

Viability of Safety and Labour Conditions in Construction Sites

P.S.Sathish Kumar, M.Logesh Kumar

ABSTRACT:-Construction is the second largest economic activity in India next to agriculture. Construction Industry has recorded enormous growth worldwide and particularly in last decade. Constructing safe structures and providing safe working environment to the personnel is a vital factor in successful construction business. Thus safety is an important function in the management of construction projects. The concern of safety has to start from the design stage and continues till the facilities are delivered to the owner. Construction is also a high accident prone industry employing major work force, most of them being labourers and skilled workers. Besides, construction sector is a highly unorganized sector and is a high risk Industry for clients, contractors and workers. In India comprehensive and universal safety rules and regulations have not been developed. Workers are generally unskilled or semiskilled, poorly paid, temporarily employed and often migrate in a group from one place to another in search of work. Typically labourers are not trained in safe work practices and there tend to be a lack of management commitment to safety programs and procedures. Considering the safety and labour criterions that are essential for a safe worksite a questionnaire was developed. This paper presents the results of a questionnaire survey, which was distributed among the construction sites and formal interviews with the key personnel at sites.

Index Terms— Hazard, Accident, Safe, High Rise.

I. INTRODUCTION

Construction Industry is an unorganized sector and it is the least researched industries even today. The system of reporting data about internal working and safety is also minimal. The manpower driven industry is facing regular accidents in daily working, which cause heavy losses in terms of men, money and time. The past studies show that on an average, 60 to 80 accidents occur per 1000 workers in the manufacturing sector while, construction sector averages around 160 to 250 per 1000 workers. In spite of all the extensive studies and efforts of various organizations working for the cause, nothing concrete has been established for the same. The main cause of the low safety standards and working conditions at the construction sites is the lack of exclusive legislations applicable to the construction industry. Throughout the world, the construction area of civil engineering is one of the most hazardous industries. The major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions and poor safety management which results in unsafe work methods, equipments and procedures. However, safety is not a luxury and may be considered as an important function to be used against unnecessary loss of property, injury or death.

Preventing occupational illness and injuries should be a primary concern of all employers. Especially in developing country like India, there must be an effort to raise the level of awareness among both the employers and employees of the importance of health and safety at work sites. It is a general observation that the large scale infrastructure projects command good safety checks and procedures due to statutory requirements of the tender contracts. But construction in everyday life comprises of large number of small scale projects which are local contractors undertakings lacking in compliance of safety requirements and labour laws. It is the high time that the awareness regarding the present scenario of safety and labour conditions should spread adequately.

II. DEFINITIONS

High rise buildings: There is no universally accepted definition for a “high rise” building. For this reason, we have called all G + 2 and above structures as high rise buildings for the purpose of the study.

Accident: Accident is an unplanned event which has a probability of causing personal injury or property damage.

Hazard: Hazard is a condition with the potential of causing an accident or ill health.

Safe: A thing is provisionally categorized as safe if its risk are deemed known and in light of that knowledge judged to be acceptable.

III. SCOPE OF THE STUDY

The scope of the study was restricted to R.C.C. high rise buildings which fall under the residential and commercial category/ type. The construction cost of the building is not considered as the decisive factor for this study.

IV. LITERATURE REVIEW

Xingu Huang and Jimmie Hinze (2003) had analysed about the construction worker fall accident and the result shows that most fall accidents take place at elevations of less than 9.15m (30 ft), occurring primarily on new construction projects of commercial buildings and residential projects of relatively low construction cost[20]. Edward J.Jaselskis, Stuart D.Anderson and Jeffrey S.Russell (1996) had done safety related research which tends to be more qualitative in nature, addressing “what” factors are important for success as opposed to “how much” is appropriate to achieve successful safety outcomes [1]. Osama Ahmed Jannadi and Mohammed

S.Bu-khamsin (2002) had conducted a questionnaire survey, which was distributed among industrial contractors in the Eastern province of Saudi Arabia and formal interviews were taken with the contractors, officials responsible for construction safety. 72% of the companies participated in this survey were the general building construction companies. The paper identifies 20 main factors and 85 sub-factors and determines their level of importance based on the survey results and the analysis [10].

PARAMETERS CONSIDERED FOR SURVEY

- i. General information about the site
- ii. Safety program & policy
- iii. Safety program implementation
- iv. Use of personal protective equipment (ppe)
- v. Hazards and their protection
- vi. Housekeeping
- vii. Emergency compliance
- viii. Labour information
- ix. Record of injury / death
- x. Remarks / special observations

V. QUESTIONNAIRE SURVEY

In order to quantify the criterions that are influencing the safety at site, they are given weightage depending upon its importance and the survey is carried out to find the condition at site. The criterions considered for survey are (i) safety programs and policy, (ii) safety program implementation, (iii) use of personal protective equipment, (iv) hazards and their protection, (v) housekeeping, (vi) emergency compliance. Finally the safety of the site is graded accordingly to data given in Table 1. The factors regarding the labour conditions at site are included in the questionnaire and those factors are to be analysed qualitatively.

Table 1 – Safety Scale

SAFETY SCALE	% COMPLIANCE	GRADING
S0	80-100	Most Safe
S1	60-80	Safe
S2	40-60	Average
S3	20-40	Unsafe
S4	0-20	Most Unsafe

The developed questionnaires were distributed to fifty residential and commercial sites altogether in and around Coimbatore. On the whole the response percentage is 72.

VI. ANALYSIS AND RESULT

The data collected from all the sites were analysed and each site is given grading depending upon the points gained by corresponding sites. The overall result of the survey is represented in the Figure (a).

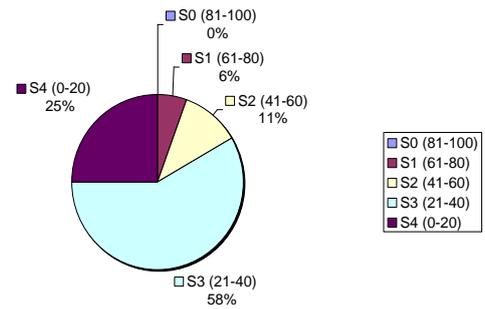


Fig 1 (A): Overall Result

As can be seen from Figure (a), no site has satisfied the requirements of the most of the safety grade. Totally 83% of the construction sites fall under unsafe and most unsafe sites. Only 6% of the sites fall in the safe zone. Criteria wise comparison was done and the results are depicted in the form of charts.

Safety Program & Policy

Even though the safety policy is available with some contractors they are not having the safety plan for their particular site. In some cases the safety program is incomplete, that is, there is no safety engineer or any other person responsible for safety at site and some doesn't have formal organisation for safety. It is miserable to notice that some sites do not have their insurance for the labourers and the person working at site. It shows the lack of awareness among the person working at site.

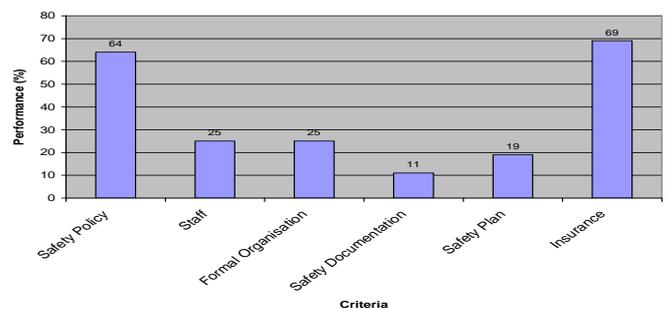


Fig 1 (B): Safety Program & Policy

Only very few sites are taking care about safety documentation and it is clear from the Figure (b) that only 11% of the sites surveyed do their safety documentation.

Safety Program Implementation

It is found that the safety policy & programs are not effectively implemented at the site. Training to staff regarding the safe working condition is not provided. Training to the labourers is insufficient. In sites where training is given to labourers highly concentrate on the skilled labourers rather than the unskilled labourer which is very clear from the Figure (c). There was insufficient display of the safety programs and policies through posters. The site where the client is more committed towards safety is giving safety awareness

programme to the staff and labourers. Motivation and awareness among the workers regarding safety is almost zero.

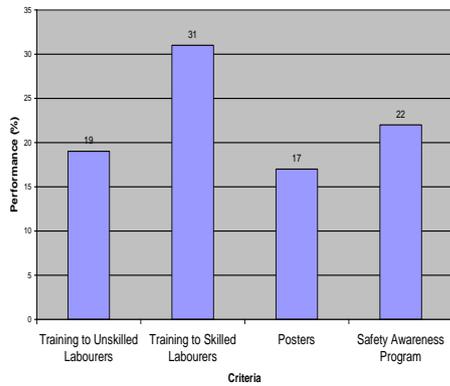


Fig 1 (C): Safety Program Implementation
Use of Personal Protective Equipment (PPE)

Usage of personal protective equipment is very minimal. Helmets are not familiar in most of the sites. Awareness among the workers regarding the usage of PPE is lacking. The contractor / employer is not providing the PPE to the labourers at their site. In some sites, even though workers are provided with PPE, workers are not using it properly. For example, workers are using their helmets for storing and carrying oil which is required for applying on the formwork at the time of shuttering process. At the time of interview with the workers, they said that they feel discomfort while working with the PPE. This shows the lack of management commitment towards safe working environment and their lack of motivation for safe work practices. Moreover some contractors said that the labourers do not use PPE even they provide them and so they are not buying PPE for their site and some said they are quite expensive.

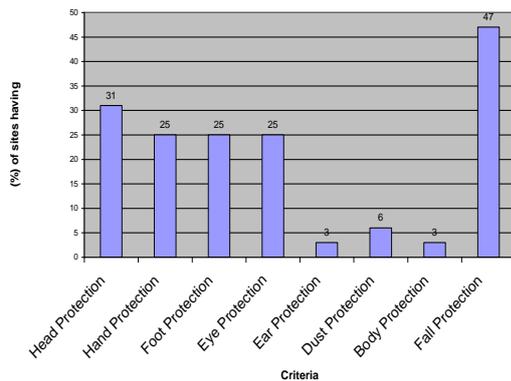


Fig 1 (d): Use of PPE

Falling Hazard

This is also the most neglected area as far as safety is concerned. The ladders are provided without handrails and enough night illumination is not provided at 11% of the sites. Safety nets are provided around the building only in very few sites. Sign boards are not properly provided to indicate the

hazardous areas in majority of the sites and it is very clear from the Figure (e).

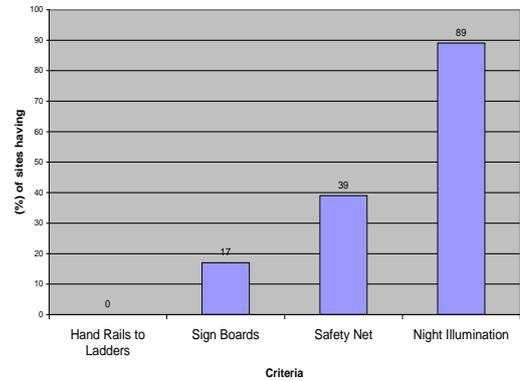


Fig 1 (E): Falling Of Person
Electrical Hazard

This is the only criterion in which majority of the sites are falling above the average safety grid. Even though checking of the electrical related work was found to be only 33% in the surveyed sites {Figure (f)}.

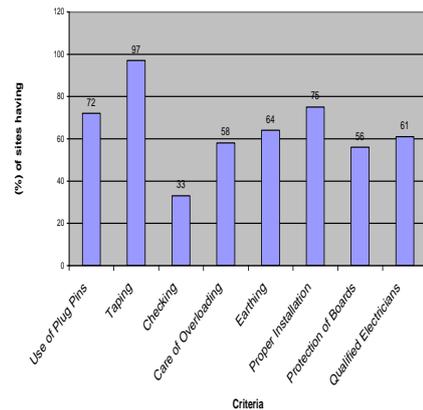


Fig 1 (f): Electrical Hazard

House Keeping

More than 56% of the surveyed sites do not have proper job layout. Debris removal is not frequent at sites and they were dumped in the working area itself. Only 53% of the sites surveyed stack the materials properly. Few sites are taking care to keep the internal work ways and stairways clear. Refer Figure (g).

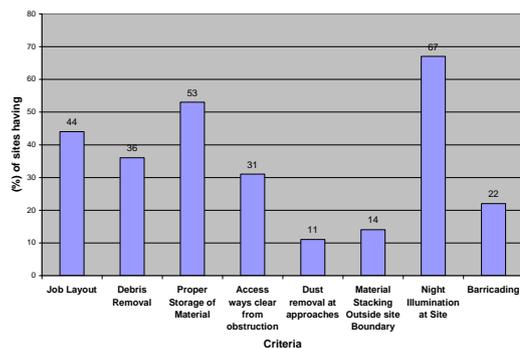


Fig 1 (g): House Keeping

Emergency Compliance

Majority of the sites have scored well in this criterion. 72% of the sites surveyed have first aid kits available at the sites and 92% of the sites have emergency numbers which have been displayed in some of the sites as well. Even though, the fire extinguisher availability was low and the arrangements for ambulance, where workforce are more than 300, was found to be very minimal and this is clear from Figure (h).

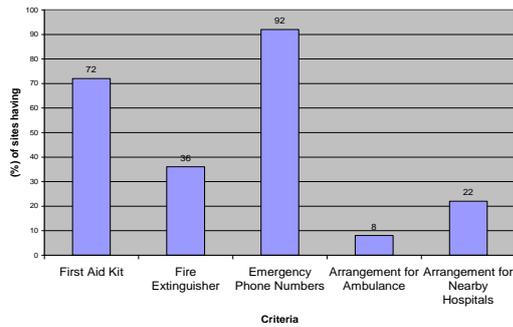


Fig 1 (h): Emergency Compliance

Qualitative Analysis of Labour Condition

- The wages for the workers who are migrated from other states was found to be low than the native workers.
- Many sites are having workers below the age of 18 years and some sites where migrated people are deployed for the work are having workers below age of 14 years also.
- Regular medical checkups of labourers were being done only at 8% of the surveyed sites.
- There was no labour union for protecting labourer's rights.
- Only 5% of the surveyed sites are providing recreational facilities to the labourers.
- None of the workers are aware of the welfare acts.
- The children of construction labourers live in poor conditions. While their parents work on construction sites, the children can be seen loitering about the sites and playing in the dust.
- Sites with labour colony have problems such as poor ventilation (48%), poor sanitation (53%) and poor flooring (33%).
- In most of the sites labourers are not provided with personal protective equipments.

VII. CONCLUSION

- ⊖ Safety is a management initiative, which was found completely lacking on all most all the sites surveyed.
- ⊖ Generally, all aspects of safety are neglected at construction sites. In particular, it can be seen that the most critical factors like safety policy, awareness among the workers and falling hazards are neglected.
- ⊖ Even though personal protective equipment are being used at many sites, hand glove are widely used mainly

for concreting operations. Also in some sites helmets were found to be used for carrying water and storing oil which is used for applying to the formwork.

- ⊖ Barricading, handrails and signage are not provided, to safe guard the person from falling, in most of the sites.
- ⊖ Proper stacking of material is not done.
- ⊖ Majority of the sites do not have their access ways clear from obstruction.
- ⊖ In most of the sites trained operators were not used for operating the machineries and there is lack of manual of maintenance at the site.
- ⊖ Site engineer/ Site-in-charge did not know the capacities of the equipments present at the site.
- ⊖ Traffic signage and flagging was completely absent in all most all of the sites.
- ⊖ There was complete ignorance about the laws and rights of labourers. Also there were no labour unions to fight for the labour rights.
- ⊖ No contractor has been given notice regarding unsafe working conditions by any government department.

ACKNOWLEDGMENT

F.A and S.A would like to thank the engineers of various construction firms in Tamilnadu who helped for the survey.

REFERENCES

- [1] Edward J.Jaselskis, Stuart D.Anderson and Jeffrey S.Russell (1996), "Strategies for Achieving Excellence in Construction Safety Performance", Journal of Construction Engineering & Management, Vol.122, No.1, pp.61-70.
- [2] Emad Elbeltagi, Tarek Hegazy and Adel Eldosouky (2004), "Dynamic Layout of Construction Temporary Facilities Considering Safety", Journal of Construction Engineering and Management, Vol. 130, No.4, pp. 534-541.
- [3] Enno "Ed" Koehn, Rupesh K.Kothari and Chih-shing Pan (1995), "Safety in Developing Countries: Professional and Bureaucratic Problems", Journal of Construction Engineering and Management, Vol. 121, No.3, pp. 261-265.
- [4] Erkki Yranheikki and Heikki Savolainen (2000), "Special International Report: Occupational Safety and Health in Finland", Journal of Safety Research, Vol. 31, No. 4, pp. 177-183.
- [5] Everlett J.G., and Frank,P.B.(1996),Cost of accidents and injuries to the construction industry, Lewis publishers.
- [6] Haytham M.Sanad, Mohammad A.Ammar and Moheeb E.Ibrahim (2008), "Optimal Construction Site Layout Considering Safety and Environmental Aspects", Journal of Construction Engineering and Management, Vol. 134, No.7, pp. 536-543.
- [7] Joe M.Wilson and Enno "Ed" Koehn (2000), "Safety Management: Problems Encountered and Recommended Solutions", Journal of Construction Engineering and Management, Vol. 126, No.1, pp. 77-79.

- [8] Jose L.Melia, Kathryn Mearns, Silvia A.Silva and M.Luisa Lima (2008) "Safety Climate Responses and the Perceived Risk of Accidents in the Construction Industry", Safety Science 46, pp. 949-958.
- [9] M.Nagesh and Devanshu Pandit (2006), "A Study on Construction Safety and Labour Conditions in and around Ahmedabad", NICMAR Journal of Construction Management, Vol. XXI, No.3, pp. 15-37.
- [10] Osama Ahmed Jannadi and Mohammed S.Bu-khamsin (2002), "Safety Factors Considered by Industrial Contractors in Saudi Arabia", Building and Environment 37, pp. 539-547.
- [11] Rafiq M.Choudhry, Dongping Fang and Sherif Mohamed (2007), "The Nature of Safety Culture: A Survey of the State-of-the-art", Safety Science 45, pp. 993-1012.
- [12] Richard J.Coble and Robert L.Blatter (1999), "Concerns with Safety in Design/ Build Process", Journal of Architectural Engineering, Vol.5, No.2, pp.44-48.
- [13] R.A.Haslam, S.A.Hide, A.G.F.Gibb, D.E.Gyi, T.Pavitt, S.Atkinson and A.R.Duff (2005), "Contributing Factors in Construction Accidents", Applied Ergonomics 36, pp. 401-415.
- [14] R.B.Blackmon and A.K.Gramopadhye (1995), "Improving Construction Safety by Providing Positive Feedback on Backup Alarms", Journal of Construction Engineering and Management, Vol. 121, No.2, pp. 166-171.
- [15] Sherif Mohamed (2002), "Safety Climate in Construction Site Environments", Journal of Construction Engineering and Management, Vol.128, No.5, pp.375-384.
- [16] Stewart Young (1996), "Construction Safety: A Vision for the Future", Journal of Management in Engineering, pp. 33-36.
- [17] Syed M.Ahmed, Jack Chu Kwan, Fox Young Wel Ming and Derrick Chong Pul Ho (2000), "Site Safety Management in Hong Kong", Journal of Management in Engineering, pp. 34-42.
- [18] Tariq S. Abdelhamid and G.Everett (2000), "Identifying Root Causes of Construction Accidents", Journal of Construction Engineering and Management, Vol.126, No.1, pp. 52-59.
- [19] T.Michael Toole (2002), "Construction Site Safety Roles", Journal of Construction Engineering and Management, Vol.128, No.3, pp. 203-210.
- [20] Xingu Huang and Jimmie Hinze (2003), "Analysis of Construction Worker Fall Accidents", Journal of Construction Engineering and Management, Vol.129, No.3, pp. 262-271.

Membership: Member of Indian Society for Technical Education

AUTHOR'S PROFILE

Name: P.S.Sathish Kumar,



Qualification: B.E. in Civil Engineering,
M.E. in Construction Engineering and Management.

Membership: Member of Indian Society for Technical Education

Name: M.Logesh Kumar,



Qualification: B.E. in Civil Engineering,
M.E. in Construction Engineering and Management.