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Institution of Safety Engineers (India)

"Aim to prevent Accident, Protect Environment & Minimises Losses during disaster"

www.iseindia.in

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Award: To promoting Safety Health Environment & Quality Management System in organization, Institution of Safety Engineers (India) accept application and reward to elected person, organisation & Institution.

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SAFETY MANAGEMENT SYSTEM (SMS) IN CONSTRUCTION INDUSTRIES

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ABSTRACT

A construction industry is Hazardous prone industries. Every year several people killed & several injured due to unawareness of safety rule. At construction site day by day activity changes, so need to take adequate control measure to control risk at workplace. Construction industries playing vital role to growth of country. A construction industry has positive and Negative impacts. A positive impact is good for country development and it creates employment opportunities. A negative impact is injury, Death of person and damage of environment that is very bad for any country. Numbers of people injured and several killed due to ineffective safety management system in construction industries. Effective safety management systems always help to create safe healthy work environment. Accident is defined as event that may cause of injury, damage to property, Damage to work place environment or combination of these. Costs of accident are direct & indirect cost and indirect costs of accident are several times more that direct cost. The main objective of the paper is to analyse the effective safety management system at workplace to control Risk and prevent any type of harm that occur at construction site. Hazard is defined as source or situations that have potential to lead cause of injury, Damage to property, Damage to environment or combination of these.

The study indicated the positive impacts of implementing safety norms and procedures for reducing harm. It focuses the standard practices to achieving standard safety culture at construction site. Positive Impacts have greater significance to complete construction work on minor harm or no harm. This help to complete construction work within time frame to achieved better relation with employees & stake holder and negative impacts always effect to construction work and increases project cost. This may be causes of prosecution by legal or govt. authority. Respective country or state Government make rules & regulation to Protect to people and environment and It is responsibility to follow and comply at site is of employer.

Keywords: Safety Management system (SMS) in construction industries, Hazard identification & its control Prevention strategies, Risk Management.

1. INTRODUCTION:

Safety management system is systematically approach to managing health and safety risk at workplace. Safety management system help to minimise risk as low a reasonable practicable (ALARP) and creating safe healthy work environment. Safety Management system (SMS) help to improve safety performance and ensuring Environment Health & Safety (EHS) compliances. Good health and safety management practices encourage higher staff retention and increased productivity. SMS play vital role to create safe healthy work environment, maintain better relation with stakeholders and improve organisation Safety performance. Organisation always effect due to poor SMS system and now a day's effective SMS required for every organisation to manage Safety at workplace and growing their business. Now Numbers of governmental and non-governmental organisation working in field of safety to protect the environment as well as human beings.

Safety is important because it protects to person, organisational property and Environment. Safety Management system (SMS) help to increase profitability of any organisation and help to protect from prosecution, maintain good relation with stakeholder. Management, Legal and Social point of view effective Safety Management system (SMS) required on priority basis for every organisation.

1.1 Safe work place versus Accident Rate graph

Safe work place is inversely proportional to accident Rate. When work place will be safe then accident rate will be reduced and productivity is increases.

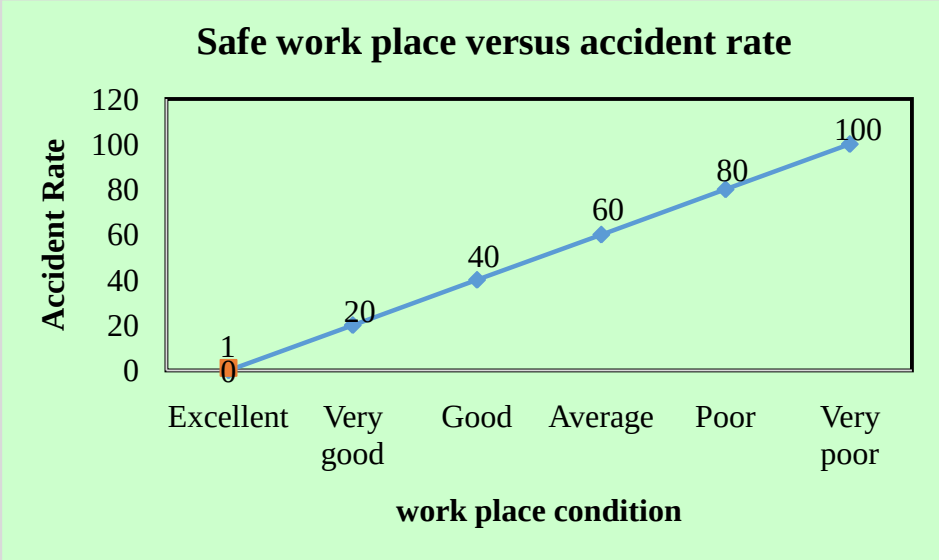

Fig. 1: Safe work place versus Accident Rate

$$\text{Accident Rate} = \frac{\text{Total Nos. of Accident}}{\text{Average Nos. of Employees}} \times 1000$$

In India central government passed The Building & Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 for ensuring safety in construction industries. Apart from This Government have made different rule & regulation Like the Factories Act 1948 to ensuring safety compliance inside factories. Similarly in foreign, respective government make Rule & regulation to ensure compliance to prevent accident & protect environment.

2. OBJECTIVE:

Objective to manage safety in construction industries are:

- Controlling Risk at work place.
- Reducing work injury & cost arises due to injury like medical expenses, injured employees wages, Replacement of labour cost, Poor reputation of organisation & legal expenses etc.
- Increasing Employees Moral.
- Protection from prosecution by legal authority.
- Help to improve safety performance & finding opportunities for improvement.
- Maintain better relation with stakeholder & enhancing organisation reputation.

3. CAUSES OF ACCIDENT IN CONSTRUCTION INDUSTRIES

Human & mechanical Failure are root cause of accident. In other terms human failure is known as unsafe acts and mechanical failure is known as unsafe condition. When unsafe acts and unsafe condition meet at one place accident happened. Such conditions create due to unawareness of safety, availability of hazard at work place, overconfidence, work load, health problem of working people.

4. HAZARD IN CONSTRUCTION INDUSTRIES

Material shifting, Material Loading & unloading, Vehicle movement, Excavation, Civil activity like excavation, Reinforcement, Concrete job, Scaffolding erection & Dismantling Job, shuttering & De-shuttering job, Fabrication, welding, Gas cutting, Grinding, Erection, Lifting, painting work, Electrical power cable laying, panel erection, commissioning, Working at height, working in confined space like activity carried out at construction site. Common types of Hazard found in construction industries are:

- Fall of person due to poor workmanship, loss of balance, uneven surface, floor opening, poor work platform, working at height without using full body harness, Defective ladder or stair, slippery floor, Loose material in assess etc.
- Fall of material due to failure of lifting appliances, Tools & tackles, loose material keeping at edge on height or near floor opening, Poor method of Material lifting & shifting etc.
- Mechanical hazard (entanglement, contact with sharp edge, Ejection of particle during grinding like job).
- Electrical hazard Like Fire, Electrocution, Burn injury, Fall due to electrical shock.
- Fire Hazard due to hot job near flammable material, Inadequate storage of Flammable material metal storage tank, Smoking,
- Physical Hazard like heat, Poor illumination, Cold stress,
- Environmental hazard like dust, fumes, Gases, Nox, Sox, Noise
- Ergonomical hazard includes repetitive movement, manual handling, workplace/job/task design, uncomfortable workstation and poor body positioning
- Chemical hazard like dust, fumes, gases create central nervous system problem & respiratory problem due to inhalation and create skin problem when come in its contact.
- Vehicle movement may cause of hit to person, Hit to object or Collision or topples.

Long term exposure of Noise create Hearing loss & Known as Noise induced hearing Loss (NIHL). Vibration create vibration induced white finger.

After collection & examined data of Accident of three construction industries in Raipur area, it is found that 65-70 Percent accident happened at construction Site are due to person falling or Material falling on person body and it may lead to cause of injury or fatality.

5. SAFETY MANAGEMENT IN CONSTRUCTION INDUSTRIES

To Manage Safety at construction site, there is need to identify hazard that are present at site. Hazard at construction site may be identified by specialist, engineers, Supervisor, Safety Personnel and concerns. Numbers of techniques like Site safety inspection, Job Safety Analysis, Hazard identification & Risk assessment, Safety survey, Safety Audit, Near Miss/ Incident investigation like Techniques used to identify hazard. Apart from this Construction work activity safety checklist, previous injury report also help to find work place hazard. Near miss should be investigated to identify root causes and taking corrective & preventive action to avoid similar future incident. Hazard can be controlled at construction site to Eliminate Hazard or Isolate Hazard, or Engineering control or Administrative control. If this method is not applicable to control hazard, then we may use suitable Personnel Protective equipment (PPE's). PPE's not prevent likelihood of hazardous event, it only minimise the severity of Hazardous event.

To avoid any types of undesired event at construction site there is need to prevent human & mechanical failure. Safety culture is important parameter that help to prevent accident or harm. Regular Supervision required of site by competent supervisor and safety Awareness Program including Training must be conducted. Strictly enforcement of safety norms help to make Accident free to construction site. Element of Safety Management System of Construction industries is, Safety Policy, Planning, Implementation & operation, Checking & corrective action, Management Review and continual improvement.

6. CONCLUSION:

Safety Management system is major parts to Reducing work injury & cost arises due to injury. Poor Safety Management system effect to business and productivity decreases. Accordingly Priority of Risk, Safety control measure to be taken. High level of supervision by skilled and experience person help to identify hazard and control Risk. Fall hazard may be controlled to ensure suitable access, suitable work platform, and use of harness, suitable Planning and use of standard lifting equipments. Proactive approach to be adopted to control risk. All element of Safety management system of Construction industries must be identified and ensure compliance according.

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[6] The Factories Act 1948 (India).

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JOB SAFETY ANALYSIS TECHNIQUES

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ABSTRACT

Each & every Day Number of People killed in industries due to not taking adequate measure to control Hazard. Hazard is a source or situations that have potential to cause harm of people or Environment or property or combination of these. Numbers of Techniques and procedures used to identify hazard in which one most important Technique is Job Safety Analysis. Effective job safety Analysis procedures help to identify hazard and control them. Effective hazard identification procedures always help to control risk at work place. The study indicated the positive impacts to prevent future harm to identify hazard in sub activity to break a particular activity of process or construction industries, Ensuring control measure and implementing them to reduce any types of harm. It focuses to hazard and control measure.

Keywords: Job Safety Analysis (JSA), Hazard identification & Control Procedures, Risk Management.

1. INTRODUCTION:

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown. Some individuals prefer to expand the analysis into all aspects of the job, not just safety. This approach is known as total job analysis. Methodology is based on the idea that safety is an integral part of every job and not a separate entity. In this document, only health and safety aspects will be considered.

The terms “job” and “task” are commonly used interchangeably to mean a specific work assignment, such as “operating a grinder,” “using a pressurized water extinguisher,” or “changing a flat tire.” JSAs are not suitable for jobs defined too broadly, for example, “overhauling an engine”; or too narrowly, for example, “positioning car jack.”

2. BENEFITS OF DOING A JOB SAFETY ANALYSIS:

One of the methods used in this example is to observe a worker actually perform the job. The major advantages of this method include that it does not rely on individual memory and that observing or performing the process prompts the recognition of hazards. For infrequently performed or new jobs, observation may not be practical.

One approach is to have a group of experienced workers and supervisors complete the analysis through discussion. An advantage of this method is that more people are involved in a wider base of experience and promoting a more ready acceptance of the resulting work procedure. Members of the health and safety committee must also participate in this process.

Initial benefits from developing a JSA will become clear in the preparation stage. The analysis process may identify previously undetected hazards and increase the job knowledge of those participating. Safety and health awareness is raised, communication between workers and supervisors is improved, and acceptance of safe work procedures is promoted.

A JSA, or better still, a written work procedure based on it, can form the basis for regular contact between supervisors and workers. It can serve as a teaching aid for initial job training and as a briefing guide for

infrequent jobs. It may be used as a standard for health and safety inspections or observations. In particular, a JSA will assist in completing comprehensive accident investigations.

3. METHOD / PROCEDURE / RECOMMENDATION:

(a) What are the four basic steps?

Four basic stages in conducting a JSA are:

- Selecting the job to be analysed
- Breaking the job down into a sequence of steps
- Identifying potential hazards
- Determining preventive measures to overcome these hazards

(b) What is important to know when "selecting the job"?

Ideally, all jobs should be subjected to a JSA. In some cases there are practical constraints posed by the amount of time and effort required to do a JSA. Another consideration is that each JSA will require revision whenever equipment, raw materials, processes, or the environment change. For these reasons, it is usually necessary to identify which jobs are to be analysed. Even if analysis of all jobs is planned, this step ensures that the most critical jobs are examined first.

Factors to be considered in setting a priority for analysis of jobs include:

- **Accident frequency and severity:** Jobs where accidents occur frequently or where they occur infrequently but result in serious injuries.
- **Potential for severe injuries or illnesses:** The consequences of an accident, hazardous condition, or exposure to harmful products are potentially severe.
- **Newly established jobs:** Due to lack of experience in these jobs, hazards may not be evident or anticipated.
- **Modified jobs:** New hazards may be associated with changes in job procedures.
- **Infrequently performed jobs:** workers may be at greater risk when undertaking non-routine jobs, and a JSA provides a means of reviewing hazards.

(c) I How do I break the job into "basic steps"?

After a job has been chosen for analysis, the next stage is to break the job into steps. A job step is defined as a segment of the operation necessary to advance the work. See below examples.

Care must be taken not to make the steps too general. Missing specific steps and their associated hazards will not help. On the other hand, if they are too detailed, there will be too many steps. A rule of thumb is that most jobs can be described in less than ten steps. If more steps are required, you might want to divide the job into two segments, each with its separate JSA, or combine steps where appropriate. As an example, the job of changing a flat tire will be used in this document.

An important point to remember is to keep the steps in their correct sequence. Any step which is out of order may miss serious potential hazards or introduce hazards which do not actually exist.

Each step is recorded in sequence. Make notes about what is done rather than how it is done. Each item is started with an action verb. Appendix A (below) illustrates a format which can be used as a worksheet in preparing a JSA. Job steps are recorded in the left hand column.

This part of the analysis is usually prepared by knowing or watching a worker do the job. The observer is normally the immediate supervisor. However, a more thorough analysis often happens by having another person, preferably a member of the health and safety committee, participate in the observation. Key points are less likely to be missed in this way.

The job observer should have experienced and be capable in all parts of the job. To strengthen full co-operation and participation, the reason for the exercise must be clearly explained. The JSA is neither a time and motion study in disguise, nor an attempt to uncover individual unsafe acts. The job, not the individual, is being studied in an effort to make it safer by identifying hazards and making modifications to eliminate or reduce them. The worker's experience contributes in making job and safety improvements.

The job should be observed during normal times and situations. For example, if a job is routinely done only at night, the JSA review should also be done at night. Similarly, only regular tools and equipment should be used. The only difference from normal operations is the fact that the worker is being observed.

When completed, the breakdown of steps should be discussed by all the participants (always including the worker) to make that all basic steps have been noted and are in the correct order.

(d) How do I "identify potential hazards"?

Once the basic steps have been recorded, potential hazards must be identified at each step. Based on observations of the job, knowledge of accident and injury causes, and personal experience, list the things that could go wrong at each step.

A second observation of the job being performed may be needed. Since the basic steps have already been recorded, more attention can now be focused on each potential hazards. At this stage, no attempt is made to solve any problems which may have been detected.

To help identify potential hazards, the job analyst may use questions such as these (this is not a complete list):

- Can any body part get caught in or between objects?
- Do tools, machines, or equipment present any hazards?
- Can the worker make harmful contact with moving objects?
- Can the worker slip, trip, or fall?
- Can the worker suffer strain from lifting, pushing, or pulling?
- Is the worker exposed to extreme heat or cold?
- Is excessive noise or vibration a problem?
- Is there a danger from falling objects?
- Is lighting a problem?
- Can weather conditions affect safety?
- Is harmful radiation a possibility?
- Can contact be made with hot, toxic, or caustic products?
- Are there dusts, fumes, mists, or vapours in the air?

Potential hazards are listed in the middle column of the worksheet, numbered to match the corresponding job step. For example:

Again, all participants should jointly review this part of the analysis.

(e) How do I "determine preventive measures?"

The final stage in a JSA is to determine ways to eliminate or control the hazards identified. The generally accepted measures, in order of preference, are:

Eliminate the hazard: Elimination is the most effective measure. These techniques should be used to eliminate the hazards:

- Choose a different process
- Modify an existing process

- Substitute with less hazardous product
- Improve environment (e.g., ventilation)
- Modify or change equipment or tools contain the hazard

If the hazard cannot be eliminated, contact might be prevented by using enclosures, machine guards, worker booths or similar devices.

Revise work procedures: Consideration might be given to modifying steps which are hazardous, changing the sequence of steps, or adding additional steps (such as locking out energy sources).

Reduce the exposure: These measures are the least effective and should only be used if no other solutions are possible. One way of minimizing exposure is to reduce the number of times the hazard is encountered. An example would be modifying machinery so that less maintenance is necessary. The use of appropriate personal protective equipment may be required. To reduce the severity of an incident, emergency facilities, such as eyewash stations, may need to be provided.

In listing the preventive measures, do not use general statements such as “be careful” or “use caution”. Specific statements which describe both what action is to be taken and how it is to be performed are preferable. The recommended measures are listed in the right hand column of the worksheet, numbered to match the hazard in question.

(f) How should I make the information available to everyone else?

(g) JSA is a useful technique for identifying hazards so that workers can take measures to eliminate or control hazards. Once the analysis is completed, the results must be communicated to all workers who are, or will be, performing that job. The side-by-side format used in JSA worksheets is not an ideal one for instructional purposes. Better results can be achieved by using a narrative-style communication format. For example, the work procedure based on the partial JSA developed as an example in this document might start out like this:

I. Park vehicle

(a) Drive vehicle off the road to an area well clear of traffic, even if it requires rolling on a flat tire. Turn on the emergency flashers to alert passing drivers so that they will not hit you.
(b) Choose a firm and level area for parking. You can jack up the vehicle to prevent rolling.
(c) Apply the parking brake, leave the transmission in PARK, place blocks in front and back of the wheel diagonally opposite the flat. These actions will also help prevent the vehicle from rolling.

II. Remove spare and tool kit

(a) To avoid back strain, turn the spare up into an upright position in its well. Stand as close to the trunk as possible and slide the spare close to your body. Lift out and roll to flat tire.

III. Pry off hub cap, loosen lug bolts (nuts)

(a) Pry off hub cap slowly with steady pressure to prevent it from popping off and striking you.
(b) Using the proper lug wrench, apply steady pressure slowly to loosen the lug bolts (nuts) so that the wrench will not slip, get lost or and hurt your knuckles.

IV. And so on

4. CONCLUSION:

Job Safety Analysis (JSA) is a useful technique to identify hazards so that employees can take measures to control Risk. Once the analysis is completed, the results must be communicated to all employees who are, or will be, performing that job. It will help to aware employees and taking control measure as per JSA document. This Technique is most effective because we identify hazard sub-activity wise of selected activity

and control risk on based on identification. Hazard may be control to eliminate them and If cannot be eliminated, then it might be prevented by using enclosures, machine guards, worker booths or similar devices. So Job Safety Analysis (JSA) techniques play major role to prevent future injury or losses to identify hazard in proper manner and controlling them.

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[2] OSHA—Occupational Safety and Health Administration, "Occupational Safety and Health Guidelines," 2009.
[3] The Building & Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996.

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Personal protective equipment (**PPE**):

Personal protective equipment (**PPE**) refers to Safety helmets, safety shoes, gloves, high-visibility clothing, goggles, or **equipment** designed to protect personnel from injury or exposure. PPE does not eliminate to hazard, it minimises the severity of hazardous event and protect to personnel from exposure of hazard.

Types of personal protective equipment: PPE can be classified in the following categories, based on the type of protection:

- Head protection – for example, Safety helmets, hard hats
- Foot protection – for example, Safety shoes/boots
- Respiratory protection - for example, disposable, cartridge, air line, half or full face
- Hearing protection – for example, Ear plugs & ear muffs.
- Hand protection – for example, gloves and barrier creams
- Eye protection – for example, goggles/ spectacles, shields, visors
- Working from heights - for example, harness and fall arrest devices
- Skin protection – for example, Full body suit, Heat resistant suit
- **Other personal protective equipment:** This may include PPE for specific job such disposable clothing for working with chemicals, radiation hazards, painting, welding, Gas cutting. Examples include: lead aprons for x-ray protection; sleeve protectors, aprons, coveralls when using chemicals; leather jackets, trousers and spats for welding; thermal and cold protective clothing for work near furnaces and cool rooms.

Training Calendar

ISE (India) Training Calendar (April-2018 to June-2018)				
Training Title/ Course	**Duration**	**Schedule**	**Location**	**Remarks**
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	05-04-18 to 07-04-18	Raipur	Exam Schedule 08-04-18
Lead Auditor (OHSAS 18001:2007)	5 days or Min. 40 hours Training	17-04-18 to 21-04-18	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	04-05-18 to 10-05-18	Raipur	Exam Schedule 11-05-18
Lead Auditor (ISO 14001:2015)	5 days or Min. 30 hours Training	16-05-18 to 20-05-18	Raipur	
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	29-05-18 to 31-05-18	Raipur	Exam Schedule 01-06-18
ISE-QM (Total Quality Management)	3 day or Min. 24 hours Training	14-06-18 to 15-06-18	Raipur	Exam Schedule 16-06-18
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	25-06-18 to 01-07-18	Raipur	Exam Schedule 02-07-18
Diploma In Industrial Safety	One Year	Winter 2018	Raipur	

For more details visit www.iseindia.in or mail info@iseindia.

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