Safety Awareness of Workers for Construction Sites in Nepal

Madhav Prasad Koirala, Ph.D.
Associate Professor, School of Engineering, Pokhara University.

Abstract

Construction industry is one of the largest and most important industries in Nepal. Construction safety in the industry still suffers from ignorance and lack of supervision and accident rate on construction projects is very high. The objective of this study is to identify the awareness launched in the construction industries that relate to safety, problems related ergonomic health and safety, and the status of safety engineering management as perceived by construction and consultancies to help reduction of accidents. A survey was conducted by using a number of questionnaires which was distributed to 38 respondents. Analysis of the responses found the most important factors that included: “Awareness programs are lunching in construction industries about health, safety and environment “Weather Construction firms are managing problems related ergonomic health and safety in construction sites? How well is the management of safety engineering in construction projects by every firm of Nepal? “.

Keywords: Suggested, Worker safety, Awareness, Ergonomic, Site safety

Introduction

Construction sites are working place for worker. Workers are provided and by the practice of procuring the goods or service legally agreed to provide by contractors. From old days to modern period, same principle is applied but becoming more complex with respect to time, cost constraints. Several research and invention performed, it is still being more risky in terms of time money and several risk factors. From safety point of view, it is being more risky. Construction work is a dangerous job. Some construction site jobs are: building houses, roads, workplaces, repair and maintenance of structures. Some works, such as working with height, excavation, noise, dust, power tools and equipment. The most common injuries and deaths are caused by the fatal four which are shocks, fall, caught in machine and collapse. Construction work has been increasing in developing and undeveloped countries over the past few years. With an increase in this type of work occupational fatalities have increased. Some individuals that pass away on the job or performing work related accidents. In Nepal construction site maintenance are very poor in most of the projects which cause accidents to occur and becoming main cause for affecting the plan and schedule of the works. There is no new concrete act that has not yet formulated in favor of affected people at work place health, safety and environment (HSE).

Background

Disease at Construction Sites

Occupational disease and accidents is hazardous to the workers in the construction sites. The occupational health disease in the construction sites can be divided into six types:

Construction Material-related diseases: Some construction materials are hazardous for health, for example asbestos-related disease that may lead to death to workers. The danger is due to when asbestos fibers become airborne and remain suspended in the air. Breathing of these fibers may badly affect the lungs and causes cancer. Similarly, Silica is another particles, it is due to, when construction materials containing silica, such as bricks, concrete, granite or tiles are cut, drilled, crushed. This crystalline silica can be breathed in and may reach the deep lungs of the workers. This can
cause difficulties in breathing problems for the workers.

**Noise-induced hearing loss:** High noise at construction site can lead to tinnitus and hearing loss of the workers. It is due to the sounds of machines, sounds from construction plant etc may badly affect the hearing problem.

**Hand-arm vibration syndrome:** When workers used hand-held power tools are regularly used in construction site, the vibration of these tools can cause hand-arm vibration syndrome (HAVS). It is due to the vibration of drilling machine, vibration due to hammering, vibration due to cutting of materials etc. This type of vibration may affects fingers, hands and arms and can cause permanent damage over time.

**Musculoskeletal disorders (MSDs):** This cause injuries, damage or disorder of the joints or other tissues in the upper or lower limbs or back. Issues can be caused by regularly lifting, carrying or handling materials like unloading the cement and sand sacks or carrying the stone in the construction site.

**Psychological stress:** Mental relaxation of workers is predominant for completing the work efficiently. So workers need leisure time for relaxing and for entertainment purposes. Due to the long duration continuous work they are mentally tired, so it will affect their work too.

Safety at Construction sites normally, the following types of accidents may occurs at construction sites.

**Slips or falls from height**

Slips or falling from height is the major accident happening in the construction site. This hazard is happening mainly at the time of concreting or shuttering at heights. In the case of late time work adequate and good lightning must be provided. Owing to bad workmanship that is due to bad positioning of scaffolding, shuttering may fail it may cause accidents.

**Caught in Machineries and Trenches**

It is predominant that everyone who works at construction sites be aware of these types of risks, and knows how to react it. Caught-in and caught-between dangers are one of the major construction site hazards along with fall, electrical. Some accidents are as follows:

- Machinery with rotating or other moving parts that are unprotected and not properly powered down at the time of maintenance; this may result in body parts or clothing getting caught in the machine.
- Unprotected trenches and excavations resulting in burial or drowning, as well as underground caves getting caught beneath collapsing scaffolding is a similar hazard in this category.
- Getting crushed between a wall or the ground and a piece of material or equipment, shoring and construction materials, large items being stacked, etc.

**Fire and Explosion**

Due to the many inflammable chemicals, pressurized containers and heat-powered tools, such as soldering iron, construction site fires and explosions are very common and very dangerous. Each of these injuries due to fire and explosion needs immediate medical attention. According to Mishra and Shrestha (2017a) fire safety preparedness is lacking as occupants were not aware about building plan and exit location, assembly point and emergency evacuation procedure. Further Mishra and Sharestha (2017b) found the code NBC 107: 1994 is neither addressing of issues nor compiled strongly.

**Accidents by Vehicles**

Every year in the construction industry, people are killed or injured as a result of being struck by moving vehicles. Accidents may occur from the ground work to the finishing work of structures. Managers, workers, site visitors and the public can all be at risk if construction vehicle activities are not properly managed and controlled.

- **Beginning**

Health and safety management at the construction site is very challengeable job. For better performance of the project, all workers need to qualified, healthy and well trained regarding health, safety and environment at the construction site.

- **Ending**

Optimum aim of better performance is safe from incidents, and healthy with maintaining good environment. It is never ending will run till construction management remains.

**Problems**

It is observing probably the most injurious site is construction industries among most of the industries. Construction work is done on sites under natural and hazardous conditions. Construction site is at remote places or far from cities. Labor is brought in as gangs for short durations. Employment relationships are contractual and they exist for the project duration only. Piece rate system of payment motivates workers to put in long hours of work. They live near the work sites without adequate housing, civic amenities and other facilities. Difficult terrain makes it impossible for government inspectors, if they want, or trade union organizers to reach the construction sites. Accidents may not get reported. In general, the work environment at construction sites is far from satisfactory. Both the contractors and workers are on the site to complete the
job, make money and go home. It is a peculiar situation where both employer and employee scheme to comfort labor laws and safety requirements. The only party that is expected to show some concern for these matters is the government but it cannot reach the sites.

Specific information are scattered and fragmented. Despite technological advancements of information and knowledge management in the building and construction industry, a link between safety management and information models is still missing. Construction safety ontology is proposed to formalize the safety management knowledge. It consists of three main domain ontology models, including Construction Product Model, Construction Process Model, and Construction Safety Model (Zhang et al., 2015). Workers who report poor living and working conditions are more likely to report accidents and injuries. The occurrence of workplace accidents is therefore strongly associated with perceptions of their accommodation and the work environment. Migrants who work in Qatar and Saudi Arabia in the construction industry are three times more likely to experience workplace accidents than those working in a Malaysian factory. It is, therefore, argued that to reduce the health risks of workers in host countries the Government of Nepal should ensure that migrants are offered compulsory health insurance by the companies they work for, particularly in Middle Eastern destinations. Mandatory pre-departure health and safety training with refresher sessions on arrival are also strongly recommended (Adhikary et al., 2017). Practical training tools such as action-checklists, group discussions, and local good example photos were particularly useful in supporting such workers’ initiative in a locally adjusted manner. Workers’ practical action proposals taking into account low-cost ideas have often strengthened the constructive relationships with their employers. The trade union networks have fortified the workers’ initiative in improving safety and health and expanded the POSITIVE program reaching many grass-root workplaces. It was confirmed that action-oriented safety and health programs can be built on the workers’ own experiences and initiative. We need to further encourage the application of practical training tools for involving local human resources and experiences (Kawakami et al., 2004).

Occupational Safety, Health and Environment in Nepal

There is no concrete policy of government regarding the occupational safety, health and environment, but it need to endorse the policy from legislation of Nepal government.

There are few scientific studies conducted so far in Occupational Safety and Health in Nepal. Summing up the limited literature available, it is found that the overall status of occupational safety and health in Nepal is not satisfactory. Most of the work places, especially the ones requiring more physical work and labor, do not possess proper safety and preventive measures, likewise, the workers do not have proper understanding of exposure to hazards and measures to minimize them. Thus, in such conditions, there should be immediate and strong interventions at all levels including the government, employers and the employees (Joshi et al.,

**Figure 1. Conceptual Framework of Safety Engineering**

- **Objectives of the Studies**

Main objective is to assess awareness in safety management status based on ergonomic approach of selected construction sites.

The specific objectives are:

i. To explore the problems related ergonomic health and safety in construction sites

ii. To assess the safety management status at selected construction site

- **Limitations**

The limitation of this research is valid and reliable in similar developing countries like Nepal and cannot generalized economically developed countries all over the worlds.

**Literature Review**

**To Aware Construction Workers’ concerned on HSE**

The awareness program which is very important in every construction site that needs to conduct to skilled and unskilled workers too.

The findings also indicate that the challenge of making worksites safe should not be placed solely on the contractors, but should be shared by all parties affecting the value chain of construction, including the developers, the consultants and the government (Cheah, 2007). From the survey it was found that the most influential safety factor was personal awareness followed closely by communication. Suggestions and recommendations on equipment design and improved work practices and procedures to improve the efficiency and productivity of construction workers were proposed. Management was urged to get their workers better informed about safety matter (Ismail et al., 2011). Construction safety related knowledge and project
Explore the Problems related Ergonomic Health, Safety and Environment at Construction sites

Recent experiences in using participatory methods for ergonomic workplace improvement are reviewed to know how these methods can be effective in different settings. The review covered participatory programmes for managers and workers in small enterprises, home workers, construction workers and farmers in Asian countries. To meet diversifying ergonomic needs, participatory steps reviewed are found to usually follow a good-practice approach easily adjustable according to local needs. These steps are found to usually focus on low-cost improvements. They can thus lead to concrete results particularly by addressing multiple technical areas together. Typical areas include materials handling, workstation design, physical environment and work organization. Further, the review confirms that the participatory methods are always modified according to each local situation. This is done by developing a group-work toolkit comprising action checklists and illustrated manuals and by building a support network of trained trainers (Kog, 2006). The literature had documented that environmental factors were responsible for most of the cases. This paper aims to highlight on the causation factors of accidents and injuries at the construction sites based on the human factor. Selected journals and research papers related with accidents at construction sites were reviewed and human error was found to be the main causation factor of accidents at construction sites. This study urges for more in depth study on the actions or interventions that could be taken to minimize the occurrence of human error in the construction site, thus, minimizing the occurrence of accidents, injuries and even mortality (Kamal et al, 2013).

Safety Management at Construction sites

Safety issues have gained vital importance throughout the construction industry. Many construction companies around the world are implementing safety, health, and environmental management systems to reduce injuries, eliminate illness, and to provide a safe work environment in their construction sites (Choudhry et al, 2008). Construction industry is contributing 2.39% to the GDP of Pakistan and is employing over four million people; however it is the second most injury prone industry, where employees often have to work under extreme weather conditions without taking precautionary measures. Construction of multi-storey buildings is at increase in the major cities where large and medium sized companies are working as main and sub-contractors; however these projects are suffering from fatal accidents, as safety measures are not rigorously enforced (Zahoora et al, 2015). Construction Health and Safety (H&S) is of significant importance to the improvement and sustainability of the construction process. This is why at various levels of the construction process, clients, project managers, architects, engineers, contractors, subcontractors, suppliers, and manufacturers have endeavored to improve H&S management practices in construction. However, the implementation of H&S in construction has not resulted in a commensurate improvement in the industry (Chiocha et al, 2011). The construction industry is considered as one of the most hazardous industrial sectors wherein the construction workers are more prone to accidents. Despite recent efforts to improve site safety, construction still accounts for a disproportionate number of occupational related fatalities. In developed countries there is strict legal enforcement of safety in the construction industry and also in the implementation of safety management systems which are designed to minimize or eliminate accidents at work places. However, occupational safety in construction industry is very poor in developing countries because lack of safety regulations and standards, low priority of safety, lack of data on safety at construction sites, lack of safety training, lack of safety promotion, and lack of documented and organized safety management systems (Mir et al, 2015). Based on a study conducted in Nepal by Mishra and Shrestha (2017), there are generally claim that the contractors don’t provide health facilities at the construction site for causal workers. They are compelled to work without proper sanitary facilities, safe drinking water, no proper catering service and others. Employees think that health related facilities are lacking in the site under RIP. Even though contractor has these provisions in the contract, they hesitate to invest the extra amount of money for safety equipment. No proper monitoring on this matter was found in RIP. Casual workers were found untrained, unskilled and uninformed about the safety measure and equipment’s to be used. Only the workers at Balaju-Ranipauwa road construction site were provided hats and boots as safety equipment. In Road improvement project, regarding health and safety facilities and provision, there is a clause in the contract to address health and safety issues and all the respondents reported that they have worker’s insurance on their construction sites. Safety monitoring has been done monthly to check the quality assessment of the workers and their working conditions. But there was no detailed record for safety reporting and accident investigation. Generally, safety reporting is done only to the internal management. One environmental engineer and one social engineer are assigned for this job. The training to workers is necessary to improve construction safety. It was found from the survey that most of the casual workers are not getting safety
training. From the employee’s perception, inadequate instruction concerning work is ranked as the main cause of the accident on a construction site. Safe drinking water and safety signs are ranked as the most important health and safety facility that need to be provided on site to the casual workers. Besides this, the other important factors were first-aid equipment’s, sanitary facilities such as toilets, showers, changing rooms, etc. and hard hats or helmet as they believe should be provided to the causal workers but in reality, they neglect and gives less importance to the health and safety of the causal workers. There is no proper supervision on this matter in RIP. Workers need proper instruction and planning prior starting any work to ensuring safety in construction sites.

Hierarchy of Hazard Controls

It is a systematic step by step process used in workplaces to minimize or reduce exposure to hazards. The Hierarchy breaks down as follows, with the most effective measures at the top of the pyramid and the least effective at the bottom.

In this research the methodology is extensively book, News paper, research articles were studied and then research questions were prepared after adopting the pilot test. Respondents were selected by snowball system that was.

Research Design

The research design adopted was a descriptive survey study in an attempt to explain the factors affecting implementation of workplace health and safety measures in the construction industry. Descriptive survey study was used because it was best suited to answer the ‘what’ and ‘how’ research questions in the study.

Population and Sample

The targeted population in this study was the construction firms doing work in Nepal. The researcher established the population to be fifty-three (53) from the FCAN (Federation of Contractors’ Association of Nepal) elected on 2018, executive members register in Nepal, and eighteen (18) from Society of Consulting Architectural & Engineering Firms (SCAEF), considered this to be adequate in providing data for the study.

Sample size and Sampling procedure forty six (46) subjects formed an ideal sample size for the study, for a population running into forty six, the sample size should be 50%, the researcher therefore aimed at least for 50% subjects in each group as reflected in table (1). The registered contractors of infrastructures construction companies is categorized in groups from I to II according to capacity limited by the value of work in of millions of shillings, beginning from category I and II. Simple random sampling enabled selection of subjects from each group, with each subject having a known nonzero chance of selection.

Research Methodology

In this section the researcher explains the procedures employed in carrying out the study, which include; the research design, the targeted population, the sample size and the sampling procedure, research tools, their validity and reliability, data collection techniques, ethical considerations and the operational definition of the variables.

Data Collection Methods

Primary data for the study was gathered using self-administered questionnaires, supplemented by interviews and observations. Secondary data was derived from published material such journals and books with content material related to the study. Self administered questionnaires formed the researcher’s tool of data collection for this study. The researcher formulated a questionnaire with closed ended multiple choice questions as well as simple short answer questions which were mailed to the correspondents. The correspondents constituted the management personnel in the selected respondents’ construction firms.
Research Area

Research area was chosen the territory of Nepal.

Validity and reliability of data collection instruments is essentially to minimize bias in the study findings. Reliability of data collection instruments refers to the accuracy and precision of the measuring procedures. In order to ensure reliability of the data collection instruments, the researcher carried out a pre test by randomly selecting a few building construction firms in number, administered the questionnaire and observed the response to note if the questions were understood, and if the answers given were relevant to the study. Observed weaknesses in the data collection instrument were noted corrections made.

The validity of the data collection instruments refers to the relevance of the data collection instruments in relation to the anticipated outcome of the study. To ensure validity of the data collection instruments the researcher formulated simple easy to understand questions whose answers had a critical bearing to the variables under investigation so as to guide the study achieve its purpose.

Data collected was analyzed both qualitatively and quantitatively using the appropriate tools computer software and results presented in tables as percentages and frequencies.

The ethical considerations concerned the confidentiality of the information obtained from the respondents for the purpose of this study. It was important that the respondents were guaranteed of confidentiality of the information they divulged in case they felt the questions were personal or sensitive in nature. The researcher had to bring to light the fact that the study was basically academic for the purpose of fulfilling the requirements of the degree, and that the report will not be published for public consumption. In this respect an introduction letter from the university administration was a necessity.

The Construction site, awareness program are launching in construction industries health, safety and environment problems normally occur in construction project sites, as the detailed literature review has been performed out from various books, journal, and reports. Afterward this health related problems were sanctioned by interviewing the professionals working in construction industry at different construction sites. Then, a questionnaire was prepared to get the response of the experts working in the construction industry. The respondents were requested to rank frequency of occurrence and impact level of these health problems on a scale ranging from 1-5 [(1) Very Much; (2) Somewhat; (3) Undecided; (4) Not really; and (5) Not at all]. And then, the respondents were asked to give their opinion in construction firms managing problems related ergonomic health and safety at construction sites, the respondents were replied to the important of another scale ranging from 1-5 [(1) Strongly Disagree; (2) Disagree; (3) Neither agree nor Disagree; (4) Agree; and (5) Strongly Agree]. Finally, regarding the question are you agree well managed of safety engineering in construction projects by every firm of Nepal, the respondents were replied to the important of another scale ranging from 1-5 [(1) Extremely Satisfied; (2) Very Satisfied; (3) Moderately Satisfied; (4) Slightly Satisfied; and (5) Not Satisfied].

The data has been collected from current ongoing public and private projects in Nepal.

The methodology of the study is described below:

- A thorough literature review was done.
- A questionnaire was developed with the help of information extracted from literature review.
- Distribution and collection of questionnaire.
- Analyze the collected data.
- Relevant conclusions and recommendations were drawn.

Data Analysis

Researchers were asked the question regarding the awareness programs weather launched in construction industries about health, safety and environment?

One respondent said the awareness program was launched very much, and two respondents said somewhat it was launched, three respondents did not want to speak on this issue, twenty-four respondents responded that awareness program are not really launched and eight respondents said that they had not at all listen the awareness program at site.

The response was plotted on radar chart as given below;
this discipline improves the efficiency and productivity of construction industries. For years, many employers have known that good ergonomics is often good economics, similarly those employers have not only saved their workers from injury and potential misery, but they have saved the big amount of money in the process.

Regarding research question about Construction firms managing problems related ergonomic health and safety in construction sites?

Eleven respondents said that ergonomic health and safety problems at construction site manage by stake holders or construction forms, twenty respondents said that they disagree about management of ergonomic problems, three respondents neither they were agree or disagree, other three were agree upon the management of ergonomic problem by construction firms and one responds was strongly agree on the same.

The response was plotted on radar chart as given below;

None respondent said that safety engineering management was extremely satisfied, three respondents were very satisfied, seven respondents were moderately satisfied, thirteen respondents were slightly satisfied and twenty-five respondents were not at all satisfied.

The response was plotted on radar chart as given below;

Conclusion

In the introduction part men, machine, material, money are resources and using in every minute with safety environment. This research has explained on the safety, health and environment of workers who involve in construction project and provided a conceptual framework based on a comprehensive review of the existing literature. Every one need to safe first, next keep safe to all skilled and unskilled workers and then need to performance of the projects. In the methodology part several literatures have been studies and the gape was identified to fulfill the gape survey research have been conducted. Based on the datum, analysis has been done and finally, the conclusions have been drawn. Based on limited literature study appears to have been conducted to investigate on safety awareness involved at sites until to construction stage. The problems related to ergonomic safety and health and the status of safety engineering management adopted by the project manager. Then, the safety, health and environment priority involved to entire construction stage will suggest to stake holders in line with the improvement of existing policy and guideline.

References


