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SAFETY MANAGEMENT AND AUDITING IN CONSTRUCTION INDUSTRY

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Abstract: Construction by its very nature presents numerous hazards and is considered as high accident-prone industry. Accident statistics detail in India is not available. It is estimated that more than 10 million workers receive injuries in the course of one year throughout the world. The work will give a brief concept of safety and safety aspects. For the formulation of this report a detailed study of safety and its importance in construction industry is done. Moreover, the various causes of accidents and their impacts have been studied. The safety audit of a construction project is done and their findings and recommendations have been listed to find out the key safety issues of the site thereby helping the management to provide proper safety measures. A questionnaire survey was done to find out the safety practices followed in the construction sites. Summary based on the data is made and recommendations are given

Keywords: Safety, Audit

I. INTRODUCTION

Construction industry is associated with many problems. One of the major issues is safety. Construction industry is associated with lot of safety issues. It has been one of the worst sector for workers as safety is concerned. Lots of accidents due to poor safety measures are being happened every year. It is estimated that more than 10 million construction workers receive injuries in the course of one year throughout the world

It is said that “accidents do not happen, but they are caused”. Most accidents can be prevented. Various measures are available to improve job-site safety in construction. An effective safety program may prevent many accidents on construction sites. Unfortunately safety is often neglected on construction sites and rarely managed even though the issue is supported by everyone. People feel that safety management is a costly process and requires lot of time to make it effective. This results in neglecting safety in construction. It is the duty of construction engineers to make aware of the importance of safety.

Safety auditing is a method of inspecting the site and finding the safety measures taken and recommendation and changes to be done is analyzed subsequently. Safety auditing is used to find the effectiveness of safety measures taken in the site. Safety audit gives an overlook of the site safety and whether the desired standard of the company is achieved. Results obtained from safety auditing helps the firm to evaluate their performance and plan for future changes.

II. LITERATURE REVIEW

The construction industry is notorious for its poor safety record when compared with other industries. Kartam (1997) found major causes of accidents have been identified, and can be directly attributed to unsafe design and site practices. Said accidents arise from different causes that can generally be classified as physical incidents posing hazardous situations, and behavioral incidents caused by unsafe acts.

Cooke and Williams (1998) said construction process itself is also seen as being poorly planned in terms of both design and construction, with major inadequacies relating to the erection, maintenance, and demolition of buildings and structures. According to Mohammed (2002) an underlying belief is that the majority of accidents arenot caused by careless workers but by failure in control, whichultimately is the responsibility of management.Toole (2002)explicitly state that the responsibility for site safety rests with the general contractor and do not mention the roles, however small, that designers and owners, or subcontractors could or should assume regarding safety

Tariq (2000) said construction work is hazardous work. The National Council reports that in 1996 alone, 1,000 construction workers lost their lives at work and another 350,000 received disabling injuries. Construction accounted

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for only 5% of the United States' workforce but claimed a disproportionate 20% of all occupational fatalities and 9% of all disabling occupational injuries

Grubb and Swanson (1999) said, unfortunately the construction industry continues to rely heavily on traditional measures such as accident and workers compensation statistics. This implies that the issue of measuring the safety climate in construction is in its infancy and needs to be addressed. He also noted, there is virtually no research examining work organizational factors such as the safety climate in construction. This problem lead to increase in the accident and safety issues every year and labors suffer from these as they are the prime victim of these types of safety issues.

III. OBJECTIVE

The objective of this study was to find out the safety practices followed in Indian sites and to ascertain whether safety practices are followed and the attitude of the management and labours towards it. Study was done to determine Safety aspects in construction industry by detailed literature review.

The causes of accidents and their impact on the managements and labours. Safety management practices to be done at site. Safety practices followed in one or more construction company by visiting the company.Safety practices followed in various construction companies by conducting questionnaire survey.Conducting a detailed safety audit at one site along with the safety officer of the site. Give recommendation for improving safety at construction sites by reviewing and analyzing the result obtained from safety audit and questionnaire survey.

IV. METHODOLOGY

The methodology followed in the formulation of this report is by first preparing a detailed literature review featuring the safety aspects in India and the attitude of the management and labours towards it. Accidents and their causes were studied and the safety management practice usually done at site was studied.

Safety practices followed in one of the large construction company in Tirur was studied by conducting a safety audit at site along with the safety officer of the site. A questionnaire survey was conducted in various construction companies in and around Tirur and the result was analyzed and recommendations to be followed were formulated.

V. SAFETY MANAGEMENT

There are several ways for safety management in sites. They are awareness among labours, providing safety equipment's etc. Khitoliya (1994) formulated some techniques. They are discussed in detail below

Safety Program:

Safety program which is done in an effective manner prevent many accidents on construction sites on a large scale. Many companies give safety good priority during meetings, while in reality they give less importance for safety and allocate only fewer amounts for safety measures. Through implementation of an effective safety program many accidents and unwanted condition can be avoided. Accidents and unsafe condition give an actual picture of the effectiveness of the management policy. Safety must be given equal importance as that of the other policies of the company.

Education and training:

Safety education given for the employees and others concerned is an important way for safety management. Education and training involves generating a positive attitude towards safety and developing proper policies. Top and middle management require education in the fundamentals of safety and the need for an effective accident prevention program. The cost of accidents, both direct and indirect costs, must be taken in concern and given equal importance. The management has to provide facilities to give proper training to the supervisor and engineers and the type of training should be suitable to each classes.

The supervisors must understand their responsibility towards safety and the need to implement it. Employees on the other hand should understand their responsibility of obeying safety rules and the need to obeying it. Periodic safety meeting conducted at site should relate to topics such as how to prevent accidents, accident causes, and importance of

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good housekeeping, handling material safety, first aid, machine hazards, fire prevention and use of personal protective equipment.

Safety signs and signals:

Safety signs and symbols are to deploy in the site at suitable places. The purpose of displaying signs and symbols is to draw attention rapidly to objects and situations affecting safety and health.

They should not replace the need for proper accident prevention measures.

Safety handbook:

Employees are given a safety handbook when they are first appointed to site. This ensures that each employees know the safety rules to be taken in the site, their needs, consequences of not following it etc.

it should be given to every employee working in the site whether permanent or temporary.

Posters:

Posters showing the safety signs, safety quotes and rules should be displayed in the site so that it creates awareness among the employees about safety.

These posters should be displayed in local languages so that labours can understand what the hazard behind each activity is or what accident can meet with.

Films:

Films and video shows relating to safety in construction industry should be arranged particularly in Indian condition as most of the Indian workers are illiterate.
This will have a good impact on safety awareness between the labours.

Publications

Some publication specializing in safety and health are suitable for wide circulation to the staff members, while others are suitable for reference.

Personal protective equipment (PPE)

Personal protective equipment's are equipment or clothing that is worn or held by a worker that protect them from one or more risks to their safety or health. It should be given the last priority in safety. This should be the last method adopted by the organization to avoid unwanted incidents or injuries.

When the hazard has been largely,but not totally,eliminated,personal protective equipment may still be required for emergencies and as a last line of defense.Sometimes the need of PPE is obvious and readily accepted.PPE should be designed in such a way to suit climate conditions so that they do not cause discomfort.Everything possible should be done to awaken and maintain the interest of employees in the use of this equipment's.

The use of PPE will depend on the level and type of risk.Still an awareness should be created among the labours that "they are ask to wear these equipment's because it's not a rule but for their own safety"

VI. SAFETY PRACTICES AND AUDIT

The project was done from one of the leading construction company in Calicut. Safety practices followed there were studied and a safety audit was conducted to find out the safety measures taken in the site.

Accident analysis report
Accident analysis was done in the site to find out the no and type of accident in the site during the last one year

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January 21 to December 21

month	First aid	Minor	major	total
January	2	4	1	7
February	2	3	0	5
March	1	5	0	6
April	3	5	0	8
May	2	4	0	6
June	1	7	0	8
July	1	6	0	7
August	1	1	0	2
September	2	1	0	3
October	1	10	4	15
November	2	3	0	5
December	1	2	0	3
total	19	51	5	75

Activity	Total
Material handling	28
Electrical works	10
Reinforcement works	8
Fall down	8
Struck in between	7
Miscellaneous	14
Total	75

As a part of this work, safety practices followed in other companies were also studied. This was done by conducting questionnaire survey. A total of 15 contractors were contacted for the questionnaire survey which included both well-known contractors and small contractors.

Results of Questionnaire Survey

- All the contractors visited for the survey had safety department.
- Out of the 13 companies, 10 suggested very high priority should be given for safety, 2 suggested for high and 1 for medium priority.
- Safety audit was conducted at 12 companies and 1 company didn't conduct audit till date.
- All the companies conduct safety meeting at their site.
- 13 companies employed safety officers at their sites. All the 15 companies had safety supervisors and first aid box at their sites. 12 companies provided first aid room. Some companies didn't provide first aid room because of space constraints. But all necessary treatments were given for labours at sites.
- Only one company has not prepared the PPE list. But all necessary PPE's were made available for the workers
- 12 companies used checklist for the inspection purpose, some companies used both checklist and oral instructions. Only one company used other methods which involved their own standard practice of conducting walk about. Walk about is an activity conducted every week and the officials note down the work which are not in accordance with the standards and they check whether these works are rectified next week when they conduct walk about.
- There were only 2 fatal accidents took place. The number indicating temporary disability is 20. It doesn't mean that all the contacted 15 companies had one disability each. Some companies had 1; some had 3, and had 7 and so on.
- Only one respondent was not aware of the national safety day. He was not a safety officer and two companies didn't celebrate safety day till date.
- Most of the companies gave gifts and certificates for the best safety officer at site.

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Audit report:

Safety audit was done on duration of 2 months, February and March 2014. Safety officer of the site were accompanied during the audit purpose. The observations and findings were noted, observations regarding the unsafe acts in the site were formulated and a brief report is been formulated here.
Safety observations

ELECTRICAL SAFETY

Electrical safety is a key issue in this site. Many harmfull incidents were seen in the site which may lead to serious injury and fatality. Grounding of the electrical appliances were not good and has to be done immediately. Distribution boards were maintained in a good manner. In many places wires were inserted into the sockets which are dangerous. Some areas earth leakage circuit breakers (ELCB) were not provided. Workers are using PPE's but in some areas they were not using it properly. Overall electrical safety has to be increased

WELDING

Workers were using necessary PPE's. Some workers were not using eye shields which have to be taken care. Separate areas for welding have to be provided. Overall welding safety is satisfactory.

CHEMICAL STORAGE

Chemicals were provided separate storage and were blocked from public to access, this is appreciable. Storagearea was well maintained.

FIRE FIGHTING EQUIPMENTS

Firefightingequipment used in the site is of good standard. They were well maintained and usage methods were written. Equipment's whether in working condition were not tested and this is a serious issue and has to be done.

LIFTS AND CRANES

4 lifts were provided in the site for material movements. Lifts were provided with barricades but was not satisfactory and should be modified. Safe load carrying capacity is not mentioned and has to be done and followed. Cranes is been used in the site and proper measures has been taken to avoid accidents.

EDGE PROTECTION AND BARRICADINGS

Edge protection is being done with nets and is well maintained. Along with it pipes has to be tied along the edges for assuring safety. Openings were provided with pipe barricading and is appreciable. Some places ropes were used which has to be changed to pipes

MACHINARIES

All machineries should be earthed and safety barricading with steel mesh has to be provided which is not provided in many areas. Operation of machineries should be done under the strict supervision.

PERSONAL PROTECTIVE EQUIPMENTS

PPE's were given to the labours and most of them were using it. Safety helmets are provided for every person entering the site. This is appreciable. Some areas workers were not using safety belts which have to be taken care. Areas like welding electrical works has to be taken key care.

FIRST AID

First aid room was kept well. Medicines and other equipment's were provided. First aider is provided and a doctor was visiting the site twice a week. This is appreciable. Overall first aid is satisfactory.

SITE ENTRY

Entry to the site was well maintained. Security officers were deployed at the entry and access will be granted only to authorized persons. Safety helmets were provided here to all persons entering site and is satisfactory.
Recommendations to be done in the site

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Safety observations and auditing done above was analyzed and recommendations to be done as per the regulation are listed below.

- As most of the accidents are due to material handling and falling of objects safety helmets should be strictly worn by all persons and it should be done at the site entry were only authorized persons with safety helmets should be allowed to enter the site.
- Separate path should be provided for the vehicles entering the site and its speed should not exceed 10 km/h.
- Fix adequate sign board with blinkers near the work spot to warn the driver
- Hard barricade should be provided for all the openings, unprotected edges and on the sides of the vehicle path.
- Provide trolleys for storage and transportation of cylinder, supervision, adequate training
- Lifting web slings should be changed. All lifting's, gears and equipment's should be checked properly and mark with current colour code, safe working load.
- The scaffolds are to be kept in proper conditions and have to be checked regularly.
- Proper fuse should be taken for supply and electrical supply should be through ELCB.
- Proper earthing should be given for equipment's.
- Proper training and awareness should be provided to the workers, staff on the safety rules and the importance of safety.
- Giving penalty for not obeying safety rule

VII. SUMMARY AND CONCLUSION

Safety in the construction industry is an important factor and is an inevitable part. Safety is almost completely neglected in the Indian construction industry which in turn leads to large number of accidents ranging from minor injury to death. Accidents causes huge amount of loss to both the management and the labours. Companies spent huge amount of money as compensation for the injured persons which leads to increase in expense. So safety is a key issue and has to be taken important.

In the case of the company analyzed main safety problems can be listed as follows

1. Improper barricading and edge protection.
2. Careless use of electrical equipment's and associated parts leading to electric shocks
3. Improper storage of materials leading to falls and accidents.
4. Vehicles moving speedily causing accidents.
5. Labours are giving less importance to PPE's.
6. Lack of proper safety supervision.

These unsafe acts have to be properly analyzed and solutions to avoid this have to be done and the initiative should be done by the management.

The main activities leading to accidents in the site are material handling, electrical works and reinforcement works. Proper care should be taken while these activities are being done so that most of the accidents can be avoided.

Safe construction can only be done with the proper cooperation of management and labours and they should be made aware of the importance of safety for their and others wellbeing. When the data collected from questionnaire survey was analyzed it was seen that most of the companies give importance to safety but when coming to reality it is being reduced to first aid room and use of PPE's which has to be changed.

After thorough study of safety and safety aspects some recommendation to be done for improving safety at site is listed below

- Safety aspects should be mentioned in contract agreements.
- A particular percentage of the budget should be allocated for safety.
- Workers should be given adequate training in safety; continuous awareness regarding safety matters because most labours are illiterate.
- Film show on safety will give a good impact to the labours .
- Safety should be every body's responsibilities; it should not be like that safety officials will look after safety matters

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