, gender, educational level, experience and the type of occupation of the works and the causes of injuries are lack of use of safety resources and personnel protective equipment (PPE). Similarly, (M. Suarez-Cebador, 2014) found out variables including age, occupation, company size, preventive

measures, physical activity, body part injured, accident location etc. are related to the severity of electrical accidents in Spain.

According to Mengesha, (2021), occupational accidents in construction projects occurred due to failure of management to develop and enforce workplace safety.

Literatures discussed, Management commitment and involvement should be the first point to consider when an organization thinks of implementing occupational safety and health management systems (Christian et al., 2012; ILO, 2011). safety policies and procedures should be vital for implementing OSH management (Int.J.Curr.Res. Rev, 2014). Through formulation of safety committee, providing of training and communicating safety issues workers can be involved and participates in the overall workplace safety and health management program is also one of the facilitators of OSMS practices (Christian et al., 2012).

Figure 1: Conceptual framework model (source: Semiret Metaferia, 2015 model)



As we show on figure-1 above the independent variables are the main factors for the overall practices of electrical occupational safety management system in construction company. Hence, the positive outcome of OSMS practice is depending on the positive outcome of independent variables.

Chapter three

3. Research design and methodology

3.1 Introduction

Research methodology is a way to analytically resolve research problems (Kothari, 2004), cited by (Mengesha, 2021). This chapter deals with the methodology adopted in conducting the study. It organized as research approach, research design, data collection methods, sampling design, sources of data and data collection instruments. And also will analyze the Electrical Works Occupational Safety Management Practices and challenges of the implementation of occupational safety standards in selected building construction projects in Addis Ababa.

3.2 Research Approach

This study used a mixed approach. (Bryman, 2012), explained the importance of mixed method research combines qualitative and quantitative approach to social science research at the same time. Thus, both quantitative and qualitative approaches used to analyze data collected from primary and secondary sources. In addition, legislations, conventions, and standards in the area are reviewed and included.

3.3 Research design

This research used a descriptive research design method. Descriptive research design method can use a wide variety of research methods to investigate one or more variables and observes and measures them. (Reference www.scribbr.com/methodology/descriptive-research/).

Descriptive research design is appropriate for the purpose of studying, describing and obtaining relevant information on the existing reality of Electrical Works Occupational Safety Management Practices and challenges of the implementation of occupational safety standards in selected building construction projects in Addis Ababa.

3.4 Sampling design

“Sampling design is a mathematical function that gives us the probability of any given sample being drawn. Sample design refers to the plans and methods to be followed in selecting a sample from the target population and the estimation technique vis-à-vis formula for computing the sample statistics.” (Reference: www.iedunote.com/sampling).

3.4.1 Target Population

Considering time and cost for this project work, the population for the study was selected building projects in Addis Ababa. The targeted population/ respondents were relevant staffs working in occupational health and safety issues in the firms, safety officers, project managers and the entire population who were directly exposed to workplace hazards. Administrative staffs who were working apart from construction site were excluded.

3.4.2 Sampling Frame

Sampling frame for this study is limited to relevant staffs working in occupational health and safety issues in the firms, safety officers, project managers and the entire population who are directly exposed to workplace hazards.

3.4.3 Sampling technique

“Sampling is the act, process, or technique of selecting a representative part of a population for the purpose of determining parameters or characteristics of the whole population” (The merriam webster dictionary, 1843).

There are different types of sampling i.e. probability (simple random, systematic, stratified random, cluster and multi stage sampling) and non-probability (deliberate or purposive, shopping mall intercept, sequential, quota, panel, snowball and convenience) samplings (Abdurazak, 2014). For this study, a mixed of convenience and snowball sampling technique was used. In some cases, purposive sampling will be supported by snowball sampling in which a researcher begins with a small population of known individuals and expands the sample by asking those initial participants to identify others that should participate in the study (Abdurazak, 2014).

3.4.4 Sample size

Since, we have studied the research in titled “*Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa*” the

respondents were those who were related to electrical workers, safety officers, project managers and the entire population who are directly exposed to workplace hazards. So that the sample size of this study was total of 42 employees within three construction sites in which the status of each site was at different level were selected for this study as respondents for questionnaire and interviews. 38 of respondents were for questionnaires and the other four respondents were taken from managerial level and safety officers using purposive sampling methods for interviews.

3.4.5 Sampling procedure

The sampling procedure was done after looking and visiting of the construction project sites, then, careful investigation and selecting the appropriate sites was done. i.e. the sites which has mainly electrical installation works and other major works that has done using electric power to addresses the statement of the problem and research questions. The study mainly focused on the primary data collected through questionnaire and interviews. The questionnaire was administered after discussing with the responsible persons of the firm at construction sites on the objective of the study.

3.5 Sources of data

In this project work the researcher was used primary data sources from questionnaires, interviews and physical observation of the sites and secondary data. In addition, legislations, conventions and standards in the area were reviewed and included in this study.

3.5.1 Primary data

Primary sources provided direct and firsthand evidence about an event and the original material in which other is based and enable other researchers to get as possible to what actually happened during a particular event. This study was used questionnaire, interviews, actual project documents, and physical observation as primary data sources.

3.5.2 Secondary data

Secondary data are those gathered by other researchers/parties than the user himself, which helps to supplement information obtained from primary data. It includes articles, reports, books, internet sources, journals. The data obtained from the literature was used to compare with the results/ findings obtained from this research.

3.6 Method of data collection

The methods of data collection were used in this study are self-administrated questionnaire, interviews and personal observation at the site as a primary data. The questionnaires were prepared in two different languages (English and Amharic) for site workers, site engineers, foremen. The participants those who were professionals that have the capacity to understand English language used the English version and others used the Amharic version. Structured self-administered questionnaire was distributed to willing respondents. The respondents were given an orientation about the objective of the study, how to answer the questionnaire, and when to return back it. After data collection for the purpose of data analyzing and processing the English version was used. And the researcher conducted the interviews for managerial level management staffs directly to as semi structured questions and records their responses at the construction site or their offices. Work environment observations were taken using a structured checklist involving physical hazards. Reviewing of injury records of a firm was not available at any of the sites.

3.7 Data collection instruments

The data collections instruments used in this research were interviews, questionnaires, documentary analysis and work environment observation structured checklist involving physical hazards.

3.8 Data analysis methods

The collected data was analyzed quantitatively and qualitatively by descriptive method using MS Excel spreadsheet and IBM SPSS software version 26. The quantitative data collected from respondents who were working in the building construction projects as employees of the company was analyzed using averages, percentages, frequencies, tables, graphs and figures to answer the research questions. The quantitative data gathered from interviews and observations was analyzed separately but presented in combination with the quantitative data obtained from questionnaire. And also, document analysis and observation used to triangulate the data gained through questionnaire and interviews.

3.9 Validity and reliability

3.9.1 Validity

To ensure the validity of the research design in sampling, data collection, and analysis, an extensive literature review was done. To check the validity of questionnaire (Argaw, 2020), did in his research identify relevant respondents in the firm, give time to read, understand and answer the questions and including redundant questions in critical issues to cross check the consistency. According to (Leyikun, 2019), few numbers of the project managers were piloted to answer the questionnaire to ensure the consistency, clarity and relevancy of the instruments. The researcher also was referred standard requirements to design the questionnaire. The researcher ensured the validity of instruments by doing the pilot test using purposive sampling to selected individuals at sites.

3.9.2 Reliability

“Reliability is the quality of being trustworthy or of performing consistently well” (The merriam webster dictionary, 1843). To test reliability of the data is Cronbach’s alpha value on this scale the value of 0.7 or greater is considered as adequate to analyze results (Argaw, 2020).

The questionnaire was designed to take into considerations the issues related to the research questions and objectives of the study on the subject. To assure the reliability of the instrument the most commonly used method for internal consistency analysis for Likert type questionnaire Crombach-Alpha Reliability Coefficients were used (Metaferia S. , 2015). Gleam & Rosemary, (2003) explained that information gathered in the social sciences and descriptions of people’s environment involves the use of Likert-type scales.

Cronbach's alpha is a coefficient number between 0 and 1 that is used to rate the internal consistency or the correlation of the items in a test. Cronbach's alpha will generally increase as the inter correlations among test items increase and is thus known as an internal consistency estimate of reliability of test scores. Cronbach's alpha is widely believed to indirectly indicate the degree to which a set of items measures a single construct Wale, (2014) cited (Metaferia S. , 2015) by provide the following rules of thumb: > .9 Excellent, > .8 Good, > .7 Acceptable, > .6 Questionable, > .5 Poor, and < .5 Unacceptable. Accordingly, this study overall reliability

statistics, Cronbach's Alpha coefficient result is 0.877 acceptable which is above 0 .70 based on research (Argaw, 2020).

Table 3.1. Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
.877	20

Source: Pilot survey (2022)

3.10 Ethical consideration

First of all, the participants were informed to their rights to this research ethics process. Then, it was made clear to them, then, they participated in this research voluntarily and the data collected was used for research purpose only. To ensure confidentiality, the process of data gathering, processing and analyzing was done by without identifiers.

Chapter Four

4. Data presentation, analysis and discussion

4.1. Introduction

The data obtained from the respondents and observation of the researcher is compiled, discussed, and analyzed in this chapter. A total of 38 employees within three construction sites were selected for this study as respondents for questionnaire. In addition, data were thoroughly scrutinized and presented in a tabular format to attain the stated objective of the study. The questionnaires were used to obtain data on whether building construction sites have *Electrical Works Occupational Safety Management Practices*.

4.2. Data Presentation

In this section data obtained from completed questionnaire presented. A total number of 38 questionnaires were distributed, yet 36 was returned and 35 of them are completed which represent response rate of 92.11%.

4.2.1. Reliability Test

The researcher has used Cronbach's Alpha to measure reliability of the instrument used to gather data. Accordingly, result from the SPSS unveiled Cronbach's Alpha coefficient of 0.877 which according to suggestion from Nunally, (1978) is acceptable at it is above the threshold of 0.70.

Table 4.1. Reliability Statistics

Case Processing Summary			
		N	%
Cases	Valid	35	100.0
	Excluded	0	.0
	Total	35	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's	
Alpha	N of Items
.877	20

4.3 Results of the study

4.3.1 Demographic Characteristics of the Respondents

The target respondents of the questionnaire survey were construction workers in three construction sites in Addis Ababa at different locations. 38 survey questionnaires were distributed to the construction workers in these sites. This section analyzed the personal characteristics of 35 respondents who were returned valid questionnaire for this study. It covered the personal data of respondents, such as gender, age, educational background, occupation and work experience at these sites. The following subsequent tables will reveal the total demographic characteristics of the respondents.

Table. 4.2 Demographic Characteristics of Respondents

Item	Description	Frequency	Valid Percent
Gender	Male	24	68.57
	Female	11	31.43
	Total	35	100.00
Age	18-25	10	28.57
	26-35	12	34.29
	36-47	10	28.57
	48-54	1	2.86
	55-65	2	5.71
	Total	35	100.00
Work experience in the field	1-7	18	51.43
	8-14	8	22.86

	15-21	4	11.43
	22-28	5	14.29
	Total	35	100.00
Education Background	Msc or MA degree	1	2.86
	Bsc or BA degree	18	51.43
	Diploma graduate	12	34.29
	Secondary school	2	5.71
	Elementary school	1	2.86
	Illiterate	1	2.86
	Total	35	100.00
Occupation	Electrician/welder	9	25.71
	wood worker	1	2.86
	Operator/Driver	2	5.71
	Site Engineer/manager	6	17.14
	aluminum worker	1	2.86
	others	16	45.71
	Total	35	100.00

Source: Questionnaire data 2022

In table 4.2, item 1 indicates that 68.57% (24) of the respondents are males and 31.43% (11) are females. This implies that the gender balance is more employees are males. And item 2 indicates age category, the highest group of respondents 12 (34.9%) fall under age of 26-35, 10 (28.57%) of the age category grouped in age between 18-25 and 36-47 each and 1(2.86%) and 2(5.71%) fall under age category of 48-54 and 55-65 respectively. This implies that about 32 of the respondent are below 47 years old. The remaining 8.57% (3) in the age category of the respondents are age of 48 and above. And 22(62.86%) of the employees are below 36 years old. Thus we can say that the employees in the selected sites are active workers and employed with less work experience that needs high safety care.

Table 4.2 item 3 indicates that about 18(51.43%) of the total respondents have between 1-7 years' experience which shows that respondents in these sites have less work experience this

implies that at construction companies skilled manpower are working at contract base and changing their work place frequently.

The above table 4.2 item 4 also demonstrates educational background of the respondents. As indicated in the table, 18(51.43%) of the total respondents are first degree holder followed by diploma graduate 12(34.29%). The rest 5(14.28%) of the respondents are postgraduate, elementary and secondary school and illiterate. This shows that most of the employees are educated (1st degree holder employees) those who can easily train to improve individual and group safety management issues.

The above table 4.2 item 5 demonstrates that most of the respondents considered in this study were workers whose occupation related to electricity. So that, as indicated in the table, 9 (25.71%) of the total respondent are electricians/welders followed by others (plasterers, masons, carpenters, daily laborers etc.)16(45.71%) and 6(17.14%)of the respondents are site engineers.

4.3.2 Assessment result on Electrical Works Occupational Safety Management Practice

Introduction

In this section the researcher has tried to assess the *Electrical Works Occupational Safety Management Practices* in selected construction sites in Addis Ababa. The researcher used Likert five point scales 5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree, the intervals for breaking the range in measuring each variable (Metaferia, 2015), i.e. Electrical safety practice and challenges of implementing electrical occupational safety standards.

The translation of level ranking is analyzed based on the following criteria designed by best (1977:174) as cited by (Metaferia, 2015).

Agreement level 3.41-4.20 means agree

Agreement level 4.41-5.00 means strongly agree

Accordingly, the researcher compute arithmetic mean as per the above mentioned level of agreement above and equal to 3.41 mean can enable the researcher to say electrical occupational safety management system is effective in these considered construction sites (Metaferia S. , 2015).

Table 4.3: Electrical safety practice of the company

No	Description	Mean	Std. Deviation
1	Personal protective equipment is available	2.40	0.77
2	Personal protective equipment are used at the right time and at the right place	2.71	0.71
3	Training and/or orientation on electrical work place safety provided	2.23	0.69
4	First Aid kits available	3.46	1.04
5	The workers are aware of electrical occupational safety practices at site	2.89	0.63

6	Frequency of accident occur in the project sites due to electricity	2.91	0.95
7	Willingness of the workers to follow guidelines and procedures in the work site	2.74	0.78
8	Major accident occur due to electricity on site	2.71	0.83
9	The contractor assigns a safety officer on site	2.91	1.36
10	Fatalities and injuries due to electrical accidents on the projects site reported by the concerned body	2.77	1.06
11	Budget allowed to the project by top management for electrical safety	2.26	0.89
12	The construction site has mechanisms and regular meeting to give awareness to the site worker about electrical safety procedure	2.54	0.85
	Aggregate mean	2.71	0.88

Source: Questionnaire data 2022

Table 4.3 above indicated that First Aid kits available (mean=3.46) shows positive impact for the Electrical safety practice of the companies which is above the agreed value mean 3.41. However, all the rest item shows the negative impact of the sites and the collectively result mean=2.71 is much lower than the agreed mean 3.41. This shows that the construction companies have very poor occupational electrical safety at sites. So that attention has to be given to the electrical safety, revise and follow up the policies and procedures with regard to occupational electrical safety management system policy. According to the managers' interview response the budget for electrical safety has to be included in the contract documents. Up on checking of the contract documents the budget for safety is no separately itemized.

Table 4.4: Employee Involvement towards occupational safety management system

No	Description	Mean	Std. Deviation
1	Making of the organization's occupational safety policy	2.29	0.83
2	participation in OSM training decision making	2.40	0.88
3	Safety training and orientation for all employees	2.94	0.91
4	Participate in hazard prevention, control and evaluation activities	2.80	0.72
5	Health and safety committee	2.54	0.89
6	Safety committee has plan, implementation and inspection	2.91	0.78
7	Assignment of safety responsibility is attached to an accountability mechanism	2.94	0.87
8	Assigned safety responsibility are authorized and supplied with the necessary resources(s) to carry out their duties	2.31	0.96
	Aggregate mean	2.64	0.85

Source: Questionnaire data 2022

According to table 4.4 above indicated that in the selected construction sites employee participation making of organization's safety policy shows mean=2.29. This implies that employees are not involved in making of OSM policy. In the opinion of employees are allowed to participate in Occupational Safety Management training decision making the mean result shows 2.40. Concerning to safety training and orientation are giving for all employees at the beginning and periodically, the mean result shows mean=2.94. This result implies that employees have not updated information about safety regularly. Employees participation in

hazard prevention, control and evaluation activities also shows mean=2.80, this implies that less employee participation concerning to hazard prevention. The response of health and safety committee exist (mean=2.54) and safety committee has plan, implementation and inspection (mean=2.91). This result showed that absence of safety committee in the construction site.

Assignment of safety responsibility is attached to an accountability mechanism and supplied with the necessary resources (mean=2.31). On the physical site observation, the researcher observed that there is no safety committee in the construction sites. Regarding the interviewee's opinion on assignment of safety responsibility supplied with the necessary resources, there is no pre-planned budget for safety, but on demand the management released insufficient budget when accidents occur at site. In some sites there is an insurance for employees in which the expense will be refund after the reporting of the accident to the insurance company and settled with receipts. The aggregate mean result showed that mean =2.64, the employee involvement towards OSMS effectiveness is poor.

Table 4.5: The company/management commitment on risk reduction practices

No	Description	Mean	Std. Deviation
1	The organization/management tries to remove the electrical risk entirely	3.26	0.89
2	The organization/management swapping an item or work process for a safer work process	2.97	0.98
3	The organization/management modifies the working environment or equipment that poses the risk	2.74	0.85
4	The organization/management rotates employees who have awareness through several different work tasks to prevent repetitive stress injuries	3.00	0.84
5	Safety gear worn by the workers, such as hard hats, safety glasses, and chemical-	3.74	0.85

	resistant gloves provided by the organization		
6	The organization facilitates electrical safety training on site	2.77	1.03
	Aggregate mean	3.08	0.91

Source: Questionnaire data 2022

Table 4.5 above indicated that only item no. 5 safety gear worn by the workers, such as hard hats, safety glasses, and chemical-resistant gloves provided by the organization showed that relatively a good risk reduction mechanism. The researcher can say that if safety tools are available the employees can wear it and reduce risks. However, the other items showed that the effort to reduce risk by the companies at site is extremely poor. Interviewees' opinion on this regard implies that there is a shortage of PPE materials on site. This is confirmed by the researcher by observing at the sites. This result aggregate mean showed that mean= 3.08 less than the agreed value mean=3.41. This result collectively implies that the companies' involvement towards the reduction of electrical risks at construction site is poor.

Table 4.6: Challenges of implementing electrical occupational safety standards

No	Description	Mean	Std. Deviation
1	Implementing electrical occupational safety practices are expensive and no budget allocated	3.69	1.11
2	Following electrical occupational safety procedures reduces output of the worker	3.17	1.22
3	The top management is less concerned to the electrical occupational safety issues	3.94	0.76
4	Electrical occupational safety related accidents are difficult to manage	2.46	0.85
5	Workers are not willing to wear personal	3.26	0.92

	protective equipment (PPE)		
6	There is no inspection of electrical occupational safety practices	3.77	0.94
	Aggregate mean	3.38	0.97

Source: Questionnaire data 2022

Table 4.6 above indicates that implementing electrical occupational safety practices are expensive and no budget allocated (mean=3.69). This result implies that due to expensive nature of the safety items no budget is allocated. The top management is less concerned to the electrical occupational safety issues (mean=3.94) above the agreed mean value showed that the top management has to give attention to implement the policies and regulations. The collective mean value=3.38 showed that there are no challenges to implement the occupational safety standards.

Table 4.7: Overall practice of electrical works occupational safety Management

No	Variables	Mean (Aggregate)	Std. deviation
1	Electrical safety practice of the construction company	2.71	0.88
2	Employee Involvement towards occupational safety management system	2.64	0.85
3	The company/management commitment on risk reduction practices	3.08	0.91
4	Challenges of implementing electrical occupational safety standards	3.38	0.97
	Overall mean	2.993	0.903

Source: Questionnaire data 2022

The above table 4.7 shows the result of overall practice of occupational safety management system at construction sites. In this regard the aggregate mean Electrical safety practice of the construction company is 2.71. This implies that the companies' electrical safety practice is poor.

Moreover, regarding to employee involvement/participation toward occupational safety and health management, the result shows that mean=2.64. It implies that employees have not active participation towards their occupational safety management activities. This result enables to conclude that employee involvement is not yet practiced in construction sites. The company/management commitment on risk reduction practices the result showed that mean 3.08 which is below the agreed mean for measurement of OSMS practice. Hence this result implies that occupational safety management systems are not well supported by management especially management is not encouraging employees and supervisors for safe work practice. And challenges of implementing electrical occupational safety standards result showed that mean =3.38 below the agreed mean value=3.41, this shows that the possibility of the implementation of the occupational safety standards is as such difficult.

As table 4.7 indicated that all variables showed below the agreed mean 3.41 which is enable the researcher electrical works occupational safety management practice implementation in selected construction sites is poor. So that the construction companies have to have their occupational safety implementation procedures and policies.

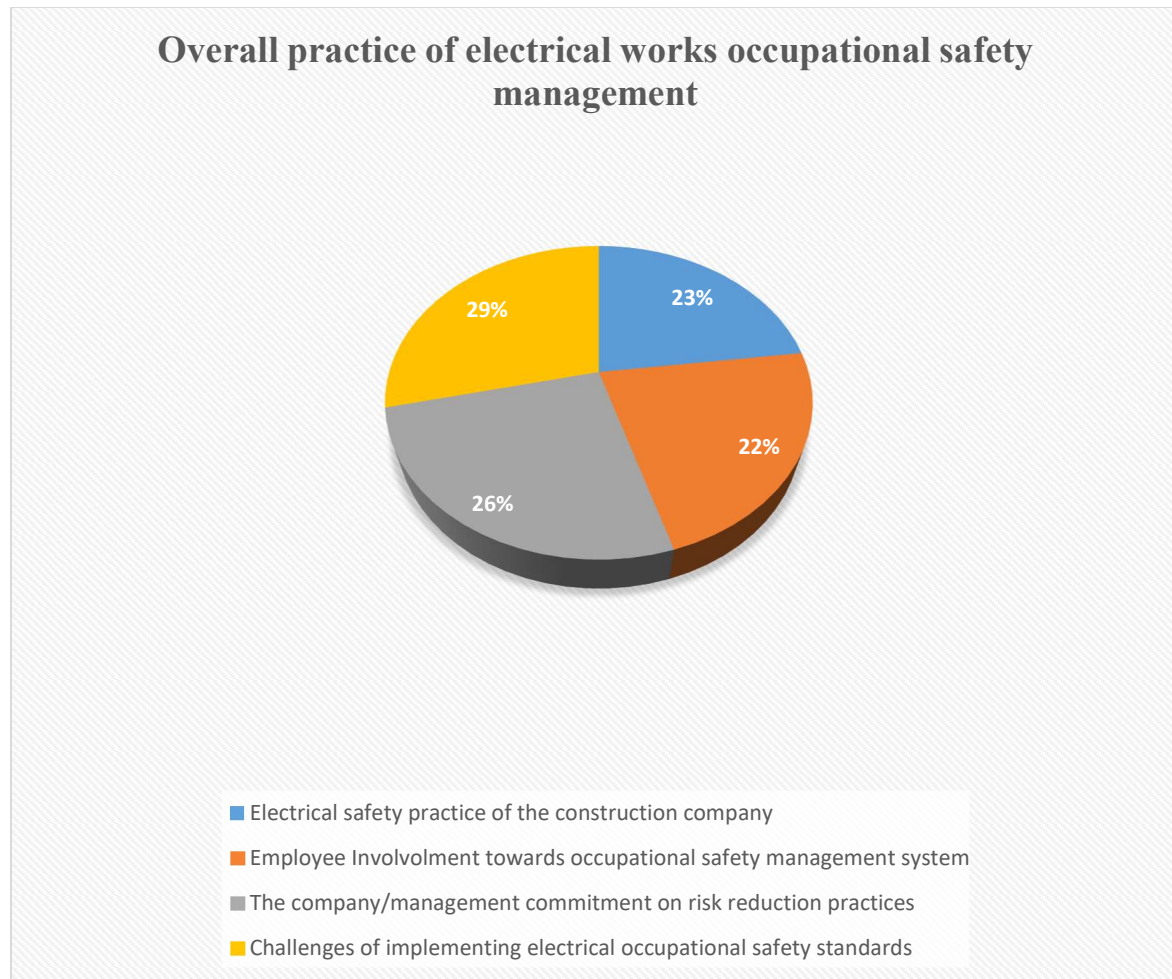


Figure 2; Overall practice of electrical works occupational safety Management

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

Introduction

This last chapter contains the summary, conclusion and recommendations parts of the study. This paper assessed the Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa. This chapter concludes the major findings in combination with the purpose of the study and suggested recommendations for Electrical Works Occupational Safety Management Practice. In addition, limitation of the study and suggestions for further future research works are included.

5.1 Summary of the findings

This study reviews the Electrical Works Occupational Safety Management Practice in selected building construction projects in Addis Ababa. The researcher selected purposefully three construction sites in which their construction status is at different levels. The first site was at structural work and its stage is at 6th floor level. In this site the electric power is used for cutting of rebar, office works, welding, for winch to transport the materials up and down wards. The second one is at preliminary finishing stage (plastering, plumbing, electrical installation, window cell and door threshold placing activities in progress). In this stage electric power is used for plumbing work (for connecting of PPR with fittings, for winch to transport the materials up and down, office works, welding, grinding and drilling purposes. The final site was at end of finishing level (ceramic works, sanitary fixture placing, electrical fittings, aluminum works, woodwork activities such as kitchen cabinet, cap boards, internal doors) activities are in progress. In this stage electric power is used for the same as others above but additionally, cutting of ceramics, fixing of wooden and aluminum products, fixing of sanitary fixtures and electrical fittings and others.

For this study 38 questionnaires were distributed to the respondents and 35 of them is properly filled and returned. Based on the demographic characteristics 68.57% (24) were male and 31.43%(11) of them were female. This implies that the construction workers tending to more male employees. For the rest of the analysis results refer from table 4.1 to table 4.7.

The results of the present study have demonstrated the Electrical Works Occupational Safety Management Practice in selected building construction project sites in Addis Ababa. From the study the users of electricity for work and other workers at site are not well informed or aware about the electricity hazards and safety measures, no involvement & commitment of the company/management, there is no budget allocated for occupational safety and no provision of PPE safety resources. Furthermore, there are no mechanisms for reporting injuries and record data, no well-organized safety trainings, lack of supervision of workers and low occupational safety awareness creation on sites.

5.2 Conclusion

From the descriptive statistics analysis result the companies'/management commitment towards to the reduction of electrical risks and budget allocation for occupational safety are the major factors need vital concern. The study results showed that all variables are below the agreed mean value. Thus, electrical works occupational safety management practice in construction sites is very poor or immature in Ethiopia. Therefore, well organized safety policies, regulation and procedures consisting of safety requirements, at every construction project is essential for the safe working environment at construction sites especially for electrical works as any mistake or failure will have no any excuses on electrical accidents.

5.3 Recommendations

Based on the research result obtained from questionnaire survey and interviews, the researcher forwarded the following recommendations to concerned representatives of different stakeholders (client, contractor, regulatory bodies, consultants, employees, managers and others) and other researchers in the area.

1. As any mistake or failure will have no excuses on electrical accidents so that the users of electricity for work and other workers at site are not well informed or aware about the electricity hazards and safety measures and periodic safety training is required for all workers at site.
2. Hazards and safety practices attribute to each equipment, appliances and machines should be printed on it. It will remind the users when using them.

3. The government should apply the electrical safety rules and regulation law enforcement to construction companies that do not obey to the electrical safety requirements.
4. Brochures, safety sign boards, cautions explaining the dangers of electricity and the rules to be applied in order to avoid electrical accidents should be placed in appropriate places.
5. According to the managers' interview responses safety is related to cost, so that we recommend the budget for electrical safety should be included in the contract documents like as general item for provision of vehicle for consultant, office supplies and other costs.
6. More research studies on electrical safety should be conducted by other researchers especially in Ethiopia.

5.4 Research Limitation and areas of further research

5.4.1 Limitation of the study

The limited availability research studies on occupational safety practice on electrical works in Ethiopian context.

As this study used nonprobability sampling technique which will be one of the limitation of the study.

5.4.2 Suggestion for future research

This study tried to address the gaps associated with electrical works occupational safety management practice in selected building construction sites, in Addis Ababa. The researcher believes further work on the area is essential since there is limited studies in the field and to give the efficient use of occupational safety management issues in the industry.

The researcher forwarded the following points for the future researchers;

- i. Study on better electrical works occupational safety management practice contributions to maximizing the good reputation of the company and compare the impacts of poor OSM of other companies in Ethiopia.
- ii. Study and compare the electrical works occupational safety management practice of local contractors with foreign construction companies in Ethiopia.
- iii. Study the rules and regulation on electrical works occupational safety management practice in Ethiopia and compare it with other countries.

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Appendix: Questionnaires

Appendix I: English version

Addis Ababa University School of Commerce

Project Management Department

Questionnaire to be filled by Respondents

Dear respondent, this questionnaire is designed to collect information about *Assessing Electrical Works Occupational Safety Management Practice: The Case of Selected Building Projects in Addis Ababa*. I request your kind cooperation to respond all the questions carefully and genuinely. The information you provide will have a great value for the successfully completion of this research. Detailed instructions are given for each section of the questionnaire for your guidance. Your responses will be treated as strictly confidential and will be used only for the academic purpose.

Thank you for your cooperation in advance.

This questionnaire paper has five main parts; these are:

Part I: General information

Part II: Electrical safety management practice of the company

Part III: Employee Involvement towards electrical occupational safety management

Part IV: Company/ management commitment on electrical risk reduction practices

Part V: Challenges of implementing electrical occupational safety standards in the company

Part I: General information

Direction: Here are some of the personal information's. You are required to write the necessary information on the space provided for some questions and for other you are required to indicate your response by marking "X" given in the form of choices, on the space provided/thick the appropriate and/or choose from the list or circle your appropriate answer.

1. Gender

A. Male ☐

B. Female ☐

2. Age

A. 18-25 ☐

B. 26-35 ☐

C. 36-47 ☐

D. 48-54 ☐ E. 55-65 ☐ F. Above 65 ☐

3. Work experience in the field

A. 0 – 7 Years ☐ B. 8 – 14 Years ☐
C. 15-21 Year ☐ D. 22- 28 years ☐
E. over 29 years ☐

4. Educational Background

A. (MA/MSc degree) graduate ☐ B. BSC/BA graduate ☐
C. Diploma Graduate ☐ D. Elementary, school ☐
E. Secondary school ☐ E. Illiterate ☐

5. Occupation

A. Welder/ Electrician ☐ B. Wood worker ☐ C. Operator/Driver ☐
D. Site Engineer ☐ E. Plumber ☐ F. Tiler ☐ G. Aluminum worker ☐
H. Others ☐

Part II: Electrical safety management practice of the company and related question with it

Kindly rate your opinion by ticking “X” on each of the following causes of accident on construction site in Addis Ababa using the scale below.

No	Electrical safety practice of the company and related question with it	strongly agree	agree	Neutral	disagree	strongly disagree
1	Personal protective equipment is available					
2	Personal protective equipment are used at the right time and at the right place					
3	Training and/or orientation on electrical work place safety provided					
4	First Aid kits available					
5	The workers are aware of electrical occupational safety practices at site					
6	Frequency of accident occur in the project sites due to electricity					
7	Willingness of the workers to follow guidelines and procedures in the work					

	site					
8	Major accident occur due to electricity on site					
9	The contractor assigns a safety officer on site					
10	Fatalities and injuries due to electrical accidents on the projects site reported by the concerned body					
11	Budget allowed to the project by top management for electrical safety					
12	The construction site has mechanisms and regular meeting to give awareness to the site worker about electrical safety procedure					

If there is another factor, you can list here:

Part III: Employee Involvement towards occupational safety management system

Kindly rate your opinion by ticking “X” on each of the following causes of accident on construction site in Addis Ababa using the scale below.

No	Employee Involvement towards occupational safety management system	strongly agree	agree	Neutral	disagree	strongly disagree
1	Making of the organization’s occupational safety policy					
2	participation in OSHM training decision making					
3	Safety training and orientation for all employees					
4	Participate in hazard prevention, control and evaluation activities					
5	Health and safety committee					
6	Safety committee has plan, implementation and inspection					
7	Assignment of safety responsibility is attached to an accountability					

	mechanism					
8	Assigned safety responsibility are authorized and supplied with the necessary resources(s) to carry out their duties					

If there is another factor, you can list here:

Part IV: Company/ management commitment on risk reduction practices

Kindly rate your opinion by ticking “X” on each of the following causes of accident on construction site in Addis Ababa using the scale below.

No	Company/ management commitment on risk reduction practices	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The organization/management tries to remove the electrical risk entirely					
2	The organization/management swapping an item or work process for a safer work process					
3	The organization/management modifies the working environment or equipment that poses the risk					
4	The organization/management rotates employees who have awareness through several different work tasks to prevent repetitive stress injuries					
5	Safety gear worn by the workers, such as hard hats, safety glasses, and chemical-resistant gloves provided by the organization					
6	The organization facilitates electrical safety training on site					

If there is another factor, you can list here:

Part V: Challenges of implementing electrical occupational safety standards

Kindly rate your opinion by ticking “X” on each of the following causes of accident on construction site in Addis Ababa using the scale below.

No	Challenges of implementing electrical occupational safety standards	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Implementing electrical occupational safety practices are expensive and no budget allocated					
2	Following electrical occupational safety procedures reduces output of the worker					
3	The top management is less concerned to the electrical occupational safety issues					
4	Electrical occupational safety related accidents are difficult to manage					
5	Workers are not willing to wear personal protective equipment (PPE)					
6	There is no inspection of electrical occupational safety practices					

If there is another factor, you can list here:

Thank you

Appendix II: Amharic version

አዲስ አበባ ዩኒቨርሲቲ ንግድ ስራ ኮሌጅ ፕሮጀክት ማኔጅመንት ክፍል

ለሰራተኞች የቀረበ የጽሑፍ መጠይቅ

የተከበራችሁ ሠራተኞች

ይህ መጠይቅ በኤሌክትሪክ ደህንነት ላይ ያለው ልምድና አተገባበር በሚል ርዕስ ለሁለተኛ ዲግሪ በኮንስትራክሽን ማኔጅመንት ት/ት ማሟያ ለማጥናት የተዘጋጀው ነው። በመሆኑም እርስዎ ለዚህ ጥናት መሳካት በመጠይቁ መሠረት ግልጽና ነፃ አስተያየትዎን እንዲሰጡ በማክበር እየጠየቅኩ፤ የሚሰጡት አስተያየት ለጥናቱ ምርምራዊ ጉዳይ ብቻ የሚውል እንጂ ለሌላ ሦስተኛ ወገን የማይተላለፍ መሆኑን በእርግጠኝነት ለማሳወቅ እወዳለሁ።

ስለትብብርዎበጣም እናመሰግናለን!

ይህ ቃለ መጠይቅ አምስት ክፍሎችን የያዘ ነው። እነሱም

ክፍል አንድ፡ አጠቃላይ መረጃ

ክፍል ሁለት፡ ድርጅቱ በኮንስትራክሽን ስራ በኤሌክትሪክ ደህንነት ላይ ያለው ልምድና ተያያዥ ጥያቄዎች

ክፍል ሶስት፡ የሰራተኞች በኤሌክትሪክ ደህንነት ዙሪያ ላይ ያላቸው ልምድ

ክፍል አራት፡ ድርጅቱ/ የማጅመንት አባላቶች አደጋ የመቀነስ ላቸው ቁርጠኝነት

ክፍል አምስት፡ የኤሌክትሪክ የደህንነት መስፈርቶች ለመተግበር አስቸጋሪ ሁኔታዎች

ክፍልአንድ፡ አጠቃላይመረጃ

መመሪያ- ከዚህ ቀጥሎ የእርስዎን አጠቃላይ መረጃ በሚመለከት ቀርቦአል፡፡ ጥያቄዎች በክፍትቦታ እና በምርጫ መልክ የቀረቡ በመሆኑ የሚወክልዎትን ተገቢ መልስበ "X" ምልክት በሳፕትዉስፕ ያስቀምጡ፡፡

1. ያታ

ሀ. ወንድ ☐ ለ. ሴት ☐

2. እድሜ

ሀ. ከ 18-25 ☐ ለ. 26 - 35 ☐ ሐ. 36 - 47 ☐
መ. 48 - 54 ☐ ሰ. 55 - 64 ☐ ረ. ከ65 በላይ ☐

3. በዘርፉ ያለዎት የስራ ልምድ

ሀ. 0 - 7 ዓመት ☐ ለ. 8 - 14 ዓመት ☐ ሐ. 15 - 21 ዓመት ☐
መ. 22 - 28 ዓመት ☐ ሰ. ከ 29 በላይ ዓመት ☐

4. የትምህርት ደረጃ

ሀ. ማስተርስ/ሁለተኛ ዲግሪ ☐ ለ. የመጀመሪያ ዲግሪ ☐ ሐ. የዲፕሎማ ምሩቅ ☐
መ. የሁለተኛ ደረጃ ትምህርት ያጠናቀቀ ☐ ሰ. የአንደኛ ደረጃ ትምህርት ያጠናቀቀ ☐

5. የተሰማሩበት የስራ ዘርፍ

ሀ. በያጅ/ኤሌክትሪሽያን ☐ ለ. እንጨት ሰራተኛ ☐ ሐ. ማሸን አፕሬተር/ሾፌር ☐
መ. ሳይት መሃንዲስ ☐ ሰ. ባንባ ሰራተኛ ☐ ረ. ሴራሚክ ሰራተኛ ☐
ሠ. አሉሚኒየም ሰራተኛ ☐ ሸ. ሌሎች

ክፍል ሁለት፡ ድርጅቱ በኮንስትራክሽን ስራ በኤሌክትሪክ ደህንነት ላይ ያለው ልምድና ተያያዥ ጥያቄዎች

ከዚህ በታች ለተዘረዘሩት ጥያቄዎች ተስማሚ የሆነውን “X” ምልክት በማድረግ በተሰጠው ቦታ ላይ ያስቀምጡ

ተቁ	ድርጅቱ በኮንስትራክሽን ስራ በኤሌክትሪክ ደህንነት ላይ ያለው ልምድና ተያያዥ ጥያቄዎች	በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ ነኝ	አልስማማም	በጣም አልስማማም
1	የግል የአደጋ የመከላከያ ትጥቅ ሳይሆን ላይ አሉ					
2	የግል የአደጋ የመከላከያ ትጥቅ በትክክለኛ ቦታና ጊዜ ጥቅም ላይይዟል					
3	በኤሌክትሪክ ደህንነት ዙሪያ ስልጠና/ገለጻ ሳይሆን ላይ ይሰጣል					
4	የመጀመሪያ እርዳታ መስጫ					
5	ሰራተኞች የኤሌክትሪክ የስራ ላይ ደህንነት ግንዛቤ ያላቸው					
6	በኤሌክትሪክ ምክንያት አደጋ በተደጋጋሚ ሰራ ቦታ ላይ ይከሰታል					
7	ሰራተኞች የኤሌክትሪክ የስራ ላይ ደህንነት መመሪያዎች ና ቅደም ተከተሎችን ይከተላሉ					
8	በኤሌክትሪክ ምክንያት ለሞት የሚያበቃ አደጋ ስራ ቦታ ላይ ይከሰታል					
9	ድርጅቱ የጤና መኮንኖች በሳይት ስራ ላይ ያሰማራል					
10	በኤሌክትሪክ ምክንያት ለሞት የሚያበቃ አደጋ/ጉዳት ስራ ቦታ ላይ በሚሟላበት አካል ሪፖርት ይይደረጋል					
11	ድርጅቱ የኤሌክትሪክ ለስራ ላይ ደህንነት በስራ ሃላፊዎች በጀት ይመደብላታል					
12	ድርጅቱ የኤሌክትሪክ ስራ ደህንነት ለሰራተኞች ለማስመዝገብ የራሱ ቅደም ተከተልና ወይይቶች የአሰራር ዘዴ አለው					

ሌላ ምክንያት ካለ ይዘርዝሩ

ክፍል ሶስት: የሰራተኞች በኤሌክትሪክ ደህንነት ዙሪያ ላይ ያላቸው ልምድ

ከዚህ በታች ለተዘረዘሩት ጥያቄዎች ተስማሚ የሆነውን “X” ምልክት በማድረግ በተሰጠው ቦታ ላይ ያስቀምጡ

ተቁ	የሰራተኞች በኤሌክትሪክ ደህንነት ዙሪያ ላይ ያላቸው ልምድ	በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ ነኝ	አልስማማም	በጣም አልስማማም
1	ሰራተኞች በድርጅቱ የኤሌክትሪክ ደህንነት ፖሊሲ ማወጣት ላይ ተሳትፎ አላቸው					
2	የኤሌክትሪክ ደህንነት ስልተናዎች እንዲሰጡ ወሳኔዎች ላይ ይሳተፋሉ					
3	ሁሉም የኤሌክትሪክ ደህንነት ስልተናዎችና ግንዛቤዎች ይሰጣቸዋል					
4	ሰራተኞች በድርጅቱ የኤሌክትሪክ አደጋ መንስኤዎች ላይ መከላከል፣ መቆጣጠርና ምዘና ስራዎች ላይ ይሳተፋሉ					
5	የኤሌክትሪክ ደህንነት ኮሚቴ አለ					
6	የኤሌክትሪክ ደህንነት ኮሚቴው እቅድ፣ ትግበራና ክትትል ስራዎችን ያደርጋል					

7	የኤሌክትሪክ ደህንነት ሃላፊነት የሚወስዱ ተጠያቂዎች ናቸው					
8	የኤሌክትሪክ ደህንነት ሃላፊነት የወሰደ ሰው የደህንነት ትጥቆችን የማማላት ሀላፊነት አለበት					

ሌላ ምክንያት ካለ ይዘርዝሩ

ክፍል አራት: ድርጅቱ/ የማጅመንት አባላቶች አደጋ የመቀነስ ላቸው ቁርጠኝነት

ከዚህ በታች ለተዘረዘሩት ጥያቄዎች ተሰማሚ የሆነውን “X” ምልክት በማድረግ በተሰጠው ቦታ ላይ ያስቀምጡ

ተቁ	ድርጅቱ/ የማጅመንት አባላቶች አደጋ የመቀነስ ላቸው ቁርጠኝነት	በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ ነኝ	አልስማማም	በጣም አልስማማም
1	ድርጅቱ የኤሌክትሪክ አደጋዎችን ሙሉ በሙሉ እንዲወገድ ለማድረግ ያመቻቻል					
2	አሰሪዎች/ የድርጅት ባለቤቶች/ ከፍተኛ የኤሌክትሪክ አደጋዎችን በመቀነስ ያሰራሉ					
3	አሰሪዎች/ የድርጅት ባለቤቶች/ የኤሌክትሪክ አደጋዎችን ለመቀነስ ምቹ የሥራ ሁኔታ ይፈጥራሉ					
4	አሰሪዎች/ የድርጅት ባለቤቶች/ ግንዛቤ ያላቸውን ሰራተኞችን ከቦታ ቦታ በማዘዋወር እና የሥራ ጫና በመቀነስ ሰራዊታችን የማሰራት ልምድ ያላቸው መሆኑ					
5	ሰራተኞች የግል የአደጋ የመከላከያ ትጥቆች ማለትም ጠንካራ ሄልሜቶችን፣ መከላከያ መንጸሮችን፣ጓንት በመልበስ ይሰራሉ					
6	አሰሪዎች/ የድርጅት ባለቤቶች/ የኤሌክትሪክ አደጋዎችን ለመቀነስ ስልጠናዎችን ያመቻቻሉ					

ሌላ ምክንያት ካለ ይዘርዝሩ

ክፍል አምስት: የኤሌክትሪክ የደህንነት መስፈርቶች ለመተግበር አስቸጋሪ ሁኔታዎች

ከዚህ በታች ለተዘረዘሩት ጥያቄዎች ተሰማሚ የሆነውን “X” ምልክት በማድረግ በተሰጠው ቦታ ላይ ያስቀምጡ

ተቁ	የኤሌክትሪክ የደህንነት መስፈርቶች ለመተግበር	በጣም	እስማ	ሊሆን	አልስማማም	በጣም
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	አስቸጋሪ ሁሄታዎች	እስማማለሁ	ማለሁ	ይችላል		አልስማማም
1	የኤሌክትሪክ የደህንነት መስፈርቶች ለመተግበር ወደ መሆንና በቂ የሆነ በጀት አለመመደብ					
2	የኤሌክትሪክ የደህንነት መስፈርቶች ለመተግበር የሰራተኞች የሰራ ውጤት ስለሚቆንስ					
3	የድርጅት ባለቤቶች/ሃላፊዎች/ ለኤሌክትሪክ ደህንነት ትኩረት አለመስጠት					
4	በኤሌክትሪክ ምክንያት የሚከሰቱ አደጋዎች በጣም አስቸጋሪ በመሆኑ					
5	ሰራተኞች የግል የአደጋ የመከላከያ ትጥቆች ለመልበስ ፈቃደኛ ባለመሆን					
6	የኤሌክትሪክ የደህንነት መስፈርቶች በየጊዜው ቁጥጥር አለመደረግ					

ሌላ ምክንያት ካለ ይዘርዝሩ

አመሰግናለሁ

Appendix III. Interview Questions

1. Is there a practice of evaluating the effectiveness of electrical occupational safety practices? If there is how do you evaluate?
2. Is there periodical training provided to the works exposed to hazardous work exposure?
3. How do you express the company's effort towards creating awareness and safety on electrical works procedure?
4. Do you provide sufficient and standard personal protective Equipment (PPE) for all workers who are exposed to hazard?
5. Does the company have any mechanism to aware or inform the users of electricity for work and other workers at site about the electricity hazards and safety measures?

6. What can you say about the contract documents on the electrical occupational safety practices or any occupational safety?

Table. 4.2 Demographic Characteristics of Respondents

Item	Description	Frequency	Valid Percent
Gender	Male	24	68.57
	Female	11	31.43
	Total	35	100.00
Age	18-25	10	28.57

	26-35	12	34.29
	36-47	10	28.57
	48-54	1	2.86
	55-65	2	5.71
	Total	35	100.00
Work experience in the field	1-7	18	51.43
	8-14	8	22.86
	15-21	4	11.43
	22-28	5	14.29
	Total	35	100.00
Education Background	Msc or MA degree	1	2.86
	Bsc or BA degree	18	51.43
	Diploma graduate	12	34.29
	Secondary school	2	5.71
	Elementary school	1	2.86
	Illiterate	1	2.86
	Total	35	100.00
Occupation	Electrician/welder	9	25.71
	wood worker	1	2.86
	Operator/Driver	2	5.71
	Site Engineer/manager	6	17.14
	aluminum worker	1	2.86
	others	16	45.71
	Total	35	100.00

Source: Questionnaire data 2022

Appendix IV. Statistical result frequency tables

Part II: Electrical safety practice of the company and related question with it

No	Item	Level of agreement	Frequency	%	Mean	Standard Dev.
1	Personal protective equipment is available	Strongly agree	0	0.00	2.40	0.77
		Agree	1	2.90		
		Neutral	17	48.60		
		Disagree	12	34.30		
		Strongly disagree	5	14.30		
2	Personal protective equipment are used at the right time and at the right place	Strongly agree	0	0.00	2.71	0.71
		Agree	5	14.3		
		Neutral	15	42.90		
		Disagree	15	42.90		
		Strongly disagree	0	0.00		
3	Training and/or orientation on electrical work place safety provided	Strongly agree	0	0.00	2.23	0.69
		Agree	1	2.90		
		Neutral	10	28.60		
		Disagree	20	57.10		
		Strongly disagree	4	11.40		
4	First Aid kits available	Strongly agree	5	14.30	3.46	1.04
		Agree	15	42,90		
		Neutral	6	17.10		
		Disagree	9	25.70		
		Strongly disagree	0	0.00		
5	The workers are aware of electrical occupational safety practices at site	Strongly agree	0	0.00	2.89	0.63
		Agree	5	14.30		
		Neutral	21	60.00		
		Disagree	9	25.70		
		Strongly disagree	0	0.00		
6	Frequency of accident occur in the project sites	Strongly agree	0	0.00	2.91	0.95

	due to electricity	Agree	13	37.10		
		Neutral	7	20.00		
		Disagree	14	40.00		
		Strongly disagree	1	2.90		
7	Willingness of the workers to follow guidelines and procedures in the work site	Strongly agree	1	2.90		
		Agree	4	11.40		
		Neutral	15	42.90		
		Disagree	15	42.90		
		Strongly disagree	0	0.00	2.74	0.78
8	Major accident occur due to electricity on site	Strongly agree	1	2.90		
		Agree	2	5.70		
		Neutral	21	60.00		
		Disagree	8	22.90		
		Strongly disagree	3	8.60		
					2.71	0.83
9	The contractor assigns a safety officer on site	Strongly agree	6	17.10		
		Agree	6	17.10		
		Neutral	8	22.90		
		Disagree	9	25.70		
		Strongly disagree	6	17.10		
					2.91	1.36
10	Fatalities and injuries due to electrical accidents on the projects site reported by the concerned body	Strongly agree	0	0.00		
		Agree	10	28.60		
		Neutral	13	37.10		
		Disagree	6	17.10		
		Strongly disagree	6	17.10	2.77	1.06
11	Budget allowed to the project by top management for electrical safety	Strongly agree	0	0.00		
		Agree	3	8.60		
		Neutral	10	28.60		
		Disagree	15	42.90		
		Strongly disagree	7	20.00	2.26	0.89

12	The construction site has mechanisms and regular meeting to give awareness to the site worker about electrical safety procedure	Strongly agree	0	0.00	2.54	0.85
		Agree	6	17.10		
		Neutral	9	25.70		
		Disagree	18	51.40		
		Strongly disagree	2	5.70		

Part III: Employee Involvement towards occupational safety management system

No	Item	Level of agreement	Frequency	%	Mean	Standard Dev.
1	Making of the organization's occupational safety policy	Strongly agree	0	0.00	2.29	0.83
		agree	3	8.60		
		Neutral	9	25.70		
		disagree	18	51.40		
		Strongly disagree	5	14.30		
2	participation in OSHM	Strongly agree	0	0.00	2.40	0.88

	training decision making	agree	3	8.60		
		Neutral	14	40.00		
		disagree	12	34.30		
		Strongly disagree	6	17.10		
3	Safety training and orientation for all employees	Strongly agree	0	0.00		
		agree	9	25.70		
		Neutral	19	54.30		
		disagree	3	8.60		
		Strongly disagree	4	11.40	2.94	0.91
4	Participate in hazard prevention, control and evaluation activities	Strongly agree	0	0.00		
		agree	4	11.40		
		Neutral	22	62.90		
		disagree	7	20.00		
		Strongly disagree	2	5.70		
					2.80	0.72
5	Health and safety committee	Strongly agree	0	0.00		
		agree	4	11.40		
		Neutral	16	45.70		
		disagree	10	28.60		
		Strongly disagree	5	14.30	2.54	0.89
6	Safety committee has plan, implementation and inspection	Strongly agree	0	0.00		
		agree	8	22.90		
		Neutral	17	48.60		
		disagree	9	25.70		
		Strongly disagree	1	2.90	2.91	0.78
7	Assignment of safety responsibility is attached to an accountability mechanism	Strongly agree	1	2.90		
		agree	8	22.90		
		Neutral	15	42.90		
		disagree	10	28.60		
		Strongly disagree	1	2.90	2.94	0.87
8	Assigned safety responsibility are authorized and supplied with the necessary resources(s) to carry out their duties	Strongly agree	0	0.00		
		agree	5	14.30		
		Neutral	8	22.90		
		disagree	15	42.90		
		Strongly disagree	7	20.00		
					2.31	0.96

Part IV: Company/ management commitment on risk reduction practices

No	Item	Level of agreement	Frequency	%	Mean	Standard Dev.
1	The organization/ management tries to remove the electrical risk entirely	Strongly agree	3	0.00	3.26	0.89
		Agree	10	8.60		
		Neutral	15	28.60		
		disagree	7	42.90		
		Strongly disagree	0	20.00		
2	The organization/management swapping an item or work process for a safer work process	Strongly agree	1	2.90	2.97	0.98
		Agree	11	31.40		
		Neutral	11	31.40		
		disagree	10	28.60		
		Strongly disagree	2	5.70		
3	The organization/management modifies the working environment or equipment that poses the risk	Strongly agree	1	2.90	2.74	0.85
		Agree	6	17.10		
		Neutral	11	31.40		
		disagree	17	48.60		
		Strongly disagree	0	0.00		
4	The organization/management rotates employees who have awareness through several different work tasks to prevent repetitive stress injuries	Strongly agree	2	5.70	3.00	0.84
		Agree	6	17.10		
		Neutral	17	48.60		
		disagree	10	28.60		
		Strongly disagree	0	0.00		
5	Safety gear worn by the workers, such as hard hats, safety glasses, and chemical-resistant gloves provided by the organization	Strongly agree	4	11.40	3.74	0.85
		Agree	23	65.70		
		Neutral	3	8.60		
		disagree	5	14.30		
		Strongly disagree	0	0.00		
6	The organization facilitates electrical safety training on site	Strongly agree	3	8.60	2.77	1.03
		Agree	5	14.30		
		Neutral	9	25.70		

	disagree	17	48.60		
	Strongly disagree	1	2.90		

Part V: Challenges of implementing electrical occupational safety standards

No	Item	Level of agreement	Frequency	%	Mean	Standard Dev.
1	Implementing electrical occupational safety practices are expensive and no budget allocated	Strongly agree	8	22.90	3.69	1.11
		Agree	15	42.90		
		Neutral	7	20.00		
		disagree	3	8.60		
		Strongly disagree	2	5.70		
2	Following electrical occupational safety procedures reduces output of the worker	Strongly agree	8	22.90	3.17	1.22
		Agree	5	14.30		
		Neutral	7	20.00		
		disagree	15	42.90		
		Strongly disagree	0	0.00		
3	The top management is less concerned to the electrical occupational safety issues	Strongly agree	8	22.90	3.94	0.76
		Agree	18	51.40		
		Neutral	8	22.90		
		disagree	1	2.90		
		Strongly disagree	0	0.00		
4	Electrical occupational safety related accidents are difficult to manage	Strongly agree	1	2.90	2.46	0.85
		Agree	2	5.70		
		Neutral	12	34.30		
		disagree	17	48.60		
		Strongly disagree	3	8.60		
5	Workers are not willing to wear personal protective equipment (PPE)	Strongly agree	2	5.70	3.26	0.92
		Agree	13	37.10		
		Neutral	13	37.10		

		disagree	6	17.10		
		Strongly disagree	1	2.90		
6	There is no inspection of electrical occupational safety practices	Strongly agree	8	22.90	3.77	0.94
		Agree	15	42.90		
		Neutral	8	22.90		
		disagree	4	11.40		
		Strongly disagree	0	0.00		