

# Evaluation of Health and Safety Practice in Building Construction: A Case Study in Addis Ababa

Lucy Fekele, Prof. Emer T. Quezon, Yolente C. Macarubbo

**Abstract**— The construction industry has been seen as one of the hazardous industries. This is because the industry has a poor health and safety performance record compared to other industries all over the world. Labor law in every nation provides that it is the duty of an employer to ensure that every worker employed works under satisfactory, safe and healthy conditions. The research is focused on evaluating the health and safety issues in building construction projects in Addis Ababa, Ethiopia. The roles of the Client, Consultant and Contractor in health and safety consideration during project implementation were examined. It also determined the factors affecting health and safety performance of laborers. Whether, safety is used as criteria in selecting a contractor during the prequalification phase of public bidding was also identified. Building Construction Companies were involved in the sampling. All the information that could help in attaining the study objectives were collected, reviewed and formalized from the literature review. Data were collected and evaluated and the Relative Importance Index for each factor affecting health and safety was determined. The study determined the practical situation of building construction projects in consideration of health and safety, which was evaluated as low to medium. Relative Importance (RII) index of 12 factors affecting health and safety performance of laborers were calculated. The top three factors identified were: (1) Non availability of a clear company Health and safety policy (0.85); (2) Inadequate enforcement of the existing building rules and regulations (0.82); and (3) Safety awareness of the company's top management (0.80). To improve the safety and health performance of building construction projects, the following major recommendations were proposed: each building, construction projects should have their own safety and health policy; include safety as a pay item in contract document; and allocate budget and time frames for health and safety in the contract document.

**Index Terms**— Addis Ababa, Company Policies, Hazards, Health and Safety Practices, Rules and Regulations

## 1 INTRODUCTION

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 construction industry is divided into three major segments. Construction of buildings contractors or general contractors builds residential, industrial, commercial, and other buildings [2].

Annually, throughout the world, an estimated number of 271 million people suffer with work-related injuries, and 2 million die as a consequence of these injuries. The estimated economic loss caused by work-related injuries and disease was equivalent to 4 % of the world's gross national product [11].

The improvement of safety, health and working conditions depends ultimately upon people working together, whether government, employers or workers. Safety management involves the functions of planning, identifying problem areas, coordinating, controlling and directing the safety activities at the work site, all aimed at the prevention of accidents and ill health. Effective safety management has three main objectives: to make the environment safe; to make the job safe; and to make worker safety conscious [6].

The causes of accident and ill health in the industry are well known. Falling from heights, such as scaffolding, is one of the biggest problems, along with accidents involving transport, both on and off site. Dermatitis, occupational deafness, and asbestosis are among many occupational

diseases that continue to cause long term suffering for many workers in the industry.

There is a good reason construction workers are asked to wear hard hats, gloves, safety goggles, and various other safety equipment while on the job; construction sites are dangerous, filled with heavy and sharp objects, platforms of varying heights, flying sparks and debris, and a number of other potentially dangerous elements. It is no wonder so many injuries occur on construction sites unfortunately, too many workers are either unaware of the risks, or exhibit a high risk tolerance, often coupled with an opposition to what they see as burdening or cumbersome safety equipment [4].

The construction industry, employing the largest labor force, has accounted for about 11% of all occupational injuries and 20% deaths resulting from occupational accidents. International Labor Organization estimates that at least 60,000 fatalities occur at construction sites around the world every year. This means that one fatal accident occurs every ten minutes in the sector. Most of these accidents are created due to unsafe behavior and unsafe conditions [8]. Hence, health and safety problem in building construction is the major and worldwide issue which needs strong consideration since it affects the life of the workmen (manpower), project time, project cost and also project quality. Safety consideration in construction building has not yet been studied and evaluated as problem in Ethiopia. The selected area of this study is in Addis Ababa due to a lot of construction and consulting

companies and building construction found here. This research dealt with the current situation of safety consideration and the ways of achieving free of injury and zero accident environment of building construction.

The objectives of this research work were to answer the following questions: What are those Health and safety issues concerning building construction in Addis Ababa? What are the roles of the Client, Consultant and Contractor in health and safety consideration during project implementation stage? What are the factors that affect health and safety performance of laborers? Is health and safety issues are used as criteria in selecting contractor during prequalification phase for public bidding? And what can be proposed to overcome safety problems in building construction?

## 2 LITERATURE REVIEW

The International Labor Organization (ILO) and the World Health Organization (WHO) have shared a common definition of occupational health. The definition reads: "Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and to summarize the adaptation of work to man and of each man to his job" [9].

### 2.1 Construction Health & Safety Rules and Regulations

Safe and healthy working conditions do not happen by chance. Employers need to have a written safety policy for their enterprise setting out the safety and health standards which it is their objective to achieve. The policy should name the senior executive who is responsible for seeing that the standards are achieved, and who has authority to allocate responsibilities to management and supervisors at all levels and to see they are carried out [6].

Nearly 6.5 million people work at approximately 252,000 construction sites across the nation on any given day. The fatal injury rate for the construction industry is higher than the national average in this category for all industries. Potential hazards for workers in construction include:

- Scaffold collapse
- Falls (from heights)
- Trench collapse
- Electric shock and arc flash/arc blast
- Failure to use proper personal protective equipment and, repetitive motion injuries [5].

### 2.2 Construction health and safety rules in Ethiopia

The fundamental law of the state which is the Constitution of the Federal Democratic Republic of Ethiopia, the Civil Code (Proclamation # 165/1960) together with the Labor Code (Proclamation No 377/20003) are the general legal basis for health and safety rules in Ethiopia. Numerous

articles/provisions are provided under these general laws regarding health and safety of people.

Labor Code ensures worker-employer relations and enables workers and employers to maintain industrial peace. It strengthens and defines the powers and duties of the organ charged with the responsibility of inspecting labor administration, particularly labor conditions, occupational safety, health and environment. The following provisions are set: Article 92 clearly spells out the fundamental obligations of an employer with regard to putting in place of all the necessary measures in order to ensure, workplaces are safe, healthy and free of any danger to the well being of workers. In the same article the employer is obliged to take, in particular the following measures to safeguard the health and safety of the workers:

- To comply with the occupational safety and health requirements provided for in the proclamation; take appropriate steps to ensure that workers are properly instructed is notified concerning the hazards of their respective occupations and the pre cautions necessary to avoid accident and injury to health. Ensure that directive are given and also assign safety officer, establishes an occupational, safety and health committee, provides workers with protective equipment, clothing and other materials and instruct them of its use, obliged to register and notify to the nearest labor inspection services occupational accident and diseases) arrange according to the nature of the work at his/her own expense, for the medical examination of newly employed workers, and for those workers engaged in hazardous work as may nearly, take appropriate pre-executions to ensure that all processes of work shall not be a source or cause of physical, chemical, biological, ergonomical and psychological hazards to the health and safety of the workers.

Article 93 provides the obligations of workers pertaining to the required co-operation and putting into practice of the regulation and instruction given by the employer in order to ensure safety health and working conditions at work places. The law has clearly stipulated about occupational injuries with all other related provisions.

### 2.3 General Duties of competent authorities in Health and safety practice

#### 2.3.1 Contractors

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

an important matter that literally affects the life and limb of each and every worker on the jobsite [8].

### 2.3.2 Safety officer/manager

Every construction company of any size should appoint a properly qualified person (or persons) whose special and main responsibility is the promotion of safety and health [6]. Proactive companies may establish a safety committee composed of upper management, risk managers, safety directors, and operational staff to continually discuss and review safety performance [1]. Whoever is appointed should have direct access to an executive director of the company.

To carry out the functions the safety officer should have experience of the industry and should be properly trained and qualified and, where such exists, should be a member of a recognized professional safety and health body [6].

### 2.3.3 Consultants/ Supervisors

Good planning and organization at each work site and the assignment of clear responsibility of supervisors are fundamental to safety in construction. Each supervisor requires the direct support of site management and should seek to assure within his or her field of competence that: Working conditions and equipment are safe; Workplace safety is regularly inspected; Workers have been adequately trained for the job they are expected to do; Workplace safety measures are implemented; The best solutions are adopted using available resources and skills; and Necessary personal protective equipment is available and used.

Making the work site safe will require regular inspection and provision of the means for taking remedial measures. The training of workers enables them to recognize the risks involved and how they can overcome them. Workers should be shown the safe way of getting a job done [6].

### 2.3.4 Client

Communication was a key feature in achieving client-led safety initiatives and for driving a top-down approach to safety. This more intensive approach to communication meant communicating safety messages for the overall project direction or directly communicating with personnel on-site. Further, the client's involvement (or that of a client's representative) with on-site activities including inductions, safety meetings, inspections and safety walks was perceived as contributing to safety best practice [3].

In the case of Sydney Airport Gate 24, client representatives were involved with activities on-site maintaining frequent communication with the contractor and closely monitoring safety. In some cases, client-appointed external facilitators reported directly to the client. In the Wivenhoe Alliance the facilitator worked through safety goals and objectives and communicated effectively and openly with other stakeholders [10].

### 2.3.5 Safety Committees

An active safety committee is a great spur to safety. Its primary purpose is to enable management and workers to

work together to monitor the site safety plan so as to prevent accidents and improve working conditions on site. Its size and membership will depend on the size and nature of the site and upon differing legal and social conditions in the countries concerned, but it should always be an action-oriented group of people in which both management and workers are represented. The safety committee carrying out a site inspection together raises the level of safety consciousness at the site [6].

### 2.3.6 Outside Agencies

#### 2.3.6.1 Government Intervention

In many countries there are laws and regulations governing the conditions of work in the construction industry. These are usually enforced by factory or labor inspectors who are often also able and willing to provide advice on compliance. However, even in the best-regulated countries the numbers of inspectors are too few to provide day-to-day surveillance on site, even where it is their job to do so [6].

#### 2.3.6.2 International Agreements

National laws and regulations are often based upon international conventions, agreements, declarations and programs. These have been drawn up by different United Nation Organizations including the International Labor Organization (ILO) and the World Health Organization (WHO). In 1988 the ILO adopted the Safety and Health in Construction Convention (No.167), and its accompanying Recommendation (No.175), which provide a foundation of law on which safe and healthy working conditions can be built [6].

### 2.3.7 Workers

Every worker is under a moral, and often also a legal, duty to take the maximum care for his or her own safety and that of fellow workers. There are various ways of involving workers directly in site conditions, such as:

- "Toolbox briefing", a five- to ten-minute session with the supervisor just prior to starting a task gives the workers and the supervisor a chance to talk about Safety problems likely to be encountered and potential solutions to those problems. This activity is simple to implement and it may prevent a serious accident;
- "Safety check"; a check by workers that the environment is safe before starting an operation may allow them to take remedial action to correct an unsafe situation that could later endanger them or another worker [6].

### 2.3.8 Factors that affect Health and safety performance of laborers.

**Table 2.1: Factors that affect health and safety Performance of laborers**

N	Factors that affect health and safety performance of
---	--

o.	laborers
1	Safety awareness of company's top management
2	Availability of a clear company health and safety policy
3	Project cost
4	Project duration
5	Weather condition
6	Reward and punishment system
7	Conducting Safety and Health Training and orientation
8	Employee experience
9	Safety investment on Personal Protective Equipment (PPE)
10	Inadequate enforcement of the existing building rules and regulations
11	Recording and reporting of daily safety issues(safety audit)
12	Age of workers

### 2.3.9 Selection of qualified contractor for safety

Pre-qualification and Tender Requirements: Most consistently, safety, pre-qualification and tender specifications that included safety criteria were mentioned as a valuable contribution to safety best practices. The pre-construction or tender phase proved to be a critical stage for setting the foundations for safety practices. In some cases, only pre-qualified constructors with a proven safety record were invited to tender by the client. This approach was adopted in the Cobram Barooga Bridge project, where all potential principal contractors had to be pre-registered and meet certain safety criteria. Once a pre-qualified contractor was selected, in most cases, they were required to submit a safety plan, such as in the case of Basslink and Cobram Barooga Bridge [3].

## 3 RESEARCH METHODOLOGY

The specific objectives of this study were: 1. To identify health and safety issues in building construction; 2. To examine the roles of the Client, Consultant and Contractor in health and safety consideration during project implementation; 3. To determine factors that affect health and safety performance of laborers; and 4. To identify whether the safety is used as criteria in selecting a contractor during the prequalification phase of public bidding. To achieve the objectives of this study, a questionnaire was designed to study more about the safety management practices in the construction industry and ways to improve safety performance in construction works. This Questionnaire was formulated by screening and comprehending the relevant literatures in the area of health and safety practice in building construction and targeting field persons like contractors, engineers, project managers and consultant. As a preference, building construction sites constituting scaffolding operations and working on heights operations was selected. One hundred (100) questionnaires were distributed targeting the building construction progress.

### 3.1 Sample size and sampling procedures

Construction Companies were involved in the sampling. Per

each construction company three to five questionnaires were filled by project manager, Human resource manager, site supervisor & Health care center representative on site.

The sample size that represents the targeted population was determined from following equation, formula used by some researchers like (Hassanein & Hanna, 2008):

$$n = n' / (1 + n'N) \quad (1)$$

Where:

N: sample size of finite population.

n' is the sample size of infinite population, which can be calculated from the following formula:

$$n' = S^2 / V^2 \quad (2)$$

Where:

N: Total population (445 contractors)

V: Standard error of sample population equal 0.05 for the confidence level 95 % = 1.96.

S: Standard error variance of population elements

Where:  $S^2 = (1 - P)$ ; maximum at  $P = 0.5$

The sample size of the contractors' population can be calculated from the previous equations as follows:

$$n' = S^2 / V^2 = (0.5)^2 / (0.05)^2 = 100$$

The size of the sample was calculated by using  $n = n' / (1 + n'N)$ .

Overall then the sample size of companies is 81

$$\text{Companies. } n = 100 / (1 + (100/445)) = 81$$

To the extent of health and safety application, statistics about accidents and frequency of occurrence, the degree of impact is constructed on a Five-point Likert scale [10]

**Table 3.1: Classification of sample size**

Number of population	445
Number of distributed questionnaires	100
Number of respondents	78
Number of valid respondents	66

**Table 3.2: Extent of health and safety applies Likert scale**

Level	Complete	More than half	Half	Less than half	Not at all
Scale	5	4	3	2	1

On the general duties of competent authorities in health and safety practice the degree of impact is constructed on a Five-point Likert scale as shown below.

**Table 3.3: General Duties of competent authorities in health & safety Likert scale**

Level	Extremely applicable	Very applicable	Applicable	Less applicable	Not at all
Scale	5	4	3	2	1

On the factors affecting the safety and health performance of laborers in the construction industry, there contains 12 factors presented in (Table 2.1) above. For each factor there is a question, for measuring the degree of impact on safety and health performance of construction project.

**Table 3.4: Factors affecting the safety and health performance of laborers in Likert scale**

Level	Very High	High	Average	Low	Very Low
Scale	5	4	3	2	1

To determine the relative ranking of the factors, these scores were then transformed to importance indices based on the formula:

$$\text{Relative Importance Index (RII)} = \frac{\sum w}{AN} = \frac{(5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1)}{5N} \quad (3)$$

Where:

w is the weighting given to each factor by the respondent, ranging from 1 to 5,

n1 = number of respondents for very high,

n2 = number of respondents for high,

n3 = number of respondents for average,

n4 = number of respondents for low,

n5 = number of respondents for very low,

A is the highest (i.e. 5 in the study) and

N is the total number of samples.

The relative importance index ranges from 0 to 1.

Thus, the questions are in a standardized format and sequence. A descriptive method has been used for the analysis of the data which provides a general overview of the results in order to make interpretations and discussions based on the results.

## 4 RESULTS AND DISCUSSION

### 4.1. Company and Current Project Information

This section represents the description of the respondents who participated in this study. The results collected from the questionnaire shows the (66) companies participated in the study located in Addis Ababa. The following sections describe the characteristics of the respondents that participated in this survey. These characteristics also include the companies' categories, experience and size of the companies.

**Table 4.1: Job Title of Respondents**

Job Title	Frequency	Percent (%)	Cumulative Percent (%)
Project Manager	14	21.2	21.2
Office Engineer	14	21.2	42.4
Safety Officer/ Advisor	5	7.6	50.0
Resident Engineer	14	21.2	71.2
Site Engineer	16	24.2	95.5
Others	3	4.5	100.0
Total	66	100.0	

From the above table, it shows that only 7.6% of the respondents were from the safety departments of the companies, while the rest of the respondents (92.4%) were not from the safety department.

### 4.1.1. Work experience of the organization and Respondents' professional experience in the construction industry

Working experience is measured in the number for years a company and respondents had been working in the construction industry. The work experience both in construction industry helps improve work and have better potential. More than 56% of the organization have greater than 10 years of experience and about 43.9% of the organization have less than 10 years' experience in the construction industry. Thus, most of addressed Construction Companies are well experienced in the field. While the respondent's year of experience gives higher confidence in the quality of answers.

**Table 4.2: Work experience of the organization and Respondents' professional work experience in the construction industry**

No. of years	Work experience of the organization			Respondents' professional work experience		
	Frequency	Percent (%)	Cumulative Percent	Frequency	Percent (%)	Cumulative (in %)
0-5	17	25.8	25.8	22	33.3	33.3
6-10	12	18.2	43.9	22	33.3	66.7
11-15	17	25.8	69.7	15	22.7	89.4
>15	20	30.3	100	7	10.6	100
Total	66	100		66	100	

**Table 4.3: Educational status of respondents**

Education Level	Frequency	Percent (%)	Cumulative Percent (%)
Diploma/ Advanced Diploma	4	6.1	6.1
BSc	43	65.2	71.2
MSc	19	28.8	100
Total	66	100	

The respondents' educational status was important that the respondents can understand the questionnaire well and also have a better understanding of health and safety issues through their education. More than 93.9% have BSc and above. Only 6.1% have less than BSc educational level. From this percentage it is practicable to decide that the respondents have enough knowledge and education to understand the depth of importance of safety and health consideration in a construction site.

### 4.1.2. Safety and Health Administration staffs

All who are concerned about safety and health issues on

construction projects either from the management or workers are having responsibilities and duties which have to be performed. It varies from company to another or authority to another, the number and the category of the certified safety persons required, but the aim is still the same. From the result, 92.42% do not have a Safety and health Administration staffs, 3.03% have inspected, 3.03% have an advisor and 1.52% have safety manager.

**Table 4.4: Safety and health administration staff classification**

	Frequenc y	Percent	Cumulative percent
Safety Manager	1	1.52	1.52
Advisor	2	3.03	4.55
Inspector	2	3.03	7.58
No Safety Staff	61	92.42	100
Total	66	100	

**4.1.3. Extent of health and safety application**

The practical situation of health and safety practice in construction sites was assessed as follows in percent. The Contractors which have first aid and occupational health service are 53.94% only. Contractors with PPE (Safety shoe, helmet, goggles, welding masks, face shield, hearing protection, respirator protection) on site was only 56.08%. From these the Contractors were not practicing all the necessary health and safety issues.

Provide training and instruction regarding health and safety to every worker with 59.34% only. Training and instruction regarding health and safety to every worker are very vital, but contractors fail to do so in every worker. Scaffolding and Ladders inspection at regular intervals with 49.4% only and guardrails, handrails provision and covers for opening installed wherever there is danger of employees with 52.14% only were the major activities the contractor should undertake in a hundred percent to protect the workers since it can cause major accidents. Only 32.26 only responded that the company has a checklist for safety at height, scaffolding, crane, which means that they are not well provided with basic information before work starts.

**4.1.4 Causes of Injury**

Perhaps the worst nightmare for construction companies is the fatal accidents due to the consequences of outcomes of such accidents. When the respondents were asked to rate each cause of injury that crew experienced in construction sites, it was found that falling from height is the 1<sup>st</sup> case of injury. Falling from height is the major cause of injury due to the reason that no horizontal protection made to high rise building. Scaffold collapse is the 2<sup>nd</sup> cause and this is due to the reason that the Scaffolding used was eucalyptus tree which can decay after some times. Failure to use personal protective equipment (PPE) is the 3<sup>rd</sup> cause of injury. PPE equipment can protect skin injuries, but the workers fail to use due to lack of investment in personal protective equipment by contractors and the other was due to worker’s feeling of

discomfort using personal protective equipment. Trench collapse is the 4<sup>th</sup> cause and this is due to poor work methodology during trench excavation, fails to brace. Struck by object as the 5<sup>th</sup>, while Defective /misuse of equipment, Electric shock and others are 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup>, respectively.

**Table 4.5: Causes of Injury**

	Total	Total in %	Rank
Falling from height	318.2	79.55	1
Trench collapse	257.6	64.4	4
Scaffold collapse	258.8	71.45	2
Electric shock	193.9	48.48	7
Failure to use personal protective equipment	284.9	71.23	3
Defective /misuse of equipment	235.1	58.78	6
Struck by object	242.1	60.53	5
Others	121	30.25	8

**Table 4.6: General Duties of competent authorities in health & safety practice**

	5	4	3	2	1	Total	RII
Client Check that timeframes and budgets will allow health and safety provisions to be included in the project.	25	12	78	44	10	169	0.51
Check that the contractors are competent and have made proper provision for health and safety to do any of the work.	15	36	72	54	3	180	0.55
Checks that Consultant appointed have the necessary health and safety knowledge and experience.	20	20	69	60	4	173	0.52
The contract document prepared for tender has guidelines for health and safety regulation and enables us to enforce rules and regulations for health and safety problem	25	24	60	54	8	171	0.52

minimization.							
Use OSHA as a guideline to prepare contract documents	5	44	54	42	15	160	0.48
Has Checklist (Construction Safety Checklist (SCL)) for each activity on the site	10	64	51	48	7	180	0.55
Provides all necessary safety tools(safety shoe, helmet, gloves, wear, belt, glass	10	60	72	42	4	188	0.57
Made sure training for health and safety is carried out	10	56	69	44	5	184	0.56
Made arrangements to monitor health and safety performance (such as reports, audits and inspections)	5	52	75	40	7	179	0.54
Incident and accident reporting	-	-	-	-	-	-	-
Ensured the coordination of subcontractors regarding safety	10	76	75	30	5	196	0.59
Obtain and check site-specific safety plans from subcontractors	10	16	54	52	16	148	0.45

Clients' role on timeframes and budget allocation for health and safety provisions was applicable only at 51% on the construction project in Addis Ababa. That is additional time and budget will not be allocated for safety and health in building construction. Clients' role in the case of ensuring that the contractors are competent and have made proper provision for health and safety to do any of the work was applied at 55%. Competency of the contractors on health and safety practice was considered for mega projects and some selected projects. In selection of qualified contractors for intended project health and safety audit report is not included. Therefore, the competency of contractor in terms of health and safety provision was not practiced for all contractors. Clients' role in ensuring that Consultant appointed have the necessary health and safety knowledge and experience to undertake the intended project was practiced at 52%. It is the clients' role to select the consultant that can represent them. But the selection of Consultant was mostly based on the design aesthetic and no more on health and safety knowledge and experience of the

consultant.

Consultant's role in checking that whether the contract document prepared for tender has guidelines for health and safety regulation and enables to enforce rules and regulations for health and safety problem minimization was applicable at 52% with that of Clients' role in ensuring that Consultant appointed have the necessary health and safety knowledge and experience to undertake the intended project. Health and safety issues was mentioned in the contract document in general condition of contract. But it cannot enable the contractor to enforce rules and regulations for health and safety stated on Occupational Safety and Health Administration (OSHA) and other governmental rules. And also the consultant cannot enforce the contractor to have a safety checklist for each activity.

Contractors' role in providing all necessary safety tools (safety shoe, helmet, gloves, wear, belt, glass) was applicable at 57%. Some of the building construction projects do not have any safety wears, some have provided for top management and for key personnel only and only a few of the building construction projects have been provided for all of their workers and even for guest. Contractors should have to provide training for their all workers participating in the work directly or indirectly. But training for health and safety was carried out on assessing construction sites at 56%.

Contractors should have arranged health and safety performance report per month. But contractors that have made arrangements to monitor health and safety performance (such as reports, audits and inspections) was applied at 54%. The main contractor should have to ensure coordination of subcontractors regarding safety. The subcontractor should have safety knowledge and experience. 59% where main Contractors had ensured that the subcontractors had coordination regarding health and safety issues which is extremely applicable. The main Contractors' role in obtaining and checking site-specific safety plans from subcontractors was less applicable at 45%. The sub-contractor should have to submit the site specific plan on health and safety before starting the work which is as per main Contractors' interest.

#### 4.1.6. Factors that affect health and safety performance of laborers

The questionnaire includes the list of factors affecting safety and health performance of laborers in the construction industry. It contains twelve factors which had been discussed in the literature review.

**Table 4.7: Factors that affect health and safety performance of laborers**

Factors	Total	Relative Importance Index (RII)	Rank
Safety awareness of company's top management	263	0.80	3
Availability of a clear company Health and	279	0.85	1

safety policy			
Project cost	236	0.72	8
Project duration	235	0.71	9
Weather condition	216	0.65	12
Reward and punishment system	242	0.73	7
Conducting Safety and Health Training and orientation	218	0.66	11
Employee experience	233	0.71	10
Safety investment on Personal Protective Equipment	262	0.79	4
Inadequate enforcement of the existing building rules and regulations	269	0.82	2
Recording and reporting of daily safety issues (safety audit)	247	0.75	5
Age of workers	243	0.74	6

It can be found from the results that the most factor affecting the safety and health performance of laborers in the construction industry in Addis Ababa is availability of a clear company health and safety policy (RII=0.85) and comes with the first rank. Availability of a clear company health and safety policy is used in preventing accident before happening by giving attention in all phases of the company activities. The company with clear health and safety policy will insist safe work practices by all employees at all times by having a common understanding as per the company policy. The supervisors can control the health and safety practice according to the policy of the company. Non availability of a clear company Health and safety policy leads poor performance of laborers on health and safety practice.

The second was inadequate enforcement of the existing building rules and regulations (RII=0.82). The existing building rules and regulations on health and safety issue were not practiced well on construction projects. Health and safety performance of laborers cannot be practiced without enforcement of the existing building rules and regulations.

The 3rd was safety awareness of the company's top management (RII=0.80). Safety awareness on the construction site should have to start from top management to implement well and to have an impact on workers and to make safety and health issue the core value of the company. Health and safety performance of laborers can be affected due to less awareness of the company's top management of health and safety practice. In the 4th rank safety investment on Personal Protective Equipment (PPE) with (RII=0.79). Some PPE such as safety helmets and footwear should be used on all construction sites. Proper work clothes will provide protection for the skin. Falling from height of small object at head of the worker without a helmet can cause injury. Less or no investment on Personal Protective Equipment can affect performance of laborers to protect themselves from hazards.

Recording and reporting of daily safety issues (safety audit) with (RII=0.75) were the 5<sup>th</sup>. All accidents to workers, causing loss of life or serious injury should be reported, other injuries causing incapacity for work for periods of time as may be specified in national laws or regulations, and prescribed occupational diseases should be reported to the competent authority within such time and in such form as may be specified and action can be taken. But the failure of recording and reporting of daily safety issues (safety audit) can affect health and safety performance of laborers.

Age of worker on 6<sup>th</sup> rank (RII=0.74) can affect health and safety performance of laborers. Youth age 16 and 17 may work in the construction industry and on construction sites, but there are several tasks or jobs that are too hazardous for them to perform. Being underage or too old can affect their health and safety performance.

Reward and punishment system is found on 7<sup>th</sup> rank (RII=0.73). Incentives are one of the factors that motivate workers to perform in an anticipated manner to safety and health rules on site. The reward can improve safety and health performance as it encourages workers to monitor their own safety behavior and also punishment enables workers to perform well and give due consideration for safety and health.

Project cost is found on 8<sup>th</sup> rank (RII=0.72) as a factor that affect health and safety performance of laborers. Big projects that were 'under-budgeted' had a higher incidence of accident rate when compared to projects of low investment in health and safety.

Project duration is found on 9<sup>th</sup> (RII=0.71). Tight project duration cannot allow the practice of health and safety issues. Due to the crushed schedule of the project the time cannot allow laborers to practice health and safety.

Employee experience is found on 10<sup>th</sup> rank (RII=0.7). Non experienced (unskilled or semi-skilled, poorly paid, temporarily employed) exhibit low production (productivity) rates and can affect health and safety performance of the laborers.

Conducting safety and health training and orientation is found on the 11<sup>th</sup> (RII=0.66). Training shows a significant role in enhancing the workers' safety and health performance. Training usually initiates with workers' orientation and continues as workers need to become more educated about certain features of the work they are performing. Announcing every new activity of newly hired workers can enhance performance of laborers on health and safety.

Weather condition is found on 12<sup>th</sup> rank (RII=0.65). This is the last factor, because Weather condition is least seen factor that affects health and safety performance of laborers in our country and in Addis Ababa particularly.

## 4 CONCLUSION

### 4.1 On the extent of health and safety practice

The majority of the companies (56.1%) has more than (10) years of experience in the local market, which should make them familiar with safety and health regulations of the country. However, only (7.6%) respondents were from the



safety department. Not all companies have a professional safety department yet this department drives majorly for the health and safety of workers. The satisfaction level of workers towards the company expenditures on safety and health is lower which is less than 50% for all raised question such as Availability of First Aid and occupational health service on site, Availability of PPE (Safety shoe, helmet, goggles, Welding masks, Face shield, hearing protection, Respirators protection) on site, Providing Training and instruction regarding health and safety to every workers, Scaffolding and Ladders inspection at regular intervals, Guardrails, handrails and covers for opening installed wherever there is danger of employees, preparation of Safety audit report and having checklist for safety at height, scaffolding, crane.

Falling from height is the most cause of injury followed by Scaffold collapse, then Failure to use personal protective equipment, Trench collapse, struck by an object, Defective /misuse equipment and lastly Electric shock. Further, the majority of respondents agreed on the poor site supervision, which is the main reason of accident occurrence.

#### 4.2 On the General duties of competent authorities in health and safety

**Clients' role:** Clients' role in the selection of contractors that are competent and have made proper provision for health and safety and in the selection of Consultant with necessary health and safety knowledge and experience to represent him was less applicable. In the selection of the contractor and Consultant, health and safety issues was not considered. Therefore, Clients' role in health and safety practice on assessing construction projects was poor.

**Contractors' role:** In providing all necessary safety tools (safety shoe, helmet, gloves, wear, belt, and glass), training for their workers, health and safety performance report per month (such as reports, audits and inspections) was not applicable. This is applicable only to few construction projects.

#### 4.3 On the Factors that affect health and safety performance of laborers

From RII results non availability of a clear company health and safety policy ranks first which indicates that it is very vital to improve health and safety performance of laborers. The 2<sup>nd</sup> factor was inadequate enforcement of the existing building rules and regulations for health and safety performance of laborers cannot be practiced without enforcement of the existing building rules and regulations in the company. And the 3<sup>rd</sup> was safety awareness of the company's top management, which means that Safety awareness on the construction project should start from top management then down to laborers for uniform knowledge and implementation. The 4<sup>th</sup> rank which is a safety investment on Personal Protective Equipment (PPE) has its own impact on the performance of laborers. Less or no investment on PPE can affect performance of laborers and will expose them to hazards. Recording and reporting of daily safety issues (safety

audit), age of worker, reward and punishment system, and the other factors should be given due consideration. This indicates that the respondents agreed that clients' role is very vital in safety problem reduction.

**Consultant's role:** In checking whether the contract document prepared for tender has guidelines for health and safety regulation and enables to enforce rules and regulations for health and safety problem minimization it is found to be less applicable. The Consultant cannot enable the contractor to enforce rules and regulations for health and safety stated on Occupational Safety and Health Administration (OSHA) and other governmental rules. Also cannot enforce the contractor to have a safety checklist for each activity, increase health and safety performance of laborers.

### 5 RECOMMENDATION

Based on the study, the following are key recommendations that can help improve health and safety practice in building construction.

- It is imperative for construction companies to increase the quality and quantity of safety and health supervisors since poor supervision is the main reason which is responsible for the accident occurrence. Each construction company should have their own safety and health policy.
- More efforts need to be done by the construction companies and the different authorities to improve awareness and the training for the workforces. In addition, an adequate budget for safety and health provision should be stated in all construction contracts which should be approved by all parties. Safety as a pay item in contract document is suggested to be included.
- To monitor health and safety performance (such as reports, audits and inspections) during bid the contractors should have to incorporate Safety audit report for their qualification. The contract document prepared for tender should have guidelines for health and safety regulation and enables the enforcement of rules and regulations for health and safety problem minimization.

### ACKNOWLEDGMENT

The authors wish to thank the Jimma Institute of Technology, Jimma University, and the Ethiopian Road Authority. This hard work could not be materialized without this joint sponsorship program.

- Ms. Lucy Fekete has earned her master's degree in Civil Engineering at Jimma Institute of Technology, Jimma University, Jimma, Ethiopia. Email address: [lucyfekele2012@gmail.com](mailto:lucyfekele2012@gmail.com)
- Prof. Emer T. Quezon is currently professor of Civil Engineering at Jimma Institute of Technology, Jimma

University, Jimma, Ethiopia. Email address:  
[quezonet09@yahoo.com](mailto:quezonet09@yahoo.com)

- Ms. Yolente Macarubbo is currently a lecturer of Civil Engineering at Jimma Institute of Technology, Jimma University, Jimma, Ethiopia. Email address:  
[macarubboyolente@yahoo.com](mailto:macarubboyolente@yahoo.com)

## REFERENCES

- [1] George Cesarini, Geoffrey Hall and Matthew Kupiec, Building a Proactive Safety culture in the Construction industry.
- [2] Perspectives of Consultants on Health and Safety Provisions in the Labor Act: A Study into Theory and Practical, Engineering Management Research; Vol. 2, No. 1; 2013
- [3] Guide to Best Practice for Safer Construction: Case studies by Kerry Brown, Rachel Ryan & Michael Charles
- [4] PANTOM, Vision Research, Case Study Construction Site Safety
- [5] OSHA Pocket Guide, worker safety series Construction
- [6] Safety, health and welfare on construction sites, a training manual
- [7] OSHA publication 3146 Fall Protection in Construction U.S. Department of Labor OSHA 3146, 1998(Revised)
- [8] Evaluation of Safety Performance Level of Construction Firms in Around Erode Zone, K. Mouleeswaran
- [9] Global Occupational Health. Guidotti, T. L., 2011. 1st ed. New York: Oxford University Press.
- [10] Construction safety and Health performance in Dubaiby Michael Kosman Sadek Zekri, H00112628 August 2013
- [11] Occupational health program of WHO Headquarters, Geneva, Switzerland. The Global Occupational Health Network 2003
- [12] Constitution of the Federal Democratic Republic of Ethiopia
- [13] Ethiopian Civil code (Proclamation No. 165/1960)
- [14] Ethiopia Labor Code (Proclamation No. 377/2003)
- [15] Construction Safety Requirements, the University of Michigan, Architecture, Engineering and Construction Occupational Safety and Environmental Health
- [16] Hassanein and Hanna, 2008