



# **iJRASET**

International Journal For Research in  
Applied Science and Engineering Technology



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# **INTERNATIONAL JOURNAL FOR RESEARCH**

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

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**Volume: 4**

**Issue: IX**

**Month of publication: September 2016**

**DOI:**

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# **Effective Use of Safety and Emergency Management Model on Construction Sites**

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*Abstract - The largest employees in India after agriculture is in the construction industry and there is a very fast development in construction industry. In construction industry, during working the safety of a human life is very important rather than anything else. In construction sector the lot of crowd is comes or connected from rural area, so there is a lack of knowledge regarding the safety and regarding the training and these are two main factors which are cause for the accidents. Accidents in construction sites are unplanned incidences involving movement of persons, objects or materials which are result in injuries, damages and losses to properties or people and to reduce these proper safety and emergency management is needed in construction industry. This study helping to develop a new guideline model named SMEM. For this the data is collected by visiting the number of sites and by preparing the questionnaire. A questionnaire survey was conducted on large Construction by visiting the number of sites and the collected data was analysed to rank the safety performance and to develop a new model.*

**Keywords:** Safety management, Emergency management, Accidents, SMEM.

## **I. INTRODUCTION**

In India, construction industry is a very rapid growing industry and the Construction job is dangerous job in safety views. The number of fatalities occurring from construction work in the industry is quite disturbing and the knowledge regarding the work even the training or the safety during the work are the major causes for serious accidents. The construction industry is risky for its employees and the number of injuries and fatalities is high. Over 3.5 crore people are working in construction industry of India. Even all over the world the safety of workers during work is the matter of worry. In India also this is a major issue. As per international labor organization (ILO), last year more than 1200 workers got injured and near about 350 workers died at construction site. During working on construction site human life and safety is most important. So systematic safety and emergency management is essential at construction site. For the safety management the proper care should be taken by the construction industry as well as, the government should take energetic contribution to complete this route. Construction accidents can be condensed just by identifying the root causes of accidents, which is possible by accident investigation techniques such as theories of accident causation and human errors. As per the survey in India the most of construction industries especially in rural areas are do not have safety and emergency department in there firm. In some construction industries safety and emergency responsibilities is just given to individuals who do not possess proper knowledge and experience in this field also there are safety and emergency provision made but implementation of these provisions are not found which can prevent accidents. The safety graph of construction industry is always poor.

## **II. OBJECTIVES**

The objectives of this study are:

- A. To study the present status of safety and emergency management in Indian construction industry.
- B. To study, determine and collect data required for SMEM in residential project with respect to following points:
  - 1) Safety activity
  - 2) Emergency activity
  - 3) Risk assessment
- C. To study following parameters for SMEM
  - 1) Hazards area identification.
  - 2) Height of building.

To develop a model named (SMEM) Safety management and Emergency management for small as well as large construction organization to avoid risk of accidental injuries and deaths by using the data and parameter studies.

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## III. METHODOLOGY

According to methodology questionnaire was prepared. The questionnaire was prepared to see how many companies were carried out safety management process on site and to analyse the present practice of safety process. The companies were selected based on the references and those are ready to share data. Some construction companies were carried out for safety and data was collected. After collection of data analysis and conclusion has been completed for the pre work regarding the SMEM.

### A. Questionnaire Preparation

The factors caused for the accidents are found in many of the research papers and actual condition of sites may lead to make the perfect Preparation of Questionnaire. The actual data is us to priorities these factors according to their impact to minimize the accident rate on site. The two different questionnaires were prepared for the analyses and by using the Relative Important Index and Likert scale the important parameters regarding safety are calculated.

### B. Analysis Of Survey

For the study of the current safety and emergency status in Indian construction sector, I have visited near about 50 sites in pune including small and large sites but the only 30 companies replied with the filled quaternaries. After visiting all these sites I have found that, lot of construction firms are just showing the safety management for the paper work only but in actual condition very less important things are using on sites for the safety (only for the show purpose) and due to this reason they have to face the major as well as minor accidents on sites. To find out the reasons of accidents and also the rate of accidents I have prepared the two different sets of questionnaires in which the first carries the rating system to find out the most important parameters related to the safety and emergency management and the another having the objective and descriptive questions to know the current live status of safety and emergency on site. For finding the important parameters of safety management the data is collected from the books, Internet, Literature Papers etc. From the study of all these materials, from the view of safety management and emergency management near about 18 parameters are found for the residential construction projects. After finding the important parameters these all points are arranged in a questionnaire format with linking to Likert scale to find out the exact importance of this factor on actual site and the This study suggests the technique Relative Importance Index (RII) to rate the top five factors from the questionnaire prepared. From the data collected from 30 sites, by using the Likert scale the top five important parameters for safety and emergency management are calculated which are helpful for the further design of the safety models.

Table no. 3.1 Top parameters for safety management

Sr. No	Top Parameters	RII	Ranking
1	Use of PPEs	0.972	1
2	Proper Qualified Staff for Proper Work	0.959	2
3	Use of Check Lists	0.841	3
4	Work Permit	0.841	3
5	No Smoking and Drinking	0.834	4
6	Display Sign Boards	0.834	4
7	Use of Barricades	0.71	5
8	Proper Housekeeping	0.71	5
9	Availability of Fire Extinguisher on Site	0.71	5

From above table it is found that there are nine important factors connected to the safety on sites so to minimize the problems regarding the safety management and emergency management the priorities should give to the above important points .Lot of companies are not running the safety department even they are not taking any kind of precautions to minimize the accidents and the other companies which are working with the safety department they are also not properly following the rules of safety.

### C. Result Analysis

After the analysis of survey for other questionnaires we have found out the causes of accidents of all sites

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Table No. 3.4 Type and Causes of Accidents with Activity

NUMBER OF SITES FROM DATA COLLECTED	TYPE OF ACCIDENTS  MAJOR, MINOR	ACTIVITY WORK	CAUSES OF ACCIDENTS
20	MINOR-14 MAJOR-06	1. EXCAVATION	FALLS FROM HEIGHT, SAFETY BELT NOT USE AND NO PLATFORM FOR WORK.
		2. HEIGHT WORK	BOTH DID NOT USE PPE'S (PERSONAL PROTECTIVE EQUIPMENT)
		3. PAINTING	SAFETY BELT NOT USED AND GOOD PLATFORM NOT PROVIDED.
		4. SCAFFOLDING	SAFETY BELT WAS SLIP.
		5. EXTERNAL PLASTERING.	SAFETY BELT SLIPPED AND GOO PROPER PLATFORM NOT PROVIDED.
		6. HEIGHT WORK	SAFETY BELT WAS SLIP
		7. PAINTING	SLIPPING OF ROPE.

Based on the Table no. 3.5 (No. of accidents) causes are classified into three categories.

Unsafe act (65%)

Unsafe condition (25%)

Beyond human control (10%)

#### IV. SAFETY MANAGEMENT AND EMERGENCY MANAGEMENT (SMEM)

Safety and Emergency management is a guideline model which is developed based on questionnaire survey, data collection, interviewing safety engineers from all the sites selected for study. It contains the organization chart, general safety rules and gives activity wise precaution on the site. The main purpose of SMEM is to reduce the accidents on site and enhance safety management on sites.

As talk about the causes of accidents and number of accidents, safety and Emergency management is suggested which describe the organization chart along with duties and responsibilities of various safety personal. It also describes the working of safety committee, frequency of training and safety meetings as well as use of personal protective equipment. Safety management and Emergency management is a guideline model which is developed based on questionnaire survey, data collection, interviewing safety engineers from all the four sites selected for study. It contains the organization chart, general safety rules and gives activity wise precaution on the site. The main purpose of SMEM is reduce the accidents on site and enhance safety management on sites. It is helpful for avoiding accidents on sites with activity wise. The workers should be also understood how safety is important when working on the sites and workers should be motivated towards safety. Based on questionnaire survey of four construction sites, on construction sites various activities are available but for my model I have chosen six most dangerous activities namely:

Housekeeping

Excavation

Height of work (scaffolding)

Welding and gas cutting

Electricity

Painting

##### A. Safety Models for Various Activities (Sample for Housekeeping)

After the preparation of this model the preparation of the general hazards and the exceptional hazards are listed with the proper precautions which are important on site to control the accident rate on site during the work. If the prepared list is followed then we can predict the possibilities of accidents and ones we found it then automatically we can do the control measure for that and in the list the precaution measures are also mentioned so it is very helpful on site for the better work. The general checklist is also prepared

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for each related work in which the important precautions are mentioned before starting the work which is again helping to control or to decrease the rate of accidents on construction site. The sample model for housekeeping work is mentioned below.

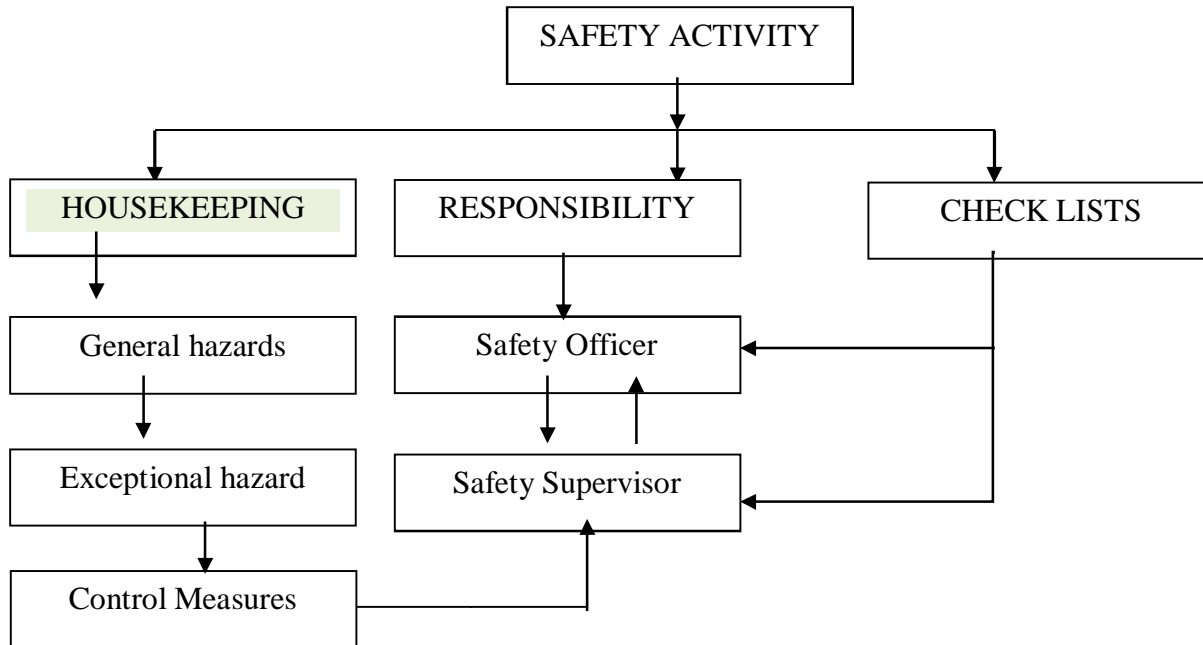


Fig. No. 4.1: Model for Housekeeping

### B. Emergency Management

Modern industry, characterized by complex process and technology is open to an ever increasing danger from disasters, which can seriously affect the safety, security and stability of the organization. Some of these disasters are natural such as earthquakes, floods, tsunamis, cyclones, lightning, while others are man-made. The man-made disasters included dangerous spills & leak of chemicals, fires & explosions, hit by external objects, contamination & poisoning of food, terrorist attacks, etc. All of these have occurred several times in industries, when unprepared for such disasters creating panic, disorder and confusion. The result has been extensive damage to men and material. Major accidents/disasters in a factory is one which has the potential to cause serious injury or loss of life. It may cause extensive damage to property, loss of life and serious disruption both within and outside the works. An emergency plan is an informative document, which acquaints the occupants of a factory or occupancy with procedures to be implemented, during an emergency. It details standard operational guidelines to emergency controllers and their personnel, who may be required to fulfill a key functional role, during the various stages of an emergency. In other words, it contains critical information, which can assist emergency services personnel to formulate appropriate incident management strategies and tactics, when attending on an emergency at a plant. Since it is a critical document in implementing appropriate management strategies, it is important that the plan is comprehensive and easy to read and use. Each works shall formulate an emergency/disaster management plan, detailing explicitly what action will be taken in the event of a major accident occurring on site, to prevent further escalation and to ensure rapid control. The emergency planning within the factory premises is known as On-Site Emergency Plan.

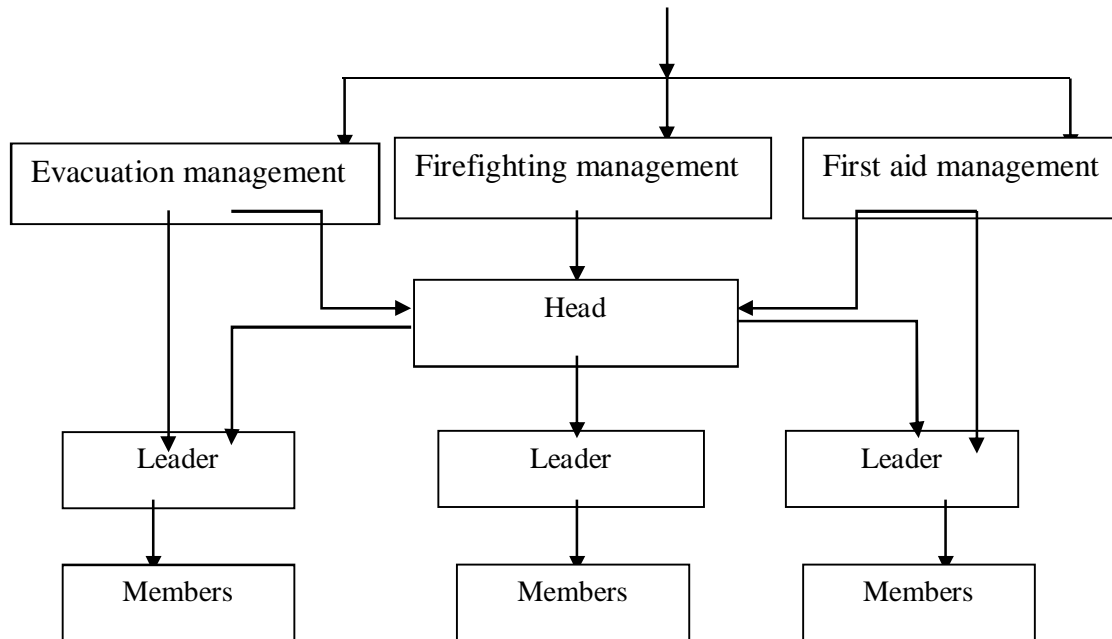
An On-Site Emergency Plan must be related to final assessment of the size and nature of events foreseen. It means that it should be specific. The effectiveness of response during emergencies depends on the amount of planning and training. If management is not interested in employee protection and minimizing property loss, very little can be done to promote a safe workplace. It is therefore, management's responsibility to see that a programme is instituted and that it is frequently reviewed and updated. The input and support of all employees must be obtained to ensure an effective on-site emergency programme. The emergency response plan should be developed locally and should be comprehensive enough to deal with all type of emergencies. For the succeed management of safety models the emergency models is also very important.

### C. Emergency Preparedness Response Model

The basic emergency model for the three basic activities is very important on site for the best safety management. The common layout of model is shown below.

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(EPRM)



## V. DISCUSSION

In construction industry lot of companies are having the safety management but every company is not using the modern techniques but just they are carry a basic safety management. By studying out my survey only one companies have good safety and emergency management and one company is not using a single thing for the safety as well as for the emergency. By the opinions of all of the visited sites hey need an advanced guideline model for minimizing the accidents and also it should be economical and very effective than present models. The SMEM model which is created is having more advanced things and also have lot of advantages as compared to current management models.

## VI. CONCLUSION

By studying about the it is conclude that, small projects are not working with respect to safety and emergency management which causes the major number of accidents but the large projects are working by using safety and emergency techniques which results the less amount of accidents. From questionnaire survey it is concluded that lot of construction companies are not carrying safety management process. Some of companies carry safety management but only 65% implementation of safety process is done on sites. From the surveys of all sites we analyze the total number of accidents. These accidents are classified into 2 types -major and minor. In major cases Permanent death, body part injury, fatal etc. and in minor cases first aid cases, temporary body part injury. Total major no. of accidents are 6 and minor no of accidents are 14 based on questionnaire survey and interviewing safety engineers. Major accidents are occurs 30% and Minor accidents are occurs 70% from all sites. From survey of four construction sites only one company carry good safety management, other two are carry safety management but they are not satisfied and one company having no anyone safety management. Based on no. of accidents and data collection Mostly accident are occurs due to unsafe condition. They are classified as Causes of accidents -Unsafe act 65%, unsafe condition 30% and beyond human control only 10%. SMEM is developed with responsibilities of various safety persons. General safety rules are helpful for workers and Working of safety committee will manage the safety on sites. Suggested model of each activity give precaution of safety on construction sites under risk, hazards. The checklist of each activity avoids the occurrence of the accidents. The duties are suggested for avoiding accidents on site for the six most dangerous activities like housekeeping, excavation, electrical work, gas cutting and welding, scaffolding, painting. By using SMEM model these accidents may be reduce up to large extent. The level of awareness of SMEM is better than the current safety management. SMEM model is helpful for motivates towards the safety and it increases the company profit due to less accidents. It can be implement from ground to top level of management.

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## VII. ACKNOWLEDGMENT

I am highly grateful thank to my guide Prof. Nikhil Bhalerao for his constant intellectual support in the form of his innovative ideas and valuable guidance. I am also grateful to Dr. A. B. More (Head of the Department) and Prof. Minde P. R [P.G. Co-coordinator Civil Engineering Department, P.V.P.I.T. Pune] for their guidance. We place on record my extreme indebtedness to them for providing us proper guidance at every step.

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