



# A Study On The Procedures And Investments On Safety In Construction Industry

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**Abstract**—This paper aims to analyse and study the procedures and investments on construction safety. The attitudes and views of employees towards health and safety behaviour make up an organization's safety in construction. The project's primary goal is to increase safety and reduce risks and losses in the construction industry by using safety measures. For 50 days, a large construction site was the subject of a study on safety practises. At different other sites, surveys on safety practises and investment strategies were also done to see how businesses felt about spending money on safety. The study aids businesses in familiarising themselves with safety management systems and putting them into practise at the structures they create.

**Keywords**— Construction, Health & Safety Assessment, Construction Design Management

## I. INTRODUCTION

In India, managing construction safety has always been a major problem. Though much improvement in construction safety has been achieved, India continues to lag behind most other countries with regard to safety. The safety in construction of any organization consists of employee's attitudes towards and perceptions of health and safety behaviour. The project mainly focuses on implementing safety techniques in construction industry to improve safety and to reduce the losses and risks. A study on safety techniques was conducted on a huge construction site for a period of 50 days and a survey was conducted on the safety procedures and the investment strategies at various other sites to obtain the stand of the firms on investment on safety. The study helps

organisations to be acquainted with safety management system and to implement the same at the constructions they build up.

The second-largest industry in India after agriculture is the construction sector. Next only to traffic accidents, this industry has the second-highest accident rate. Work in the construction sector is dynamic by nature. Because of the use of heavy machinery and operations at various depths and heights, the industry is dynamic. Accidents are a serious problem because human life is irreplaceable and because the building business has too many fatalities. Accidents are the major cause of loss in construction. Falls from heights and into openings are the causes of severe accidents. The risk involved in the industry poses the challenge to work on it.

The recovery of safety standards and practises in the building industry has been aided by the passage of safety and health acts. These acts helped to perk up the standards of large-scale constructions whereas the small-scale constructions are still prone to severe accidents. Lack of knowledge about the safety measures and the aftermath of the accidents, cause the recklessness in small scale construction. Effective safety measures can reduce accidents and reduce project cost directly or indirectly. There are a few practices that can be followed to accelerate the safety performance in the construction. Every safety practice implemented in the job defines a cost and provides a resistance to the direct or indirect cost caused due to accidents.

## II. OBJECTIVE AND METHODOLOGY

### A. Objective of the Project

The objective is to study the procedures and investments on safety in construction. Survey is conducted to study the investment strategies of the organization. The samples are then analyzed to obtain the results.

Moreover, beyond all the fundamentals of an EHS management system, its implementation aims to:

1. Identify and control all the risks related to the construction activities
2. Raise awareness of the encountered risks to reduce occupational accidents.
3. Reduce the activities' impact on the environment.
4. Improve productivity.
5. Adopt a responsible approach centred on the sustainable development.
6. Show a better brand image.

### B. Problem Identification

At the Data Centre Development Project in Tamil Nadu's Chennai area, a study on safety precautions was done. Major construction projects come with a lot of dangers that could prohibit them from being completed on time and on budget.

#### Construction Safety Planning

Safety begins at planning for the construction works and these planning helps increase the efficiency of the safety techniques. The two major theories could be used to improve the safety planning.

#### 5s Theory

Sorting- sorting is the process of segregation of works according to its category or group. This helps in reducing the puzzlement at the construction site.

Simplifying- it is the process in which the complexity of the works is reduced. Failures occur due to complexity of the work. Simplifying helps reduce failures.

Systematic- it is the process of following a set of order to obtain the result precisely. Systematic work helps attain result with precision. Helps reduce accident.

Standardizing- it is a process where one follows a set of standards to diminish the probability of failures.

Sustaining- sustain is the process of maintaining the above theories without failing. Sustaining these works is the most important factor to complete the works successfully.

7. Shortages of materials or skilled labour
8. Work stoppages
9. Unforeseen engineering, environmental and/or geological problems.
10. Weather interference
11. Unanticipated cost increases; and,
12. Unavailability of construction equipment.

### C. Methodology

Identifying the risk connected to a certain activity, circumstance, or product is the first step in a methodical process that also involves assessing the risk connected to that risk and if eradication is not possible, finding strategies to minimise it.



**Fig 3.1 Methodology**

#### 5e Theory

Education – the employees need to be educated about the safety techniques and the causes of failures. This helps to avoid manual error.

Engineering methods- complexity of the construction could be reduced by bettering the engineering methods. Better design could help avoid accidents.

Evaluation- all the activities at the construction site must be evaluated at regular intervals. These evaluations must be compared to the standards set.

Enthusiasm – the employees should be enthusiastic to work. The feel of excitement to work will help active participation.

Enforcement- enforcement of laws, rules and regulations can help avoid accidents. It is among the most important reasons to adhere to better safety procedures.

#### Factors Influencing Safety Performance

- Personal Factors
- Economic Factors
- Management Factors
- Environmental Factors
- Technical Factors

### III. DATA COLLECTION

Whether a project is under construction or not, it must possess the following qualities:

- A Clear goal or objective.
- The Specific duties to be carried out.
- A clear beginning and conclusion.
- Use of Resources.

The goal of construction project is to build something. Construction differs from other businesses in that projects are frequently enormous, built on-site, and unique. The project uses a variety of resources, including time, money, labour, equipment, and materials. Every project starts with a clear objective that is set by the owner and achieved by the project team. The two team members learn more about the project than was understood when the goal was originally set as the team starts to design, estimate, and plan out the project. Finally, the project is completed with the help of the available resources, and the completed building is delivered to the Owner.



**Fig 3.2 Factors in Resources in Construction Management**

Success in construction projects depends not only on the calibre and quantity of work, but also in significant part on appropriate availability and effective resource management. There are many different types of resources used in the construction business, including the materials, labour, equipment, capital, and physical space needed at each step of development. The success of the project's cost is influenced by the project manager's ability to manage construction resources.

#### Materials

There are numerous materials used in construction. The use of some materials depends on project conditions and practices. Materials are the essence in the construction industry which represents a substantial proportion of the total value of the project. Resources in Construction

management are Time, Space, Men, Machine Material and Money. Hence, efficient material management is an important criterion for success of any project.

### IV. ANALYSIS OF QUESTIONNAIRE

On an average 2.48% of the total cost is being invested on the safety procedures, and 69.56% of the companies' state that loss due to lack of investment on safety causes more accidents. Only 43% of the companies investigate the accidents occurring at the site. Loss of productivity is the most frequent loss occurring during construction and loss of investment stand next to productivity (table 1).

**Table 5.1 Frequency of loss due to accidents**

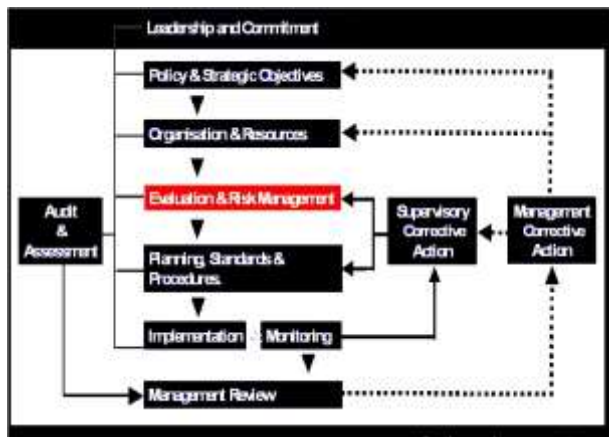
S.NO	FACTORS	PERCENTAGE (%)
1	Loss of productivity	43
2	Loss of Investment	33
3	Time Delay	22
4	Loss of life	2

**Table 5.2 Costs due to accidents- Indirect**

S.NO	FACTORS	PERCENTAGE (%)
1	Loss of productivity of injured labour	32
2	Loss of productivity of assisting crew	26
3	Loss due to compensating work	18
4	Loss of productivity due to inspection	11

Worker's error and lack of safe working conditions causes the major number of accidents at the construction site (table2).

## V. PRINCIPLES OF SAFETY MANAGEMENT



**Figure 6.1 Principles of Safety Management**

## VI. SAFETY IN DESIGN

By including elements in the design process that will improve constructability, Safety in Design (SiD) or Prevention through Design (PtD) has the potential to lower environmental damage, injuries, and fatalities at construction sites.

The SiD/PtD Risk Register will be developed and maintained by the design team prior to engagement with the Partners. The Partners shall take ownership of the register for further development until the successful handover of the project.

The main goals of CDM are to promote cooperation among all project participants and to integrate health and safety into project management.

The Contractor is expected to meticulously plan out the arrangements that will need to be made for the Falcon project in order to.

Timely and incident-free project completion.

Enhance the project's planning and management from the outset by bringing in subject-matter specialists to make sure that risks related to all elements of business, especially those involving hazardous operations, are accurately assessed.

Identify hazards early on, so they can be eliminated or reduced at the design or planning stage so that the remaining risks can be properly managed.

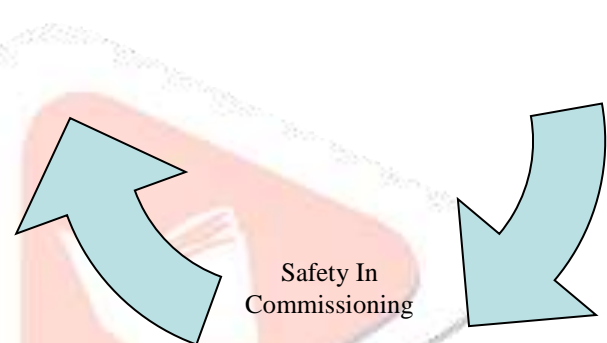
Target effort where it can do the best in terms of EHS.

Discourage unnecessary bureaucracy and Proper usage of resources and waste reduction.

The contractor needs to include details of how we are going to ensure safety is considered at all stages of the construction based on safety in design including opportunities for construction teams to feed into the design process throughout its lifecycle. Monthly, fortnightly, and weekly plan to develop, communicate and implement in a safe and sustainable way. Contractor's designers (architects, engineers, contractors, etc.) carrying out design work is to be competent and adequately resourced to address the EHS issues likely to be involved in the design.

Safety In Design

Safety In Construction



## VII. CONCLUSION

Safety management plays a vital role in the uninterrupted functioning of the project. Safety management helps trim down the number of accidents. Accidents cause a number of losses like loss of productivity, loss of investments, time delay and fatalities.

Accidents are caused due to a number of causes like lack of safety measures, lack of safe working conditions, workers error and difficulty in construction.

The common cost that occur due to accidents at the construction sites are medical, liability, indemnity and miscellaneous. And the most frequent cost occurring are the medical and liability costs.

While medical expenses and liability are the direct losses there are a few losses that cost the investor indirectly loss of productivity, loss of productivity of assisting crew, loss due to compensating work, loss of productivity due to

inspection works, loss due to repair and replacing and impact cost.

The implementation of SiD/PtD Risk Register could reduce the frequency of accidents this clears the obstacles for the uninterrupted completion of the project. Training programs could help the labour gain adequate knowledge on the type of hazards at the construction site. Toolbox meeting has to be conducted by the safety supervisors to make the employees aware of the mistakes they commit at the work site.

The safety management plays a major role in providing a safe working environment. Inspections at regular intervals are to be conducted. Checklist and standards are used for inspections.

Workers error causes 43% of the accidents at work site. Adequate training programs can help reduce these accidents. The management should appoint safety supervisors to educate the labours. Safety supervisors play a major role in avoiding accidents and monitor the works of the labours.

In-direct cost are negligible yet need to reduce to increase the efficiency of the employees. The organisations must follow the standards to avoid accidents. The rules and regulations have to be enforced to acquire safe working conditions.

Proactive nature towards safety techniques should be adopted by the organisations to obtain a safer working environment, avoid losses and fatalities. This could help increase the overall efficiency of the project.

#### VIII. REFERNCES

1. Sherif Mohamed. (2002). Safety Climate in Construction Site Environments. *Journal of Construction Engineering and Management*. ASCE, 128(5), 375–384.
2. T. Michael toole. (2005). Increase engineers role in construction safety: opportunities and barriers. *Journal of professional in engineering education and practise*. ASCE, 131(3), 199-207.
3. J. C. Rubio-romero and C. García-hernández. (2013). Analysis of construction equipment safety in temporary work at height. *Journal of construction engineering and management*. ASCE, 139(1), 9-14.
4. Rafiq m. Choudhry and Syed m. Ahmed. (2008). Safety management in construction: Best practices in Hong Kong. *Journal of professional issues in engineering education and practice*. ASCE, 134(1), 20-32.
5. Alexander laufer and William b. Ledbetter. (1986). Assessment of safety performance measures at construction sites. *Journal of construction engineering and management*. ASCE, 112(4), 530-542.
6. Jimmie hinze and Francis wiegand. (1992). Role of designers in construction worker safety. *Journal of construction engineering and management*. ASCE, 118(4), 677-684.
7. Jimmie hinze and Paul raboud. (1988). Safety on large building construction projects. *Journal of construction engineering and management*. ASCE, 114(2), 286-293.
8. Xinyu huang and Jimmie hinze. (2006). Owner's role in construction safety: guidance model. *Journal of construction engineering and management*. ASCE. 132(2), 174-181.
9. Aref charehzehi, and Alireza ahankoob. (2012). Enhancement of safety performance at construction site. *International journal of advances in engineering & technology*. ASCE. 5(1), 303-312.
10. Jimmie hinze and Lisa lytle. (1991). Costs of construction injuries. *Journal of construction engineering and management*. ASCE. 117(3), 537-550.