PREVENTING ACCIDENTS IN BUILDING CONSTRUCTION THROUGH SAFETY MANAGEMENT

Hirushi Nibandi Perera*[1]
Faculty of Development and Society – Sheffield Hallam University - UK
hirushinibandi98@gmail.com

Vathsala Somachandra*[2]
Faculty of Construction, International College of Business and Technology
Vathsala@icbtcampus.edu.lk

N.C Samarasiri*[3]
Department of Industrial Management, University of Moratuwa
nawodic@uom.lk

Abstract

Building Construction sector is one of the major sectors in the construction industry in Sri Lanka. As in other sectors, building construction workers also have to face various types of hazards and accidents. Due to these accidents, there is a significant lost to the industry in terms of valuable lives, wasted time and cost overruns and these adversely affect the reputation of the construction industry. The construction includes the different specific areas such as building, road, tunnel, bridges, harbors, reservoirs etc. But, the most researchers have carried out research in the general area of construction without any separation. Further the Health and Safety of Building construction have not been covered properly by the researchers in the past. However, one of the different areas of the industry, building construction has become the most hazardous industry compared to others. This study identifies the global practices to reduce the accident probability in Building construction projects. It also identifies the accidents that frequently happen, causes for those accidents, and the impact of those accidents on the on Building Construction projects in Sri Lanka. And also from the research it is possible to investigate the applicability of globally identified best practices in Sri Lankan Building Construction Projects. The main objective of this research was to develop a guideline for Sri Lankan Building Construction projects, which would be useful in reducing accidents probability in order to minimize various losses in Sri Lanka building construction projects.

Currently there is no proper research carried out regarding this issue to reduce accidents probability and minimize losses in Sri Lankan Building construction projects. Thus, this research is useful to fill that research gap in the Sri Lankan Building Construction Sector.

Key Words: Sri Lankan, Building Construction, Safety Management, Accidents

Introduction

Construction industry is one of the most sectors in the Sri Lankan economy. Accidents happen frequently at construction sites.

As such doing research on safety management in construction has an important practical significance on improving the construction site safety and ensuring the smooth implementation of the construction projects.

Construction industry needs a proper methodology for risk assessment based on the workers' experiences and obligation to avoid workplace injuries (Beriha et al, 2012)

In addition to that Smith et al. (2006) have highlighted that the advantage of following OHS risk assessment and historical data of the health and safety management would help to take decisions in future projects.

As Sri Lanka is still a developing country, there is no proper framework for safety management. Sri Lankan construction is only concerned with the time and the budget. Another reason for poor safety management practice is poor knowledge of the safety management in construction industry. Currently, there is no any proper research completed in Sri Lankan building construction and safety management. Due to that there is no proper control over the accidents which are taking place in construction industry. Hence many accidents are happening frequently and most projects are delayed due to this reason.

Thus in this research, the focus was mainly on preventing accidents in building construction through study of safety management in comparison to the globally accepted safety guidelines and precautions. Therefore, if the industry is not guided by a proper framework, further damage it could make to the whole system is unrecoverable. It is the responsibility of the researchers to provide the industry with adequate framework to maintain their health and safety for safe development and not merely to brand themselves as responsible organization through Health and Safety activities. This research study is aimed at the Health and Safety practices in the construction industry.

Aim

The main aim of the study is to develop a framework to reduce accident probability to minimize various losses in Sri Lanka building construction projects.

Objectives

- To identify the global practices to reduce the accident probability in building construction projects;
- To identify the accidents generally happen, causes for those accidents and the impact of those accidents towards Building Construction projects in Sri Lanka;
- To describe the applicability of globally identified best practices to Sri Lankan Building Construction Projects;
- To develop guidelines for Sri Lankan Building Construction projects to reduce accident probability to minimize time wastage in Sri Lanka building construction projects.

Literature Review

Work-related accidents and diseases kill 2.2 million people annually as per International Labor Organization (ILO) estimates. Of these deaths, 1.7 million or almost 4 out of 5, are due to work-related disease. Each year sees 160 million new incidents. "One out of six accidents happens on construction sites. Twenty-five out of forty deaths also occur in construction sites," (Spangenberga 2001). From these data, the present rate of accidents in Sri Lankan Building construction site can be compared. (Priyadarshani, et al, 2013)

In Sri Lanka most of the fatal accidents are happening because of construction accidents in buildings. Presently there are many construction work in high rise buildings and therefore accidents are mainly due to men falling from scaffoldings. Therefore, if an accident occurs, it is likely to be a fatal accident.

Global Practices to Reduce the Accident Probability in Building Construction Projects

Worldwide, the construction sector is one of the most dangerous. In the UK, it accounts for 5% of employees but 27% of fatal workplace injuries and 9% of reported major injuries (HSE 2010). The resulting human and economic costs of accidents and injuries are substantial.

In most of the countries, safety has become a major problem in their construction sites. Every year thousands of people are killed due to industrial safety issues in construction sites (Phillips and Leung, 2004)

Statistical data represent that on average 77 construction workers died from construction accidents in the United Kingdom in 2006/ 2007

Furthermore, falling from heights accounts for 30 per cent from the total accident in the construction industry (Sherratt, 2009)

The above data implied that the proper Health and Safety is the most important consideration in the construction sites to safeguard the lives of the workers. Similarly, for the Sri Lankan construction industry has the same Health and Safety issues and Occupational Health and Safety issues (OHS) are to be considered sensitively.

Methodology

Research strategy is the way how a research is successfully carried out by effectively achieving the objectives. (Naoum SG, 2007). This research acts as a replacement for theoretical study in a more practical manner. This research case study brings out in a practical way as a replacement for theoretical study. In this study objectives are mainly based on the accidents which are faced by the worker in Sri Lankan Building Construction projects and its affect to the construction industry.

By considering the above chapters, the main data collection method is the questionnaire survey. The questionnaire was developed mainly based on the concept of achieving the research aims and objectives. The main target is the crowd who are working as labourers in the building construction field and the managers who are in building construction sector.

This system was used for its simplicity and suitability to this study. In this study, three Building Construction projects in Sri Lanka and 150 workers among these projects were considered for the questionnaire survey. To meet the research secretor's objectives of this questionnaire survey, it has to be carried out in two ways. One Survey was carried out by considering the 120 workers such as laborers, masons, bar benders, electricians, riggers, etc. and the other survey carried out with 30 office workers who are in management level among three sites of building construction projects.

Research Findings

For this case study, there were 150 practitioners who were working in building construction sector from contractor side. These 150 included all three related construction projects. Out of 150 people, 120 were labours and 30 people were management level. In the labourer category there were masons, helpers, carpenters, riggers, scaffolds, bar benders, electricians.

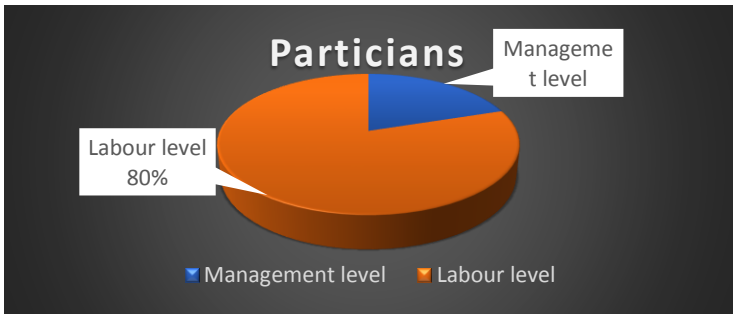


Figure 1 Percentage of Questionnaire Participants

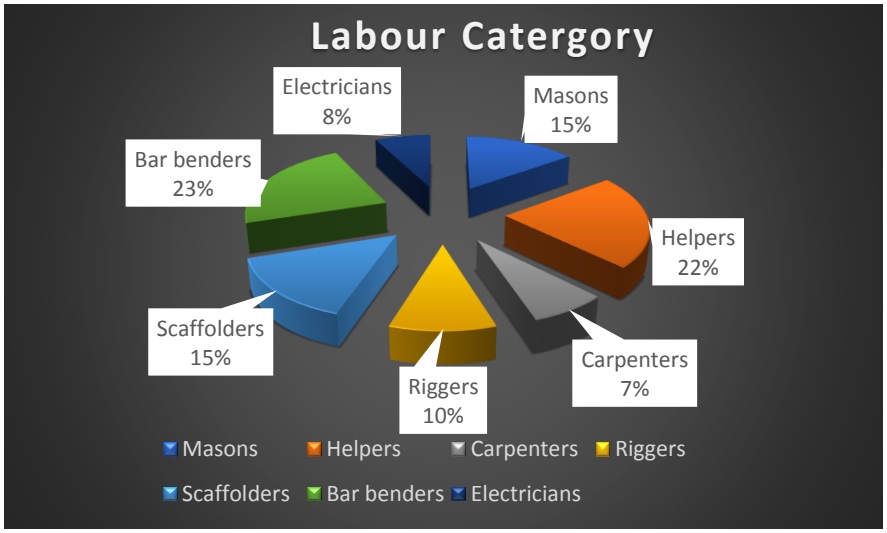


Figure 2 Labour Category

Description	Management level	Labour level
Site A	10	40
Site B	10	40
Site C	10	40

Table 1 Represented Category

Above labourers and white collars staff clarification selected by each site in equally to take the most accurate average to achieve this research aims and objectives successfully.

Identify the safety problems in building construction site

An accident may be defined as unacceptable events which cause personal injury or property damage. Most of accidents are preventable. (Phillips, 2010) Safety precautions have been placed at site in order to avoid accidents. Laborers are instructed to use the safety instruments while they are working at sites. Though it may be difficult to find an accident free construction site, some of the accidents are fatal and some result in permanent damage complete or partials. People have begun to realize that occupational accidents have economic as well as physical consequences. Here in after the research sectors considered in the building construction site in relation to this case study is addressed as Site A, Site B and Site C. When considering the related construction sites the labourers are not properly using safety equipment. Most of the labourers resist to adhere safety precautions. Not only the labourers more of the white collars teams should wear the helmets and other safety equipment when entering to the construction site.

Results

General accidents happening in Site.

- **Considering Site A, Site B & Site C**

Accident No:	General accidents happen in Sites	Frequency	Average %
1	Falling from ladders	90	60
2	Falling from scaffoldings & working platforms	40	27
3	Falling objectives from upper floors	112	74
4	Soil Collapse while excavation	22	14
5	Slipping and Stripping at the site	123	82
6	Working with hazardous materials (dust, liquids, gasses and fames)	68	45
7	Electrocution	86	57
8	Fire and Explosions	8	5
9	Elevator accidents	6	4
10	Building collapse	2	1
11	When using vehicles and machines	110	73

Table 2 General accidents

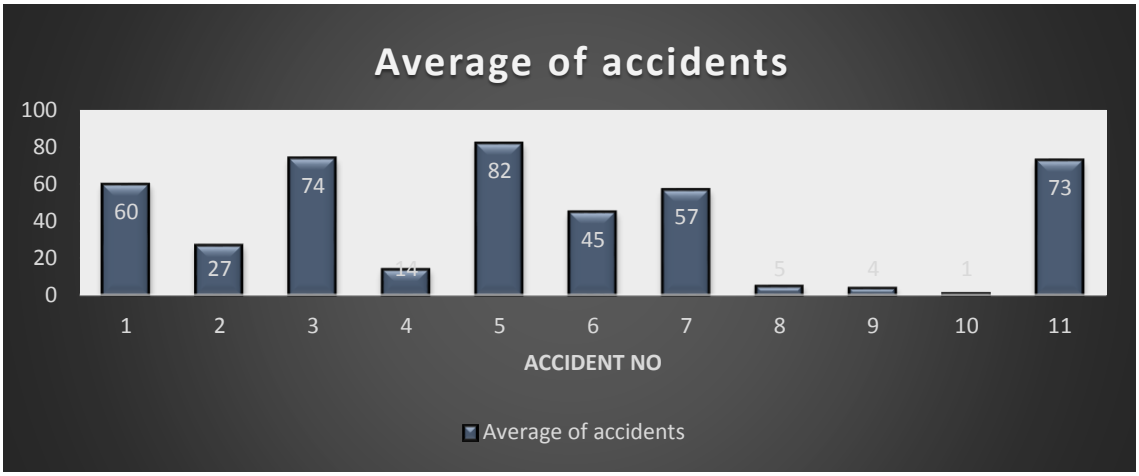


Figure 3 Average of Accidents

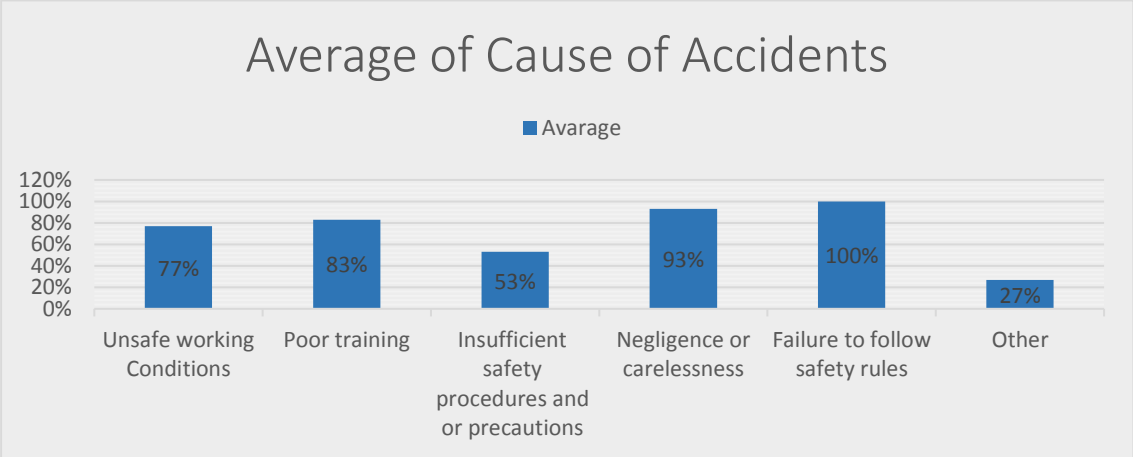
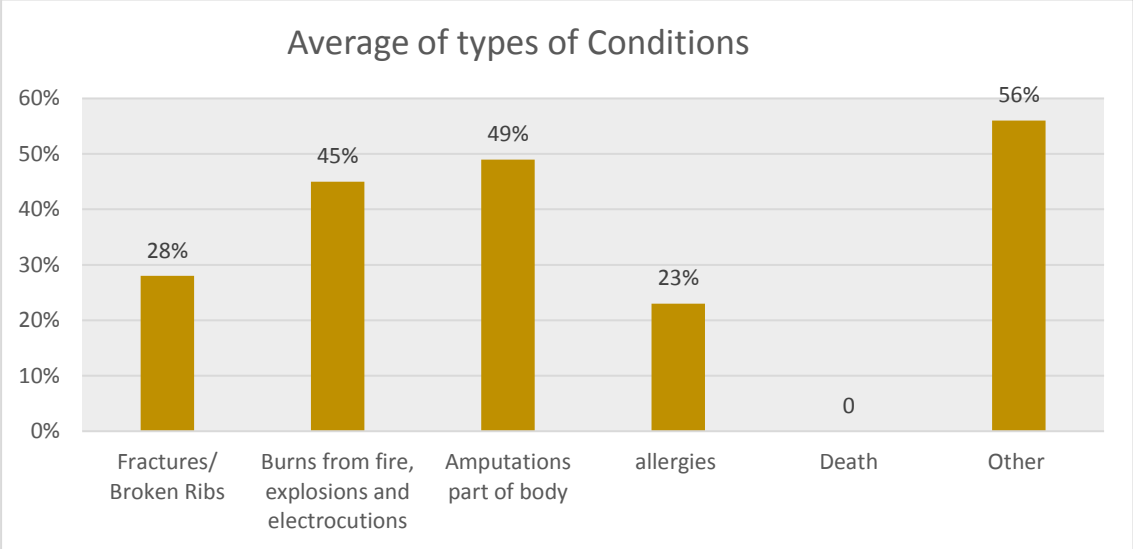


Figure 4 Cause of accidents at construction site



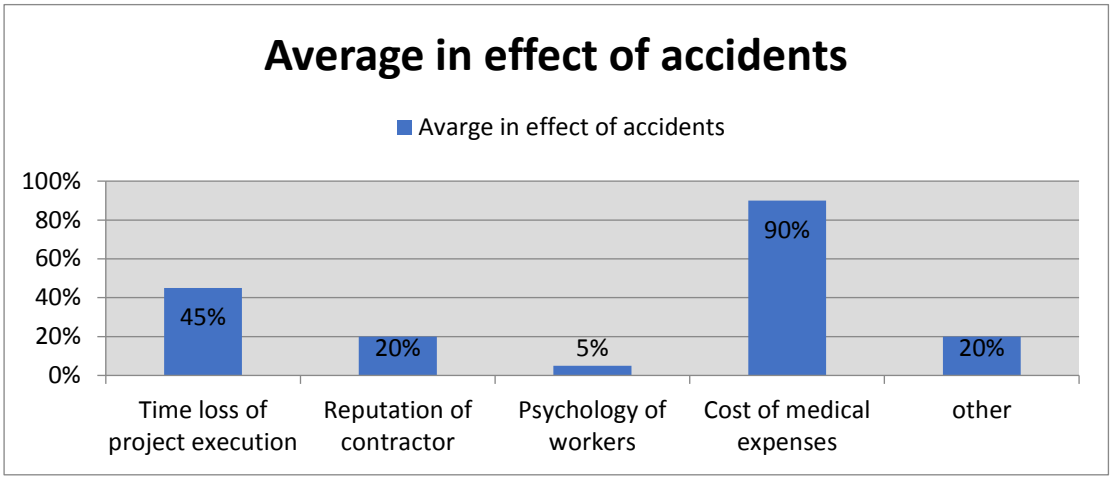
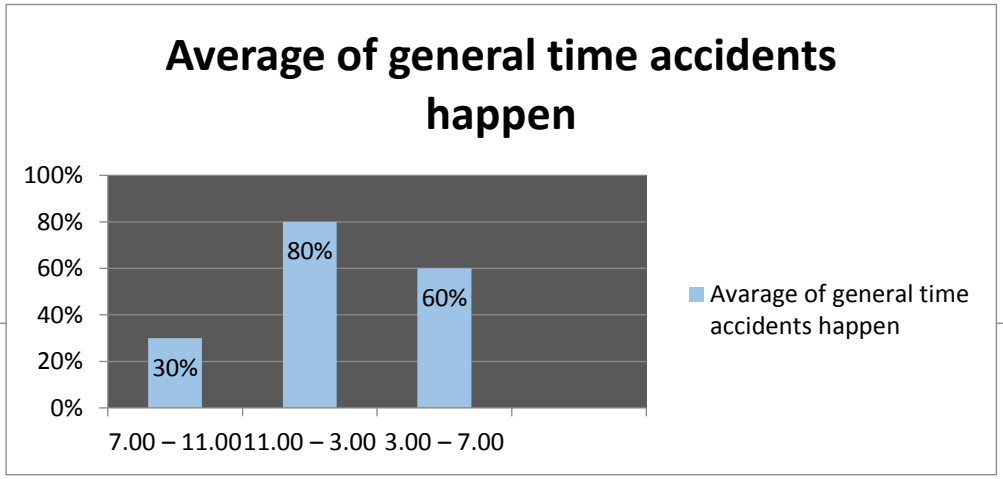


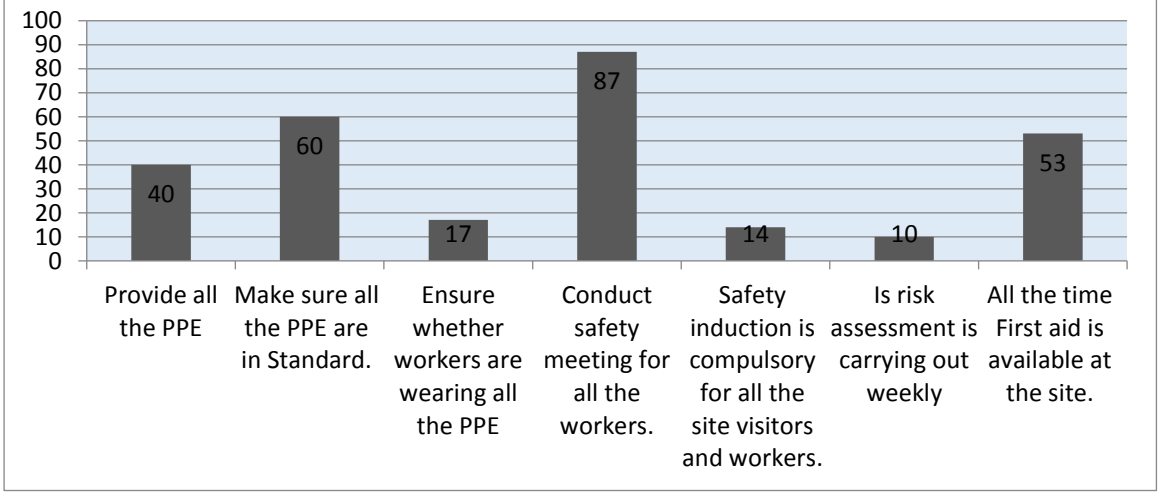
Figure 5 Types of Conditions caused by construction injuries.

Figure 6 Effect of accident on site

Figure 7 Current Practices

Figure 8 General time accidents happen in the site





Discussion

According to above analysis there were several main accidents happened in relevant construction sites. As per the Graph 01 most of the accidents are caused happen by slipping and stripping at the site. There is no proper storage system and there is a high possibility to cause accidents when using machines and falling objects from upper floors. According to Graph 02 higher average cause of accidents occurred in relevant construction site are due to failing to follow safety rules and also insufficient safety procedures and precautions in the construction site. These causes happen as a result of lack of responsible personnel to search all the time whether the work is carried out under safety procedures. Most of the times in Sri Lankan construction industry new technology to prevent accidents are not considered. By analyzing above data we could identify there are several types of effect of accidents on site. Those are time loss of project execution, reputation of contractor, psychology of workers, cost of medical expense and other effects. As per the discussion held with construction managers of these construction projects, two of them in separate projects mentioned that this causes delays in building construction since they could not finish for the given date. Considering Graph 4 we could identify average by time loss of project execution has been taken the second place. It is an excessive effect to construction site. Generally working hours of the construction site is 7.00 a.m. to 7.00 p.m. As per the Graph 5 high probability of accidents happens in between 11.00 a.m. to 3.00 p.m. where the lunch time is included. Generally workers are tired & feeling sleepy after the lunch time. Hence more accidents could be caused while working with machinery & other equipment due to fatigue & drowsiness due to heavy lunch.

Conclusion and Recommendations

Finally, it is identified that most of the accidents caused due to slipping and stripping and cause of that accident is negligence and carelessness. From these accidents workers has to face small injuries and broken bones. There is a greater effect to time loss of project execution and cost of medical expenses where these accidents happen generally between 11.00 a.m. to 3.00 p.m. from these accidents in the relevant building constructions.

In Sri Lanka most of the sites are going on residential areas. Hence there is a probability where these accidents could affect to civilians. But currently no proper advice is given to civilians about the hazardous impacts might cause in the construction and its affect to them. Consequently, the research sector is providing suggestions to conduct proper safety induction programmers for public.

Full safety equipment for labourers should be provided while making it a mandatory requirement to adhere at sites. In addition to that there should be appropriate pre-start briefing sessions by the supervisor and should be kept at the location.

Most of the accidents happen because of unauthorized works going on the construction site. Thus, there should be proper permits to carry out in restricted areas such as excavation Permit, Ladder permits, Hot Work Permit. These are required for any activity which will produce sparks or open flames like grinding, welding water proofing and demolition permits.

In Sri Lanka, there is no appropriate debris managing system. But the other develops countries they are using well practical system to manage the construction debris.

Waste Type	Color of Bin/Skip	Waste Source	Recycler's Locations	Recycled Product
Concrete Waste	Yellow	Concrete Activities		Crushed concrete.
Metal(Steel) Waste	Gray	Steel Reinforcement.		Recycled Rebar
Plastic Waste	White	PVC Pipes and others		Recycled plastic products
Paper and cardboard waste	Green	Packing of materials		Recycled paper and cardboard
Timber Waste	Brown	Joinery and Framework		Wood Pallets
Miscellaneous Waste	Blue	Miscellaneous		N/A
COSHH Waste (Hazardous)	Black	Empty Chemical Containers		N/A

Table 3 Debris management system

Daily safety meetings and training programmes for the workers and monthly site safety meetings should be organized through which employees could be advised to avoid risk at site. Further new technology & new method for work safety could be introduced. Therefore, can award and prizes for good employee practices on weekly basis.

In a construction site identifying hazards is an appreciated task where a standard format should be followed to recognize hazards before it occurs, hence instructions could be provided accordingly to prevent accidents. The biggest importance here is it may save workers' lives. If the expensive machinery is damaged while working, steps to be followed to recover the damage can be envisioned by adhering a format. If the workers get injured or deceased, a way of compensation can also be determined by this system.

References

Beriha GS et al. (2012). Assessment of safety performance in Indian industries using fuzzy approach. *Expert Systems with Applications, 39*(3), 3311-3323.

Cameron. (2006). *Reducing construction accidents.* Caledonian University.

Cesarini G, Hall G and Kupiec M. (2013). *Building a Proactive Safety Culture in the Construction Industry.*

Kim L. (2010). *Occupational health and safety risks.*

Naoum SG. (2007). *Dissertation Research and Writing for Construction Students* (n nd ed ed.). United Kingdom: Elsevier Ltd.

Phillips. (2010). *Phillips International.* Retrieved from http://www.resource4constructionsiteaccidents.com/topics/typesofconstructionsiteaccidents.html

Phillips D, Leung T.W. (2004). Safety climate and safety performance among construction workers in Hong Kong : the role of psychological strains as mediators. *Accident Analysis & Prevention, 36*(3), 359-366.

Priyadarshani K, Karunasena G, Jayasuriya S. (2013). *Construction Safety Assessment Framework for Developing Countries: A Case Study of Sri Lanka.* PENERBIT UNIVERSITI SAINS. MALAYSIA: Journal of Construction in Developing Countries.

Sherratt, F. (2009). *Unpacking Construction Site Safety.* John Wileys & Sons.

Spangenberga S. (2001). *The construction industry in the twentyfirst.* Geneva.

V.Ramachandran. (2011). *Bright Hub Engineering.* Retrieved from http://www.brighthubengineering.com/building-construction-design/84994-safety-in-buiding-construction/