SOME OF THE SAFETY MEASURES IN CONSTRUCTION INDUSTRY: RECENT TRENDS

Papa Rao, K¹, Sitesh Kumar Singh², and V. S. S. Kumar³

Abstract: Road safety improvements are of high priority for road authorities because of growing public awareness and concern of the high social and monetary expenses of crashes. Construction industries are playing crucial role in the nation’s financial development. It is the second largest industry in the Nation after agriculture and offers colossal degree for development and advancement of Human Resources. The unsuitable safety documentation has consistently been featured, as safety is a neglected area. It has not been required in the construction industry although a number of Indian Standards and Labour Laws exist on Safety in Construction. Information assortment is brought out through poll study. It is likewise assembled through organized communications led with experienced work force from development field. Safety practices in the construction industries are not even meeting up to 50%. Hence it is necessary to execute the safety measures to improve safety at work environment. Responses to the inquiries on the parts of safety levels of mindfulness, culture, execution, persistence, implementation, checking and control, wellbeing improvement measures and furthermore interest in safety are gathered and positioned in which 86 responses are analyzed using frequency and relative index analysis. This study is paying attention on identifying the existing safety practices in construction industry in the areas of infrastructures like bridges, roads, dams, highways, ports, low and high rise buildings.

Keywords: Accidents, Construction Engineering, OSHA, Safety.

I. INTRODUCTION

Improvements to road safety have gained importance for road authorities due to growing public awareness and worry of the high social and economic costs of collisions. Construction industry has conventionally been recognized as one of the most important financial sectors that have been contributed significantly in our nation development. It is the second biggest industry in the Nation after horticulture and offers gigantic extension for development and advancement of human resource. Being 8-10% of industrial work force employed, construction accounted for 15-18% of all workplace deaths and 10-12% of disabling injuries. All through the world, it is one of the most unsafe businesses. The significant reasons for mishaps are identified with political interventions, human conduct, troublesome work site conditions and poor safety management, hazardous work strategies, gear, and techniques.

Accidents and its impact have been faded by high paces of mishaps and casualty frequencies that have happened on destinations. Along these lines are viewed as an exceptionally dangerous and risky industry problems of the nation. Absolutely, there is a need to investigate a few different ways and techniques in improving its imperfect picture.

Safety management system is an ignored area and has not been pursued and implemented methodically in the construction industry although a number of Indian Standards and Labour Laws exist on Safety in Construction. Safety at workplace is an area affecting all businesses, since most firms do not feel that it is crucial to success and are afraid of possibility of prosecution. Though the construction industry involves a very difficult process, it should give importance on finding a management strategy and resolution in dropping the rate of accidents and need to establish appropriate safety practices.

Quality safety practices help in decreasing injuries at building site and furthermore to decrease development costs, increment of efficiency and productivity, more significantly it will spare existences of laborers and therefore contribute emphatically to development industry and country in general. Hinze and Harrison (1981) [1] have mentioned importance in safety practices to reduce the injury rate at construction site. Accidents not only incur costs but also hinder the operations and project deliverables. Therefore as instructed by the OSHA (Occupational Safety and Health Administration) it is mandatory for construction industry to provide a safe and favorable working environment for their subcontractors and workers at construction area.

II. SCOPE AND LIMITATIONS OF THE RESEARCH

This research work is centered on distinguishing the present safety practices in construction industry. The civil industries include construction in the areas of infrastructures like roads, bridges, dams, highways, ports and others. Data collection is helped out through poll review. It is additionally assembled through organized connections directed with experienced staff from safety related industries.

A. Literature Review

Much work has been done to analyze the types of accident reports and to categorize the most common forms of accidents that occur in a particular trade and how those accidents occur. Particularly in terms of these observations in directing accident management strategies, investigation into construction accidents stop early to determine the root causes of accidents. The most important theories developed after
these investigations are Accident Causation Theories and Human Error Theories (John and Peter 1996) [2].

According to Construction Industry and Development Council publications of 2010, construction industry in our country is one of the most vulnerable segments of the unorganised labor in the country (Smith and Bohn 1999) [3]. Blackmon and Gramopadhye (1995) [4] mentioned that the industry being highly labor intensive and it should be comprehensively addressed at national level. National Policy on Safety Health and Environment (Ministry of Labour and Environment, GOI official web site 2011) envisages human conditions of work and also securing the health and strength of men and women.

Heinrich (1997) [5] mentioned many practices in the construction industry that have become very much interested for best safety practices to reduce construction related injuries and fatalities as the cost of medical treatment and convalescent care has increased substantially. Reese and Edison (2006) [6] stated that the strong interest in safety practices is perhaps most acute among larger firms, those with sizable labour budgets, and consequently those with considerable sums at stake (Bing and Tiong 1999) [7]. Although small firms could similarly benefit from safety practices, generally they have not been enthusiastic about catering budget on safety practices. Though the current literature thoroughly examines the root causes of accidents, it does not though much light on safety practices which help in the reduction of accidents and these issues are investigated in this research.

B. Objectives of the Research

The Objectives of the research are

- to define the existing safety standards in the construction field,
- to analyze the levels of certain key components in the safety protocols of the construction industry,
- to identify some initiatives that can be taken to enhance the safety practices of the building industry and,
- to propose a few good safety practices for the construction sector.

C. Research Methodology

The research methodology (RM) is shown in the following flow chart

The proposed method of this research work consists of following steps:

- **STEP I.**
  Comments were collected and classified to the questions on safety levels of culture, awareness, compliance, implementation, enforcement, monitoring and control. Safety enhancement initiatives were gathered. Each number carries the following rating such as (a) poor, (b) satisfactory, (c) good, (d) very good & (e) excellent.

- **STEP II.**
  The raw data obtained from the survey questionnaires on aspects of safety implementation and management conducted by construction firms (‘yes’ or ‘no’ questions) are evaluated by percentage estimation in order to obtain the desired results and conclusions. Although the Frequency Analysis and Relative Index (RI) were used to evaluate the data collected from the safety-level responses.

- **STEP III:**
  The relative index (RI) was determined using the equation below (Abd Majid and McCaffer, 1997) [8]
  \[
  RI = \frac{\sum n_1 + 2n_2 + 3n_3}{3(n_1 + n_2 + n_3)}
  \]
  Here \(n_x\) is the number of respondents that agree to \(x\) choice (Bing and Tiong 1999) [7]. RI estimation using this formula yields the value from 0.2 to 1.0; where 0.2 represents the minimum strength and 1.0 represents the maximum strength. The calculated RI from the responses are grouped as Disagree (0.2 \(\leq\) RI < 0.4), Agree (0.4 \(\leq\) RI < 0.7), Strongly Agree (0.7 \(\leq\) RI < 1.0).

- **STEP IV:**
  Based on the data collected, the best practices are suggested with respect to given parameters and constraints.
III. CASE STUDY

A construction company was awarded a contract for construction of buildings. The total cost of the project is Rs. 40 crores. The work undertaken is manpower oriented. The contractor wants to follow adequate safety practices with following constraints:

- Acceptable accidents - 2 to 4
- Fatalities - less than 2
- Budget - As recommended.

The case is evaluated according to the criteria and limitations are recommended by the contractor, depending on the 86 responses of survey database.

A. Levels of Safety Key Elements

The levels of key elements are achieved through questionnaire survey and structured interactions.

<table>
<thead>
<tr>
<th>Table 1: Participants Responses to Key Elements</th>
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</thead>
<tbody>
<tr>
<td><strong>Key Elements</strong></td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>The current level of safety awareness in Construction Industry is 'high'.</td>
</tr>
<tr>
<td>The current level of safety implementation and compliance in Construction Industry is 'low'.</td>
</tr>
<tr>
<td>The current level of safety monitoring and control in Construction Industry is 'low'.</td>
</tr>
<tr>
<td>The current level of safety culture in Construction Industry is 'low'.</td>
</tr>
<tr>
<td>The current level of safety enforcement by authorities is 'low'.</td>
</tr>
</tbody>
</table>

The level of safety implementation and compliance in Gas Construction Industry is 'high'.

The level of safety implementation and compliance in Gas Construction Industry is ‘higher than’ Construction Industry.

Disagree (0.2 < RI < 0.4), Agree (0.4 < RI < 0.7), Strongly Agree (0.7 ≤ RI ≤ 1.0).

Based on the outcome of the survey shown in Table 1 above, the aggregate preferences of the responses are for the rates of main elements surveyed in the categories 'agree' and 'strongly agree'. The survey showed that the respondents considered the overall degree of safety management and procedures is just '0.3' on average.

B. Measures to Improve Safety Practices

Safety measures can be adopted to improve the practices were determined through questionnaire survey.

<table>
<thead>
<tr>
<th>Table 2: Participants Responses to develop the Construction Safety</th>
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</thead>
<tbody>
<tr>
<td><strong>Safety Improvement Measures</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Engage a competent safety officer/supervisor</td>
</tr>
<tr>
<td>Implement safety indicators in measuring safety targets and performances</td>
</tr>
<tr>
<td>Emphasis on safety performances in the annual appraisal</td>
</tr>
<tr>
<td>Celebrate Safety Day to appreciate workers’ contributions in achieving safety targets and milestones</td>
</tr>
<tr>
<td>Reward workers who exhibit excellent safety performances</td>
</tr>
</tbody>
</table>

In Table 2 it is found that 86.05% of the respondents did not celebrate ‘safety day’, 80.23% of those whose businesses did not concentrate on safety in annual reviews, 70.93% did not enforce safety metrics and 69.77% did not employ a qualified safety officer. This indicates that the company management is clearly in need of introducing the aforementioned steps in order to further improve the safety of construction.
Table 3: Participants Responses to Measures to Improve the Construction Safety

<table>
<thead>
<tr>
<th>Safety Improvement Measures</th>
<th>Respondent Frequency</th>
<th>Respondent Rank</th>
<th>RI</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementing safety measures can enhance the building safety</td>
<td>1, 6, 0, 25</td>
<td>0.76</td>
<td>1</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>Investing in safety practices is a viable and worthy business investment</td>
<td>3, 6, 2, 21</td>
<td>0.74</td>
<td>3</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>Implementation of safety metrics is ‘low’ while evaluating safety goals and results</td>
<td>8, 6, 6, 12</td>
<td>0.68</td>
<td>2</td>
<td>Agree</td>
</tr>
</tbody>
</table>

Disagree (0.2 ≤ RI ≤ 0.4), Agree (0.4 < RI ≤ 0.7), Strongly Agree (0.7 < RI ≤ 1.0)

In Table 3 participants appear to ‘strongly agree’ that the implementation of all the recommended steps can enhance the safety of building, safety expenditure is a suitable and deserving initiative of safety indicators is poor. The survey results also show that the most common cause of accidents is due to falls and least is electric shock. In the order of most common to least common causes of accidents are struck by, falls, electric shock, caught in/between and other conditions i.e. fire/explosion/drowning/cave in. Hence, there is a need to ensure that measures are taken to avoid such incidents in construction industry.

The current budget for safety needs to be focused and the safety standards are as follows: -

a) Have a safety team and a safety officer.
b) Have an overall safety strategy and form safety committees.
c) Carry out annual internal and external assessments and performance reviews.
d) Carry out personnel/ workers instruction on safety issues.
e) Demarcate the Red and Green borders.
f) Emphasize on PPE.
g) Emphasize safety / hazard analysis and recognize occupational hazards.
h) Provide fire extinguishers and place signs at the site of operation.
i) Each three months hold annual reviews of all facilities and health meetings.
j) Focus on workplace emergency access and egress.
k) Effectively communicate and disseminate all knowledge relevant to health at all levels of the organization.
l) Provide services by Physicians group.
m) Provide workplace ‘ first aid ’ kit and sick ward for injured staff.

Additional recommended practices are:

(a) Maintain a Response Team.
(b) Perform occupational drug and alcohol screening.
(c) Hold daily community health meetings.
(d) Conduct medical care for staff and jobs.

Results

Based on the survey from the 86 respondents, the relative index is 0.3 which shows the safety management is average. It is found that 86.05% of the respondents did not celebrate ‘safety day’, 80.23% did not concentrate on safety in annual reviews, 70.93% did not enforce safety metrics and 69.77% did not employ a qualified safety officer. Organization should introduce effective monitoring and control over the implementation and conformance of safety.

Recommendations

Recommendations on some of the best practices for construction industry are: -

- Overall safety planning, targets, objectives and programs be set annually.
- Safety department headed by a competent safety officer should be part of operations.
- The Committee on Safety and Health should be formed as the total number of working employees is less than fifty.
- Management will inspect and make sure the workplace is free of dangers and dangerous conditions and activities.
- There should be safety metrics and goals to be met annually relative to last year's accomplishments and focus should be put on safety results in the annual evaluation of employees.
- The safety rules and procedures in the contract agreement will include the safety budget and milestone. Focus should be placed on good day-to-day housekeeping management and monitoring should be ensured for any hazards and dangerous actions and conditions.
- Red and green zone boundaries should be marked by installing fence and safety signboards at red zone, having emergency drill, “first-aid”
box and access/ingress and fire extinguisher equipment at work environment be ensured.

- Maintain an emergency response unit, and hold emergency drill every six months and keep records.
- Safety training for workers and supervisors should be ensured as also safety training manual need to be developed and implemented. Job superintendents should be in responsibility loop.
- All incidents should be investigated and data maintained for future reference to prevent such happenings.
- Safety should be viewed as an individual and corporate value rather than a priority, which can be changed. Higher management should visit jobsites more frequently so that working safely becomes a natural thing to do with pure motivation for well being of all employees.

IV. CONCLUSIONS

This research is concluded to recommend the best practices that the construction industry should follow on the basis of specific needs, based on specified parameters. The recommendations are as follows:

- Based on the survey findings very good trend in basic safety practices in construction industry exists but also reflects very low commitment and concern on the importance of handling emergency situations. The staff are free from the effects of alcohol and narcotics. Eventually, in the building industry, just 43.33 per cent of the protection standards studied are being enforced.
- Overall, the views of the survey respondents are in the categories ' accept ' and ' strongly agree ' for the rates of main elements being surveyed. Even the organized interaction respondents gave similar ratings.
- The business is very much in need of implementing the aforementioned steps to further improve the safety of the building. The respondents appear to strongly accept that implementing all the proposed steps will improve the safety of building, safety expenditure is a viable and worthy effort and the implementation of safety indicators is low.

REFERENCES


AUTHORS PROFILE

Mr. Papa Rao is a research scholar in the department of Civil Engineering.

Dr Sitesh Kumar Singh is an Associate Professor in the Department of Civil Engineering, Lingayas Vidyapeeth, Faridabad, New Delhi, India.

Prof. V S S Kumar obtained his bachelor degree from University College of engineering, Osmania University, M.Tech and PhD degree from Indian Institute of Technology, Delhi. He was a post-Doctoral fellow with the university of Wisconsin, Madison, USA. Dr. Kumar was Vice-Chancellor for JNTUK, Kakinada and iC VC for ANU, and Logistics University at AP. Dr. Kumar produced nine PhDs and published over 120 research papers in various international and national journals and conferences and reviewer for ASCE journal for construction engineering and management.