



**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**Assessment of Construction Safety and Health practice in Addis
Ababa City Road Authority Road Projects**

By:

BERSABEH DEBEBE

**A Thesis Submitted to the School of Graduate Studies of St. Mary's University in Partial
Fulfillment of the Requirements for the Degree of Masters of Art in
Project Management**

Advisor: Muluadam Alemu (PhD)

**MARCH 2023
ADDIS ABABA, ETHIOPIA**

**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF PROJECT MANAGEMENT**

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Assessment of Construction Safety and Health Practice in Addis Ababa City Road
Authority Road Projects

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DECLARATION

I, undersigned, declare that this thesis entitled “Assessment of construction safety and health practice in Addis Ababa City Road Authority Road Projects” is my original work, and has not been presented by any other person for award of a degree in this or any other university.

Bersabeh Debebe

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Addis Ababa March 2023

ENDORCEMENT

This investigation, entitled “Assessment of construction safety and health practice in Addis Ababa City Road Authority Road Projects” was carried out by Bersabeh Debebe, so as to obtain her second degree from St. Mary University. She conducted her original thesis under my guidance and supervision. I certify that, the study is her own original work and suitable for submission of the award of MA in Project Management.

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03/03.2023

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Addis Ababa March 2023

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Abstract

This study focuses on assessment of construction safety and health practice in Addis Ababa City Road Authority road projects. Safety and health are the decisive concerns of a particular construction project and it gives an opportunity to define the overall success and performance of the project outcome equally to the cost, time and quality aspects. Thus, to examine the case of Addis Ababa City Road Construction Projects, a questionnaire survey was designed by including the current practice of safety and health practices in the aforementioned projects, causes that results an accident in the construction site, and the ways to improve this safety performance. The sample size was determined by subjective method using conventional approach that is taking the average of sample size of different other studies. Therefore, 65 questionnaires were distributed and 59 interpretable responses were gained from the construction officials (contractor, consultant and the client). The collected data from respondents were rated with various terms related to the type of question and further analyzed by quantitatively descriptive statistics Microsoft excel & SPSS. This study was conducted in a relatively potential construction working area. However, it was revealed the safety and health practices of Addis Ababa Road Construction Projects are below standards irrespective of their operating budgets. The causes of accidents are mainly lack of personal protective equipment, lack of top management commitment, lack of technical guidance, a reluctance to allocate resources for safety, workers physical exhaustion, lack of insufficient supervisory inspection, lack of awareness of written safety policy rules and standards are the principal factors for unsafe working conditions on the Addis Ababa City Road construction sites. To improve these insufficient performances, providing adequate safety equipment, improved personal behavior, responsible top management, good communication between management and workers and surveying worker's safety perception and give expert advice and trainings are considered as the key solutions.

Acronym

AACRA	Addis Ababa City Road Authority
GC	Gregorian Calendar
ERA	Ethiopian Road Authority
ETB	Ethiopian Birr
ICAO	International Civil Aviation Organization
ILO	International Labor Organization
FPPA	Federal Public Procurement Agency
FIDIC	International Federation of Consulting Engineers
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment

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1. INTRODUCTION

1.1 Background of the Study

Construction is a vast and an active sector, which is a backbone of the world's economy in general and Ethiopia in particular; mobilizing an enormous number of various resources and budgets and embracing huge manpower by creating a large job opportunity (Engineering Management Research, 2013). According to National Bank of Ethiopia (NBE, 2016) half of the entire nation's industry is construction base. The industry is expanding rapidly. Data from the NBE also suggests that during 2013/14 the construction sector grew 37%.

Considering the above statistics, construction accounted for 7.5% of Ethiopia's total GDP during the aforementioned period. According to African Economic Outlook, this equates to 9.4% of total output at current prices. This would give the construction industry a market value of around 6 billion USD (African Economic Outlook, 2015).

Eid and Sewefy (2009) stated that, the construction sector plays a special role in the economic growth of every country, it is also apparent that it has a higher accident rate, which results in absence from work, loss of productivity, permanent disabilities and even fatality. The greatest global occupational injury rates of all the major industries are in the construction (Lehtola et al 2008). The construction industry is one of the most hazardous industries (Edwards & Nicholas, 2002). Despite the significant improvement, a worker still experiences high injury and fatality rate in comparison to other industries (Bureau of Labor Statistics, 2012).

According to the International labor organization (ILO, 2014) there are 270 million occupational accidents causing 2 million deaths annually. The estimated economic loss caused by work-related injuries and disease was equivalent to 4 % of the world's gross national product (Global Occupational Health Network, 2003)

Many measures were taken to reduce construction hazards but it remains far from satisfactory as the incidents continue to dominate and the occurrences of these hazards increase alarmingly. Accidents at work occur due to lack of knowledge, supervision, lack of means to carry out a

work safely, errors in judgments, carelessness in making decision or total irresponsibility. (Chang, 2012)

The expense of accidents, either directly or indirectly, could be another factor drawing major attention to safety research among construction firms in addition to fatalities and severe injuries. Although fatalities and injuries in construction are high compared to other industries (Leigh & Robbins, 2004), there are few cost estimations about injuries and fatalities available (Waehrer et al., 2007). The total cost of fatal and non-fatal injuries was estimated to be around \$11.5 billion in 2002, or about \$27,000 per case. Injury compensation payment that construction workers receive is about double the amount that workers in other industries receive (Georgine et al., 1997).

It is apparent that safety of working environment has a direct impact on people's life, and a well-functioning construction industry has an important role towards this end (Tsegay, 2009). Taking into account the aforementioned observed facts and more importantly to contribute to the continuing effort of the Addis Ababa City Road Authority (AACRA) to improve the safety and health management system; this research aims to describe and assess the gaps causing the occupational injuries and effects in the case of AACRA's road projects.

1.2 Statement of the Problem

Effective Management health and safety principles has 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 construction process becomes difficult because of tradition (Adow,2013).

Construction hazards rated as eight times riskier as those from manufacturing sector (*Jain, 2007*). The bureau of Labor statistics (2020) reported that fatal injuries to workers at road construction sites from 2003- 2019, 2103 workers lost their lives at road construction sites and the number of fatal work-related injuries at road construction sites averaged 124 per year.

ILO (2021) reporting, recording and notification of occupational accidents shows that every day, 7500 workers die from work-related causes: 6500 from diseases and 1000 from occupational accidents. In addition, almost 4% of the world's annual GDP is lost due to these preventable accidents.

For the last two decades, the number of occupational accidents and related injuries is increasing in most of the developing nations such as sub-Saharan countries and Ethiopia from year to year (MoLSA, National Occupational Safety and Health Policy, 2014). For instance, Gebermeskel and Yimer(2019) Study finding from Dessie town and Addis Ababa, Ethiopia, reported that the lowest injury prevalence of 32.6%, whereas the highest prevalence was 84.7% among construction workers, respectively

As Mosly (2019) stated, the hazardous environment of construction could be triggered by many mechanisms that cause an accident is thought to be influenced by a person's personal and professional attributes in conjunction with organizational variables and the workplace. In addition, Mostly the causal factor of accidents in the construction industry are insufficient safety measures (Gohardani & Bjork, 2013), human error (Choudry,2008), site conditions or working environment (Chi, Han & Kim, 2012).

Several studies revealed the effects of construction accidents have great impact on a countries economy. The estimated direct and indirect costs of fatal and nonfatal construction injuries totaled about \$13 billion annually and the medical expense of nonfatal injuries alone costs more than \$1.36 billion annually (Tadesse & Israel, 2016). Furthermore, Shakil (2019) studied the consequence of construction accidents and identified the major five effects of construction hazards are: loss of human lives, demotivation of workers, conflict with workers and delay and loss of productivity of the project.

Though the construction sector is well known for the risk of injury, the Occupational Health Services (OHS) for workers in Ethiopia is lacking behind like in many other middle-income countries (Rantanen, Lehtinen, Valenti, and Iavicoli, 2017). In fact, the majority of roads in Addis Ababa are built parallel to the traffic, pedestrians and living areas, which increase the sectors susceptibility to accidents but pay considerably less attention to preventive and protective measures leading to the fact that accidents are increasing alarmingly (Betelhem,2019).

Additionally, as per the reviewed literatures, there is lack of data about determinant factors and recorded work-related injuries. Knowing the associated factors of work-related injuries can be a critical step for improving the working condition of workers in the sector (Vad & Kines, 2011)

The personal experience and observation of dug pits left uncovered without warning tapes, inadequate use of PPE, poorly coordinated work with other officials, leaving incomplete roads open for traffic without safety barriers, operating works at pick hours that makes pedestrians and traffic much closer to accident lead to an interest in studying the chosen subject matter area.

1.3 Objective of the Study

1.3.1. General Objective

The general objective of this study is to investigate the safety and health management practice in Addis Ababa City Road Authority road construction projects

1.3.2. Specific Objective

To attain the general objective, the following specific objectives were carried out:

1. To identify the existing practices of safety and health management systems in Addis Ababa City Road Authority Road construction projects
2. To assess causes of construction accidents in Addis Ababa city Road construction
3. To identify actions to be taken to improve safety performance

1.4. Research Questions

The research addressed the following questions:

1. How is the existing practice of safety and health management systems in Addis Ababa City Road Construction Projects? Are there better approaches to better quality of safety and health measures?
2. What are the causes of construction accidents in Addis Ababa city Road construction?
3. What are the actions that have to be taken to improve safety performance?

1.5 Scope and Limitation of the Study

This study is limited to construction safety, health management practices on Addis Ababa City Road Authority, eastern region master plan road projects, which are currently on progress and worth project cost exceeding one billion ETB due to time, and budget constraints.

The scope of this study is safety and health management practice on these specified projects such as contractor's health, Safety and Quality Assurance Plan, progress report and contract document.

1.6 Significance of the study

It is to look forward that this research contributes to safety and health management trends, and help to modernize the traditional safety and health management on construction industry. The ideas and researches presented here under may help a similar movement in construction among contractors, consultants, clients and further implementation on the benefits of safety management in the future.

This research is significant to the groups of professionals: Construction contractors –because it is defining what causes occupational injuries, the factors that helps in improving safety performance & identify the existing practices of safety

1.7 Organization of the thesis

This research report has five chapters. The first chapter is all about general background information, statement of the problem, objective of the study, significance of the study and scope and limitation. The second chapter deals with the literature review both on theoretical and empirical views. The third chapter deals with the research design, approach, research population, sample size, data sources, data collection, and the data analysis systems. Fourth chapter presents the overall findings and discussions. The last chapter comprises the summary of the study, conclusion and recommendations.

2. REVIEW OF RELATED LITRATURE

2.1. Introduction

This Chapter is concerned about different literatures conducted on the area of study to provide theories used as an input for this research. As the nature of construction is dynamic, complex and unique and again safety and health issue are worldwide, the literature discussed here under comprises different countries and situation studies to understand and get detailed knowhow on the process.

2.2. Theoretical Review

2.2.1 General Overview of Safety and Health Management

The definition of a safety management system is “a series of defined, organization-wide process that provides for effective risk-based decision-making related to your daily business” (SMIC, 2010). International Civil Aviation Organization (ICAO) has defined health and safety management systems as “systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures” (ICAO, 2007). International Labor Organization (ILO, 2001) has defined safety management systems as “a set of interrelated or interacting elements to establish occupational safety and health policy and objectives and to achieve those objectives”- Cited on (Elyas Jazayeri & Gabriel B. Dadi, 2017).

Takele Tadesse & Mengesha Admassu (2006) stated that, Occupational health and safety is one of the most important aspects of human concern. Its goal is to adapt the workplace to the needs of the workers in order to promote and maintain the maximum possible level of their physical, mental and social welfare in all jobs. Making working place healthy and safe is in the best interest of employees, companies, the government and the public. Although it seems simple and obvious, this idea has not yet gained meaningful universal recognition. Hundreds of millions of people throughout the world are employed in conditions that breed ill health and/or are unsafe. An occupational injury is defined as any personal injury, disease or death resulting from an

occupational accident (ILO, 2016). Moreover, an accident is some sudden event that results in injury or ill health. (Health and safety executive, 2016)

2.2.2. Construction Safety and Health Practices in Ethiopia

There is no doubt that the construction sector plays significant role for the economic development of every nation and Ethiopia is striving hard to improve its basic amenities by building schools, hospitals, housing complexes, shops, offices, highways, power plants, industries, bridges and other infrastructures. However, unskilled labor forces at cheap rate and temporary employee carry out all these construction activities (Adane et al., 2013). Occupational injuries and accidents among these workers are high due to illiteracy, poverty, lack of health and safety training and information on health hazards and risks at the work place (Tolera, 2016).

Several studies show that occupational injury owing to dangerous working conditions and an environment of illegal human behavior is on the rise in Ethiopia, where the status of workplace injuries is often poorly defined.

Even though, the construction industry is known to be accident prone, there is lack of national occupational injury recording and reporting system leads to a varied injury prevalence estimate and unable to show the magnitude of injury, which further limits the prevention effort in the sector. (Seblework, 2006)

According to OSHA pocket guide (2012), potential hazards for workers in construction include scaffold collapse, falls from height, trench collapse, electric shock, failure to use proper personal protective equipment and those potential hazards are the most frequently occurred safety problems in Ethiopia too. It is no wonder so many injuries occur on construction sites unfortunately, too many workers are either unaware of the risks, or exhibit a high-risk tolerance, often coupled with an opposition to what they see as burdening or cumbersome safety equipment. (PANTOM Vision Research) cited by Lucy, Emer, Yolente, (2016)

2.3. Empirical Review

2.3.1 Construction Health and Safety Management

Safety management involves the functions of planning, identifying problem areas, coordinating, controlling safety policies, procedures and practices and directing the safety activities at the work site (Lucy et al., 2016). Every level of company or part of a cross-organization project should apply safety as management concept (Cheng et al.2004). Effective safety management has three main objectives: to make the environment safe; to make the job safe; and to make worker safety conscious (Global Occupational Health, 2011)

Experience around the world has demonstrated that it is possible to substantially reduce potential safety problems by implementing systematic safety checks of proposed road projects at various stages; that is, in planning, design and construction processes and at road operation stage. These systematic safety checks are known as road safety audits (RSAs), which is very crucial to manage the project safety issues systematical way (ERA 2012).

Choudhry, Fang and Mohamed, (2007) discussed the benefits of a safety management system in construction industry as it contributes on preventing and controlling workplace dangers and lowering the likelihood of catastrophic accidents. Accordingly, reducing the number of injuries to personnel and operatives in the workplace through the prevention and control of workplace hazards, controlling workplace risks improve employee morale and enhance productivity, minimizing production interruptions and reducing material and equipment damage, reducing the cost of insurance, cost of accident litigation as well as the cost of employee absences, minimizing legal, fines, reducing expenditures on emergency supplies and reducing accident investigation time, supervisors' time diverted, clerical efforts, and the loss of expertise and experiences" are basic.

Although, health and safety management in construction industry indeed is a challenging task due to the dynamic nature of construction activity coupled with involvement of unskilled,

illiterate and mobile work force, some regions have been making progress over the years. However, there is still a long way to go to reach the vision of an industry where people return home at the end of a shift healthier than when they arrived (Aoife & Alistair, 2013)

2.3.2 Factor Affecting Safety and Health in Construction Projects

To identify the major factor that affects the safety and health performance, several researches has been done and revised. Mahjoob, Ahmed and Raouf (2014) concluded that there has been a severe lack of interest in the science of occupational safety and personal protection requirements, lack of data for injured workers, lack of training and awareness of health and safety regulators. The study has also showed that most injuries in construction sites occur to construction workers more than other specialties. Furthermore, it has been concluded that the workers should develop their practice in order to avoid hazard in the work.

Durdyev, Mohammed, Lay and Ismail (2017) studied the key factors affecting safety in Cambodian construction and identified five principal factors which the researcher believe it may also work for Ethiopia. Those are management and organization factor, resources, site management, cosmetic, and workforce.

Management and organization

The researchers justified management and organization as the main principal factor by explaining 21.05% of total variance among 30 safety items. It is obvious that attitude (Teo, Ling and Chong, 2005) and support (Herrero et al. 2006) from the top management of an organization play a significant role in cultivating a good safety culture, which will subsequently lead to efficient and effective construction safety performance. However, with cost, time and quality the main targets to achieve in construction projects, safety-related issues are not a priority of contractors (Durdyev, Mohammed, Lay and Ismail (2017)

Resources

Resources include men, material, machinery, money and method accounted for 18.13% of the total variance among the 30-safety item. The results justified 'lack of experience on project management', 'lack of personal protective equipment', 'poor equipment', 'lack of skilled labor',

‘low educated labor’, ‘insufficient safety budget’ and ‘financial pressure’. Therefore, top management commitment in construction projects in Cambodia plays a significant role in providing the required resources at an appropriate level.

Site Management

Site Management explained about 15% of the total variance among the items. The most prominent construction safety item in Cambodia is ‘lack of safe construction site environment’ ‘lack of technical guidance’ and ‘lack of safety supervisor onsite’

Cosmetic

The researcher identified cosmetic as the fourth principal factor accounted for about 11% of the total variance among the 30 safety items. This principal factor was labeled ‘cosmetic’ because the relevant items are beyond the contractor’s influence or control, including (according to their respondent loadings): the ineffectiveness of current safety policies; poor legislation, codes and standards; poor weather conditions; and lack of worker compensation insurance.

Workforce

The most influential safety item within the workforce cluster was reckless operations. The main causes of reckless operations on construction sites are economic conditions (low wages) (Pinto, Nunes and Ribeiro, 2011) low level of education and skills (Cooper and Cotton, 2000), pressure to work overtime (also the cause of workers’ physical fatigue) (Caruso et al., 2004) and lack of safety training (Toole, 2002). In Cambodia, construction workers generally come from poor provinces, and are unskilled, uneducated and untrained

2.3.3 General Responsibilities of Construction Stake Holders in Health and Safety Practices

The stakeholders or competent authorities in construction are the Contractor, the one who is responsible to commence the construction work, Consultant who is responsible for supervising

and checking the commenced work complies with the regulated requirements and Client who is the owner of the project (Designing Buildings Wiki, 2020)

2.3.3.1 Obligations of Contractor Regarding Health and Safety Measures

According to FPPA (2011) Sub-Clause 45.5 of the Conditions of Particular Application of the Contract, the formulation and enforcement of an adequate safety program shall be the obligation of the Contractor with respect to all the works under the Contract, regardless of whether performed by the Contractor or his Subcontractors. In this regard, the contractor is required to submit a written safety, security and environmental protection programs to the consulting Engineer, aimed at minimizing illnesses and accidents among the workers and the public during the construction period, covering the overall works and based on the laws and regulations of Ethiopia. FIDIC, 1987, sub clause 8.2 also stated that the contractor shall take the responsibility for the adequacy, stability and safety of all site operation and method of construction. Sub clause 19.1 (a) of the FIDIC, 1987 further oblige the contractor have full regard on the safety of all personnel entitled to be upon the site and keep the working environment

In terms of effectiveness, safe working conditions at construction jobsites are best achieved when the prime or general contractor assumes his rightful leadership role and takes the responsibility to (a) establish, (b) coordinate, (c) monitor and (d) generally manage the overall basic safety program content and structure for all parties and persons at his job site. Undefined authority among the parties involved related to jobsite safety is not a workable arrangement for such an important matter that literally affects the life and limb of each worker on the jobsite (Mouleeswaren,2014).

2.3.3.2 Obligations of Consultant/ Supervisor

Good planning and organization at each work site and the assignment of clear responsibility of supervisors are fundamental to safety in construction. Each supervisor requires the direct support of site management and should seek to assure within his or her field of competence (Lucy, Emer and Yolente, 2016).

As per the FIDIC (1987) sub clause 8.2, it is the duties of the consulting engineer to keep /monitor the site safety (OSH) before any operation of works. Safety, health and welfare on construction sites, a training manual (2011) mentioned that Making the work site safe will require regular inspection and provision of the means for taking remedial measures. The training of workers enables them to recognize the risks involved and how they can overcome them. Workers should be trained the safe way of getting a job done.

OSHA Safety and Health Program Management guideline (2015) stated that a team of construction safety supervisors must be established and specific instructions must be written for each activity, outlining what will be done, how it will be done and what safeguards will be used to protect the health and safety of everyone working there.

Consultants are hired by the client to supervise and follow all the works on behalf of the client. The responsibilities are ensuring safe working conditions and equipment, inspecting workplace safety regularly, implementing safety measures.

The consultant should follow the basic safety philosophy that is, all accidents are preventable, every job should be under safe circumstances, safety is everyone's responsibility, Legal obligation shall be the minimum requirements for our health and safety standards, individuals shall be trained and equipped to have the skills and facilities to ensure an accident-free workplace.

2.3.3.3 Client Responsibilities

Communication is a key feature in achieving client-led safety initiatives and for driving a top-down approach to safety. This more intensive approach to communication meant communicating safety messages for the overall project direction or directly communicating with personnel on-site. Further, the client's involvement (or that of a client's representative) with on-site activities including inductions, safety meetings, inspections and safety walks was perceived as contributing to safety best practice (Kerry, Rachel and Michael, 2005).

2.3.4 Safety and Health Management Program

The main objective of safety and health program is to prevent workplace injuries, illness and death as well as the suffering and financial hardship these events can cause from workers, their families and employers (OSHA, 2015).

As stated by Journal of Education and Practice (2016) there might be a number of good reasons to have a construction health and safety program, humanitarian, legal/contractual and economic reasons shall be the first three in the development of the safety policy. Employers need to have a written safety policy for their enterprise setting out the safety and health standards, which it is their objective to achieve. The policy should name the senior executive who is responsible for seeing that the standards are achieved, and who has authority to allocate responsibilities to management and supervisors at all levels and to see they carried out. Therefore, the project department sets up a safety working group in which the project manager is entitled as chief director, the chief engineer as vice director, leaders of each department and work teams as group members and safety officer. Leaders of each department and work teams are directly responsible for daily safety management (Safety, Health and Welfare on construction sites, Training Manual, 1999).

In addition, OSHA guideline (2015) developed four core elements of safety and health program. These are management leadership, worker participation, hazard identification and assessment, hazard prevention and control, education and training, program evaluation and improvement, coordination and communication on multiemployer worksites. The details are summarized here under.

I. Management Leadership

Management provides the leadership, vision and resources needed to implement effective safety and health program. This can be implemented by commitment to a safety and health program which can be accomplished by establishing a written policy signed by top management describing the organization's commitment to safety and health and communicate the policy to all workers and relevant stakeholders,

II. Workers Participation

Workers participation results in better design implementation and evaluation since Workers are often best positioned to identify safety and health concerns and program deficiencies, such as emerging workplace hazards, unsafe conditions, close calls/near misses, and actual incidents. By encouraging reporting and following up promptly on all reports, Defining/documenting safe work practices and Conducting site inspections.

III. Hazard Identification and Assessment

A proactive assessment and identification of hazards in order to fix them is a core, ongoing process to identify and element of any effective safety and health program. Hazard identification and assessment comprises the following issues Collect and review information, periodically inspect the workplace, investigate injuries, illnesses and determine the severity and likelihood of incidents in the workplace.

IV. Hazard Prevention and Control

Effective controls protect workers from work place hazards generally; prevent injuries, illnesses, controls protect workers from work and incidents; minimize or eliminate safety and health risks; and help employers provide workers with safe and healthy working conditions.

V. Education and Training

Workers who know about workplace hazards and the measures in place to control them can work more safely and be more productive. Education and training give an awareness and understanding of workplace hazards as well as how to identify, report, and control them.

Involves providing awareness program and train workers on their specific roles and responsibilities in the safety and health program and hazard identification and controls.

VI. Program Evaluation and Improvement

Program evaluation and improvement means establish, report, and track metrics that indicate whether the program is effective and evaluate the overall program, initially and periodically, to identify deficiencies and opportunities for improvement.

VII. Multiemployer Worksites

The owner, contractor or subcontractors may employ mostly some workers as a temporary or supporting staff. In these settings, employers must establish mechanisms to coordinate their efforts and communicate information to ensure that all workers on site and their representatives can participate in efforts to prevent and control injuries and illnesses, and those workers are afforded equal protection against hazards

2.3.5 Cause and Effect of construction Accidents

The construction projects are being experienced troubles by many risks, uncertainties, complexities due to frequently happened accidents in construction project (Sousa, Almeda, & Dias, 2014). The exposure to accidents increases in developing countries like Ethiopia because there are no strict rules and strict practicing of safety to be followed by the construction parties, failure of management to provide trainings, manuals & maintenance as the authority or the construction stake holders focus more only on the work to be executed. According to Bureau of Labor Statistics (BLS), 150,000 construction workers were injured in 2019/2020

The causes of accidents in construction industry are related to unique nature of the industry, human behavior, improper site conditions, unsafe work method, equipment and procedures, which affected from poor safety management (Charehzehi & Ahankoob, 2012). Several in-depth researches have been conducted in order to identify the causes of accidents. Among that, Priyadarshani et al., (2013) revealed that lack of commitment of management, lack of safety measures, negligence of workers to respond on safety practices and unskilled workers are most leading factors for the occurrences of accident in construction industry.

Arunkumar (2018) classified main root causes of accident in to three that are failure to identify an unsafe condition that exists before and/or after the start of activity, carry on a work in unsafe condition, and decide to perform regardless of unsafe site condition or unsafe acts.

Kavaya.K,T. Pradeep (2019) further clarified and summarized this conditions as follows;

Unsafe Conditions

Unsafe conditions are conditions that are considered as main causes of accidents. Such as: loose and incorrect placement of scaffolding or ladder resulting in failure from height, insecure objects

fallen in the ground like sharp and solid objects, unavailability of first aid kits, faulty equipment that is not checked well for the functionality prior to work, inaccurate construction planning and scheduling that cause improper management of manpower, equipment and resources, noise hazards coming from heavy machinery and equipment might result in deafness and numbness and electrocution like electric shocks and electric firing

Unsafe Acts

An unsafe act comes from irresponsible and reckless behavior of human. Reducing unsafe act significantly reduce unsafe site conditions.

An unsafe act includes; Inaccurate construction planning, scheduling & improper ways of sequencing, unable to providing proper training and expert advice to the workers, demotivation of workers or job dissatisfaction, unavailability and do not enforce workers to use personal protective equipment.

Preventive measures

Based on the above specified facts and literatures contributing to the causes of accidents, the preventive measures can mainly be achieved by top management commitment for proper planning, scheduling and sequencing, providing workers trainings and knowledge on using defensive appliances and overall safety behaviors, encourage workers to be part of safety program, ensuring the usage of PPE like helmets, heavy duty gloves, eyeglasses, reflective clothes, slip- resistant boots as well as making working site clean and tidy, providing catch net, safety barriers and warning tapes, Make workers safe from traffic and provide adequate traffic flow like detour.

Effects of occupational accidents

Accidents in work place can have huge impact in that it can cost human lives, demotivation of workers or moral reduction, fear, conflict with workers, loss of productivity of project or economic losses, loss of reputation for the contractor as well as the supervisor and in worst cases company closure (Khalatbari et al., 2013)

2.3.6 Improvement of Safety Performance

Safety performance is the quality of safety related work. Safety related work is regarded as the efforts made to achieve safety (Nevhage and Lindahl, 2008). Perhaps the perception of factors that influence the safety performance in construction sites is gained by measuring the safety performance in construction sites.

Generally, safety performance is often evaluated based on negative indicators such as accident number, days lost, injury rates and accident cost. The importance of evaluating safety performance is to gauge the effectiveness of construction firms' management in accident prevention by setting out safety objectives and targets (Permana, 2007).

It is crucial for every employer to provide training and the comprehensive safety programs, which can improve safety performance continuously to reduce potential hazard in construction project (Charehzehi A. & Ahankoob A., 2012).

Jannadi and Bu-Khamsin (2002) identified the key elements of safety performance. The most significant factors were management involvement, personal protective equipment, emergency/disaster planning and preparation, ionization radiation, scaffolding and ladders, crane and lifting equipment, fire prevention, electrical equipment, excavation, trenching and shoring, and mechanical equipment. Supervisors having daily site inspections and reinforcing the workers abide by the safety rules are also essential for safe performance. Furthermore, making workers undergo in trainings and skills and actively report any accidents or near misses.

Hinze, Hallowell and Baud (2013) analyzed 22 safety practices implemented on construction sites for safety performance improvement. The results of an empirical data analysis revealed that the following safety activities differentiate safety performance: worker observation programs, worker safety perception surveys, tracking of first-aid injuries, supervisor involvement in policy making, active owner involvement in safety, site-specific safety training for managers, adequate safety staffing, and other practices.

3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the study area, research design, population and sampling method, sources and tools of data collection, data analysis methods and ethical consideration.

3.2 Research Approach

This research followed quantitative approach using data collected from questionnaires distributed to Contractor staffs, consultants and client officials who are relevant and are involved in the road construction projects.

3.3 Research Design

This study employed descriptive survey research design in order to identify the problem under study and focus on the issues of existing practice. Furthermore, it also describes the results obtained from the descriptive statistical tools and applied quantitative research approach to address the stated objectives.

The study design included structured questionnaire survey and visit on the study area in order to collect primary data. Besides, reference of various reports on safety management as secondary source of data was also used. Finally, based on the observations and analyzed data, description, conclusions and recommendations on safety and health practices in Addis Ababa City Road Authority Road Projects will be drawn and forwarded respectively.

3.3.1. Research Population and Sample Size

A construction site- based study was conducted to examine the existing management practice to overcome the safety and health problems encountered in road construction workers. To achieve the objectives of this study, a structured questionnaire was designed to study more about the existing safety and health management practices in the road construction, to assess the causes of

accidents and ways to improve safety and health performance in construction works. The Questionnaire was formulated by screening and comprehending the relevant literatures in the area of safety practice in road construction and study populations are those who are representatives of from the contractor, consultant and client officials.

In order to get the required sample size, subjective sampling method specifically conventional approach that is taking the average of sample sizes of similar other studies was employed. Therefore, the researcher decided the sample size to be 65 respondents restricted to the east region master plan road construction officials. In a way, samples were taken from each different field of discipline representatives such as consulting staffs, client officials, skilled and semi-skilled workers and senior staffs or engineers of the contractor of the selected project.

3.3.2. Data Sources and Data Collection

The study relied on primary data collected by questionnaires from different participants who have direct relation to the execution of the construction work. The distributed questionnaire was based on the research question and it contains close-ended questions. To simplify the question and thereby to get wider range of responses, the survey comprises multiple choices and Likert 5-scale to assess the level of agreement of the employees ranging from ‘strongly agree’ to ‘strongly disagree’.

In this study, quantitative data were collected from the construction parties (primary data sources) using self-administered questionnaire in order to answer the research questions and objectives.

3.3.3. Data Analysis Method

In this study, after collecting the primary data, the researcher coded and analyzed the data through SPSS (Statistical package for social sciences) version 20 and Microsoft Excel for further uses. Descriptive statistics such as percentages and frequency distribution were used to describe the safety and health practice on Addis Ababa city road construction projects.

3.3.4. Validity & Reliability

Validity

Validity is the extent on how accurately a method measures what it is intended to measure (Roberta, 2019). The researcher ensured that questionnaires were thoroughly scrutinized after collection from respondents for valid representation by pilot testing on 15 respondents before distributing final data collection tool.

Reliability

Reliability is referred to the ability of a research instrument to produce the same outcome even when the parameters are measured in varying conditions and are used to measure consistency of research instrument (Field, 2013). The researcher used Cronbach's alpha measure to check the reliability of this study. Cronbach's alpha is a measure used to assess the reliability or internal consistency of a set of scale or test items (Gliem,2003)

Cronbach's alpha is computed by correlating the score for each scale item with the total score for each observation and then comparing that to the variance for all individual item scores:

$$\alpha = \frac{k \times \bar{c}}{\bar{v} + (k-1) \bar{c}}$$

Where: k refers to the number of scale items

\bar{c} refers to the average of all covariance's between items

\bar{v} refers to the average variance of each item

Table 1 Reliability test

Reliability Statistics			
Variable	Alpha Test	No. of items	Total No. of cases
Safety and Health Practice	0.707	18	59
Causes of Construction Accidents	0.814	13	59
Ways of improving safety performance	0.713	13	59

3.4 Ethical Consideration

In this research work, respondents as well as the selected working site organizations were clearly are communicated about the objectives of the research and their willingness before they are asked to give their answer.

The confidentiality and privacy of the voluntary respondents are assured. This independent and impartial research work is sure not to harm or fear the respondents in any way. Accordingly, the researcher optimally considers all the ethical perspectives.

4. RESULTS AND DISCUSSION

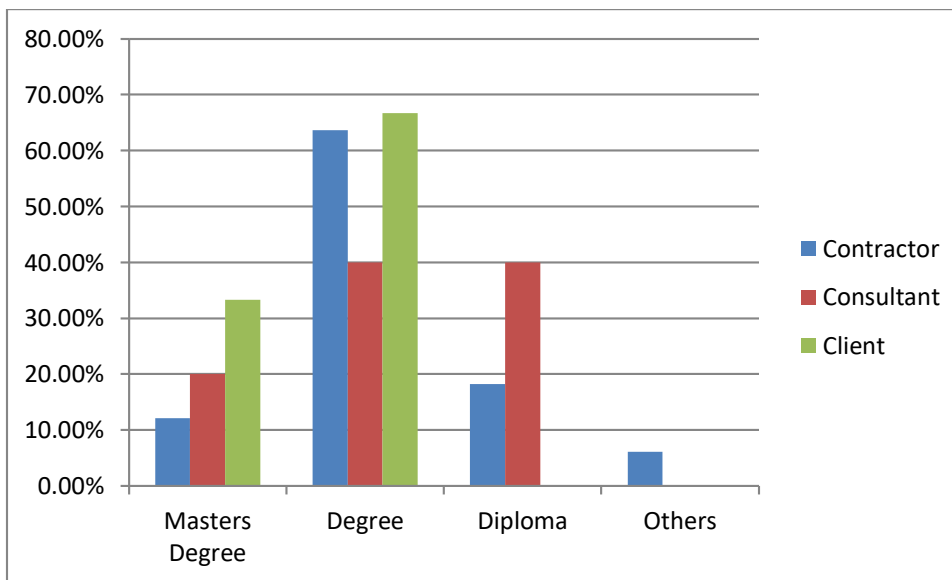
4.1. Introduction

This chapter consists of the data presentation, analysis and interpretations on three major topics that are related to the research questions. For this study, five ongoing AACRA east region master plan road projects are selected for the survey. The questioner was organized into four parts. The first part was about the general profile of the respondent. The second part deals with describing the existing safety and health practices. The third is all about the causes and effects of construction accidents and the last part asses the ways of improving safety performance. Tables and charts are used for detail interpretation of analyzed data to have better understanding and clear picture on the subject matter.

4.2 General Profile of the Respondents

The general background of the respondents that is educational status, total work experience and the side of construction sector they are working on presented in this section.

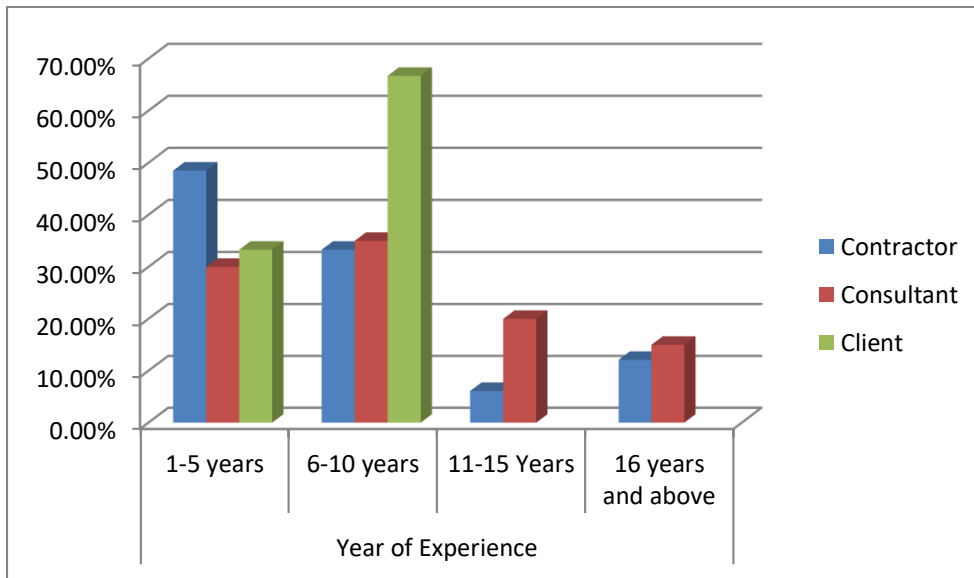
Figure 1: Educational status of the respondents



The responses come from 33 contractor staff, 20 consultant staffs and 6 client staffs out of which from the contractor staffs, 12.1 % have a master’s degree, 63.6 % have degree, 18.2% have diploma and 6.1 % are a high school and elementary levels. On the other hand, from the consultant side 20% of the staffs have a master’s degree, 40% have a degree and again 40% have a diploma. In addition, from the client side, 33.3% have master’s degree and 66.7% have a degree. This figure indicates 16.9% of the respondents have a master’s degree, 55.9% have a degree, diploma makes 23.7% and high school and elementary levels are 3.4 %.

Total Work Experience in Road Construction

Figure 2: Total work experience of the respondents



From the above figure, 12.1% of the contractor staff have 16 years and above working experience, 6.1% have 11 up to 15 years of experience, 33.3 % of them have experience between 6 to 10 years and 48.5 % have 1 up to 5 years of experience. From the consultant side, 15.0% of the respondents have above 16 years of experience, 20 % have 11 up to 15 years of experience, 35 % have 6 up to 10 years and 30 % of them have 1 up to 5 years of experience. The client- side respondents, 66.7% of them have 6 up to 10 years of experience and 33.3 % have 1 up to 5 years of experience in road construction sector.

4.3 Current safety and Health Practices of AACRA Road Construction

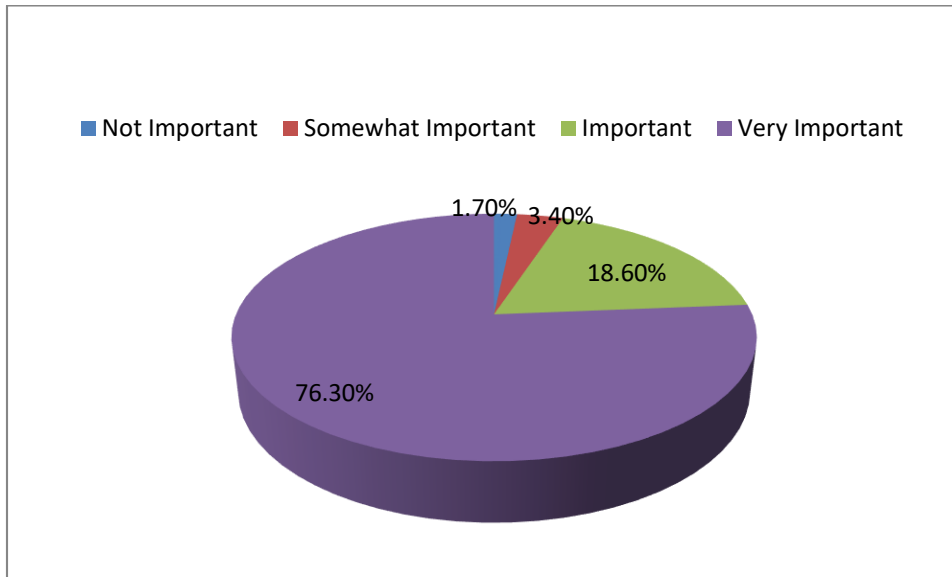
Projects

This section analyzes the current safety and health practices of the selected projects at their execution phases. It comprises further description on the perception of workers about safety and health, the level of concern and devotion of the contractor and consultant on creating safe working environment. The analyzed data collected from the questioner is displayed graphically in tables and figures.

4.3.1 Importance of Creating Safe and Healthy environment

The respondents were asked about their thought on how important is creating safe and healthy working environment and their response is tabulated below.

Figure 3: Importance of creating safe and healthy working environment



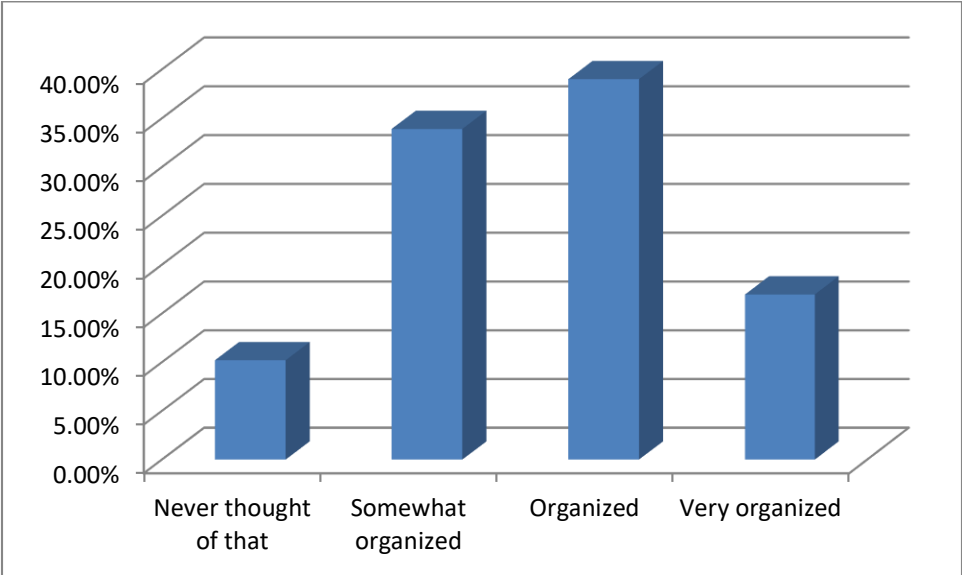
The figure above demonstrated the attitude of the respondents towards creating safe and healthy working environment aiming to understand the perception of the workers on how important is maintaining and ensuring health and safety at Workplace. Out of the total 59 respondents 45 of them, which makes 76.3% witnessed creating safe and health-working environment is very

important. 11 (18.6%) respondents said it is important the other 2 or 3.4 % think it is somewhat important and one respondent said it is not important. It is mentioned that construction sites under this study have a relatively higher working potential and they hire of good qualified employee with a positive attitude towards maintaining safe working environment, which is also assured from this result.

4.3.2. Level of Workers Organization to Stay Safe from Working Site Injury

In here, the workers were asked how organized they are in order to make themselves safe from any injuries in working site since it is the duty of the employee to behave in a manner that safeguards his/her own and co-workers’ health and safety and their response is shown on the chart below

Figure 4: Level of respondent’s organization to stay safe from working site injury

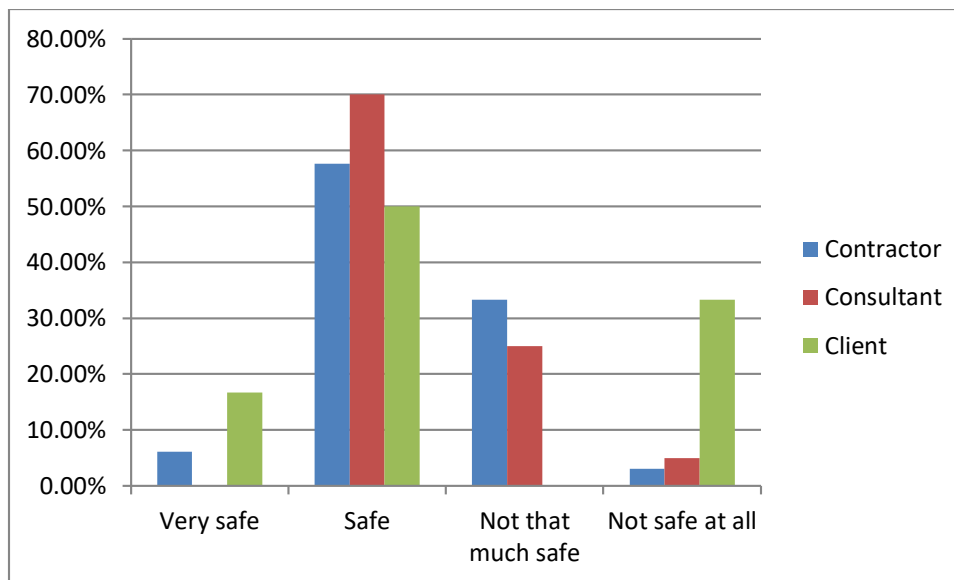


According to the above data, 16.95 % of the overall respondents are very organized to make themselves safe from any injuries on site. 39 % thinks they are organized the other 33.9 % said they are somewhat organized and the rest 10.2% never thought about being organized.

4.3.3 Assessment on the Safety of Construction Site-Working Environment

FIDIC, 1987, sub clause 8.2 stated that the contractor shall take the responsibility for the adequacy, stability and safety of all site operation and method of construction. It further explains the contractor should take adequate measure to make the site free of any accident causing obstacles prior to execution of any works. In conjunction to this statement, the respondents were asked how safe is their construction site and the collected data shows among the contractor staffs, 6.1 % of them think that their working site is very safe. Majority of the staff that is 57.6% witnessed the site to be safe, 33.3 % said the site is not that much safe and the rest 3 % answered the site is not safe at all. On the other hand, from the consultant staff, 70 % respondents said the site is safe, 25% responded it is not that much safe and 5% thinks the site is not safe at all. When coming to the client side respondents, only 16.7 % of them said the site is very safe, 50 % witnessed the site is safe and the rest 33.3% said their site is not safe at all.

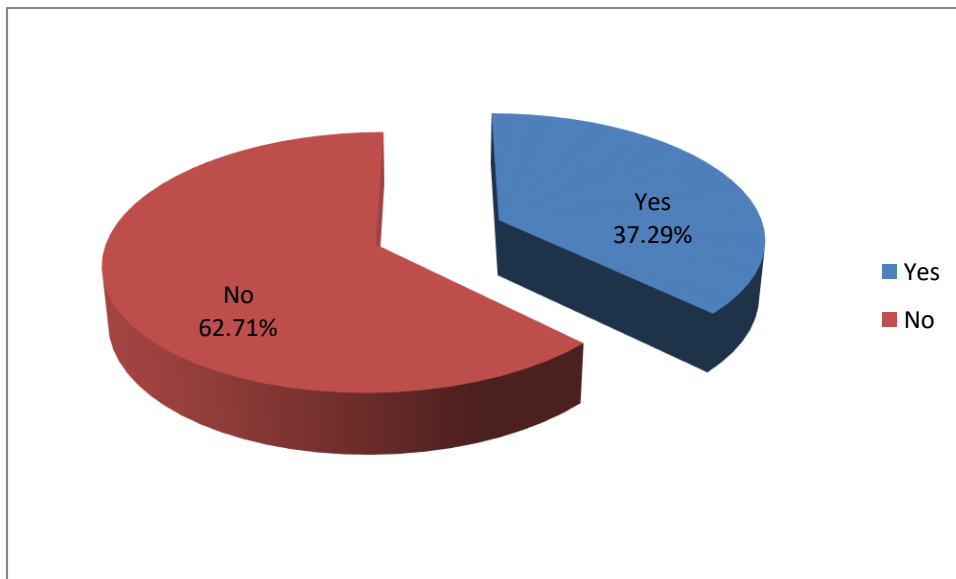
Figure 5: safety of construction site working environment



4.3.4 on-Job Trainings Taken with Regard to Safety and Health in Road Construction

The training of workers enables them to recognize the risks involved and how they can overcome them. Workers should be trained the safe way of getting a job done (FIDIC, 1987). To check how certain, the contractor is on creating safety mind set to his employees, the respondents were asked if they attend trainings regarding safety and health in road construction throughout their on-job experiences. However, out of total respondents, majority of them that is 62.71% have never been on safety trainings and only 37.29% had the chance to take trainings. Moreover, this can be further interpreted as, 66.7% of the contractor staff did not take any trainings and the remaining 33.3% are trained on the subject matter and from the consultant side, 65% of the respondents are not trained and on the contrary, 66.7% of the clients got the chance of trainings. This figure is displayed below with a pie chart.

Figure 6: on-Job Trainings



To assess the level of the awareness, those respondents who took training were further asked how frequent they took the trainings and they answered as 12.1 % of the contractor staff took a

training ranging from 1 to 4 times, 12.1 % from 5 to 7 times and the other 9.1% took more than 7 times on their on job experience. Consultants, 20% of them took trainings from 1 up to 4 times, the other 5% took from 5 to 7 times and the rest 10% took more than 7 times. 33.3% of the client staffs were trained from 1 up to 4 times and also 16.7% took a training ranging from 5 up to 7 times the left 16.7% got more than 7 times trainings. Based on the Occupational Safety and Health Profile for Ethiopia (2006), provision of Article 92 of the proclamation No 377/2003 there is a requirement on employers to give adequate training to their workers on matters of safety, health and existing hazards at work places. But unfortunately, this assessment shows that there is still a long way to go in giving construction workers training and awareness about the significance of safe and healthy environment in this hazardous sector.

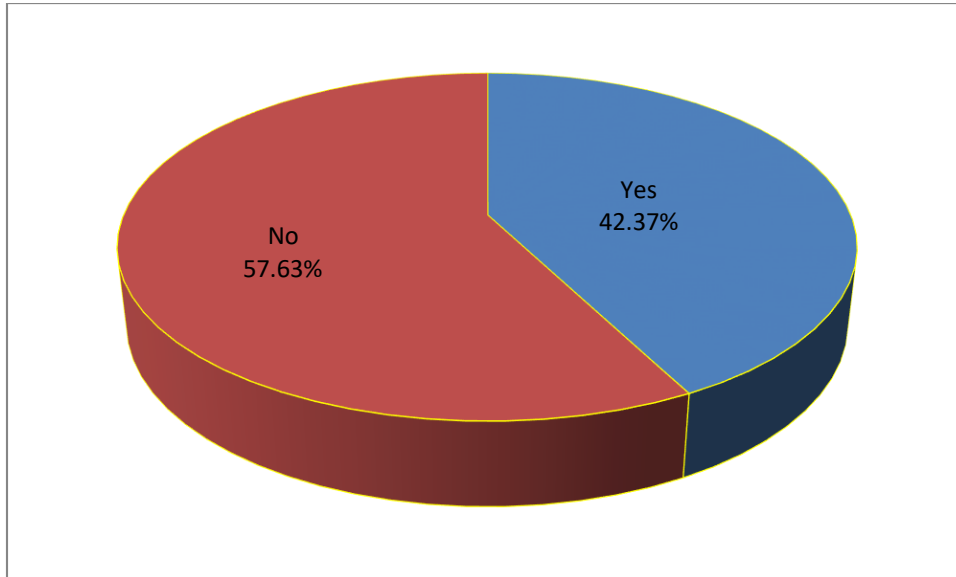
Table 2: frequency of training for trained respondents

Frequency	Contractor (%)	Consultant(%)	Client (%)
1 up to 4 times	12.1	20	33.3
5 up to 7 times	12.1	5	16.7
more than 7 times	9.1	10	16.7
none	66.7	65	33.3

4.3.5. Availability of Adequate Safety Equipment on Site

The Addis Ababa City Construction Bureau has drafted a health and safety regulation requiring contractors to fulfill mandatory safety materials and procedures before they start work. In addition, the FIDIC, 1987 also obliges the contractor to take the responsibility for the adequacy of safety equipment but unfortunately, the initial planning will be done on paper and win contracts but integrating this comprehensive Management health and safety principles into construction process becomes difficult because of tradition (Adow, 2013). According to the question forwarded to the respondent if the contractor provides adequate safety equipment on site, 57.63 % of respondents revealed that there are not enough safety equipment's on site and the rest 42.4% answered the reverse.

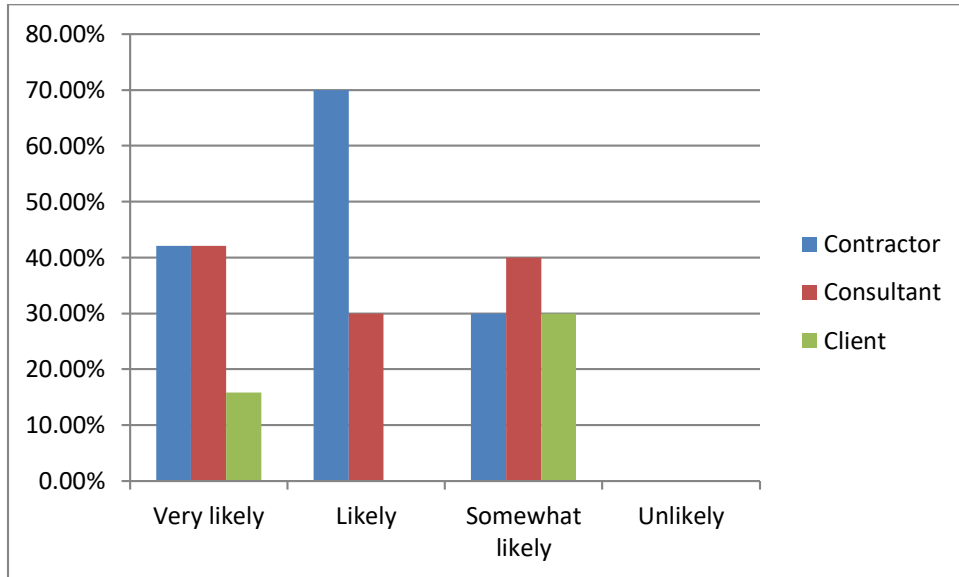
Figure 7: availability of adequate safety equipment



4.3.6 Willingness for the utilization or Applying of Safety Equipment

Health and safety management in construction industry indeed is a challenging task due to construction activity executed with involvement of unskilled, illiterate and mobile work force, (Aoife & Alistair, 2013). The respondents were asked how likely they could apply safety equipment if they are provided with. Their response was 42.1 % of the contractor staff, 42.1% of the consultant and 15.8% of the client is very likely to apply the safety equipment. On the other hand, 70 % of the contractor and 30% of the consultant are likely to use and the rest 40 % of the consultant, 30 % of the contractor and 30% of the client responded that they have lower probability of applying or they somewhat likely to apply the safety equipment. Even if this result showed the willingness of most respondents to wear their safety gear, still other few compelled to use the safety equipment.

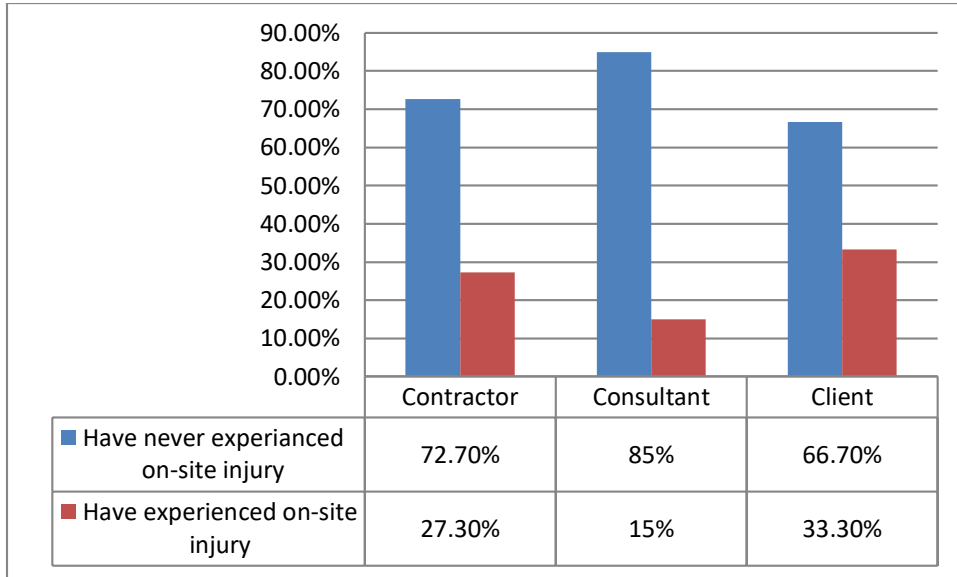
Figure 8: willingness on applying safety equipment.



4.3.7. Site Injury and Near Misses occurrence on Working Sites

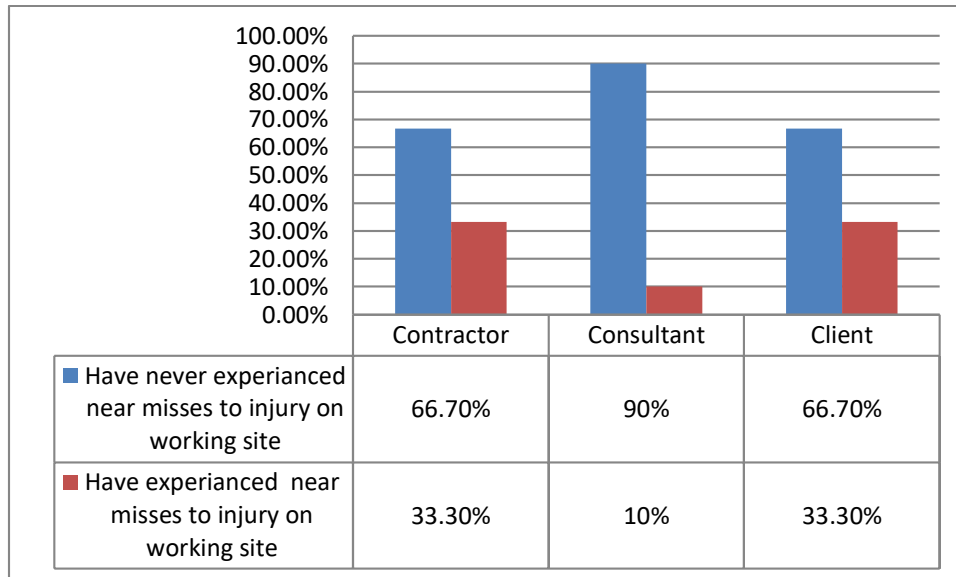
In general, Arunkumar (2018) revealed the major causes of accident as failure to recognize harmful conditions before or after the commencement of an activity, continuing to operate in an unsafe environment and deciding to execute in spite of unsafe site conditions. The figure below gives an answer on the question dealing with if the respondent ever experienced any injury or near misses on working sites. Therefore, out of total respondents, 72.7 % of the contractor staffs have never experienced injury and 27.3 % faced injury on working sites. On the other hand, 85 % of the consultant representatives were free of injuries but 15% of them have experienced onsite injuries. Client staffs that make 66.7 % have not experienced working site injuries and in contrary 33.3% have faced injuries on site. Those who experienced accidents were asked the reason behind their injury and revealed lack of PPE and unsafe site working conditions.

Figure 9: working site injury occurrences



Furthermore, the respondents were also asked if they have ever experienced near misses to injury on working site. As described below in the chart, 66.7 % of the contractors have never experienced near misses to injuries and 33.3 % have an experience. 90 % of consultant staffs responded negative for the near misses and the rest 10% have experienced injury near misses. On the other hand, 66.7 % of the clients have not experienced injury near misses on working site and the other 33.3 % have faced injury near misses on site.

Figure 10: Near misses to injury on working site



4.3.8. Actions to be taken in Case of Accidents

The Ethiopian Labour Code (1993) stated, when a worker sustains occupational injuries, the employer shall cover the general medical expenses, periodic payment while he is temporarily disabled, disablement compensation where he sustains permanent disablement and survivors' pension gratuity or compensation to his dependent when he dies. The Ministry of Labour and Social Affairs (2006) article 95-112 clarified the above statement as employers are responsible for all work-related injuries to employees, with the exception of those brought on by willful disregard for safety instructions, willful disregard for accident prevention laws, and injuries brought on by intoxication.

First aid is a provision of primary care for an injury since qualified first aid staff to an injured person administers it until; if necessary, final medical treatment can be obtained. It is essential for each construction site to have the appropriate first aid arrangements. First aid equipment and material should also be readily available for treating possible injuries or sickness at all workplaces. Such equipment includes a first aid kit and a stretcher with blankets.

For further clarification, the respondents were asked what action would be taken in case of minor accidents as well as major accidents. 49.15 % of the contractor staffs revealed that they will be taken to clinic in case of major injuries and 6.78% said they might be treated with first aid on site. While in case of minor injuries, 8.47% of the contractor staffs answered they might be taken clinic, 37.29% said they would be treated with first aid on site and the rest 10.17% said they will get treated traditionally with colleagues. When coming to the consultant staffs, in case of major injuries, 30.51 said they will be taken to the clinic and the rest 3.39 % said will get treated on site. On the other hand, for minor injuries, all consultant staffs revealed that they would be treated on site with first aid. The client staffs responded as when in major injuries, 3.39% of them said they will get treated with first aid and 6.78% said they will be taken to clinic and the same percent response was given for the minor injuries.

Table 3 : Action to be taken in case of major and minor injuries

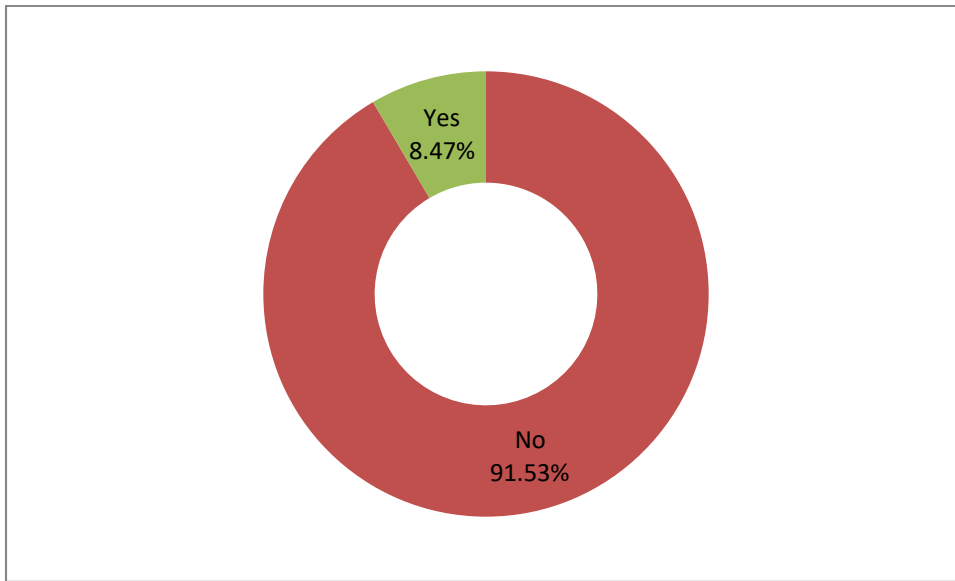
	Actions to be taken	Contractor (%)	Consultant (%)	Client (%)
Major Injuries	Will be taken to clinic	49.15	30.51	6.78
	Will get first aid on site	6.78	3.39	3.39
	will get treated with colleagues traditionally			
Minor Injuries	Will be taken to clinic	8.47		6.78
	Will get first aid on site	37.29	33.90	3.39
	will get treated with colleagues traditionally	10.17		

4.3.9. Fatality Records

Respondents were asked, if their working site ever experienced fatality record. 91.53% responded negative and the rest 8.47% revealed the occurrence of fatality on their site. It was further analyzed that how the fatalities were handled and asserted for compensation. As

mentioned earlier FIDIC (1987) oblige the contractor to have full regard on the safety of all personnel entitled to be upon the site and keep the working environment safer. The contractor will also be obliged to enter in to workmanship insurance for in case of injuries and even death.

Figure 11: fatality record



4.3.10. Safety and Health Planning, Handling and Controlling Mechanism

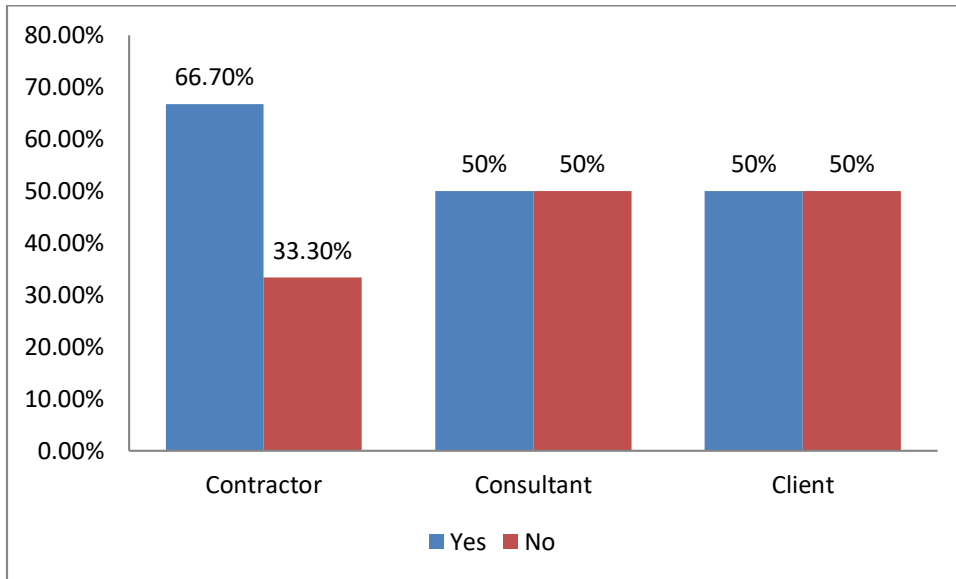
The Ethiopian Ministry of Labor and Social Affairs (2006) Article 92 clearly spells out the primary responsibility of employer is to take adequate steps to guarantee that workers are properly instructed and notified concerning the hazards of their respective occupations and the precautions necessary to avoid accident and injury to health. Ensure that directives are given and assign safety officer, establish an occupational safety and health committee, provides workers with the protective equipment, clothing and other materials and instruct them of its use

Furthermore, the governing law of the contractor, FPPA (2011) stated providing safety planning, handling and controlling mechanism is the first prerequisite for the contractor prior to executing

any work. Moreover, the consultant is in charge of checking safety of the working site according to the stated planning and controlling mechanisms.

With the above regard, the respondents of the selected projects were asked if they have information on if there is safety and health planning, handling and controlling mechanism in their site. The results are interpreted in the figure below.

Figure 12: Construction company safety and health planning, handling and controlling

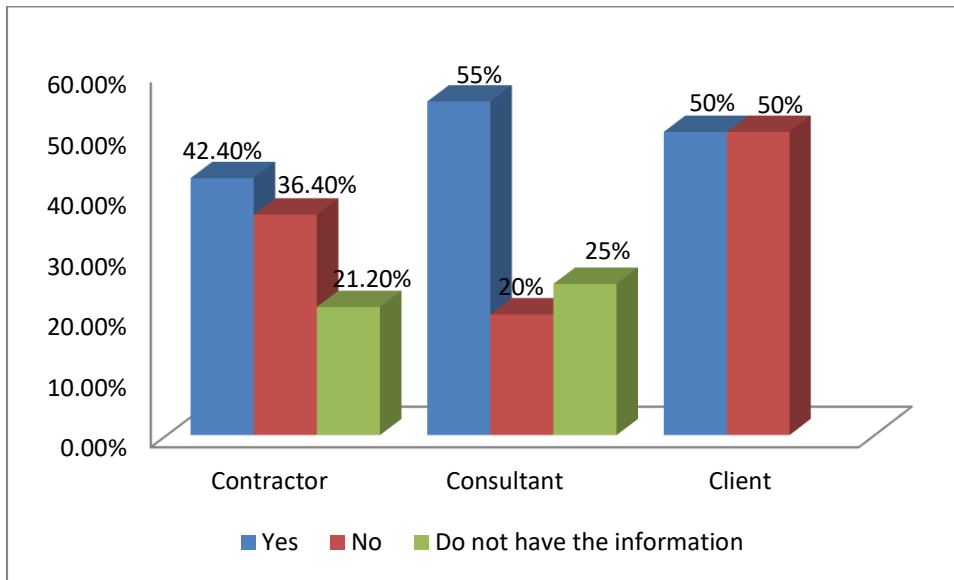


4.3.11. Written Safety and Health Rules and Regulation

As FPPA (2011) decree absolute, the contractor is required to submit a written safety, security and environmental protection programs to the consulting engineer, which is to be implemented in every working situation in order to avoid any accidents in the working site. In addition, Journal of Education and Practice (2016) stipulated employers need to have a written safety policy for their enterprise setting out the safety and health standards, which it is their objective to achieve. The policy should name the senior executive who is responsible for seeing that the standards are achieved, and who has authority to allocate responsibilities to management and supervisors at all levels and to see they carried out. Based on this rule, respondents were asked if the company have written safety and health rules and regulations. Therefore, 42.4% of the contractor, 55% of the consultant and 50% of the client staffs justified the availability of written safety and health

policy. 36.4 % of the contractor, 20% of the consultant and 50% of client officials said there is no written policy and the rest 21.2 % of contractor staffs and 25% of consultant staffs do not have the information on the subject matter.

Figure 13 : Written safety and health rules and regulation

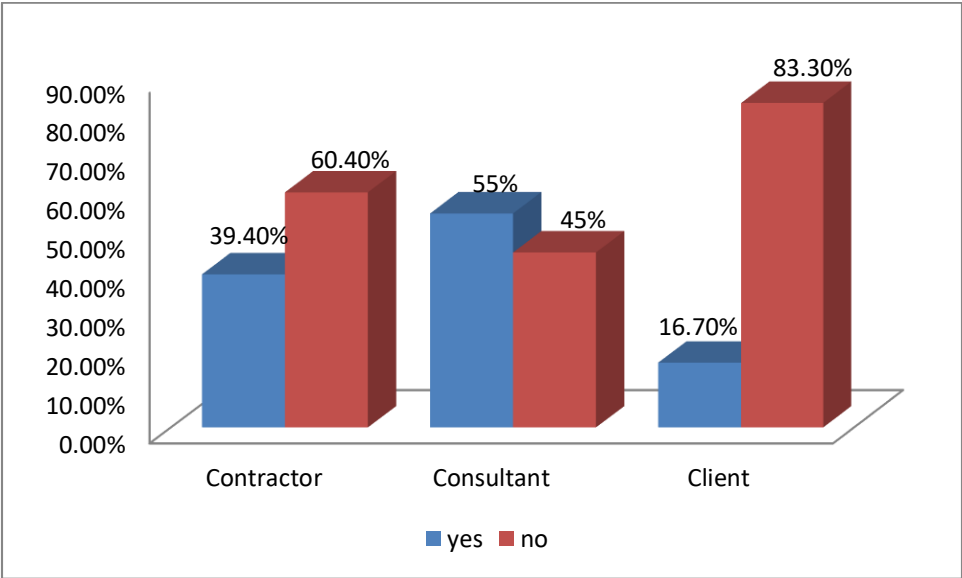


4.3.12 Obligation on the Usage of PPE

As described earlier some construction workers show reluctance on the application of PPE. Therefore, the researcher wanted to reappraise if construction sites have obligations on wearing this protective equipment to make the working site safer. In line with this, employees of the study area were asked if their company oblige to use PPE while working. 39.4% of the contractor staff said yes and the rest 60.6% said there is no any obligation. 55 % of the consultant witnessed there is obligation to wear and 45% said no. 16.7% of the client responded positive and 83.3% said there is no obligation. To summarize these figures, 42.4% of the study population said there is this rule of wearing PPE and the other 57.6 % revealed the reverse.

The chart below further elaborates the above finding based on the total count of study population.

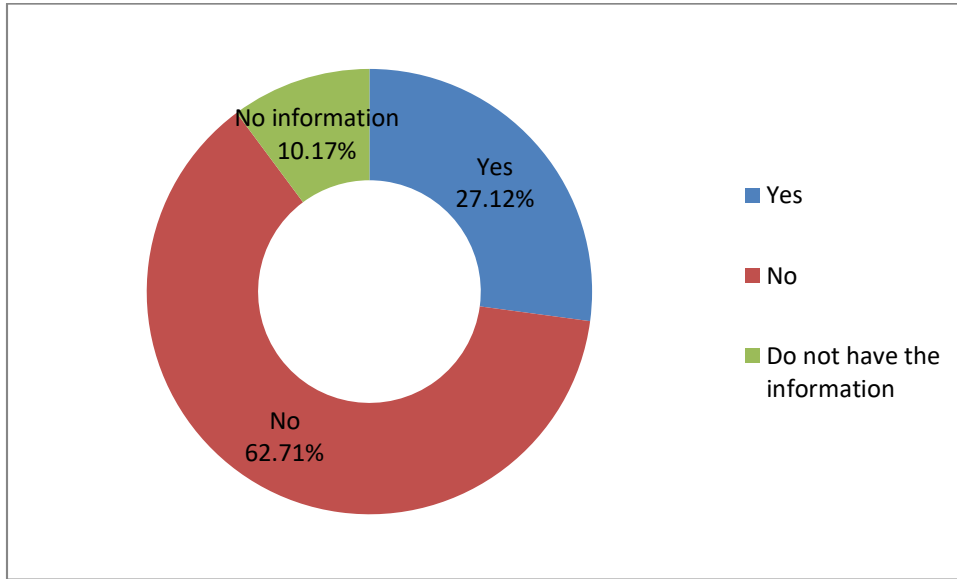
Figure 14: Obligation on the usage of PPE



4.3.13 Providing Written Safety and Health Awareness

Respondents were asked if their construction company provide them a written awareness about safety and health procedure. From total respondents, 62.7% said no, 27.1% said yes and the rest 10.2% said they do not have the information.

Figure 15 : Written safety and health awareness

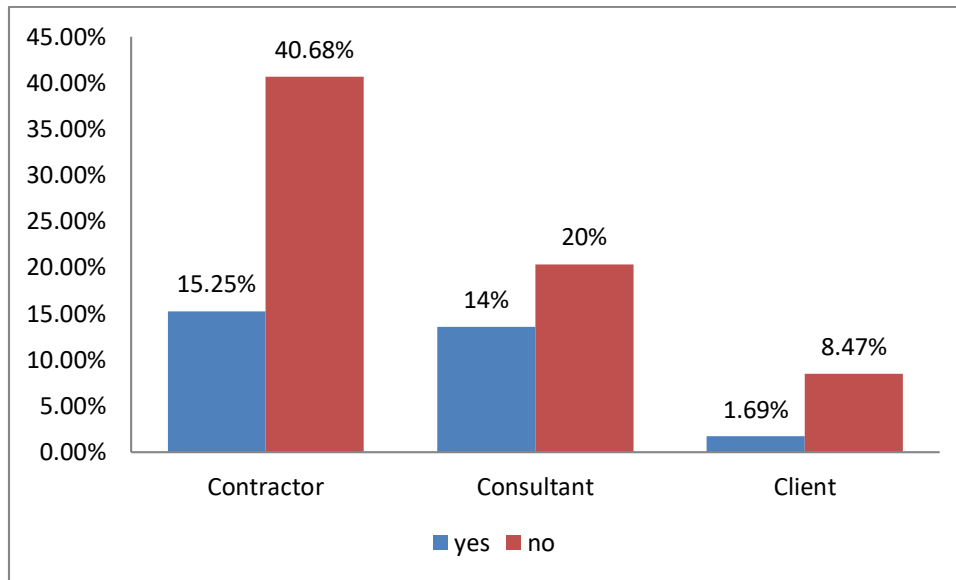


4.3.14 Training on Safety and Availability of Appliance Manuals

OSHA (2015) guidelines generalize workers who know about workplace hazards and the measures in place to control them can work more safely and be more productive. Education and training give an awareness and understanding of workplace hazards as well as how to identify, report, and control them. Education and training involves providing awareness program and train workers on their specific roles and responsibilities in the safety and health program and hazard identification and controls

The chart below shows the percentage of respondents who were asked if their construction company provide any training on safety and manuals on how to use working appliances. Therefore, 40.68% of the contractor staff, 20.34% of the consultant staff and 8.47% of the client staff answered no and 15.25% of the contractor staff, 13.56% of the consultant and 1.69% of the client staffs said yes.

Figure 16: availability of safety training and appliance manual

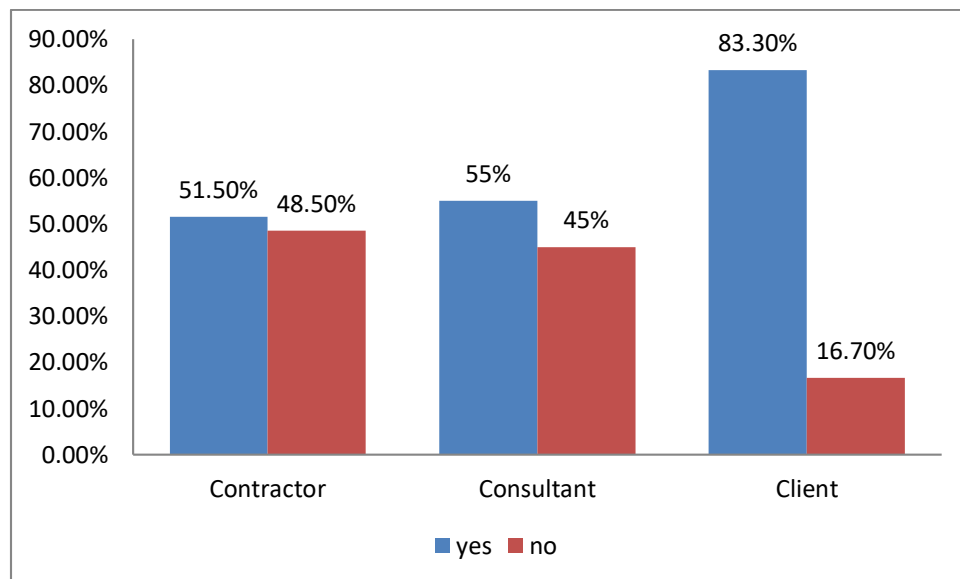


4.3.15 Accident Keeping and Reporting System

Health and safety executive (HSE,2022) stated that information on accidents, incidents and ill health can be used as an aid to risk assessment, helping to develop solution to potential risks and also this record help to prevent injuries, ill health and control costs from accident loss. This statement will definitely work for the contractor and the consultant also. There for it is contractor as well as the consultant duty to carefully keep and report an accident since it is useful aid in planning and carrying out improvements.

Respondents were asked if there is accident record keeping and reporting system at their working site. In fact, 51.5 % of the contractor respondents, 55 % of the consultant and 83.3% of the client respondents assure the existence of the accident keeping and report system. The other 48.5 % of the contractor, 45 % of the consultant and 16.7 % of the client said no.

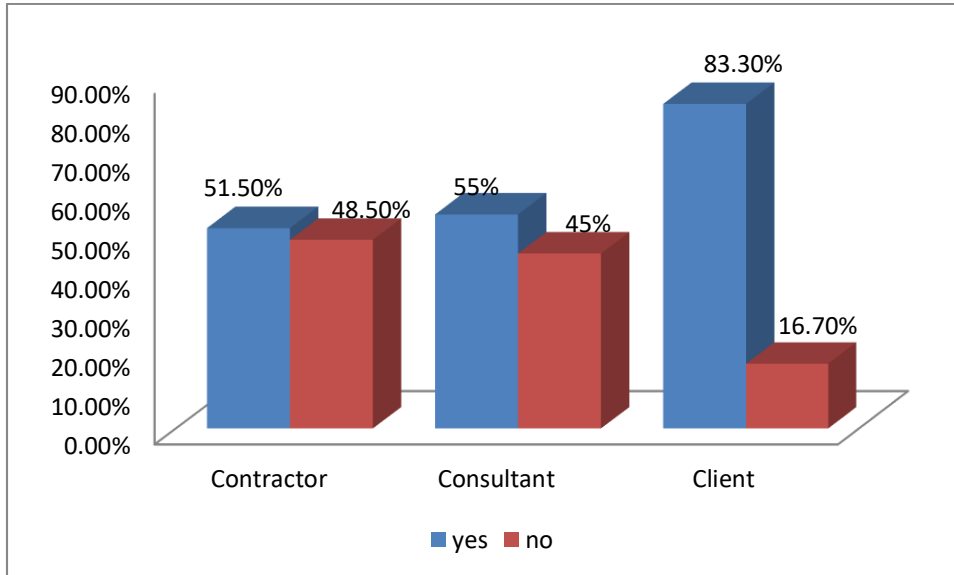
Figure 27: Accident keeping and reporting system.



4.3.16 Supervisor Site Inspection and Frequency

As previously mentioned, in the obligation of the consultant, making the work site safe require regular inspection and provision of the means for taking remedial measures and in addition, supervisors will have to assess the road projects for safety concern and ensure that they adhere to safety rules. While carrying out inspections, since it is impossible to remember everything, checklists are helpful comprising inspection records, workshop premises and obstacle-free passageways, PPE, explosives and other chemicals, individual work areas, work organization processes (ILO,2014). With respect to this fact, respondents were asked if their site supervisor inspect and follow up the safety and health practices on site. Out of all respondents, 51.5% contractor respondents, 60.0 % of consultants and 66.7% of the client said yes and the rest 48.5% of the contractor, 40% of the consultant and 33.3% of the client respondents said no.

Figure 18: supervisor inspection and follow up



For those respondents who said yes for the inspection and follow up, inspection frequency was also asked for further assessment and their responses are displayed on the figure below.

Table 4: inspection frequency

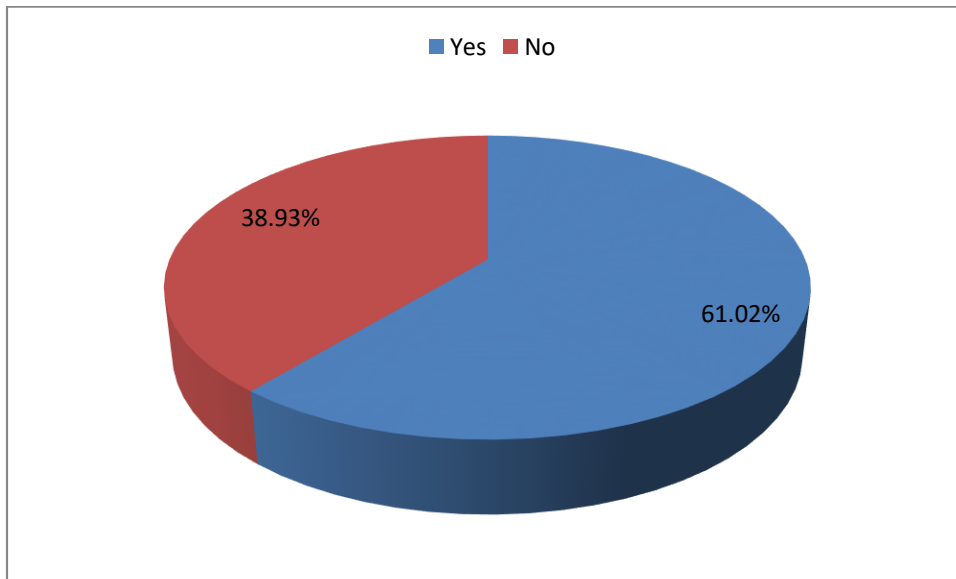
Frequency of inspection	Contractor	Consultant	Client
Everyday	15.20%	15%	16.70%
Every other day	9.10%	15%	16.70%
Once a weak	12.10%	15%	16.7
Rarely	15.20%	15%	
None	48.50%	40%	50

4.3.17 Flagman

Canadian Center for Occupational Health and Safety (CCOHS,2017) defined Flagman is a control person who stops, slow and safely direct the traffic flow through work on road construction sites, protect workers in the construction zone by regulating traffic flow and keep the flow of traffic moving with the possible few delays. As this study were conducted on the

capital city where there is high traffic flow and higher number of pedestrians, the study population of these construction site was asked if there is a flagman that can facilitate the traffic. Therefore, 61.02% of them said yes and the rest 38.98% said no.

Figure 19: Availability of Flagman



4.4 Causes of Construction Accidents

The construction projects are being experienced troubles by many risks, uncertainties, complexities due to frequently happened accidents in construction project. The causes of accidents in construction industry are related to unique nature of the industry, human behavior, improper site conditions, unsafe work method, equipment and procedures, which affected from poor safety management (Charehzehi & Ahankoob, 2012). Several in-depth researches have been conducted in order to identify the causes of accidents in many developing countries and to identify the case of this study areas, several causes of construction accidents were listed and respondents were asked to rank on their level of agreement. Thus, more than 50% of the respondents express their agreement on most frequent causes as lack of PPE (55.9%) as first, lack of technical guide (54.2%) as second cause and reluctance to input resources for safety (52.5%) as third most frequent cause and workers physical fatigue (49.2%) as fourth. As it can

be generalized from these figures, most construction accidents are preventable with improved human behavior and organizational commitment. The overall figure for each cause is listed below on the table and the level of agreement of the respondents ranges from ‘strongly agree’ to ‘strongly disagree’.

SA - strongly Agree N- Neutral SD- Strongly Disagree
 A- Agree D- Disagree

Table 5: causes of construction accidents

Causes of accident	SA (%)	A (%)	N (%)	D (%)	SD (%)
Unskilled labor	30.5	44.1	18.6	6.8	
Lack of PPE	28.8	55.9	13.6	1.7	
Lack of technical guide or trainings	28.8	54.2	6.8	10.2	
Ineffectiveness of safety and health safety policy	32.2	33.9	16.9	16.9	
Lack of management commitment on safety and health practices	39	40.7	10.2	8.5	1.7
Lack of adequate inspection by the supervisor	22	49	13.6	11.9	3.4
Insufficient safety Budgets	35.6	45.8	11.9	6.8	
Reluctance to input resources for safety	25.4	52.5	16.9	5.1	
Excessive working hours	13.6	28.8	40.7	16.9	
Poor performance of machineries	11.9	35.6	37.3	15.3	
No signals or safety barriers on excavated or on construction roads	20.3	45.8	20.3	13.6	
Work over lap	16.9	35.6	37.3	10.2	
Job dissatisfaction	8.5	37.3	44.1	10.2	
Workers physical fatigue	18.6	49.2	28.8	3.4	

Source: Kavaya K, (2019)

4.5. Ways of Improving Safety Performance

This section of the questioner was formulated to assess the ways to improve safety performance. Hence, the respondents were asked the reason that results in poor safety performance, the possible measure that are frequently undertaken to improve safety performance and the major factor contributing for best safety performance in road construction.

In line with measures that are frequently undertaken to improve safety performance on road construction, 57.6% of the contractor staffs answered risk assessment is the first measure, 65% of the consultants said the possible measure is giving an adequate training and follow the safety policy and 66.7% clients revealed risk assessment and adequate training. Furthermore, for the factor that results in poor safety performance, 87.9 % of the contractor, 95% of the consultant and 100 % of the client rely on lack of trainings and awareness about safety. In addition, the opinion of respondents towards to major factor contributing for best performance and 84.5 % of the contractor, 85% of the consultant and 100% of the client believed proper and adequate safety equipment as a major factor for best performance. The overall result about safety performance is tabulated below.

Table 6 ways to improve safety performance

Description	Charactersitics	Contractor	Consultant	Client
Measure that are frequently undertaken to improve safety performance on road construction	Risk assessment	57.60%	50%	66.70%
	Give adequate training	45.5%	65%	66.70%
	Follow the safety policy	39.40%	65%	33.30%
	Safety signs	54.50%	45%	50%
The reason that result in poor safety performance	Reckless behavior of top management	48.50%	30%	33.30%
	Unwillingness of workers to wear PPE	30.30%	20%	33.30%
	Lack of trainings and awareness about safety	87.90%	95%	100%
	Improper inspection by the supervisor	42.40%	15%	50%
	Lack of safety culture	66.70%	70%	16.70%
Major factor contributing for best safety performance	Good communication medium between the management and the workers	57.60%	50%	66.70%
	Personal behavior	63.60%	55%	66.70%
	Accident reporting and records	30%	40%	66.70%
	Surveying workers safety perception and give expert advice	51.50%	30%	66.70%
	proper and adequate use of safety equipment	84.50%	85%	100%

5. SUMMARY, CONCLUSION AND RECOMMENDATION

In this chapter summary of the overall findings and based on the findings, conclusions and recommendations are presented.

5.1. Summary

The study was undertaken in Addis Ababa city road construction projects, which worth over one-billion-birr operating cost indicating that potential contractors perform these projects. The study analyzed the safety and health practice of the aforementioned project and identified that most workers have positive attitude about working site safety. However, majority of them do not have the access to safety training opportunities or written safety and health awareness materials as well as no manual for working tools or appliances. In addition, it is revealed that there is no adequate safety equipment on site. In fact, it is assured about the availability of safety and health planning, handling and controlling mechanism by 59.3 % of the participants. 42.4 % of the contractor, 55% of the consultant and 50 % of the client witnessed there is written safety and health rules and regulations and to the opposite 21.2% of the contractor, 25 % of the consultant respondents do not have any information about the issue. The contractor gave the system for recording and reporting accidents a 51.5 % rating, the consultant gave it 50 % and clients gave it an 83.3% rating. The study also identified that there is inadequate supervision inspection and follow up on safety and health practice on site.

The study further idealizes the five leading factors for the causes of accidents are identified to be lack of PPE, lack of technical guide, reluctance to input resources for safety, workers physical fatigue and lack of adequate inspection by supervisor. According to their ratings, these leading factors for the causal of accidents are 55.9%, 54.2 %, 52.5%, 49.2% and 40% respectively.

In addition, the most influential factor for best safety performance is proper and adequate safety equipment, personal behavior, competent top management, good communication medium between the management and workers.

5.2. Conclusion

This study has described the current practice of safety and health management in Addis Ababa city east region master plan road construction projects. It was structured based on the aim to assess the level of concern of construction stakeholders about employee's safety and health practices in these study areas, what are the causes of accidents that most workers face on working and what should be done to improve the safety performance.

The existing safety practice is still far and needs serious attention to ensure workers to get back home safely after finishing the day work. This study confirmed that employees are working in unsafe conditions with insufficient safety gear and training on how to prevent accidents for themselves and their workplace, no manual for operating appliances, long working hours that left employees physically exhausted, lack of top management commitment to budget resources on safety and inadequate site safety inspection by supervisor.

Accordingly, it can be confirmed that the health and safety issues on construction sites are directly related to top managers of both the contractor and consultant supervisor. It is indeed the obligation of the contractor to provide safety policy and consultant duty to assure all the works commenced with respect to this policy. Nevertheless, nearly half of the respondents confirm the existence of the written safety policy but also the other half witnesses the unavailability and also few of them do not even know about these policies

Five principal accident causal factors were also extracted from 14 variables using SPSS. These are; lack of PPE, lack of technical guide, reluctance to input resources for safety, workers physical fatigue and lack of adequate inspection by supervisor and this study was limited to identifying these factors in AACRA ongoing master plan road projects owing project cost over 1 billion birr.

Finally, it was also concluded that, to save people's lives and to perform best in safety, to increase productivity and reduce costs, priorities should be given in providing adequate safety equipment, improved personal behavior, committed top management, good communication between management and workers and surveying worker's safety perception and give expert advice and trainings are the key factors.

5.3 Recommendations

Based on the findings of this study, the following recommendations are given for the construction parties or stakeholders of Addis Ababa City Road Construction Road projects to create zero injury-working zones.

- ❖ Mostly safety is considered as luxury or a second need. Even if the contractor has provided PPE at the beginning of the project, this supply will not be provided until the end of the project. Additionally, some workers are not willing to wear the PPE. Therefore, the contractor/ consultant should hire an official safety engineer that could follow up the whole safety process.
- ❖ In addition to identifying risk prone areas and ensuring that the rules and standards are applied properly, risk assessment should be formulated and used to create written safety and health regulations and standards that can serve as governing laws.
- ❖ Formal training programs should be organized based on the skill level of the employees and address their concerns for a safe and healthy work environment. Instructions on how to operate functioning appliances, handle materials and store should also be provided.
- ❖ As safety program is crucial, in order for it to be efficient and effective, senior management is a key factor. Managers should be required to support and encourage employees to participate in safety and health programs and trainings. They should also set an example by using PPE effectively and abiding by the law
- ❖ Signals, signboards, safety barriers and flagman should have to be located in places of excavated pits or where so ever needed.
- ❖ It could be a good move if the government can make a panel discussion and experience sharing stages for the construction stake holders.

5.4. Agenda for Future Research

- Several researches are mainly conducted on building sector. In addition, in-depth researches covering wider range of road construction areas can also be conducted.
- Research can be conducted on the costs of fatal and non-fatal construction occupational injuries
- Research can also be conducted on the safety performance of Ethiopian road construction sector.

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St. Mary's University
MA Thesis Questionnaire

A Survey on Assessment of Safety and Health 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 MA Degree in Project Management at St. Mary's University. The questionnaire is developed to obtain professional opinion on issues of the Safety and health 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. It intends to assess the safety practice; to create awareness among the different stakeholders of the projects, to identifying areas of safety deficiencies in road construction projects and to recommend possible remedial measures in mitigating them. All data included in this questionnaire will only be used for academic research purpose and will be strictly confidential.

I genuinely thank you for your cooperation in advance.

Regards, Bersabeh Debebe

Tel: 0913-907174

E-mail: bersabehdebebe@gmail.com

Appendix

Part I. General Profile of the Respondent

Direction: - This section is about general background of the respondents, dear respondent; you are kindly requested to circle on your appropriate response

1. Education level 1. PhD. 2. Master Degree 3. Degree 4. Diploma 5. Other

2. Your total work Experience in road construction

1. 1-5 years 2. 6-10 years 3. 11-15 years 4. 16 years and above

3. Which side of the project are you working on?

1. Contractor 2. Consultant 3. Client 4. others

PART II. Safety and Health Practice

Direction: - The concern of this section is all about safety and health practices in your working site as well as throughout your experience. Please put “X” sign on your response

1. How important is creating a safe and healthy working environment for you?

Not important	Somewhat important	Important	Very Important

2. How organized are you to make yourself save from any injuries in your working sites

Never thought of that	Somewhat organized	organized	Very organized

3. How safe is your construction site-working environment?

Not safe at all	Not that much safe	safe	Very safe

4. Have you ever taken any training regarding safety and health practices in road construction projects?

(Yes/No) _____

5. If yes, how many trainings have you taken?

From 1 up to 4 times	5 up to 7 times	More than 7 times
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6. Does the contractor provide adequate safety equipment on site?

(Yes/No) _____

7. If you are provided with PPE, how likely are you applying them?

Very likely	likely	Somewhat likely	unlikely

8. Have you ever faced any injury on working site?

(Yes/No) _____

9. Have you ever experienced near misses to injury on working site?

(Yes/No) _____

10. If your answer is yes for either or both for question no. 8 and 9, please mention the reason below

11. If your answer is No for either or both for question no. 8 and 9, please mention the reason that helped you and your organization to succeed

12. What actions will be taken in case of minor injuries on site?

Will get treated with colleagues traditionally	Will get first aid on site	Will be taken to clinic

13. What actions will be taken in case of major injuries on site?

Will get treated with colleagues traditionally	Will get first aid on site	Will be taken to clinic

14. Have the site ever had fatality record? (For office)

Yes No

15. If your answer is yes, how was it handled?

16. Do you have information that your company has safety and health planning, handling and controlling mechanisms?

(Yes/No) _____

17. Does your company have a written Safety and health rules & regulations, which reflect management concerns for safety and health on construction?

Yes		No		Don't have the information	
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18. Does your Company oblige employees to use safety equipment or PPE while on work?

Yes No

19. Does the construction site provide a written awareness about safety and health procedures?

Yes No Do not have the information

20. Do the workers get any training on safety and manuals on how to use working appliances?

Yes No

21. Is there any accident record keeping and reporting system on your company?

Yes No

22. Does the supervisor inspect and follow up the safety and health practices on site?

Yes No

23. If yes for question no.16, how frequent does the supervisor inspect?

Daily	Every other day	Once a weak	Rarely

24. Is there any flagman that can facilitate the traffic or movement of vehicles on site?

Yes

No

PART III: - Causes of Construction Accidents

Direction: Dear respondents, the question raised under this part is about the causes and effects of construction accidents. How is your level of agreement on the factors mentioned below? Please put (X) sign for your appropriate answer.

Causes of accident	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Unskilled labor					
Lack of PPE					
Lack of technical guide or trainings					
Ineffectiveness of safety and health safety policy					
Lack of management commitment on safety and health practices					
Lack of adequate inspection by the supervisor					
Insufficient safety Budgets					
Reluctance to input resources for safety					
Excessive working hours					
Poor performance of machineries					
No signals or safety barriers on excavated or on construction roads					
Work over lap					
Job dissatisfaction					
Workers physical fatigue					

PART IV: - Ways of improving safety performance

Direction: - this section is related with the ways of improving safety performance to achieve accident free construction working site. Please mark on your best choice. **Multiple answers are possible**

1. What possible measures are frequently undertaken to improve safety performance on road construction?

Risk assessment

Give adequate training

Follow the safety policy

Safety signs

2. What is the reason that results in poor safety performance?

Reckless behavior of top management

Unwillingness of workers to wear PPE

Lack of trainings and awareness about safety

Improper inspection by the supervisor

Lack of safety culture

3. In your opinion, what is the major factor contributing for best safety performance

Good communication medium between the management and the workers

Personal behavior

Accident reporting and records

Surveying worker's safety perception and give expert advice

proper and adequate use of safety equipment