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Effective Implementation of Safety Management for Construction of a Building

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ABSTRACT: Buildings are built for function, utility, convenience, profit, commercialization, economy and the hierarchy of motivation depending on the owner or developer. Safety has not been generally considered a critical factor. But in construction of buildings, the cost in terms of human life in a natural disaster or man-made accident will be so high that life safety must become the most important consideration, starting from the initial concept stage. Living and working at height are unavoidable in modern urban environment. This topic includes strategies implemented for ensuring safety management of workers under working conditions. Accidents cause pain and suffering to victims and anxiety to their families. In order to prevent accidents to persons and property, total involvement by all levels of management, as well as each individual is necessary. This paper constitutes descriptions explaining systematic methods/procedures and assigning responsibilities for reducing the risk of personal injury, death or property damage. The provisions of safety program are well within requirements set forth by local, state and federal regulations, as well as standard industrial practices. This study is intended to increase the level of employees awareness concerning potential workplace hazards and encourage safe work practices.

KEYWORDS: Natural Disaster, Safety Management, working conditions, safety program, etc.

I. INTRODUCTION

It is crystal clear that any enterprise cannot operate on its own. Even a contractor can neither build nor operate on itself. Therefore, it has to be manned by the people who form the backbone of the enterprise, and it is their candid performance on which the success of the whole enterprise depends. They are to be led and directed, they are to be motivated, their activities are to be coordinated. So the whole process of these integrated efforts is nothing but management. At the same time it is also important to minimize the risk of accident i.e. the safety of the men who are working for that enterprise. Therefore, there is the need for another branch of management i.e. safety managements which deals with the safety of the men working for that particular enterprise. Even various precautions taken there are always chances of mishaps to happen. Safety at all job sites does not just occur. A safe operation is one which is organized, clean and efficient. If all the employees view accidents in the same way as we consider all other aspects of the company operations, we will be in excellent position not only to control accidents but also to improve the total performance of our company. Therefore it is of utmost importance that all aspects of our safety management be strictly enforced and followed. Even though it is difficult to obtain accurate data and statistics in an industry in which many accidents go undetected and unreported, those involving loss of working time, frequently exceed those in any other manufacturing industry. Contributing to the high rate of accidents are those characteristics of the industry which distinguish it from the rest of the manufacturing sector and these are:

1. Damage to plant and equipment.
2. The high proportion of small firms and of self-employed workers.
3. Loss of productive work time while debris is cleared and damaged work rebuilt.
4. The variety and comparatively short life of construction sites.
5. The high turnover of workers.
6. Loss of confidence and reputation.
7. The large numbers of seasonal and migrant workers, many of whom are unfamiliar with construction processes.

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8. Exposure to the weather.

1.1 Concept of Safety Management:

Safety is often considered an issue supported by everyone. Unfortunately, when it comes to spending money on safety, many people do not feel it is vital to the success of projects. Thus, it is not normally a cost code item, and it is subject to cutbacks if budgetary constraints develop. This stems from the failure of many to recognize that an effective safety program can reduce job accidents and directly or indirectly reduce project costs. Identifying the appropriate means of achieving or maintaining acceptable safety performance measures

1. Cost of lost time of injured employee.
2. Cost of work stoppage of other employees from Curiosity, Sympathy, Providing assistance
3. Lost supervisory time assisting injured employee, Investigation of accident, Rearranging work crews because of lost employee, Hiring and training a new employee, preparing state accident reports and/or attending hearings before state officials.
4. Cost of time spent on the case by first-aid attendant and hospital department staff when not paid for by the insurance carrier.
5. Cost of damage to the machinery tools, or other property.

1.2 Scope of Study:

Safety during the construction of a project is largely influenced by decisions made during the planning and design process. Some design or construction plans are inherently difficult and dangerous to implement, whereas, other comparable plans may considerably reduce the possibility of accident. Beyond these design decisions, safety largely depends upon education and training, inspection and co-operation during construction. Educating workers and managers in proper procedures and hazards can have a direct impact on job site safety. This has made realized involvement of the large costs in construction injuries and illness provides a considerable motivation for awareness and education.

The project work will provide with detail study of activities at that are taking place at multi-storeyed construction site and will focus on the factors that are responsible for the accidents. The study will also help in finding out the performance of the management and workers which would be helpful in minimizing the accidents at the construction site.

II. LITERATURE REVIEW

In the developed as well as developing part of the world, construction industry is considered to be one of the most significant industries in terms of contributing to GDP and also in terms of its impact on health and safety of the working population. Construction industry is both economically and socially important. However, the construction industry, at the same time is also recognized to be the most hazardous industry. Although dramatic improvements have taken place in recent decades, the safety record in the construction industry continues to be one of the poorest. Studies shows that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures.

Charles J. Kibert and Richard J. Coble stated that many construction safety issues are closely connected to environmental problems. The consolidation of safety and environmental regulation at federal and state levels, either partially or totally would provide the construction industry with a single agency that would provide uniform and accurate guidance, avoid unnecessary duplication of guidance and information, and virtually eliminate conflicts that are currently caused by multiagency oversight. In addition to benefits to the industry, there are also significant cost savings that could be attained by the various levels of government involved in monitoring the construction industry by combining their various safety and environmental regulatory functions. Combining certain Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) functions would increase efficiency and provide a good model for the contemporary movement to reinvent government. The resulting consistency of regulation would decrease conflicting guidance from agencies that are regulating similar issues and, at the same time, increase the quality of worker safety and environmental protection. In addition to the regulation of hazardous material by both

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agencies, there are significant additional opportunities for consolidating operations and regulation of the construction industry.[1]

The Indian construction industry is of significant economic importance. It accounts for about 11% of gross domestic product and employs approximately 33 million people, making it second biggest industry of the country after agriculture. It is an essential contributor to infrastructural developments like: roads, dams, irrigation works, schools, houses, and hospitals. These construction works are the physical foundation on which development and improving standards of the country are established. The amount of money invested and jobs provided by the construction industry are larger than any other industry in India. About 50% of all expenditure incurred in five year plans is directly traced to the Indian construction industry. High-rise structures are also called “vertical cities”, having the potential to decongest urban sprawl. Indian cities are witnessing immense demographic expansion due to migration from surrounding villages, leading to urban sprawl, housing demand, rise in cost of land. Housing has developed into an economy generating industry. Given this demand, while high-rise residential structures have become a solution in the metropolitan cities, they remain eluded in tier II cities in India. Low-rise or mid-rise high-density dwelling types have developed in these cities. A study of Pune city’s housing needs, demands, market, and type of structures being built, reveal that tall buildings of 11 floors are being developed on the city’s urban fringe. Most of the high-rise projects remain as proposals. An investigation in this case study reveal that high rise structures are not preferred due to user perception of insecurity in case of fire and high cost of the building. The paper aims at studying the availability and use of fly ash in various proportions, which can be used in Indian high-rise residential buildings. The research paper indicates that fly ash concrete can be used to reduce the cost of construction and has the potential to minimize the damage caused due to high temperature.

In general there are several items which influence the safety performance that should be analyzed and specified in design and pre-construction stage in order to increase safety.

Sawacha, Naoum and Fong (1999) explained different variables that effect safety on construction sites. In their research the impacts of the historical, economical, technical, procedural, organizational and environmental subjects are recognized in terms of how these items are connected to the level of site safety. The results show that variables regarding the organization strategy are the most influential group of factors that has effects on safety performance in the United Kingdom construction industry.

In another study conducted by Evelyn, Florence and Adrian (2005), the results of a postal survey of contractors in Singapore discussed. The obtained results of this research showed that site accidents take place when there are insufficient company policies, unsafe procedures, poor attitudes of construction personnel, low efficiency in management commitment and inadequate safety knowledge and training of staff. The study recommended that project managers must pay more attention regarding the factors determined above to enhance safety performance on construction sites and alleviate the frequency of accidents.

From the above investigation, it can be understood that having the right policies in conjunction with safety management associated in design and pre-construction phase can greatly reduce accidents. One way that an owner should apply is to hire contractors who have proved a record of good safety performance. This factor should be considered during the processes of qualifying contractors for bidding work and ranking contractors for a contract award. A prospective contractor with an acceptable history of safety performance commitment is more likely to perform safely in the future than a contractor with a poor safety record. In the following section we will discuss on the main elements of improving safety in construction project.

Large building construction projects in Canada were studied to assess the degree that policies and practices of a company or project influence worker safety, as measured in terms of injury frequency. Results showed that company-level practices influence safety performance. Safety performances were better on projects of companies that employed a full-time company safety officer; those which exhibited stronger top-management support for safety; those which conducted safety meetings for supervisors; and those which monitored the safety performances of their supervisors. Lower injury rates were also noted on projects that employed a project safety officer; those on which specific job site safety tours were conducted; and those which included safety issues in regularly held coordination meetings. Better safety performances occurred on projects which employed more sophisticated scheduling methods. It was also noted that better safety results occurred when the owner or the owner's representative was included in coordination meetings. Job pressures, particularly those imposed by budgetary constraints, were found to adversely affect safety performance.[2]

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III. METHOD OF SAFETY MANAGEMENT FOR CONSTRUCTION OF A BUILDING

1. Safety policy
2. Objective and safety plan
3. Implement and operation
4. Checking and corrective action
5. Management review

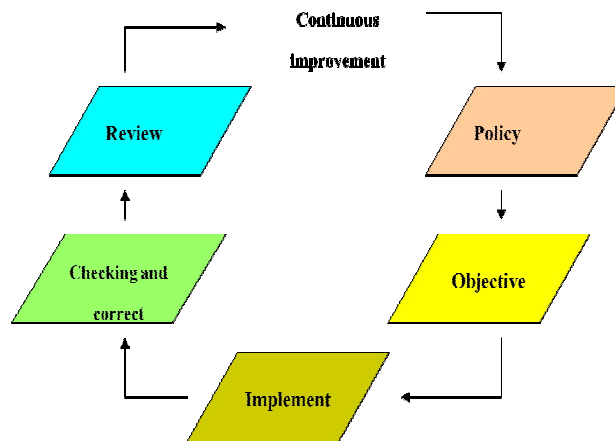


Chart -1: Flow chart of safety management principles

3.1 SAFETY CODES OF PRACTICES:

Ensuring life safety is the most essential aspect of all building codes. In India, the 2005 version of the National Building Code (NBC) is representing the present state of knowledge on various aspects of building construction, which is followed by all most all parts of the country. The NBC as a whole is the basic model code for all other codes in the country and by and large most of the states and local bodies in India have adopted many of the code provisions in their own building regulations. The Maharashtra Fire Prevention and Life Safety Rules, 2009, framed under the Maharashtra Fire Prevention and Life Safety Act, 2006, are mostly based on NBC Part 4. Adhering to the National Building Code of India, 2005, and as amended from time to time, failing which, it shall be treated as a violation of the said Act. It means that the onus of maintaining and documenting the fire safety installations in a building is the responsibility of the building owner or occupier.

3.2 Occupational health and safety management systems: (OHSAS 18001)

Requirements:

This Occupational Health and Safety Assessment Series (OHSAS) Standard specifies requirements for an occupational health and safety (OH&S) management system, to enable an organization to control its OH&S risks and improve its OH&S performance. It does not state specific OH&S performance criteria, nor does it give detailed specifications for the design of a management system.

This OHSAS Standard is applicable to any organization that wishes to:

- a) Establish an OH&S management system to eliminate or minimize risks to personnel and other interested parties who could be exposed to OH&S hazards associated with its activities;
- b) Implement, maintain and continually improve an OH&S management system;
- c) Assure itself of its conformity with its stated OH&S policy;
- d) Demonstrate conformity with this OHSAS Standard by:

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- 1) Making a self-determination and self-declaration, or
- 2) Seeking confirmation of its conformance by parties having an interest in the organization, such as customers, or
- 3) Seeking confirmation of its self-declaration by a party external to the organization, or
- 4) Seeking certification/registration of its OH&S management system by an external organization.

All the requirements in this OHSAS Standard are intended to be incorporated into any OH&S management system. The extent of the application will depend on such factors as the OH&S policy of the organization, the nature of its activities and the risks and complexity of its operations.

This OHSAS Standard is intended to address occupational health and safety, and is not intended to address other health and safety areas such as employee wellbeing/wellness programme, product safety, property damage or environmental impacts.

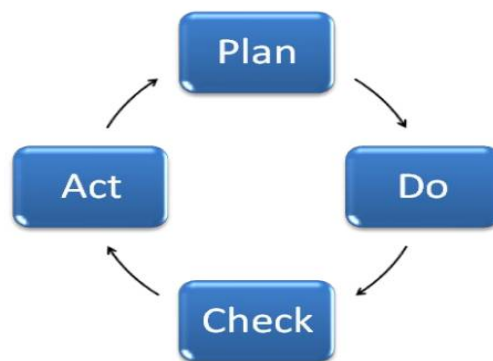


Fig – 1: Working principle of OHSAS 18001

3.3 WORKERS SAFETY AND HEALTH EDUCATION

Many of the construction projects neglect the safety and health of their worker. Workers safety and health education plays a very important role in managing construction site safety. There are various ways in which workers can be given education regarding safety practices at sites. One of the basic program regarding workers safety and health is that of training.

Training is one of the key ingredients of an effective safety program. It is generally accepted that occupant of safety in the construction projects via training plays a significant role in helping workers to avoid hazards and the resultant injuries. Worker orientation continues to be a very important aspect of construction safety. Worker orientation has been shown to be effective in reducing worker injuries, especially when the orientation is formal, when it is required of all workers, and when participants are examined or tested to evaluate the extent of comprehension of the training they have received. Training also extends to topics well beyond the orientation session, including training for supervisory and managerial personnel.

Workers' training is the key to the effectiveness of a company's safety and health program, and to the prevention of injuries and illnesses. The purpose of workers training is to provide instruction in safe work practices and rules, and to provide the skills and knowledge necessary to identify and control work-place hazards. Awareness of the physical or administrative consequences of ignoring safe practices will foster a healthy respect for company policy and procedures, as well as the hazards themselves. Training should be an ongoing process for all workers, including office workers and field personnel. It should address general safety and health issues, as well as specific procedures for working safely. Training can be conducted in a group sitting or on an individual basis. It can be performed in many ways such as:

- New-workers orientation.
- Supervisor training.
- Communication of company safety rules.
- Site-specific training.
- Training for non-routine tasks.
- Equipment and machinery training.
- Hazard-communication training.

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- Weekly toolbox talks.

Table -1: Safety factors for on-site Construction

Sr. No.	Working Conditions	Places where Safety is concerned
01	SAFE PLACES OF WORK	Access to workplace
		Scaffolding
		Working on Roofs
		Working over Water
		Excavations
		Hazardous atmospheres/ confined spaces
		Refurbishing contracts
		Temporary electrical supplies & lighting
		Noise
		Fire precautions
02	HAND TOOLS – safe use and handling	Storage
		Electrically operated tools
		Air operated tools
		Cartridge assisted tools
		Power saws
		Abrasive wheels
03	WORKING WITH PLANT	Goods hoists
		Small dumpers
		Cranes/slinging operation
		Excavators
		Compressors
		Rough terrain fork lifts
		Woodworking machinery
		Concrete mixers
04	WORKING NEAR EXISTING SERVICES	Overhead power lines
		Underground cables
05	DEMOLITION	--
06	ROADWORKS	Safety zones
		Advance signs
		Ahead signs
		Roadworks checklist
07	PERSONAL PROTECTIVE EQUIPMENT (PPE)	Hands
		Eyes
		Safety helmets
		Ear protection
		Respiratory protection
		Safety boots
		Working at height / working inside shaft
08	WELFARE FACILITIES	Drinking water
		Washing facilities
		Sanitary conveniences
		Shelter, clothing and taking meals
		Cooking
09	FIRST AID	First aiders

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		First aid equipment
		Emergency first aid treatment
10	HOUSEKEEPING	Logistics management
		Important locations of housekeeping
		General housekeeping & workmanship

IV. DISCUSSIONS AND SUGGESTIONS FOR CONSTRUCTION OF A BUILDING

Activities such as excavation, demolition, scaffolding, welding, etc are discuss and various suggestion are given in order to perform such activities in a safe and proper manner. An activity is considered as successful in all respect if it does not harm its operator. So following points are considered in regards to carrying safe working practices.

- i. While doing excavation complete information on the underground structures (such as water pipelines, sewers, gas mains, electrical conduit system and other facilities) is essential before doing the excavation work.
- ii. Shoring and timbering should be carried along with the opening of a trench. No person shall work in any excavation, shaft, or earthwork unless all timbering used therein are inspected by a competent person and also after explosives have been used in or near the excavation, shaft or earthwork. Inspection shall be carried out after heavy rain or storms to ensure safe working conditions.
- iii. Excavation areas shall be adequately lighted for night work. During the hours of darkness all public sidewalks and walkways shall be adequately illuminated and warning lights shall be placed in proper sites to ensure safety of pedestrians and the vehicular traffic.
- iv. Scaffolding shall be provided for all work that cannot be safely performed from the ground or from solid construction. Every scaffold and every part thereof including supports shall be of good construction, suitable and sound material and having adequate strength for the purpose for which it is used.
- v. Welding and cutting operations, wherever necessary, should be carried out with strict precautions and under proper supervision. All combustible materials lying around should be removed or covered with wet gunny bags, tin sheets, etc, as welding sparks can fly up to 10 m.
- vi. Cables should be supported so as not to create dangerous obstructions. Frames of arc-welding machines should be effectively earthed. Electrode holders should have adequate current carrying capacity and be adequately insulated to prevent shock, short-circuiting or flash overs. Circuit connections should be waterproof. Connections to welding terminals should be made at distribution boxes, socket outlets by bolted joints.
- vii. Electrical wiring in vehicle shall be fully insulated so as to prevent danger of short circuiting and at least two fire extinguishers shall be carried. No metal except approved metal truck bodies shall be allowed to come in contact with cases of explosives

V. CONCLUSION

Construction industry is considered as the back bone of the country. Its contribution in the development of the country is very crucial, since it is the second largest sector employing the workers next to the agricultural sector, but in terms of accident it is the close to the road accidents. This does not result only in loss of life and property and slow down of the work, but also create a feeling of fearness amongst its operators (management, supervisors, workers, etc).

1. It is necessary to provide a safe working platform for the operators of the construction project to work without the fear of any incident.
2. Health and safety management at the construction project site of High rise Building can be studied by performing an investigation at the work place.
3. For this it is necessary to form an investigation team at the project site which comprises of project officials, safety officer, engineer, site supervisor and workers association members.
4. Every individual worker should look towards the safety of themselves and the fellow workers for this reason they are required to perform their duties and responsibilities in a safe manner.
5. Various laws related to safety of workers are to be implemented at the project site to study the performance of the management towards the safety performance.

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6. Health and Safety education programs such as training, workshops, mock drills, etc related to various activities should be carried out for the existing or newly appointed workers.
7. Also safety related camps should be organized at the project site to make workers aware of various happening at the workplace.

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