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Safety Management and Accident Prevention

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Abstract: *Construction activities have made a great breakthrough in the last two decades on the back of an increase in development activities, and public demand. Still, occupational health and safety issues have become a major concern to construction organizations. The world society and economy have suffered financial and human losses as a result of poor safety management in the construction industry. The impact is however more in developing countries. The purpose of this study is to explore major safety provisions and also a detailed study has been conducted on safety management procedures in construction sites. Different types of accidents occurring in construction sites and measures taken to control these accidents are also analyzed in this paper. Data have been collected through various site visits, literature reviews, and from various construction safety standards including BIS and OSHA (Occupational Safety and Health Administration). The paper has been concluded after putting forward a set of recommendations for construction organizations to improve occupational safety in the construction sites.*

Keywords: *Safety, Construction and Infrastructure Management, safety standards, Accidents*

I. INTRODUCTION

Accidents as an unplanned and unexpected occurrence, which upsets a planned sequence of work; are resulting in loss of production, injury to personnel, damage to plant and equipment and eventually interrupting production flow. Control measures as an act of limiting or making something happen in a particular way, stop something from spreading, going out of hand, or getting worse. Identify safety in construction as the process or way of protecting the health and life of those who build, operate, maintain and demolish engineering works; and others affected by those works. The construction industry a deadly working place. Accidents on building sites are inevitable but could be controlled to prevent minor or serious consequences on the workers. Thus, control measures of accidents to ensure the safety of workers and minimize accident-related waste on sites are essential. Hence, the ultimate aim of this research is to minimize accidents' occurrence on sites. The specific objectives are to identify types of accidents on sites and their control measures, to identify accident prevention methodologies, to examine the frequency of usage of control measures on sites, and to most accidents can be prevented by taking simple measures or adopting proper working procedures. If we work carefully and take appropriate safety measures, there will be fewer work injury cases, and our sites will become a safe and secure place to work in. The occupational safety and health ordinance, which came into operation on 23 May 1997, cover most workplaces to protect the safety and health of employees at work. Other legislation applicable to construction sites includes the factories and industrial undertakings ordinance and its subsidiary legislation, particularly the construction sites (safety) regulations.

The construction industry is highly hazardous and comprises a wide variety of activities. By implication, it also attracts a range of employees who have different levels of skills. Fostering a sustainable safety culture, however, is a company-wide effort that requires commitment and participation from the chief executive to project managers, superintendents, foremen, and individual workers on the job site and that commitment should extend to the selection of subcontractors who also embrace a strong safety mindset and work ethic.

II. LITERATURE REVIEW

A. *Massey, A. & Walford, G. 1998. describes the safety Beliefs, Values and Attitudes*

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. Massey & Walford, 6 describes the safety beliefs, values, and attitudes that are shared by the majority of people in an organization or workplace ("the way we do things around here") Project planners should also work with their insurers to determine the most effective risk management strategies before a project begins and while it's being built. A safety culture can only be built through management commitment and involvement right from the boardroom to the lowest level of employees. A poor culture encourages an atmosphere where not complying with safe working practices is acceptable, and it doesn't help the organization to take effective action to solve health and safety problems. Quite often, organizations that have a poor safety culture can have the same underlying attitude to all processes and procedures. This can result in poor product quality and financial control as well as poor health and safety.

B. Barling, J., Loughlin, C., and Kelloway, K.K. (2002). *Development and test of a model linking transformational leadership and occupational safety.*

Specific empirical studies conducted by Barling, Loughlin 3 and Kelloway 3, Zohar 9, Kelloway 2, Mullen and Francis 10 illustrate the significant impact of safety-specific transformational leadership on 56 Industrial Engineering and Operations Management Conference, Detroit, Michigan, 23- 25 September 2016 safety-related events and workplace injuries. It emerged from these studies that the safety climate facilitates the relationship between transformational leadership and occupational safety. This translates into the manager’s behavior and leadership style towards employees and how it enables a safe working environment.

C. Winkler, C. (2003), *CIRIA: Designing for Health and Safety, Wrexham, June 2003, p3.*

Winkler (2003), in a report to Construction Productivity Network, pointed out that over 12 years between 1990 to 2001, the HSE statistics showed that the construction industry has made improvements regarding the number of fatalities, decreasing from over 150 in 1990 to just over 100 in 2001, with a low of 65 in 1999. Despite the overall fatalities figure reduction from 1990 to 2001, the number remains significantly high. For instance, accidents by fall, whilst not the largest single cause of death, are a significant cause of mortality on sites (CIRIA2003).

D. Davies, V.J and Tomasin, K (1996), *Construction Safety Handbook, 2nd Edition, Thomas Telford Publishing, London.*

Moreover, while there has, reportedly, been some improvement in site safety in recent years, Davies and Tomasin (1996) suggested that statistics are unreliable due to under-reporting and that the number of fatalities in the construction industry is only the tip of the iceberg. There are thousands of major injuries each year and even more minor injuries, which result in absence from work on more than three consecutive working days, which go unreported. The Health and Safety Executive recognizes that only a fraction of non-fatal injuries are reported each year. Despite this apparent improvement, it is clear that the injury rate for the construction industry is still at an unacceptably high level.

E. Nutt, B. McLennan, P., and Walters, R (1998), *Refurbishing Occupied Buildings: Management risk under the CDM Regulations. Thomas Telford, London.*

Accidents on construction sites are a major cause of avoidable ill-health; injury and death DOH (1993). Nutt et al (1998) suggest that 20% of reported construction accidents could be attributed to poor site logistics. Every week, more than one person is severely injured or dies of an accident cause CIRIA (2003). Accidents on sites are one of the most important factors in health service utilization (DOH 1993). Efforts to improve Health and Safety on site have been of primary importance in an industry that continues to kill and maim its people every week.

III. METHODOLOGY

The safety program of a Construction organization is a compact package that comprises a safety policy, a safety department to implement the policy, and specially trained personnel to man it. The general safety inspection program that has to be followed in the Construction site is shown in figure 1.

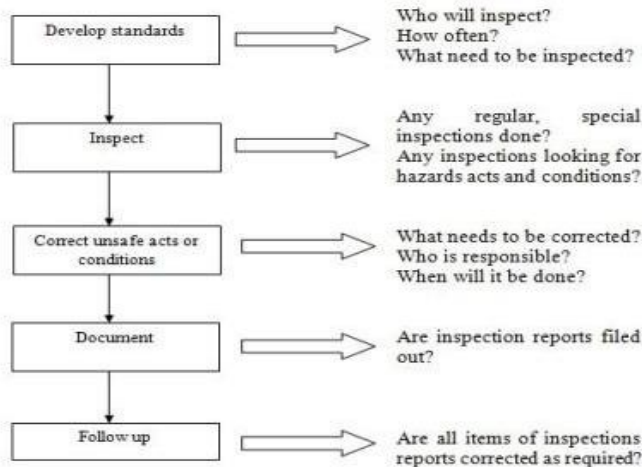


Fig 1 General Safety Inspection Program

A. Safety Policy

To implement safety practices at the construction site, the company provides safety and health policy for all key players in compliance with the occupational safety and health act 1994. The policy of the company is to conduct its operation in a manner that will ensure the reasonable practice of safety, health, and welfare at work for the employees. In addition, it also ensures that the prevention of risk to employees and property comply fully with all relevant laws and regulations.

B. Education And Training

The company always emphasizes the significance of safety and health on construction sites. One of the ways to inculcate a safety culture among the key players is by educating them through training courses. The company will ensure that all new workers will attend the induction training that is provided weekly. All new workers will be given an introduction to safety and health matter during the induction training. The safety officer will show them the safety symbol signage that is typically used at the construction site. The workers are reminded of the safety measures that have to be practiced while performing the tasks.

C. Site Safety Inspection

A site safety inspection is a compulsory practice that needs to be conducted to ensure the safety practices at the construction site are running smoothly. Based on the interviewee's opinion, the majority of the safety officers at the construction site will conduct safety inspections but the effectiveness of the safety inspection has always been questioned. For this project, the safety officer will conduct a weekly safety inspection by having a site safety walk. During the safety inspection session, the safety officer will strictly take immediate action for workers who fail to comply with the safety regulations. Furthermore, the safety officer will fill in the checklist which includes with score system to indicate the level of safety implementing at the construction site.

D. Safety Auditing

The company conducts safety auditing twice a year. Normally, it will be carried out by the International Organization of Standardization's representatives. It includes safety inspections, an inspection of documents, and interviewing the safety officer in charge. Safety auditing is important to measure the level of safety at the construction site. After the auditing session, the safety officer may discover the level of safety at the construction site whether it meets the safety standard requirement or not.

E. Site Safety Inspection

From the interviewee's point of view, site safety inspection is the most important practice that needs to be conducted regularly. The safety inspection will be held every Saturday by the safety officer and the safety manager. They will conduct a "safety tour" where all safety officers and safety managers will walk around the construction site and inspect the works done by all workers. The safety committee will bring a safety checklist together with them and if any workers did not comply with the safety requirements, the safety committee will take note of it. In addition to that, the safety officer will check the air compressor, scaffold, welding set, vehicle, and excavation support to ensure that these machines are in a good condition.

F. Safety Meeting

To manage the safety matters at a construction site, this company provides monthly safety meetings. This meeting is compulsory for all the key players such as the main contractor, sub-contractor, engineer, quantity surveyor, architect, and safety committee to attend. The meeting will be led by the representative of the safety committee. During the safety meeting, they will discuss the current issues regarding safety matters such as current accident statistics, recent accident cases, the implementation of safety practices at construction sites, etc.

IV. CONCLUSION

- A. Laborers happen to be the main class of workers that are responsible for accidents on construction sites and are also the major victims of construction site accidents.
- B. Negligence was the major cause of accidents on construction sites. The main effect of accidents on construction sites is the loss of time in project execution. To ensure a safe and accident-free construction site, management must understand, undertake and implement all or some of the following measures which are regular supervision and inspection by safety officials and leaders on-site, constant training on the use of tools and equipment, proper use of safety items and attire, signs and notices should be provided on construction sites and should be located at strategic areas on-site, training programs should be provided regularly

which should include how to handle tools, equipment, and plants, how to understand and interpret signs and symbols, management must ensure safety policies are obeyed, plants, machinery and equipment's should be maintained regularly, a medical test should be carried on employees for drug use, alcohol intake and other and future purposes.

- C. The method for assessing the occupation safety at a construction site presented will allow for quick determination of the status of occupational safety. The result obtained will be presented on a scale of 1–10 and will provide information for many of the participants of the investment process. Employees will know if the employer cares about employee's safety at the construction site, construction manager, because of their obligation to comply with the principles of OHS at the construction site will be able to check the degree of security, and employers will not have to worry about their employees' health and lives.
- D. The state of safety measures in the construction sector has improved in recent years, however, we should be aware that not all accidents on construction sites are reported, due to the fear of the consequences (financial penalties). The presented methodology of evaluation of safety on construction sites will allow for easy analysis of the safety of works to be carried out, which in turn should prevent accidents in the industry.
- E. Informing participants of the investment process and of the importance of maintaining occupational safety on construction sites, may in a few years, cause the assessment of construction site safety concerning previous contracts carried out by the subcontractor to emerge as an important criterion in the tendering process.
- F. From the study, site visits, questionnaire survey, and discussion with project managers we arrived at the following conclusions.
 - 1) Workers were found untrained, unskilled, and uninformed about safety measures and equipment to be used.
 - 2) Workers were found unaware of the type of accidents.
 - 3) Workers were found to be careless with the use of safety equipment.
 - 4) Employers were found giving less priority to safety and safety management.
 - 5) Employers hesitate to invest an extra amount of money for safety equipment.
 - 6) Programmes of safety training and safety awareness were not found to be conducted.
 - 7) Equipment to a proper extent was not provided.
 - 8) Provision for safety awards and safety supervisors were not found.
 - 9) There are fewer safety regulations and those present were also not found to be implemented at the site.

Workers were found unaware of the labor act. With increasing construction works the accidents have increased a lot. We recommend the following for the safety of workers:

- a) Safety training should be given to workers.
- b) They should be made aware of types of accidents and should be informed about the use of equipment.
- c) Safety equipment should be provided to a proper extent.
- d) Safety supervisors should be provided.
- e) Workers should be psychologically motivated to reduce carelessness in using the equipment.
- f) Provision for safety awards should be made to encourage the workers.
- g) Major priority should be given to safety in a project.
- h) Regulations and laws should be strictly implemented.
- i) Extra amount of money should be allocated for the safety equipment to prevent a huge loss in the future.
- j) All the individuals related to construction should be aware of Labour Act.
- k) Greater attention should be given to the design and selection of tools, equipment, and materials. Safety, rather than price, should be the paramount consideration

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