

An Investigational Analysis of Factors Influencing Safety for Construction Projects

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Abstract:

Construction activity in India has travelled a long distance in a relatively short period of time. The social concern of safety of construction workers and their protection against injury arising out of their employment is quite evident for a long term. Measures are taken to translate social concern into programmes of action-legislative. Construction projects are dynamic they are characterized by many factors such as – frequent work team rotation, exposure to weather conditions, high proportion of unskilled and temporary workers. Construction sites undergo change in topography, topology, working conditions throughout the duration of project.

In general, accidents at work occur due to lack of knowledge or training, lack of supervision, lack of labour to carry out work safely, without carelessness. This Project Aims at Providing a Healthy & Safe work environment for all employees to conduct their roles and responsibilities and thus by minimizing impacts of accidents. It also provides training to all employees to understand the hazards and appropriate control measures. Hence it develops a workplace-environment where continual improvement and learning from mistakes is embraced by all employees.

Introduction:

Construction activity in India has travelled a long distance during a comparatively short amount of time. The social concern of safety of construction staff and their protection against injury arising out of their employment is kind of evident for a protracted term.

Measures are taken to translate social concern into programs of action- legislative, administration, education doesn't bring desired result so happened thanks to peculiar nature of trade. Construction comes are unit dynamic they're characterized by several factors like –frequent work team rotation, exposure to weather, high proportion of unskilled and temporary staff. Construction sites bear modification in topography, topology, operating conditions throughout the period of project. In general, accidents at work occur thanks to lack of information or coaching, lack of oversight, lack of suggests that to hold out work safely, carelessness. Staff area unit being exposed to large choice of significant structure health & safety hazards that the speed of fatal accidents in Indian industry is four to five times that of producing sector

The reasons for considering safety embrace

- Humanitarian concern
- Economic reasons
- Laws and rules
- Organizational image

The EHS Management System provides the framework for managing EHS problems and activity throughout the project and can guarantee roles and responsibilities, Sound risk management, decision creating, systematic approach to vital safety activities and ensures Continuous improvement .It is aimed to ascertain bound performance expectations .The EHS management system has been designed to boost the prevailing level of operational activity.

LITERATURE REVIEW:

Ophir Rozenfeld et al (2009) studied of distinguishing and assessing the Hazards and Risk is an important step in safety management. Construction comes area unit dynamic and that they area unit influenced by several factors like frequent work rotation, exposure to weather, high proportion of unskilled and temporary employees. Job Safety Analysis (JSA), is additionally called Job Hazard Analysis, is associate degree economical proactive live for safety risk assessment utilized in industry.

Masoud Gheisari et al,(2010) studied state of affairs Awareness (SA)improves decision-making and performance in complicated, situations. Situational awareness has not been thought-about as a potential technique of up job-site safety in construction.

Felix Hammon et al, (2012) studied the price of accidents has received abundant attention within the recent past, and on-line interactive tools were developed to assess the price of accidents to organizations.

Edwin Sawacha et al, (1999)studied the impacts of the historical, economical, psychological, technical, procedural, structure and therefore the environmental problems area unit thought-about The historical issue is assessed by the background and characteristics of the individual, like age and experience.

Gregory Carter et al, (2009) studied hazard identification is key toconstruction safety management; unidentified hazards gift the most unmanageable risks. This ends up in the presentation of associate degree info Technology IT tool for construction project safety management that helps in up levels of hazard identification.

Samaneh Zolfagharian et al, (2011) studied the development business has the most important variety of injuries compared to different industries.

One in all the essential steps for construction safety management is hazard identification, It was additionally found that an absence of safety-forward attitudes, an absence of awareness of safety rules, poor safety awareness of project managers, and an absence of data area unit the hazards in construction comes.

TYPES OF POLLUTION:

Construction activities causes different kinds of pollution such as

- Air Pollution
- Water Pollution
- Noise Pollution

ENVIRONMENTAL OBSERVATION FROM SITE

Air Monitoring System

- The goal of this air quality monitoring is to defend humans and the surroundings from harmful air pollution.
- Battery operation makes this instrument convenient, moveable and reasonable for air quality monitoring.
- It measures the speed flow of air figure 4.1 shows air monitoring system provided in site



Figure 4.1 Air Monitoring System 4.3.2 Debris Chute

- Debris from prime floors are brought down through lined pipe.
- Dust mesh is provided everywhere the aspect were debris is stored.
- These dust mesh prevents the dust from being flown to remaining parts of site. Figure 4.2 shows provision of debris chute.



Figure 4.2 Debris Chute for Controlling Dust



Figure 4.4 Provision of LED Lights

Water Disposal

- Waste water from labor colony is collected in proper channel drain .
- These collected waste water is disposed out of site.
- Water stagnation is entirely prevented breeding of mosquitoes and other diseases are prevented figure 4.3 shows removal of waste water from colony.



Figure 4.3 Waste water removed from labour colony

LED Lights:

- LED emit more a lot of lumens per watt than incandescent light.
- They turn out less heat radiation compared to alternative kind of light weight emission
- LED light up terribly quickly and have longer life time figure 4.4 shows provision of LED lights in site.

WORKMEN ENVIRON FACILITIES – SPECIFICATIONS

Minimum requirements should be provided for the employees in labor colony Tab 5.1 shows the minimum requirement provided in workman habitat.

Tab 5.1 Workmen Habitat Facilities – Specification & Minimum requirements

Sl.No	Description	Quantity	Our current habitat status.
1	Floor Area per person	4 SQM	Bunkers being used – Will be derived accordingly
2	Max no of person per room	9 nos	
3	Minimum height of the room	2.4 M	2.4m
4	Area for sanitary facilities per Person	0.60 SQM	0.60 SQM
5	Area for Kitchen per person	0.20 SQM	0.20 SQM
6	Lavatories	1 per 10 person	1 per 10 person
7	Bathroom	1 unit per 15 person	Open bathr oom available

FACILITIES PROVIDED IN LABOUR CALONY

Sanitary Facilities

Toilet and laundry facilities shall be unbroken clean Waste water from wash areas, loos and bathrooms shall be hold on in septic tanks / soak pits and fittingly disposed. Septic tanks / soak pits shall be set at a distance of 18m from the wells. No waste water shall be let to ground or alternative sources while not correct treatment figure five.1 shows hygienically facilities provided in colony.



Figure 5.1 Sanitary Facilities Provided in colony

Drinking water provisions

Sufficient quantity of potable water shall be made available for drinking Drinking water tanks ought to be decipherable marked “Drinking Water” in a very language understood by a majority of the staff and half dozen meters faraway from laundry place, plumbing fixture or public lavatory. Drinking water sampling and testing is to be done Storage tanks should be clean and maintained properly. Figure 5.2 shows drinking water provision in colony.



Figure 5.2 Drinking water provisions

Cookery space

Cooking shall not be permissible within the living space. Separate selected room to be provided meeting the minimum space needs mentioned on top of. Correct lighting and ventilations square measure to be

provided figure 5.3 shows cookery space out there in colony.



Figure 5.3 Cooking area

Fire Prevention

Dry Chemical Powder fire extinguishers shall be set such that one mustn't to travel over 15m distance to access a hearth asphyxiate Diesel generator Shed and ignitable liquid cargo deck storage areas shall be supplied with foam sort fire extinguishers and fire buckets “No Smoking” boards shall be displayed in gas cylinder and ignitable liquid storage areas. All the safety shall be trained on use of fire extinguishers figure five.4 shows provision of fire extinguisher.

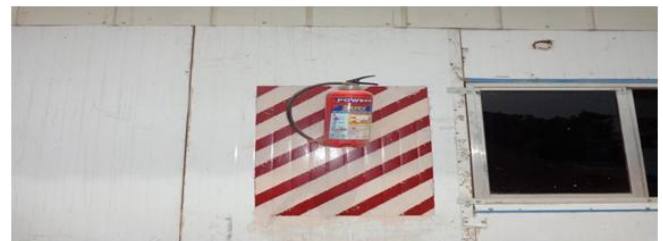


Figure 5.4 Provision of fire extinguishers

SAFETY MEASURES IN SITE

Provision of Appropriate PPE's

Safety of working person is way thought-about. Appropriate PPE's (Helmet, Shoes, Safety Jacket, and Hand glues) should be provided for private Safety. Safety rope ought to be mounted with Safety jackets whereas functioning at heights .No staff area unit allowed to figure tall while not sporting necessary PPE's figure half dozen.1 shows labor sporting PPE's in web site.



**Figure 6.1 Labor working with Appropriate PPE's
Safety Training Programme**

Safety awareness coaching programs area unit given to staff by EHSO. Safety educational program should be conducted double during a month. Demo of accidents area unit shown and trained for handling Emergency things. Hazard identification, guidelines to handle equipment's area unit main areas targeted throughout coaching program figure half dozen.2 shows safety program conducted for staff.



Figure 6.2 Safety training program for workers

Safety Ropes Provided at Edges

Safety nets are provided to stop fall of materials and staff whereas working at heights. Safety Ropes area unit provided at the perimeters of platform to stop falling or slippage of staff whereas functioning at platform edges. Entire platform is roofed with safety web and cord before beginning of works. Safety ropes and safety nets area unit to be tied bolt to a firm surface to resist the load if some materials or staff have slipped into it figure 6.3 shows provision of safety ropes in web site.



**Figure 6.3 Safety ropes provided at edges Full
Decking of Openings**

Full decking should be done to stop fall of materials and staff through the openings. Chiefly full decking is provided in areas having carry shafts. Decking material is created of rigid stell components on resist the load falling over it figure half dozen.4 shows full decking of platform.



Figure 6.4 full decking of openings

RISK ASSESMENT MATRIX

The vertical axis in figure nine represents increasing chance (levels one to 5) of the prevalence. The horizontal axis represents increasing consequences (severity levels one to 5) in terms of damage to individuals. Boxes within the matrix represent levels of risk, increasing from prime left to bottom right corners of the matrix. The matrix is split into blue, yellow and red areas for example the increasing level of risk. Once the chance and severity are established, the chance level will be determined from the chance matrix. The intersection of severity column and chance row indicates risk Level. Risk assessment is carried out for various environmental, health and safety side. EHSO can determine the main activates inflicting impact and potential outcomes owing to the activities area unit established.

Appropriate likelihood and severity rating area unit given by EHSO with the reference of risk assessment matrix risk impact level is given like low, medium, high. Activities of low level impact arasure} neglected however activities of medium and high level impact area unit noted and appropriate suggestive me in table 7.1

Table 7.1. Risk assesment matrix

	Likelihood	Severity				
		Minor	Moderate	High	Very High	Extreme
		1	2	3	4	5
Limited	Impact not expected at this site; control in place to minimize impact.	Low				
Possible	Impact not expected at this site, but could still occur.			Medium		
Occasional	Impact can occur at a frequency not more than once in a year					High
Periodic	Impact can occur at regular intervals; once in a month					
Routine	Impact can occur through everyday operations.					

IMPLEMENTATION OF PROACTIVE EHS

Proactive thinking will avoid accidents well before its occurrence and it's evidenced to be best management system for dominant accidents. Implementation of proactive EHS is shown in table 8.1.

Table 8.1 Implementation of proactive EHS

Sr.No	Name of the staff	PS No	No of hazards reported in his area by EHS department / committee work done	No. of hazards rectified by client / consultant	No. of hazards rectified	Number of safety improvement suggestions	No. of Safety to start work card prepared (including Pop talks)	No of EHS suggestions from this area	No of near miss from his area	No of EHS training conducted (as per the pop cards in EHS card)	No of safety Training Attended (as per the format EHS training organized by HR)	Total
Execution												
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

DATA ANALYSIS

The questionnaire survey was designed primarily to fetch info from website engineers, project managers, health and safety managers and similar personnel.

These personnel were chosen as a result of {they area unit they're} to blame for health and safety performance within the housing industry and are most knowledgeable on problems regarding health and safety performance. The form consisted of multiple alternative queries. within the form, contractors were asked to estimate what quantity their organizations takes care on health and safety measures and to estimate the full advantages increased to their organization as a results of the actions taken to forestall accidents. To encourage a decent response, the questionnaires were mail-clad out with a signed missive to numerous firms of varied levels (small scale, medium sclae, giant scale companies).

RESPONSE RATE

A total of fifteen questionnaires were received from the target sample. From the results of the survey, thirty three (42%) painted response from little contractors, followed by twenty five (approximately 31%) giant contractors, and twenty one medium contractors (approximately 27%). the information assortment was conducted from Feb one, 2015 to March one,2015 was followed by information analyses. the information Analysis is completed through SPSS package. Major firms area unit contacted like L&T Construction, M+W Group, Hex ware Construction, ETA Construction, Sapthagiri developers, Rifsu bulders, Icon builders and few additional builders were contacted to gather the responses.

SPSS SOFTWARE

SPSS provides facilities for analyzing and displaying info employing a style of techniques. Few things which will be enclosed during this section area unit analysis of measurement Instruments, Sample Size and choice, analysis of Mean, turn out Bar Charts.

SPSS Analysis Results

Health connected questionnaires are framed and analyzed in SPSS package and corresponding mean values area unit shown in table 9.1 and bar charts in figure 9.1

Table 9.1 Mean values for Health related questioners

Health Related Questioner	Mean	Priority
Is medical test conducted for workers frequently	1.85	Priority 1
Are the wash basins provided with hot and cold running water	1.78	Priority 2
Are the wash basins large enough to wash up to elbow	1.71	Priority 3
Are the toilets readily available and kept clean	1.50	Priority 4

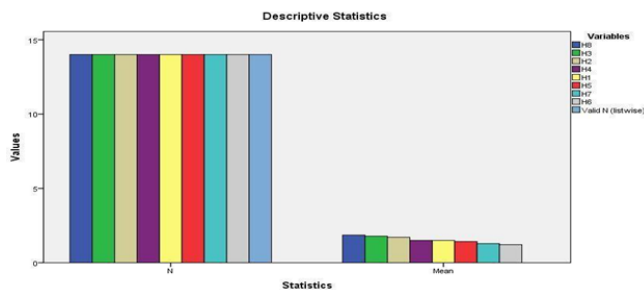


Figure 9.1 Mean values for Health Related Questioners

Environmental related questionnaires are framed and analyzed in SPSS Software and corresponding mean values are shown in table 9.2 and bar charts in figure 9.2.

Table 9.2 Mean values for Environmental related questioners

Environmental Related Questioner	Mean	Priority
If you could choose one alternative to Develop pollution free site which one would you choose?	2.78	Priority 1
What is the most common source of Noise in construction?	2.71	Priority 2
How Frequently the Air quality monitored in your construction site	2.64	Priority 3
What is the main problem with renewable energy sources	2.42	Priority 4

Safety related questionnaires are framed and analyzed in SPSS Software and corresponding mean values are shown in table 9.3 and bar charts in figure 9.3

Table 9.3 Mean values for Safety related questioners

Safety Related Questioner	Mean	Priority
Are the barriers and other protection available for preventing vehicles to fall in	1.5	Priority 1
Is the pedestrian provided for movement of pedestrian	1.42	Priority 2
Is ladders used to climb more than 1.5m	1.42	Priority 3
Is the route map provided at entrance of Site	1.40	Priority 4

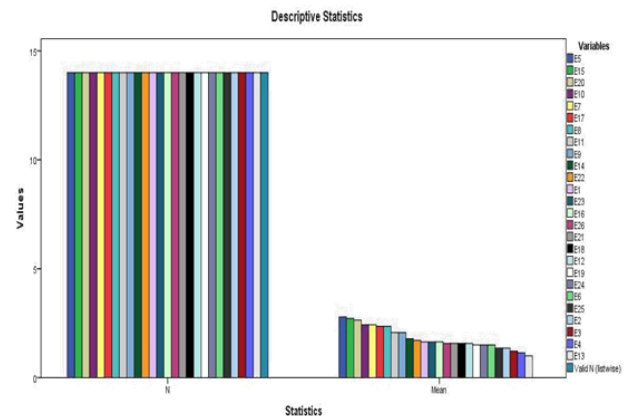


Figure 9.2 Mean values for Environmental Related Questioners

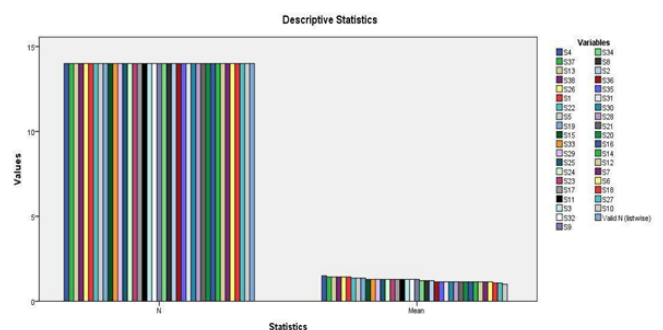


Figure 9.3 Mean values for Safety related Questioners

CONCLUSION

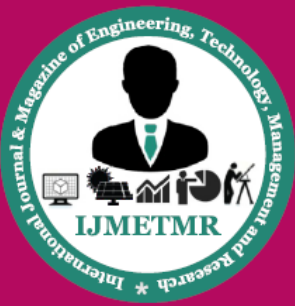
The information obtained from this study may be helpful to several construction firms, particularly for firms wherever construction safety awareness is not

high. The findings might offer helpful information's to project managers and safety practitioners in creating their sites safer. Based on the survey conducted the below observations and points has been finished with sure enhancements. Based on the results it appears that the businesses have to be compelled to focus additional on formal coaching programmers relating to safety and health practices to attenuate construction accidents.

RECOMMENDATIONS

From the findings of labor it had been ascertained that the sites have their own deserves and demerits. Survey results reveal that construction sites face serious issues in safety and health management .Hence, few recommendations area unit given to beat the Environmental, Heath and issues of safety prevailing in site.

- Management ought to guarantee to avail statutory requirements-Interstate migrant license act 1979, BOC act 1996, Tamilnadu contractor labor license, Health insurance policy, Workman compensation policy.
- Work must be properly planned administered to forestall accidents .
- The firms ought to take care of the employees at work jointly would take care of their family reception .Company ought to make sure that every worker perceive and settle for his/her personal responsibility for safety.
- Establishing role and responsibilities that every entity will play can scale back the accidents from occurring and improve the level of safety on construction site
- Adequate lighting to be arranged in project premises/labor camps.
- Importance of Environmental problems ought to be created familiar to all from top management to lowest level.
- All the staff on the construction site should be provided with appropriate safety training.
- The firm should anticipate the risk that may arise from changes in equipment or methods and make use of expert safety devices available to help guard against such new hazards.
- Companies should cooperate fully with those organizations which are actively concerned with worker safety.
- Companies should ensure proper PPE provisions to workers. Workers should be explained about the hazardous nature of work environment.
- Major accidents occur due to layout design and poor house keeping, work procedures and poor practices, experience and workmanship, lack of safety culture, handling storage and other conditions.
- Establishing the role and responsibilities that each entity can play will reduce the accidents from occurring and improve the overall level of safety on construction site.
- Conduct awareness campaign to site workers that could be generated through different methods like on site safety charts having pictures to explain safe work habits, practices, demonstration on site.
- Arranging regular formal education and training programme for workers on site.
- Develop the attitude of workers and giving incentives for motivation good safety culture on construction site.
- Top management should formulate strategies and develop policies that nurture a safe culture.
- Strictly following safety rules and wearing PPE as required.
- Safety regulations need to be defined and enforced strictly.
- Minimum requirements and needs for Healthy living of workers should be provided.
- Frequent health checkups should be given for workers.
- Environmental Concern should be kept in mind while executing each activity.
- Unsafe site conditions can significantly increase the possibility of construction accidents.

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