



**SAINT MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**HEALTH AND SAFETY RISK MANAGEMENT IN BUILDING
CONSTRUCTION: THE CASE OF SUNSHINE CONSTRUCTION.**

BY

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List of Acronyms

ILO	International Labor Office
WHO	World Health Organization
HSE	Health and Safety Executive
PPE	Personal Protective Equipment
E.C	Ethiopian Calendar
B.B	'Bole Beshale'
FIDIC	Federation International Des Ingenieurs-Conseils
OHS	Optimum Health and Safety
HEEPO	Human, Equipment, Environment, Product and Organization
UK	United Kingdom
Fig.	Figure
P.L.C.	Private Limited Company
SSOW	safe system of work
A.A	Addis Ababa
H.O	Health officer
No	Number
H&S	Health &safety
FDRE	Federal Democratic republic of Ethiopia

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Abstract

This research deals with the study of health and safety risk management in building construction in case of sunshine construction projects. The objective of the research were to assess occupational health and safety risk management in construction industry, to measure the level of awareness of employees of the construction industry regarding construction safety program & to identify major factors causing accidents in construction sites .Different literature was assessed to show that health & safety risk management is very important process that helps in making projects successful. Data is collected from progress report, Site observation, questionnaire & interview from sunshine construction company to observe their awareness and how they deal health & safety risk management in building projects. The findings of the research indicated that the standard of safety and health in sunshine construction PLC is very poor. The study shows that companies have no safety officer and safety committee on site and also Safety meetings and trainings are not conducted and also there is poor provision and use of safety equipments (PPE).The study also reveals that most frequent type of accident that occurs at construction sites are working at height, hit falling object, manual handling, dust, & noise are the most critical hazards respectively. Further findings of this study show that Lack of awareness in both workers and project manager, Cost of safety preventing methods, less attention by the company & Time pressure are Major Challenges of Safety and health risk Management. The study recommends Government organizations like the Ministry of Labor and Social Affairs should develop occupational safety rules and regulations and implement legal rights for workers safety.

Key words

Safety risk management, occupational health, safety program, safety officer, Safety committee, safety equipment

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Construction is a vast and an active sector, which is a backbone of the world's economy in general and Ethiopia in particular; mobilizing an enormous amount of various resources and budgets and embracing huge manpower by creating a large job opportunity.

The International Labor Office (ILO) estimates that every year there are some 125 million work related accidents, 220000 of them fatal. According to WHO, 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. Every nine minutes, someone is killed by their job. In 1994, employers reported 6.3million disabling work injuries and 515000cases of occupational diseases. Annually, throughout the world, an estimated 271 million people suffer from work related injuries, and 2 million die from these injuries .Worldwide as it has been estimated in 2005, 250 million occupational injuries and 5.4million deaths due to injuries occurred annually. From this, over 90 percent was in low- and middle income countries where the greatest concentration of world's workforce and low level of factories found.

Although many prevention efforts and intervention programs have been undertaken, it is a known fact that construction workers continue to carry a particularly high risk of sustaining fatal and nonfatal injuries. In most countries throughout the world the construction industry continues to account for a disturbingly high proportion of fatal and nonfatal injuries. The International Labor Organization (ILO) estimates that more than 100,000 construction workers around the world die every year - that is one person every five minutes. Although many prevention efforts and intervention programs have been undertaken .it is a known fact that construction workers continue to carry a particularly high risk of sustaining fatal and nonfatal injuries

Ethiopia is currently enjoying a relatively strong growth in construction activities. The country's booming construction sector is attracting thousands of laborers (Plus News, 2010).

Unfortunately, Ethiopia's construction industry suffers from poor safety and health conditions, even though; the constitution (1995) article 42/2 declared rights of labors to work in a healthy and safe work environment. The framework of the existing occupational safety and health conditions is fragmented and inadequately enforced, making construction sites more hazardous.

The high technology character of the construction industry results in two major impacts on the occupation safety and health of construction workers on site. In the first instance the high levels of technology applied in the machines and process used requires that special precautions must be taken to protect the workers on site. The second major problem, however, is seen in the worker's exposure to a number of materials either associated with the final product or as a part of the manufacturing process for which little may be known about the long-term health effects on the workers of exposure to these materials (Adenuga, Soyingbe and Ajayi, 2007).

Construction Projects are by far liable to safety hazards than any other projects due to its nature; that is,

- Fragmented system of organization
- Physical nature of tasks
- Client and management priority
- Attitudes of employees
- Time and cost pressure
- Contract obligation burden
- High labor turnover

In our country, even though there is no accurate records or researches done, exports forward that construction is the second Hazardous next to transportation. During construction a lot of accidents occur on and around the Sites in relation to both traffic and occupational hazards; i.e.

□ large number of workers suffers a serious problem due to different mechanical injury during the work (occupational hazards).

□ Large number of traffic accidents occurs at detours due to dust and / or mud, which worsen the bad traffic accident trained of Ethiopia and results in:

- Death and injury of people (workers and road users)
- Damage of property (contractor's and road users')

The consequence of these accidents:

□ Pose adverse effect on the cost and time of the project which may contribute a black spot to the overall progress of the project

□ Cause a negative impact on the socio– economic value of the country

In spite of the fact that everyone agrees on the prevalence of the above problems, little Attention is given and no research is done on the minimization and mitigation of accidents.

During construction phase of building projects. Due to this, the problem becomes more and more serious from time to time.

The focus of the thesis is to search out the causes and find appropriate procedures to be manage safety & health risks in building construction.

1.2. Statement of Problem

Recently, Ethiopia's construction industry has experienced considerable growth in construction activities especially in Addis Ababa city. The high rate of urbanization has heightened demand by residential and commercial consumers of Addis Ababa services which has increased the number of construction activities. This is therefore has provided employment opportunities for wide range of laborers, both skilled, and the urban poor who do not have many skills.

The construction industry is an important part of the economy in Ethiopia, often seen as the driver

of economic growth. Typically, in 2002/03-2006/07 the Ethiopia construction industry contributed averagely 5.2% to the national GDP. The contribution of the industry in terms of creating employment has slightly improved over the year. For instance, according to the 2005 of the total employed population in the country (31.4 million), 1.4 percent was estimated to be in the Construction industry. Despite its importance, construction sites have been regarded as very risky areas where Construction workers are subject to fatalities and ill- health problems. Many building construction Activities are inherently risky to health and safety such as working at height, working underground, working in confined spaces and close proximity to falling materials, handling loads manually, handling hazardous substances, noises, dusts, using plant and equipment, fire and exposure to live cables. Moreover permanent disabilities and severe injuries have been on the increase for building workers through major accidents and poor working conditions. This unfortunate scenario has been a monumental threat to the productivity and the overall performance of construction projects as well as diminishing the labor force and the economy of the country. How to reduce the accidents and ill-health problems at construction sites in Ethiopia has been a challenge for a long time. There is very little prior studies conducted in the area of safety in construction industry .The existing few health and safety studies were focused on the manufacturing industries rather than the construction sector. Since health and safety features in different industries are likely to be different. Furthermore the findings of studies conducted in developed countries may not apply to a developing country like Ethiopia due to various factors associated with the level of economic development of the countries. In addition almost all the existing limited studies in Ethiopia focus on identifying factors causing accident in industries. Hence; they did not study occupational health and safety management on building Construction. Therefore, unlike prior researches, this study is aimed at studying occupational health and safety risk management on building Construction.

1.3. Research Questions

This study focuses on the practice employed for health and safety risk management (risk assessment, communication and control) at construction sites in Addis Ababa, Ethiopia. The following are research questions which this study will answer.

1. What is the nature of the health and safety risks in the Ethiopia construction industry?
2. What methods and tools are used for health and safety risk assessment, Communications and control on Ethiopia construction sites?

3. What factors influence and hinder risk assessment, risk control and risk communication on construction site in Ethiopia?

1.4 Objective

General Objective of the Study

The main objective of this study is to assess occupational health and safety risk management in construction industry in Ethiopia to make the environment safe; to make the job safe; and to make worker safety conscious.

Specific Objective of the Study

The specific objectives of this study are:

- To assess the existing occupational health and safety standards, and their implementation in the Construction industry.
- To measure the level of awareness of employees of the construction industry regarding construction safety program.
- To identify major factors causing accidents in construction sites
- To evaluate the effect of accidents on building construction projects and on the society too.
- To identify methods and tools that used for health and safety risk assessment, communications and control on building construction.

1.5. Significance of the Study

This study contributes to the literature of safety and health for other researcher and it serves as a spring board for future researchers in the area. The findings of this study may be utilized by the government to formulate policies on safety and health issues. In addition the construction companies, consultants, worker in construction companies and the general public are among the beneficiaries of the research outcome

1.6. Scope of the study

The study considers death & injuries due to accidents that had been occurred during the budget year of 2008 (September - June) 2008 E.c because it was vast to consider above one year progress report & difficult to find complete progress report.

Only Sunshine construction company were consider for the case study because Sunshine Construction Company is one of the leading companies capable of handling complex and challenging projects ranging from residential, warehouse, office, complex buildings, road and bridge construction. To mention some of the well-known buildings that sunshine has constructed ;Sunshine Building Complex, Ethiopian Leather and Leather products Training Institute, Civil Service College Dormitory, Ethiopian Management Institute, Ethiopian Pilots' Association New Club ,Sunshine Terminal Complex,, Kirkos Market Center ,Ministry of Defense Officers' Apartments, Sululta Depot and etc ..And now have ventured in three projects (Meri Loki CMC-2 Real Estate project, B.B Real Estate Project, Estefan's Marriot Hotel Project) the data were collected from these projects information only

1.7. Definitions of the Key Terms

The field of risk management is faced with difficulties in defining and agreeing on principles. Risks are dealt with differently across different countries, industries and sectors and fields. Terms, definitions and interpretations are as varied as the number of sources providing them. There are no agreed unified definitions of risk, risk analysis, assessment and management. There are often misconceptions. Different terms, for example “risk analysis” and “risk assessment”, are often used interchangeably (Lingard and Rowlinson, 2005).

Health

Health is the general condition of a person in mind, body and spirit, usually meaning to be free from illness, injury or pain. The World Health Organization (WHO) defined health in its broader sense in 1946 as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (WHO, 2006). In this study health means being free from illness, injury or pain which can be caused by construction activities.

Safety

Safety is related to external threats, and the perception of being sheltered from threats. According to the business Dictionary, safety is defined as a relative freedom from danger, risk, or threat of harm, injury, or loss of personnel and/or property, whether caused deliberately or by accident. Safety can also be defined as the control of recognized hazards to achieve an acceptable level of risk. In this study, safety means freedom from danger, harm, and injury to the person involved in construction activities.

Hazards

A hazard is the potential for harm. In practical terms, a hazard is often associated with a condition or activity that, if left uncontrolled, can result in an injury or illness. It also define as any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Basically, a hazard can cause harm or adverse effects (to individuals as health effects or to organizations as loss of property or equipment). In this study hazard mean anything which has the potential to cause harm to people on construction sites.

Risk

Risk has been traditionally defined as a measure of the probability and severity of adverse effects (Haimes, 2009). Rowel (1982) provides that risk is related to hazard whereby risk becomes the hazard level (hazard severity) combined with the likelihood of the hazard leading to hazard consequence. Valsamakis et al (2004) define risk as a variation in actual outcome from the expected one, which implies the presence of uncertainty. The general concept of all definitions of risk provides that risk is a danger of unwanted and unfortunate events. For the purpose of this

study risk is a probability of occurrence (likelihood) of an event and the magnitude of its consequence (Kaplan and Garrick, 1981; Mondarres et al 1999)

Risk= (S, P, C): where S= Scenario leading to hazard

P= Probability of occurrence

C= Consequence (severity)

Accident and Injury

The terms accident and injury refer to separate phenomena, mutually interrelated as cause and effect (exposure and outcome). The terms 'accident' and 'injury' are hereby used in accordance with the definition adopted at the first World Conference on Accident and Injury Prevention (WHO, 1989); that is, an accident is an unintentional event which results or could result in an injury, whereas injury is a collective term for health outcomes from traumatic events. Rejda (1992) defined an accident as a "sudden, unforeseen and unintentional" event, which may result in physical harm to a person and/or damage to a property. The use of the term 'accident' in this thesis is based on an event which causes physical harm or damage to the body resulting from an exchange, usually acute, of mechanical, chemical, thermal, or other environmental energy that exceeds the body's tolerance. An event which has the potential to damage property is not considered in this thesis.

Risk Assessment

The Health and Safety Executive (HSE), (1998) defined risk assessment as a process that identifies the hazards associated with particular activities/tasks, evaluates the effects of exposure to these hazards and implements the measure needed to control the risk of injury/ill health to as low a level as possible. In addition, risk assessment has been defined as a structured process that identifies both the likelihood, and extent, of adverse consequences

Arising from a given activity, facility or system (*Kaplan and Garrick, 1981; Gillett, 1998*). The assessment of risks informs risk control decisions, the implementation of which is monitored and reviewed to ensure that risk is controlled and remains within tolerable limits (*Lingard and*

Rowlinson, 2005). Assessing risks allows someone to prioritize the action to be taken to control them. In other words, risk assessment is about deciding who might be harmed and then judging how likely it is something goes wrong, and how serious the consequences could be (Mondarres et al, 1999) In this study risk assessment is the process that identifies the hazards associated with particular activities/tasks on construction sites, evaluates the effects and estimate hazard of exposure to these hazards.

Risk Communication

Risk communication is an interactive process of exchange of information and opinions among individuals, groups, and institutions, often involving multiple messages about the nature of the risk or expressing concern, opinions or reactions to risk messages or to the legal and institutional arrangements for risk management.

Risk Control

Risk control is a technique that utilizes findings from risk assessments (identifying potential risk factors in a firm's operations, such as technical and non-technical aspects of the business, financial policies, and other policies that may impact the well-being of the firm), and implementing changes to reduce risk in these areas.

Health and Safety Information: A worker who have got any kind of information in-one-year period through any kind of media about health and safety of construction workers

Health and Safety Training: Trainings given to a worker about health and safety to construction workers

Personal Protective Equipment (PPE): Utilization of the worker-specialized clothing or equipment worn by employees for protection against health and safety hazards at the time of interview.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

1 Introduction

Construction Safety: Safety in the context of construction management is defined as the Discipline of preserving the health of those who build, operate, maintain and demolish Engineering works, and of those affected by those work (V.J.DAVIES 1990). These can apply equally to danger of physical injury and to the risk of damage to health over a period of Time.

Construction project threats, health and safety come from myriads of sources. Among these are the physical nature of tasks, the attitudes of employees, the culture of industry, cost and time pressure, uncertain production environment, client and management priorities, onerous contract and fragmented system of organization. It's thus such issues and their management that are tied at the heart of construction accidents.

Generally hazards in construction work can be categorized into

- a) Those that result physical injury or death accidentally (accidents)
- b) Those that result health problems in the long run or after a period of time (health hazards)

2.2 Why Construction Safety Management?

Accident is one of the important factors that play a profound role in the project lifetime and Cost. So, for a good project management, safety should be incorporated. Generally, the need

For safety management comes from:

□ *Economic reason:* an economic minded management pays a greater attention to health and safety management, because each unit of cost invested in the program produces a corresponding accident reduction and increasing return. Analysis shows that investment cost for safety program is always less than unexpected

Costs due to accidents. (National safety council 2nd edition,

□ **Social reason:** accidents may result in permanent bodily impairment of workers and/or others so that they must always live with it and no amount of personal compensation will actually offset the loss. On the other hand, accidents may also result in death of socially important workers and/or others, which affect their

Family in particular and the community in general.

□ **Legislation law:** management must meet legal obligations because now a days many countries and territories have laws and regulations to the employer not only to pay compensation for death and injuries suffered by their workers due to accidents but also to conform to a reasonable standard of safety in their operation.

2.3 Contract and Safety

With increasing frequency, contracts for the construction of public projects include required Safety standards that must be maintained on the job. Internationally used conditions of contracts like FIDIC incorporate safety as one of the contractor's responsibility.

International donors like World Bank also put safety requirements in contracts implemented with their fund. On the other hand labor agreements may also impose contractual safety requirements on the contractor. The National Labor Relations Board has ruled that safety regulations, as an essential part of employees' terms and conditions of employment, are mandatory subjects of bargaining whenever either party places the issue on the bargaining table.

2.4 Safety Related Legislations In Relation To Project Implementation

In the earlier time, it was believed by the management that most work related accidents were caused by the carelessness of the employee himself/herself and that it was the worker's responsibility to avoid accidents. However, the grim loss of life, limb, and livelihood aroused the public consciences and the latter half of the ninth century witnessed a gradual change in the attitude towards work safety.

Nowadays most countries have established legislation and rules in the areas of occupational health and safety. Although standards and codes of safety vary from country to country. Most codes of safety require first aid and protective equipment in the work place. These rules make the employer

and the supervisory personnel responsible for compliance with these codes and standards for suitable safety instruction to the workers. In turn, the employee is required to make use of safeguards provided for his/her protection and to conduct his/her work in conformance with the established safety rules.

2.5 Safety Related Construction Risk and Its Allocation

Risk in context of construction project is defined as occurrence of unforeseen conditions or Events (Jekale, Handout). Construction projects are naturally liable to risk due to their nature.

Some of the risks are related to safety. The management of risk requires both forecasting of risk and its allocation to the contracting parties. Standard condition of contracts (FIDIC, World Bank) sets the allocation of risk in a general manner.

Table-2.1 some of safety related risks and their allocation are shown below based on FIDIC 1987.

Risk type	Risk taker	Clause number
Insurance against accident to Workmen	Contractor	24.1
Interference with traffic and adjoining properties	Contractors	29.1
Occupational safety and Health	Contractors transfer to Insurance	19.1
Third party damage to person & property	Contractors transfer to Insurance	23.1

Risks in the project are unavoidable, but can be minimized by appropriate planning and Remedying. Risk associated with accidents on the construction project is shared among contractor, workers, society and insurance company and presented as follows in table 2.2

<i>Risk taker</i>	<i>In the form of:</i>
Contractor	Indirect cost
Worker	Injury and fatality
Insurance	Compensation insurance and insurance to the work
Society	Social cost

Table-2.2 Risk sharing among parties

2.6 Accidents on Construction Projects

A lot of accidents occur during the implementation of construction projects, which may affect Efficiency of the project.

2.6.1 Causes of Accidents

Generally, accidents may occur due to either unsafe conditions or unsafe acts (American Safety Council, 4th edition, 1973). Unsafe conditions are the presence potential of hazards in Work places, whereas unsafe acts refer to the behavior or culture of workers against the Safety rules and policies. However, these are the two faces of the same coin in the Management of safety.

I. Unsafe Conditions

This is the accident due to high hazardous potential and lack of appropriate safety policy, Procedure and etc.

II. Unsafe Acts/Practices

Recent data even for developed countries, in spite of advanced technology contributing for Safety purpose, show that accident records prevail little improvements. The reason for this is Employees' attitude. Human errors can occur for a whole multitude reasons. For example, people may be:

- Unaware of or underestimate the hazards associated with their work.
- Feel it is “macho” to follow safety procedures such as wearing protective equipment to rationalize risks away.
- believing ‘it will not happen to me’.
- deviating from safety procedures to gain some personal benefits such as getting home earlier, or receiving bonus.
- in the context of intense time and economic pressure typical of construction work, there is high tendency of people to cut corners in the belief that they are acting in the interest of their employer in finishing the job early or on time to avoid penalties.
- Quite simply humans are fallible and make mistakes or behave unpredictably, perhaps due to tiredness or preoccupation with other issue.

Adequate supervision, proper training, providing safety incentives, and building employee moral can minimize accidents due to unsafe acts.

2.6.2 Effects of Accidents on Construction Projects

Accidents claim the lives of people and properties of significant value. Control of losses associated with crashes of vehicles around the construction site and the safety of workers

should be the day-to-day responsibility of all management personnel, just as the responsibility to control other business losses and maintain top-quality performance. A rapid changing and expanding of technology are associated with different accidents with high

Costs, waste and poor quality, which decline the profit of a project; therefore, considering the effects of accidents on the construction project is vital.

I. Costs of Accidents

Accidents cost money-and thus result in less profit and low qualities Project outcome. Money lost because of accidents is not like money spent for material or wages. There is no return on money spent on accidents. Think about how this money is dissipated, everyone can see money for medical expenses and for workmen's compensation (American Safety Council,4th edition, 1973). Although the amounts vary, in no case do any currencies fully compensate an employee for his lost time lost working capacity and his suffering.

Even if a company carries insurance to take care of losses, the company still eventually pays for them. The greater a company's injury experience, the higher are the costs. Medical, compensation and insurance costs are necessary costs of doing business. Insurance premiums, however, do not pay the entire accident bill, what should be realized in that the hidden costs of accidents-those which are not covered by the insurance –can be higher than medical, compensation and insurance costs. Mostly a company accident report shows only a disabling

Injury with first aid treatment and no lost time; but reports to the equipment and loss of production time cost several substantial amount of money. Generally, accident costs include

The following components:

- Damage to plant and equipment
- Loss of productive work time during accidents
- Reduced work rate until normal site working rhythm and morale are restored
- Disruption of work during investigation of the accident

- Legal cost
- Increase in insurance premiums
- Loss of confidence and reputation
- Loss of skilled man power
- Cost to be paid for non-productive period or working below standard for injured employee. In addition to indirect cost imposing on the project, accidents also cause social problems:
- If a permanent bodily impairment is involved, the worker must always live with it and no amount of personnel compensation will actually offset the loss
- Death and disabling injuries have an in coverable effect for the workers family and the whole community.

These costs can be classified as either direct (insured) or indirect (uninsured):

□ **Direct costs:** are costs which include compensation, insurance premiums and in some cases, medical expenses. For example:

- Worker's compensation
- Insurance provided hospital and medical care
- Substance payments, and
- Rehabilitation and other benefits by law injured workers and their families are the major direct cost components

□ **Indirect costs:** these are costs, which are more difficult to determine; but are estimated by national safety council to about equal to (and some times higher than) the insured costs. And these costs include the following:

1) Production losses that arise from partial or complete shutdown due to:

- a) Damage of materials, equipment or production area
- b) Emotional upset and lowered employee morale which tends to lower the production
- c) Increased tension resulting in an increase of materials spoiled pieces rejected
- d) Replacement employee(s) who produce less while being trained to fill injured worker's job

2) Time lost by supervisors due to:

- a) Assisting injured employee
- b) Investigating the accident
- c) Preparing accident report
- d) Hiring and training new employee(s)
- e) Attending hearings conducted by the court

3) Time lost by co-workers of injured employees:

- a) In aiding injured person(s)
- b) Because of curiosity
- c) Because of sympathy

4) Other losses:

- a) Loss of business because of late deliveries
- b) Loss of goodwill and prestige
- c) Grievances, cost of impairment of employer-employee relationship

I. Accident and Efficiency

All accidents reduce efficiency and effectiveness. They are, furthermore, symptoms that something is wrong. Because accidents stem from lack of control over men, materials, Processes and environment, lack of control will inevitably detract from an efficient and Effective operation (American Safety Council, 4th edition, 1973).

A good production person likes to operate on schedule. He/she wants to know that he/she has an available person to handle each job. He /she want to know each day how close each job is to completion. Efficient production demands effective planning. To accomplish this, the Manager needs to know what he/she is going to do next. He/she needs time for improving Methods and time for figuring out other tasks. An accident adversely affects the operation of a system. It is never “scheduled” and often happens at the most inconvenient time. It may knock out one of the best producers, or damage key equipment. At the very least, it is sure to pull the supervisor away from his/her regular responsibility-not only to take care of the injured person, but also to arrange for a temporary (and sometimes permanent) replacement. If equipment has been damaged, repairs

Or replacement must be scheduled. So, other production or department may be affected. Thus, the damaged equipment has to be repaired or scrapped before adversely affecting the delivery Dates. When any of these results occur, the supervisor realizes the importance of an effective safety Program. It is not just an accident that causes trouble, but a series of little accidents can keep A department or even a company in state of inefficiency.

II. Accidents and Morale

A military general once defined morale as “the belief by everyone that his regiment is the Best in the army, that his company is the best in the regiment, and that he is the best in Regiment, and that he is the best man in the company.”(American Safety Council, 4th edition, 1973).No soldier, however, can feel that way if his leader makes frequent mistakes. Similarly, neither can a worker have feeling about his/her job if his department has a high accident rate. A high injury rate depresses employee morale. Unsafe plant conditions contribute to Accidents, and lead to lowered morale and poor job performance. A serious accident makes everyone nervous,

sometimes fearful. Repeated accidents make employees feel their Company doesn't care about them, or feel that their supervisor is not on top of his job. They Lose confidence and interest in doing their job well. An outstanding safety record, on the other hand, contributes to real pride and enthusiasm, just like an outstanding production record does. Employees develop loyalty to their company and a sense of a job security. Good morale is worth more than money in the bank.

III. Accidents and Public Relations

Building a good reputation in the community is second only to building a good reputation among employees. The entire community notices a good safety record. A company gets to be known as "a good place to work." Management values this kind of reputation and thinks well of supervisor who helps gain it. Bad accidents too, are reported to the community, and Damage a company reputation (American Safety Council, 4th edition, 1973). Every employee, every activity, every facility of a company contributes to the overall feeling that persons outside a company have about that company. These are true public relations. Prevention of accidents, therefore, must not be a sideline, followed when there is time or when it is convenient. Accident prevention is part of business-it pays off in good public relations and image.

IV. Accidents and Insurance Premium

Even though premium rates for compensation insurance vary from country to country, the

Basic criteria to set the rate depend on

- Accident occurrence
- Type of work and
- Accident history

Based on some insurance policies, workmen's compensation insurance is sold on retrospective Bases under which the final premium that the contractor pays is adjusted up or down According to his accident experience. When the retrospective rating plan is used, the Contractor pays his regular compensation premium rates during the lifetime of the policy.

Some period after the expiration of the policy (usually 1 year), the insurance carrier evaluates the contractor's loss under the policy. The premium is then adjusted up or down depending

On the contractor's experience of loss due to accident. The contractor receiving a rebate if his Loss is low, and pays additional if his accident loss is high but the maximum and minimum Premium is set in the policy. Based on this policy, the premium is directly proportional to Accident.

2.7 Safety Program

Safety program is an integrated component of operation in any construction company. The Organizational structure and policies depend from company to company. But any safety Program must receive the full support of the entire organization, beginning with the top Management and continuing down through the ranks to include the project superintendents, Foremen and workers. It is the responsibility of management to inaugurate the program and to contribute the continuing support necessary to keep the operation effectively (Martin

Loosen, 1st edition, 2003). Even though, the scope differs, any typical safety program should incorporate at least the Following.

- Managerial leadership to assume responsibility and declare policy.
- Assignment of responsibility to operating officials, safety directors and Supervisors.
- Inspection and maintenance of safe working condition.
- Establishment of appropriate safety training.
- An accident recording system for analysis of future planning (including injury Reports, measurement of result, corrective action and follow up).
- Medical and first aid system (including pre-placement examination, treatment of injuries, first aid services, periodic health examination).
- Acceptance of personal responsibilities by employees for training and maintenance of interest.
- Two-way communication

2.8 Optimum Investment of Safety Program

Unquestionably accidents result in cost. Safety programs cannot be run without cost. So how Much a construction company should invest to a reasonable return? The answer can be obtained by detail analysis of accident cost verses cost of safety program. As mentioned earlier accident cost can be categorized in to insurable (direct) none insurable

(Indirect). Direct costs include

- Property damage
- Compensation cost.
- Medical cost.
- None insurable cost includes:
 - Process interruption.
 - Diminished employee morale.
 - Industrial relation problem.
 - Poor corporate image.
 - Reduction of productivity.
 - Additional administration time.
 - Replacement and retraining cost etc

Alarming studies show that insurable cost is always less than none insurable one in any accident (Martin Loosen, 1st edition, 2003). Based on Health and Safety Executive (HSE) in

London (1993) study typical ratio of insurable cost to none insurable one in any accident is 1:11. This highlights the sever resource implication for companies with poor safety records and the hidden nature of the cost, which is probably the reason why many companies fail to make safety a high priority. If

so, how much a construction company should invest on Optimum Health and Safety (OHS) program? This needs some analysis. From purely economic point of view, this depends up on the level of risk they take, which in turn depends up on the type of work they undertake, the effectiveness of their safety program systems and work culture. Unquestionably, the more risky the situation, the greater the investment justified. The key point is there that each unit of

Currency invested for OHS produces a corresponding reduction in accidents cost, making it possible to identify an optimum point beyond which investments produces diminishing return. This situation is shown as figure below:

However, such rational approach to safety and health is both ethically and economically questionable. Ethically, for example, it is difficult to place an economic value on people health, and in safety terms there is no such thing as tolerable risk. Economically, it may be questionable because the cost of work-related accidents are shared between employer, workers and community but the rational approach considers the cost of employer which would mean insufficient to cover total OHS problem costs. It is also possible to say that

Accidents can produce social problems both on community and employee that can't be expressed in terms terms of money, which makes the proportions of the employer cost incomparable. Therefore, a socially responsible construction company will seek to reduce risk below the equilibrium (optimum) level and invests in a higher level. But, for planning purposes, it is the reference frame of management decision.

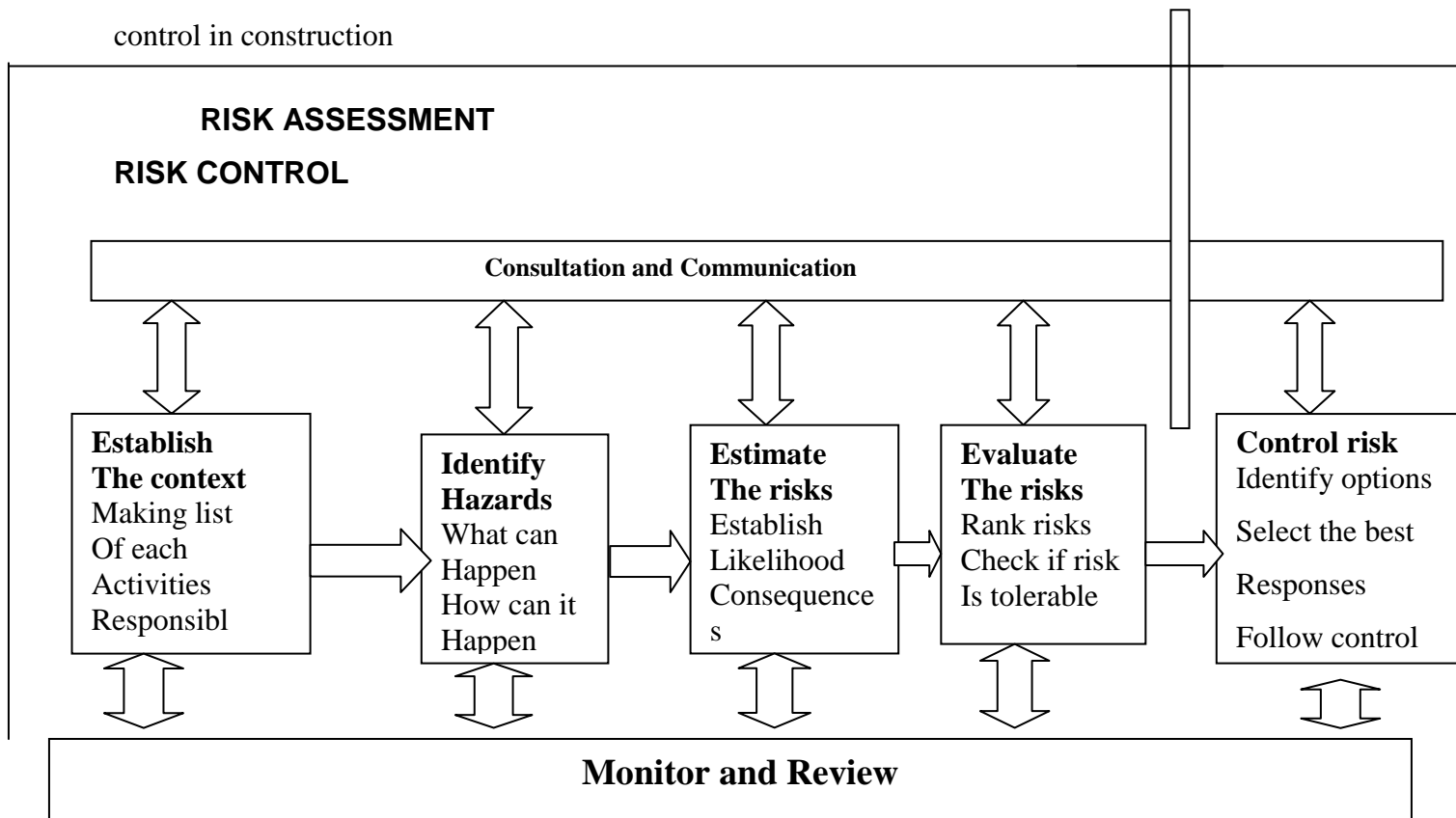
2.9 Risk Management System

There are no fixed rules about how occupational health and safety risk assessment, communication and control should occur. However, there are some general principles that should be followed. Several researchers have developed risk assessment methodologies to suit their requirements (HSE, 2004; Lingard and Rowlinson, 2005; Huges and Ferret, 2011).However,

regardless of the differences in approaches or industries, most of the risk Assessment methodologies are similar in terms of basic principles and contain the key components described in Figure 2.3 that include work analysis, hazard identification, risk estimation and risk evaluation. Some risk assessment

methodologies include risk control as part of risk assessment, but this study considers that risk control is a separate part from risk assessment. The complexity of risk assessment, risk communication and risk control depends to a major extent on factors such as the size of the organization, the workplace situations within the organization, and the nature, complexity, and significance of the risks to which the organization is exposed (Rwamamara, 2007). However it has been argued that, it is critical that risk should be assessed at every stage in the life of a construction project, and that the input of key stakeholders and project participants is sought (HSE, 2004; Lingard and Rowlinson, 2005). These authors further state that, involving designers in health and safety risk assessment exercises can provide opportunities to “design out” features of a building or structure that pose a threat to health and safety of crews during the construction phase. In the same vein, Rwamamara (2007) commented that an effective risk management process should be managed by a cross-disciplinary team, and be supported by free and open communication and consultation between the project stakeholders.

Figure 2.1 presents risk management system focusing on risk assessment, risk communication and risk control in construction



Identifying the risk, estimating the risk, evaluating the risk and controlling/responding to the risk. Assessing risk is a step-wise process consisting of interrelated but distinct phases. Thus the context must be established first before the hazard is identified. The same is true for estimation of the risk stage, in that it cannot start until finishing identification of the hazard stage. Figure 2.1 also indicates that risk assessment, risk communication and risk control is not a linear process that is undertaken once. It is cyclical in nature where at each stage there is Communication, monitoring and a review of the process. The cyclical nature is particularly important in the constantly changing construction environment, in which new or emergent risks must often be assessed, and the changing construction environment in which new or emergent risks must often be assessed and controlled. The following sections discuss the details of each stage of management.

2.10 Hazard Identification.

Having established the tasks the assessor(s) must then identify what hazards are present, who might be harmed and how. Hazard identification is aimed at determining potential risks associated with any given assignment to be performed by an employee. In addition, it involves identification of locations and processes associated with the risk, as well as employees who are exposed, or people who might be exposed to it such as visitors, employees or contractors. It has been argued that risk identification is the most important stage of the risk assessment (Carter and Smith, 2006). In risk identification “HEEPO, which stands for Human, Equipment, Environment, Product and Organization” has been used (Carter and Smith, 2006; Huges and Ferret, 2011). Thus hazard identification should consider hazards associated with humans, such as hazards from equipment, hazards from the work

Environment, for example, the condition of the site, hazards from the product such as the design and specification of the materials, hazards from the organization such as management styles and leadership. According to HSE (2004), it is emphasized that the process of hazard identification should encompass the whole work system. The process of hazard identification is based on direct observation of the site and all available hazard data, as well as observations made on the walk-through survey. Detailed information on equipment and raw materials, systems of work and human factors should be available, together with a sketch of the working area. There are

a number of tools and techniques for identifying the health and safety hazard which have been categorized in three groups as: intuitive, inductive or deductive. However, generally, the methods include brainstorming, expert opinion, structured interviews, questionnaires, checklists, historical data, previous experience, testing and modeling and Evaluation of other projects (Simu, 2007, Carter and Smith, 2006; Lingard and Rowlinson,2005). Empirical studies of risk management practice show that checklists and brainstorming are the most usable techniques for identifying hazard (Simu, 2007, Lyons and Skitmore 2004,Lingard and Rowlinson, 2005; Huges and Ferret, 2011).

2.11 Risk Estimation and Characterization

In this step of the process, risks are estimated from the hazards identified in the preceding stage. The consideration is made concerning how many people are exposed to each hazard and for how long. Thus, the probability and severity of harm that can be caused by a hazard is considered. To establish the probability and severity of harm, it has been argued that the estimator should have an appreciation of the flow of the typical workday activities of

Construction activities. Meanwhile, knowledge of the regulations and safety standards under which the facility operates is also important, as some of the regulations provide guidelines on how risk should be assessed and some potential hazards which may be encounter at construction sites. Furthermore, experience is also important as some expert judgment may be required to estimate risk (Lingard and Rowlinson 2005).Based on the methods used to determine or estimate probability and severity, it has been argued that they are divided into qualitative terms, quantitative terms and semi-quantitative terms (Ayyubu, 2003; Lingard and Rowlinson, 2005; Huges and Ferret, 2011). Qualitative estimate uses descriptive terms to define the likelihood and consequences of risk events. The

Process relies on an individual's collective judgment in assessing the magnitude of the risks considered, which often uses risk identification terms of low, medium or high

2.12 Risk evaluation

The purpose of risk evaluations is to decide whether or not a risk is tolerable (Lingard and Rawlinson, 2005; Huges and Ferret, 2011). If the risk is regarded as unacceptable different risk reduction options have to be analyzed and compared so that the best risk reduction option can be identified. The evaluating stage of the

Risk-assessment process involves assessing the team making decisions on the most appropriate risk control strategies. Once a level has been established for the risk estimated; the levels are compared with previously established risk criteria to create a prioritized list of risks to be controlled. It may become an important task to identify and select the relevant specific risk criteria for specific estimated risks in a specific country and/or industry. Selecting risk criteria

may also depend on the results of the risk analysis and how risks are estimated. There are different principles described in the literature for evaluating risk and it is important that the principle used is openly communicated and accepted by the stakeholders involved. The evaluation principles form the basis for defining risk tolerability (Barnard, 2005).

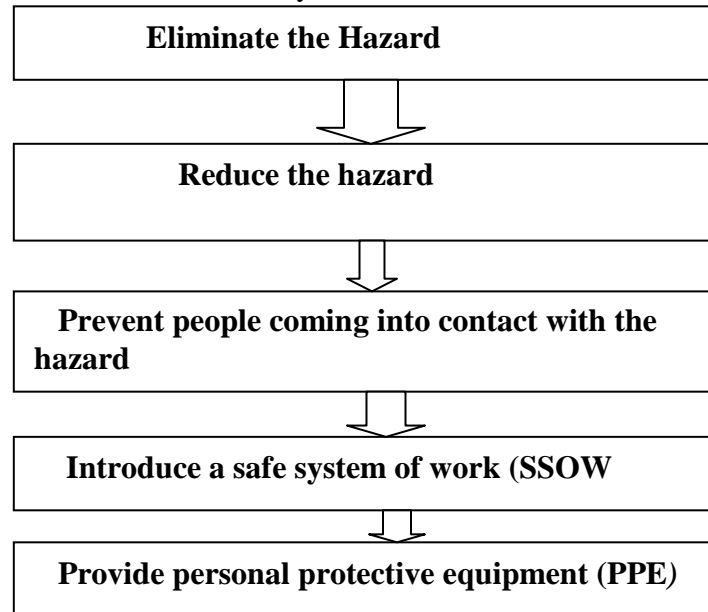
2.13 Risk control

A control measure is part of a facility, including any system, procedure, process or device that is intended to eliminate hazards, prevent hazardous incidents from occurring or reduce the severity of consequences of any incident that does occur (Lingard and Rowlinson, 2005.) Control measures may be proactive, in that they eliminate, prevent or reduce the likelihood of incidents, or they may be reactive, in that they reduce the consequences of incidents (Huges and Ferret, 2011) The information on control measures can be obtained from Codes of practice, Industry or trade associations, specialists, and other publications including those of manufacturers and suppliers. In the occupational health and safety context, risk control is categorized according

To hierarchy, often simply called the “risk control hierarchy.” This hierarchy helps people to decide on which risk control to implement. Risk control options at the top of the hierarchy are preferred more than those at the bottom of the hierarchy. The preferred options are the most effective means of controlling risks because they are much less reliant on people to do something

and they can protect a larger number of people. Therefore, control measures should be considered and adopted in the order presented.

Figure 2.2 represents the risk control Hierarchy.



The first stage is elimination of the hazard. At this stage hazard is totally eliminated. For example, the mechanization of tasks to remove manual handling or closing a road to traffic when repairing a road are the most effective and preferred ways of controlling a risk because the hazard is no longer present. However, it is difficult to eliminate all unsafe conditions, and therefore elimination is not always possible (Marhavilas and Koulouriotis, 2008). The second stage is reducing the hazard or making a substitution. At this stage the risk is controlled by reducing it or substituting it with lesser hazards, such as using less toxic paint or carrying a lighter load when handling manually. The third stage is isolation where risks are combated at source and access to the hazard is prevented, such as guarding machinery or installing barriers and fences, and installing edge protection to open edges on landings, stairways and fixed platforms, sound enclosures and circuit breakers. The fourth stage is introducing a safe system of work (SSOW). This stage uses information such as written procedures and safe systems of work, instruction, training and supervision. It ensures that employees understand what they must do and when, how they must do it and what activities are prohibited. These are work practices that alter the way the work is done in order to reduce the risk of hazardous tasks. Providing personal protective equipment (PPE) is the last stage in the Risk control hierarchy. It has been argued that

PPE should be opted only as the last resort and only after all other measures have been implemented (HSE, 1999; Huges and Ferret, 2011).

2.14 Consultation and Communication

Consultation and communication is both a key component of the risk management process and a major beneficial side effect. Risk management decision makers have both legal and moral responsibility to provide information to people exposed to risks. Successful risk management relies on achieving a high level of creative input and involving all parties in achieving a successful outcome of the project or business process being addressed. According to Hampel, (2006) risk communication is not a task where bits of information are transported

from the sender to the recipient of the communication but a process, where both sender and recipient interact in order to develop a common frame for an understanding of the problem. In both the planning and execution of the risk management process, it is essential to ensure that all those who need to be involved are given an adequate opportunity to do so and are kept informed of developments in arriving at an understanding of the risks and the measures taken

to deal with them. One important part of risk communication is how to present the risk information. Slovic (2001) pointed out that different ways of presenting the same risk information can lead to different evaluations and decisions, even though they are logically equivalent. Risk research has shown that the basic understanding of risks differs within societies. The fact that people's perception of risk differs is one of the reasons why risk communication is complicated. According to Bohrmann (2000), effective communication depends greatly on

the characteristics of the messages distributed, the conveying authority, the receiving audiences and the context in which the communication process occurs. This communication must be understandable by the audience and may require the use of photographs, diagrams or a translator on construction sites different tools can be used to send information, such as Induction training, hand books, team briefings, tool box talks, supervision meetings or other Management meetings, specific or general instruction or training sessions and hands-on Training (HSE, 2010). People in interaction with each other tend to communicate in different Ways, either formally or informally Bohrmann (2000). Formal communication is Communication that is spontaneous, structured,

interactive and rich, conveyed through Communication channels while informal communication is interaction between individuals without rules, or hierarchy.

2.15 Safety in Building construction projects

A construction in simple words is a process of constructing something by human for one purpose or another. It may be a road, bridge, a dam, a private residence, an airport, a commercial building, etc. According to Wikipedia, construction is a process that consists of the building or assembling of infrastructure. Construction is the recruitment and utilization of capital, specialized personnel, materials, and equipment on a specific site in accordance with drawings, specifications, and contract documents prepared to serve the purposes of a client. According to Moavenzdadeh F. (1976), construction contributes to the economic development of any country by satisfying some of the basic objectives of development including output generation, employment creation and income generation and re distribution; it also plays a major role in satisfying basic physical and social needs, including the production of shelter, infrastructure and consumer goods.

Wikipedia, the free encyclopedia, defines building construction as the process of adding structure with walls to real property or construction of buildings. It further discusses that if this buildings are not designed and constructed by professionals they might lead to undesirable results such as structural collapse.

Various researchers have divided health and safety hazards into two categories, namely the physical injury hazards and the Ill-health hazards. Hazard of physical injury include death consequences. Hazard of ill-health can only be notified after a long period and shall cause sickness or death after a certain period of time. Listed below are just a few of the main hazards that are encountered on a typical construction site:

2.15.1 Height

The main hazards associated with working at height are people and objects falling onto people below. Falls from height have been viewed as the one of the most frequent killers of the workers on construction sites. Statistics indicate that nearly 1,000 construction workers are killed each

year at their work places. Of these, one-third or over 300 deaths are a result of construction site falls.

The study from different countries for example, New Zealand, indicates that, falls from heights are the leading cause of occupational injuries on construction sites. In China's construction industry, falls account for approximately 51% of injuries. In Hong Kong, work-related falls from heights represented more than 47% of all fatal incidents. In Taiwan more than 30% of fatalities can be attributed to falls.

As a result, falls are the most costly occupational hazard in many countries. Common construction site falls include roof-related falls, crane falls, scaffolding falls, elevator shaft falls, falls resulting from holes in flooring, and falling objects. These may occur as a result of inadequate edge protection, or from objects in storage being poorly secured. Workers at risk of falling from a height include painters, masons, decorators and window cleaners and those who undertake one-off jobs without proper training, planning or equipment

2.15.2 Slips and Trips

Slips and trips are seen as the most common workplace hazards and contribute to over a third of all major injuries. They occur in almost all workplaces and 95 % of major slips result in broken bones. According to statistics from the Health and Safety Executive (HSE), slips and trips are the single most common cause of injuries at work, and account for over a third of all major work injuries (HSE, 1998). They cost employers over £512m a year in lost production and other costs and account for over half of all reported injuries to members of the public.

The study done by Lipscomb et al (2008) on the USA revealed that slips account for 18% of all injuries and 25% of workers' compensation payments. Slips contributed to 85% of falls on the same level and over 30% of falls from height as well as a significant number of musculoskeletal injuries sustained after slipping. They can also be the initial cause of a range of other types of accidents, such as falls from

Heights. Slips and trips are caused when materials are scattered everywhere haphazardly, the floor is wet or greasy, inappropriate footwear is worn, mainly by casual employees and visitors, something large or heavy is being carried, reducing one's balance, and when the lighting is poor.

2.15.3 Equipment, Machinery, Tools and Transport

Vehicles are necessary for transporting goods and people. However, many people die and are injured due to being struck and crushed by equipment and machinery at construction sites, especially by reversing machinery, site machinery falling in the excavation area, machines overturning due to travelling down a steep slope, and material falling from construction equipment especially haulage trucks, hitting people behind it or nearby. Crush injuries can have a wide range of serious effects, including fractures, internal injuries, head and brain injuries, and back injuries. In some cases, a crush injury may result in amputation and permanent disability of the affected worker.

Meanwhile, many people are injured due to being chopped and cuts by equipment and hand –held working tools such as chisels, screwdrivers, knives, saws, hammers, nails and drilling machines. The greatest hazards posed by hand tools results from misused and improper maintenance.

2.15.4 Electricity

Electricity is widely used on construction sites but has the potential to be very hazardous with possible fatal results. Someone coming into contact with a live electrical conductor will get a shock that may lead to injuries or even death. In the UK, for example, 2% of all fatalities at work are caused by electric shocks. Most injuries and deaths from electricity are due to, using poorly maintained electrical equipment, working near overhead high tension lines or domestic electricity supplies, contact with underground power cables during excavation work and working without appropriate safety gear. There are also a growing number of electrocutions involving workers who are not qualified electricians but who are carrying electrical work, such as plumbers and joiners and decorators.

2.15.5 Fire

Fire is one of the many hazards that construction workers could face on site. Although fire hazards are not seen as such as a high risk compared with falling from a height and slipping, tripping and falling, fire hazards need to be considered at all stages of the building process. Every year on many construction sites, workers are killed or injured as a result of fire. There are about 400 construction fires annually in United Kingdom (UK) and about 100 of them cause over £50,000 worth of damage and can result in the incomplete dislocation of the project schedule. Fires on site are caused by braising work carried out by plumbers, gas lines for underground work, power lines, power leads and tools, machinery requiring petrol and diesel, and hazardous chemicals.

2.15.6 Manual Handling

Manual handling is defined as the movement of a load by human effort alone. It can include any activity requiring the use of force exerted by a person to lift, push, pull, carry or otherwise move or restrain any moving or stationary object. It has been argued that lifting bricks, cement blocks and cement bags weighing 50 kilos has been regarded as risky activities on construction sites. Back injuries and emasculatory disorders, sciatica, hernias and slipped discs are often the most serious of construction site injuries. In the study by Smallwood (2008) it was revealed that in construction, 25% of injuries are back injuries. Almost 30% of all construction workers complain of back pain that requires over thirty days off. The average number of days of work missed by a construction worker is higher than in other fields of employment.

2.15.7. Noise

Occupational noise-induced hearing loss is defined as hearing impairment arising from exposure to excessive noise at work, which is also commonly known as industrial deafness the NOHSC National Code of Practice (2004). Exposure to hazardous noise levels is so widespread as to be routine, and occupational deafness is very common among building workers. Some activities on construction sites are notoriously noisy, for example, rock breaking during demolition work or the operation of a jack hammer. The use of vibrating wacker plates, electric tools, explosive powered nail guns and vibrators during concrete pours; all cause specific noise problems for the

operators and workers in the vicinity in relation to maintaining their hearing ability. Noise comes from the operation of plant, machinery and power tools, the movement of vehicles and deliveries of materials.

2.15.8 Chemicals Substances:

Construction activities involve using chemicals which pose health and safety risks to workers. For example solvents of many different kinds are used in paints, varnishes, pesticides used to treat timber, bonding agents, lacquers and adhesives (HSE, 1998). At the construction site, workers might be exposed to chemicals by breathing them in, ingestion and absorption through the eyes or skin. Chemicals at work sites can cause headaches, eye irritation, dizziness, faintness, sleepiness and affect judgment and coordination. They can damage to the central nervous system and can harm the skin, liver, kidneys and cardiovascular system. Some solvents increase the likelihood of cancer.

Solvents can also cause reproductive problems. They can reduce fertility and cause birth defects and miscarriages. Some paints and varnishes, bonding agents and resins, can cause asthma and dermatitis. Welding fumes – which may include a cocktail of metal fumes, can cause serious health problems in the long term. The respiratory system is affected and, as chemicals are absorbed, they can slowly affect the brain and internal organs.

2.15.9 Dust:

Dust is a common hazard on roads and building works at many sites. The health risks associated with a dusty jobs depend on the type of dust (physical, chemical and mineralogical), which will determine its toxicological properties, and hence the resulting health effect; and the exposure, which determines the dose. If dust is released into the atmosphere, there is a good chance that someone will be exposed to it and inhale it. If the dust is harmful, there is a chance that someone will suffer an adverse health effect, which may range from some minor impairment to irreversible disease and even life-threatening conditions. There are higher death rates from respiratory disease and from lung and stomach cancers in dusty trades. At construction sites cement, silica and wood dust and dust from medium-density fiber board poses particular risks.

2.15.10 Hand Arm Vibration Syndrome

Hand arm vibration syndrome, or ‘blue finger’ as it is commonly referred to, is a painful and debilitating industrial disease of the blood vessels, nerves and joints, triggered by prolonged use of vibratory power tools and ground working equipment.

This industrial disease is frequently cited in compensation claim cases opened by ex-construction workers who worked for years with little or no protection, using inappropriate and poorly maintained equipment.

2.15.11 Material & Manual Handling

Materials and equipment is being constantly lifted and moved around on a construction site, whether manually or by the use of lifting equipment. Different trades will involve greater demands, but all may involve some degree of risk.

Where employee’s duties involve manual handling, then adequate training must be carried out. Where lifting equipment is used, then adequate training must also be carried out, but may involve some form of test, to confirm competency. Records of training must be maintained for verification.

2.15.12 Collapse

Not exactly a hazard, more a risk – an accident in waiting.

Every year excavations and trenches collapse bury and seriously injure people working in them – precautions need to be planned before the work starts.

The risk of an unintended collapse is generally more associated with demolition works or when a partially completed building or scaffolding collapses, but still accounts for a percentage of fatalities each year.

2.15.13 Asbestos

Today there is a new generation of construction workers, including; joiners, electricians and plumbers for whom asbestos is seen as a historical problem, something from the past that's now long gone...but that is a mistakenly.

There are an estimated 500,000 public buildings in the UK that contain harmful asbestos materials: often hidden away, forgotten, and by and large, harmless – in its undisturbed state. Workers need to know where it is and what to do if they come across suspicious materials that might contain asbestos.

Asbestos: - a highly heat-resistant fibrous silicate mineral able to be woven into fabrics, used in brake linings and in fire-resistant and insulating materials.

Biological hazards

Biological hazards are presented by exposure to infectious micro-organisms, to toxic substances of biological origin or animal attacks. Excavation workers, for example, can develop histoplasmosis, an infection of the lung caused by a common soil fungus. Since there is constant change in the composition of the labor force on any one project, individual workers come in contact with other workers and, as a consequence, may become infected with contagious diseases—influenza or tuberculosis, for example. Workers may also be at risk of malaria, yellow fever or Lyme disease if work is conducted in areas where these organisms and their insect vectors are prevalent.

Toxic substances of plant origin come from poison ivy, poison oak, poison sumac and nettles, all of which can cause skin eruptions. Some wood dusts are carcinogenic, and some (e.g., western red cedar) are allergenic.

Attacks by animals are rare but may occur whenever a construction project disturbs them or encroaches on their habitat. This could include wasps, hornets, fire ants, snakes and many others. Underwater workers may be at risk from attack by sharks or other fish.

Eating and sanitary facilities

A lack of eating and sanitary facilities may also lead to increased exposures. Often, workers cannot wash before meals and must eat in the work zone, which means they may inadvertently swallow toxic substances transferred from their hands to food or cigarettes. A lack of changing facilities at a worksite may result in transport of contaminants from the workplace to a worker's home.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Research Design

This study designed as qualitative approach it tries to find out Healthy and risk management in building construction. This study design as Descriptive and Exploratory research design since the study conducted in Ethiopia for the first time as per the knowledge of the researcher.

3.2 Population and Sampling Techniques

The selected samples in the construction site were considered as the study population and all the require information were collected from project population. A total of 302 workers were involved in a three construction site. By mathematical calculation I found 172 sample sizes. Based upon the job description the study populations were stratified in to twelve different strata. The number of samples from each stratum was 18 Daily laborer, 18 plasterer, 34 carpenter, 10 mason, 4 welder /electrician, 6 data collector ,6 coordinator,6 sub-contractor, 12 Forman ,6 engineer,3 project manager and 3 Consultant .The total sample of the study was 126 sample size from the strata.

For the case study, I select sunshine Construction Plc. Since Sunshine Construction Company is one of the leading companies in Ethiopia capable of handling complex and challenging projects ranging from residential, warehouse and office complex buildings, road and bridge construction, and now three building projects that were in implementation level were selected for case study (Meri Loki CMC-2 Real Estate project ,B.B Real Estate Project, Estifanos Marriot Hotel Project).

3.3 Types of Data and Tools/Instruments of Data Collection

Data used for this study were mixed type (secondary and primary) for primary data; the research instruments used Questionnaire (daily labor, skilled worker, Forman & engineers) of the selected projects, Interview and discussion with consultant & project managers of the projects. Site visit and observation also used as primary data. Secondary data were collected from Contract documents, Progress report &Medical report.

3.4. Procedures of Data Collection

Both quantitative and qualitative data has been collected by structured questionnaire, consisting of both closed and open-ended questions and by in depth interview. For validity and reliability of the data I carried out pilot study. The data were collected by using the “Amharic” version of the questionnaire. Detailed information about awareness and practice towards occupational health among construction workers and episodes of injuries in the past one year were collected.

3.5 Data analysis & interpretation

The study tried to analyze Healthy and safety risk management in Ethiopia the case of sunshine construction PLC. Therefore both the primary and secondary data’s gathered analysed using percentage by manual. Descriptive statistics like frequency distribution mean and Percentage calculation was made for most of the variables. Finally, the results were presented with 95% confidence Interval (CI)

CHAPTER FOUR: RESULTS & DISCUSSION

4.1 Results/findings of the study

On the basis of methodology employed, the following result were obtained for each method or approach adopted.

Case Study

For this research study the case study approach was used. Three large building projects Sites were selected as the case study. The three cases are ongoing construction projects owned by sunshine construction plc Situated in A.A city.

4.1.1 General Description of the company

Sunshine Construction Plc is one of the leading companies in the construction sector of Ethiopia. It was first established in 1984 GC under the leadership of its President and CEO Ato Samuel Tafese. It started with the company taking contracts of minor constructions and water proofing works. It had less than ten employees and participated in small scale projects.

In 1993 GC it became a private limited company as its capital and man power grew, which took part in larger scale construction projects both in Addis Ababa and outside of the capital city. Due to the high discipline and work ethics of its managers it didn't take long for sunshine to surpass all its competitors in the construction sector and become a **level one** contractor.

Currently sunshine Construction Plc. Participates in the construction of many buildings, roads, bridges and real estate developments in both Addis Ababa and many other places in Ethiopia. Sunshine Investment Group which handles many businesses and philanthropic activities in our city has helped to provide jobs for thousands of Ethiopians and is one of the economic back bones of our country.

Sunshine Construction Plc. is a highly organized and disciplined company with very good quality products which make it a favorite for people wishing to purchase residential buildings and apartment buildings. Not only does it deliver its services with good quality, it also finishes its projects in time and never seems to disappoint its clients.

Sunshine has many high rise building constructions it is building across the city and outside of the city. Some of the buildings are self-owned while the others projects are sunshine has taken as a contract. The building projects that collected the data for this thesis are three projects that are still under construction .these are Meri Loki CMC-2 Real Estate project, B.B Real Estate Project, Estefanos Marriot Hotel Project the data were collected from these projects.

Table 4.1 sunshine Projects Site & No of Houses

No	Project Site	No. of Houses
1	“Bole Beshale” (Around Hayat Real Estate)	75 G+1 Villas & 14 apartment buildings
2	“Meri Luke No. 2“ (Around CMC)	Around 120 G+4 apartment building
3	Marriot Hotel (Around Bole)	G-3+10

4.1.2 Outcome of Safety Issues from Contract document

The contract document focusing on after the occurrence of accident. in construction site accidents could occur and so first aid given to the employees working on construction. Sunshine Construction Company set up one clinic for three sites with the aid of one doctor. The clinic is supposed give first aid but if serious injuries occur the employees are transferred to Yordanos or T/Hymanot hospital.

The company provides up to 3000birr, for medical checkups only for permanent workers per year. And also 800 birr for eye glasses ones every two years.

For injuries that is caused on site the company pays for all medical treatments as far as needed in the company for all workers including temporary workers.

Sunshine construction has pay compensation for Injury to build morale and attract labors to the company; this compensation is according to employer’s country regulation and laws (Ethiopian labor laws) that enforce to pay for any damage or loss suffered in consequence of accidents.

Alcoholic drugs lead workers to unsafe acts, which are the major cause’s different accidents in and around construction sites. Sunshine constructions have a rule and regulations that hinder sell, give, and use any of alcoholic &drugs.

4.1.3 Results Obtained from Progress Reports

In this part of the result, accidents obtained from the progress reports from medical report are summarized in the following table for the 2008 calendar year.

Month	<i>No. and severity of injuries</i>	<i>Causes of the accident</i>
September 2008	9 simple injury 5 moderate injury	•Falling of object •Cutting machine
October	17 simple injury 7 moderate injury 2 serious injury	•handling heavy load •falling from height
November	10 simple injury 8 moderate injury 1 serious injury	•Cutting by rebar •Falling of HCB •Falling from scaffolding
DECEMBER	7 simple injury 10 moderate injury 4 serious injury	•Falling from stair case •falling on floor •cutting by hammer
Jan	15 simple injury 4 moderate injury 3 serious injury	•Cutting by nails •Falling of stone •falling from story
FEB	14 simple injury 4 moderate injury 3 serious injury	•Caring heavy load •Falling of object
March	16 simple injury 4 moderate injury	•Falling of object •Cutting by stone
April	17 simple injury 3 moderate injury 2 serious injury	•deformed by stone Masson •Falling of object
May	21 simple injury 2 moderate injury 1 death	•Infected by cement ash •falling on the floor •falling from 3 rd floor
June	21 simple injury 5 moderate injury 3 serious injury	•Poisoned by chemicals •by slipping on ceramic •cutting by stone
JULY	14 simple injury 2 moderate injury 4 serious injury	•handling heavy load •sliding from scaffolding •loading & unloading of stone

4.1.4 Outcome of Site observation

In this section observations made during site visit are presented below

The following majors are taken in project sites.

- Workers had no body protection
- They provide enough working space for the whole excavation and while excavating pit
- Steel scaffoldings are being used which more safe than using timber is scaffolding
- For huge materials lifting they use a crane so as to avoid workers from back injuries
- The batching plant is not located far away from the working area so as the workers are exposed to dusts
- They have not enough first aid facility, for three projects they have one HO the projects are scattered in different area but they have not ambulance service.
- There is no quality of available water and toilets in the project sites. There were only two toilets one for the construction workers and on other for office workers for each sites also there is no any quality water for the workers for drinking, showering and for other purposes as well this causes worker ill

4.1.5 Outcome of the Questionnaire

Demographic characteristics of the respondents

Table 4.3 Demographic characteristics of the respondents

Characterstics		Frequency	Percent
Sex	male	70	63%
	female	42	38%
Age	20-35	76	68%
	36-45	24	21%
	45+	12	11%
Employment pattern	permanent	34	30%
	Temporary	76	68%
	sub contract	2	2%
Working sections (job category)	Engineer	6	5%
	Forman	12	11%
	Masson	10	9%
	electrical	4	4%
	Carpenter	34	30%
	plasterer	18	16%
	Data collector	6	5%
	cordinator	6	5%
	sub contractor	6	5%
	daily labor	10	9%
Educational level	primary school	56	50%
	Secondary school	22	20%
	technical	8	7%
	college	16	14%
	university	10	9%
Service Years	<1year	10	9%
	1-5 years	78	70%
	>5 years	24	21%

From 120 Questionnaire 112 are qualified the other eight are disqualified. Among 112 respondents 70 were men & 42 were female. Most respondents ages ranged between 20 and 45 years, with the majority (68%) being 20 years to 35 years old, followed by 24 (21%) respondents ranging between 36 and 45 years of age & 12 (11%) were above 45 years old. In this study the majority (68%) ranged between 20 and 35 years of age. This study shows that, since most activities on construction sites are done by manually, one need to be physically strong.

This study showed that the majority of workers were employed on Temporary. The nature of workers' employment has been raised as the one of the challenges to implementing health and safety standards on construction sites.

Among the respondents (50%) had only primary education, Followed by 20% who had secondary education, 14% college, 9% had university education & 7 % taken technical training.

70% of the study shows primary & secondary education this result revealed that the majority of Workers have a very low level of education, which can be a challenges to communication and the way they perceive health and safety risks.

Regarding their experience, (70%) of respondents have 1to 5 years' experience in construction. The results show that the majority of workers have had little education their level of experience.

Knowledge of health and safety risks on construction sites

Workers were asked about their knowledge of health and safety risks on construction site, and The results are indicated in Table 4.4

	Characteristics	Frequency	Percent	
1	have you Awareness about healthy and safty in working place	yes	62 55%	
		no	50 45%	
2	if yes ;Where did you get information about safty	From organization	40 36%	
		from Short training	16 14%	
		from my co- workers	6 5%	
			Frequency Percent	
11	Training	yes	16 14%	
		no	96 86%	
3	Helmet	yes	48 43%	
		no	64 57%	
	Eye protection	yes	12 11%	
		no	102 91%	
	Ear protection	yes	4 4%	
		no	108 96%	
	Hand protection	yes	16 14%	
		no	96 86%	
	Feet protection	yes	14 13%	
		no	98 88%	
	4	Reason not using ppE	Not provided	28 25%
			Unsuitable for work	28 25%

Table 4.4, Knowledge of health and safety risks on construction sites

Table 4.4 shows that 55% of workers have awareness about health and safety in working place at sunshine construction. Among 55%, 36% get information from organization orientation, 14% from short training & 5% get from co workers.

This finding suggests that the majority of workers (86%) had no formal health and safety training, so that they have poor perception to use PPE. Among 56 person that not to use PPE 50% (28 persons) are reasoned not provided by the company, the other 25% Believe that wearing PPE affects their productivity.

Risk perceptions

Engineers, Forman and workers were asked to indicate qualitatively the Probability of health and safety problems occurring when working in a hazardous situation the results are as indicated in table 4.5

Table 4.5, Risk Perception of respondent

	Type of hazard	frequency	Ranking
1	Waking at height	41	B
2	Manual handling	39	C
3	Handling heavy load	49	A
4	Noise (using block/brick cutting machine)	21	E
5	Dust (mortal/ cement)	36	D

It may be clearly seen in table 4.5 that the probability of Handling heavy load is the most likely to occur on construction sites (49 respondents –ranked- A), followed walking at height (41 respondents-B-), manual handling (39 respondents-C-), dust (36 respondents-D-) & noise (21 respondents-E-).

4: Hazard Consequences Categorization

This categorization is performed so as to determine which hazard consequence is perceived a

Higher by both group supervisors and workers. In hazard categorization, hazard consequence Were calculated according to the number of respondents who indicated that the probability of Occurrence was very likely to occur.

	Type of hazard	frequency	Ranking
1	Falling from height (Serious injury of fatal injury)	47	A
2	Falling object (blocks, bricks, debris) heating head body including feet	44	B
3	Manual handling (carrying cement bags or bricks/blocks) Neck, back or arm injury	29	C
4	Noise (using block/brick cutting machine) which cause hearing loss	13	E
5	Inhalation of dust from cement-cancer, respiratory system	25	D

Table 4.6 Hazard consequence categories

Key to the hazard consequence categories

A: Highest hazard consequence category

B: Second hazard consequence category

C: Third hazard consequence category

D: Fourth hazard consequence category

Table 4.6 indicates that the occurrence of falling from a height was perceived by many respondents, which fall under category A. Meanwhile the probability of hit falling object was in the B category.

Health problem due to manual handling (carrying cement bag or bricks) fall under category C and healthy problem due to dust & noise are ranked D & E respectively. While no hazard consequences should be completely ignored, priority should be given to reducing the risks associated with these Categories A, B & C hazards.

4.1.6 Interview Results

In the research interviews were held with three experienced project managers & one consultant on the nature and management of health and safety hazards at sunshine construction plc. The responses obtained from are summarized in the following sections.

A. Project Managers

I. Measures Taken for the Prevention of Accidents in the Future

The prevention method will be providing billboard size notice, which is fixed at the main gate of the site to attract the attention of workers on the need to care for safety. This notice constitutes different rules and regulations to the workers while they are working. So, as they come in and out of the compound they will get education about safety.

II. Accident Prevention Mechanism in Construction Sites

On construction areas, different activities concerning safety should be performed while the work is in progress. Out of these accident prevention methods, checking while the workers are using the available body protection materials or not, etc. are the major ones. Applying appropriate safety program, for example, a training program can minimize accident.

III. Safety management system in construction site

IN construction site safety is adopted by Recording and reporting for company admin with regard to safety.

IV. Is the following existing in working?

Table 4.7 summary of accident prevention mechanisms in construction sites filled by project manager

<i>Safety mechanism</i>		If Yes (Frequency)				No (Frequency)
		v. good	Good	fair	Poor	
Training of workers						3
First aid			2	1		
body protection	Helmet			1	2	
	Eye protection				3	
	Ear protection				3	
	Hand protection				3	
	Feet protection			1	2	

V. Difficulty in Safety Management

Safety management in nature is capital intensive which is an additional cost to the project. So, cost of safety prevention is one factor. Another factor that has a potential of difficulty in safety management is unawareness of the workers and negligence of workers.

VI. The major causes of accidents from their experience? (Ethiopian Context).

Respondent=3

	Type of hazard	Frequency	Ranking
1	Falling from height (Serious injury of fatal injury)	3	A
2	Falling object (blocks, bricks, debris) heating head body including feet	3	A
3	Manual handling (carrying cement bags or bricks/blocks) Neck, back or arm injury	2	B
4	Noise (using block/brick cutting machine) which cause hearing loss	1	C
5	Inhalation of dust from cement-cancer, respiratory system	2	B

Table 4.8, Health and safety hazard consequences as ranked by project managers

Vii. Risk Assessment

“The actual assessment is based on experience and is an everyday activity as each task has its own risks. From the schedule of the work, they identify a hazard and if you know there is one then automatically there is a risk.

Viii) Risk Communication

Concerning communicating risks to workers, it was revealed that they communicated this information verbally to the worker. Every week meeting they discussed safety issue as one issue.

iX) Risk Control Measure

Regarding the health and safety control process, emphasis is placed on workers wearing PPE.

B. From consultant

A) Response by the Consultant

I. Measures Taken To Prevent Such Accidents in the Future

The consultant advised the company to:

- Follow appropriate safety procedure
- Give trainings
- Employ health professional on site

II .Accident Prevention Mechanism Exercised at the Work Area

This question was forwarded to the consultants in a tabular form, as it is important to determine safety mechanisms and their status on the working area of the project. The consultant’s response was shown in table 4.9

<i>Safety mechanism</i>		If Yes				No
		v.good	Good	fair	Poor	
Training of workers						√
First aid				√		
body protection	Helmet				√	
	Eye protection				√	
	Ear protection				√	
	Nose Protection				√	
	Hand protection				√	
	Feet protection				√	

Table 4.9, summary of accident prevention mechanisms in construction sites signed by consultant

III. Major Problems of Safety Management in Ethiopia according to the Consultant Opinion

- Lack of awareness in both workers and project manager
- Cost of safety preventing methods
- less attention by the company
- Time pressure
- Complexity of design

4.2. Discussions

In this chapter, an attempt is made to reveal the major implications of the result obtained in the previous chapter.

4.2.1 Discussion of Safety Issues in Contract document

Deficient contract documentations are the biggest drawback in occupational health and safety management in Ethiopia. In sunshine construction the contract document not stated about safety before the occurrence of accident. Employers tend not to make any allowance for provisional sums or contingencies to implement a safety program in their contract documents, nor design Engineers in documentation. To improve the safety status of the project, Employers should make allowances for provisional sums or contingencies to implement a safety program in their contract documents. The contractors/sunshine construction should also make some contribution to implement a safety program and should give emphasis safety issues during the contract Agreement

4.2.2 Progress Reports

In this section, accidents and safety matters reported to the head office of company (sunshine construction) during 2008 budget year.

a. Types of Accidents Occurred

As records of accident report shown in the result, many accidents had occurred in the project. Out of the accident 178 are simple injury, 65 moderate accidents, 24 serious accident & 1 death.

b. Causes of Accidents Occurred

The nature of accidents occurred was constant; and the causes of these accidents was Due to unsafe acts. In order to take appropriate safety measures for accidents not happen In the future, identifying and studying the causes of accident is essential. Accordingly the analyses of the causes of accidents occurred in 2008 E.C was as follows:

- I. *Accidental fall of workers*: many accidents occurred in each month due to accidental fall of workers. The repetition of this cause of accident shows that the contractor/company is weak in investigating the cause of hazardous areas, and poor in finding measures for accident not to happen again.
- II. *Carelessness during loading and unloading of objects*: like accidental fall,

Falling of objects has caused many accidents to workers that are due to carelessness of worker and the supervisors. This problem shows that the company is weak in establishing safety program and the supervisor is not following strictly the procedure with regard to safety management. So, the contractor should establish safety program and the supervisor has the responsibility of strictly following for all safety issues to identify the hazardous areas and to take proper measures for accident not happen again. Generally, all the accidents occurred were due to unsafe acts & weakness of the contractor in identifying the cause's accidents. Therefore, all the intended parties or construction family has to participate and communicate to each other in identifying the potential causes of the accidents, for proper safety implementations.

c. Effects of accidents

Some of the effects of accidents on the project are:

Loss of trained manpower: this leads to recruitment of new employees, training of employees.

Additional cost: additional cost is incurred due to loss of Contractor's equipment, compensation of injured workers.

Project delay: time is lost due to settlements of accidents, recruiting and training of new employs, owning of equipment to substitute the lost one.

Generally, properly knowing and identifying the effects of accidents on project enhance the development of safety management. Therefore, the contractor and the intended consultant have to identify the effects of accidents, and should have to implement safety management.

4.2.3 Field Observation

As shown in the results, different accidents were occurred in site due to many reasons. From field observation, the causes of accidents were due to weakness of the company (since sunshine construction is contractor and also Clint of the buildings of the case study.) in addressing their responsibility. These causes were mainly due to

- Unawareness and negligence of workers
- not strict follow up of the supervisor on safety issues
- Absence of enough body protection equipment, etc

4.2.4 Discussion of outcomes from questionnaires & interview

The discussions of the findings are presented according to the specific objectives.

The finding from the study the most common health and safety hazards at construction sites include working at a height; hit falling object, manual handling, dust, & noise.

Based on the perception of supervisors and workers of those hazards consequence, it was revealed that include working at a height, hit falling object ,manual handling, dust, & noise are among the most noted critical hazards respectively.

Regarding the cause of accidents, it was observed that ignorance, attitudes and carelessness are the main causes of accidents.

Methods and techniques used for health and safety risk assessment, risk communication and risk control.

Risk Assessment

The findings in this study revealed that risk assessment on construction sites is coordinated by site managers through supervisors. Hazards are established either from the programed (work schedule) or the daily physical environment (work done on the sites). Furthermore, it was observed that brainstorming based on experience and educational background is used to judge the level of risk. This implies that risks are assessed

Through individual judgment guided by regulations, without any help from numerical judgment or any other tool or technique. Meanwhile, there is no clear demarcation between risk estimation and risk evaluation.

The findings also revealed that risk assessment and communication are carried out only during the construction phase. All responsibility on risk management is with the contractor, and thus no risk assessment is done during the design or procurement stages. The finding is contrary to Mohamed (2004) who argued that the principle on which safety management is based, is that all project participants (clients, designers, sub-contractors, contractors) are included in considering safety systematically, stage-by-stage at the outset of the project. From the system thinking perspective on the construction project, it is argued that each phase of construction projects contribute to health and safety hazards. Meanwhile design and procurement have been argued to be the root cause of accidents in construction site.

Risk Communication Methods

The finding from the sites implies that verbal formal communication such as orientation, informal communication such as informal discussions, written communication such as billboards were used for communication of health and safety risks in sunshine construction.

Supervisors seem to focus more on production and ignore health and safety aspects. In some cases, supervisors allow workers to work without any PPE so the company should organize safety committee for communicating

With workers

Risk Control Methods

The findings reveal that, the consequences of falling from a height & hit falling object were controlled by wearing personal protective equipment (PPE) ,Manual handling was controlled by using mechanical aids such as a wheel, pipe to transport concrete, compacting machine and lifts.

Meanwhile formal communication through Meetings was used to change workers' behavior/attitudes to the correct safety system.

The findings from the study show that although different methods were used to control risk, PPE was mainly used method. Following the hierarchy of risk control, PPE was the first to be considered. This could be due to the fact that risk is assessed during construction phase. Although PPE is the main risk control Measure some challenges were observed in using them while several workers were provided with incomplete sets of PPE others were not provided at all. Another surprising finding was that several of those who were provided with sets of PPE were not wearing them, the reasons is Being discomfort.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

The study depicted that the standard of safety and health in the construction sector is very poor. The companies do not have written safety policy; contrary to this, Article 92 of the labor proclamation no. 377/2003 of the FDRE requires that employers should have written safety and health policy and this should be communicated to employees. Similarly, attention is not given by the construction companies regarding safety officer and safety committee; unlike, the Article 92 sub Art2 of the labor proclamation no. 377/2003 of the FDRE that states the employer has an obligation to assign safety officer as well as establish an occupational safety and health committee. This implies that the proclamation is not implemented by the construction companies.

The study also reveals that — safety meetings are not conducted frequently and there is also poor provision and use of safety equipment's. Even though proper reporting and correction of safety hazards is necessary for better safety, sunshine companies have not established a program for such activity. On the other hand, workers are not urged to follow safety procedures while working, based on the study companies have a nurse /HO but it is not satisfactory. Little training and orientation is given to employees regarding health and safety by the companies. This contradicts with the provisions of the labor proclamation no.377/2003 of the FDRE, which seriously requires the provision of regular health and safety training to employees of the construction company. Again with regard to site safety inspections,

This is not in agreement with the principle —safety comes firstl.

Because of the fact that there is weak safety and health condition in the construction industry, the project managers/Consultants suggest strong government regulation for the implementation of safety and health standards Therefore, more attention should be given for the implementation of safety and health standards by the Ministry Of Labor and Social Affairs and other concerned government bodies in Ethiopia.

supervisors as well as management of the companies have relatively lower knowledge and implementation compared to what supposed to be attributes poor construction H&S performance

to a lack of management commitment, inadequate supervision and inadequate or a lack of H&S training .The most frequent type of accident that occurs at construction areas according to this study is working at a height, hit falling object; manual handling, dust, & noise are among the most noted critical hazards respectively. When it comes to the main cause of accidents in construction sites is lack of personal protective equipment (PPE).According to Article 92 sub article 3 of the labor proclamation no. 377/2003 of the FDRE that states the employer is obliged to provide workers with the appropriate personal protective equipment besides the employer is responsible for the maintenance of the PPE.

5.2. Limitations of the study

The following were constraints for this study

- Time and finance to make repeatedly site visit.
- Absence of literatures and researches that had been done or written about safety during construction projects in Ethiopia.
- Incompleteness of progress report.

5.3. Recommendation

Based on the above findings and conclusion Healthy & safety risk management in building construction site, the following recommendations are made for action:

- Provide appropriate health and safety training for workers, beginning with the first day of their employment.
- Strength strict supervision of workplace and working conditions. Establish active and functional health and safety programs.
- Encourage the wearing of safety clothing (e.g. safety boots, goggles and gloves).
- Government organizations, like the Ministry of Labor and Social Affairs should develop occupational safety rules and regulations, and implement legal rights for workers safety.
- Some penalties such as a warning letter and dismissed from sites were issued to workers to make sure they adhered to the safety rules.
- Supervisors seem to focus more on production and ignore health and safety aspects. In some cases, supervisors allow workers to work without any PPE so the company should organize safety committee for communicating with workers.

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APPENDIX-A

Questionnaire

Purpose:

This data will be used for research aimed at contributing to the minimization of accidents at Working area of building projects.

We would like to thank you in advance for providing us with the appropriate information for the following questions.

1) Are u Male Female

2) Your age

20-35 36-45 46-55 above 55

3) Are you employed on the basis of

Permanent Temporary (daily labor) Sub contract

4) Job title, daily labor Masson plasterer carpentry

Welder electrical others (specify).....

5) Experience on construction on site

6) Education background; Primary education

Secondary education technical College university other (specify).....

7) Do you have any information about health and safety in the workplaces?

Yes I Know Don't Know

8) If yes where did you get information?

From organization Short training my co- workers my supervisor

9) How safe are you feeling when you are working with your task (1=very safe, 2 =safe, 3=moderate safe

4 =not safe, 5= not safe at all)

Type of hazard	1	2	3	4	5
Waking at height					
Manual handling					
Overcrowded site					
Handling heavy load					
Manual handling (carrying cement bags or bricks/blocks)					
Noise (using block/brick cutting machine)					
Dust (mortal/ cement)					
Bending, twisting while laying blocks/ bricks					

10) In your experience how probable do you think you the following risk will occur in the task performing

Type of hazard	1	2	3	4	5
Falling from height (Serious injury of fatal injury)					
Falling object (blocks, bricks, debris) heating head body including feet					
Manual handling (carrying cement bags or bricks/blocks) Neck, back or arm injury					
Workers crushed or stucked by moving vehicles, focal lift					
Noise (using block/brick cutting machine) which cause hearing loss					
Handling heavy load					
Inhalation of dust from cement-cancer, respiratory system					
muscular skeleton disorder, back pain due to					

Bending, twisting while laying blocks/ bricks					
--	--	--	--	--	--

11) Is the following used in working site?

Safety mechanism		If Yes				No
		v.good	good	fair	poor	
Training of workers						
First aid						
body protection	Helmet					
	Eye protection					
	Ear protection					
	Hand protection					
	Feet protection					

12) Reason not used body protection

Not provided unstable for work others _____

APPENDIX-B

Interview for consultants & project managers

- 1) What are the major causes of accidents from your experience? (Ethiopian)
- 2) What are the measures taken to prevent accidents in working area?
- 3) In your management system how safety is adapted?
- 4) Is the following existing in working?

<i>Safety mechanism</i>		If Yes				No
		v.good	good	fair	poor	
Training of workers						
First aid						
body protection	Helmet					
	Eye protection					
	Ear protection					
	Hand protection					
	Feet protection					

- 5) in your practice, what makes safety management difficult? (Ethiopian context).
- 6) How do you involved on risk assessment, what methods/ tool used for risk assessment
- 7) How do you involved in risk communication, what methods used for communication, what message are
Communicated
- 8) How do you involved in risk control, what methods used for risk control.

መጠይቅ

አላማው፡-ይህ መረጃ ኢትዮጵያ ውስጥ ሳይት ላይ የሚደርሱ የጤናና የአካል ጉዳቶችን ወይም አደጋዎችን ለመቀነስ ሲባል የሚሰራ ጥናት ነው። እርሶም ሀላፊነት በተሞላበት ስሜት በተገቢው መልኩ ስለሚሞሉልን እናመሰግናለን።

1) የታ ወንድ ሴት

2)እድሜ

20-35 36-45 46-55 above 55

3) የቅጥር ሁኔታ

ቋሚ ጊዜያዊ (በቀን ስራተኛ) ንዑስ ተቋራጭ ሌላ ካለ ግለፅ _____

የሥራ መደብ የቀን ስራተኛ ግንባኛ ለሳኝ አናፂ

ኤሌክትሪሻል ሌላ (ግለፅ).....

(5) በሳይት ላይ የሰራ ልምድ

6) የትምህርት ደረጃ የመጀመሪያ ደረጃ

ሁለተኛ ደረጃ ሞያና ሥልጠና ዩኒቨርሲቲ ሌላ (ግለፅ).....

7) በስራ ቦታ ላይ ስለሚደረግ ደህንነት(ሴፍቲ) እና ጤናዎች (ሄልዚ) ላይ መረጃ አለዎት?

አዎ አለኝ የለኝም

8) ካሎት መረጃውን ከየት አገኛት?

ከምሰራበት ድርጅት ከአጭር ስልጠና አብራ ከምሰራው ሰው ከሥራ ሀላፊዬ

9) ሳይት ላይ ስራዎችን ሲሰሩ ምን ያህል ደህንነት ወይም ምቹት ይሰማዎታል?(1=በጣም ይመቻል, 2 =ይመቻል, 3=በመጠኑ ይመቻል 4 =አይመችም, 5=ፈፀሞ አይመችም

የአደጋው አይነት	1	2	3	4	5
ፎቅ ላይ በስካፎልዲንግ መውጣት					
ባሬላ ይዞ ርቀት ያለው ቦታ ማጓጓዝ(ብሎኬት፣አርማታ...ወዘተ)					
በተጣበበ ቦታ ላይ መስራት(መቆፈር፣አርማታ መሙላት፣መለሰን.....ወዘተ)					
ከባድ ሽክም መሸከም					
ተንሸራቶ ወይም ተደናቅፎ በመውደቅ					
ጫጫታ ወይም ሁካታ (የማሸን፣የመቁረጫ)					
አባራ (የሲሚንቶ፣የአርማታ)					

10) ከልምዶች በመነሳት በስራ ላይ በተደጋጋሚ ሊደርስ የሚችለው አደጋ

የአደጋው አይነት	1	2	3	4	5
ከከፍታ ቦታ መውደቅ (የአካል ጉዳተኛ መሆን ወይም ሞት ያስከተላል)					
ብሎኬት፣ድንጋይ ወይም ሸክላ ጭንቅላት ላይ ወይም ሌላ አካል ላይ መውደቅ					
ከባድ ዕቃ በመሸከም (ሲሚንቶ፣ብሎኬት...ወዘተ በመሸከም) የአንገት የጀርባ ወይም የከንድ ጉዳት					
በጫጫታ ምክንያት የመስማት ክህሎት መቀነስ					
በሲሚንቶ አባራ ምክንያት የካንሰር ወይም የመተንፈሻ አካሎች ህመምተኛ መሆን					

11. በምስሩበት ሳይት ላይ ቀጥሎ የተዘረዘሩት በስራ ላይ ከአደጋ መከላከያ መሳሪያዎች ትጠቀማላቸው ?

ስውነትን ከአደጋ መከላከያ ዘዴዎች	በጣም እጠቀማለሁ	እጠቀማለው	አንዳዴ እጠቀማለው	አልጠቀምም
ሄልሜት (Helmet)				
መነፅር (ዐይን መከላከያ)				
ጀር መከላከያ				
ጓንት (የእጅ መከላከያ)				
ሴፍቲ ሹዝ (የእግር መከላከያ)				

12. በስራ ላይ ስውነትን ከአደጋ መከላከያ መሳሪያዎችን ማትጠቀሙበት ምክንያት

ክድርጅቱ ስለማይቀርብ ለሥራ ስለማይመች ሌላ ካለ ግለፅ _____