Occupational Safety and Health Management System Development for Construction Industry

(Case of Construction Companies in Addis Ababa)

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This is to certify that the thesis prepared by Assegid Gebremariam, entitled; "Occupational Safety and Health Management System Development for Construction Companies" and submitted in partial fulfillment of the requirement for the degree of master of sciences (Industrial Engineering) compile with the regulation of the university and meets the accepted standards with respect to originality and quality.

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I hereby declare that the work which is being presented in this thesis entitled "Occupational Safety and Health Management System Development for Construction Industries" is original work of my own and has not been presented for a degree of any other university and all the resources of references used for the thesis have been duly acknowledged.

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Abstract

In the 21st century, promoting safety and health in workplaces is one of the major aspects of human being receiving a considerable attention of researchers, scholars, government and NGOs, and organizations. Accidents in workplaces of all industrial sectors cause injuries and illnesses on employees and damage of companies' property and asset. This in turn, insists the industries to put much effort in order to solve these problems through continual improvement of their workplaces safety and workers' health. The main aim of this study is to investigate the work place safety and health problems and analyzing the negative impacts of occupational accidents, diseases and related injuries on productivity of workers and profitability of company in order to develop a system occupational safety and health management for construction industries in Addis Ababa. The construction industry is considered as back bone of growth and development of a nation, but it is also one of the hazardous sectors due to various complicated construction activities and dangerous materials involved in the project. The study used both qualitative and quantitative approaches and obtained the relevant data through questionnaire survey, formal interview and construction site observation from large sized (grade I & II) and medium sized (grade III & IV) construction companies. According to the findings of the analysis of questionnaire revealed that occupational accidents and incidents in construction site are causing various negative impacts and consequences on contractor and workers those range from light work related injuries potential disability, temporary and permanent disability and even death. The main accidents identified are abrasion, burn, cut, puncture, and eye injury, fracture and wound. The leading causes to these accidents are factors related to the work site situations (machine, hand tools ,)and workers' behavior such as workers' fault, mishandling, falling from height, hit by falling objects, (fall, slip and trip), and lifting heavy objects. Legs, finger, shoulder & neck are the body parts affected, while headache, pain in joint, shoulder and neck, back pain and depression are common illnesses in construction companies. Lack of PPE, poor hygienic condition and exposure to sunlight contributed for these diseases. Thousands of days are lost due to these accidents and diseases which entailed huge amount of financial cost to the companies. Occupational safety and health management system is developed to improve safety and health in construction industry.

Keywords: Occupational safety and health, accidents, OSHMS, productivity, policy, cost

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List of Acronyms

APSEC:	Asia and Pacific Science and Environment Conference
BC:	Building contractor
BOLSA:	Bureau of labor and social Affairs
CGAA:	City Government of Addis Ababa
COR:	Crude odds ratio
CREATE:	Construction Research Education and Training Enterprises
CSA:	Central statics agency
EACO:	Environmental Abatement Council of Ontario
ERF:	Emergency prevention, preparedness, response and Fire Rescue
ESAW:	European Statistics on Accident at Work
GC:	General contractor
GDP:	Gross domestic product
HIRARC:	Hazard identification risk assessment and risk control
HSPA:	Health and safety professionals' alliance
ILO:	International labor organization
MIOSHA:	Michigan occupational safety and health administration
MOLSA:	Ministry of labor social affair
MOUDC:	Ministry of urban development and construction
OSHA:	Occupational safety and health association
OSH:	Occupational safety and health
OSHMS:	Occupational safety and health management system
PPE:	Personal protective equipment
PLC:	Private limited company
SPSS:	Software package for social science
WHO:	World health Organization

Chapter One

1. Introduction and Back Ground of the Study

1.1. Introduction

Construction industry is one of the vital economic sectors and mainly considered as the backbone of development of all nations. Construction site is a very important place, where a considerable number of workers with various professional back ground (Vitharana, 2015) are involved in construction activities. Occupational accidents with the resulting injuries and ill-health problems in workplaces insisted organizations to put much effort and develop effective strategy on occupational health and safety and sustain best practices (Ramazan, 2016). As people spend more than one-third of each day at work (Roberto, 2006), it has been an important field of interest for industries especially in developing countries to improve occupational health and safety (OHS) and productivity of employee (Ramazan, 2016). The construction sector is characterized by countless incidences of injury, absenteeism, death and huge compensation and replacement costs resulted from accidents the hazardous conditions in construction sites (Mulinge, 2014). Occupational injuries pose a major public health and development problem which could be prevented implementing appropriate occupational safety and health practices. Out of the total 3 billion workers in the world over 85% of them work and live in condition with no access to proper and effective occupational safety and health services and facilities (Rantanen, 2012)**.**

For the last two decades the number of occupational accidents and related injuries is increasing in most of the developing nations (Kadiri, 2014) such as sub-Saharan countries and Ethiopia from year to year (MOLSA, 2016). Even though all countries are in a better position to tackle their particular problems because there are model actions of progress being made both by Governments and individual companies in many countries around the world and ILO is playing a leading role in encouraging them to improve their health and safety record by developing national systems and programs (Karen, 2009). It is estimated that 317 million accidents occur on the job annually due to poor health and safety conditions at work 6,300 people die every day and more than 2.3 million deaths per year occur (ILO, 2014). In stark terms, this is equivalent to that of killing the entire population of a small country. According to the report of (Karen, 2009)the

vast majority of these deaths are avoidable and preventable; which is also exceedingly unacceptable morally, politically, socially and economically.

Most of these accidents significantly resulted in loss of human lives, damage of company's property; reduce organizational productivity and economic burden on the victimized workers, their families, community and the nation at large (Frankiln, 2013). Globally, 4 percent of annual Gross Domestic Product (GDP) or $1.25 trillion US cost incurred due to work-related ill health and accidents resulted from poor health and safety practices, unsafe and unhealthy workplaces (ILO, 2013)Indirect cost is empirically believed to be about two to three times more than direct cost associated with unsafe and unhealthy work practices which could in turn raise the global percentage of GDP lost. Some 160 million workers suffer from work-related diseases and about two-thirds of those are away from work for at least four working days or quite longer in some cases. Occupational injuries are the fourth main cause of fatalities next to work-related cancers, circulatory diseases and certain communicable diseases, related to occupational. Findings of globally conducted report by the World Health Organization (WHO, 2013) indicate that overall occupational accident and disease rates are slowly declining in most industrialized countries but are level or increasing in developing and industrializing countries (Alli, 2014). In sub-Saharan Africa, the fatality rate per 100,000 workers is 21 and each year 54,000 workers die and 42 million work related accidents take place that cause at least three days' absence from work (Benjamin, 2011)**.** However, the construction industry has been identified as one of the most hazardous industries in many parts of the country. Besides the annual magazines of ministry and bureau of labor and social affairs, few recent studies conducted regarding workplace safety and accidents in construction industries presented that the prevalence of work related injury in construction industry is 265 per 1100 exposed workers per year (Thewodros, 2016)

In Ethiopia, during the last few years several accidents have occurred on various sites of construction projects all over the country where some of them were cause for fatal injuries. Due to this, construction sector became one of three most hazardous and dangerous industries with frequent and high rate occurrence of accidents which entails both fatal and non-fatal injuries and ill-health problems to workers, practitioners as well as great loss of economy to the company and country at large (Hanna, 2017). Although many prevention efforts and intervention programs have been undertaken throughout the world, it is recognized that construction workers continue

suffering from low to extremely high risk fatal and nonfatal injuries. Only 19% of global work-related deaths are thought to account due to accidents and the remainder being due to ill-health problems and diseases (Karen, 2009). An estimate of studies conducted by ILO indicated that more than 100,000 construction workers die every year at world level i.e. death of around one worker every five minutes (ILO, 2010). In most countries the construction industry continues to account for a disturbingly high proportion of both fatal and non-fatal accidents and injuries of workers (Thewodros, 2016).

Construction industries particularly, the construction site poses many hazards that can cause injury to workers, from transport in the workplace, exposure to excessive noise and harmful substances, dangerous large work equipment and plant, risk of slips from a wet working environment, manual handling and working with unsafe machinery, risks of fire and explosions (ILO, 2006). Most of the accidents in workplaces happened due to combination of various complex hazard factors. The leading causes of work related hazards in construction Industries include physical hazards, biological hazards, mechanical hazards and chemical hazards. These hazards are mostly prevalent in project sites of construction industries (Abera, 2016).

In general, the work place environment plays a significant role in our health and wellbeing in addition to its importance in providing great opportunity of social and economic advantages.

1.2. Statement of the problem

Despite the existence of various policies, regulations, rules and standards of work place safety and health promotion systems, in construction sites tend to persist the industry with lack of/ or few activities in action to mitigate the problems.

Compared with other industries construction industry is unique and complex and it contains a wide range of construction materials and products, building services, manufactures, contractors, sub-contractors, operation, with the harmful chemicals and substances, hazardous equipment and situations make the construction industry as one of the most hazardous industries that causes high rate of accidents (Vitharana, 2015).

The occurrence of accidents, incidents, injuries and fatalities continues with no significant reduction in intensity on construction sites, with consistently high rates worldwide (Thewodros,

2016). Despite existence of various policies, standards, regulations and rules regarding the work place safety and health, in most of the regions and nations in world, the situation tends to persist in the construction industry. Globally, about 330 million work-related accidents and 160 million work-related diseases are estimated to occur annually (ILO, 2010). Among these victims it is estimated that above 2 million workers suffered from fatal ill-health and injuries and resulted in loss of about 1.8-6% in a country (Noora, 2014) and 4-5% annual GDP of world (ILO, 2013; Hanna, 2017), which is around $US 1.25 trillion.

Few studies conducted on occupational safety and health concerns in Ethiopian construction industries indicated the prevalence of work related injury 333 female and 489 male per 1000 exposed workers (Kassu, 2017). The individual behavior, job type and organizational related factors are associated (Frankiln, 2013). According to a report of Ethiopian ministry of labor and social affairs (MOLSA, 2016)from 334 companies total of 4535 work related accidents were reported 100(2.21%) were fatal whereas 4435(97.79%) were non-fatal in 20015/16 fiscal year. Due to these safety and health related problems a cost of 3,787,430.76 ETB is incurred for medical case and loss of 11,466 work days by absent injured employees. According to above report of 2015/16, the construction industry is third hazardous sector (5.16%) victims of non-fatal work related accidents, next to manufacturing; and agriculture, hunting, forestry and fishing. Successive annual reports of (MOLSA, 2016) proved that a construction sector claims more lives due to the fatal accident record in Ethiopia. Injuries related to construction work remain a serious problem worldwide so that construction industries suffer distinctly higher rate of fatal and non-fatal injuries to workers (Karupannan, 2016). For these reasons, this economic sector provided a vast employment for both skilled and unskilled employees, all the efforts of promoting and implementing safety and health in workplaces call different types of management systems, principles and measures.

The following indicative problems were identified and summarized from previously conducted studies: (1) Occupational safety and health in construction industries is not given attention equal to other business matters such as quality service provision and productivity improvement; (2) less consideration is given to OSH issues of workplace safety and health construction industries in developing countries; (3) only 5-10% of workers in developing countries have access to adequate occupational safety and health services; (4) lack of training and awareness creation

programs on OSH issues is contributing for poor safety and health practices in sites of Ethiopian construction industries which made the sector leading one by the numbers fatal incidents; and problems regarding the management commitment to occupational health and safety practice besides the ignorance of workers in using proper personal protective devices.

Generally, few studies were carried out concerning the practice, challenges and promoting safety and health related issue in workplaces of construction industry. Among the existing studies most of them focused on assessing and investigating the existence of the problem in the sector. None of these studies have forwarded a way for effective management of safety and health issues in construction work place.

Therefore, this study intended to fill the gaps identified with respect to the prevalence of occupational accidents, diseases and the related factors causing the problems on employees and develop management system of occupational safety and health for construction industries in Addis Ababa.

1.3. Research Questions

In accomplishing the study, in order to achieve the objective of the study, all the efforts and attempts are put to answer the following basic research questions. These are:

1. What are the critical factors causing occupational accidents and ill-health problems in workplaces of global and Ethiopian construction industries?
2. How do occupational accidents and diseases affect the productivity of construction workers and challenge the implementation of occupational safety and health construction industries in Addis Ababa?
3. What management approaches could be implemented in mitigating challenges to safety and health promotion practices in workplaces of construction industry?

1.4. Objectives of Study

1.4.1. General Objective

The main objective of this study is to investigate the accidents, diseases and their causative factor in order to develop occupational safety and health management system for construction industries found in Addis Ababa.

1.4.2. Specific Objective

It is necessary to accomplish the following specific activities by answering the research questions in attaining the general objective of the study.

1. To identify critical factors frequently causing occupational accidents and ill-health in sites of construction industries in Addis Ababa;
2. To investigate impacts of occupational accidents and diseases to the workers and construction companies in Addis Ababa and;
3. To develop management system to improve occupational safety and health in construction industries in Addis Ababa.

1.5. Scope and Limitations of the study

As occupational safety and health is vast area of concern that includes various people of disciplines and field of study, it could not be feasible and manageable to cover all the concerns related to it in this study. Thus, this study focused on development of occupational health and safety management system for construction industries in Addis Ababa by identifying the work related accidents, injuries and ill-health in addition to their negative impacts on workers and construction companies. Only the construction sites and active workers on those sites are the targeted focus of this study because these construction employees are exposed directly to the unsafe workplaces and a number of hazardous conditions which negatively affect their health and performance more than workers at business office.

Regarding the challenges the researcher faced during the study time, there are three matters to be mentioned as follows. A serious accidental problem that happened to the researcher's family member was the first factor which drawn the attention of the researcher and resulted in being late

in study activities. Specially, the two limitations which held up the data collection process related to the respondents status and financial need. Some of the respondents were not sure, even after giving orientation on the confidentiality issues of their responses with how to respond the questionnaire, about such concern. This has obligated the researcher to put additional effort in clarifying the purpose of the study as well as to assure that no part of their responses and opinions will be exposed to anybody (individuals, organizations, government or media). Secondly, as the period of the study has been late for more than one year beyond the schedule, it called additional budget. But, it was impossible to get additional financial support from anybody. This particularly, affected the data collection process.

1.6. Significance of the Study

The significance of this study could be seen from two major sides. The first one is knowledge addition on the existing knowledge on the practical experience about the work-related accidents and resulting troubles on victim employees, their families, society and the construction sector in Addis Ababa, Ethiopia. Thus, regarding occupational safety and health concerns; its impact on workers wellbeing and productivity of organization, the findings of present research study have revealed occupational safety and health practices as well as its impact on the wellbeing and health of the construction workers and their families and productivity of construction companies in Addis Ababa. Secondly, it provides a bench mark to develop system for managing safety and health in worksites of construction companies. It will be used as a basis for establishing occupational safety and health programs in order to create safe and healthier working conditions which in turn has greater contribution in reducing accidents and hazards to the workers in construction sector. Thus, the study could be taken as stepping stone for the companies, government, policy makers and planners to develop workplace safety and health management systems to reduce occupational accidents and diseases. Similarly the findings of the study would contribute a part of knowledge by filling the gaps in awareness about occupational safety and health with respect to its multi-dimensional impacts on workers and Construction Company.

This material might be used as guideline for conducting research and for implementing similar programs and initiatives in other development sectors of the country. For reviewers, it may provide an opportunity of developing insight for who are searching for relevant data and materials on various issues of occupational safety and health. Even though development and

industrialization in construction have made vast positive contributions to economic, social, wellbeing and health, as well as other aspects of human being, they also have adverse health consequences on workers, their families and society at large. It might be useful stepping stone for further investigation on conditions and factors causing the incidents, accidents, injuries and their negative consequences in construction sites as well as to which in turn will support in modification of the developed system in this study.

1.7. Organization of the Paper

The study organized in to six chapters. The first chapter presents the introduction and back ground of the study were introduction, problem statement, research questions, objectives, the limitation, scope, and the significance of the study are clearly described. The second chapter deals with review of related literature on occupational safety and health concerns. In this chapter, previously conducted studies are reviewed in order to explore basic concepts and main practical activities on occupational safety and health and related concerns both at global and local level. The third chapter presents the research design and methodology of the study while the fourth chapter deals with data analysis and presentation. The fifth chapter presents approaches to be implemented for promoting safety and health through development occupational safety and health management system for Ethiopia construction industries. The sixth and last chapter deals with three issues. Firstly conclusions drawn from the results and findings of construction sites safety and health data analysis are presented and secondly, recommendations were forwarded for the responsible stakeholders to protecting the workers from occupational accidents, injuries. Finally, future research directions are indicated for those interested in conducting further investigations on ways of creating safer construction sites and promotion of safety and health in workplaces and related topics.

Chapter two

2. Literature Review

2.1. Introduction

In this chapter the global and local status or trend of occupational safety and health related issues in work places, particularly, construction work sites are reviewed. The issues of occupational safety and health in both industrially developed and developing countries in respective of implementing and sustaining safety and health management system is reviewed to find gaps in construction site safety and health concerns. The sub sections of the chapter largely dedicated to the basic and conceptual definitions; characteristics construction industries; prevalence of occupational hazards, accidents and diseases with the factors causing them; practices in prevention and controlling as well as the costs of poor safety and healthy in workplace. Finally, principles, programs and management systems developed and which are used as bench mark to develop occupational safety and health management system for construction industries in Addis Ababa in accordance of policies and standards of ILO.

2.2. Basic Concepts and Definitions of Operational Terminologies

For the purpose of easily understanding this study by readers from various disciplines, definitions of some technical and operational terminologies it was attempted to determine as follows.

Occupational: means work-related matters and work concerned activities. ***Occupational Health*** is to be defined as a state of optimal physical, mental and social well-being. The term '***job safety'*** is the interrelationship between people and work, material, equipment and machinery, environmental, and economic considerations such as productivity. ***Occupational safety and health*** (OSH) is the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general construction environment (OSHA, 2015). The European Union defines health and safety, in a wider sense, as going beyond the avoidance of accidents and prevention of disease to include all aspects of the worker's well-being. ***Accident*** is an unplanned event/incident that happen suddenly and unintentionally resulting damage to property or injury and loss of life; short and long term effects

or incidents due to exposure on construction site and consequently interruption to construction process (ESAW, 2007). ***Work-related accident*** refers to an event that directly affects a worker's health during the performance of work activities (Roberto, 2006), but ***ill health*** is to be defined as an identifiable/ or adverse physical or mental condition arising from and/or made worse by a work activity and/or work related situation. ***Hazard*** is source, situation, or act with a potential for harm in terms of human injury or ill health and damage to property (OSHA, 2015). It can be defined as potential for harm which is often associated with a condition or activity that can result in an injury or illness to people and damage to property, when not properly controlled. ***Physical hazards:*** - this related to harm cause to the body from noise, vibration, light and radiation; ***biological hazards***: - this related mainly to illness resulting from bacteria, fungus and viruses; ***psychosocial hazards:*** - this related mainly to stress, violence and bullying; ***ergonomic hazards***: - this related to harm cause to the body repetitive movements and improper setup of work station. ***Risk*** i is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard (a source of potential damage or harm). **R*isk*** is combination of the likelihood of an occurrence of a hazardous event or exposure with specified period or in specified circumstances and the severity of injury or damage to the health of people, property, environment or any combination of these caused by the event or exposure, while ***risk assessment*** is process of estimating and evaluating the risk(s) arising from a hazard(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable ***Occupational injury*** can be defined as damage or loss of any part of body resulting from the occupational accident and ***Occupational disease*** is disorders of health resulting from behavioral factors and environmental conditions in the workplace. Work related injuries can be "**f*atal*"** which lead to the death of the victimized person whether immediately or later, and "***non-fatal*"** injuries those do not result in the death of the person, but cause temporary and permanent disability or loss of victim part of the body**.** ***Industry/***or ***Company*** is a social unit of people systematically structured and managed to meet a need or to pursue collective goals on a continuing basis. ***Workplace*** is a physical location in which construction activities are performed and whenever OSH effect on personnel are involved. ***Employee*** is an individual who is employed to give services to a company/organization on a regular basis in exchange for compensation and who does not provide these services as part of an independent business, whereas is the owner of the company is to be ***employer***. ***Absenteeism*** is the condition in

construction work when a worker(s) will not be at workplace during working time due to health problems and illness related to work. ***Personal Protective Equipment*** (PPE): worker-specialized clothing or equipment worn by employees for protection against health and safety hazards at the workplace. **OSHMS** is part of the company's overall management system used to establish and implement OSH policy and objectives, and to achieve those objectives. **Audit** is a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which the defined criteria are fulfilled (Kawasan, 2004) whereas, **performance** is the accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed in a manner that releases the performer from all liabilities under the contract (OSHA, 2015). ***Policy*** is the set of basic principles and associated guidelines, formulated and enforced by the governing body of an organization, to direct and limit its actions in pursuit of long-term goals. **Corrective action** is an action to eliminate the cause of a detected nonconformity or other undesirable situation. **Continual improvement** is an iterative process of enhancing the OSHMS to achieve improvements in the overall OSH performance (Kawasan, 2004).

2.3. Work place Characteristics of Construction industry

Construction is a vast and an active economic sector, which is also considered as backbone of the world's economy in general (Panassaya, 2015). Particularly in Ethiopia, this sector mobilizes an enormous amount of various resources and budgets that embraces huge manpower of different professions by creating a large job opportunity (Lucy, 2016). Many professionals involve and work together on a construction site: client, project supervisor, coordinator for safety and health matters, and contractors and contractors deliver many construction materials and inputs, often heavy and bulky to the site. The ill-defined conditions of construction site with numerous material-handling, transportation and storing operations which involve various equipment is considered as responsible factor for frequent occupational accidents and occupational diseases (Jean Caude, 2004). Therefore, determining the routes and areas for the passage and movement of plant and equipment; the conditions under which various materials are handled (handling and lifting equipment, working platforms, removal of waste and debris, dangerous materials); and preparing areas for the storage of various materials are vital decisions to be made for multidimensional benefits.

Improved logistics and material handling culture in construction site benefits from different perspectives such as: removing useless activities, reducing number of accident risks particularly caused by manual handling, increasing productivity and creating better brand image of construction sector as a whole (Alli, 2008). Thus, well-established communication habits between the people involved and the interest of new parts for health and safety matters must be questioned.

The construction sector plays a major role in economic development, gross domestic product (GDP) and gross domestic capital formation (GDCF) both in industrialized as well as developing countries by creating job opportunity and producing capital facilities and assets for building other infrastructure (Mulinge, 2014). Construction work is featured by high labor turnover, constantly changing work environment and conditions on site, and different types of work being carried out simultaneously by several contractors (Jain, 2007) and these features would further increase the safety and health risks of workers while performing their jobs in construction sites.

The employment in the industry is mostly temporary in nature and once the job or project is completed, the workers are obliged to find other jobs or return to their place of origin. The construction industry employs large unskilled labor. For example in fiscal year of 2009, over 11 million workers in USA that represents about 8% of the total labor force at that time, were employed in construction industries (Benjamin, 2011).

In Ethiopia, it was reported that in year 2013 the construction sector has created both temporary and permanent job opportunity for about 1.2 million peoples which are 12% of the county's work force at the period of investigation (Lucy, 2016). Throughout the developing world, the majority of employees in the industry are unskilled and women are also involving the construction works due to easy employment opportunity in this industry.

In Ethiopia even though construction industry is currently becoming the major economic sector, it is also found as one of the most hazardous industries in both fatal and non-fatal accidents (Hanna, 2017). Regarding the safety and health matter the country's construction sector is facing various challenges related with manpower in the field, facilities and equipment which is essential for the implementation and sustaining safer and healthy workplace in the construction sites, regardless of job category of the professionals involving (Panassaya, 2015). The most common

factors affecting the safety and health performance of the laborers of construction companies are (Lucy, 2016): safety awareness of top management, a clear company health and safety policy; project cost; project duration; weather condition; reward and punishment system; safety and health training and orientation; employee experience; investment on personal protective equipment (PPE); inadequate enforcement rules and regulations, recording and reporting of safety issues(safety audit) and the age of workers.

Thus, each stakeholder should understood their rights and obligation in order to contribute their part in creating safer, healthier and hazard free construction sites. (Jamie, 2014). Among the factors which are considered as main reasons for poor safety and health practices in construction industry lack of clear health and safety policy in companies took the leading share followed by inadequate enforcement system of the existing building rule and regulations.

Scaffold: Scaffold is a structure constructed for the purpose of working at height and it is one of the main sources of hazards in construction sites. Checklist of hazards regarding scaffold works at site includes competence of persons, access and condition of elements, ties and working platform, guard rail, toe boards, signage and inspection.

Among the issues that require attention while dealing with activities related to scaffold are: (1) intermediate guard rails are still lacking; (2) barrier or warning notices are most of time or insufficient to warn people using the incomplete scaffold received and (3) periodical inspection of the scaffold.

However, elements of scaffold that secured to the building or structure to prevent collapse resulted in a quite satisfactory achievement.

Power Access Equipment: Hazard in association with power access equipment is required to be checked and maintained include competence person, skill of operator, equipment security, guard rail, barrier and power supply. Item such as precaution taken to prevent people from being struck is to be identified to demarcate additional works if required in satisfying original specification.

Ladder: Hazard in association with ladder include item such as ladder condition, position and foundation, suitability and prevention to slipping sideways.

Roof Works: When dealing with roof works, some of safety and health related conditions require precaution to exclude people from area below roof works and other additional precautions to stop debris falling onto them. Roof works require extensive perspective of works to satisfy the safety rules and regulation for the works at construction sites.

Manual Handling: Hazard in association with manual handling was identified as risk of injuries due to manual handling.

Plant and Machinery: Most of the hazards in association with plant and machinery were identified to be more significant at site involve in infrastructure works and industry building. However, overall rank for these groups of hazards are quite satisfactory with overall ranking of which demarcate only additional works required to satisfy the specification. Hazards that need to take note by all community at sites in association to plant and machinery shall be condition of guards for any dangerous part and the precaution on the dangerous part.

Excavation: Excavation is the major hazardous activity in construction sites. Among the items to be dealt with during excavation slope, access, guard, barrier, signage and spoil are the basic ones. Additional attention may be given for the following hazards in association with excavation at sites: 1. Unavailability and insufficient stop-block or signage to prevent tipping vehicle falling, 2. Inadequate guard rail to prevent people falling, and 3. Edge of excavation being occupied by construction material and equipment etc.

Fire and emergency: was detected as one of the most common hazards in all construction sites. In the earlier part, we had defined this hazard to be one of the common hazards that had great exposure to the workers at construction sites. Among the items survey are storage for flammable substances, suitability and availability for extinguisher, ignition sources, exit, alarm, awareness and emergency procedure (Christer, 2006). Emergency procedures of evacuating during fire alarm have to be clearly demarcated for ease usage. During the sites visit, it was realized that majority of the project sites do not have such procedure during fire alarm. Awareness of fire and emergency procedures by workers at sites and ignorance to the importance of procedure of fire and emergency by the workers and the upper supervisors are responsible factors for poor safety condition. Although poor perception regarding to working conditions, lack of training, and job stress increased the risk of occupational injuries, injuries related to construction work remain a

serious problem worldwide (Takele, 2007), most studies conducted on occupational health and safety in developed countries revealed that increased focus on educational levels in the organizations have been associated with decreased work-related injuries (Thewodros, 2016).

2.4. Global Status and Trends of Occupational Safety and Health

In developed nations there are good practices and standardized ways of providing timely and reliable information about work related accidents and diseases from which worker force of world is suffering. But in developing countries do not have such standardized ways of recording and keeping work accidents and resulting ill health consequences to help obtain relevant data in order to withstand the (Lucy, 2016). The construction industry has been seen as one of the hazardous industries. This is because the industry has a poor health and safety performance record compared to other industries all over the world (Asaad, 2012). The attention of the national and international media is periodically being attracted by the health and safety issues of the world's workforce (Hanna, 2017; Lucy, 2016). According to the report of ILO, in this twenty first century of rapid change of industrialization and revolution of information technology; the number of accidents and health problems at workplaces are increasing at shocking rate than before (ILO, 2014) especially in developing nations. Annually, throughout the world, an estimated number of 271 million people suffer with work-related injuries and about 2.3 million die as a consequence of these work related diseases and injuries (MOLSA, 2016) and (Lucy, 2016). While industrial disasters, especially those resulting in multiple fatalities, make global headlines; the reality is that many thousands of people die from their work activities every day and numerous fatalities are unreported or ignored. In addition, many millions of workers suffer non-fatal injuries and illnesses and that represents a huge social and economic burden for enterprises, communities and countries, not to mention the appalling human and financial problem for workers and their families (ILO, 2014).

Though labor law in every nation provides that it is the duty of an employer to ensure that every worker employed works under satisfactory, safe and healthy conditions still now, the accident rate in construction projects is higher than average rate in other industries across the world (Lucy, 2016). Occupational Safety and Health (OSH) in developing countries is far behind OSH in developed countries and it is very important to minimize the level of accident in the construction industry. Experts highlighted that to improve a safety performance through

education/training; safety education must be developed in vocational school, college, graduate school, and also in course in professional association (Mulinge, 2014).

Though the development and industrialization have made immense positive contributions to improvement in living standards and needs for health, educational; social and economic growth it had brought adverse health consequences on work places. In developing countries, like Ethiopia, the current rapid economic development has brought changes in characteristics and condition of employment in various economic sectors (Takele, 2011). In Ethiopia even though there are no adequately compiled figures and reports on the intensity of occupational accidents and ill-health, according to the research reports from few data sources, the numbers of accidents occurring in work places is increasing from year to year and total economic losses, social and human crises resulting due to these accidents are enormous (MOLSA, 2016).

According to a study conducted by collaboration of WHO and ILO, in every 15 seconds, a worker dies among 153 workers being exposed to a work-related accident (ILO, 2014). Though the construction industry is understood as a dangerous economic sector, the performance of the industry in occupational health and safety is very poor and standards of work place health, safety and related matter are even worse in developing countries (Shamsuddin, 2015). Workplace accidents and resulting fatalities, injuries and illnesses lead to enormous health and economic burdens from which individual workers; organizations and community are suffering (Jebel, 2012) in various ways. In Ethiopian, even though construction industry is significantly booming and some initiatives are being undertaken by the government to implement OHS rules and regulations, the enforcement procedures and commitment of responsible stakeholders is poor and less yet relative to the demand for promotion of safe workplaces.

The health status of the workforce in every country has an immediate and direct impact on national and world economies. Thus, making working environments safe and healthy is the interest of workers, employers, governments as well as the community at large (WHO, 2008). A recent report of WHO has verified that it seems simple and obvious, this idea has not yet gained meaningful universal recognition. Hundreds of millions of people throughout the world are employed today in conditions that breed ill health and/or are unsafe (ILO, 2014). The following alarming findings are obtained from the surveys under above report:

(1) Each year, work-related injuries and health illness kill an estimated of 1.1 million people worldwide, which roughly equals the global annual number of deaths from malaria.

(2) 250 million occupational accidents result in more than 300 000 fatalities annually. Many of these accidents lead to partial or complete incapacity to work and generate income.

(3) Annually, an estimated 160 million new cases of work-related diseases occur worldwide, including respiratory and cardiovascular diseases, cancer, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses.

(4) An increasing number of workers in industrial countries complain about psychological stress and overwork. These psychological factors have been found to be strongly associated with insomnia, depression and fatigue, and burn-out syndromes, as well as with elevated risks of cardiovascular diseases.

(5) Only 5-10% of workers in developing countries and 20-50% of workers in industrial countries (with a few exceptions) are estimated to have access to adequate occupational health services. In the USA, for example, 40% of the workforces of 130 million employees do not have such access (Roberto, 2006).

(6) Even in advanced economies, a large proportion of work sites are not regularly inspected for occupational health and safety. For instance, the report by ILO (Benjamin, 2008), the following rates of figures of recorded data per 100, 000 workers exposure were obtained in one year of investigation.

Table 2-1 Occupational accidents and fatal rates in different regions of the world

SN	Country/Region	Accident rate	Fatal rate	Consequences / influence
1	Latin America/Caribbean	22.6millions	30,000/year	Partial/complete loss of parts of body, at least 3days absent from work, inability to perform tasks and generate income etc.
2	Sub Saharan Africa	42millions	54,000/year	
3	China	8,028	10.4/year	
4	India	8,700	10.4/year	

In order to change these negative out comes and impacts of poor occupational accidents and ill-health/ diseases promoting occupational safety and health programs in each organization should be recognized as key responsibility of the management and actions have to be implemented with full commitment of stake holders. Thus, for organizations to prevent their production or service

delivery process from accidents and risks; and make workplaces safer for their employees, it is vital to develop occupational safety and health management system (OSHMS) and implements simultaneously with other business aspects such as quality improvement, profit enhancement, increasing customer satisfaction (OSHA, 2015).

The practices of occupational safety and health promotion in various industrial sectors of the developed and developing countries differ in knowledge level, technological and economic advancement, and the commitment of stakeholder and cooperative involvement of the government. This indicated that the development and implementation of procedures to keep workplaces safer and worker healthier needs active involvement of all.

2.5. Occupational Accidents and Related Injuries in Construction Industry

Most developing countries that still employ the major part of the workforce in agriculture, construction and other types of primary production sectors face occupational health problems that are different from those experienced in the industrial countries (Ramazan, 2016). In these nations, non-human factors such as infectious diseases, poor hygiene and sanitations, poor nutrition, general poverty and illiteracy are contributing a lot for the problem and against the actions of mitigating the challenge (Benjamin, 2008). Accident is the main issue to be considered in any industrial sector (Ramazan, 2016) and construction is a high-risk industry that covers a wide range of activities involving (Panassaya, 2015). The construction industry, employing the largest workforce and has accounted for about 11% of all occupational injuries and the fatality rate in this sector is almost higher than the national average among industries worldwide. Accidents that occur during various phases of the construction processes (even before the construction works begin during the phase of survey and investigation and after completion of project) result in injuries and diseases on the employees and other personals involving in the sector. International Labor Organization estimates that at least 60,000 fatalities occur at construction sites which account 20% of deaths resulting from occupational accidents around the world every year (Lucy, 2016). This means that one fatal accident occurs every ten minutes in the sector. Most of these accidents are created due to unsafe behavior of the employees and participants and unsafe conditions in the construction workplace (Hanna, 2017).

Though construction sites are subjected to many different safety regulations, but accidents can happen. In general, construction accidents can be mainly by three key factors: ergonomic design, environment and supporting policy. Accidents in construction industry are caused by various contributing factors related to the activities being carried out and peoples and equipment involved. Since the construction environment is an uncontrollable factor it is important to focus on either ergonomic design or supporting policy in order to reduce these accidents or cope with environmental factors (Panassaya, 2015). Whether you are a construction worker or manager on site, or a project owner, always ensure that you adhere to the highest possible safety standards for the safety of yourself and others (Wright, 2013). Below are some of the most commonly occurring construction site accidents.

Falls: Falls are one of the largest causes of construction site. Fall incidence has been true for several years and till continues to be one of the leading cause for fatal accidents. Issues regarding fall protection are also one of the over cited construction site safety violations in many research studies.

Electrocution accidents: Electrocution and shocks are also a common cause of accidents at construction sites. Since construction sites often have unfinished and exposed wiring the danger of coming in contact with one is greatly heightened. Electrical accidents can be as treatable as a small burn, but they can also be fatal. As with falls, an extremely important part of lowering the risk of electrocution is prevention. Training workers in electrical safety and in how to make sure wires are safe will help prevent many avoidable accidents and injuries (Frankiln, 2013).

Vehicular Accidents: Another disturbingly common cause of construction site accidents is workers being injured or killed by vehicle. Even many accidents are caused by non-personnel, construction sites pose their own vehicular hazards (Lucy, 2016) due to the equipment often required. Construction workers working near or on a roadway are at an increased risk for these types of accidents. Anyone driving through a construction site should remember that keeping his/her eyes and mind on the road can save a life.

Overexertion is another condition in construction sites which could lead to heat stroke. While the risk of overexertion increases in months with high heat, it can happen during any season. Overexertion in colder months frostbite and other conditions related to exposure to the elements

so that pre-hire physical assessments have to be always considered (HSPA, 2012) to ensure that workers are prepared for the physical strains that would likely be placed on them. Safety training and workplace assessments can also prepare workers for activities that could cause them injuries due to overexertion. A little attention from top management for safety training significantly raises awareness on the type of accidents resulted due to overexertion (Panassaya, 2015) and will help in prevention process.

Therefore, accidents occurring in most of construction sites have different causing agents mainly related the project site situation, construction tool and equipment, workers psychological status, availability of basic personal protection devices and the habit of using them. Through careful investigation of hazards and assessment of risks, and applying administrative and engineering or providing personal protection equipment, these accidents and their impacts can be minimized.

2.6. Impacts of Poor Safety and Health Practice in workplace

The human, social and economic costs of occupational accidents, injuries and related diseases and major industrial disasters have long been cause for concern at all levels from the individual workplace to the national and international (James, 2007). The health status of the workforce in every country has an immediate and direct impact on national and world economies (Christer, 2006). According to the report, despite a slow continuous improvement, occupational accidents and diseases are still too frequent and their cost in terms of human suffering and economic burden continues to be significant. Injuries related to construction work remain a serious problem worldwide (Thewodros, 2016). The International Labor Office (ILO, 2014) estimates that every year there are some 125 million work related accidents, 220000 of them fatal. European Statistics on Accidents at Work (Thewodros, 2016), every year in 15 member states of European Union (EU) out of 5million victims of accidents at work place leading to more than three days' absence from work, 5000 workers were killed in accidents at work place. According to the report of ILO it is estimated about 2.2 million fatalities occur due to occupational ill-health consequences across the world every year (Lucy, 2016).

Report of (ILO, 2010) indicated that 160 million new cases of occupational diseases are caused annually by exposure and dangerous conditions at the work place; 30-40% of them can be

expected to lead to chronic diseases and about 10% are likely to result in permanent disability (Thewodros, 2016).

It has been estimated that two-thirds of the workers of the world still work in conditions that do not meet the minimum standards of ILO and most workplace exposures also affect family members because most of the time is spent in the combined home and work environment. The work-related accidents or diseases impose direct and indirect costs on individual workers employers/or organizations, community as well as on country at large (OSHA, 2015). Physical pain and suffering of the injury or illness, the loss of income, loss of a job, health-care costs, payment for unworked time, medical and compensation payments, repair or replacement of damaged machinery and equipment, increased training expenses and administration costs. Total economic losses due to occupational illnesses and injuries are enormous. As an example, according to findings of two studies the cost of occupational injuries and deaths in the United States is staggering, estimated at $250 billion to $370 billion a year (Takele, 2011). Not only absence of proper safety management system, but also investing in promotion of occupational safety and health in workplace entailed various types of cost. Particularly, reduction in the quality of service and competence are some of the direct costs where as los of productivity, loss of earnings, lost potential output and the cost of providing social welfare programs for injured or incapacitated workers and the human suffering caused to workers' families. The level of costs incurred by each economic agent varies with the severity of the injury or disease. According to report of 5th conference of APSEC as reported by (Shamsuddin, 2015)construction industry, as the hidden or indirect cost of workplace accident is much more than direct costs, the total cost of accident can run into billions of birr for mega projects. While measures of direct costs are understood and reasonably simple to measure, these costs cover only a fraction of the total cost of work-related injury and disease.

2.7. Hazards and Risks in Workplaces of Construction Industry

Construction workers may be exposed to various hazards at their work sites. Hazards may include physical, chemical and biological agents, and infectious diseases that pose a level of risk to life, health, property or environment. The hazard potential may be dependent on several factors, which may interact together to create a risk (EACO, 2014). Construction work accident may occur as a result of unsafe working condition, unsafe acts, personal failure and lack of

awareness on the side of both the employers and workers. The failure on the part of the management in realizing and applying properly guarded machine, proper illumination and ventilation, non-defective tools usage could be considered as one of the causes to work accidents (MOLSA, 2016). It is because the OSH management system is a neglected area and a function that has not been pursued systematically in the construction industry. While it is recognized that safety is an important issue, many employers do not feel it is vital to the success of companies. For a long time, the construction industry has been labeled as with poor OSH culture and performance. But a mature construction company is able to perform well in safety area with general goals for the continuous improvement in overall aspect of the organization. Understanding the concept of the OSH management system will help us to understand the application of OSH management system in Ethiopia and legislation needed. The rules and legislation are always protecting the worker safety and ensuring healthy workplaces. The type of works involved at sites has a relation to the type of hazards to which the workers are exposed.

Hazardous work places or construction sites pose a multitude of health and safety concerns, one of which could result in serious injury or death (Takele, 2011). There are five general sources/or categories of safety and health hazards in constructions workplace: Physical, Psychological, Biological, Physiological and Ergonomic hazards. These hazards are a function of the nature of the site as well as a consequence of the work being performed, such as chemical exposure, fire and explosion, oxygen deficiency, ionizing radiation, biological hazards, safety hazards, electrical hazards, heat stress, cold exposure, vibration and noise.

The physical hazard contains items generally affect working environments and can be applied to all types of construction sites. Since almost all of the construction activities took place outdoor, risks of work are more with respect to length of time spent outdoors, air temperature, wind velocity, sunshine, rain, dust and slipperiness.

The physical factors of construction sites are mostly non-human factors such as temperature, layout, lighting, noise, tools, weather, electricity and dust. These are basic workplace safety and health factor causing hazards as discussed below.

Workplace Temperature**:** Temperature is another critical environmental factor to be considered in providing safer and comfortable workplace.

Working in hot environments can cause a number of heat stress conditions: heat rash (prickly heat, heat cramps, fainting, heat exhaustion and heat stroke whereas working in cold areas may result in nonfreezing injuries, freezing injuries and hypothermia, which is the most serious. Besides the common signs indicating the stages (mild moderate and severe), experts have outlined the core temperature ranges cause these injuries and illness as a guideline for concerned people. Hands and feet tend to get cold more quickly because: they lose heat more rapidly; since they have a higher surface area-to-volume ratio and they are more likely to be in contact with colder surfaces than other parts of the body.

Wherever it is possible and necessary, workplace temperature and humidity must be capable of being regulated. The following temperature recommendations and maximum values have been set by experts for different kinds of work. However, such standards are not applicable for construction industry due to the nature of outdoor working sites which no suitable to control.

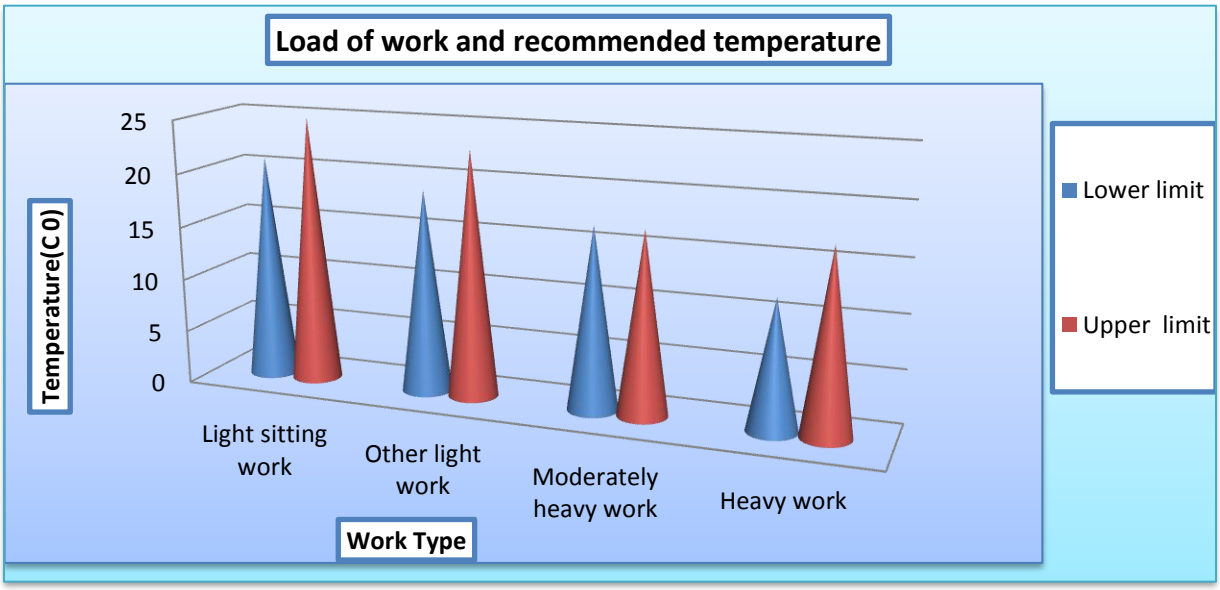


Figure 2.1 Temperature recommendetions for various work types (HSPA, 2012)

Using engineering controls to provide a cooler workplace, practicing safe work to reduce exposure and learning to recognize the signs of heat stress and ways to prevent heat illnesses the risk of heat-related illnesses can be significantly reduced (Alberta, 2005).

Cold or hot objects can cause injuries from extreme cold and burns, respectively. Hot or very cold parts of work tools should be protected, if necessary, so that workers are in no danger of

touching them or coming too near. Workers must have the necessary protective equipment to handle cold or hot objects.

Light/Illumination: Light is one of the critical components of workplace to be considered in creating work place of less/ or minimum accident. It is linked to visibility related accident in workplace (Hinze, 2011). It is necessary to provide comfort working atmosphere for worker in needs of adequate and continuous light. In some occasion, insufficient lighting and blind spots can cause accidents (Kumar, 2012).Sometimes glare reflected from equipment and tool can disrupt visibility in a person field of vision causing run over accidents.

Vibration: It is common characteristics of working equipment, machines and tools at work place environments when there is a shock and in case results in instability of operation (Jaffar, 2011). Working with operating machine or equipment that vibrates at a high frequency could cause workers to become exhausted and stagnant (Sornprom, 2012).

An investigation must be made in order to whether the workplace uses vibrating machines or equipment (e.g. pneumatic and electrically driven hand tools, mobile work machines), whether vibration causes problems and whether the workers display vibration-related symptoms. In addition, the need for further investigations must be assessed.

For example, daily exposure limit value for hand-arm vibration prescribed by law is 5 m/s2 and if this is exceeded, the employer obligated to take steps to lower the vibration and prepare a vibration control program.

Noise/Sound hazards Noise is one of the most common workplace health hazards. Frequent exposure to high level of noises either from the environment or from equipment can cause hearing damage (Panassaya, 2015). In manufacturing and industrial environments, permanent hearing loss is becoming one of major health problem which results in annoyance, stress and interference with speech communication (Kadiri, 2014).

Workplaces where engineering control methods are not possible to apply administrative controls like rotating workers in to tasks or areas and providing worker with shade from sun or moving the work to a shaded location is alternative way to control the exposure to such ill-health. The

exposure to physical hazards is also controlled by using suitable and appropriate personal protective equipment as a last option (Alberta, 2005).

2.8. Occupational Health and Safety Problems in the Construction Industry

Although it is interest of all stakeholders and seems simple and obvious to make working conditions safe and healthy, the idea has not yet gained meaningful universal recognition. For this reason hundreds of millions of people throughout the world are employed in conditions that breed ill health and/or are unsafe. Even in advanced economies, a large proportion of work sites are not regularly inspected for occupational health and safety matters. For example, 28-32% of the workforces of some 130 million employees in USA do not have adequate safety and health service access (Christer, 2006). One of the conditions for the success in the implementation of OSH Act 1994 was the setting up of an OSH management system (Joan, 2010). Developing policies, procedures, safety culture and leadership in safety and improving safety performance are continuing challenges for the construction industry. But the responsibility of promoting OSH in the workplace rested equally on all stakeholders who directly or indirectly involved (Don Dingsdag, 2009). Responsibility and commitment of each stakeholder have connection with the risks created as well as those who have to work with the risk (Sarok, 2012). It is recommended that workers must be assured of their right to a safe and healthy work environment. In his review report, (James, 2007)suggests that there is a need to provide workers with information, education and training so that they would know best how to protect themselves. Safety training for employees is the key to achieving a successful safety program and management must invest in safety (Thewodros, 2016). He also stressed that it is the responsibility of management to ensure that safety must be a culture of the organization. Through the implementation of safe work procedures and usage of personal protective equipment (PPE), workers would be prevented from accidents. Mainly the unsafe working environments with poor design of equipment and work station, lack of specific personal protective equipment and inadequate training of workers for work-related safety and health issues (Hanna, 2017).

2.9. Accidents and Diseases Prevention in Construction Industry

Most of the accidents in construction sites and the factors causing these fatal and non-fatal accidents are preventable if they are properly managed and controlled. The actions taken and solutions provided to promote safer and healthy workplaces are needed to be cost-effective (Jean

Caude, 2004). Although the cost of some of the solutions may be too high for small and medium-sized contractors, successful implementation will lead to quick recovery of the investment in many cases (Gebrekiros, 2006). The guidelines of ILO for preventing occupational accidents and diseases described the following seven step by step actions in order to keep workers safe in workplace. These are hiring smarter, training the staff, demanding safe work practice, providing the right tools and equipment, demonstrating that worker safety is valued, looking for ways to improve safety and finally, remembering that there are a lot of right answers (ILO, 2013).

In the procedure of promoting safe workplaces and ensuring health of employees, companies apply various types of methods and follow some procedures in addition to taking various conditions and factors of the workplaces in consideration (Lucy, 2016). While dealing about the ways of controlling and preventing accidents and related ill-health problems in workplace we should mainly focus on the proactive ways of preventions rather than reactive ways after they occurred (OSHA, 2015). According to the seminar report of (John, 2011) Construction Research Education and Training Enterprises (CREATE) every phases of the construction project involves numerous hazards and risks. Therefore, from the design stage through the finishing stages of the construction the issues of health and safety have to be seriously considered by all stakeholders. Among various systems, procedures and other strategies implemented to mitigate or eliminate theses hazards and risky conditions, designing for construction safety and health (H&S) and ergonomics is one effective strategy. In this strategy the designers have vital contribution during procurement and construction in addition to during designing stage.

2.10. Importance of Occupational Safety and Health in Construction Industry

Since most workers spend at least eight hours a day in their workplace, work plays a central role in people's lives, whether it is a field/or office or manufacturing /or service giving. A study by (Christer, 2006)revealed that about 45% of the world’s population and 58% of the population over 10 years of age belong to the global workforce. This covers 60-70% of the adult male and 30-60% of the adult female population of the world. Making working conditions safe and healthy is in the interest of workers, employers and governments, as well as the public at large (James, 2007).

The most successful economies have checked out that workplaces designed according to good principles of occupational safety, health and ergonomics are also the most sustainable and productive. A healthy economy, high quality of products or service and long-term productivity are difficult to achieve in poor working conditions where workers are exposed to health and safety hazards (ILO, 2014). Therefore, the ultimate aim of promoting occupational safety and health in workplace should be prevention of the hazardous situations and risks on the site before they occurred.

In the 21st century the governments, trade unions, international unions and agreements are giving their attention to formulate strategies and programs of protecting life, property and environment in order to promote healthy and safer work place for workers and the whole society at large. The commitment of employers/contractors to provide safer and healthy environment of construction site is an indicative factor of the value and attention given by the company to its workers, its long-term plan of achieving competence and total productivity improvement (Rwamamara, 2010). Thus, considering workplace safety and health practices and improvement methods is like establishing the infrastructure for the company's economic development and productivity enhancement.

Due to unsafe workplace conditions and work environments various forms of costs might be incurred on the individual employees, their families, enterprise and country. Now days, most companies are getting aware of the importance of creating and maintaining a safer and healthy workplace atmosphere for their employees in order to improve productivity and become competitive. Besides, to adopt a sustainable economic growth and social development it is necessary for any country to have workforce certified of occupational health and safety to improve productivity. Workplace safety and health is one of the main driving economic and social development pillar factor. Number from annual reports of ILO and WHO showed that lots of employees are suffering from workplace injuries caused by occupational accidents, and frequent damages to property and equipment of company resulted in reduction of economic growth to the companies.

2.11. Occupational Safety and Health Management System (OSHMS)

After recognizing the importance of developing a system to manage the safety and health in work place the next step is determining the relevant occupational safety and health management system that comprises the activities designed to facilitate the coordination and collaboration of workers' and employers in the promoting and sustaining safer and healthy workplace environment for all. The concept of management regarding safety is more about the rights, roles and responsibilities in actions in hazards identification and in proper implementation of preventive measures (Alli, 2008). Occupational health and safety management system (OSHMS) is applicable to any organization that wishes to establish safe working conditions (OSHA, 2015). OSHMS have been defined by (ILO, 2014) as "a combination of the planning and reviewing the management, organizational arrangements, the consultative arrangements, and the specific program elements that work together in an integrated way to improve health and safety performance" (Mulinge, 2014), also noted that occupational health and safety management system is the deliberate linking and sequencing of processes to achieve specific objectives and to create a repeatable and identifiable way of managing occupational safety and health (OSH).

Daily Nation in its publication of 2011 reported that lack of information and experience on responsible bodies have limited the intervention process of improving healthy and safe working environment in the construction sites. It is also highlighted that even though many accidents and ill-health problems remain unreported, it is clearly recognized for the existence of alarming situation regarding safety and health (OSHA, 2015). The situation is further complicated in construction projects in Kenya by the extremely diverse range of people with different levels of education, cultural background among the workers as most laborers migrates from rural to urban, cultural differences between employer (contractor) and workers, performing the actual work in the construction sites and have different levels of health and safety awareness and requires different ways of training and communication (Takele, 2011), described that occupational health and safety management enable an organization to control its occupational health and safety risks and improve its performance. Occupational safety and health management system (OSHMS) is an integral part of the overall organization management system. In addition he described that, OSHMS facilitates the management of the OSH risks associated with the construction of the organization. This includes the organization structure, planning activities, responsibilities,

practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organization's OSH policy.

The guidelines of ILO regarding occupational safety and Health management system (OSHMS) (Joan, 2010) encourage the integration of (OSHMS) with other management system and state that OSH should be an integral part of business management. While integration is desirable, flexible arrangements are required depending on the size and type of operation (OSHA, 2007). ILO and WHO emphasizes that OSH should be a line or staff management responsibility at the organization in which their guidelines stress that the OSH management systems in the organization has the following main sections: namely policy, organizational structure, planning and implementation, workers participation, employee training; and monitoring and evaluation. Guide lines of International Labor Organization occupational safety and health management system states that the employer, in consultation with workers and their representatives, should set out in writing an OSH policy (HSPA, 2012).

2.12. Contribution of Occupationnal Safety and Health Management System

The main goal of safety and health management system is to protect the workers, and resources of the employers from workplace injuries, illness, and minimizing the suffering and financial hardship these events can cause (OSHA, 2015). Organizations devote considerable resources in protecting workers safety and ensuring healthy workplaces. For both business and financial reasons, many go beyond the minimum requirements set by occupational health and safety laws. OSH management system provides organizations with the framework to develop a solution to the increasing challenges facing them at the workplace today, from serious injury and illness, lost work days, increasing occupational health and safety regulations, large citations/ penalties, rising worker's compensation costs, costly medical claims, worker retention and employee satisfaction (Takele, 2011).

Since the implementation of safety and health programs in work places has a significant influence on the performance and profitability of firms' developing system for improving safety and health in these industries provides the following direct and indirect benefits for the individuals as well as for the employer.

Direct benefits: such as higher employment opportunities; reduced insurance premiums; reduced litigation costs; reduced sick pay costs; improved production/productivity rates; reduced production and materials damage and lower accident costs/production delays will be yield while an organization implements proper management system of safety and health matters in workplace.

Indirect benefits: reduced absenteeism**;** reduce staff turnover**;** improved corporate image**;** improved chances of winning contracts and more job satisfaction/employee morale.

Thus, companies with effective occupational safety and health management system earn positive returns and benefits on their health and safety investment by savings operational cost through integrated OSH management. Among these; less work-related accidents and ill health and associated costs; improving performance through heightened employee morale and adherence to policies and procedures; increased control of regulator issue;
Reinforcing a responsible and well-managed reputation with customers, stakeholders and communities; the company receives clear demonstration of legal and regulatory compliance to regulatory authorities, customers and employees; better management of health and safety risks increased access to new customers and business partners through an improved company image.

2.13. Challenges of Promoting OSH in Construction Industry

Occupational Safety and Health is necessarily vast field encompassing a large number of disciplines and numerous issues related to accidents, injuries, diseases and hazards in workplaces. Even though, 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 (Mulinge, 2014). 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 (ILO, 2014). Significant costs can be incurred to employers, a burden could be placed on healthcare providers by these occupational injuries and potentially have a detrimental impact on the long-term health and socio-economic status of injured workers and their families (Macdonald, 2012).

The challenge for all stakeholders is therefore to build positive developments and to sustain preventative efforts in a constantly changing world of work. In case of Ethiopia, the country 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, all these construction activities are carried out by unskilled labor forces at cheap rate. 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 (Thewodros, 2016). It is also consolidated in this article and some pocket studies that status of occupational injuries in workplaces of Ethiopia indicated that occupational injury due to an unsafe working environmental conditions is increasing. As highlighted in the findings of a study by (Takele, 2006) on the challenges for occupational health in Ethiopia, fundamental tackles for occupational safety and health promotion measures and actions have shown significant reduction from time to time.

In conclusion, the future work places (specially construction sector) will be suffered from newly emerging hazards and health risks such as: (1) occupational health problems linked to new emerging information technologies and automation; (2)transfer of hazardous technologies from developed nations to developing ones; (3) aging and unskilled working populations;,(4) rarely special problems of vulnerable and underserved groups (e.g. Chronically ill and handicapped) workers, high migrants with poor or no basic needs in addition to being employed temporarily. Also the problems related to growing mobility of worker populations and occurrence of new occupational diseases and less capacity and performance of local contractors and consultants, improvement of quality and productivity, utilization of appropriate construction technologies, and application of proper building regulations and standards have been mentioned as the major challenges of the construction industry in the process of sustaining social and economic development in the country.

From the review of related literature, regarding workplace safety and health practices, challenges and their impacts, the following main problems and research gaps were identified.

Only 5-10% of workers in developing countries and 20-50% of workers in industrial countries (with a few exceptions) are estimated to have access to adequate occupational health services. In the USA, for example, 40% of the workforces of 130 million employees do not have such access (Roberto, 2006). In economically advanced countries large proportion of work sites are not regularly inspected for occupational health risks and safety hazards. For instance, the report by

ILO (Benjamin, 2008), the following rates of figures of recorded data per 100, 000 workers exposure were obtained in one year of investigation. The impact of occupational health and safety hazards on construction workers in developing countries is 10 to 20 times higher than those in industrialized countries (Seble, 2016). Each year, work-related accidents and ill-health problems kill an estimated of 1.1 million people worldwide, which roughly equals the global annual number of deaths from malaria, and about 250 million occupational accidents result in more than 300 000 fatalities annually, while many of these accidents lead to partial or complete disability which in turn make the victims unable to work and generate income.

Around 160 million new cases of work-related diseases (including respiratory and cardiovascular diseases, cancer, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses) are estimated occur worldwide annually, (Asaad, 2012). Number of workers complaining about psychological stress and physical work load is increasing from year to year in developed countries. These psychological factors have been found to be strongly associated with insomnia, depression and fatigue, and burn-out syndromes, as well as with elevated risks of cardiovascular (Gebrekiros, 2006). Besides, occupational hazards causing frequently occurring accidents and injuries to employees and those who involve in construction activities are identified as risky and vulnerable for the contractors. These accidents result numerous negative consequences (such as, machinery and equipment damage, , loss of skilled manpower, destruction of companies equipment and machineries, legal obligation and humanitarian issues related to safety and health of community near by the project site, permanent and temporary loss of body part, disability and death). These all matters directly and indirectly affect the productivity of employees, quality of service, project over cost, construction delay and less profitability and competence.

Summary of basic gaps identified:

Even though adequate guidelines of workplace safety and health management are available in economically advanced nations, there are few studies effectively conducted in most of African countries, like Ethiopia. Specifically, available studies mostly targeted the manufacturing and leather industry sectors.

According to the results of literature review in this study, the construction sector in both industrialized and developing countries are suffering from enormous consequences and impacts of unsafe construction activities and hazardous nature of the project sites. Among the major factors affecting safety and health practices of construction sector are unskilled and untrained work force, less or no commitment of employers and management on safety and health concern of the workers, construction materials (scaffoldings, swings and related construction structures) remnants and debris on the site etc.), poor construction tools, absence of personal protective devices (PPEs). Lack of unique and responsibly established safety and health committee with strong enforcement measures and procedures for promoting safer workplace and keeping the workers healthier, is also contributing for unsafe situations on the sites.

In general, those few studies conducted in Ethiopia on occupational safety and health related issues mainly focused on the investigation of accidents and injuries related to the construction activities and their causes as well as the consequences. None of these studies dealt with development of a system to manage safety and health in the construction industry.

Chapter Three

3. Research Methodology and Design Procedure

3.1. Introduction

In this chapter; the procedures, tools and materials used in this study for collecting, analyzing and methods of presenting the analyzed data for occupational safety and health management system development for construction companies in Addis Ababa are discussed in detail. The chapter includes the sub sections dealing with research design, background of study area, sources of data, population and sample size determination procedures and variables of the study, required to investigate existing occupational safety and health conditions of the construction industry.

3.2. Research Design

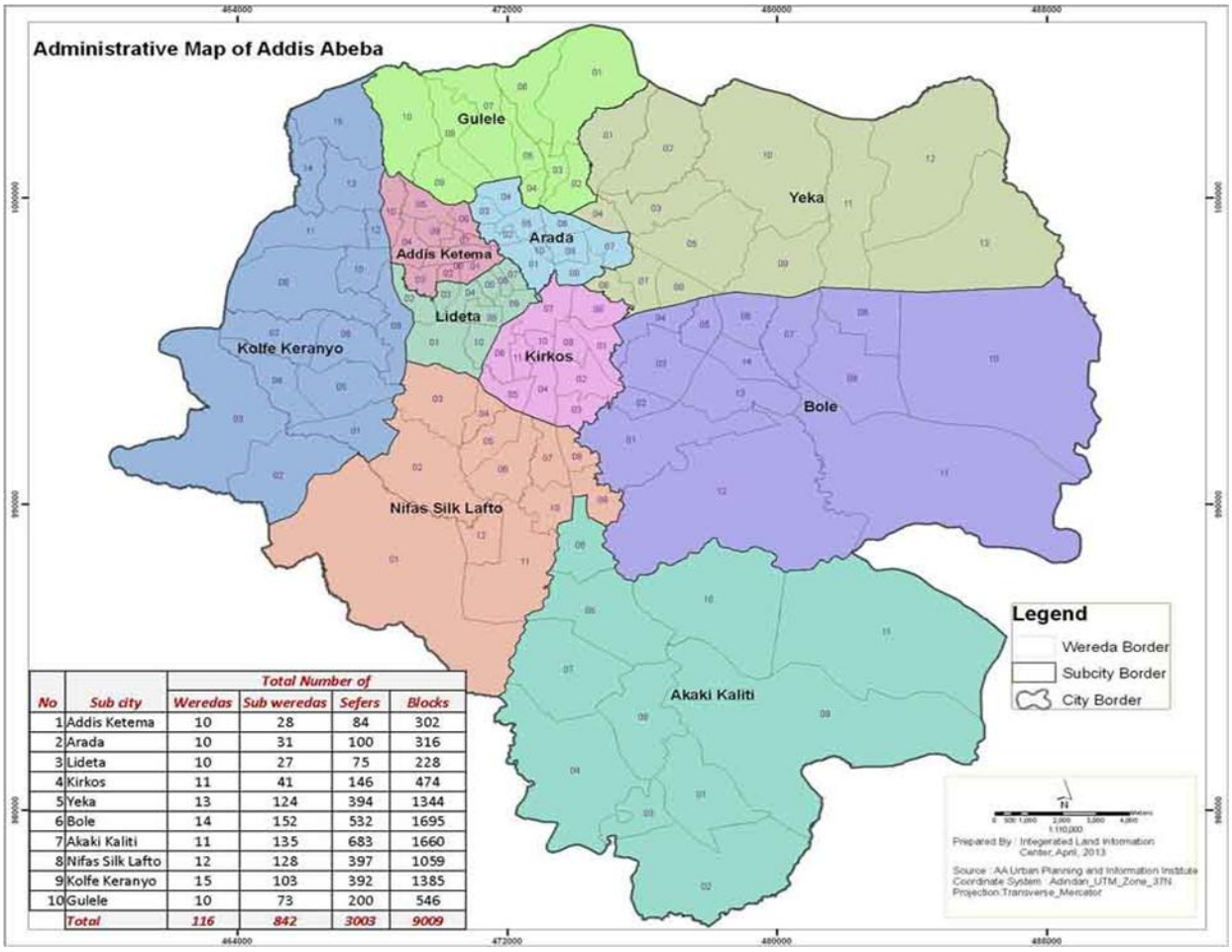
In this study, combination of both quantitative and qualitative methods is implemented data related to the target group in the population of the selected construction companies and workers. For each approach has its limitations and advantages; using both approaches in combination is vital in order to find better result from the analysis and investigation regarding occupational safety and health related issues in construction workplaces. The study was scheduled to be accomplished from December 2016 to June 2017, but due to some mishaps and accidental problems happened to the family of the researcher, it was completed in October, 2018.

The qualitative design approach deals with data which are primarily verbal and derive meaning from the participant's perspective. It is used to collect relevant data through methods such as interview, field observation, company document and manuals review. Qualitative approach whereas the quantitative data were collected by the implementation of questionnaires survey as well as formal and informal interview with the site engineers.

3.3. Study Area

The construction companies found in Addis Ababa are included in this study and Addis Ababa city administration is the study area. Addis Ababa is the capital city of Ethiopia and located at the center of the country. The relative and absolute locations of the city are briefly described as follows.

The construction companies from all the grades (grade I- grade X) and types (general, building and road contractors) are categorized in to three strata called: largest size (Level I and II), medium size (Level III and IV) and (Levels V through X) lowest size. The sample companies were randomly selected from list of all construction companies in Addis Ababa.



No	Sub city	Total Number of			
		Weredas	Sub weredas	Sefers	Blocks
1	Addis Ketema	10	28	84	302
2	Arada	10	31	100	316
3	Lideta	10	27	75	228
4	Kirkos	11	41	146	474
5	Yeka	13	124	394	1344
6	Bole	14	152	532	1695
7	Akaki Kaliti	11	135	683	1660
8	Nifas Silk Lafto	12	128	397	1059
9	Kolfe Keranyo	15	103	392	1385
10	Gulele	10	73	200	546
	Total	*116*	*842*	*3003*	*9009*

Figure 3.1 Map of study area/ Addis Ababa city administration (CGAA,2011)

The list of selected sample construction companies with their category and sample employees taken from each company is to be provided in appendix section (***appendix A***) of this document.

For this study, Addis Ababa is chosen as study area because among 4260 construction companies those renewed their contract license, in 2009 E.C. most of them 3254 (76.37%) are found in Addis Ababa city. Thus, results and findings of the study from these companies could adequately represent those found in other regions of Ethiopia.

3.4. Sources of Data

Both primary and secondary data sources are used for collecting relevant information that are required for reviewing and analyzing in order to draw conclusion and forward recommendation in this study beyond provision of a system for managing occupational safety and health in construction industry.

3.4.1. Secondary Data sources

Secondary data sources are data those provide information gathered from published materials of various types and easier to get. Among these sources, widely used for this study are OSH related global and local articles and literatures are reviewed in order to acquire deeper understanding about concepts of occupational safety and health and related concerns. More relevant and supportive data were also obtained through reviewing annual magazines and reports from federal ministry of labor and social affairs (MOLSA) and Addis Ababa city administration bureau of labor and social affairs (BOLSA) on occupational accidents, diseases and related costs; safety guidelines and operational manuals of the selected sample companies, reviewing thesis papers as well as the regulation and proclamations of construction companies on work place safety and health. Recent and up-to-date newspapers, magazines, conference proceedings and newsletters are reviewed in addition to the policies guidelines and annual reports of ILO and WHO regarding occupational safety and health as they are fundamental and vital sources of data in understating the concepts of safety and health in relation to the workplaces.

3.4.2. Primary data sources

Primary data are the data obtained from the original source of information and they are more reliable and with high confidence level of decision making with the trusted analysis having direct intact with the occurrence of the events. The following techniques were some of the mechanism of primary data obtaining approaches.

Construction sites/ or work environment and employees in construction site are taken in to account and preferred as sources of primary data rather than the business center and workers at office.

For thousands of contractors/ or construction companies exist in Ethiopia, it will not be feasible economically, in terms of resource and time; and it is beyond the scope of the study to include all types of construction companies found in country. Work sites of construction companies in Addis Ababa are considered as source of relevant information for this study. Thus the scope of the study is limited to the construction sites of the companies/or contractors in Addis Ababa. Workers and management personnel at construction sites of the selected companies who have worked for a period of year and more time are purposely included in the study.

3.5. Population of the Study

The appropriate and representative sample sizes for construction companies and the respondent employees for questionnaire and the population from which sample was taken are decided and determined based on scientific procedure described under.

3.5.1. Source of population data

All the selected construction industries employees who were involved in Addis Ababa city construction industries were considered as a source of population data and the required sample size was taken from this population. All of the employees those directly involved in the activities of construction at the sites during the study time and who have been working for at least one year in the selected construction industries irrespective of various demographic back grounds were included in the study. The population of the study consists of all the workers of selected construction industries in the range of ages of 18 through 56 years and above and each of the selected sample workers is considered as a unit of computation and analysis.

The sample construction companies selected from above population construction industries in Addis Ababa are considered as the study population. The eight construction companies and the sample employees required for questionnaire and interview are taken from this population.

3.6. Sampling technique and sample size determination

A stratified random sampling technique that is considered as a technique fairly represent all of the construction companies and the workers in these companies is implemented to select the representative sample size for the study. The construction industries with ten grades were stratified into their size and based on division and category of ministry of Ethiopian construction

and housing development agency. The contractors from category of building, general and road contraction were stratified in to three strata as: lowest grade (grade V-X), medium-sized (grade III-IV) and largest (grade I & II) based on their capacity of generating annual capital. Lowest, medium and largest sized contractors were nominated based on capital generating capacity where those generate of less than 5million belongs to lowest sized, 5 million-15million to medium sized , and above 15million are large sized, respectively.

3.6.1. Sample Size Determination Procedure

For construction companies and the employees of these companies to be included in questionnaire survey of this study, the representative sample sizes are required to be determined using some scientific procedures and methods. The following sub sections focused on the determination of sample companies and construction workers.

3.6.2. Sample Size Determination Procedure for Construction Companies

Out of 4260 registered construction companies with renewed contract license for budget year 2016/17, 76.37% (3254 contractors) of them are found in Addis Ababa, capital of Ethiopia. Among these construction companies the majority 2573 (83.4%) are lowest sized, whereas only 487 (12.5%) and 157(4.1%) are medium size and large –sized, respectively. To select proportional sample size of contractors, using multi stage sampling technique they are grouped in to three strata of lower sized (grade V-X), medium sized (grade III-IV) and larger size (grade I-II) contractors. Only eight contractors with renewed contract license for 2016/17 or (2009 E.C.) budget year are purposely selected as case/ sample companies for this study.

There are fundamental reasons for considering only eight companies of grades (I-IV). Firstly, the contractors in grade range of (VIII-X) are operating with extremely few numbers of workers per project site in comparison with the other large sized one and their capital generating capacity is considered to be critically low. This in turn significantly affects the companies not to consider investing in workplace safety and health with the provision of necessary skilled manpower, resource and adequate budget to apply regulatory measures provided in labor law proclamation through implementation of safety and health management system.

Secondly, contractors in range of (grade V-VII) are mostly operating as sub-contractor under those large size/ high level (grade I-IV) where they involve in specific parts of the project with workers of particular job category assigned for the sub-contractor. Thus, sub-contractors working under the Sample Company are accounted as one section of the main contractor.

Thirdly, in addition to above issues the constraint related to time and financial to include adequate construction companies, the size of companies and the type of projects carried out are taken in to consideration. The industries are as mentioned above and the collected data are computed based on expected risk rate work related accidents, injury, ill health that impose negative impacts on construction industries and their employees.

From these 8 companies the relevant data are obtained to analysis, draw fundamental conclusions and provide recommendation for respective stakeholders for protecting the workers and the environment. Among these companies contractors based on the number of working force, 75.0% (6 companies) are taken from large size (four grade-I and two grade-II) while the counter parts 25.0 % (2 companies) from medium size (two from grade-III and grade-IV). On the basis of facts mentioned above, the results of analysis from these sample companies is believed to be convenient to represent the occupational health and safety status and practices and related issues in other construction companies in Addis Ababa as well as country level.

3.6.3. Sample Size Determination for Questionnaire

Since the total population of the eight selected contractors is known, the sample size (n) of the employees to participate in questionnaire is obtained using single population proportional formula (Singh, 2014) (for finite population) as follows:

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

Where,

n = sample size of employees of the companies from all strata;

N= total number of population/or employees in 8 sample companies during the survey time; which is total of (N) =2581 construction workers were estimated.

Sampling error (e) of the sample population =0.05 and $Z_{0.05}$=1.96, 95% confidence level

The sample size on which this study would be conducted is calculated based on the above strata as:

$$(n) = \frac{\mathbf{N}}{\mathbf{1+N(e)2}} = \frac{2581}{\mathbf{1}+2581(\mathbf{0.05})\mathbf{2}} = \underline{580}$$ employees (sample workers)

Therefore, for the questionnaire survey 580 construction workers were taken from the eight selected sample construction companies.

The calculated sample size (n= 580) is allocated to two strata taking the size of contractors and number of employees in proportion to the companies' total population of workforce (MoUDC, 2013).

Table 3-1 Case construction companies and sample respondents

SN	Size	Levels included	No of companies	Employees No for survey
1	Largest	Grades (I and II)	6 companies	390
2	Medium	Grades (III and IV)	2 companies	190
Total		Grade(I-IV) contractors	8 companies	580

These 580 employees have equal chance to participate as respondent in this study. As provided in data analysis and presentation section only 512 respondents have correctly responded the questionnaire whose opinion and response are taken in to consideration for analysis and decision making.

3.7. Data collection tools

Structured questionnaire was developed by studying several international journals. First the questionnaire was prepared in English and it was translated into Amharic. The data collected in Amharic was translated into English for analysis purpose. The questionnaire focuses on socio demographic, behavioral factors of the respondents and work site environmental factors that can determine occupational accidents and diseases within the construction site workplace. The questionnaire was distributed for daily workers, site engineers, Foremen, carpenters, plasters and other workers directly involving in occupational safety and health concerns. Primary data was also collected through formally structured interview. The interview was conducted with people

who are considered to be particularly knowledgeable about the topic of interest in the sites of the companies.

3.8. Data Collection Procedure

All the necessary and useful information concerning the status of occupational safety and health in workplaces, particularly construction industry are collected to attain the objective of the study. First both quantitative and qualitative data were collected using closed and open ended questions. Then face to face interview was carried out for additional information in order to obtained data through driving the attitude and behavioral opinion of the participants. The Amharic version questionnaire were employed to gather the data concerning the socio demographic status, behavioral status, socio-economic status, rates and frequency of accidents and cause of accidents, occupational diseases, parts of body affected, health safety policy and practice near occupational health and safety among workers of construction companies and period of injuries in the past one year.

3.9. Study Variables

The variable for the analysis and computation of the collected data to be carried out are either independent or dependent. These are briefly described below.

Independent Variable

Based on factors of consideration in dealing with the safety and health issues related to the workers and working environment, the independent variables of the study are categorized in three

Socio demographic factors: including age, sex, condition of employment, educational level and work experience.

Behavioral factors: addictive behaviors (such as chat chewing, alcohol drinking and cigarette smoking), job satisfaction and culture of obeying safety procedures and using personal protective equipment.

Work environment factors: including workplace supervision, job category, health and safety related training, work shift, existence of toilets and lunch room, and availability of proper PPE.

Dependent Variables

In this study, parameters such as occupational accidents, injuries, illness, death, damages to equipment, costs, family and societal disorders and all negative consequences of accidents and injuries on wellbeing and health of employees are considered as dependent variable. In addition work-related musculoskeletal disorders (MSD)/musculoskeletal trauma (MST) are taken as dependent.

3.10. Data Analysis Methods and Tools

In the process of answering the research questions of the study; the following procedures, methods and tools are implemented. First of all in order to investigate the gaps in knowledge and practical experience of system for managing occupational safety and health, regulations and guidelines in both industrial and developing nations were briefly reviewed and compared with respect to the negative impacts of poor OSH practices at individual worker, company, societal and country level.

Detailed analysis on the types of workplace hazards, accidents and their causative factors, injuries, ill health and their costs based on the conditions was conducted and the qualitative data collected from sample companies through questionnaire and interview are analyzed using various soft wares, statistical tools and presented using tables and figures for better and easier understanding.

After the data collection, the raw data is analyzed by classifying and summarizing the response from questionnaires and interview on the basis of various issues and matters of the respondents. The analysis was done using both qualitative and quantitative tools. With the quantitative tools: statistical package for social science (SPSS) of the recent version (SPSS ver. 20. 0) data analysis program, Microsoft excel are used for analysis whereas figures, table, and statistical tools such as graphs, charts, and diagrams were used for presenting the results of analysis and findings from site construction site observation.

Since both qualitative and quantitative data were used in this study; the quantitative survey data were encoded and analyzed with supported of the SPSS package. It is a powerful tool to analyze and to perform comparison of the results of different variables used in the questionnaires and interview. The process of data entering and some extent of analyzing tasks have been exhaustive

and a detail analysis and synthesis are carried out depending on the type of raw data collected from the different sources stated above. The research methodology and design process is shown in (Fig.3.2)

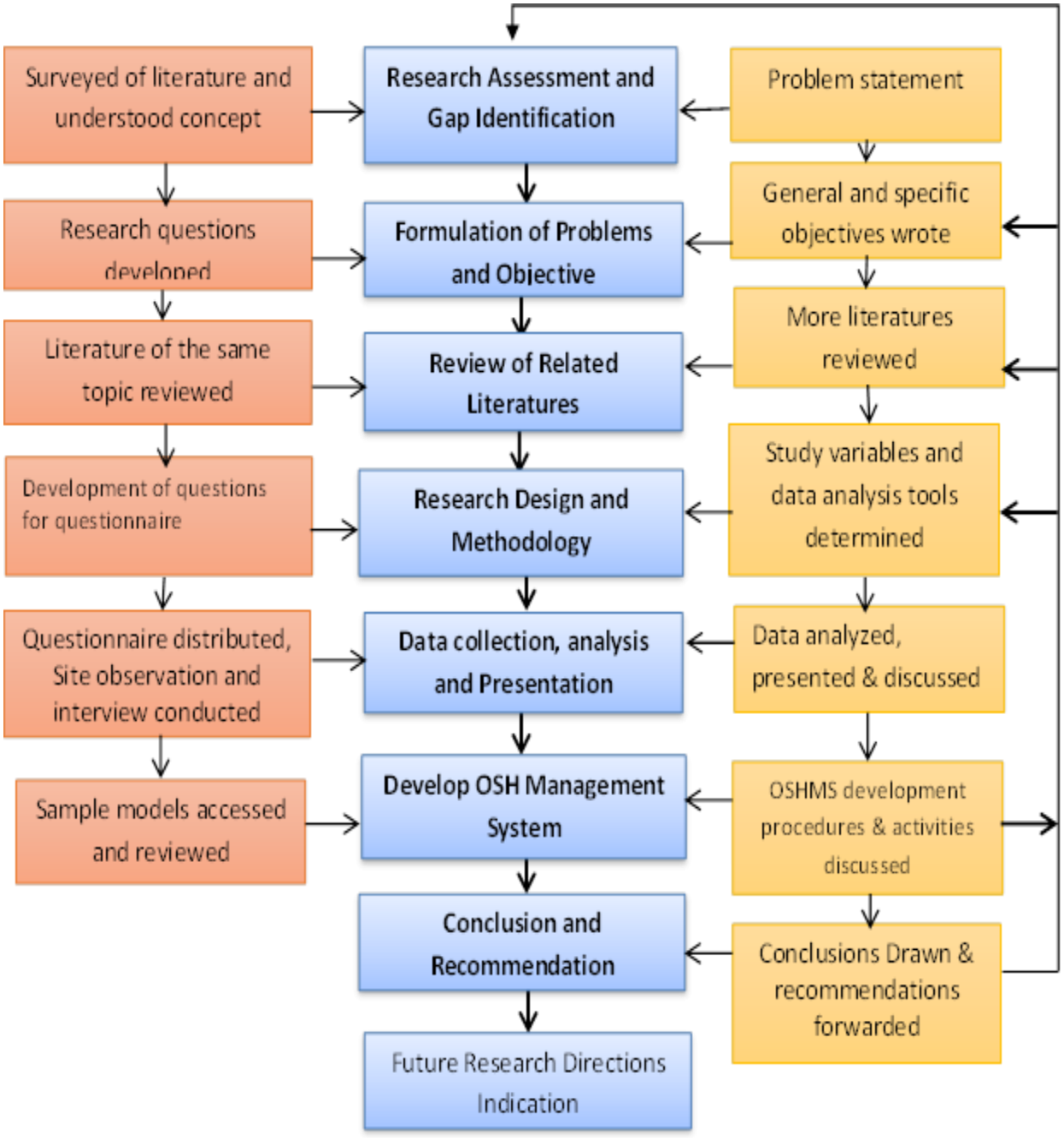


Figure 3.2 Research methodology and Design Process

Chapter Four

4. Data Analysis and presentation

4.1. Introduction

This chapter focuses on the data analysis and presentation ways based on the data collected through interview, observation and questionnaire. Total of 580 employees within eight construction industries were included in this study as respondents for questionnaire. In addition, to implement occupational safety and health management system that incorporate policies and procedures to promoting safer workplace for employees of construction companies in Addis Ababa, the detail analysis of the data obtained from site observation and company records carried out.

4.2. Analysis and Presentation of Data from Questionnaire

4.2.1. Backgrounds and Demography factors of respondents

The main demographic factors of respondents considered in this study are age, gender, work experience, educational level and job category. The provision of hygienic and sanitary facilities on construction sites ; availability of PPEs as well as the employees' culture of using them, relevant trainings related to safety and health matters in workplace, management personals commitment and attention given to safety and health issues in the construction sites are considered and discussed in successive sub section of the chapter. Among 580 employees selected as a sample size for questionnaire survey 389 (67.2%) are from four companies under category of largest sized contractors and 191(32.8%) are from two medium sized companies.

As indicated in Table 4.-1, socio demographic characteristics of respondents are briefly indicated in the table. As indicated in the below there are 303 (59.18%) male and 209(40.8%) are female in those eight construction industries. The employees were asked about their educational level and age range in order to investigate the educational qualifications of the respondents who participated in the study in respective of their impact in dealing the issues of consideration.

Table 4-1 Demographic factors of respondents

Demographic factor			
Gender	Frequency	Percentage	Cumulative percent
Male	303	59.2%	59.2

Female	209	40.8%	100.0
Employment Condition			
Temporary/ contract	344	67.20%	67.20%
Permanent	168	32.80%	100.0%
Educational Status			
Illiterate	20	3.90%	3.9
Elementary (grade 1-8)	164	32.00%	35.9
Secondary (grade 9-12)	230	44.90%	80.9
Certificate and Diploma	58	11.30%	92.2
Bachelor (1st degree) & above	40	7.80%	100.0

As indicated in the Table 4.1 , the educational level of most of the construction workers 230(45.0%) is in secondary school (grade 9-12) which is followed by elementary level, 164 (32.0%), diploma and certificate 58(11.3%). Employees with the educational level of bachelor (First Degree) & above 40(7.8%) and illiterate 20(3.9%) took the minimum share, respectively. The above data show that majority of the employees have attained secondary school whose opinions and view are guided and well informed.

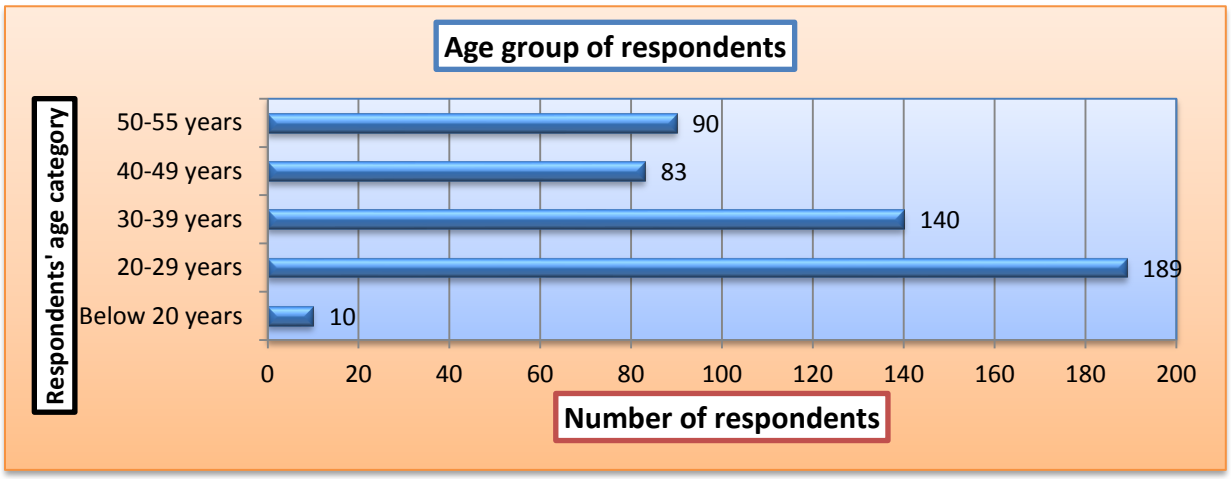


Figure 4.1 Age group of the respondents

Regarding the employment condition of construction workers, out of 512 employees assigned to various job categories workers with temporary/ contract work accounts 344 (67.2%) and only 168(32.8%) are permanently employed to their current company.

On the other hand, with respect to the position/ job category of the construction workers, daily laborers are the dominant ones with rate of 239(46. 8%) followed by carpenters with 121 (23.62%). Machine operators, site Engineers and foreman took the least number.

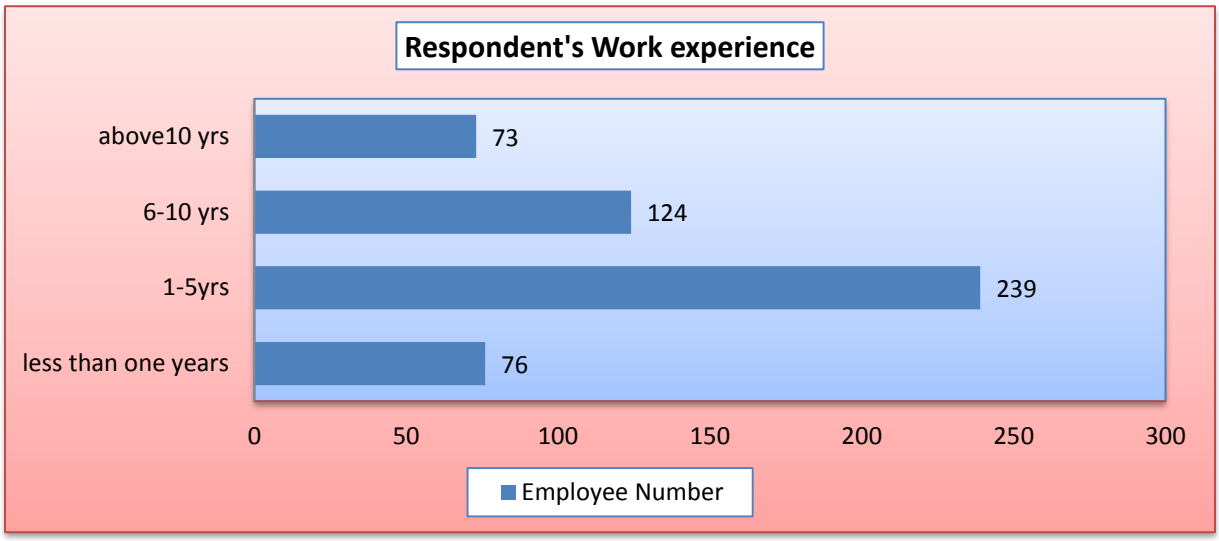


Figure 4.2 Work experience of respondents

Regarding the work experience of the participants of this study, the majority of them 239 (46.70%) have work experience of (1-5 years) followed by 176 (34.40%) with work experience of (less than one year) in sample construction companies. Very few employees 73 (14.30%) in construction companies 73 (14.3%) are with more than ten years of work experience.

Also among 512 construction workers those involved in questionnaire survey the dominant ones are daily laborers which accounts 317 (60.0 %) followed by Masonary workers and plasters (12%) and (7%) respectively. The job categories of all the participant workers in this study are as presented in Fig.4.3.

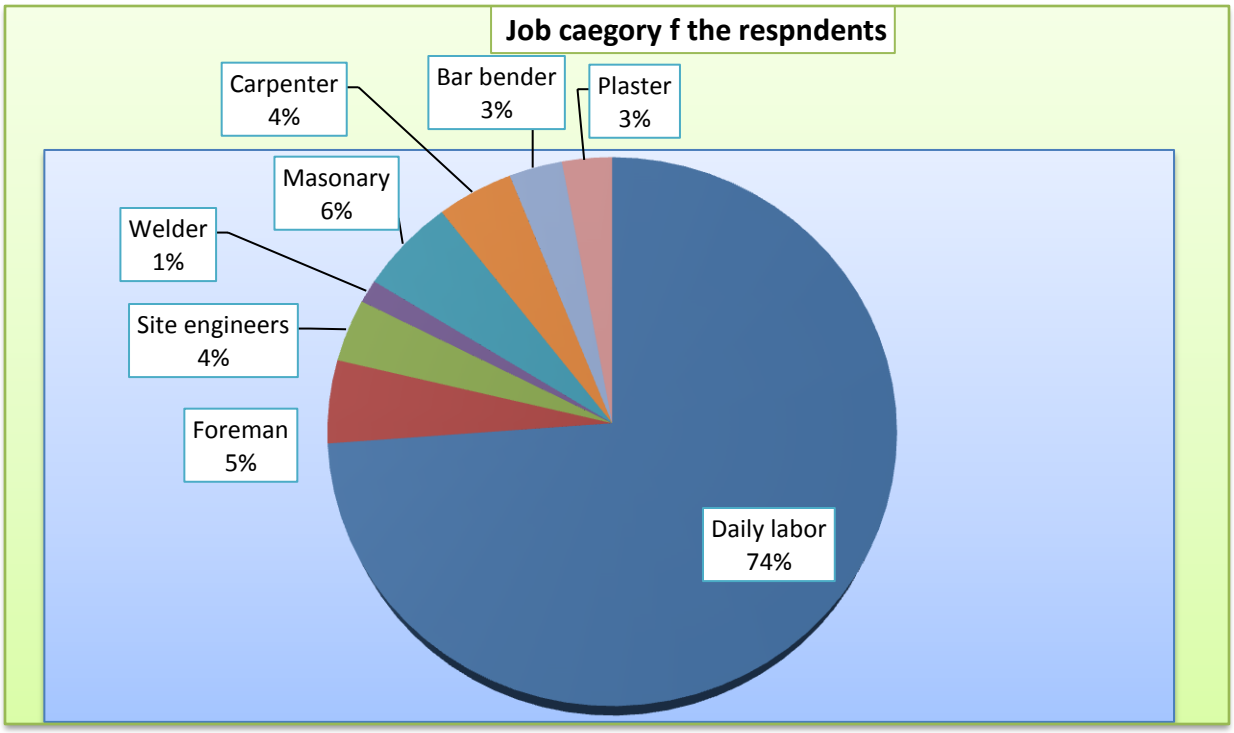


Figure 4.3 Job category of construction workers

4.2.2. Working Place Conditions of Workers in Construction Companies

The time construction workers stay at their work places depends on the type employment (contract, permanent), peoples' job category and various conditions and nature of the construction site. Out of the participants of this study, more than a half 295 (57.6%) of the sample workers stay for 8 and less than 8 hours per day/ or six days per week. As presented in Fig. 4.4, 147 (28.7%) of them spent more than 48 hours/day and / or 6 days per week at their work place. This is mainly due to workers' voluntary to work for overtime with additional time in order to increase their income. On the other hand, 70 (13.7%)) of the respondents explained that their duration in project site depends on various factors nature of the project and construction issues Responses for how much hours do employees of construction companies spend in their work in a day and rest days in a week are provide as follows in Fig. 4.4.

From Fig. 4.4, it can be easily understood that most of the construction workers have only one rest day (Sunday) in a week, since Saturday was working day in construction industry. Therefore, the employees are exposed to accidents as well as other hazardous factors in the work

site due to the longer work hours and less rest time which in turn increase the chance of being physically fatigue, stressed and tired at the end of day.

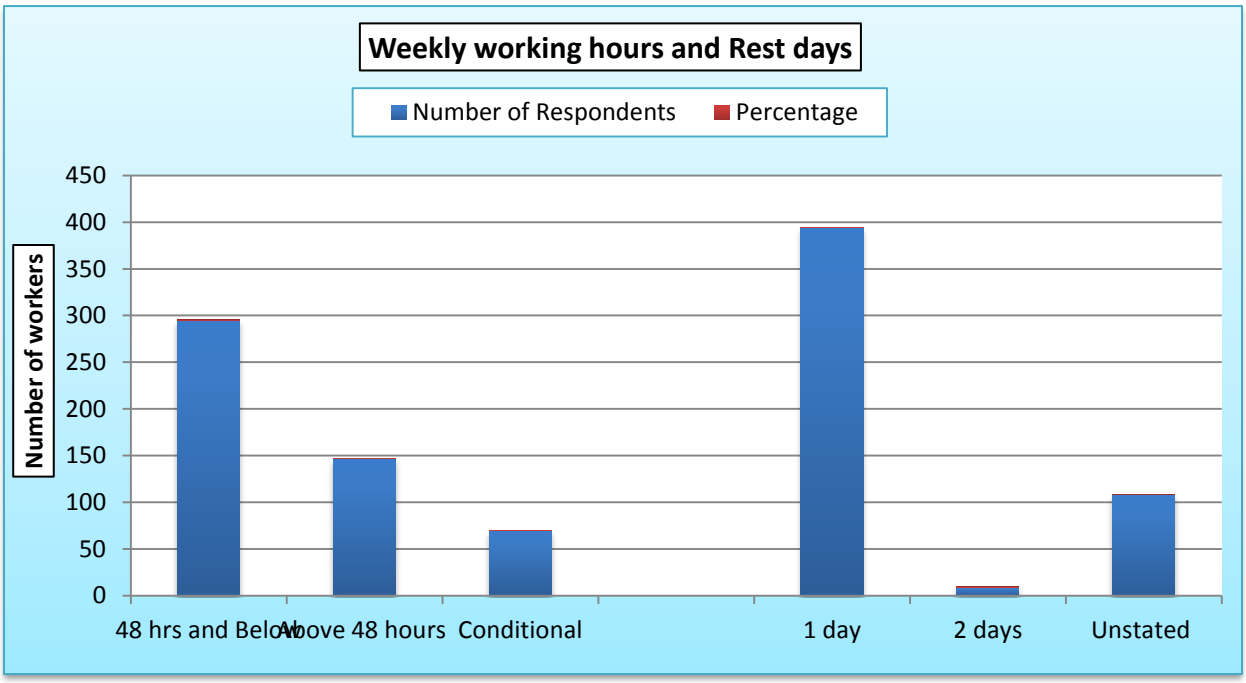


Figure 4.4 Weekly working hours and rest days of construction workers

4.2.3. Safety and health and Conditions in Workplaces of Construction Companies

There are various workplace factors in construction site which are related to the safety and health concerns of the people involved in the project activities besides the construction machines and equipment. The exposure of workers to work-related accidents and illness, provision of safety and health concerned training and the workers' perspective to the importance of the training in project sites of the case construction companies are given in the Fig. 4.5.

Among the construction workers involved in the questionnaire survey, about a half of them 250(48.8. %) do not have adequate knowledge about occupational health and safety in the construction. The workers' response for a question about whether they took any training related to safety and health issues in their work site described that only 63(12.3%) of the workers have taken safety and health training related to their job and about the four-fifth 424(82.9%) of the respondents revealed that they didn't take any safety and health training related to their work, while other 25(4.8%) of the workers are unresponsive.

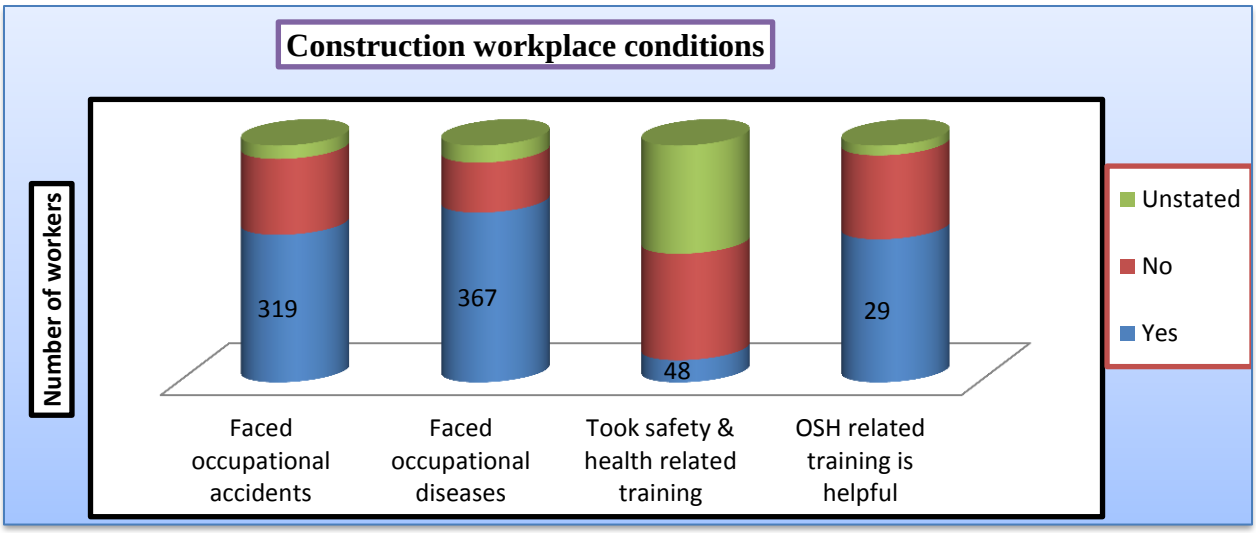


Figure 4.5 Construction workplace safety and health conditions

Regarding the exposure rate of the construction workers of the case companies, 319 (62.3%) and 367(71.7%) have respectively faced accidents and diseases and injuries related to their construction job of resulted from their work. On the other hand, only 164(32.0%) and 108(21.1%) of them did not suffered from occupational accidents and diseases, respectively. On average less than 38 (7.3 %%) never respond for both matters.

Employees from case construction companies are requested to rate the impact of hazardous factors in their work places to their job performance and their wellbeing. Four scales of comfort level are used as mentioned in Fig.4.6. The representative scales are: very comfortable, comfortable, uncomfortable, and cannot mention. While dealing with how comfort is the conditions of construction tools, PPE, material handling systems, supervision, payment (salary) in construction site the following results are obtained from the analysis and provided in Fig.4.6

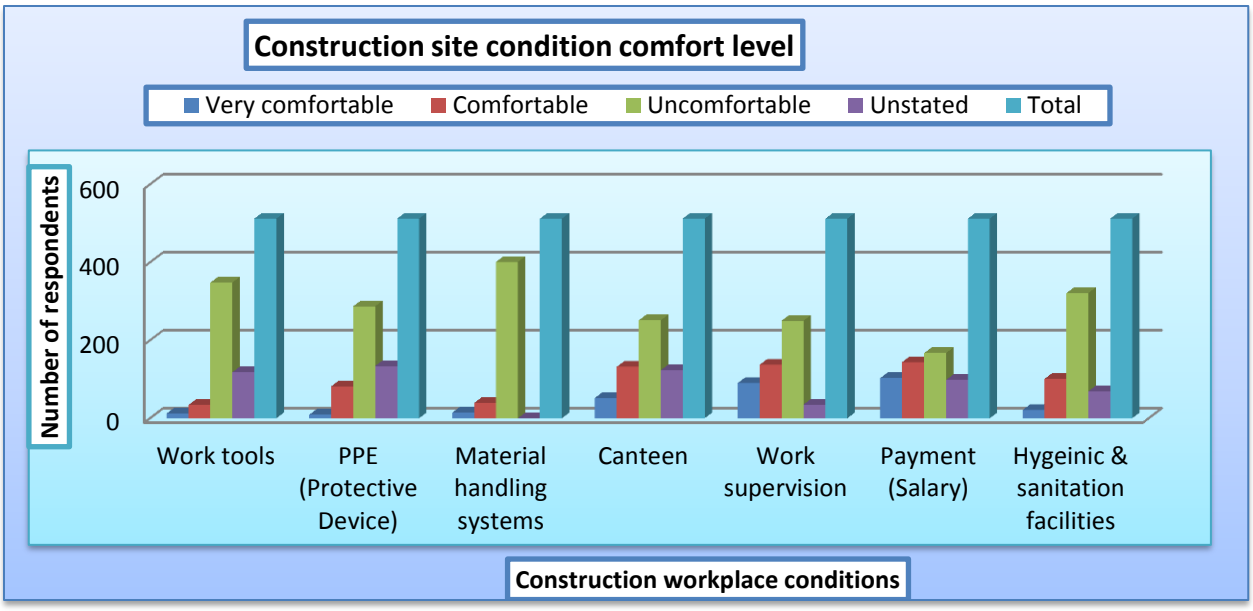


Figure 4.6 Comfort level of construction worksite condition

The numbers of workers who are feeling very comfortable about all the above conditions of their work site do not exceed 20% of the participants. For example, out 512 only 9 (1.8%), 12 (2.3%), 14 (2.8%) and 101 (19.7%) proved that they are very comfortable of the PPE, work tools, material handling and payment, respectively.

According to the results from questionnaire survey the majority: 401 (78.3%), 351(68.5%), 348(68.0%) and 321(62.7%), of the respondents were uncomfortable with material handling system, canteen, work tools, and work site safety, respectively.

4.2.4. Behavioral characteristics of the Construction workers

Some of behavioral characteristics of workers of construction industries in relation to safety and health issues considered in this study are: their job satisfaction, their habit of wearing personal protective equipment (PPE) and regularly usage of work tools/equipment, and obeying safety rules and regulations while performing their jobs. The participant workers were asked about these matters with respect to promotion of safer working environment and preventing themselves from hazards and accidents in the site. The frequency and rate of their response are clearly provided in Fig.4.7.

As indicated in Fig. 4.7, 238(50.8%) and 185(42.5%) of the respondents reported that they properly use personal protective equipment and work tools/materials, respectively, while they performance their jobs. On the other hand, out of 458 construction workers those gave their suggestion on the importance of training, more than three-fourth 332(70.5%) of them were not aware of that their job activity needs occupation safety and health related training and only one–fourth believe that their job real needs the safety training.

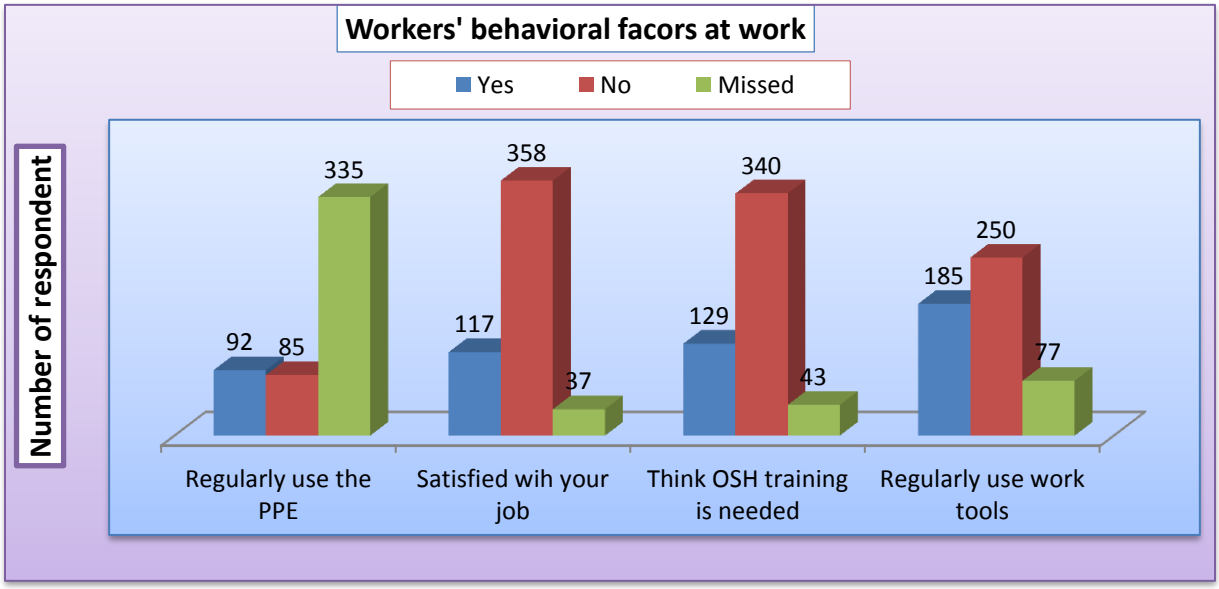


Figure 4.7 Workers' behavioral factors in construction workplace

As shwon in Fig.4.7, almost one-fifth 85(49.1%) of the workers do not regularly use personal protective devices and more than a half of the workers 250(48.8%) do not frequently use work tools during work. Concerning their job satisfaction of the workers, only 117(22.9%) of the respondents revealed that they were satisfied with their assigned job whereas 358(69.9%) of them are not satisfied with their jobs.

4.2.5. Demographic Factors and Occupational Accidents in Construction Site

Multivariate analysis of socio demographic characteristic of the respondents such as (gender, age educational, work experience and employment condition etc.) with respect to occupational accidents in construction sites revealed that these demographic characteristics have significant contribution to the rate of workers' exposure to occupational accidents in construction sites. The

exposure rate of employees to occupational accidents is compared and contrasted among various categories of these characteristics. The results of analysis are presented in Table 4.2.

The response rate of the employees with respect to the frequency and rate of exposure to work related accidents at work places of the eight sample construction companies in Addis Ababa is about 83.3%(483 respondents), which seems adequate to represent the population with the findings and conclusions to be drawn.

Regarding occurrence rate of occupational accident with respect to the gender of the employees, female workers are victimized to accidents related to their job 1.326 time more likely than male workers [COR: 1.326, 95% CI (1.052-1.706)].

Table 4-2 Respodents' demography and exposure rate to occupational accidents

Demographic factors		Did you face occupational accidents at your job?		COR:95%CI
		Yes	No	
Gender	Male	172(61.6%)	107(38.4%)	1.000
	Female	147(52.7%)	57(47.3%)	1.326(1.052-1.706)
Age	Less than 20yrs	6(60%)	4 (40.0%)	1.00
	20-29 years	106(61.6%)	66 (38.4%)	1.434(0.771-2.666)
	30-39 years	88 (65.2%)	47(34.8%)	1.00
	40-49 years	60(74.1%)	21(25.9%)	1.00
	50-55 years	59(69.4%)	26 (30.6%)	1.00
Work experience	Less than 1year	47(66.2%)	24(33.8%)	1.882 (0.313-2.182)
	1-5 years	134(60.6%)	87 (39.4%)	1.125 (0.579-1.725)
	6-10 years	87(72.5%)	33(27.5%)	1.00
	Above 10 years	51(71.8%)	20 (28.2%)	1.00
Educational level	Illiterate	11 (61.1%)	7(38.9%)	1.00
	Elementary (1-8)	113 (72.9%)	42(27.1%)	1.335(0.497-2.964)
	Secondary (9-12)	155(72.1%)	60(27.9%)	1.00
	Certificate and diploma	25(44.6%)	31(55.4%)	1.00
	Bachelor and above	15 (38.5%)	24(61.5%)	1.00
Employment condition	Temporary	205(62.5%)	123(37.5%)	1.429(1.076-2.019)
	Permanent	41(25.5%)	114(73.5%)	1.00
Total		319 (66%)	164 (34.0%)	483

With respect to the age of construction workers, the analysis shown that most of them are in range of 20-29 years and the workers in this age group are highly exposed to work accident in relative to other age groups. The workers in this age group are 1.434 time more likely victim of work-related accidents than the remaining ones [COR: 1.434, 95% CI (0.771-2.666)

While concerning the work experience of the workers of construction companies in relation to their chance of exposure to work related accident, the workers with work more experience are highly facing the problem, particularly for this study workers with work experience less than one year are highly encountering the incidence. Workers with experience of below than one year exposed to occupational accidents 1.882times more likely than those with work experience of more than five year[COR: 1.882, 95%,CI: 1.882 (0.313-2.182)]. As service year of employees increases the more they will be aware and familiarized to the situation in work place which in turn helped the workers to protect themselves from hazards causing accidents and ill-health problems. This could be verified from analysis results given above where workers with (1-5 year) work experience have relatively less incidence rate to work-related accidents in construction site, victimized about 1.673 times less compared to those with less than one year work experience[COR: 1.125, 95% CI (0.579-1.725)]

The employment pattern is one of factors considered as they have impact on the occurrence rate and frequency of the accidents at work site. From the result of analysis it is obtained that temporary employed exposed to occupational accidents 1.139 times more likely than permanent[COR:1.139, 95% CI(1.429(1.076-2.019)].

Similarly, the educational level of the respondents has been attempted to relate with the occurrence rate of work related accidents. Additionally, the result revealed that disregarding to the number of workers in each category of educational level there is no such significant differences in various category educational levels of the respondents.

According to the annual reports of ILO on safety and health work, the higher the educational back ground of the workers, is the easier to deliver and implement the trainings, procedures, programs and regulations related occupational health and safety in the workplace. This in turn helps them protect themselves from accident causing hazards and risk. In contrast, while the workers is have lower educational status they are mostly employed and assigned to jobs like

construction sector which requires much physical labor than skills related to the job. This in turn increases the incidence rate of the workers to be exposed to work accidents and injuries.

The type of job to which the employees are assigned is another factor which contributes to the exposure of the workers to accidents and hazardous conditions on the site.

Table 4-3 Job category and exposure rate of construction workers to occupational accident

Variable	Did you face occupational accident in your work place?			COR: 95%CI
		Yes	No	
Job Category	**Daily laborer**	247 (69.2%)	110(30.8%)	1.296(1.006-1.670)
	Masonary worker	19(67.9%)	9 (32.1%)	5.211(0.789-34.395)
	Carpenter	13(61.9%)	8(38.1%)	1.000
	Welder	3(42.9%)	4(57.1%)	1.333(0.757-2.348)
	Bar bender	10(71.4%)	4(28.6%)	1.00
	Plaster	11(84.6%)	2(15.4%)	1.00
	Foreman	7(29.2%)	17(70.8%)	1.00
	Site Engineer	9(47.4%)	10(52.6%)	1.00
Total		319 (66.0%)	164 (34%)	____

According to the results of analysis from questionnaire, respondents confirm this fact, where among 483 employees involved and correctly responded the questionnaire 319 (66.0%) of them have faced accidents related to their job atleast once a year whereas 164 (34.0%) of the reported that they did not exposed to the same incidence in last 12 months. The impact of job category of the construction workers on exposure to occupational accidents is presented in the table. As shown above the workplace accident exposure rate of the construction workers due to the type of job they are assigned has its own impact on being victim to the problems. Based on the results of multivariante data analysis using SPSS package, daily laborers, masonary workers and welders are extremely victim of the accidents in work sites of construction projects in Addis Ababa.

4.2.6. Environmental, Behavioral Factors and Exposure to Occupational Accidents

The work place environmental factors such as provision of occupational safety and health related training, length of working hours have siginificant influence on the occurrence of accidents in construction sites in combination with other conditions in the workplace. The rate of occurrence of work related diseases to construction workers with respect to the length of working hours and provision of safety and health training related to their job, by the company is analyzed and presented in the Table 4.4. Accordingly, working hours per day and provision of training on

occupational safety and health issues are also other parameters considered regarding their influence on occurrence of accidents at work place of construction companies and are analyzed as follows. The findings indicated that respondents working more than 8 hours per day have got more opportunity of encountering work related accidents than those working for 8 hours per day i.e., workers those spend more than 48 hours per week have 1.198 times more chances to face these work related accidents than those spent 48 and less hours at their work per week [COR: 1.198, 95% CI (0.351-4.083)].

According to results of the analysis, among 278 workers responded the question on the above issues only 48 (17.3%) of them took trainings related to workplace safety and have quite awareness while more than four-fifth 230(82.7%) do not get such access.

More than half which account151 (53.9%) of them stay in their workplace for more than 48hours in a week. With respect to the rate of exposure to occupational ill-health problem those employees who spend more 48 hours at site have 1.331 times more chance of being victim of diseases caused due to their occupation [COR:1.331, 95% CI (0.757-1.438)].

However, both those who have some awareness about the safety and health matters as well as those do not have relevant information about the issues have suffering from accidents.

Table 4-4 Environmental factors and exposure to accident

Environmental factors	Did you face Occupational Accidents on the site?				COR: 95% CI
		Yes	No	Total	
Did you take OSH training in your current company?	Yes	45	5	295	1.00
	No	218	27		1.232(1.067-1.506)
How long do you stay at work in a week?	Above 48hrs	151	7	280	1.331(0.757-1.438)
	<= 48hours	114	9		1.00

The exposure of workers to work related diseases in construction industries in Addis Ababa with respect to the availability and usage of PPE as well as job satisfaction identified and discussed. The responses the construction workers participated in this study, to the question about the availability of basic personal protective devices (PPE) to perform their job safely is analyzzed and presented in Table 4.5. The rate of the workers' exposure to work-related accident is also attenpted to investigate and the findings are summarized as shown in Table 4.5.

Table 4-5 Worker's behavior and thei exposure to accidents

Behavioral factors	Did you face work related accidents on the site?				COR:95% CI
		Yes	No	total	
Did you regularly use the PPE while working?	Yes	170	68	468	1.00
	No	142	88		1.157 (1.016-1.317)
Are you satisfied with job you are assigned?	Yes	105	9	465	1.00
	No	204	149		1.585(1.429-1.758)
Did you think your job needs OSH related training?	Yes	110	1	458	1.00
	No	198	134		1.464(1.328-1.646)
Did you properly use your work tools/equipment?	Yes	68	117	435	1.00
	No	153	97		1.549(1.052-2.282)

The habit of construction workers of construction companies in Addis Ababa in using their work tools has its own effect on how often they are facing the work-related accidents. The results also indicated that workers those regularly use PPE have likely 1.157 time less chance of encountering the incidence than those do not use[COR: 1.157, 95% CI (1.016-1.317).

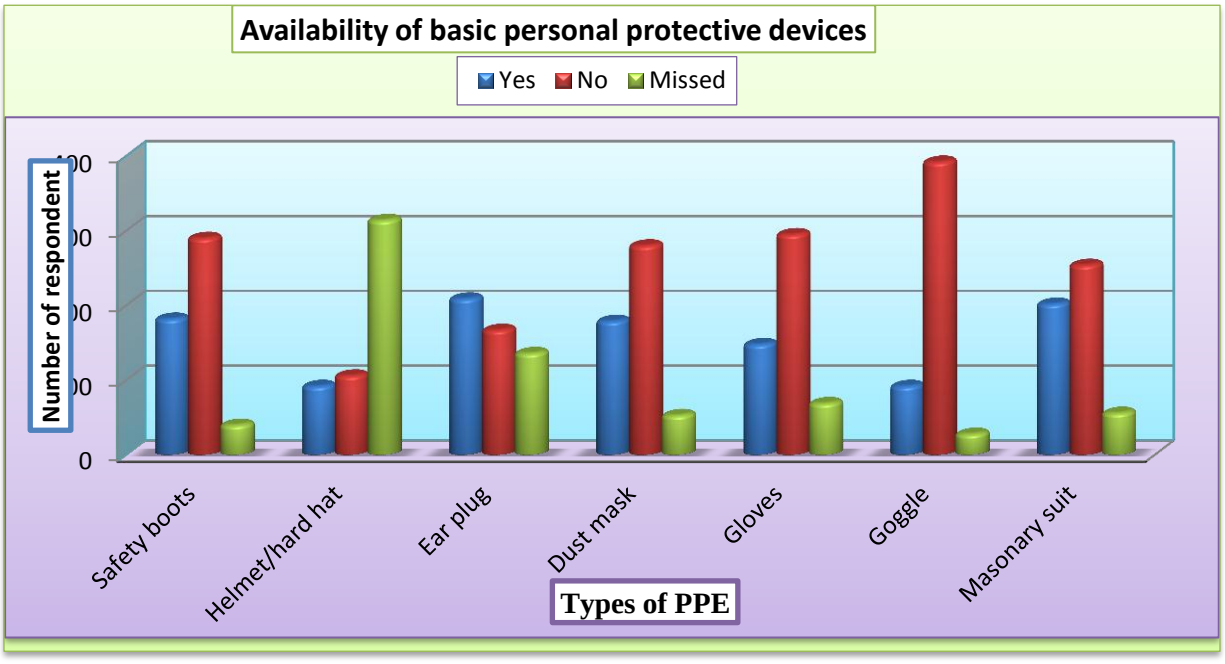


Figure 4.8 Availability of basic personal protective equipment

As clearly indicated in Fig.4.8, almost the availability of basic construction site personal protective devices is less than 45%. As an examples the respondents got the chance of receiving safety boots 182(35.5%) helmet/hard hat 92 (18.0%) ear plug 209(40.8%), dust mask 179(35.0%), gloves 148(28.9%), goggles 92 (18%) and masonar suit/cloth 202(24.0%) only.

This reveals that the average availability of the fundamental personal protective devices in Ethiopian construction industries is 18.8%. On the other hand the mojority of the respondents in this study 290(56.6%), 280(54.7%), 295(57.6%) 392 (%)and 254 (49.6%) resppectively, are not provided of the basic protective bdevies called safety boots, dusk musk, gloves, goggles and masonary suits.

Helmet/hard hat, goggles and gloves are some basic and fundamental personal protective equipment and facilities are quite available in most of the case companies. In contrast, most of the construction workers besides negligence to use regularly, in adequate awareness about their importance , lack of enforcement procedure on regularly using while performing their job and other matters related to the workers' behavior on the site made the provision of basic PPE valueless for long time.

4.2.7. Causes of Occupational Accidents on Construction Sites

In order to investigate main factors frequently causing accidents in construction site the respondents were asked a question "which of the following factors have caused occupational accident they faced at their work place in last one year. As it is indicated their responses are tabulated in Fig. 4.9

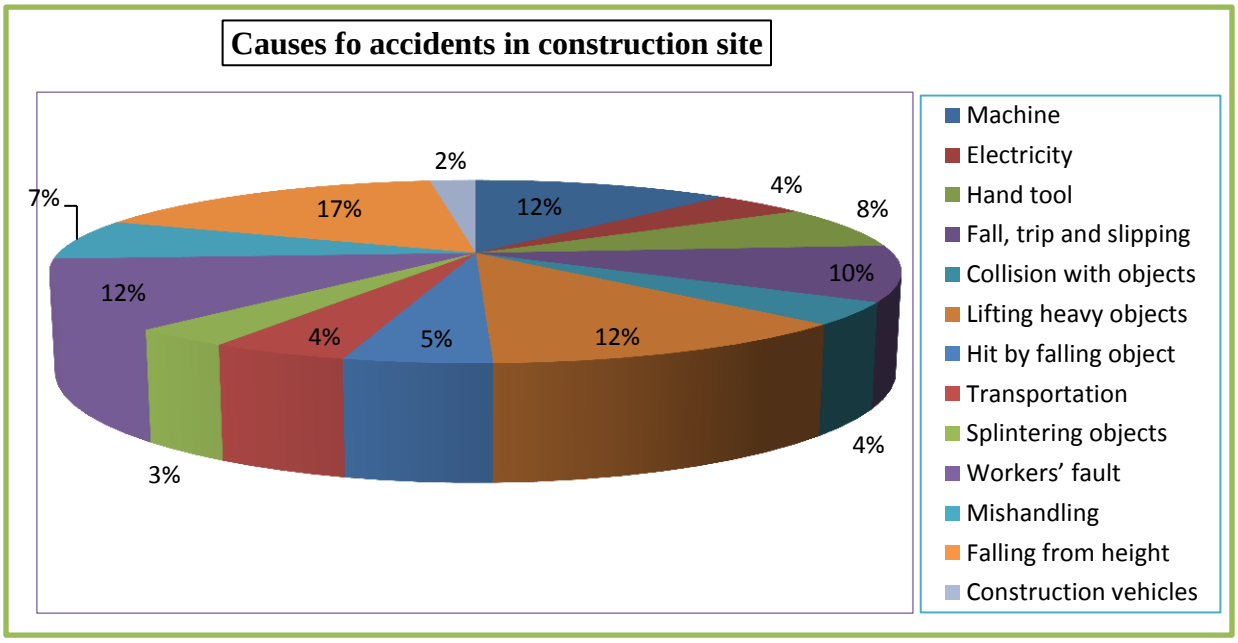


Figure 4.9 Main factors causing occupaional accidents in construction site

The prevalence of various factors causing accidents in construction site various from project to project and company to company at large. As described in Fig. 4.9, majority of work- related accidents (more than 68%) are caused due to falling from heiht 331(16.73%), workers' fault, 243(12.28 %), lifting heavy objects 241(12.18%), and machine 235(11.87%), and on the other hand, the three least causes of occupational accidents in construction sites are: construction vehicles 42 (2.12%), splintering objects 64(3.23%) and collision with objects 77 (3.89%). In addition, among 512 participants of this study those faced work-related accidents improper material handling, hand tools, transportation, fall, trip and slipping, and hit by falling objects in combination contribute for about 489(32.2%) of the the accidents. Quite much number of workers did not give the reasons of accidents except the occurrence of the incident to them.

4.2.8. Sources of hazards in work sites of construction Companies

In construction sites workers have much chance of being exposed to numerous types of hazards like: physical, chemical, biological and psychosocial and ergonomic hazards that cause both light and serious risk to their health. Heavy physical workloads or ergonomically poor working conditions in the site result injuries and musculoskeletal disorders. As construction industry is ill-defined sector with its hazardous nature of construction work environment. For the purpose of investigating major sources of hazards on sites of construction industries in Addis Ababa, the responses from questionnaire survey are compared and contrasted among each other. According to the analysis the most common factors considered in this study are: dust particle form cement fumes, mental stress due to work load, poor and inadequate hygienic and sanitary facilities, infection from biological agents, poor standing and walking work positions, un safe equipment or machine, repetitive activities and motion, poor lighting, extreme noise, chemicals, extreme heat and coldness, and extreme vibration from work tools and machines.

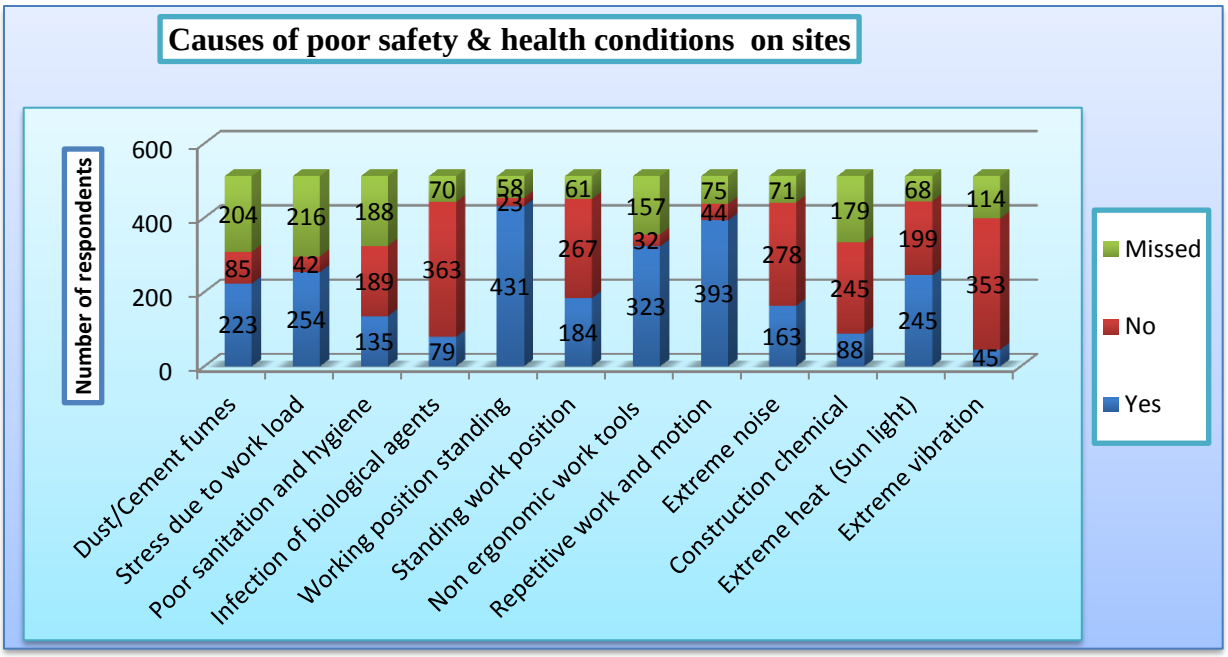


Figure 4.10 Causes of poor safety and health conditions on construction sites

According to the results of questionnaire survey analysis the first six major causes of poor safety and health workplaces in project sites of construction companies are identified as repetitive task and movement, non-ergonomic work tools, work position (standing and overextension), work load stress, dusts (cement fumes) and exposure sunlight. On the other hand, mechanical vibration and noise from various construction equipment, chemicals and infections due to biological agents have the least contribution for unsafe and hazardous conditions of workplaces of construction sites in Addis Ababa. The sanitary and hygienic facilities (such as water, dressing room, canteen, work tool storage area, latrine) are more or less available in each site. But the habit of workers in using these facilities properly and responsibly is still extremely poor and this in turn quietly affects the health matter of the workers on the site.

4.2.9. Occupational Injuries and Affected Body Parts in Construction Sites

Another question raised to workers of construction industries is that "whether they have been suffering from accidents in construction sites and resulted in various forms of injuries such as abrasion, burn, cut punctured, fracture, sprain and dislocation and injuries of different body parts. According to their response, most employees of construction companies have experienced various forms of injuries happened as consequence of the work-related accidents.

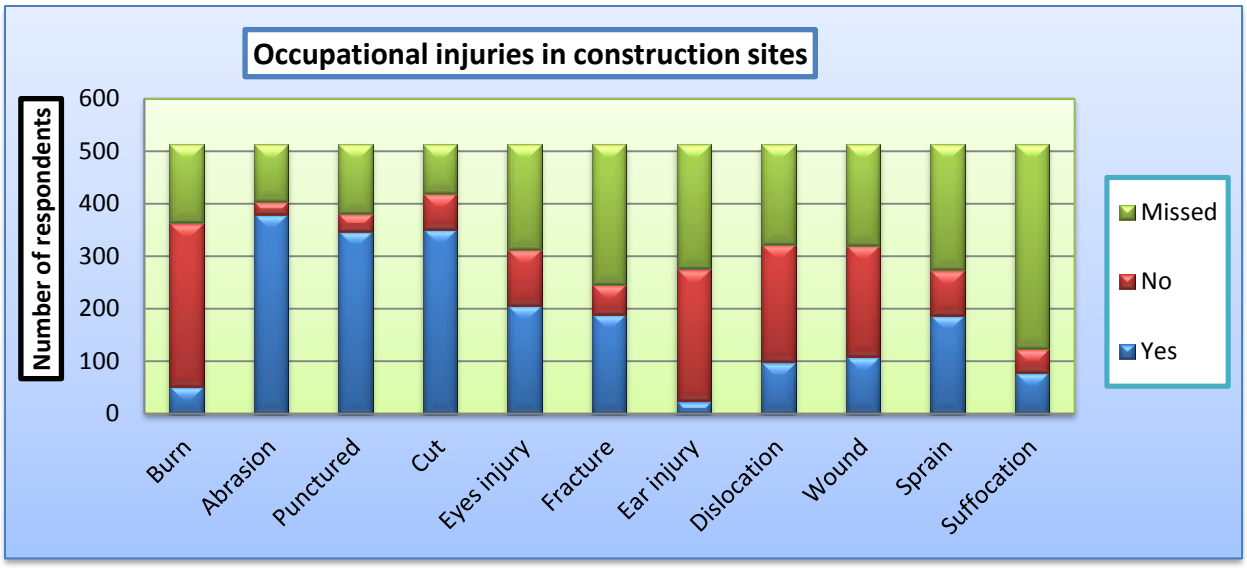


Figure 4.11 Occupational injuries in construction site suffering the workers

Abrasions, puncture and cut are the frequently occurring occupational injuries from which most the construction workers in eight sample companies are suffering. Regarding the type of injuries from which workers in construction project sites are requently suffering, abrasion 379 (74.0%), cut 351(68.6%), puncture 347(67.8%), and eye injury 206(40.2%) are identified as the four most common ones. On the other hand; ear injury, suffocation, burn, and dislocation are reported as the injurry types those are rarely affecting the workers, which accounts 24(4.7%), 45(8.8%), 52(10.2%) and 98(19.1%) respectively.

In this study, the parts of body mostly affected by the work-related injuries in construction project sites are also attempted to be investigated. And the analysis indicated that fingers, head and toes are extremely vulnerable to accidental injury in construction workplaces, and more injuries are caused to hands and wrists than to any other part of the body. They are largely preventable by using proper work tools and equipment, and by wearing suitable hand protection such as protective gloves.

The employees of the case construction companies, those faced accidental injuries, were questioned to designate the parts of their body which have been mostly affected for the last one year. Among these respondents, most of them were injured of their finger 341(66.6%), toes 331(64.6%), hand 301 (58.8%), shoulder and neck 298(58.2%) while performing their

construction job in last 12 months. Thu, the five most frequently injured body parts of construction workers are finger, toes, shoulder and neck, head, toes and hand of workers of construction companies in Addis Ababa are the commonly being affected body parts by accidents in work site.

The extent of how often do workers face work-related diseases at their workplaces in connection sites with the contribution of their demographic status have been analyzed. The majority of the respondents; 188(66.4%) of the male and 179(93.2%) of female construction workers have repetitively faced work-related diseases whereas in average about one-fourth (21.1%) of the workers described that they did not experience the illness or incidence.

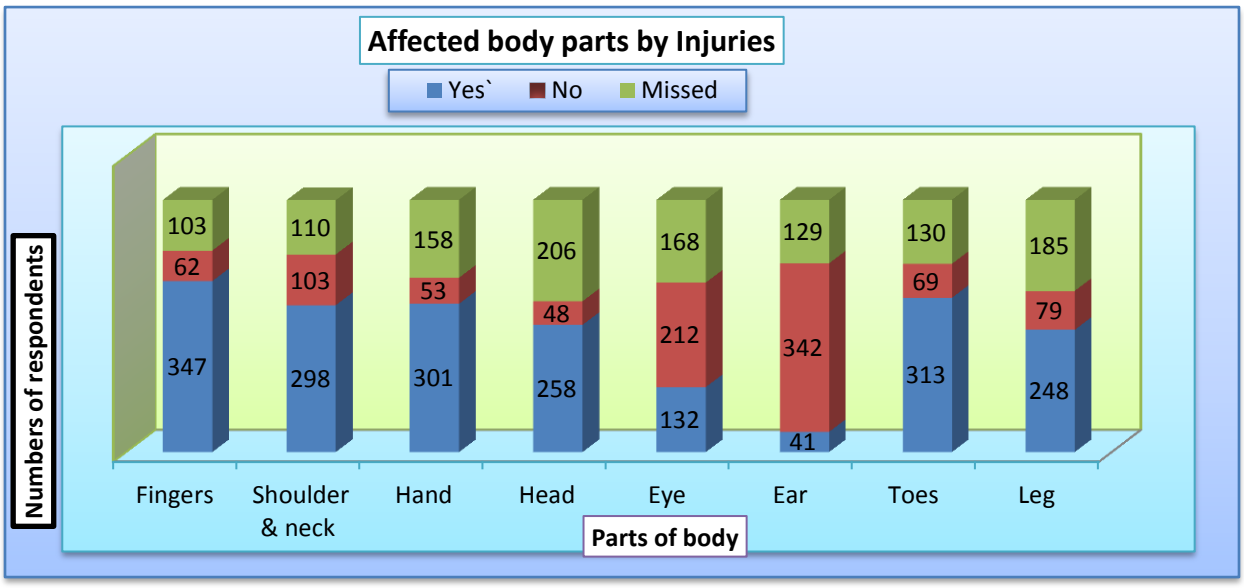


Figure 4.12 Workers' body parts affected by injuries

Like the exposure of workers to occupational accidents in work site, the analysis about rate of exposure to work-related diseases is given Table 4.6.

Table 4-6 Workers' demography and their exposure rate to occupational diseases

Demographic characteristics		Did you face work related diseases at your workplace?			COR:95% CI
		Yes	No	Total	
Gender	Male	188(66.4%)	95(33.6%)	283	1.000
	Female	179(93.2%)	13(6.8%)	192	1.326(1.052-1.706)
Age	Less than 20yrs	6(60%)	4 (40%)	20	1.00

	20-29 years	136(81.4%)	31(19.6%)	167	1.00
	30-39 years	106(80.9%)	25(19.1%)	131	1.173(0.267-2.152)
	40-49 years	61(76.2%)	19(23.8%)	80	1.00
	50-55 years	58(66.7%)	29(33.3%)	87	1.00
Work experience	Less than 1year	47(66.2%)	24(33.8%)	71	1.882(0.313-2.488)
	1-5 years	134(60.6%)	87(39.4%)	221	1.125(0.579-1.725)
	6-10 years	87(72.5%)	33(27.5%)	120	1.00
	Above 10 years	51(71.8%)	20(28.2%)	71	1.00
Educational level	Illiterate	14(70.0%)	6(30.0%)	20	1.237(0.721-1.479)
	Elementary (1-8)	113(63.4%)	41(36.6%)	154	1.107(0.546-1.137)
	Secondary (9-12)	147(70.5%)	61(29.5%)	208	1.121(0.750-1.212)
	Certificate-diploma	13(25.1%)	40(74.9%)	53	1.00
	Bachelor and above	15(37.5%)	25(62.5%)	40	1.00
Employment condition	*Temporary*	231(62.5%)	95(37.5%)	326	1.288(1.183-1.403)
	Permanent	136(91.3%)	13(8.7%)	149	1.00
Job Category	*Daily laborer*	274(78.7%)	74(21.3%)	348	4.712(2.635-8.427)
	Manson	24(92.3%)	2 (7.70%)	26	1.167(0.081-16.719)
	Carpenter	17(73.9%)	6 (26.1%)	23	1.000
	Welder	10 (58.8%)	7(41.2%)	17	1.00
	Bar bender	11(78.6%)	3 (21.4%)	14	1.00
	Plaster	11(84.6%)	2 (15.4%)	13	1.00
	Foreman	15(60.0%)	10(40.0%)	25	1.00
	Site Engineer	11(57.9%)	8 (42.1%)	19	1.00
Total		320 (67.3.0%)	155 (32.7%)	475	_____

The exposure rate of the construction workers to occupational diseases with respect to their gender, age, educational level, employment condition and job category was analyzed as presented in Table 4.6. Regarding their gender, among the prespondants participated in this study, the female employees are 1.326time more likely exposed to these ill health problem than their male counter parts COR:1.326; 95% CI (1.052-1.706). Regarding the age group of the respondents, the workers in categories of 30-39 years old are victim 1.173 times more likely to the diseases related to their occupation than those in other groups ranging COR:1.173; 95% CI (0.267-2.152). On the other hand the participants with work experience of less than one year are exposed to these diseases 1.882 times more likely than those with six years and above work experience COR: 1.882; 95% CI (0.313-2.488). Even though the rate of exposure of the workers with one to five (1-5years) work experiences are relatively less it quitely takes the attention of stakeholder which is 1.125time more than those with six years and above COR:1.125; 95% CI (0.579-1.725), but as the service years of the workers inceases they become more aware of the

hazadous and unhealth conditions in their workplace which in turn relatively reduced the chnces of being affected by thes illness and incidences.

Educational level of the respondents is also another demographic factor analysed in relation with theeir opportunity to be caught by the work related diseases and ill-health problems. And accordingly, it is highlighted that the respondents of this study with less educatonal status are mostly being affected by theses diseases. The findings of the analysis verified this which is that workers with no vaccational knowledge are frequently affected of theses incidences, as hown in Table 4.6 .

4.2.10. Frequency of Occupational Disease Occurrence in Construction Site

The other important issue to be considered while dealing with safety and health in construction site is investigated how often work related ill-health occur at on the workers. Regarding this matter, questionnaire was distributed to total of 512 construction workers of eight companies. Then, their responses are scaled as always, sometimes, rarely and not at all. The results of analysis are presented in Fig. 4.13.

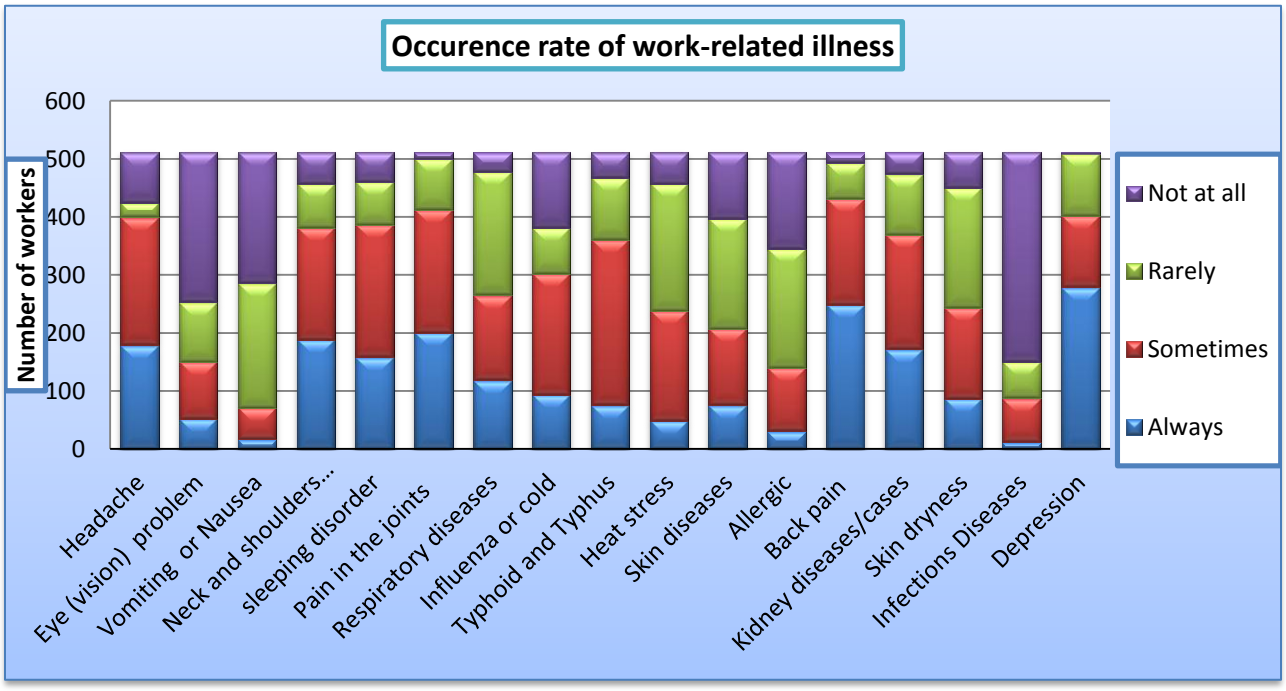


Figure 4.13 Occurance rate of work related injuries in construction

As it can be understood, headache, neck and shoulder pain, pain in the joint, back pain, kidney disease and depression are the most frequently occurring illnesses to construction workers. With respect to how often these diseases occur, those took place sometimes headache to 221(71.3%), neck and shoulder pain 193(37.7%), sleeping disorder 229(44.7%), pain in the joint 201(39.3%), influenza or cold 209 (40.8%), typhoid and typhus 285 (55.7%), heat stress 189(36.9%), and kidney diseases/cases 198(38.7%) the participants are most frequently facing. Eye problem, vomiting and infectious diseases suffer the construction workers very rarely relative to other ill-health problems with rate of 259(50.6%), 226 (44.1%) and 361(70.5%).

In general, headache, neck and shoulder pain, pain in the joint, influenza or cold, typhoid and typhus, allergic, back pain, and depression are the most frequently affecting the health matter of workers of construction companies in Addis Ababa.

4.2.11. Factors Causing Illness to Workers at Construction Sites

While we consider the causes of theses ill-health problems repetitive work and motion, dust particles, chemicals, contamination, work over load, lack/less rest time, noise from work machine, and poor communication culture, and weather condition, poor and wrong work tools, lack of sanitation facilities, absence of PPE, lack adequate diet/malnutrition as a result of unsatisfactory payment/ or monthly salary.

The selected and actively participated construction workers from the 8 case companies are requested about “which of the followings factors is commonly causing ill-health problems in their work site” and the respective responses are analyzed in detail.

In general, the results indicated that the most common causes of ill-health problems in the construction workplaces are chemical (light to heavily dangerous ones), dust particles (cement) exposure to sun light on site, working position sitting and standing, repetitive motion and task.

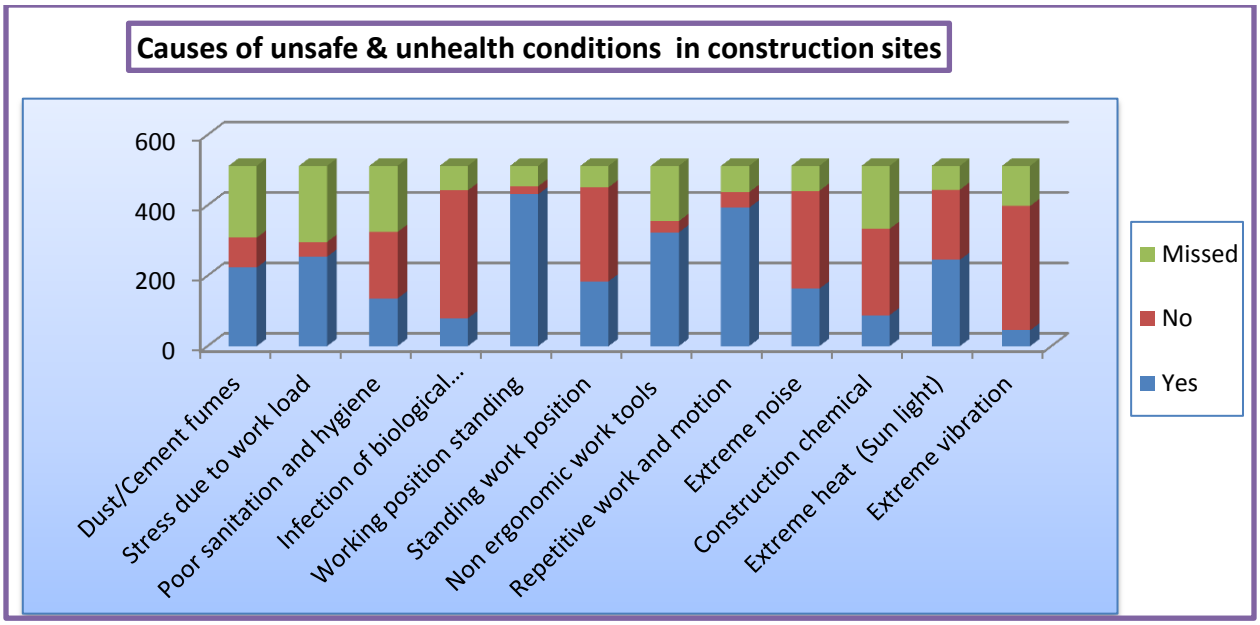


Figure 4.14 Causes of poor safety and health problems in construction

According to the results of questionnaire survey analysis the first five major causes of unsafe and unhealthy conditions of environments in project sites of construction companies are identified as repetitive task and movement, non-ergonomic work tools, work position (standing and overextension), work load stress, dusts (cement fumes) and exposure sunlight. On the other hand, mechanical vibration and noise from various construction equipment, chemicals and infections due to biological agents have the least contribution for unsafe and hazardous conditions of workplaces of construction sites in Addis Ababa. The sanitary and hygienic facilities (such as water, dressing room, lunch area, work tool storage area, latrine) are more or less available in each site. But the habit of workers in using these facilities properly and responsibly is still extremely poor and this in turn quietly affects the health and wellbeing of the workers on the site. The short forms given in (Table 4.7) are described as [SA: strongly agree, A: agree, N: neutral, D: disagree and SD: strongly disagree]

Table 4-7 Workplace safety and health practice in construction sites

SN	Occupational Safety and Health Related Issues	SA	A	N	D	SD
1	Company has a written Health and Safety Policy	0	3	2	22	17
2	Policy is adequately communicated to all company's employees	0	0	3	19	22
3	Employees are aware of their responsibilities protecting themselves	0	0	0	13	31

4	Company identifies hazardous jobs and gives attention	3	17	0	12	5
5	Safety and health meetings are regularly conducted	0	0	12	15	21
6	Company has personal for controlling safety matters on site	3	5	0	15	10
7	Safety and health issues are incorporated into business plan	3	15	0	9	5
8	Recognitions given for employees obeying safety regulations	0	1	0	19	11
9	Accessible first aid kit is available with sufficient elements in it	8	17	0	6	13
10	Accidents are constantly recorded and properly kept for analysis	2	12	7	11	16
11	Company has a Safety Representatives for each section of work	4	7	2	20	14
12	There is Safety Committee to make decision on safety issues	1	0	6	44	48
13	Safety Committee regularly records occupational accidents	0	0	7	19	18
14	The Company gives safety training to employees regularly	0	2	3	21	18
15	Company has awareness creation a schedule for the employees	0	0	6	24	14
16	Company regularly conducts project site risk assessment	0	0	7	21	16
17	Safety risk inspection results are documented and communicated	0	0	0	31	11
18	New workers get adequate orientation before starting their job	18	26	0	0	0
19	Company provides and enforces the use of safety equipment (PPE)	9	15	0	13	7
20	Company prioritizes safety as it give gives priority for profitability	0	3	4	17	20
21	Company allocates budget for occupational S&H related issues	0	4	5	29	9

Among respondents more than half of them disagree about the existence of written occupational safety and health policy and the responded that the concept of safety and health policy is not adequately communicated to the employees in their companies. Majority of the construction workers are no aware of their responsibility in protecting themselves and other workers on the site by respecting safety rules and safe working strategies. Although significant attention is not given to the identified hazards, process of hazard identification and reporting is quietly carried out in most of the construction sites. In addition, there is no regular meeting among the responsible personals and the suffering daily workers. Based on the responses of the site engineers and foreman it is understood that almost all construction companies have no safety representative for each section and no awareness creation schedule for workers. Most of the respondents do not agree that workers are given training related to safety and related issues at their workplace.

However, most of the workers in most construction companies are given orientation before starting their jobs and they are provided with personal protective equipment (PPE) followed by enforcement measures to follow the safety rules and regulations. Besides, safety issues in construction sites are not prioritized as quality, cost and time of the project the companies do not allocate separate budget for occupational safety and health incidents.

4.3. Data Analysis of Company Records and Site Observation

The data collected from the records of six case companies with in two years of study period were used here. Finding from these companies recordings for two years regarding work-related accidents and diseases as well as the lost working days and total cost incurred due to thes incidents in those sample construction companies were taken in to consideration. Diseases, injuries and work times lost due to these incidents are considered to investigate the impact of work-related illness and injuries. Among the most the frequently recorded work-related diseases, typhoid, typhus and respiratory diseases are significantly affecting the health and performance of construction workers in Addis Ababa. Regarding the age of ill workers who have taken medical treatment, the dominant ones are the productive group 18-40 years old.

Table 4-8 Occupational diseases, injuies and work days lost [Companies records]

Types of disease	Male	Female	18-30 yrs.	31-40 yrs.	41-55 yrs.	Lost day/year
Allergic	52	69	56	44	21	241
Headache	211	189	251	82	67	312
Typhus	184	177	180	170	11	541
Pneumonia	19	32	26	18	7	156
Respiratory disease	107	218	209	104	12	504
Typhoid	309	156	218	186	61	814
Total						2568 days
Type of injuries						Lost days/year
Burn	73	11	62	19	3	137
Abrasion	208	109	230	76	11	317
Cut	298	178	219	171	8	1620
Piercing	322	58	144	202	34	1045
Puncture	352	86	178	242	18	657
Fracture	47	76	43	69	11	461
Eyes Injury	112	41	5	9	19	348
Total						4585 days

With respect to the gender of the construction workers, males are dominantly suffering from both injuries and diseases in their workplace. This is mainly due to the dominant number of male workers in construction project. Female workers are critically suffered from abrasion and cut injuries whereas male workers are frequently victim of puncture, piercing, cut and abrasion injuries. Due to the nature of the job, male workers quitely encountered eye injury.

As presented in Table 4.8, the working days lost due to these dieasese and injuries 2568 days and 4585 days are total wasted, respectively. Due to these lost work days prominent cost is incurred as the workers are paid for most of these absent days. Some jobs are obligated to wait for new employees until the injured workers are recovered and damaged equipment and machinery are replaced.

4.3.1. Causes of Occupational Accidents and Injuries in Construction Companies

The cause of the accidents at work place of Construction companies in Addis Ababa with respect to the types of injuries happened, body parts affected by accident, as well as the gender and age of the victimized workers is reviewed in detail.

As shown above in the table various types of work-related accidents occurred in construction sites of the case companies. Among these accidents 126 of them caused by falling and slipping, 55 by collision, 50 by mishandling, 23 by hand tools and 16 by machines. Machie mainly caused piercing of hands and legs of the workers.

Females are extremely victim of accidents caused by industrial machine while workers with age of 40 years and above are victimized to such incidents. Electric shock is one of the causes for accidents in construction workplace and burning injury is the most commonly related to such shock to only 3 workers. For male workers are mostly closer to tasks in contact with electricity, males with age 40 years and above were injured. According to the responses from the workers those participated in the study, none of them never indicate which parts of body are exposed to such incident and injure.

Lifting heavy objects, falling object, improper handling material and splintering objects are the main causes for abrasion injury and leg and hands are injured commonly with these causative conditions. Jobs involving lifting heavy objects are mostly performed by male workers so that they are victim of injuries and accidents resulting from such activities and workers of age above

40 years are facing the problem. Splintering objects cause piercing and fracture injures, while improper handling causes puncture. In every sub-sections of the project sites, improper handling material and falling objects are common to so that workers of both sex and workers of all age ranges have suffered from accidents caused by falling from height, hit by falling, objects, as well as fallng, trip and slide caused by poor workplace and material management.

The types of occupational disease from which workers of construction companies are frequently suffering and this affect the organization. As shown in the above table that due to these diseases 162 male and 920 female workers were absent from their work at least for three days in those five case companies. This concern is a public health issue that goes beyond the injured employee to affect the entire society. When the employees‟ ability to earn is disrupted by an event such as Workplace injury or death, the financial stability of the family is seriously threatened. In turn total of 1902 working days were lost annually.

During these days the workers who are absent from work were paid for salary, medical treatment, accident and injury compensation, cost of searching for hiring new workers, lose or reduction of production capacity due to un experienced workers, loss of customers resulted from being unsatisfied of the less production capacity. Training for new employees and for safety and health related issues also call for another unproductive expenditure from the organizations.

4.3.2. Cost of Work Related Diseases and Accidents in Construction Industry

As shown in the Table 4.11, in the most common types of health problems from which the workers are suffering and incurred significant medical costs on construction industries under consideration are allergic, hypertension, headache, pneumonia, respiratory track, typhoid & typhus ,burn, abrasion , cut, piercing , puncture, fracture and eye injury. In relation to the gender of workers affected by these diseases and accidents, male workers are mostly facing the problem because much of the workers are female. The data about total number of employees taken to clinic in one year due to occupational accidents and diseases are obtained from the recorded documents of the case companies. The medical cost incurred due to work related accidents and illn-health problems respectively 251 and 523 workers suffered in two years is computed an dpresented as shown in the Table 4.9. For detailed explaination, due to accidents and illness minimum of 1265(950) birr, maximum of 1989(2123) birr, sum of 467325(247235) birr and

average of 1465.6 (1152.4) birr, respectively. Absent workers paid their salary due to accident and sickness are 173 and 1259, respectively. For these employees the number of lost working hours while they were absent due to accidents and disease in the these years with minimum of 87.34 (75.3) birr, maximum of 2185 (12564) birr, sum of 854673 (401372) birr and average of 949.3 (901.5) birr for monthly salary was paid.

The expenditure of medicating vicitmized employees due to work related accidents and diseases in addition to the salary paid for workers, which are not at their work due to injuries and sickness summarized in Table 4.9.

Table 4-9 Costs of occupational accidents, diseases and ijnuries in construction companies

Types of cost	Victim workers	Cost in Ethiopian birr			
Costs of occupational accidents and disease	N(Employees)	Min	Max	Mean	Sum
Medical expense due to accidents	251	1265	1989	1465.6	467325
Salary paid for employees absent in juried	173	87.6	2185	949.3	854673
Medical expense due to illness	523	950	2123	1152.4	247235
Salary paid for employees absent in sickness	1259	75.3	12564	901.5	401372

The resulting levels of absenteeism in construction companies have serious consequences on the economy. Firstly it affects the productivity of the individual worker, theprofitability of the firm and finally the growth of entire economy. While the worker and their families lose their ability to earn due to these injuries, they become unable support themselves for basic needs such as health care, housing and food an dclothing. Direct costs such as replacement of lost wages and medical bills are frequently insured and well documented for compansation purpose. On the other hand, indirect costs such as lost hours of construction, disability and the hardship placed on the injured employees and their family are great but such costs did not computed based on the existing data obtained from the companies recordings in this study. Because such data are rarely documented in few companies only.

In addition to the above, from the recorded data of the case companies relevant data about the number of sickleave taken by the ill and injuried workers was obtained and analyzed. Totally 87 construction workers took sickleave in two years at different rate from which some of them took more than two times.

4.3.3. Data Analysis of Construction Site Observation

Other ways which the relevant data are gathered in investigating the safety and health promotion practice and related problems in construction sites of case companies is physical observation of the site and conducting formal interview with relevant management personnels.

Through observation relevant information about availability and usage of PPE; work-tools provision and their comfort; and hazardous conditions of the construction site and access of hygienic and sanitation facilities on site are gathered by asking volunteer workers during observation. The findings from analysis in this study have reveal that the machines are not mostly guarded with proper facilities provided for this purpose so that the workers are exposed to various accidents and injuries in work site.

Regarding the nature of the construction site, it is dirty and contains hazardous particles; construction material, remnant wastes and debris, and so on. In addition, the poor safety conditions of material handling equipment might be one of factors that accelerate occurrence of accidents and injuries. Even most of the contractors provide proper personal protective equipment, in some of the workers don't use gloves while working with cements, rusted metals, paints and chemicals whereas remaining few workers extremely vulnerable to repetitive motions while handling, lifting and unloading and transporting various work materials and equipment along the temporarily made stair along various floors of the building. The provision of workers with the personal protective facilities at sites will enhance the attitude of workers to their job, the comfort level regardless of significant differences among themselves, with respect to work load, exposure rate and payment.

In addition to questionnaire and interview, further information are gathered through observation of project sites of the four case companies (TekleBerhane Ambaye general contractor,Yotek general contractor, Aford general contactor and MARF building contractor). The main objective of conducting construction site observaion is for conselidating the data obtained through questionnaire survey and interview at office. In site observation, the availability of necessary PPE, workers' willingness and habit of using theses devices, hazardous conditions oof the site, the interaction of people and construction machineries were focused.

In addition, during the onservation informal interview was conducted with concerned management personnels like site engineers, formans, inaddition to welders, masonary and daily workers. During the interview the environmental factors which have significant impact on safety and wellbeing of of workers, hazards in on the site, working time and safety training are given more focus in this study.

Chapter Five

5. Ways Forwarded for Construction Safety and Health Impeovement

5.1. Introduction

To reduce the destructive impact of safety and health problems in construction industry on workers and organization through implementation of accident prevention program is critical measure. As legal and humanitarian procedure each company is expected to develop written policy of safety and health management system (SHMS) which could or workplaces accident prevention program. A system approach is effective way that integrates safety and health objectives into the company's operational structure; it is preferred to be implemented in managing safety and health in construction sites. For workplace safety and health management system to be effective in its implementation and to be sustainable different types of procedures, actions and strategies are required be applied and practiced. First of all the work operations should be assessed including safety and health information that fits the company's specific needs, hazards based on complexity of operations in the construction project.

5.2. Summary of Main Findings of the Study Analysis

In the process of forwarding improvement way for promoting safer and healthy work environment, it is vital to summarize the main problems identified in the study in order to prioritize the measures or prevention. Among workplace safety and health problems analyzed and identified in this study, lack of awareness creation program, unavailability of personal protective equipment, less commitment of top management for safety and health issues, outdoor work environment effect and poor conditions of work tools are the common one. Consequently, the employees and the companies are suffering from potential accidents and costs which have great impact on productivity and profitability of the contractors.

Occupational accidents on construction industry are significantly resulted due to either environmental factor or workers' behavioral factor during operation. With respect to the environmental factors, seasonal weather conditions, noises from construction machineries, dust particles from cement, standing and stretching work position, and repetitive motions and task. Among factors related to worker's behavior (psychological and physiological matters), ignorance

to regularly using PPE and work tools, addictive behavior (chewing, smoking), and disobedience to safety rules and regulations.

Based on the main problems identified and the causes for those incidents in construction sites of the construction companies in Addis Ababa, a program to manage safety and health issues is forwarded here as strategy for continual improvement and sustain the program.

5.3. Occupational Safety and Health Management System Development

As legal and humanitarian procedure each company is expected to develop a written safety and health management system (SHMS) which could be considered as "workplaces accident prevention program". Managing occupational safety and health in construction companies is the responsibility and duty of the contractor or sub-contractors. The contractors or sub-contractors should show strong leadership and commitment to OSH activities in the company, and make appropriate arrangements for establishment of an OSHMS. The system shall contain the following main elements of policy, organizing, planning and implementation, evaluation and action for improvement.

Occupational Safety and Health Management program provides employers, workers, and worker representatives (OSHA, 2015; MIOSHA, 2013) with a sound, flexible framework for addressing safety and health issues in diversified workplaces. In this study a system with a proactive approach is used to manage workplace safety and health in Ethiopian construction industry, where hazards are to be identified and fixed before they cause accidents, injuries or illness. Implementing this system brings benefits such as: improvements in product, process, and service quality; better workplace morale; improved recruitment and retention; more favorable image and reputation (among customers, suppliers, and the community). Besides, implementing a safety and health program can help employers avoid the indirect costs that result from workplace incidents such as time lost due to stoppage and investigations; training and other costs associated with replacing injured workers; and damage to materials, machinery and property.

Implementing a safety and health management system (accident prevention program) can help the contractor avoid indirect costs that result from workplace incidents such as time lost due to stoppage and investigations, training and other costs associated with replacing injured workers and loss of damage to material, machinery and property (OSHA, 2015). Core elements of the

effective occupational safety and health management system (accident prevention program) are management leadership and commitment, workers participation, hazard identification and assessment, hazard prevention and control, education and training, evaluation and improvement of program (MIOSHA, 2013).

5.3.1. Management Leadership and Commitment

Management in construction safety and health provides the leadership, vision and resources needed to implement an effective safety and health management system. Leadership of management in the context of safety and health means contractors, consultants, sub-contractors and supervisors at all levels: (1) are fully for continuous improvement of workplace health and safety performance by making worker safety health critical organizational value; (2) provide sufficient and proper resources for safety and health management system implementation; and (3) clearly communicate their safety and health commitment to worker and other stakeholders. The management has responsibilities of clearly defining and communicating the roles and duties of all employees at each level of the organization. This helps them aware of their contributions and burden while performing their job. The responsibility of management starts from believing that no job or task is more important than worker health and safety.

I. Occupational Safety and Health Policy

The first element of an ideal OSH management system is policy. The management formulates an OSH policy specific to the organization, concise and clearly written by consulting with the workers and their representative. Management should incorporate the Safety statement in to safety and health and recognize it as an integral part of the company's business performance. The safety and health policy is needed to consist appropriate measure and strategy to identify hazards and risks on the work sites of construction projects with commitment of the employer and management to protect the worker so far as is reasonably practicable.

The following major actions are to be carried out for effectiveness of leadership and for communicating commitment.

- ✓ **Communicate commitment of management to a safety and health program**

A clear written safety and health policy helps communicate that safety and health is primary organizational value and it should get equal attention with profitability, productivity, and project quality and customer satisfaction.

- ✓ **Define program goals and expectations**

Management sets expectations for the employees and the management program as whole. This will be accomplished by establishing a written policy which describes the strong commitment of the company to establish and maintain safety and health.

- ✓ **Allocate resources**

The management comes up with responsibility of providing resources required for implementing safety and health management program; pursues program goals; and address program deficiencies while identified.

- ✓ **Expect performance**

The program effort is leaded by the management through establishing roles and responsibilities, setting a good example, and providing open environment for communicating about the safety and health matters.

II. Employee Involvement

There are many benefits that workers of the company gain from an effective accident prevention program and they are the most to suffer and lose if the system falls. Employees and their SH representatives are required to involve in establishment of safety and health committee, safety inspection, suggestion system development and implementation of the program (OSHA, 2015). The companies should encourage the participation of all those affected by the operations to contribute in better OSH practices, and support for their OSH policy and objectives.

- ✓ **Safety and health committee**

Safety and health committee which is to be the combination of management and employee representatives is to be established for participation in implementation of the OSHMS at respective company. The committee should have definite goals and objectives; address safety

and health issues; involve employees in problem solving; record and post minutes of meetings and document the actions taken to have formal agenda (MIOSHA, 2013).

- ✓ **Safety Inspection:**

To help identify potentially hazardous conditions and unsafe actions and initiate correction the employees will participate in regular safety and health inspection in scheduled time (daily/weekly, monthly or quarterly). After the findings are presented by the SH committee the company will direct the implementation corrective action.

- ✓ **Suggestion System:**

Safety and health suggestions of the employees help improve the process or make any improvement in the safety system. Since workers know better about their job and the existing potential hazards, without the meaningful participation of workers or their representatives, the management system will be ineffective. In order to make the employee involvement realistic the following fundamental actions have to be systematically and carefully taken.

- ✓ **Encourage workers to report safety and health concerns**

Workers are often best positioned to identify safety and health concerns and program deficiencies, such as emerging workplace hazards, actual incidents and. unsafe conditions. By encouraging reporting and following up punctually on all reports, employers can address issues before any worker gets hurt or becomes ill.

- ✓ **Encourage workers to participate in the program**

By encouraging workers to participate in the program, management signals that it values worker input into safety and health decisions. This principle will be accomplished by acknowledging and providing positive reinforcement to workers who actively participate; and by maintaining an open door that invites workers to talk to managers and make suggestions about safety and health.

- ✓ **Involve workers in all aspects of the program**

Including and valuing workers' input at every phase of health and safety program through implementation benefits committee to successfully identify the presence and causes of workplace hazards, creates a sense of program ownership among workers, enhances workers' understanding of how the program works, and helps sustain the program over time.

- ✓ **Give workers access to safety and health information**

Sharing relevant safety and health information with workers fosters trust and helps companies make more informed of safety and health decisions for continual improvement. Therefore employers are needed to give workers information they may need to understand safety and health hazards in work site.

- ✓ **Remove barriers to participation**

Workers from all levels of the organization must feel that their input is welcome and their voices will be heard in order to participate meaningfully in the safety and health management program. Participation will be suppressed if there is fear of retaliation. Therefore, (1) workers are encouraged and have means to communicate openly with management and report safety and health concerns without fear of retaliation, and (2) any potential barriers or obstacles to worker participation in the program (for example, language, lack of information, or discouragements) have to be removed or addressed.

5.3.2. Organizing

The second basic element of OSHMS is organizing. During the organizing phase, measures and activities which address the establishment of OSH responsibilities and accountabilities structures, a training system, competency definitions, documentation practices and a communication system will be arranged.

I. Responsibility, accountability authority

The contractors have overall responsibility of protecting safety and health of their workers. In addition they should allocate responsibility to each of the worker. The role, responsibility, accountability and authority of all employees who perform duties that are part of the OSHMS shall be clearly defined, documented and communicated to respective employees, which is to be

described in job descriptions, manuals and procedures. The financial and human resources, infrastructure and equipment, technology, information system and the need for training and expertise should be considered while determining the resources required for the program.

II. Competence, training and awareness

In order to effectively implement and maintain the policy, all employees should possess the necessary mental skills physical preparation, and knowledge to work safely. Competence requirement can be defined by authorities or by the employer. The management and employers have the responsibility of demonstrating competence to safety conduct or work supervision by establishing and maintaining strategic arrangements to ensure that all persons are competent to carry out their duties and responsibilities in safety and health aspects.

Though proper and adequate training enables manager, supervisors and workers to manage worksites hazards and prevent workplace accidents, requirement, procedures and arrangements should be appropriate to the company's OSH hazards or risks.

III. OSHMS documentation

The OSHMS documentation is required to be established and maintained with clearly written and presented OSH policy and objectives in way all workers could understood. The OSHMS documentation at least consists of OSHMS manual standard operating procedures, operation controls and work instructions.

IV. Communication

The written OSH policy and document shall be communicated among the top management and workers at each level. Unless it is supported by an effective two-ways flow of information (up and down) across the different sections of the project, the system will not be effective. Therefore, the companies should have a mechanism for receiving, documenting and responding to relevant communication from external community and authorities regarding safety health matters.

5.3.3. Planning and Implementation

I. Initial Review

To gather necessary information for performing gap analysis, employer with competent persons and workers representative will conduct initial review of the workplace. This is basically performed to assure as far as practicable, that all issues of OSHMS are identified so that they can be assessed and prioritized for further measures. In this review, existing applicable national OSH policies, laws and regulations, guidelines will be identified. Then by identifying and anticipating hazards and assessing risks to safety and health, it will be determined that whether planned or existing controls are adequate to eliminate the hazards or control risks.

II. Occupational safety and health objectives

Based on the initial review, in consistent with the OSH policy the company shall develop and document measurable OSH objectives. Clear objectives assist the company in determining what programs and services it needs to offer, so that OSH objectives should be specific to the company and according to its size and nature of activities. These objectives shall be periodically reviewed and communicated to workers and other stakeholders.

III. Hazard Identification Risk Assessment and Risk Control (HIRARC)

Hazard Identification: Hazard identification is the process of identifying hazards in the workplace or for a work procedure. In order to understand what hazard identification involves, it is first necessary understand the nature of hazards. Hazard identification should consider different types of hazards including physical, chemical, biological and psychosocial hazards which are found in the worksites, and provide specific hazard identification tools and techniques that are relevant to the construction activities.

Procedures are put in place to continually identify workplace hazards and evaluate risks. An initial assessment of existing hazards and control measures is followed by periodic inspections and reassessments to identify new hazards. In order to effectively conduct hazard identification, risk assessment, it is important to perform the following activities.

- ✓ **Collect existing information about workplace hazards**

Information from both internal and external sources may already be available from which employers and workers can be aware of workplace hazards.

- ✓ **Inspect the workplace**

Hazards are most commonly introduced over time when work flow and work processes change, equipment/ tools become worn and maintenance is ignored. Notwithstanding, setting time to regularly inspect construction sites for hazards help identify related problems.

- ✓ **Conduct incident investigations**

Workplace incidents, including injuries, illnesses, and reports of accidents, clearly indicate where hazards exist. Hazards that are likely to cause future harm will be identified by thorough investigation of incidents and accident reports. There are generally various causes of incidents, but the purpose of the investigation should always be to identify the "root causes" in order to prevent future occurrence.

- ✓ **Identify hazards associated with emergency and non-routine situations**

Assess and understand the hazards of non-routine or infrequent tasks such as maintenance and shutdown activities to identify foreseeable emergency scenarios. Develop plans and procedures to respond appropriately and safely in such situations.

- ✓ **Characterize nature of hazards, determine and prioritize the hazards control**

The hazards identified and the types of incidents that could result from worker exposure to those hazards are to be assessed and understood. Such information has vital role for determining which controls to implement and for setting priorities for their implementation.

Risk assessment: Risk assessment involves the estimation and evaluation of risks levels taking into account the existing controls. Risk is estimated by taking into consideration the levels of likelihood of an occurrence of a hazardous in specified circumstances and the severity of injury or damage resulted from the hazard. Risk levels for all hazards identified should be ranked to facilitate decision making in risk control.

The likelihood of an occurrence of hazardous event can be classified as (most likely, possible, conceivable, remote and inconceivable), whereas the severity of the damage or injury can be (catastrophic, fatal, serious, minor and negligible).

Hazard Prevention and Risk Control: Appropriate risk control should be established and implemented according to the level of risks identified. Effective controls of workplace hazards generally; prevent injuries, illnesses, and incidents; minimize or eliminate safety and health risks; and help employers provide workers with safe and healthy working conditions. The activities and actions to be carried out help us prevent and control the hazards identified in preceding section of 'hazard identification and assessment.

Employers and workers cooperate to identify and select options for eliminating, preventing, or controlling workplace hazards. In the process of hazard prevention and risk control requires the following four fundamental actions to be carried out step by step.

- ✓ **Identify control options**

At this step the options for controlling each of the identified potential hazards is required to be investigated by experienced personal by using available information. Consult with safety and health experts for complex hazard.

- ✓ **Select controls**

Among the identified options of workplace hazard controls, select the most feasible, effective, and permanent. The serious or potential hazards which are likely to cause death or physical harm are planned to eliminate or control immediately.

- ✓ **Develop and update a hazard control plan**

A hazard control plan is systematic draft that describes the steps to be taken to prevent and control the hazards you identified. An effective plan will address serious hazards first, but its overall goal is to ensure effective long-term hazard control. Track your progress towards completing your control plan and periodically verify that controls remain effective.

- ✓ **Select controls to protect workers during non-routine operations and Emergencies**

Plan to protect workers during non-routine operations and foreseeable emergencies, such as fires and explosions, chemical releases, hazardous material spills, unplanned equipment shutdowns, natural disasters, weather and medical emergencies.

- ✓ **Implement selected controls in the workplace**

Once effective, preventive, reliable control measures are selected, implement them according to the hazard control plan. While there is resource, limitation based on the hazard ranking priority principle established during 'hazard identification and assessment', implement worst-first strategy.

- ✓ **Follow up to confirm effectiveness of controls**

To determine and ensure whether the control measures remain effective, protective, reliable, or less costly to operate; track progress in implementing control, and follow routine preventive maintenance practices once they are installed.

IV. Emergency prevention, preparedness and Fire Rescue Response

A workplace emergency is an unforeseen situation that threatens most workers, customers and the public; shuts down your operations; and causes physical or environmental damage. Emergencies in construction site may be natural or manmade such as fires, toxic gas releases, explosions, earthquake and floods.

Prevention efforts attempt to prevent hazards from developing into disasters altogether, or to reduce the effects of disasters when they occur. An emergency action plan covers designated actions employers and workers must take to ensure employee safety from fire and other emergencies. The emergency action plan should development should involve external services and bodies such as: fire and rescue agency, police, hospitals and local safety and local labor and social affair bureaus etc.

V. Management of change

The management of change addresses OSH concerns and issues associated with the implementation of new processes or modification of existing processes or operations within

the company or changes in legislations or voluntary code of practices outside the organization. The management in consultation with employees should establish standard operating procedures in implementing management of change.

VI. Procurement

The knowledge on all regulatory requirements, code of practices related to acquisition, use, storage and disposal of procured items (materials, machines, equipment and tools) and services entering the project site are essential to understand the potential OSH ramifications they have.

Thus, company should establish a documented procedure for controlling the process of procurement. In order to ensure safety and health requirements for the company is identified, evaluated and incorporated into purchasing and leasing specifications; and national laws and regulations are identified and complied, arrangement including documented procedures of procurement shall be established.

VII. Contracting

There are different types of contractors and they may require specific safety and health arrangements. These are (1) long-term contract employees who provide support on a daily basis for an extended period of time; (2) vendors who provide services on a regular basis, but who may only be on site for short period; and (3) construction work related modifications of the facilities or installation of equipment.

5.3.4. Program Evaluation

Performance monitoring and measurement: Performance monitoring and measurement are important in managing OSH issues in the organization. Monitoring and measurement provide feedback on what is happening so that appropriate actions will be shaped to respond to changing circumstances.

Incident Investigation: The employer/ company should establish, implement and maintain procedures to notify, investigate record, analyze and document all OSH related incidents. All work-related fatalities, injuries, disabilities, ill health, diseases and near misses shall be notified

to the employer and/or relevant authorities in accordance to national laws for it to be investigated by the company.

Control measures are periodically evaluated for effectiveness. Processes are established to monitor program performance, verify program implementation, identify program deficiencies and opportunities for improvement, and take actions necessary to improve the program and overall safety and health performance.

In order to prevent recurrence, the investigation should determine the root causes of all incidents in order to identify: the need for corrective action, opportunities for preventive action and for continual improvement.

Audit: An audit program and procedure should be developed with defining the criteria of auditor competency, the audit scope and methodology, and reporting. It includes an evaluation of the company's OSHMS elements or a sub-element of these, such as OSH policy, employee participation, competence and training, prevention and control measures etc.

Management review: Management review should be carried out by the employer and top management, on a regular basis and can be carried out by meetings or other communication means. Different reviews may address different elements of the overall management review. Ensuring that reports on the overall performance of the OSHMS are presented to employer and top management, for review is the responsibility of management representative.

In general, to effectively achieve the program evaluation and phase, the following basic actions have to be carried out systematically.

- ✓ **Monitor performance and progress**

Verify that the program is implemented, is operating, and then correct the program deficiencies to identify opportunities to improve.

- ✓ **Verify the program implemente and operating**

It is necessary to evaluating the entire program at regularly planned time (at least once a year) to ensure that it operates as intended, effectively controls identified hazard, and drives progress toward established accident prevention goals and objectives.

- ✓ **Correct program deficiencies and identify opportunities to improve**

In any step and phase of the safety and health program, whenever a problem is identified, prompt action is needed to be taken to correct the problem and prevent its reoccurrence.

5.3.5. Action for improvement

Preventive and corrective actions: Based on the results from OSHMS performance monitoring and measurements, OSHMS audits and management reviews, the organization should have effective procedures for preventive and corrective actions. Root causes of nonconformities with National Laws and OSHMS requirements should be analyzed and identified, and potential problems have to be reviewed and appropriate control measures are needed to be decided. These actions should be responded timely relative to the nature and scale of the nonconformity and OSH risk and complete by documenting.

Preventive actions are actions taken to eliminate the underlying (root) cause(s) of the potential nonconformity or potential undesirable situations, in order to prevent occurrence.

Continual Improvement: Arrangements shall be established and maintained for the continual improvement of the relevant elements of the OSHMS. These arrangements for continual improvement may include the following steps.

- ✓ **Analyze continual improvement elements**

Based on the information from the OSH objectives, results of hazard identifications and risk assessments; performance monitoring and measurements; the investigation of work-related fatalities, injuries, disabilities, diseases, ill health and recommendations of audits; outcomes of the management review; changes in national laws and regulations, voluntary programs and collective agreements; as well as the results of employees health protection and promotion programs the elements of continual improvement should be analyzed by competent persons.

- ✓ **Exploring opportunities for improvement**

The opportunities for reduction of the resources, ill health and workplace incident, increase in employee participation, in hazard reporting will be explored to sustain the continual improvement.

- ✓ **Create an action plan and Communicate action plan to the relevant person**

Based on the opportunities then define responsibilities and resources to be made available for implementing the plan.

- ✓ **Monitor implementation plan**

The safety and health processes and performance of the company should be compared with others for benchmarking in order to improve its OSH performance. The results of continual improvement can contribute for better result in minimizing rates of all work-related fatalities, injuries, disabilities, ill health, diseases and near misses. By monitoring the implementation action plan, improvement in the system itself is more comprehensive and can easily understood, even in other respects better than before.

5.4. Coordination and Communication on Multiemployer Worksites

Most employers occasionally have other employer's workers present in their work site. Now a day some construction projects made workers of more than contractors working together or alongside. Some of the workers are employed by the host employer (owner or general contractor) and others by subcontractor or temporary staffing agencies. If contractors never host other employer's workers at their worksite and their workers are not assigned to a worksite controlled by another employer, this principle is not applicable them. However, if they intermittently or frequently operate in multiemployer work environment, this section of the program is important. Workers from both the host and contract employer are informed about the hazards present at the worksite and the hazards that work of the contract employer may create on site. Thus, by taking the unique situations that can arise in such work environment into account, the employers can select and effectively implement those actions provided in this guideline. The above six steps of program implementation are applicable to such condition accordingly. These are management

leadership, worker involvement, hazard identification and assessment, hazard prevention and control, education and training and program evaluation and implementation.

5.5. Conceptual Framework of OSHMS Implementation

The model conceptual implementation framework is given in Fig, 5.1. For the implementation and continual improvement purpose, the occupational safety and health management system (OSHMS) is classified in to five basic elements consist of various activities, strategies and peoples for effective accomplishment. Sub elements of each main element are also shown in the framework for easier understanding.

Note: The brown arrow (in Fig. 5.1) indicates the interaction between each main element of OSHMS, whereas the black arrow represents the systemic interaction between the sub elements respectively

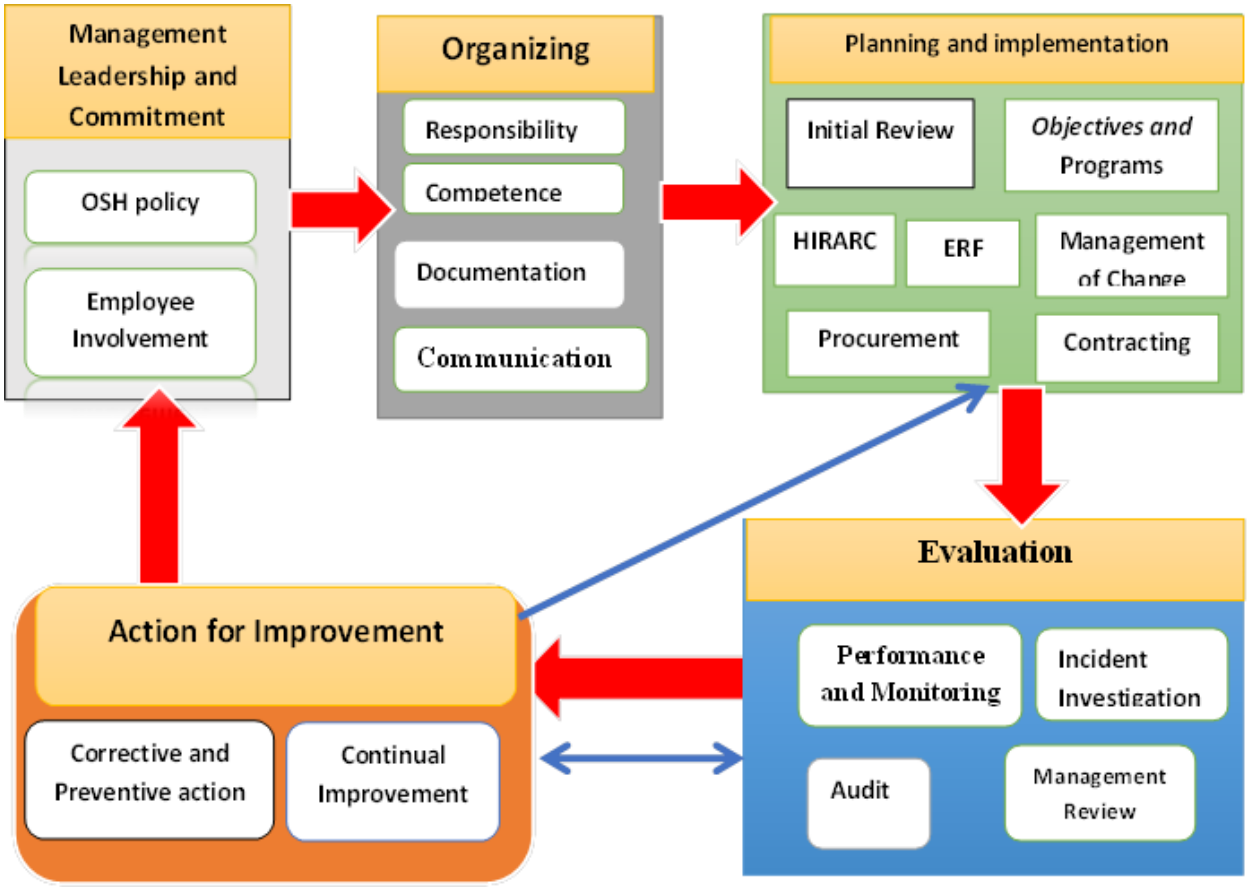


Figure 5.1 Conceptual implementation framework of model OSHMS

Chapter Six

6. Conclusion and Recommendation

6.1. Conclusion

Safety and health in workplace is a vast discipline consists of various aspects in human life which is considered as fundamental for healthier and sustainable life style. As most people spend at least one-third of their times at workplace (either office work or field career), this aspect is attracting the focuses of researchers, In this study the current existing conditions and practices of companies and business centers both at global and national level was attempted to be retrieved using different literature works. Because of these concerns, this study aimed at developing system for managing workplace safety and health and for solving work related hazards and ill health problems in construction sites of construction companies found in Addis Ababa city. For this purpose, relevant data were collected to investigate the safety and health problems and the impact of occupational accidents and ill-health problems in construction workplaces.

For the analysis, total of 580 construction workers are taken as sample respondents for questionnaire survey from 8 contractor/ or construction companies found in Addis Ababa city, the capital of Ethiopia. For triangulation purpose in investigating the reality of the data analyzed from questionnaire survey, interview and construction site observation were carried out. During the construction site observation phase, it is recognized that there is no a system to give adequate orientation about safety rules and safe working strategy for workers; and means of checking out their health status before employment.

As retrieved and presented in analysis part of the study, the findings indicated that most of the safety and health related problems in workplaces construction companies embraced in this study are numerous and complicated by their nature and impact on individual workers, employers and society as a whole. The interviews and discussions with site engineers and management personals have witnessed that workplace safety and health issues did not get the attention of the contractors as prior emphasis given for cost, duration and quality of the project. Also the analysis findings of questionnaire survey illustrated that occupational safety and health matters are not integrated with the vision and mission of the project (cost effective, quality and profitability)

aspects of the companies. As legal consideration companies have strategy for conducting safety and health related issues, but none of the companies implemented the policies. The safety and health program is not adequately communicated to the workers because employees have no awareness about their responsibility in protecting themselves and co-workers on the site. Even though the companies have experience on identification of hazards in work sites when accidents occur, due attention is not given in preventing reoccurrence of the incidents and majority of the contractors have no assigned safety and health personnel, whose job and responsibility is carrying out this duty. These records of the construction companies are not properly arranged so that such data which are relevant and have supportive for analysis purpose. This is reason why risk assessment measures are not regularly conducted.

According to the results obtained from most of the construction companies, adequate orientation and safety equipment (PPE) to new workers before they start job even if the enforcement measure in obeying safe working rules and regulations in construction sites very rare. Regarding the first aid service availability, the existing kit is not equipped with necessary compartments. Information concerning fatal rates and severe accidents and their prevalence are not provided by any of the company, because such information create negative image on the companies.

Based on the findings from the analysis of the questionnaire survey, interview and construction site field observation, poor sanitary and hygienic facilities on the sites, and addictive behavior of the workers, negligence to regularly use PPE, lack work supervision and enforcement procedures for employees to respect and follow safety rules are recognized.

6.2. Recommendation

Based on the conclusions drawn from the data analysis, following recommendations are forwarded to all beneficiary and responsible bodies/ or stakeholders in promoting effective workplace safety and health management practices in construction industry.

- Contractors should have written safety and health policy twhich is effective, reliable and proative. Assigning atleast one safety and health personal at the project site for assessing, identifying and documenting hazards helps sustain the program.
- Project owner and contractors have to provide basic personal protective equipmnet and implement strategy for enforcing the workers to regularly use the safety devices.

- Regular work place hazard analsis and construction materials inspection and giving adequate orientation on ways of performing job safely and about the hazards related to their work activity are vital actions in keeping workplace safer.
- In addittion to ooperative and collaboative program are necessary to integrate all the stakeholder in promoting safety and health practice ineffectively; establiment unique system for all construction companies to take correction measures on workers who fall to follow safety rules and regulations creates
- Collaborative and cooperative strategies and actions from government and other NGOs are requested in order to contribute a lot in promoting safey and health program of eliminating unacceptable act of killing, injuring and harming workers.

6.3. Future Research Direction

In this study it is attempted to investigate the existing practices of industrial sectors specifically the construction companies regarding promotion of safety rules and standards in their construction projects. Finally, based on the results and findings of the study, an approach of improving safety and health challenges (OSHMS) is developed. However, this study never touch every aspect of the project sites and some of the following areas in OSH aspect are indicated as if additional studies were conducted they could come up with better understanding on the issue. These are

- The impact of multi-employer involvement in promoting safety and health in workplace
- The differnce in construction safety and health practice between local and foreign contactors working in local projects
- The effect of workers, place of orgin and liguistic background in safety and health management
- The influence of change in forein currency and cost of construction materials on OSH practice and
- The contractors' commitment and accountability in considering workers with disability

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Appendices

A. List of Construction companies Selected for survey

SN	Company/ Contractors	Company size	Address(sub city)	Contractor Level
1	Teklebermane Ambaye BC	Large	Yeka	General Contractor (GC-1)
2	Yotek Contraction PLC	Large	Kirkos	General Contractor (GC-1)
3	Sunshine Contraction	Large	Kirkos	General Contractor (GC-1)
4	Afro-Tsion Construction PLC	Large	Bole	General Contractor (GC-1)
5	3M Engineering & Construction PLC	Large	Kirkos	General Contractor (GC-2)
6	Africawit Construction PLC	Large	Akaki kaliti	General Contractor (GC-2)
7	MARF Building Contractor	Medium	Yeka	General Contractor (GC-3)
8	Afford General Contractor PLC	Medium	Arada	General Contractor (BC-4)

A. Questions for questionnaire (English Version)

ADDIS ABABA UNIVERSITY

Addis Ababa institute of Technology

School of Mechanical and Industrial Engineering

Post graduate Study (Industrial Engineering stream)

Topic: Occupational Safety and Health Management System Development for Construction Industries in Addis Ababa

Dear respondent please give your response to the following questions as per the university and the researcher want to assure you that the data to be collected will be used for only educational purpose which aimed at developing occupational safety and health management system for construction sites. Your responses will be treated with utmost confidentiality and greater consideration to your rights.

Part I. Demographic background of Respondents

A-Contractor _____ B-Your Job title/position_____

1. **Sex**: Male ☐ Female ☐

2. **Age**: a) below 20yrs b)20-29yrs c) 30-39yrs d) 40-49yrs e) 50 -55yrs f) 56yrs and above
3. **Educational level** a) Illiterate b) elementary (1-8) c) high school (9-12) d) Certificate & Diploma e) BSc/BA degree and above
4. Service time/ experience in this organization? A. less than one year, b. 1-5 years, c. 6-10 yrs, d.above 10 years

5. Your employment condition: Permanent ☐ Contract/ temporary ☐

Part –II Workplace condition and human factors

1. How long do you work per day? A) below 8hrs B 8hrs C) Above 8hrs
2. How many days for rest do you have per week? A) One day B 2days C) Above 2days
3. Did you face any accident related to your work? Yes ☐ No ☐
4. Did you face any occupational diseases at your workplace? Yes ☐ No ☐

Part III. Behavioral characteristics of workers

1. Did you take training related to occupational safety in your current company?

   Yes ☐ No ☐

2. Did you think that your job requires occupational safety and healthy training? Yes ☐ No ☐
3. Is necessary work-equipment available for you at workplace? Yes ☐ No ☐
4. Do you think the work-tools are safe to use? Yes ☐ No ☐

   If work-tools not safe please specify why they seem unsafe? _____

5. Do you use the available personal protective equipment at work? Yes ☐ No ☐
6. Which of the following personal protective equipment (PPE) you use at workplace?

☐ Safety boots ☐ Helmet ☐ Ear plug ☐ Dust mask ☐ Gloves ☐ Goggles ☐ Face shield ☐ complete masonry suit

Others (specify) 1_____2_____3_____

7. If you never use PPE during work explain why you didn't use them.
   - ☐ No PPE available
   - ☐ Lack of awareness in using PPE
   - ☐ PPE are not suitable
   - ☐ Negligence
   - ☐ Discomfort due to weather condition

8. Is there work supervision related to the proper use of safety rules and principles in your worksite?

Yes ☐ No ☐

Occupational accidents and related issues

1. Describe the type of occupational accident you faced and be absent from work.

SN	Item	
1	Abrasion	
2	Burn	
3	Cut	
4	Punctured	
5	Eyes injury	
6	Fracture	
7	Ear injury	
8	Dislocation	
9	Suffocation	
10	Sprain	
11	Wound	
12	Drowning	
13	Others(specify)	

2. What are the main causes of accidents at your work site in last 12 months?

SN	Causes of accidents	Always	Sometimes	Rarely	Not at all
1	Machine				
2	Electricity				
3	Hand tool				
4	Fall, trip and slipping				
5	Collision with machine				
6	Chemical and asbestos				
7	Slides and collapse				
8	Lifting heavy objects				
9	Hit by falling object				
10	Transportation				
11	Splintering objects				
12	Workers' fault				
13	Mishandling				
14	Construction vehicles				
15	Alcohol, chat& cigarette				

3. Which part of your body affected by occupational accidents?

A. Eye ☐
B. Hand ☐
C. Ear ☐
D. Shoulder & neck ☐
E. Fingers ☐

F. Head
G. Toes
H. Leg
K. other, specify _____

IV. Occupational Ill-health problems and related issues

4. Have you been ill/sick at your work place due to any of the following hazards?

SN	Causes/ types of hazards	Yes	No
1	Dust particle/Cement fumes		
2	Stress due to work load		
3	Lack of hygienic and sanitary facilities		
4	Infection diseases biological agents		
5	Standing Work position		
6	Sitting work position		
7	Un safe equipment or machine		
8	Repetitive task		
9	Repetitive motion		
10	Poor lighting		
11	Extreme noise		
12	heavy chemical		
13	Extreme heat		
14	Extreme vibration		

5. The frequency of work related diseases occurrence at you work place

SN	Items	Always	Sometimes	Rarely	Not at all
1	Headache				
2	Dizziness				
3	Vomiting /Nausea				
4	Lung disease				
5	Pain neck & shoulders				
6	Insomnia/sleeplessness				
7	Pain in the joints				
8	Bronchial asthma				
9	Heat stress				
10	Musculoskeletal diseases				
11	Heart beat problem				
12	Skin diseases				
13	Respiratory diseases				
14	Eye problem				
15	Allergic				
16	Back pain				
17	Other(specify)				

6. List some of occupational disease you faced and be absent from work _____
7. How many times did you take sick leave due to occupational accident in a year? _____
8. How many leave days did you taken in a year due to occupational accident? _____

9. How many times you have taken sick leave due to occupational disease in a year?_____
10. How many leave days did you take in year due to these disease? _____
11. Do you get payments for sick leave periods due to accidents and diseases?

Yes ☐ No ☐

Questions to be filled by management personals

A-Contractor _____ B-Your Job title/position_____

1. **Sex**: Male ☐ Female ☐
2. **Age**: a) below 20yrs b)20-29yrs c) 30-39yrs d) 40-49yrs e) 50 -55yrs
3. **Educational level** a) Certificate b) Diploma c) BSc/BA degree and above
4. Please indicate your perception to the extent of the following items of OSH concerns in your company using any symbol you prefer[Strongly agree=SA, Agree=A, Neutral=N, Disagree=D and strongly disagree=SD]

SN	Occupational Safety and Health Related Issues	SA	A	N	D	SD
1	Company has a written Health and Safety Policy					
2	Policy is communicated to all concerned parties in the company					
3	Health and Safety Policy program is found for reporting of workplace risks and hazards					
4	Employees have adequate awareness about their rights and obligations protecting themselves from health hazards					
5	Hazardous jobs are identified and attention is given by the Company					
6	Safety and health meetings involving employees are regularly conducted					
7	Company has authorized personal for monitoring safety and health matters in construction site					
8	Safety and health issues are incorporated into business plan (tendering though constructions)					
9	Recognition is given for employees following safety rules and work in safer way					
10	Clearly visible first aid kit is available with sufficient elements in it					
11	Accidents are constantly recorded and properly kept for analysis					
12	Company has a Safety Representatives for each section of work					
13	Company has a Safety Committee with authority to make decision on safety issues					
14	Company Safety Committee regularly reports accidents records					
15	Safety Committee takes quick measures to accidents reports					
16	The Company gives safety training to employees regularly					
17	Company has a schedule for promoting and awareness creation to the employees					
18	Company regularly conducts construction site risk assessment activities					
19	The safety risk inspection results are documented and communicated					

20	Workers get adequate orientation before starting their job					
21	Company provides and enforces the use of safety equipment (PPE)					
22	Company gives priority for safety as they give priority for profitability					
23	Company allocates budget for occupational S&H related issues					

Please indicate the main challenges to the implementation of safety and health programs in your company.

A. Lack of awareness and negligence

B. lack of legal enforcement procedures

C. None inclusiveness policies and regulations

D. lack of coordination from government

E. high cost of implementation

F. Others (specify if) _____

1) Please indicate the occurrence rate of the following work related illnesses at your work site using any symbol you prefer.

Items	Always	Sometimes	Rarely	Not at all
Headache				
Eye problem(poor vision)				
Vomiting /Nausea				
Neck and shoulders Pain				
Insomnia/sleeplessness				
Pain in the joints				
Respiratory diseases				
Influenza/cold				
Typhoid/Typhus				
Heat stress				
Skin diseases				
Allergic				
Back pain				
Kidney diseases				
Skin dryness				
Infections from biological agents				
Depression				

Questions For interview

1. Does your company have written occupational safety and health police?
2. How do you measure the success of the police?
3. How occupational safety and health affect your company?
4. Which occupational accidents and diseases frequently occur in your company?
5. What are main causes for these safety and health related problems?
6. How much productivity is lost due to these occupational accidents and diseases?
7. What measures does your company take to prevent accidents and health problems?
8. How much loss occurred (in terms of human, material, capital) annually?
9. The company works in collaboration with other organization in promotion safer and healthier and decent work environment?

B. Questions for questionnaire (Amharic Version)

አዲስ አባባ ዩንቨርሲቲ

አዲስ አበባ የቴክኖሎጅ ኢንሲቲቱዩት

መካኒካል እና ኢንዱስትሪያል ምህንድስና ትምህርት ክፍል

የድህረ-ምረቃ ጥናት ትምህርት ፕሮግራም

የጥናቱ ርዕስ፡- የስራ ቦታ ደህንነትና ጤንነት አስዳደር ስርዐት ግንባታ በአዲስ አበባ ከተማ ለሚገኙ የኮንስትራሽን ኢንዱስትሪዎች

መግለጫ -ሀ ፡ በሰራተኛ የሚሞላ መጠይቅ

ዉድ ጥናቱ ተሳታፊ!! በአዲስ አበባ ከተማ ለሚገኙ የኮንስትራሽን ኢንዱስትሪዎች የስራ ቦታ ደህንነትና ጤንነት አስተዳደር ስርዐት ለመገንባት የሚያስፈልጉ ግብአቶችን ለመለየትና ለመተግበር የኮንስትራክሽ ሰራተኞች ሚና ከፍተኛና ተወዳዳሪ የሌለዉ በመሆኑ መጠይቁ ላይ ለመሳተፍ የርሶ ሙሉ ፈቃደኝነት አስፈላጊ ነዉ:: መጠይቁን ለመመለስ የጭረት ምልክት ወይም የሚመቾትን ማንኛዉንም ምልክት መጠቀም ይችላሉ::ይህ መጠይቅ የተፈለገበትም ዋና ዓላማ ለትምህርት የምርምር ስራ ማለትም ለሁለተኛ ዲግሪ (ማስተርስ) ማሟያ ጥናታዊ ጽሁፍ ለማዘጋጀት ብቻ ነዉ:: የሚሠጡት ማንኛዉም ምላሽ በምንም ሁኔታ ምስጥራዊነቱ የተጠበቀ እና ማንኛዉም ምላሽ ትክክልኛም ስህተትም የሚባል የለም:: ስለሆነ የሚሰጡን ገለልተኛና ሚዛናዊ መረጃ ለጥናቱ ታማኝና እዉነተኛ ግብአት የሚሆን እንድሁም ዉጤቱ ለምሪምሩ ስራ ስኬታማነት የሚሰጠዉ ፋይዳ ከፍ ያለ ስለሆነ ጥያቄዎችን ከልቦ እንደሚሞሉልኝ በማመን ዉድ ጊዜዎትን ሰጥተዉ ስለሚሳተፉ ከወዲዉ አመሰግናለሁ!!

ለተጨማሪ መረጃዎች በስልክ፡-251937186701 /በኢ-ሜል masegid78@gmail.com አሰግድ ገ/ማርያም

የድርጅቱ (ኩባንያው) ስም ---------- የስራ ቦታ አድራሻ(ክፍለ ከተማ)----------

አዲስ አባባ፣ ኢትዮጵያ

ክፍል 1

እባኮን የሚከተሉትን ጥየያቄዎች መልስ ይሆናል ያሉትን በማክበብ ይመልሱ

1. .ፆታ: ሀ. ወንድ ለ. ሴት
2. ዕድሜ: ሀ. ከ18 ዓመት በታች ለ.ከ18-29 ዓመት. ሐ. 30-39 ዓመት. መ. 40-49 ዓመት. ሰ. 50 -55ዓመት
3. የትምህርትደረጃሀ. ያልተማረ ለ. አንደኛ ደረጃ (1-8) ክፍል መ. ሁለተኛ ደረጃ (ከ 9-12) ክፍል ሰ. ሰርቲፊኬትና ድፕሎማ ረ. ድግሪና ና ከዚያ በላየ
4. የስራ ቅጥር ሁኔታ፡- ሀ. ቋሚ ለ. ኮንትራት/ጊዜያዊ መ. ሌላ (ካለ ይገለፅ) ----------
5. በድርጅቱ ያለዎት አገልግሎት ዘመን፡ ሀ. ከ1 ዓመት በታች ለ. 1-5 ዓመት መ. 6-10 ዓመት ሠ. ከ 10ዓመት በላይ

ክፍል ሁለት

<u>ስራ ነክ የሆኑ የስራ ቦታ ደህንነትና ጤንነት ሁኔታዎች የተመለከተ</u>

6. በድርጅትዎ ውስጥ የስራ ቦታ ደህንነት እና ጤንነት ግንዛቤ አለዎት? 1. አለኝ 2.የለኝም
7. ከስራዎ ጋር የተያያዘ የስራ ደህንነትና ጤንነት ስልጠና ያስፈልጋል ብሎ ያምናሉ? _____
8. ከድርጅቶ የስራ ቦታ ደህንነትና ጤና አጠባበቅ ጋር የተገናኙ ስልጠናዎችን ወስደዋል? 1. ወስጃለሁ 2.አልወሰድኩም
9. በስራ ቦታዎ ላይ በሚቀጥለው ሰንጠረዥ የተገለፁት የስራ ቦታዉ ሁኔታዎች የምችት ደረጃ ይግለፁ

ተ.ቁ	የስራ(የግንባታ) ቦታ ሁኔታ	በጣም ምቹ	ምቹ	ምቹ አይደለም	በጣም ምቹ አይደለም
1	ከባልደረቦች ጋር መግባባትና መረዳዳት				
2	የስራ ቦታዎች ሙቀትና አየር ሁኔታ				
3	የከባድ ሸክም ማንቀሳቀሻ መሳሪያዎች				
4	ከፍተኛ ድምፅ(ጫጫታና ሁካታ)				
5	የማሽኖች ጥንቃቄ መጠበቂያ				
6	የራስ መከላከያ መሳሪያዎች				
8	ማበረታቻና እዉቅና የመስጠት ልምድ				
9	የኮንስትራሽን ሳይት ደህንነት ሁኔታ				

10. በቀን ለምያህል ጊዜ ይሰራሉ? (በሰዓት) ሀ. ከ8 ሰኣት በታች ለ. 8ሰኣት መ. ከ8ሰኣት በላይ
11. በሳምንት ምን ያህል ቀባትን ያርፋሉ? ሀ. ለ አንድ ቀን ለ. ለሁለትቀናት መ. ከሁለት ቀናት በላይ
12. በስራዎ በሚሰሩበት ጊዜ ከሚከተሉት ውስጥ የሚጠቀማቸው የአደጋ መከላኪያዎች መሳሪያዎች የትኞቹ ናቸው?

ሀ. የደህንነት መነጽር ☐
ለ. የደህንነት ጫማ ☐
ሐ. ራስ መከላከያ ☐
መ. የእጅ ጓንት ☐
ሠ. የመዉደቅ መከላከያ ☐
ረ. የአቧራ መከላከያ ☐
ሸ. የጆሮ መሸፈኛ ☐
ቀ. ሙሉ ልብስ (ቱታ) ☐

13. ከሚከተሉት የኮንስትራከሽን ስራ መሳሪያዎች ሁል ጊዜ ለስራዎ የሚያስፈልጎት እና የሚጠቀሙትን ይግለፁ፡፡
14. በሚከተሉት ሁኔታዎች ምክንያት የተነሳ በስራ ቦታዎ ላይ ለህመም ተዳርገዉ ያውቃሉ?

ተ.ቁ	ምክንያቶች/የአደጋ አይነቶች	አዎ	አይደለም
1	ስምንቶ እና ተያያዥ ብናኞች		
2	በስራ ምክንያት መጨናነቅ		
3	የተሟላ ሽንትቤት አለመኖር		
4	ባዮሎጂካ በሆነ በሽታዎች		
5	ረጅም ጊዜ ቆሞ በመስራት		
6	ምቹ ባልሆነ የስራ መሳሪያዎችና ማሽኖች		
7	ድግግሞሽ ያለበት ስራ በመስራት		
ተ.ቁ	ምክንያቶች/የአደጋ አይነቶች	አዎ	አይደለም
8	ተደጋጋሚ እንቅስቃሴ ማድረግ		

9	ዝቅተኛ (ደብዛዛ) ብርሃን		
10	ከፍተኛ ድምፅ (ሁካታእና ጫጫታ)		
11	በከባድ ኬሚካሎች		
12	ከፍተኛ ሙቀት		
13	ከፍተኛ የመርጉበጉብ (ቫይብሬሽን)		
14	ሌላ(ይገለጽ)-------		

2. በስራ ቦታዎ ላይ ያለብዎትን ችግር ለማቃለል በግልዎ ጥረት አርገዉ ያዉቃሉ? 1. አዎ 2. አላዉቅም

3. ከስራዎ ጋር በተያያዘ ከሚከተሉት ዉስጥ በብዛት ያጋጠሞት ሽታዎች የትኞቹ ናቸው?

ተ.ቁ	የችግሮች/ የጤና እክሎች ዓይነቶች	አዎ	አይደለሁም
1	ጭንቀት		
2	ድብርት		
3	ከፍተኛ የድምፅ መታፈን		
4	ትውከት		
5	የጉበት ብግነት		
6	የሳባ አስም ጉንፋን & ኢንፍሉኤንዛ		
7	የማቅለሽለሽ ስሜት		
8	ታይፎይድ ና ታይፈስ		
9	የእንቅልፍ ማጣት		
10	የቆዳ በሽታ		
11	የመተንፈሻ አካላት ችግር		
12	የአጥንትና ጡንቻ መዛባት		
13	የተቅማጥ በሽታ		
14	የቆዳ ድርቀት		
15	የሳምባ ምች በሽታ		
16	የሳምባ በሽታ		
17	የራስ ምታት		

4. የግንባታ ስራ ቦታዎች(ሳይቶች) ላይ ስራ ነክ በሽታዎች በምን ያህል ጊዜ ዉስጥ ተደጋግሞ እንደሚከሰቱ ይግለጹ፡፡

ተ.ቁ	የበሽታዎች ዝርዝር	ብዙ ጊዜ	አልፎ አልፎ	ከስንት አንድ ጊዜ	ተከስተዉ አያዉቅም
1	የራስ ምታት				
2	ማዞር				
3	ማቅለሽለሽና ትዉከት				
4	የሳምባ በሽታ				
5	የትከሻ እና የአንገት ህመም				
6	የእንቅልፍ ማጣት				
7	የመገጣጠሚያ ህመም				
8	የሳንባ አስም				
9	በሙቀት መታፈን				
10	የጡንቻ እና አጥንት በሽታዎች				
11	የልብ ምት ችግር				
12	የቆዳ በሽታ				
13	የመተንፈሻ አካላት ችግር				
14	የአይን ችግር				
15	አለርጅክ				
16	የጀርባ/የወገብ ህመም				
17	ሌላ (_____)				

5. በስራ ቦታዎ ላይ አደጋ ደርሶበዎት ያውቃል? ከደረሰቦት ከሚከተሉት ዉስጥ የትኛዎቹ ናቸዉ?

ተ.ቁ	የስራ ቦታ አደጋዎች የሚያስከትሉኣቸዉ ችግሮች	ደርሶብኛል	አልደረሰብኝም	መግለጫ
1	መላጥና ቅጥቅጥ			
2	መቃጠል			
3	መቆረጥ			
4	መወጋት			
5	የዓይን ጉዳት			
6	መሰበር			
7	የጆሮ ጉዳት			
8	የሥር መዘር			
9	መታፈን			
10	ውልቃት			
11	መቁሰል			
12	መስጠም			
13	የጀርባ/የወገብ ህመም			
13	የአንገትና የትከሻ ህመም			
14	ሌላ (ካለ ይገለፅ)			

ነ. ባለፉት 2 ዓመታት ውስጥ በስራ ቦታዎ ላይ ለተከሰቱ አደጋዎች የትኞቹ ሁኔታዎች መንስኤዎች ሆነዋል?

ተ.ቁ	ስራ ነክ አደጋ መንስኤዎች ዝርዝር	አደጋ ባደረሱት ላይ ማንኛዉንም ምልክት ያድርጉት
1	በኮንስትራክስን ማሽኖች	
2	የኤሌክትሪክ ንዝረት	
3	ክብደት ነገሮችን መሸከም	
4	መውደቅ፣ መደናቀፍ ና ማዳለጥ	

5	የስራ መሳሪያዎች መጎዳት	
6	ከግዑዝ አካላት ጋር መጋጨት	
7	የኬሚካል እና የዛጉ ብረታ ብረቶች የተነሳ	
8	ብናኝና አቧራ	
9	ከፍተኛ የፀኃይ ብርሃን	
10	ከላይ በሚወድቁ ቁሳቁሶች	
11	በአግባብ ያልተያዙ መሳሪያዎች	
13	ሹል ዕቃዎች	
14	ከፍተኛ ጩኸት(ጫጫታ እና ሁካታ)	
15	አደገኛ የሆነ የኮንስትራክሽ ስራ ቦታ ሁኔታ	
16	ድግሞሽ ያለው ስራና እንቅስቃሴ	
17	ሌላ ካለ ይገለፅ	

2. የትኛው የሰውነትዎ ክፍልዎ አብዛኛዉን ጊዜ ለአደጋ እንደሚጋለጥ ይግለፁ

1. አይን
2. ጥርስ
3. እጅ
4. ጆሮ
5. ጉልበት
6. የእግር ጣት
7. የእጅ ጣት
8. ራስ
9.ክንድ
10. እግር
11. አከርካሪ
13. ደረት
14. ሌላ ካለ

15. በአንድ ዓመት ውስጥ ምን ያህል ጊዜና በአደጋ ምክንያት የስራፈቃድ ወስደዋል? _____
16. በአንድ ዓመት ውስጥ ምን ያህል ቀናትን በአደጋ ምክንያት ከስራዎ ቀርተዋል? _____
15. በአንድ አመት ውስጥ ምን ያህል ጊዜ በህመም ምክንያት የስራ ፈቃድ ወስደዋል?_____
16. በአንድ ዓመት ውስጥ ምን ያህል ቀናትን በህመም ምክንያት ከስራዎ ቀርተዋል? _____

[የዉይይት ቃለ-መጠይቅ ጥያቄዎች]

1. በድርጅትዎ ዉስጥ በተደጋጋሚ የሚከሰቱ አደጋዎች እና ተያያዥዥ በሽታዎች ምንድን ናቸዉ?
2. በድርጅትዎ ዉስጥ አደጋዎች እና በሽታዎች በምን ምክንያት ይከሰታሉ?
3. ስራ ነክ አደጋዎች እና ተያያዝዥ በሽታዎች ድርጅትዎ ላይ ያላቸዉ ተፅእኖ እንዴት ይገልፃሉ?
4. በነዚህ አደጋዎች እና ተያያዝዥ ሽታዎች የተነሳ ድርጅትዎ ምን ያህል የምርታማነት ኪሳራ ይደርስበታል?
5. በስራ ነክ አደጋዎች እና በሽታዎች ምክንያት ድርጅትዎ ምን ያህል ሰራተኞችን በአመት ያጣል?
6. በድርጅትዎ ዉስጥ ሰራተኞች አብዛኛዉን ጊዜ ምን አይነት የራስ መከላከያ መሳሪያዎችን ይጠቀማሉ?
7. በድርጅትዎ የስራ ደህንነት እና ጤንነት ፖሊሲ ስኬታማነቱ እንዴት ይለካል?
8. በድርጅትዎ ዉስጥ ስራ ነክ አደጋዎች እና በሽታዎች ለመከላከል የሚወሰዱ ዘላቂ እርምጃዎችምንድ ናቸዉ?