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**ORGANISING FOR HSE
IN CONSTRUCTION OF
INDUSTRIAL PROJECTS**

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A B S T R A C T

*Construction industry in the second largest employer after agriculture employing 30 million people, Large percentage of the work force are unskilled, untrained and are drawn from rural background. Coupled with this the general adverse physical/ environmental operating condition and temporary nature of work associated with high- risk potential make construction industry more prone to accidents. Hence in order to effectively manage safety Health & Environment at site a good safety Management System is essential. A good Safety Management System is established which is pro- active in nature. This research paper describe about the Accident rate in Indian construction industry is more comparing other part of country. We had framed the **HSE MANAGEMENT MODEL** for construction safety. It takes care of planning and implementation of all aspects of safety in a construction site. The main features of this system are 1) Preparation of a Site Safety Plan before starting the job. (2) Formation of a Site Safety Committee (3) Screening & Induction of workmen. (4) Training of workmen and staff. (5) Group Risk assessment & Job Safety Analysis. (6) Internal Safety Audit. (7) Regular Safety Inspection. (8) Proper Selection and use of Personal Protective Equipment (9). Work Permit System. (10) Management of First –aid. (11) Safety campaign, competition & motivation. (12) Safety Performance monitoring and measurement. (13) Accident dangerous occurrence reporting, investigation and analysis etc. The Methodology developed for improving the safety performance at construction site are PDCA& Based on this tools a new HSE management model had been developed for reducing the risk in the construction site.*

Key Words: HSE Management model, PDCA, accident, safety performance

Introduction

Construction industry in India country has significant contribution to GDP and employs around 33 million people; hence, the issue of safety and health assumes importance. It is the second largest contributor to the GDP after the agricultural sector. It generate substantial employment and provides growth impetus to other manufacturing sector like cement, bitumen, iron and steel, chemicals, bricks, paints, tiles etc. Hence the concern for safety needs attention. The industry is characterized by the predominance of migratory and unskilled labour.

A few data in respect of the industry in India is given below

Annual turnover	Rs. 3921 billion
Contribution to GDP	6.2%
Employment	33 million workers
Engineers	4.7%
Technicians & Foreman	2.5%
Skilled workers	15.3%
Unskilled workers	73.1%
Annual growth (Targeted)	8%

Source : CIDC Country Report 2005-2006

2. TREND OF ACCIDENT

As the sector in unorganized and enforcement has not yet started to its fullest extent, no accident reporting system is followed by construction companies and hence, there is no reliable and accurate accident statistics for the sector, During the period of 2003-2005, 8 fatal and 1 major accidents were reported to the office of the chief labour commissioner central. As per the report a survey conducted by ILO, 165 per 1000 workers get injured during construction activities. In addition to that the workers are exposed to a host of hazardous substances, which have a potential to cause serious health & occupational diseases such as asbestosis, silicosis, lead poisoning etc.

OBSERVATIONS AND INFERENCE:

Across the world it is felt that safety in construction is a matter of concern. In India this is one of the most vulnerable segments of the unorganized labour. The nature of work performed by the construction workers is highly hazardous in nature. Further, working conditions at sites are increasingly getting adversely affected by the use of new technology, hazardous chemicals and a wide variety of materials handling and construction equipment.

Employment relations are contractual and they exist for the project duration only. This is why permanent or semi permanent systems or arrangements are not thought of. Many small contractors do not want to invest in training the workers employed by them particularly with regard to safety measures because of short term relationship with them. The workers themselves do not ask for any safety measures lest this may affect their employment opportunity. To regulate safety and health measures at the construction sites the government of India has enacted a comprehensive safety legislation i.e., the Building and other construction workers (Regulation of Employment and conditions of service) Act, 1996- (BOCWA, 1996) which came into effect from 1-3-1996 and the central rules, 1998 effective from 11.11.1998, and identified the office of the chief labour commissioner (CLC) to enforce the Act. Till today, a few states like Kerala, Tamilnadu, Delhi, Gujarat and West Bengal have framed their states rules and identified enforcement agencies. Other

states are in the process of doing so.

Because of these measures, status of safety and health in construction sector is showing some improvement in the recent past. In order to provide good safety standard at the sites there is a need to take up training and awareness programmes vigorously. The training and skill development / certification programmes, should be upgraded both in term of content as well as reach. To encourage such training, incentive both financial and non financial may be offered to the contractors. There is no institutional framework to impart training at the worker's level, barring a few initiatives taken by construction industry development council (CIDC), National safety council (NSC) and some major construction companies. There is a need to build infrastructure so that the employers and workers have convenient access to these institutions.

NSC has providing training to the enforcement officials to help them to upgrade their technical capabilities and understand various issues. This programme and refresher programmes should be conducted on a regular basis. There should be enough experts in the specific area of management of safety and health in construction industry. Till today, many construction companies do not have safety department at their project site. The responsibility is just given to individuals who even do not possess adequate knowledge and experience in this field.

Moreover, there is a shortage of professionals for the sectors as many of the professionals are getting absorbed in factories and some are getting attracted by good salary and joining firms abroad.

Good standards of safety and health in a construction project start with the decisions made by the client; this determines the whole safety and health climate of a project. Contracts need to be awarded on the basis of lowest tender. And value for money means a completed construction project that fits its purpose, fulfils user needs, and costs throughout its life. A poor safety and health performance not only adds to the client's costs but also undermines his reputation. It is important that clients treat safety, health and environment management at construction site as any other

business investment and integrate it with all other function (i.e., 11th national conference, Status paper-Safety in construction industry, Industrial safety chronicles).

Research Problem: Construction industry is the second largest employer after agriculture, employing over 30 million people. Agrarian background, migratory nature and a very high degree of transitory employment characterise the profile of labour in construction industry. As per the background information we could understand that there is no HSE management system found among the Indian construction industries. No research has been carried out on safety management system in Indian construction site. This study set out to develop a HSE Management system model.

General adverse physical/environmental operating conditions and the associated high-risk potential makes construction different from the other industries. These operating conditions, most of them unique to construction industry, have an influence on the safety performance.

Some of these constraints are detailed below:

Non availability of adequate number of trained/ skilled manpower

Skilled personnel account for only small portion of large workforce engaged in construction. Rest of the labourers is unskilled who migrate from place to another. As per study conducted by National Institute of Construction Management & Research (NJC MAR) about 15,000 workers are trained annually through building centres, I.T.Is & apprenticeship training and industry run training schools. However, this is highly inadequate to meet the requirements. Hence, there is a big shortage of trained manpower.

Temporary Nature of Work

Construction works are generally temporary in nature. Hence most arrangements are planned and made for a short duration. This curtails application of normal safety standards and hence construction is prone to accidents. Further the feelings that the work is for short duration makes the employee to take unnecessary risks.

Seasonal Employment of Workers

Most of the labourers employed are agricultural workers who are unaware of industrial risks. They

come to construction work only during off-season of their farming activity and return once the agriculture activity picks up. Due to this transient nature of workers, imparting safety training to them is not only difficult but also is generally ineffective.

Time Constraint

Quick mobilisation of men, material and resources to remote sites is a challenging task considering quality of logistical support available. Problems are many in the event heavy machinery is required to be moved over longer distances on poor road conditions. Invariably there will be delays in mobilisation of resources and subsequently the project time needs to be crashed to meet specific customer needs.

Legal Aspects

Till 1996, there was no specific legislation applicable to construction industry. In the absence of statutory requirement adequate attention was not given to safety at construction sites. Building and other construction workers (Regulations of Employment and Condition of Service) Act was enforced on 1st March 1996. Based on this legislation, the State and Central Governments were expected to notify rules. Central Government has also notified Central Rules in November 1998. Other states are yet to form the rules. Thus notification and enforcement of rules is still lacking.

Major causes of Accidents

As per a study following are the major causes, which lead to accidents at construction sites.(i.e., Statistics collected from MNC construction firm)

➤ Fall from height (45%). ➤ Fall of materials (13%). ➤ Electrocuting (11%). ➤ Collapse of earth (4%). ➤ Run over/ hit by vehicle (11%). ➤ Caught in between and struck by object/ moving machinery (9%) ➤ Others (7%).

Objective of the Research Paper:

➤ To examine the status of safety management in the Indian construction industry
 ➤ To identify the factors affecting construction site safety
 ➤ To explore the risk-prone activities on construction sites
 ➤ To propose suggestions for improving safety performance.



Methodology**PDCA CYCLE**

Plan - A change or a review aimed at achieving an improvement. • In this phase, intended improvements should be analysed, looking for areas that hold opportunities for change. To identify these areas for change, the use of a lag indicator should be considered. • **Do** - The change or improvement (preferably on a small scale) should be carried out. • the change decided in the plan phase should be implemented.

Check or Study – the results. What was learned? What went wrong? This is a crucial step in the PDCA cycle. After the change has been implemented for a short time, it must be determined how well it is working. Is it really achieving the improvement as hoped? This must be decided on several measures that can be used to monitor the level of improvement.

Act - The change should be adopted, abandoned, or run through the cycle again.

• After planning, implementing and then monitoring a change, it must be decided whether it is worth continuing with this. If it consumed too much time, was difficult to adhere to, or even led to no improvement, aborting the change may be considered, before planning a new one. However, if the change led to a desirable improvement or outcome, expanding the trial to a different area, or slightly increasing the complexity may be considered. This recommences the Plan phase and can be the beginning of the continuous improvement process.

Management Review Continual Improvement

Implementation & Operation

• HSE Ownership • Safe Work Method • Work Permit System • Screen & Induction of Workmen • Equipment Fitness Certification • Training • Pep Talk • Communication, Participation & Consultation • Sub-Contractor Management • Emergency Response Plan • PPE & Safety Devices • HSE Reward & Reprimand

Checking & Corrective Action

• Internal HSE Audit • Key Performance Indicator on HSE • HSE Inspection • HSE Committee • HSE Statistics • Incident Investigation • Management of First Aid • Evaluation of

Compliance to legal & other requirements • Corrective & Preventive action

Planning

• Project HSE Plan • Job Hazard Analysis • HSE Objectives

HSE OBJECTIVE

CUSTOMER /REQUIREMENTS /CUSTOMER /REQUIREMENTS /LEGAL/REQUIREMENTS /LEGAL/REQUIREMENTS

HSE Management system –Model

Salient features of HSE Management System Organisational aspects relating to safety

Domestic Operations should be carried out thru Business unit Health, Safety and Environment Manager(BUHSEM). A BUHSEM will be monitoring and co-ordinate safety at various sites under the Business Unit. Overall monitoring and co-ordination of safety is done from headquarters. In major sites full time site safety co-ordinators are posted. In all other sites a site engineer is nominated as site safety co-ordinator.

Site Safety Plan (Refer ANNEXURE -1) A site safety plan is prepared as soon as a new job is received. It contains following broad parameters of safety management at site.

Safety Committee As soon as a site starts its operation, a safety committee is formed. Project Manager is the chairman, section heads are members and safety engineer is secretary of the committee. The committee discusses and decides on matters related to promoting safety at site and ensures implementation of corrective and preventive measures. Safety committee meeting is held at least once in a month. Frequency can be increased depending on site need.

Screening and Induction of workmen All new workmen are to be screened (i.e., Medical Test, Physical Ability Test) before they are put on the job. His fitness and previous experience is verified to find his suitability for a particular job. He is put on trial for few days. If the site engineer is satisfied then he can put on the required job. Safety engineer gives safety induction to the new workmen including knowledge on common hazards and relevant precautionary measures(i.e., Showing the Basic E-Package which cover basic construction safety). This ensures right man for right job and

safe working.

Pep Talk Pep Talks should be conducted regularly. Depending on the requirement it may be conducted daily. Before commencing any job the workmen are made aware of potential hazards involved in the job through pep talks. Work method and various safety precautions are explained to them. This cautions them on the associated risk and prepares them to take adequate precautions. Site engineers and safety engineers conduct pep talks.

Job Hazard Analysis Site engineers in consultation with safety engineer prepare the job safety analysis. Critical jobs with hazards & risks are identified. Such jobs are broken down into various steps. Risk/ Hazard involved in each step is identified and appropriate precautionary measures are integrated. Job safety analysis is circulated to all concerned for implementation. This helps in foreseeing risks and hazards involved in a job and taking precautionary measures for doing it safely.

Internal Safety Audit Trained internal auditors conduct internal Safety Audits at site. A site is audited at least once in six months. Any nonconformity found during Audit is brought to the notice of the site and discussed with responsible person. The Nonconformity is immediately attended to. This helps in ensuring effectiveness of safety management system.

Training Training is important aspect of safety management function. Training needs of staff are identified and Training calendar is prepared. Following training programmes are conducted regularly as per the training calendar.

➤ Safety while working at height. ➤ Safety in civil work. ➤ Safe erection methods and Rigging practices. ➤ Safety in operation of Plant & Machinery. ➤ Safety in Gas cutting and welding operations. ➤ Safety in Scaffolding. ➤ Prevention and Control of Fires. ➤ First Aid. ➤ Electrical Safety. ➤ Safety management & up-gradation of safety systems.

Safety Walk down General Site Safety Inspection is carried out weekly through safety walk down by Site Engineers & Safety Engineers Observations are documented and attended by the

concerned person.

Safety inspection All Equipment, Plant & Machinery, Vehicles, Tools, Tackles, Electrical Installations, Work areas, Scaffolds are to be inspected periodically as per standard guideline/ checklists. Compliance with site Safety rules is checked during inspection. Corrective & Preventive actions are promptly taken on points observed during inspection. Safety engineer carries out these inspections along with concerned site engineer & plant & machinery engineer. Inspections carried out at sites include

➤ General Safety Inspection. ➤ Electrical Safety Inspection. ➤ Inspection of Plant & Machinery including Vehicle. ➤ Inspection of lifting tools and tackles. ➤ Scaffold inspection. ➤ Canteen ➤ Labour and staff Quarter inspection ➤ Housekeeping inspection ➤ Office inspection ➤ ELCB inspection.

Personal Protective Equipment (PPE) Workmen are provided with required PPEs. All PPEs conform to National/ International Standards. PPEs are purchased only from approved vendors. All PPEs are inspected after receipt at site and before use. Safety engineers monitor PPE implementation.

Work permit System The work permit systems are designed and intended to specify adequate safety measures in advance against identified hazards and stipulate implementation of the said safety measures by the permittee to ensure safe execution of work in the designated workplace. The following work permit systems are used.

➤ Working in confined space. ➤ Carrying out hot work in specified location. ➤ Giving clearance for excavation work. ➤ Carrying out Industrial Radiography. ➤ Working on overhead traction line. ➤ Working on P & M and other power driven equipment. ➤ Carrying out electrical work (HT/LT) ➤ Removal of covers from manholes/ openings.

Fire Prevention Fire extinguishers are to be provided at required locations at site. Safety Engineer familiarises site personal with the basic fire fighting techniques and handling of portable fire fighting equipment. He carries out live demonstration on simulated fires. Fire extinguishers are regularly maintained.

Management of First Aid First aid boxes are provided at convenient locations under the charge of a trained staff. First aid treatment is given to injured person. If required the injured person is shifted to hospital after the first-aid at site.

Safety Campaign, Competition & Motivation

January should be celebrated as Safety Month every year at all jobsites in India and abroad. Various competitions in safety like essay competition, poster competition, quiz competition, skit competition, speech competition, song competition etc., are organised and prizes are distributed.

Accident/ dangerous occurrence reporting/ investigation and analysis

All Incidents, Near miss, dangerous occurrences are reported, investigated & analysed. Safety Engineer conducts investigation and reports his findings to site Incharge, BUHSEM and concerned department at jobsite and suggests corrective & preventive measures. Corrective and preventive actions are taken to avoid similar accidents in future.

Safety performance monitoring and measurement

Safety performance of sites is measured both monthly as well as annually. BUHSEM compiles monthly sites Safety Statistics of all sites of his Business unit and prepares a monthly Business unit Safety Report and sends the same to the Head of Safety Engineering Department at Head Quarters. Safety Engineering Department at Head Quarters, Safety statistics of company as a whole is compiled

at HQ and reported to the management.

Safety Budget

Provision is made for safety in the cost estimate while submitting the tender and this is included in the budget for site operations. This help in providing adequate financial support for safety Management at site.

Initiative on Training

Deployment of trained and skilled workers will ensure safe working at site. Based on this conviction, an initiative has to be taken for training of construction workers. Some of these initiatives are as follows.

Construction Skill developing centre:

The company should take the initiative in developing the construction Skills Training Institute for training workers in construction related trades. The training module should be developed and imparted to construction worker on different trade as follows (i.e., Masonry, Formwork/ Carpentry, Bar Bending & Steel Fixing, Plumbing & Sanitary works and tilling Masonry). These initiatives will be helping to provide trained and skilled workmen to construction industry.

Conclusion

Safety performance should be evaluation factor in the tendering process and is an important parameter for determining the award of contract. In addition safety performance of a company is a reflection of its social and welfare objectives. The above HSE management model can improve the safety performance of any construction company. The implementation of the above model will yield high value of the returns – both fiscal and social far exceed the investments on safety.

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