

Study on Safety Practices and their Performance in the Construction Industries

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Abstract—The construction industry plays an significant role in the social and economic development in our country. Safety in the construction industry is considered a major issue in developed and developing countries. The construction sector suffers recently from poor safety and health conditions as safety rules do not exist and work hazards at the workplace are not perceived. By implementing safety management is to promote working conditions and work practices that will assure all employees of a safe and healthful work environment for all construction activities. The purpose of this paper is to investigate the safety measures and strategies followed in the construction sites and evaluate the safety regulations and policies on construction sites and examine the challenges faced by the management in construction project sites. It will also look at the relationship between personal characteristics of construction employees and safety climate/safe work behavior. The methodology adopted in this paper was based on comprehensive questionnaire targeting the stakeholders. Questionnaires were distributed and data are collected and then analyzed to achieve the objectives. This study provides information about various tasks performed in the construction industry and also explain the safety practices adopted by the industries.

Keywords—safety policies; stakeholders; safety Management; construction industry; analysis; work behavior

I. INTRODUCTION

Construction industry is an unique industry and more susceptible than other industries. Each construction site involve of many human resources and they execute different types of work relate to each other. The safety of workplace is an essential component of competence and productivity. Safety is the process of being protected against physical, social, spiritual, economical, political, emotional, occupational, psychological, consequences of failure, injuries, accident, damage or any other event which could be considered non-desirable. This can take the form of being confined from the event or from exposure to something that causes. Thus, the safety is not a perception to be thought of as added to the work itself; safety is to be considered an integral part of the work to achieve a target of the organizations. It becomes necessary to consider certain safety measures and program to prevent accidents and injuries at site and helps to shaping employees beliefs and attitudes that lead to safe behavior and ultimately to a strong safety culture.

1.1. Elements for Effective Safety Management

The elements of effective safety management are helps more to attain the aspiration and to save the life of humans.

1.1.1. Jobsite safety

A poorly planned and untidy site is the underlying cause of many accidents. This results from fall of materials and conflict between workers and plant or equipment and affects the safety and health of workers and also the cost & productivity. A safety management is essential at every site and it provides a systematic way to identify hazards and control risks while maintaining the declaration that these risk controls are effective. Jobsite safety management refers to the cyclic process of planning, organizing, implementing and reviewing, control of work and manpower to reduce the accidents.

1.1.2. Safety promotion program

The objective of safety program is to develop and maintain awareness among all personnel of the organization's commitment to safety and health and individual persons' responsibility to support that commitment. Safety program is to promote working environment and work practices that will assure all employees of a safe and healthful work environment for all construction activities. Thus, the company makes full effort to establish a clear and positive 'safety culture' on each construction site. Safety promotion program should have clearly defined objectives. They require very suspicious thinking and consideration if the greatest profit is to be obtained. The proprietor or contractor should develop, as part of a safety promotion program, a procedure to recognize and acknowledge good safety performance either by individuals, teams, departments or the organization. He should assign a coordinator for the program to ensure its smooth implementation.

1.1.3. Safety meeting and campaigns

A meeting can provide a good opportunity for promoting safety. Meetings suitable for promoting safety include orientation meetings for new comers, training meetings, and tool-box meetings. Safety and health films/videos can be shown during these meetings with time allowed for discussion after the viewing. The line managers can promote safety directly to all subordinates during the normal course of work. Through the day-to-day contacts, they can get the safety messages across and make workers accept safety as a way of life. Safety seminars, conferences and campaigns are the most high-profile way to promote safety. They can be used to raise safety awareness and promote good practices and safety standards. Safety campaigns usually involve the mobilization of people at different levels for a cause and can thus focus minds on safety issues and spread the safety messages across the entire workforce.

1.1.4. Training and competency of workers

The safety officer should ensure that all workers fully understand the safety and health hazards of the processes they work with for the protection of both themselves and their fellow workers. Also, additional training in subjects such as operating procedure and safe work practices, emergency evacuation and response, safety procedures and other subjects pertinent to process safety and health should be included in the training program. Hands-on training where workers are able to use their senses beyond merely listening will enhance learning and should be provided. Other training techniques using videos or on-the-job training should also be considered. The proprietor or contractor of the relevant industrial undertaking should periodically evaluate the training program to see if the necessary skills and knowledge are being properly applied by their trained workers.

1.1.5. Personnel protective equipment (PPE)

Construction sites are having many type of hazards as explained earlier due to complexity of the work environment. For a good safety culture, all workers should be ensure to use the required PPE. Use of Personal Protective Equipment (PPE) to decrease employee contact to hazards when engineering and administrative controls are not feasible or effective in reducing these exposure to adequate levels. At times some workers may feel some inconvenience in using the PPE, but management should conscientiously enforce the use of PPE right from day one and each worker realized the importance of PPE and it should be made to believe these as last defense in depth to save their life. Broadly these are Safety helmets, Face shield, Safety belts, Safety shoes, hand gloves, goggles, Safety glasses or goggles, Earplugs or sound mufflers, Back supporter, Particle respirator, Vapor respirator, fall arrester etc. Personal protective equipment should be made available near the work spot for ease of use by workers.

1.1.6. Electrical safety

Electrical energy is almost universally used on construction sites as a power source for a range of machinery and portable tools, as well as lighting and heating are largely used in construction sites. Any building or other construction work, sufficient measures shall be taken to prevent any worker from coming into physical exposure with any electrical equipment or apparatus, machineries or live

electrical circuit which may root of electrical hazard during the course of his employment. As far as practicable, no wiring or cable, which may come in contact with water or which may be automatically damaged or which may result in electric shock. For that, all electrical tools and equipment should be inspect prior to their first use and thereafter at least at 3-months intervals. All tools and apparatus should have an identification tag state the date of last inspection and when the next is due. No part of a crane, digger, excavator, drill rig, or additional mechanical plant, structure or scaffolds may be brought closer than 4 m to an above your head line without the written consent of the power line owner. Immediate precautions are made and ensure that electrical systems are well maintained in a safe condition at every constructional activities.

1.1.7. Safety label & signs

Labels, posters and signs are shows hazard information to employees and can be useful in providing additional information and making you aware of a probable safety or health hazard. Posters must locate in the area of hazard communication, confined space and pathogens. The employer must make sure that each sign or label posted can be understood by all workers. The safety signs include illuminated signs, hand and acoustic signals, traditional signboards, such as exclusion and warning signs, signs for fire exits, fire drills and fire-fighting equipment. Safety signs, posters and signals more helpful to understand easily about the dangerous occur.

1.1.8. Identification of Hazards

Identify hazards and assess their associated risks, the safety officer of a relevant industrial undertaking should in the first place prepare a list of items covering premises, plant, people and procedures, and gather information about them. After the identification of the hazardous exposure or the risk of such exposure to the workers of a relevant industrial undertaking, the proprietor or contractor should find out whether planned or existing safety precautions are sufficient to keep the risk under control and meet legal requirements. If the conclusion are negative, he should take steps to manage the risk so that they are reduced to the lowest level that is logically practicable, using engineering methods.

1.1.9. Amenities and Facilities

Good welfare facilities improve efficiency it includes provision of drinking-water, washing, hygienic and changing accommodation, rest-rooms and shelter, canteen, temporary housing, assistance in transport from place of residence to the work site and back, cleaning of the worksite and surrounding area of construction project related debris. Storage area and walkways on construction site must be kept almost free of dangerous depressions, obstruction and debris all help to reduce fatigue and improve workers' health. Every employer is required to provide adequate first-aid facilities, appliances and requisites. The longer a wound, even a very small one, is left untreated the greater the risk of infection. The first treatment of any injury is probably the most important item in the rehabilitation of an affected person, thus it is important that first-aid boxes or cabinets be reasonably available to every employee. First-aid kits should be kept in construction vehicles as well as on site. Each employer should have a suitable trained person to administer first-aid treatment.

1.1.10. Emergency Action Plan

Emergency action plans are prepared to deal with emergencies arising out of fire and explosion, collapse of lifting appliances and transport equipment, collapse of building, sheds or structure, gas leakage or spillage of dangerous goods or chemicals, drowning of workers, sinking vessels, and Landslides getting workers buried. It is also required that there is a tie-up with the hospitals and fire stations located in the neighborhood for attending to the casualties promptly and emergency vehicle kept on reserve duty during the working hours for the purpose.

II. LITERATURE REVIEW

Sunku Venkata Siva Rajaprasad and Pasupulati Venkata Chalapathi (2015) - This study revealed that, management commitment has the highest driving power and the most dominant factor is safety

policy, which states clearly the commitment of top management towards occupational safety and health system gives better performance. It helps to Indian construction organizations to understand the communication among factors influencing in implementation of OHSAS 18001.

Mouleeswaran.K (2014)-This research shows that the major causes of accidents are related to the unique nature of the industry, human behavior, complicated work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures. Emphasis in both budding and urbanized countries needs to be placed on training and the utilization of comprehensive safety programs.

Subramani.T and Lordsonmillar.R (2014) - The study will collect data from general contractors includes, organizational safety policy, safety training, safety meetings, safety equipment, safety inspections, safety incentives and penalties, employees attitude towards safety, labor turnover rates and compliance with safety legislation and providing a set of recommendations and strategies to contractors for improving their safety performance.

Zhipeng Zhou, Yang MiangGoh, Qiming Li (2014)-In this research they focusing on topics such as i)safety assessment and safety program, ii)worker behavior, perception, and safety climate, iii)accident/incident data to improve safety performance design for safety, and safety culture.This review can serve as guidance for future construction safety research.

Zubaidah Ismail, SamadDoostdar and ZakariaHarun (2012)-The perceptions of this paper is to, number of incidences among construction people and the level of awareness on matters regarding safety were also determined and provide suggestions on equipment design and improved work practices and actions to improve the efficiency and productivity .

SathishKumar.P.S, LogeshKumar.M (2012)-This paper analyzed the main cause of the low safety standards and working conditions at the construction sites. The criterions considered in this paper are (i) safety programs and policy, (ii) safety program execution, (iii) use of personal protective equipment, (iv)hazard and their guard, (v) housekeeping and (vi) emergency compliance.

III. METHODOLOGY

The methodology adopted for this study is dramatically represented through the flow chart for the successful completion of the project.

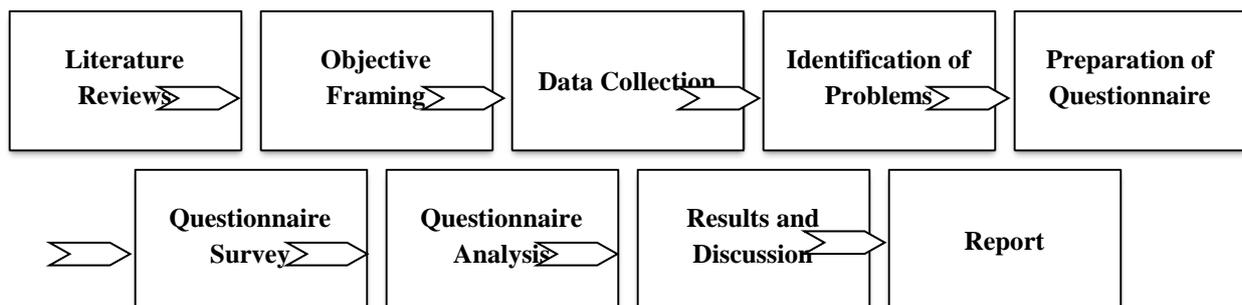


Figure.1.Methodology flow chart

IV. DATA ANALYSIS AND IMPLICATIONS

The questionnaire was distributed among 200 companies based on their size and annual turnover in our state. Totally 160 responses are collected. The response rate is 80% which is considered a good response in this type of survey. Questions regarding 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. Interviews of project managers, contractors,

site engineer and laborers were taken for the purpose of the survey. Even email reply was accepted since it was difficult to get the direct one to meeting with the owners and project managers.

4.1 Stastical Analysis

SPSS Statistics is a software package used for statistical analysis. The current versions (2015) are officially named "IBM SPSS Statistics". The software name begin with Statistical Package for the Social Sciences (SPSS) was released in its first version in 1968 later than developed by Norman H. Nie, Dale H. Bent, and C. Hadlai Hull. SPSS is among the most broadly used software for statistical analysis in social science. It is used by market researchers, health researchers, survey companies, government, tutoring researchers and others.

4.2. Reliability Analysis

The internal consistency is predicted using a reliability coefficient called Cronbach's alpha. Reliability scores for the factors range from 0.642 to 0.880 indicating adequate internal consistency. For these data, the cronbach's alpha value is 0.823. It shows the project is reliable one.

Table.1. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.823	0.863	30

4.3. Factor Analysis

Kaiser (1974) recommended accepting values greater than 0.6 as acceptable. Table (2) shows the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Bartlett's test of sphericity tests the hypothesis that the correlation matrix is an identify matrix; (i.e.) all diagonal elements are 1 and all off-diagonal elements are 0, implying that all of the variables are uncorrelated. If the Sig. value for this test is smaller than our alpha level, we reject the null hypothesis that the population matrix is an identity matrix. The Sig. value for this project leads us to reject the null hypothesis and conclude that there are correlations in the data set are appropriate for factor analysis. For these data, KMO = 0.725, which fall into the region of being good; so, we would be confident that factor analysis is appropriate for these data.

Table.2. KMO And Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.725
Bartlett's Test of Sphericity Approx. Chi-Square	1865.276
Df	435
Sig.	0.000

4.4. Descriptive Statistics

Factor interpretation can be found out through factor analysis. Mean and Standard deviation values of these factor interpretations can be derived through descriptive statistics method in statistical analysis. This result shows the lack of performance of the safety organizations at site. The factors like team orientation and risk occurrence are the major once which affects the site more.

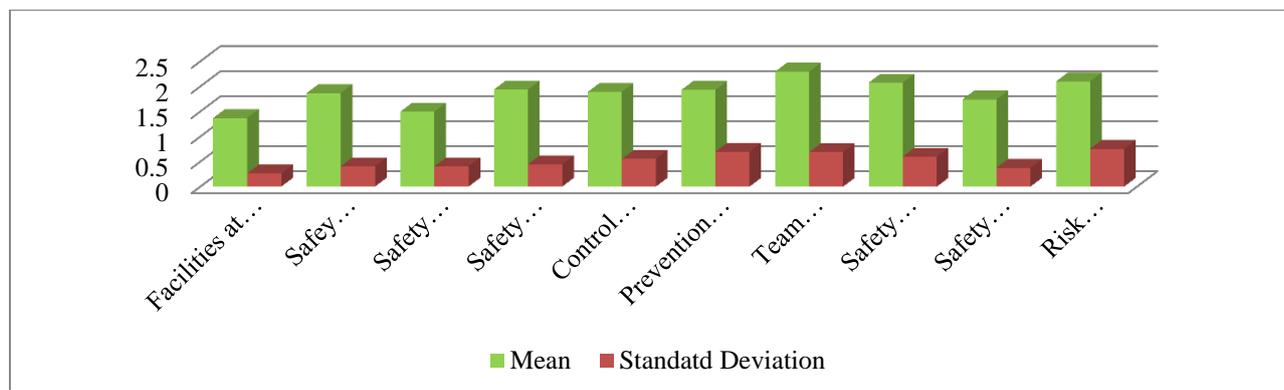


Figure.2. Factor Interpretation Results

V.CONCLUSION

This paper focused on many aspects of safety culture, behavior, attitude of workers etc., towards managing safety in the construction industry. The work investigates the following aspects of safety management, it includes safety policy and standards, safety program, team orientation, inspecting hazardous conditions, safety committee, prevention plans, personal protective program, control system, safety promotion, and management behavior. From the analysis results, it indicates that team orientation aspects in the companies are very poor due to improper co-ordination between the workers, supervisors and the management. Stakeholders cooperation, consultation of the management with the employees about work, place, health and safety issues are lacking because of improper communication between the management and employees, work pressure from the management to the employees in the site. Usage of PPE, safety booklets or manual, safety posters/symbols are not used properly in the site to avoid accidents.

Safety is everyone's responsibility it is a "way of life" for 24 hours/day. Individual will be skilled and equipped to have the skills and facilities to make sure an accident free workplace. Managers should frame the safety policies for their enterprise and train the employees to achieve the goal of zero accidents. Finally all parties in construction project must contribute their rightful parts towards making construction sites healthy and safe.

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