A STUDY OF SAFETY MANAGEMENT SYSTEM IN INDIAN CONSTRUCTION INDUSTRY

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ABSTRACT:
The Indian construction industry forms an integral part of the economy and substantial part of countries development. Construction constitutes 40% to 50% of India's capital expenditure on various sectors like highways, roads, railways, irrigation etc and construction industry is one of the second largest industry in India after agriculture. It accounts around 11% of India's GDP. . However, in some countries there is an absence of standard recording and notifications system for construction accidents while in countries such as India, the systems exist but their implementation is an issue. Occupational disease and work related accidents are world wide problems. Statistics and work related accidents are needed for prevention work at the national level. statistics on construction accidents are either unavailable or highly underreported and this leads to a situation where due attention to safety is not paid. Health and safety is an economic as well as humanitarian concern that require proper management control. The safety measures are needed to be considered from initial stage until the completion of work. Proper coordination between contractors and workers are needed for safe working condition, which is very lacking in Indian construction fields. Occupational health and safety (OHS) is an area concerned with health, safety and prosperity of the people engaged in every occupation irrespective of sex, religion, region, age etc. The OHS is necessary for welfare of workers as well as employers. This in turn is beneficial to the country as a whole. Therefore, certain laws, regulations, and provisions were made by the government of India time to time in order to promote OHS at work place and safeguard worker's health as well as worker's interest The number of injuries and fatalities can be reduced by encouraging and reinforcing behavioral change. Human error is complex topic and is directly linked to the cognitive process and one's ability to judge responsibility. Occupational Safety and Health Act (OSHA) with its regulations has had a profound impact on the construction industry. So the objective of this paper is to investigate the feasibility in knowledge acquisition about construction accidents, health hazards and related disease, and their prevention

I. INTRODUCTION
Construction is a dominant part of any country's infrastructure and industrial development. Construction industry, with its backward and forward linkages with various other industries like cement, steel bricks etc. catalyses employment generation in the country. Construction is the second largest economic activity next to agriculture. But there is a darker side to this explosive growth. For all the big money involved, the sector has barely regard for the safety of those who work in its lowest rungs. Construction in Indian industry is more labour intensive by comparing with developed nation in a global perspective. Construction industry is hazardous industry for both developed and developing countries owing to constructional accidents, injuries and illness. Researchers have shown that injuries and illness are high when compared to European countries. One of the reasons why these accidents cause scant alarm - or measures to ensure greater safety - is because little or no official record exists of the deaths of workers in construction. Statistics of occupational hazards can be seen in developing countries but that information is based on the statistics of developed countries. As like other occupation the workers in construction platform have to face challenges while performing their duties. In theory, inspectors from the Labour Department are meant to conduct checks to ensure safety measures are in place, especially if there has been an accident. Lamentably in practice, such inspections are rare. . The workers from rural side are not experienced, not well aware about the construction safety and also they are not practiced to forecast the dangers that may happen in the sites.

Why Is Construction Site Safety Important?
The construction industry is one the most dangerous in terms of workplace fatalities. The . As a manager in this line of work, you have an obligation to understand the risks and keep workers safe on the job.
Constructive Executive says that, because construction site accidents are considered common, there is a great deal of responsibility to maintain a safe worksite and to take care of their workers. Some of the most common hazards are:

- Falls from height.

- Falling objects.
- Exposure to dangerous substances.
- Dust inhalation.
- Working in confined spaces.
- Motor vehicle accidents.

SCOPE OF THE PROJECT

In Construction many accidents takes place which causes human tragedies and disorganize the construction process. Construction injuries will always have broad and adverse impact, which includes the personal suffering of the injured workers, construction delays and productivity losses incurred by the construction contractor, higher insurance premiums that result from costly injuries and possible liability suits for all parties involved in the project. Their prevention and even marginal reduction in their cost will have significant human and financial impact. The number of injuries and fatalities can be reduced by encouraging and reinforcing behavioral change. Human error is complex topic and is directly linked to the cognitive process and one's ability to judge responsibility. Occupational Safety and Health Act (OSHA) with its regulations has had a profound impact on the construction industry. Prevention of construction accidents requires predicting future accidents and their nature in given circumstances. Making such predictions must be based on knowledge about past accidents and can be estimated using about various decision support tools. The objective of this thesis is to investigate the feasibility in knowledge acquisition about construction accidents and their prevention.

II LITERATURE REVIEW

- Carter and Smith, (2006) investigated the hazard identification levels of three construction projects in the UK. These authors observed that construction projects within the nuclear industry identified 89.9% of all hazards, while projects within a railway context identified 72.8%. The research revealed that knowledge and information barriers, in addition to process and procedural barriers, prevented effective hazard identification.
- Xingu Huang and Jimmie Hinze, (2003) analysed the construction worker fall accidents 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.
- Edward et.al., (1996) had done safely 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. 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.
- Pheng and Shiua, (2000) emphasized that quality and safety should be integrated to achieve better co-ordination and utilization of resources.
- Wilson and Koehn, (2000) suggested that safety practices vary with construction sites. All construction sites have unique aspects of safety to be considered. Larger construction projects are better organized to manage safety aspects. The larger construction firms have one person responsible for keeping the team members informed about possible safety problems. Small to medium firms do not have an adequate safety program or person to oversee safety criteria. Implementation of their safety management is with project superintendent.
- Kumar and Bansal, (2012)conclude in their project that while completing high quality work within specified time and cost, safety of workers requires a significant attention. The paper sensitizes construction professionals regarding the importance of safety aspects and their consequences. The review suggests that there is a lack of responsive tools and resources to assist designers in addressing construction safety. Unsafe acts, unsafe conditions, and failure of management to anticipate hazardous situations are the main causes of accidents.
- In the past, industry has concentrated its efforts on reducing injuries by focusing on physical conditions such as the guarding of equipment or other factors that exposed employees to energy sources. Industry has also focused on addressing primarily those issues that OSHA and other agencies regulate and are likely to check during an inspection at a facility. Exhaustive inquiries into the major disasters of recent years, e.g. the escape of gas at Bhopal, the King's Cross Underground Station fire, the sinking of the Herald of Free Enterprise, the Clapham Junction rail accident, the Chernobyl nuclear accident, the Piper Alpha oil rig fire etc. came to the same conclusion that, despite the adoption of the full range of engineering and technical safe guards, complex systems

broke down calamitously because the people running them failed to do what they were supposed to do.

III SAFETY MANAGEMENT SYSTEM

In India the construction industry is the largest among the non-farming sector to generate jobs. But it also is a large contributor of grievous injuries and deaths of its workers in the country. The construction area of civil engineering is one of the most hazardous industries worldwide. The 'fatal four' causes of disastrous incidents in the construction industry are falls, electrocutions, being struck by objects and caught in between.
The rapid growth of construction industry in India today is out of proportion to practical developments in terms of safety and health aspects of the construction workers. Pitfalls in legislation combined with lack of proper implementation is also a significant contributor. The Indian construction workers form 7.5% of the world labour force, but it contributes to 16.4% of fatal global occupational accidents.

VARIOUS TECHNIQUES

There are several techniques that can be adopted for labour safety,

- Hazard Analysis
- Safety Training
- Safety organization
- Safety officer

SAFETY HAZARDS IN CONSTRUCTION SITE

- SLIPS OR FALLS FROM HEIGHT
- CAUGHT IN MACHINERIES AND TRENCHES
- FIRE AND EXPLOSION.
- ACCIDENTS USING VEHICLES
- EFFORTS PUT IN INDIA

IV ANALYSIS FOR SAFTEY MANAGEMENT

The last element of Safety Management System regarding to Oregan OSHA is Reviewing and evaluating the safety program that you have by gathering data and information from previous accidents or near misses and comparing with current data in order to evaluate the safety program and getting information about the strong and weak point of the program by asking employees, external experts or safety supervisors. Reviewing the program periodically is necessary in order to know whether you are in a right direction toward safety objectives or not. According to implementing a SMS, IHSS provide a checklist which is a guide that attributes of a SMS are implemented

- **Management Plan**
- **Safety Promotion**
- **Document and Data Information Management**
- **Hazard Identification and Risk Management**
- **Occurrence and Hazard reporting**
- **Occurrence Investigation and Analysis**
- **Occurrence Investigation and Analysis**
- **Safety Assurance Oversight Programs**
- **Safety Management Training Requirements**
- **Management of Changes**
- **Emergency Preparedness and Response**
- **Performance Measurements**

PROCEDURE OF MAKING SAFETY SAMPLING

1. Prepare a list of unsafe acts: In each specific job site there are list of unsafe acts that contains act that occur in the job site which can lead to accidents, we should have a complete list of unsafe acts in order to go through safety sampling. Each unsafe act should have number or code in order to report it easily.
2. Taking the sample: we should assign an inspector to take the sample by using the list of unsafe acts in his/her hand and go through the line and observe and monitor each employee separately and wait until you can determine whether he/she is performing their job safe or not. When you write down any unsafe act for each employee the determination could not be changed.
3. Validating the sample: for validating the sample we should have minimum number of observation which is obtained by this formula; $N=4(1-p)\ y\wedge 2*$, which N is total number of observation required, p is percentage of unsafe observation and y is the desired accuracy

As an example if we want to have + or – 10% accuracy and we had 126 observation and the total amount of unsafe acts which were observed is 32, so based on this equation we should have minimum of 1200 observation to get that accuracy.

4. Reporting to management: safety sampling report should include total percentage of unsafe activities by each department separately. Report should contain percentage of unsafe activities by supervisor and foreman. It should also contain the types of unsafe activities which were observed.

List of unsafe acts in safety sampling List of unsafe acts in safety sampling could be items like: incorrect gripping, improper footwear, improper pouring, wearing rings, standing in front of machines, walking under the load, improper lifting, improper material handling, feet under loads, improper and unsafe loading, loosing material and falling material from hand, improper dumping, lack of PPE, repairing moving machine, ladder not tied, unbraced forms, working in height without support,

uncovered rebar, it should be considered that list of unsafe acts should be detailed in depth, instead of just mentioning general items and any additional unsafe item that the observer cannot find that in the unsafe acts list should add that to the list that for future observing that unsafe act has specific item for itself. In front of each unsafe act in safety sampling worksheet, there are columns for department names that each unsafe item could be related to department associated with that easily. Measurement is divided into two broad categories which are micro measures and micro measures which is obvious that micro measurement is related to middle management, supervisory and line employees and macro measurement is related to measurement in whole organization and give general status of the organization which is upper management concern.
Based on Dan Peterson the key driver at the lower level of organization is performance to goal and there are several categories in order to set goals:

1. Routine Goals
2. Project Goals
3. Creative Goals
4. Personal Goals

The first thing for setting an objective is identifying and measuring our objective that whether they are good or not.
Good objective should be in below criteria based on Dan Peterson:
1. Zeroing of Objectives.
2. Individuality of Objectives
3. Measurability of Objective
4. Reality of the objectives

Macro measures
As we discussed before, the macro measurement is exclusively for top management within an organization and at top level of management all of the results that could be a concern is result measures instead of performance measures which is related to middle management, line managers and supervisors. There are three kind of methods for measuring safety within organization which are: incident and accident rate like what should be reported to OSHA which was discussed completely before in this report. The other two methods for measuring safety in organization from macro level standpoint are audit and perception surveys.

- Management's Credibility
- Employee involvement and participation
- Hazard Control

V CONCLUSION

Indian construction industry is one of the biggest and leading industry. But this industry is most hazardous industry which causes for the life of the workers. Sometimes the workers are exposed to risk of workplace accidents and occupational health problems in the constructions sites. However there are many Indian regulations dealing with the working conditions of construction workers, but most of the organisation or companies are failed to practice it effectively. Occupational Safety and Health Administration (OSHA) is an agency of united States to guarantee safe working condition for the workers.

Different aspects presented by various authors on labour safety in construction were discussed and analysed. But in the case of India even though some agencies are available for welfare for the workers but its not effectively managing.The government should play a more visible role in ensuring a high standards of safety in the construction industry. Contractors and owners must give utmost importance to the safety of the workers. The contractors and organization need to give some right to the workers to express their problems and feelings and they need to take remedial action to compromise workers problems.

Safety should be part of the process right from the very beginning. In working toward establishing a safer workplace, construction companies can tap the extensive knowledge of risk management experts who are well versed in their industry.

If the health of the workers are perfect automatically it will affect the completion of work. The personal protective equipment is a mandatory one which must be equipped by all the workers working in the site.

The semi-skilled and unskilled workers, together with women and children; are unaware of the use of personal protective equipment. The labour unions are often responsible for endangering the life of workers. The current status of safety in construction exposes the fact that safety has been a non-issue so far, despite the fact that almost one out of every five workers received injury annually. Constant review and up gradation of the concerned safety standards, health hazards, training programs are essential for successful safety and health management

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