

# SAFETY AND RISK MANAGEMENT IN DIFFERENT CONSTRUCTION COMPANIES-A CASE STUDY OF LUCKNOW

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## ABSTRACT

*Construction industry has traditionally been recognized as one of the major economic forces that has contributed vastly in developing our world and offers tremendous scope for growth and development of human resource. The unsatisfactory safety record of construction industry has always been highlighted since the safety management system is a neglected area and has not been pursued and implemented systematically in the construction industry. This study is focused on identifying the current safety practices in the construction industry. The construction industry includes all civil constructions in the area of infrastructures like roads, bridges highways dams ports low and high rise buildings and others. Data collection is carried out through questionnaire survey. It is also gathered structured interaction conducted with experienced personnel from construction field .A total of 30 respondents were requested out of which 17 responses' .Responses on the aspects of safety implementation and management practiced by construct companies were based on 'Yes' and 'No' scale. Responses to the questions on safety levels awareness, culture implementation / standard, compliance, enforcement, monitoring and control safety improvement measures and also investment in safety were based on Likert scale of three ordinal measures of agreement. The 17 responses were analyzed using frequency and relative index analysis. The shows a very good trend in basic safety practices but the commitments concern towards safety training keeping work site free from drug and alcohol and handling emergency situations is low. At an average 44% of the surveyed safety practices are following the construction industry. There is a strong need to implement the safety measures to improve safety at workplace. The respondents also tend to strongly agree that safety investment is agree and worthy efforts to improve the safety in construction industry. Among recommended practices are National Policy on safety, ISO Certifications,safety rules and targets, safety training/campaign and recognition/rewarding of good safety performance individuals. The software developed on the data base of 17 responses suggests the practices which should be followed by the construction industry within certain parameters.*

**Keywords: Likert Scale, OSHA, Safety, Accidents, Construction Engineering**

## I. INTRODUCTION

Construction industry has traditionally been recognized as one of the major economic forces that has contributed vastly in developing our world and offers tremendous scope for growth and development of human resource. Despite employing 8-10% of disabling work force, construction accounted for 15-18% of all workspace deaths and 10-12% of disabling injuries. Throughout the world, it is one of the most hazardous industries. The major

causes of accidents are related to the unique nature of industry, human behavior, difficult work site conditions and poor safety management, unsafe work methods, equipment and procedures. Unfortunately its reputation and image has been tarnished by high rates of accidents and fatalities incidences that have occurred on sites. Therefore, it is still being regarded as a highly risky and hazardous industry in the country. Certainly, there is a need to look into some ways and methods in improving its burnished image.

The unsatisfactory safety record of construction industry has always been highlighted since the safety management system is a neglected area and has not been pursued and implemented systematically in the construction. Safety at workspace is an issue affecting all business since most companies do not feel that it is vital to the success and are afraid of possibility of persecution.

Although the construction industry involves a very complex process, it should emphasis on finding a management strategy and resolution in reducing the rate of accident occurrence and need to implement suitable safety practices.

Good safety programme would certainly help in reducing injuries at construction site and also to minimize construction costs, increase productivity and profitability and more importantly it could save lives of workers and consequently contribute positively to construction industry and nation as a whole.

Hinze and Harrison (1981), have identified that good safety programme practiced in a big company can help to reduce the injury rate at construction site. The success of a big company in tackling safety aspects is due to the fact that safety competency certificate holders exist among its workers irrespective of any working level.

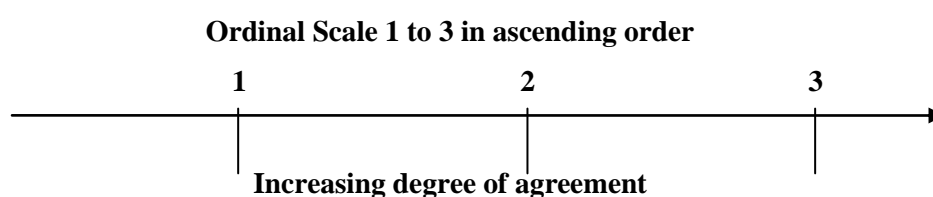
Accident cause not only delays in operations and project behaviorables but also directly and indirectly incur costs. Therefore as required by the OSHA it is mandatory for all construction companies to provide a safe and conducive working environment for their workers and subcontractor sites.

## II. RESEARCH METHODOLOGY

The aim and objectives of this thesis were achieved by using three methods. The first method was through literature to gather information about the topic and the provision of acts and regulations related to the safety. Secondly, was through conducted questionnaire survey by sending structured questionnaires to targeted respondents especially. Lastly, was through conducted structured interactions with top and middle management levels of governing bodies and authorities and also professionals who are directly and indirectly involved in the construction industry.

### 2.1 Research Methodology (Rm)

**STEP1.** Responses on the aspects of safety implementation and management practiced by construction companies were based on 'Yes' and 'No' scale. Responses to the question on safety levels of awareness, culture, implantation/standard, compliance, enforcement, monitoring and control, safety improvement measures and also investment in safety ware based on Likert scale of three ordinal measures of agreement as shows in Figure 1 below:



**Fig. 1: Likert Scale of Three Ordinal Measures of Agreement**

Each number on the carriers the following rating

- 1 = Disagree  
 2 = Agree  
 3 = strongly agree

Whereas the comparison of safety implementation standard and compliance between the oil and Construction Industry and Construction. Industry was based on a rating scale of 1 to 5 as below. This rating scale was developed based on rating scale implemented by Occupational Safety and health (OSH) in evaluating the OSH-MS construction sites.

- 1 - Poor  
 2 - Satisfactory  
 3 - Good  
 4 - Very Good  
 5 - Excellent

**STEP 2.** In achieving the desired result and conclusion, the raw data collected from the questionnaires survey on the aspects of safety implementation and management practical by construction companies ('yes' or 'no' questions) were analyzed by percentage calculation. Whereas the frequency analysis and relative index (R1) were used in analyzing collected data from the responses regarding safety levels of awareness culture, implementation standard, compliance, enforcement, monitoring and contact safety improvement measures and also investment in safety.

The relative index (R1) was calculated by means of the following formula (Abd. Majid and McCaffer, 1997).

$$R1 = \frac{\sum (1n_1 + 2n_2 + 3n_3)}{3(n_1 + n_2 + n_3)}$$

Where n is the number of respondents agreeing with x choice (Holt *et al* 1996)

The computation of relative index using this formula yields the value ranging from point two to one, where point two represents minimum strength and one represents the maximum strength as follows:

Min. strength: R1 = 0.2

Max. strength: R1 = 1.0

The rating of the responses is grouped as follows:

- Disagree:  $0.2 < R1 < 0.4$
- Agree:  $0.4 < R1 < 0.7$
- Strongly Agree:  $0.7 < R1 < 1.0$

**STEP 3.** A Software has been developed as per under mentioned parameters and constraints for developing the software input selected were.

A literature review was carried out to gather and establish some sound knowledge of the thesis topic. Though the literature review a clearer framework of the thesis was established. The sources of the said literature were obtained from published books, case studies, conference proceedings, articles in journals, magazines and newspapers, websites and also some other published research works.

Once the data were available, it was then followed by an analysis which, lead to some results discussions, and recommendations. A software has also been developed based on data gathered to help construction companies to arrive at best possible safety practices for them as per their need in terms of classification, type of work

undertaken, acceptable casualty rates and budget available, Eventually some conclusions were drawn to conclude this study.

### III. QUESTIONNAIRE SURVEY

Initially the leading questionnaire for the questionnaire was developed based on OSH Management System currently practiced and also Likert scale. Then a pilot on the assessment, the questionnaire was then finalized and later distributed to the targeted respondents who are related to safety from construction companies (contractors). The questionnaires were distributed by hand, post and through e-mails to 30 respondents out of which 17 have responded.

The questionnaire was structured as follows:

- Questionnaire cover and general information and instructions to the participants.
- Details of respondents.
- Construction safety Practices. The questions from this section cover all aspects of safety practices and implementation aspects of safety measures and indicators towards improving the safety management of a construction company.

**Table 1. Participant's Respondents to Construction Safety Practices**

S.No.	Safety practices	Frequency Analysis			
		Yes	%	No	%
1	Establish Safety Management System (SMS)	08	47.06	09	52.94
2	Emphasis of SMS	10	58.83	7	41.17
3	Allocate financial budget for safety	14	82.36	03	17.64
4	Engage safety officer	06	35.30	11	64.70
5	Establish safety department	5	29.42	12	70.58
6	Establish overall safety plan	16	94.12	01	05.88
7	From safety committee	02	11.77	15	88.23
8	Conduct management safety walkabout	03	17.64	14	82.36
9	Conduct annual internal and external safety audits and management review	07	41.17	10	58.83
10	Conduct survey on safety awareness and culture	03	17.64	14	82.36
11	Provide awareness campaign and safety Trainings/courses	05	29.42	12	70.58
12	From Emergency Response Team (ERT)	02	11.77	15	88.23

	Safety practices	Frequency Analysis			
		Yes	%	No	%
13	Demarcate green and red zones	07	41.17	10	58.83
14	Emphasis on Personal Protections Equipments	16	94.12	01	05.88
15	Emphasis on job safety/hazard analysis	06	35.30	11	64.70
16	Emphasis on putting fire extinguishers	13	94.12	01	05.88
17	Conduct drug and alcohol test (D & A) for all workers	01	05.88	16	94.12
18	Emphasis on putting safety signboards	16	94.12	01	05.88
19	Emphasis on identifying hazards	13	76.48	04	23.52
20	Conduct emergency drill	03	17.64	14	82.36
21	Emphasis on emergency access and ingress	09	52.94	08	47.06
22	Emphasis on equipment inspection	09	52.94	08	47.06
23	Is work undertaken by manpower intensive	16	94.12	01	05.88
24	Emphasis on tool box meeting	04	23.52	13	76.48
25	Communicate and disseminate safety information	07	41.17	10	58.83
26	Monitoring and control on safety implementation and compliance	10	58.83	07	41.17
27	Emphasis on workers' medical surveillance	01	05.88	16	94.12
28	Provide medical treatment	04	23.52	13	76.48
29	Provide 'First Air' box	16	94.12	01	05.88
30	Provide sick ward for injured workers	02	11.77	15	88.23

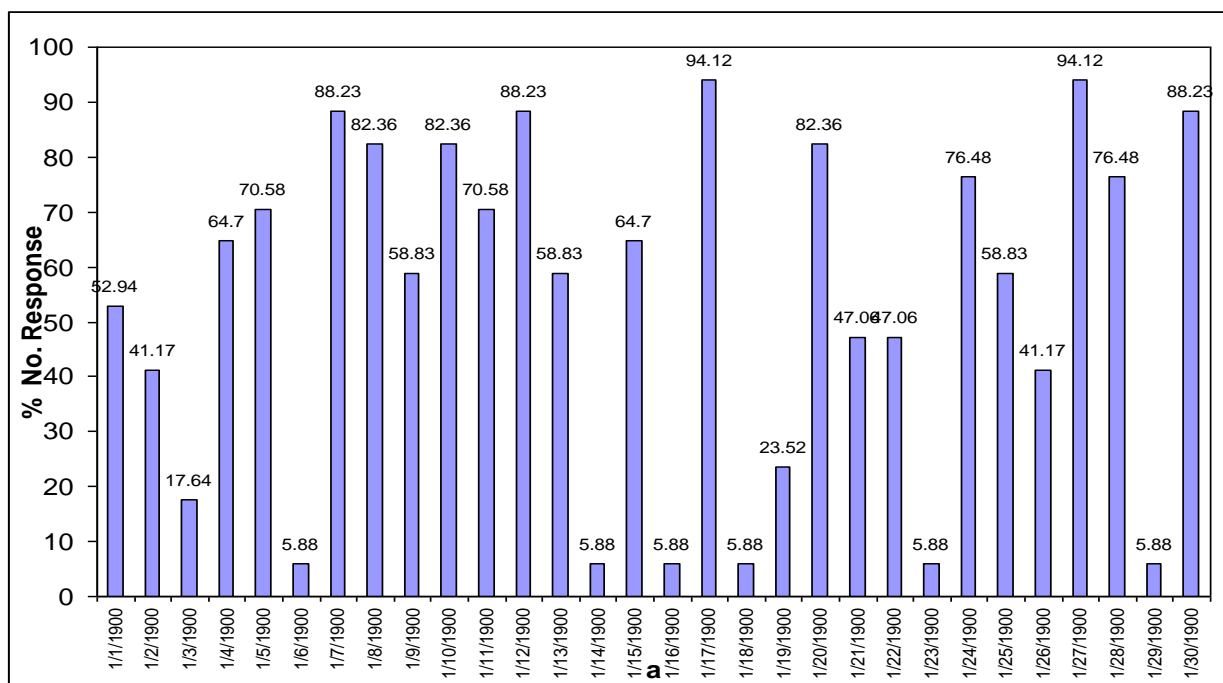


Figure 2. Participant's Respondents to Construction Safety Practices

#### IV. RESULTS AND DISCUSSION

Study case was analyzed as per parameters and constraints suggested by the contractor based on the software having a data base of 17 respondents to the questionnaire survey. The recommended safety is need based and the safety practices are as under:

- Have a Safety Officer and a safety department
- Have an overall safety plan and from safety committees
- Conduct annual internal and external safety audits and management review.
- Conduct training of staff/workers on safety aspects and organize safety walk about.
- Demarcate the boundaries of red and green zones.
- Emphasis on PPE.
- Emphasis on safety/hazard analysis and identify hazards at work site.
- Provide fire extinguishers and place signboards at work site.
- Conduct periodical inspection of all equipments and safety meeting every three months.
- Emphasis on emergency access and egress at workplace.
- Communicate and disseminate all safety related information effectively to all levels within the organization.
- Have good monitoring and control on safety implementation and compliance.
- Provide services by panel of doctors.
- Provide 'First Aid' box at workplace and a sick ward for injured workers.

Additional recommended practices are:

- Maintain an emergency response team.
- Conduct drug and alcohol test at workplace.
- Conduct group safety meetings regularly.
- Conduct medical surveillance for staff and workers

#### V. CONCLUSION

This thesis is concluded to fulfill the objectives of the thesis which is to determine the best practices that can be adopted to the construction industry as per specific need based on define parameters. The conclusions derived from literature review, questionnaire survey and structured interactions are as follows:

- Based on the survey findings, none of the companies is certified for ISO 14001: 2004 and only there are certified for OHSAS 18001: 2007 and 10 are certified with ISO 9001: 2008 out of 17 companies. The survey indicates a very good trend in basic safety practices in construction industry but also reflects very low commitment and concern on the importance of handling emergency situations and having workers who are free from the influence of drug and alcohol, finally, only 44.33% of the surveyed safety practices are being implemented in the construction industry.
- Overall the survey respondents' perceptions are in the 'agree' and 'strongly agree' categories for the level of key elements surveyed, whereas they perceived very good and only good levels of overall safety practices in oil and gas and construction industries respectively. The structured interaction respondents have also given the similar ratings. Lastly, they have proposed full PPE compliance, embracing safety with open arms, promote safety culture and safety as part of business investments.

- There is a very strong need for the companies to implement the said measures in order to further improve the construction safety. The respondents and to survey agree that implementing all the proposed measures can improve the construction safety, safety investment is a viable and worthy effect and safety indicators implemented is low.
- Among recommend safety best practices are certifications guiding policies overall safety plans and forming of safety and health committee regardless number of workers, annual safety audit and review, safety indicator around safety targets, safety performance in workers approach implement good safety rules and practices like use of PPE at red zone, safety budget, good housekeeping having 'first-air' box, emergency drill and access in grees and fire extinguish at workplace, demarcate boundaries of red and green zones, job safety and hazard analysis, from emergency response team and conduct emergency drill and drug and alcohol test, organize safety companies and promotions and certificate 'Safety Day'

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