Study of Safety Measures And Their performance in Construction Projects

Ms. Bhagyashree L. Deshpande
Dept of Civil Engineering
G H Raisoni University, Amravati

Abstract- *The construction industry is a nation's backbone, especially in developing countries, in today's world. Construction is one of the most dangerous industries in the country, since it accounts for a large number of work-related accidents and fatalities. The protection systems have been developed in a number of countries. The problem is more crucial in developed nations, where protection and health programs are either in their infancy or fail adequate execution. The rapid growth in Buildings and Infrastructure has resulted in an increase in deaths and injuries. An accident on a construction site may result in significant physical harm. People dropping from heights and being hit by falling objects became the most common deaths in the building industry. The ever-increasing number of high-rise buildings demonstrates the need for better protection and health management. As a result, the aim of this study is to figure out what causes high-rise building construction site injuries and how to avoid them. Man-made causes, environmental factors, and equipment variables have contributed to accidents. Provide appropriate Personal Protective Equipment (PPE), maintain proper housekeeping, conduct safety inspections, provide safety instruction, and conduct incidents investigations were the approaches used to prevent accidents. This research aids in explaining the causes of injuries and determining areas where preventative steps can be taken, so that staff and senior managers are more mindful of how to avoid workplace accidents.*

Keywords- Fire safety, residential buildings, risk management, Safety management

I. INTRODUCTION

Over the past decade, workers have been given safety rules and safety equipment to increase the height of the building to prevent them from falling from the ground and to maintain balance in the high ground as they are working from a height above the ground.The construction industry can be referred to as a hazardous industry in comparison to the other industries. Unlike industrial accidents, innocents are injured in the construction industry. Passersby have been injured or killed in a sudden accident at a construction site or in the collapse of equipment.

Decisions made at a time of planning and design of safety in a construction project have a huge impact. The use of planning and design to prevent or prevent accidents at construction sites is difficult and risky to implement, and other such schemes can reduce the risk of dangerous accidents. The design also relies heavily on education, vigilance and cooperation during the safety process. Worker should always be vigilant about the possibility of accidents and avoid unnecessary risks.

Unfortunately high rates of accidents and fatalities had tarnished its reputation and image. Globally, the construction industry is still considered as one of the most hazardous industries (Hinze, 2008). Construction safety as a result continues to represent a problem and pose a challenge for researchers and practitioners. Both thesociety and economy have suffered human and financial losses as a result of the poor safety performance in the construction industry.

Department of Occupational Safety and Health (DOSH) reports that occupational accidents by sector shows that the highestnumber of death was in the construction industry as of for the incidents (DOSH).

II. OBJECTIVES

To study the rules and regulations of safety in Construction Projects.

- Identify the factors affecting improper safety management on construction site.
- Evaluate the factors affected to the employees by analytical method.
- Current practices of safety management by a construction company.

III. LITERATURE REVIEW

Er.Saurabh Gawali, et.al.(June 2016) studied various health and safety risk in high rise construction, specified common hazards ,reasons of their occurrence and given hazard related solutions briefly and also stated the safety checklist to avoid hazards that causes injuries, illnesses and fatalities.

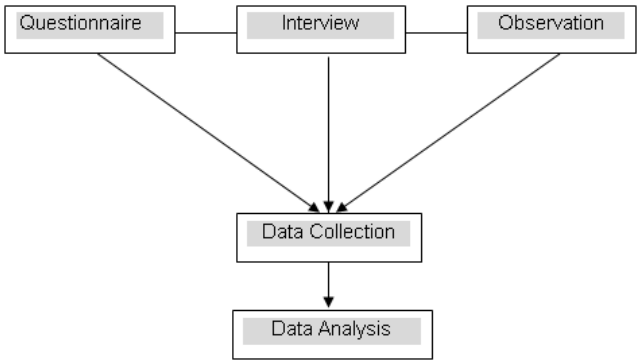
Dr. Manish Chugh, et.al (June 2017) studied that the poor state of fire services in India and setbacks of NBC-2005 when it comes to implementation, problems concerning architects not taking into accounts the fire safety during design stage of high rise buildings nor visualize the requirements of fire service personnel and poor maintenance of fire safety system and lastly pressures on training and to create awareness among people.

Venumadhav Yemul, et.al. (December 2014) described occupational safety and health on high rise (i.e.25–30 floors) building. The OSH program reduces job accidents, project cost directly or indirectly, ensures safe, healthy work environment and safe work practices, creates safety awareness among workers. It is an economic as well as humanitarian concern that requires proper management control can be achieved by following safety rules, regulations, adoption of different work permit systems, reports and checklist during construction and their records saved for future assessments.

Afzan Ahmad Zaini, et.al. (May 2015) described the recognition of the theoretical aspects on the livelihood and severity of the hazards in the high rise building construction project. This study assist the construction management personnel to make decision making on managing the occupational risk at the construction site particularly high rise building.

Kai Chen Goh, et.al. (April 2016), described an overview on the causes of accidents and preventive measures at high rise building construction site. The causes of accidents at high rise building where due to workers lack of training unskilled workers, workers unsafe acts, unsafe condition, poor site safety management and less awareness of hazardous activity at work site. Although some preventive measures have been results in reduction of the number of accidents.

IV. RESEARCH METHODOLOGY



Research is based on following flow chart:

Factors Affecting Improper Safety Management in Construction Industry:

Safety Training
Safety Inspections
Safety Incentive and Penalties
Compliance with Safety Legislation
Labour Turnover Rates
Workers' Attitude Towards Safety

Pilot Survey:

A pilot survey, also known as an exploratory survey, is a small-scale methodological evaluation designed to guarantee that proposed techniques and processes will work in practice before being included in a massive and costly study. Itis a survey that is normally conducted prior to the main survey in order to gather details in order to increase the main survey's reliability. Questionnaire have the following questions.

Evaluate By Analytical Method:

After the data processing is completed, the data will be analyzed. All of the information gathered by the questionnaires will be analysed and summarized in order to arrive at an acceptable and appropriate conclusion for protection management in building projects. Information processing is a method of de-synthesizing the information gathered. It is a method of putting statistics and figures together to address questions, as well as a structured mechanism of using evidence to arrive at a response to a query. The Relative Importance Index (RII), Average Index Formula, and Cronbach's Alpha (using SPSS Software) methods are used to analyse the survey. The scores were then converted to significance indexes using the method below.

Relative Importance/Difficulty Index:

The relative Importance Index (RII) is calculated to get the rank of the factors and the importance of safety in construction project.

Relative importance/difficulty index = $\sum W/AN$.

Where w is the weighting given to each factor by the respondents, ranging from 1 to 5,A is the highest weight (i.e. 5 in the study) and N is the total number of samples.

Average Index Formula:

The analysis was based on the qualitative measurement or ranking system. Rating forthe questionnaire is

1 – Totally Disagree, 2 – Disagree, 3 – Moderately, 4 – Agree, 5 –Totally Agree.

The Average Index Formula:

Average Index (AI) = $\sum (\beta \times n)/N$

Where,

ß is weighing given to each factor by respondents
n is the frequency of the respondents
N is the total number of respondents

With the rating scale as below:
1 = Never/Totally disagree (1.00 < Average Index < 1.50)
2 = Rarely /disagree (1.50 < Average Index < 2.50)
3 = Sometimes/Neutral (2.50 < Average Index < 3.50)
4 = Often/agree (3.50 < Average Index < 4.50)
5 = Very often/strongly agree (4.50 < Average Index < 5.00)

4.3.3 Cronbach's Alpha Using SPSS Software:
Cronbach's alpha is the most common measure of internal consistency ("reliability").The Cronbach's alpha coefficient is an internal consistency reliability test. The Cronbach's alpha coefficient value is ranged between 0.0 and +1.0 and Cronbach's alpha value nearer to 1 show higher internal consistency.

V. RESULTS AND DISCUSSIONS

As per the data collection done and further calculation work, we calculated factors affecting improper safety management implementation in construction project by RII and factors affecting improper safety management implementation in construction project by Average Index Formula.

Factors Affecting Improper Safety Management Implementation in Construction Project

Table1: Ranking on the Factors Affecting Improper safety management implementation in Construction Project

Rank	Factors	RII
1	Labour turnover rates	0.91
2	Compliance with safety legislation	0.89
3	Safety incentives and penalties	0.85
4	Worker's attitude towards safety	0.85
5	Safety inspections	0.85
6	Safety training	0.81
7	Availability of safety equipment	0.81
8	Safety meeting	0.81
9	Organization	0.81

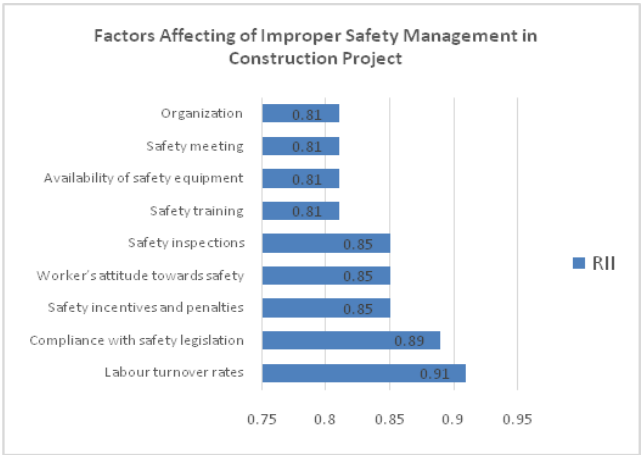


Figure 1: Factors affecting Improper Safety Management Implementation

Cronbach's Alpha Using SPSS Software:

In general, a questionnaire with a score of 0.8 is regarded as reliable (Field, 2009). As a result, since the is 0.911, this questionnaire is unquestionably reliable. The outcome should still be viewed with caution. Because the number of items in a questionnaire is factored into the equation, a large number of variables can improve the results (Cortina, 1993; Field, 2009). If we run a reliability analysis on just the items that make up the first factor in our study, we get the same result, but the average correlation is 0.49 instead of 0.43. The size of the alpha for a dataset with a specific number of items is still up for debate (Cortina, 1993). According to Cortina (1993), the adequacy of a measure of the level of precision required should be determined. However, because the reliability of this questionnaire is much higher than 0.8, we can assume it is reliable.

Table 2: Reliability Statistic

Cornbach's Alpha	Cornbach's Alpha Based on Standardized Items	N of Items
0.911	0.895	27

Current Practice of Construction Safety Management at Construction Site

Rank	Current Practices of Safety Management	Average Index
1	A safety and health officer is employed to ensure the safetyof the site	4.56
2	Any accident is notified to the nearest Department of safety and health.	4.45
3	All hoisting machinery such as mobile crane possessed a valid certificate of fitness from the DOSH.	4.35
4	Safety signboards at workplace is put at the construction site	4.22
5	Job safety/ hazard analysis (JSA/JHA) is practiced at construction site.	4.22
6	The formwork braces and other supports is inspected by the designated person.	4.22
7	Scaffold is erected and dismantled under supervision of a designated person.	4.22
8	The worker wear proper PPE at the construction site.	4.11
9	Safety tool box is conducted daily.	4.00
10	HSE policy is published to all worker.	4.00
11	DOSH guideline is briefed to all employee.	3.76
12	Safety awareness campaign is conducted by the company.	3.69
13	Emergency response plan is used at the site.	3.57
14	Safety Management System (SMS) is established by the company.	3.45

Table 3: Current Practice of Construction Safety Management at the construction site based on ranking

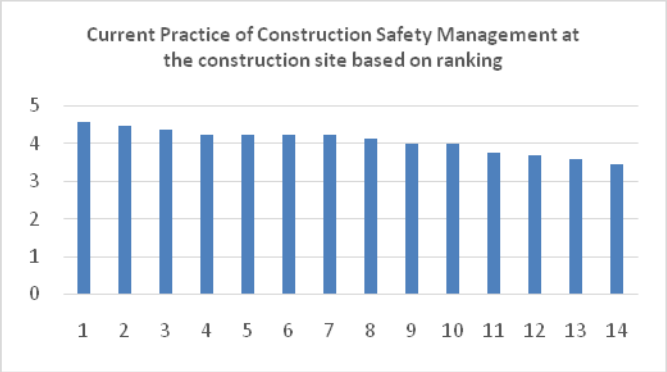


Figure 2: Current Practice of Construction Safety Management at the construction site based on ranking

Discussion:

The collect several data from the questionnaire, site visit, and informal conversations with the engineer. By comparing the results, several conclusions about the current practice of construction safety management at the project site can be drawn. The role of the safety and health officer is the first. According to the survey, having a safety officer is the most important factor. This demonstrates that for this project, the company hired a safety and health officer. On the other hand, according to the conversation with the site engineer, the site's safety officer is unqualified. This is because Green Book Training is required in order to become a competent safety and health officer. The company did not implement this. The cost and salary of paying the safety supervisor is one of the factors. Second, the results of questionnaires and site visits contradict each other. According to site visits, the majority of the construction workers were not wearing proper protective equipment (PPE) on the work. According to the company's site engineer, the site's safety enforcement is strict. On the construction site, workers are not required to wear personal protective equipment (PPE). One of the reasons for the workers' permission is that if the management takes any action against them, the site's progress will be slowed because the majority of the workers do not wear PPE. According to chart 2, 11.1 percent of respondents disagree on several items. The items are (JSA/JHA) is practiced on the construction site, workers wear PPE on the job, HSE policy is published to all workers, DOSH guidelines are briefed to all employees, safety awareness is conducted, emergency response plans are used on the job site, and the company has established a Safety Management System. The reason they disagree is that the company most likely did not adequately brief their employees on their safety policies. Aside from that, the workers themselves are unconcerned and unaware of the company's safety policies. As a result of this, the safety committee must take appropriate steps to ensure that all employees are aware of the company's safety policy, current practice, and program.

VI. CONCLUSION

- The respondents rank the first factor affecting of improper safety management in construction is labor turnover rates, with a RII of 0.91, Second is Compliance with safety legislation is 0.89, Safety incentives and penalties, Workers attitude towards safety, Safety inspections is 0.85, Safety training, Availability of safety equipment, safety meeting, Organizational safety policy is 0.81.
- A questionnaire with an α of 0.8 is considered reliable, cronbach's alpha this questionnaire certainly is reliable, since the α is 0.912.
- This will improve the program's success while also ensuring that project activities are completed on time.

Every industry requires a high level of safety. Preventing unforeseen accidents at high-rise construction sites is aided by safety measures. Accidents on construction sites can result in fatalities and cost a lot of money. As a result, safety and precautions should be an integral part of every construction site's operations. This will improve the program's success while also ensuring that project activities are completed on time. Each operation has its own set of hazards, and a safety program tailored to those hazards should be developed. As a result, our research has reached the following conclusions:

- It has been observed that workers are not well-informed about safety and precautions, which is concerning. As a result, the main concern is worker training and awareness, which can be achieved through timely meetings, safety drills, and follow-up as work progresses. All workers on the job should be required to use safety equipment or take precautions in the event of an accident.
- It was observed at the construction site that they were aware of flammable materials, their proper handling, and storage.
- Lifts were installed, which was necessary for fire safety reasons.
- There is no provision for a fire escape or external stairs, which is a major flaw in the construction.
- A refugee area is provided, which is a significant benefit in terms of high-rise safety management.
- Proper housekeeping contributes to the reduction of many hazards on the job site.
- There are no boilers or gas supply lines on site, which is advantageous because it eliminates the risk of a fire.
- Fire extinguishers, a water storage tank, and automatic sprinklers have been installed in the building to assist in the event of a fire.
- There were no air conditioning ducts, so if a fire breaks out, it will cause harm to the occupants, such as suffocation.
- There was no nearby fire hydrant, which they should have provided.
- On-site electrical services were seen to be properly managed.
- To summarize, it is impossible to complete a high-rise construction project without proper health and safety management.

Recommendations:

As a recommendation, the company's management should be aware of the company's performance in terms of safety management, as they play a significant role in this area. Restructuring the safety management team is one of the options. This is to ensure that a responsible person is in charge of safety issues. Furthermore, the government should grant small construction companies the privilege of establishing a systematic construction safety management system. In addition, the government should provide workers with free Green Book training. As a result, the company's ability to control safety issues on the construction site will be enhanced. Based on the findings, it can be concluded that construction project safety management needs to be further improved and monitored on a regular basis to ensure its effectiveness. According to the results of the case study survey, the members of the project team were aware of the importance of safety management in construction projects. However, many aspects of the system must be improved in order to ensure its effectiveness.

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