



## Analysis of Safety Management System in the Construction Industries

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**Abstract**— In a high-risk industries like construction, safety is an asset that delivers actual benefits. A safe work environment help to keep expert employees on the job and projects on track by reducing misfortunes that result in injuries and schedule delays, while also sinking the risks of proceedings and regulatory action. This project discuss about safety culture, safety practices and their implementation in a construction site. The objective of this project is to study the current working conditions and examine the problems in the workplace regards to the management of safety and health and create a safe working environment at the construction site. A questionnaire is and circulated to the construction firms all over tamilnadu. The questionnaire is prepared based on the criteria such as accidents, emergency period, safety performance, workplace hazard and risks, health & safety, management commitment. The purpose of data collection is to obtain information and maintain record, to make decisions about important issues, or to pass information on to others. The study of this paper helps to know about the current work practices at construction site.

**Keywords**—safety culture, workplace hazards, questionnaire, construction firms, injuries, health and safety.

### I. INTRODUCTION

Culturally, construction residues an industry where personnel may feel that taking risks is a part of the job and may disquiet about what their dukes think of those who take extra precautions. The reality is that construction workers are more uncovered to workplace injuries because of the intrinsic dangers of a job that often involves operational with large machinery and power tools, commonly many floors above the ground. The major causes of accidents are associated to the exclusive nature of the industry, human behavior, problematic work site conditions and humble safety management which results in insecure work methods, equipments and procedures. Preventing work-related complaint and injuries should be a chief anxiety of all employers.

By concentrating on excluding dangers at the construction site through the tactics that engraves safety and health, construction administrators can embrace and stimulate a safety attitude throughout their organization. This approach adapts the traditional enforcement mentality, which immediately intimidates workforces who violate standard shelter rules with disciplinary action. This individual-based safety philosophy follows the principle that if organizations are reminded, on a day-to-day basis, of the influence that an grievance can have on their domestic life and private affairs they will be more likely to work carefully and avoid threats that could result in accidents. A positive safety culture supports to save life of humans, reduce entitlements and interruptions, and boost up productivity and provide successto the organizations.

### II. SCOPE OF THE PROJECT

- With large scale broaden construction movement in recent years, safety become necessary to adopt measures for minimize the likelihood of accidents in this nation wide buisness.
- This study provides information about various tasks performed in the construction industry and also explain the safety practices adopted by the industries.
- It becomes necessary to consider certain safety measures and program to prevent accidents and injuries at site.

- This study helps to shaping human resources beliefs and attitudes that lead to safe behavior and ultimately to a strong safety culture.

### III. OBJECTIVES

- To study the recent operational functions and safety enactment in the construction industries.
- To detect the source of construction safety difficulties.
- To create consciousness and recover site security in the construction industries.

### IV. LITERATURE REVIEW

**Andrew Hale and David Borys (2015)** - The main focus of this paper is on occupational safety and health regulations, but a few examples from connected areas such as environmental regulation are also included. The main concepts developed and discuss here could be applied to safety regulation. The factors includes in these study are political climate, the safety culture, legislative civilization and structures, the role of insurance etc., They have focused on analyzing the problem of regulation and its burdens and offered some suggestions of ways to reduce regulatory burdens.

**Heng Li, Miaojia Lu, Shu-Chien Hsu, Matthew Gray, Ting Huang (2015)** - The purpose of their research is to identifies worker behavior as the root cause of construction accidents. They proposed the theory called Behavior-based safety (BBS) is one valuable approach in supervising employee safety issues. The implementation of PBBS management, strong safety awareness attitudes can be instilled in workers, who can then expand habitual thinking of safe ways to perform all construction activities. PBBS management also has the potential for global use as does the improved vision of BBS, which is tailored to the construction industry.

**Patrick L. Yorio , Dana R. Willmer and Susan M. Moore (2015)** - These nuances highlight the types of biases that can arise when choosing a level of dimension to assess the HSMS and techniques that can be used to minimize measurement error and increase the validity of inferences made. The contingencies are discussed from a theoretical perspective and presented in this paper. The potential benefits of these arguments, and the corresponding conceptual model presented, include stronger H&S theory growth opportunities and a broader range of hypotheses that can be generated in this study.

**Rafiq M. Choudhry, Dongping Fang and Syed M. Ahmed Safety (2008)**-This paper describes an exploratory study of site safety executive in construction site environments. It explains a successful, modern safety, health and environmental management system for a chief construction company based in Hong Kong. The findings of the survey provide practical information to construction project manager and construction safety practitioners. The information obtained from this study might be useful to many construction company, particularly for companies in developing countries where construction safety awareness is not high.

**Xinyu Huang and Jimmie Hinze (2006)**-This paper will present the results of a study on the owner's role in construction safety. Statistics were obtained by conducting interview on bulky construction projects. The connection between project safety concert and the owner's authority was examined, with particular focus on project characteristics, the selection of safe contractor, contractual safety necessities, and the owner's participation in safety management during project execution. Throughout analysis of the project interview data, it can be concluded that owners can positively manipulate project safety presentations.

### III. METHODOLOGY

The projected methodology of this paper is significantly represent through the flow chart.

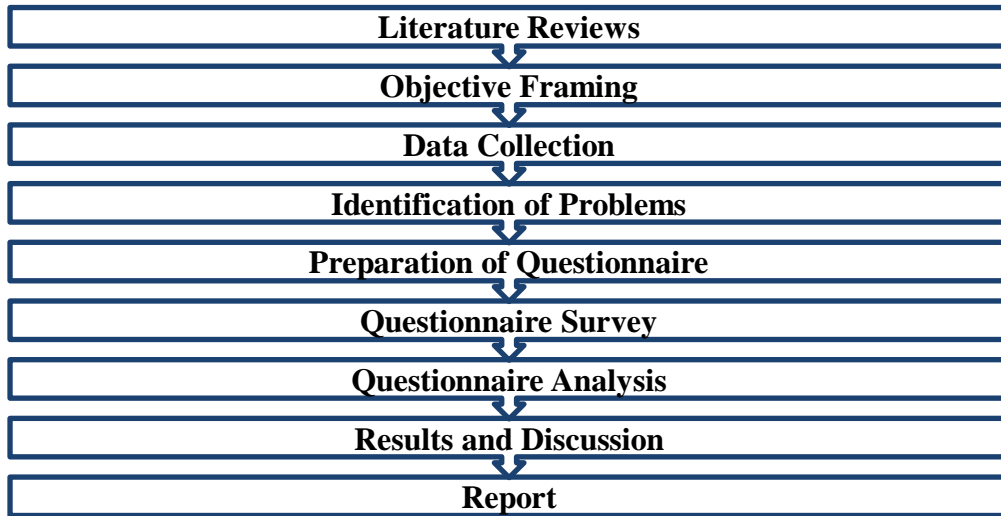


Figure.1. Methodology flow chart

### IV. PROBLEM IDENTIFICATION

These factor were recognized based on personal scrutiny and literature study. Recognizing the significant key points such as climate, culture, attitudes and behavior. In appropriate of these key drivers generate more threats and danger in the building sector. The main keys includes following points are given below.

Culture	Climate	Attitude	Behavior
<ul style="list-style-type: none"> <li>•Leadership</li> <li>•Educational Training</li> <li>•Team work</li> <li>•Rights &amp; Duties</li> <li>•Prevention planning</li> </ul>	<ul style="list-style-type: none"> <li>•Supervision &amp; Guidance</li> <li>•Security</li> <li>•Work Pressure &amp; Intensity</li> <li>•Personal Competency</li> </ul>	<ul style="list-style-type: none"> <li>•Awareness</li> <li>•Job satisfaction</li> <li>•Clear Mind Set</li> <li>•Extraversion</li> </ul>	<ul style="list-style-type: none"> <li>•Operation Safety In High Levels &amp; Hoisting Machines</li> <li>•Emergency Measures</li> <li>•PPE</li> <li>•Control system</li> </ul>

Figure.2. Key drivers for safety management

### V. QUESTIONNAIRE PREPARATION AND ANALYSIS

Questions can be prepared based on the general information about the site, the details of the safety policy and program, facilities availability in the site, record keeping, safety committee, hazard analysis, PPE usage at the site. The developed questionnaires were distributed to the large, medium and small companies based on their annual turnover. Questions form consist of both 5 point scale and 2 point scale (Yes & No) Questions. Nearly the questions given to 135 companies. On the whole 70% of responses can be arrived and analysed. Observations were made during the survey by direct interviews and through email. Interviews of project managers, contractors, site engineer and

labourers were taken for the purpose of the survey. The results are obtained by using SPSS (Statistical Package For The Social Science) software analysis.

## VI. RESULTS AND DISCUSSION

The statistical analysis can be made in which mean value of all the factors that affect construction site safety vary between 2.33 to 3.20. These are the ten factors which affects the site safety. Among these amenities and facilities, management commitment, safety meeting, hazard analysis, emergency measures, workers attitude were ranked as top six factors that concern construction safety with standard mean of 2.93, 3.20 and 3.13, 2.80, 2.73 and 2.80 respectively. Results of Likert scaled questions in given below the table.

S.No	Factors Affecting Safety	Mean	Standard Deviation
1.	Amenities and facilities	2.93	0.92
2.	Management involvement	3.20	0.91
3.	Safety meeting	3.13	1.16
4.	Safety practices	2.47	1.30
5.	Emergency measures	2.73	1.10
6.	Communication	2.33	1.05
7.	Record keeping	2.29	0.88
8.	Workers attitude	2.80	1.01
9.	Leadership	2.33	0.90
10.	Hazard analysis	2.80	0.992

*Table.1. Descriptive statistical analysis*

## VII. CONCLUSIONS

The work surroundings in construction events are usually more dangerous, than other sector due to the use of substantial equipment and tools, and insecure materials are result in many calamities and damages. Consequently, it is obvious that a safety is obligatory for each and every construction industries. To achieve safety the following recommendations are necessary in the industries. They are,

- Motivate the curiosity of employees and building workforces in safety by conducting safety campaigns, safety competitions, consultations and movie shows regarding safety and other measures are taken wherever required.
- Walk around the construction site with a vision to check the insecure performs and detect the unsafe conditions and take corrective measures immediately.
- Carryout inspection and hazard analysis related to usage of explosives, chemicals and other materials and to suggest preventive measures including appropriate personal protective equipment. Owners can energetically partake in the construction safety management in each stage of project performance including project design, contract selection, the construction phase, choosing safe contractors and developing the safety culture on the tasks through safety training and safety recognition programs.

## REFERENCES

1. Andrew Hale and David Borys (2015) "Safety regulation: The lessons of workplace safety rule management for managing the regulatory burden" Safety Science Vol. 71, pp.112-122.
2. Ashwin Mahalingam and Raymond E (2007) "Safety Issues on Global Projects Journal of Construction Engineering and Management", Vol. 133, No. 7, pp.506-516.

3. Billy Hare and Iain Cameron Kevin J (2013) "Exploratory Case Study of Pictorial Aids for Communicating Health and Safety for Migrant Construction Workers", *Journal of Construction Engineering and Management*, Vol. 139, No. 7, pp.818-825.
4. Evelyn Ai Lin Teoa and Florence Yean YngLinga (2006) "Developing a model to measure the effectiveness of safety management systems of construction sites", *Building and Environment* 41, pp.1584–1592.
5. Gustavo E. Aguilar, Kasun N. H (2013) "IT based system for construction safety management and Monitoring", *Automation in Construction* Vol. 35, pp. 217–228.
6. Heng Li, MiaoJia Lu, Shu-Chien Hsu, Matthew Gray, Ting Huang (2015) "Proactive behavior-based safety management for construction safety improvemen", *Safety Science* Vol. 75, pp.107–117.
7. Hinze.J and Raboud.P (1988) "Safety on large building construction projects", *Journal of Construction Engineering and Management*, ASCE, 114(2), Vol.33, pp.286-293.
8. Jesús Abad, Esteban Lafuente and JordiVilajosana (2013) "An assessment of the OSHAS18001 certification process: Objective drivers and consequences on safety performance and labour productivity", *Safety Science* 60, pp.47–56.
9. Kartam N.A, I. Flood, P. Koushki (2000) "Construction safety in Kuwait: issues,procedures, problems, and recommendations", *Safety Science* 36, pp.163-184.
10. Low Sui PhengAndSua Chen Shiua (2000) "The maintenance of construction safety: riding on ISO 9000 quality management systems", *Journal of Quality in MaintenanceEngineering*, Vol. 6 No. 1, 2000, pp. 28-44.
11. Ma Dolores Martínez Aires, Ma Carmen Rubio Gámez and Alistair Gibb (2010) "Prevention through design: The effect of European Directives on construction workplace accidents", *Safety Science* 48, pp.248–258.
12. Marianne Torner and Anders Pousette (2009) "Safety in construction – a comprehensive description of the characteristics of high safety standards in construction work, from the combined perspective of supervisors and experienced workers", *Journal of Safety Research* 40, pp.399–409.
13. Moheeb E. Ibrahim1, Khalid A. M. Al Hallaq2 (2012) "Safety Climate In Construction Industry-The Case Of Gaza Strip", *The 4th International Engineering Conference*, pp.1-14.
14. Mouleeswaran.K (2014) 'Evaluation of Safety Performance Level of Construction Firms In And Around Erode Zone', *International Journal of Innovative Research in Science, Engineering and Technology*, Vol.3, pp.1587-1596.
15. Patrick L. Yorio, Dana R. Willmer and Susan M. Moore (2015) "Health and safety management systems through a multilevel and strategic management perspective: Theoretical and empiricalConsiderations", *Safety Science* 72, pp. 221–228.
16. Planas.E, J. Arnaldos, R.M. Darbra, M. Muñoz, E. Pastor, J.A. Vílchez (2014) "Historical evolution of process safety and major-accident hazards prevention in Spain. Contribution of the pioneer JoaquimCasa", *Journal of Loss Prevention in the Process Industries* 28, pp.109-117.
17. Praveen Kumar A.V, C.K.Vishnuvardhan (2014) "A Study on Construction Jobsite Safety Management", *International Conference on Engineering Technology and Science*, Volume 3, Special Issue 1.
18. Rafiq M. Choudhry, Dongping Fang and Syed M. Ahmed Safety (2008) "Management in Construction: Best Practices in Hong Kong of Professional Issues in Engineering Education and Practice", Vol. 134, No. 1, pp.20-32.
19. RizaYosiaSunindijo and PatrickX.W.Zou (2013) "Conceptualizing Safety Management in Construction Projects", *Journal of Construction Engineering and Management*, Vol. 139, No. 9, pp.1144-1153.
20. SaiOn Cheung, Kevin K.W. Cheung, Henry C.H. Suen (2004) "Web-based safety and health monitoring system for construction managemen", *Journal of Safety Research* 35, pp. 159– 170.
21. SathishKumar.P.S, LogeshKumar.M (2012) "Viability of Safety and Labour Conditions in Construction Sites", *International Journal of Engineering and Innovative Technology (IJEIT)*, Vol. 2, Issue 6.
22. SunkuVenkata Siva Rajaprasad and PasupulatiVenkataChalapathi (2015) "Factors Influencing Implementation of OHSAS 18001 in Indian Construction Organizations: Interpretive Structural Modeling Approach", *Safety and Health at Work*, pp.1-6.
23. Subramani.T and Lordsonmillar.R (2014) "Safety Management Analysis In Construction Industry", *Journal of Engineering Research and Applications*, Vol. 4, Issue 6 (Version 5), pp.117-120.
24. TerjeAven (2007) "A unified framework for risk and vulnerability analysis covering both safety and security", *Reliability Engineering and System Safety* 92, pp. 745–754.
25. VineethDharmapalan, John A. Gambatese, Joe Fradella and Ali MoghaddamVahed (2014) "Quantification and Assessment of Safety Risk in the Design of Multistory Buildings", *Journal of Construction Engineering and Management*, pp.1-9.
26. Vinodkumar M.N and M. Bhasi (2011) "A study on the impact of management system certification on safety management", *Safety Science* 49, pp. 498–507.
27. XianguoWua, Qian Liu , Limao Zhang , Mirosław J. Skibniewski , Yanhong Wang (2015) "Prospective safety performance evaluation on construction sites", *Accident Analysis and Prevention* 78, pp. 58–72.
28. Xinyu Huang and Jimmie Hinze (2006) "Owner's Role in Construction Safety", *Journal of Construction Engineering and Management*, Vol.132,No.7 pp.164–173.
29. Yang MiangGoh and NurFaddilahBinteSadon (2015) "Cognitive Factors Influencing Safety Behavior at Height:A Multimethod Exploratory Study", *Journal of Construction Engineering and Management*, Vol. 56, pp.1-8.

30. Yates J.K (2014) "Design and Construction for Sustainable Industrial Construction", Journal of Construction Engineering and Management, pp.140-153.
31. Zeng S.X, Vivian W.Y. Tam, C.M. Tamc (2008) "Towards occupational health and safety systems in the construction industry of China", Safety Science 46, pp.1155–1168.
32. Zhipeng Zhou, Yang MiangGoh, QimingLi (2014) "Overview and analysis of safety management studies in the construction industry", Safety Science 72, pp.337–350.
33. Zubaidah Ismail, SamadDoostdar and ZakariaHarun (2012) "Factor influencing the implementation of a safety management system for construction sites", Safety Science 50, pp.418–423.