



Science

## **OCCUPATIONAL HAZARDS IN CONSTRUCTION INDUSTRY: CASE STUDIES FROM HOUSING AND CONSTRUCTION WORKERS AT ADDIS ABABA, ETHIOPIA**

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### **ABSTRACT**

*The status of occupational injuries in workplaces in general is ill defined in Ethiopia. Pocket studies indicate that occupational injury due to an unsafe working environment is increasing. Construction industries are growing industries region wise that has higher rate of work-related injuries. Knowing the associated factors of work-related injuries can be a critical step for improving the working condition of workers in the sector.*

*Objective: This mini research aimed to evaluate occupational hazards and to describe factors affecting its happening among construction workers' in Addis Ababa housing and construction project sites.*

*Institutional based cross-sectional study design was employed to assess occupational injuries among randomly selected construction workers from June 30 –July 20, 2014. A structured questionnaire based interviews, work environment observation were used to collect the data.*

*The response rate of this study was 82.7%. The majority of respondents were male which account 74.7% and 60 (96.8%) respondents were not using personal protective devices all the time while they are on duty. Out of the total participants, 67.7% of the workers experienced occupational injuries at least once in the last 12 months. Moreover, the three leading cause of injuries were puncture (21.0%) followed by hand injury (11.3%), and back pain (9.7%).*

*Increased rate of work related injury in construction workers was observed and implementation of basic occupational health and safety services is required together with regular supervision to ensure and promote work place safety. So Preventive measures concerning functional occupational health and safety programs are essential to safeguard the health and safety condition of workforce in construction industries.*

### **Keywords:**

*Construction workers; Occupational injuries; Personal protective devices; Ethiopia.*

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## 1. INTRODUCTION

The construction industry is a sector of the economy that transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development. It embraces the process by which the said physical infrastructure are planned, designed, procured, constructed or produced, altered, repaired, maintained, and demolished. Construction industries employing a large number of people on its workforce meeting the demands of rapidly growing economies as well as requirements for normal building, renovation, maintenance and natural calamities in all countries. Due to the advent of industrialization and recent developments, this industry is taking a pivotal role for construction of buildings, roads, bridges, and so forth.

Injuries related to construction work remain a serious problem worldwide. 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 [6]. 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 [3-4].

Although many prevention efforts and intervention programs have been undertaken [5, 6], 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 [8]. 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 [7].

For instance, the construction industry is one of the largest industries in the United States, employing over eleven million persons representing 8% of the total labor force [9-11]. Each year, several hundred thousand construction workers become ill or injured as a result of worksite hazards. The estimated rates for injuries, illnesses, and fatalities among construction workers are consistently among the highest of any occupational sector [12]. Construction hazards are rated as eight times more risky as those from manufacturing sector [28].

Occupational injuries pose a major public health and developmental problems; which result in a serious health, social and economic consequences on workers and their employers. Investigators at different places indicated that younger workers suffer more occupational injury at a higher rate than older workers. Most occupational health and safety studies conducted in developed countries revealed that increased educational levels in the factory have been associated with decreased work-related injuries [13-18]. But lack of training, sleeping disturbance, and job stress increased the risk of occupational injury. Poor perception regarding to working conditions and

safety environment had a significant influence on injury occurrence [19]. Work burden as working more than 48 hrs/ week, handling objects greater than 20 kg, visual concentration, and timely maintenance of machine and sleep disorder were significant factors for the occurrence of occupational injuries in industries [20]. Construction work is featured by high labor turnover, constantly changing work environment and conditions on site, and different types of work being carried out simultaneously by several contractors. These features would further increase the health risks of workers [24].

Even though, safety management in construction industry indeed is a challenging task due to the dynamic nature of construction activity coupled with involvement of unskilled, illiterate and mobile work force, some regions have been making progress over the years there is still a long way to go to reach the vision of an industry where people return home at the end of a shift healthier than when they arrived [22].

Ethiopia, is striving hard to improve its basic amenities by building schools, hospitals, housing complexes, shops, offices, highways, power plants, industries, bridges and other infrastructures. However, all these construction activities are carried out by unskilled labor forces at cheap rate. Occupational injuries and accidents among these workers are high due to illiteracy, poverty, lack of health and safety training and information on health hazards and risks at the work place.

The Construction Industry Policy (CIP) of Ethiopia aimed at creating an enabling environment for the development of a vibrant, efficient and sustainable local industry that meets the demand for its services to support sustainable economic and social development objectives. The construction sector has showing its increased percentage share to the country GDP at constant basic price from 4.3% in 1993 E.C to 5.8% by 2002 E.C [23]. In the meantime, the status of occupational injuries in workplaces in general is ill defined in Ethiopia and some pocket studies indicated that occupational injury due to an unsafe working environment is increasing.

In line with this, little work has been done on occupational health and safety aspects of building construction workers and as per literature review there is lack of data about prevalence and determinant factors of occupational injuries among these workers [25]. Knowing the associated factors of work-related injuries can be a critical step for improving the working condition of workers in the sector [1&2].

Briefing the current occupational risks and problems in relation to construction industry and safety at selected construction sector;

The research question is

- How many of construction workers using protective instruments?
- What is the status of hazard management in construction industry?
- What type of accidents workers have faced so far in construction site?

Addressing the research question the overall aim of the study is to evaluate the potential hazards of construction workers towards occupational safety and health administration measures that are employed at the workplace. Hence the objective of the study was to:-

- evaluate the status of hazard management in the building construction industry
- assess the type of accidents workers have faced so far in the construction industry

- Observe the workers’ level of care in securing their personal safety and health in the workplace

**2. MATERIALS AND METHODS**

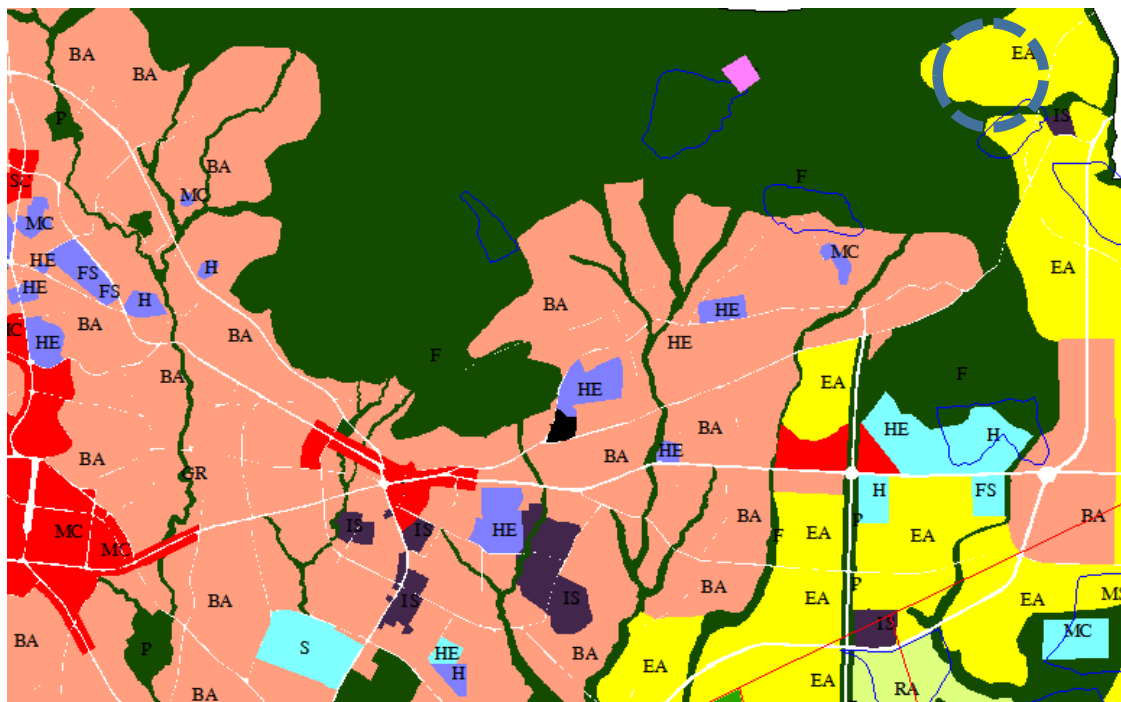
The study evaluates the status of safety and health perceptions of construction workers at the workplace. Both qualitative and quantitative data has been collected by interviews, questionnaires and observations were used. The sampling of the population was done by systematic stratified random sampling involving the various business units of the construction industry.


***STUDY AREA AND DESIGN***

A descriptive institution based cross-sectional study was conducted from June 30 –July 20, 2014; among construction workers at construction and housing project site 13 and 14 in Yeka Sub city, Abado woreda.

***STUDY AREA***

The study area (project site) is located on the North East tip of the city of Addis in Legetafo area along the Dessie road. The site is not at all developed being used for farming exercise until recent times, except for a small area settlement at the entry point to the site. The project area has covered about 100ha and it is one of the mega housing and construction project run by Addis Ababa City administration which planned to construct 538 blocks that contain 8316 households.



**Figure 1:** Land use map according to the master plan  Project location  
 Source: BET Consulting Architects and Engineers Built Environment Technology plc

### ***SOURCE POPULATION***

All construction employees who are involved in the Yeka Abado Addis Ababa housing construction project site 13 and 14 were considered as a source population and the required sample size were taken from this population.

### ***STUDY POPULATION***

The selected samples in the construction site were considered as the study population and all the required information were collected from these population. A total of 750 workers were involved in a particular contractor at a given construction site. Based upon the job description 10% of samples were taken, the study populations were stratified into nine different strata i.e. Daily laborer, Plasterer, Carpenter, Mason, Welder, Painter, General Foreman, Bar bender and Site Engineer. The number of samples from each stratum was done proportionally. Finally, simple random sampling technique was employed to select 75 sample sizes from the strata.

### ***OPERATIONAL DEFINITION***

***Occupational Injury:*** Any physical injury condition sustained on worker in connection with the performance of his or her work in construction site [26]

***Health and Safety Information:*** A worker who has 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.

### ***DATA COLLECTION PROCEDURE***

Both quantitative and qualitative data has been collected by structured questionnaire, consisting of both closed and open-ended questions and by in depth interview. The data were collected by using the “Amharic” version of the questionnaire. Detailed information about the socio-demographic, behavioral and work environment characteristics, awareness and practice towards occupational health among construction workers and episodes of injuries in the past one year were collected.

### ***DATA ANALYSIS***

The data were entered, cleaned and analyzed using SPSS software version 16.0. Descriptive statistics like frequency distribution mean and percentage calculation was made for most of the variables.

## **ETHICAL CLEARANCE**

Permission was also obtained from the local administrative bodies (Addis Ababa City housing and construction Authority) and concerned construction companies. Verbal consent was also obtained from every study subject after clearly explained the purpose of the study.

## **3. RESULTS AND DISCUSSION**

### **QUANTITATIVE RESULT**

#### **Characteristics of the study population**

75 randomly selected building construction workers in questionnaire and 8 workers from foremen, site engineer's, consultant and human resource personnel for interview participated (83 total) in the study yielding 82.7% response rate. The majority of respondents were male which account 74.7% and 67.7% Of the respondents get monthly salary below 1000 Ethiopian birr. Sixty one (98.4%) of the respondents was working 8 hours per day. Most of the respondents 77.7% of them were youths having age less than 26 years of age with relatively closer percent (77.4%) primary school and above educational status (see Table 1).

#### **Work Environment and behavioral factors**

Only 2 (3.2%) of respondents used some kinds of personal protective equipment's (PPE) while they are on duty. Most of the respondents 60 (96.8%) of them were not using PPE all the time while they are on duty. The main reasons mentioned by the respondents for none use of PPE were; no access 58 (93.5%), discomfort 4 (6.5%). All of the partial users of PPE, 2 (3.2%) purchase PPEs for themselves (See Table 2).

**Table 1:** Socio-demographic characteristic of the respondents at Yeka Abado housing construction project Site13 and 14 July 2014, Addis Ababa ( $n = 75$ ).

| <b>Variable</b>    | <b>Frequency</b> | <b>Percentage (%)</b> |
|--------------------|------------------|-----------------------|
| Residence          |                  |                       |
| <i>Urban</i>       | <b>46</b>        | <b>74.2</b>           |
| <i>Rural</i>       | <b>16</b>        | <b>25.8</b>           |
| Sex                |                  |                       |
| <i>Male</i>        | <b>56</b>        | <b>74.7</b>           |
| <i>Female</i>      | <b>19</b>        | <b>25.3</b>           |
| Age(years)         |                  |                       |
| <i>&lt;20</i>      | <b>8</b>         | <b>12.9</b>           |
| <i>20-25</i>       | <b>34</b>        | <b>54.8</b>           |
| <i>26-30</i>       | <b>18</b>        | <b>29</b>             |
| <i>31-35</i>       | <b>1</b>         | <b>1.6</b>            |
| Marital Status     |                  |                       |
| <i>Married</i>     | <b>41</b>        | <b>66.1</b>           |
| <i>Single</i>      | <b>19</b>        | <b>30.6</b>           |
| <i>Divorced</i>    | <b>2</b>         | <b>3.2</b>            |
| Educational status |                  |                       |
| <i>Illiterate</i>  | <b>7</b>         | <b>11.3</b>           |



|                                 |    |      |
|---------------------------------|----|------|
| <i>Can read &amp; write</i>     | 7  | 11.3 |
| <i>Primary School (1-8)</i>     | 33 | 53.2 |
| <i>Secondary School(9-10)</i>   | 15 | 24.2 |
| Employment pattern              |    |      |
| <i>Permanent</i>                | 1  | 1.6  |
| <i>Temporary</i>                | 61 | 98.4 |
| Working sections (job category) |    |      |
| <i>Daily laborer</i>            | 25 | 33.3 |
| <i>Bar bender</i>               | 11 | 14.7 |
| <i>Plasterer</i>                | 7  | 9.3  |
| <i>Carpenter</i>                | 11 | 14.7 |
| <i>Manson</i>                   | 9  | 12.0 |
| <i>Welder</i>                   | 4  | 5.3  |
| <i>Painter</i>                  | 8  | 10.7 |
| Service Years                   |    |      |
| <i>&lt;1year</i>                | 21 | 33.9 |
| <i>1-5 years</i>                | 34 | 54.8 |
| <i>&gt;5 years</i>              | 7  | 11.3 |

Majority of the workers (90.3%) perform their work without having any job agreement with the respective employer. But most of the workers (77.4) are satisfied being on duty at construction site (see Table 2).

**Table 2:** Selected work environment and behavioral factors at Yeka Abado housing construction project Site13 and 14 July 2014, Addis Ababa (n=62)

| Variable                                 | Frequency | Percentage (%) |
|--|-----------|----------------|
| <b>Hours worked/week</b>                 |           |                |
| <i>48 hours</i>                          | 61        | 98.4           |
| <i>&gt;48hours</i>                       | 1         | 1.6            |
| <b>Health and Safety Trainings</b>       |           |                |
| <i>Yes</i>                               | 0         |                |
| <i>No</i>                                | 62        | 100            |
| <b>Work agreement</b>                    |           |                |
| <i>Yes</i>                               | 6         | 9.7            |
| <i>No</i>                                | 56        | 90.3           |
| <b>Monthly Salary in Ethiopian Birr*</b> |           |                |
| <i>&lt;1000</i>                          | 42        | 67.7           |
| <i>&gt;1000- &lt;2000</i>                | 15        | 24.2           |
| <i>&gt;2000-&lt;3000</i>                 | 5         | 8.1            |
| <b>Job satisfaction</b>                  |           |                |
| <i>Yes</i>                               | 48        | 77.4           |
| <i>No</i>                                | 14        | 22.6           |
| <b>Using PPE</b>                         |           |                |
| <i>Yes</i>                               | 2         | 3.2            |
| <i>No</i>                                | 60        | 96.8           |
| <b>Awareness on occupational risk</b>    |           |                |
| <i>Yes</i>                               | 55        | 88.7           |
| <i>No</i>                                | 7         | 11.3           |

| <b>Reasons not using PPE</b> |           |             |
|------------------------------|-----------|-------------|
| <i>Not provided</i>          | <b>58</b> | <b>93.5</b> |
| <i>Unsuitable for work</i>   | <b>4</b>  | <b>6.5</b>  |

\*1US\$ is equivalent to 21.7ETH birr

### Occupational injury Characteristics

**Table 3:** Injury types and causes at Yeka Abado housing construction project site 13/14 July 2014, Addis Ababa (n=62)

| <b>Variable</b>                                    | <b>Frequency</b> | <b>Percentage (%)</b> |
|--|------------------|-----------------------|
| <b>Occupational injuries Types of injury(n=62)</b> |                  |                       |
| <i>Fracture</i>                                    | <b>1</b>         | <b>1.6</b>            |
| <i>Eye injury</i>                                  | <b>3</b>         | <b>4.8</b>            |
| <i>Back pain</i>                                   | <b>6</b>         | <b>9.7</b>            |
| <i>Cuts</i>  | <b>4</b>         | <b>6.5</b>            |
| <i>Puncture</i>                                    | <b>13</b>        | <b>21</b>             |
| <i>Crushing</i>                                    | <b>4</b>         | <b>6.5</b>            |
| <i>Hand injury</i>                                 | <b>7</b>         | <b>11.3</b>           |
| <i>Suffocation</i>                                 | <b>2</b>         | <b>3.2</b>            |
| <i>Respiratory infection</i>                       | <b>2</b>         | <b>3.2</b>            |
| <b>Causes of Occupational injuries(n=62)</b>       |                  |                       |
| <i>Stuck by/against an object</i>                  | <b>2</b>         | <b>3.2</b>            |
| <i>Hit by falling object</i>                       | <b>1</b>         | <b>1.6</b>            |
| <i>Falling accident</i>                            | <b>4</b>         | <b>6.5</b>            |
| <i>Absence of protective devices</i>               | <b>25</b>        | <b>40.3</b>           |
| <i>Work burden</i>                                 | <b>5</b>         | <b>8.1</b>            |
| <i>Lifting heavy objects</i>                       | <b>5</b>         | <b>8.1</b>            |

### QUALITATIVE RESULT

#### Work Environment Observation

In depth interviews were conducted on purposely selected individuals (foramens, site engineer's, consultants, human resource managers) in the housing construction site 13 and 14. Most of the participants having more than three years of working experience in the construction sector. The most common reported occupational symptoms of disease were encountered in the construction site were "...falling accident as a result death, fracture, fatigue, back pain, abdominal crump, cough, skin problem, skin puncture, irritation of the eye and nose".

#### Hygienic related issues

The other reported issue is the quality of available water and toilets in the project sites. There were only two toilets one for the construction workers and on other for administration workers. But there is no any quality water for the workers for drinking, showering and for other purposes as well. Little effort has been done to help construction workers to take care of their hygiene.



### **Factors for health symptoms (Hazards)**

Among the Interviewed subjects, mentioned that “Most health problems occur because of absence of protective devices in the work area, the primarily lack of the practicality of safety rules”.

### **Prevention of hazards**

There are limited trials to address the hazard prevention activities in the working conditions at construction, like giving PPE (Hard hat and safety shoes) to the site engineers; Some trainings on occupational health and safety at Addis Ababa city administration management institute; however, this trial is seems at infancy stage because for reasons such as an absence of unions and strong management support... To reach the desired level of prevention to protect workers adequately

### **Pre-employment safety training**

Considering new employees, equipment and other changes in general, there is no formal pre-employment safety training except that of site engineers some office workers. The obtained data reveals that there is no occupational health and safety committee; no trainings were given to the workers when they were newly employed or as refreshment. Either Ministry of Labor and Social affairs or Ministry of Health undergo regular work area supervision.

The working environmental observation check list showed that, there were no any safety signs and rules posted like danger sign. Most of the workers did not have the necessary personal protective equipment. There was no any measure taken to prevent hazards, except providing safety shoes, protective cups to some of the site engineers. There is no any copy of most important safety and health regulation in the consultants and they did not have safety personnel. Even though, both agreed to the prevalence of risks in construction site; the consultants as well as the city administration were not following written health and safety plan of action in work place in general. There was no health facility in the construction site. Even it is hard to get first aid kit.

## **4. DISCUSSIONS**

In Addis Ababa currently there are about 254 construction consultants from level 1 to 6 and 1355 construction contractors who engaged as a professional in construction industry. They have got working license from Addis Ababa city housing and construction authority by fulfilling the outlined requirements. But in the requirements nothing is expected from these firms with respect to Occupational safety and hygiene. On contrary the Ethiopian Labor proclamation No 377/06 in 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, work places are safe, healthy and free of any danger to the well-being of workers. Moreover, the proclamation ensure that workers are properly instructed and notified concerning the hazards of their respective occupations and the pre cautions necessary to avoid accident & 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 [30]. This is not practical in the study site. The study results revealed that out of total participants 67.7% of the workers experienced occupational injuries at least once in the last 12

months. This finding was markedly higher than that of the study done in Ethiopia, and India 38.7%, 22.92% respectively [25, 29]. The difference between the two might be associated to type of workforce, strengths of occupational health and safety services and diversity and complexity of work tasks, or difference in the method of data collection.

The three leading occupational injuries in the study site were puncture (21.0 %) followed by hand injury (11.3%), and back pain (9.7%). The major possible causes reported as absence of protective devices (40.3%), lifting heavy objects (8.1%) and work burden (8.1%) This result vary with the study conducted at Gondar [25] on which the leading causes of injuries were fall from ground level followed by overexertion during lifting and fall from elevation.

Almost all workers unable to use (96.8%) because they were unable to get protective devices from the organization (93.5%) or absence of occupational health trainings (100%) see Table 2. This might be associated to lack of awareness, stringent commitment on the issue, or legal controlling mechanisms of construction sector even the consultants and contractors get working license or renew it without such basic requirements of occupational safety and hygiene issue in the work place.

## 5. LIMITATIONS OF THE STUDY

- 1) Across-sectional study (few sample size) design could result in recall bias (under or over report of Injury events) and /or may be weaker to overlook the potential problems ever occurred in detail and determinants.
- 2) Sometimes the study units were not willing to disclose the whole problems in fear of job insecurity following disclosing the information.
- 3) Workers who were injured and on leave during the study time may underestimate any association.
- 4) Lack of similar studies particularly in Ethiopia made difficult in comparing results
- 5) The result may be inflated, due to respondents' positive benefit feeling after the study finding

## 6. CONCLUSION

Work-related injury prevention and control involves studying the patterns and risk factors of injuries. So the results of this study have important implications for the practice of occupational health and safety, especially in industries or occupational groups dealing with safety information. 82.7% response rate of study results revealed that out of total participants 67.7% of the workers experienced occupational injuries at least once last 12 months. Moreover, the three leading cause of injuries were puncture (21.0%) followed by hand injury (11.3%), and back pain (9.7%).

Majority of the respondents were unable to use PPE (96.8%) in the working environment. This is because they were unable to get protective devices from the organization (93.5%) and unable to buy it by themselves. The absence of occupational health trainings (100%) reveals that, the extent of occupational injuries among Addis Ababa city housing and construction project workers of project site 13/14 in Yeka Abado, needs immediate public health action. Therefore, implementation of basic occupational health and safety services including the provision of personal protective devices and insuring utilization are highly advisable.

Based on the above findings and conclusions for sustained prevention and control of work related injuries in 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.

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