(HAZARDS IDENTIFICATION & RISK ASSESSMENT IN CONSTRUCTION INDUSTRY)

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Abstract: A main major aspects of any safety and health program is the identification, assessment, elimination and/ or the control of hazards in the worksite. It is not to possible to eliminate all hazards, so the objective is to eliminate and/or control all the possible hazards with critical and high potential and to reduce the rest of the possible hazards to the minimum reasonable risk level so as to protect workers from harm. This procedure is called risk assessment, and it is the evaluation of hazards to determine their potential to cause an accident. In reality, risk assessment is something people do each and every day without giving it much thought.

IndexTerms **- Health and safety risk, Risk Management & control, Construction Sites, Preventive & corrective Measures.**

I. INTRODUCTION

Safety:-

Safety in any operation works best if the person or people in charge take a leading role in managing safety and health. Many business enterprises have proven that good safety management leads to increased productivity, and the same works for farms. By having a good safety management program, you can avoid not only farm injuries, but also other incidents that are costly, time consuming, stressful and inconvenient.

Hazard:-

Hazard is simply a condition or a set of circumstances that present a potential for harm. Hazards are divided into two broad categories:

• Health hazards (cause occupational illnesses)
• Safety hazards (cause physical harm - injuries)

Hazard Identification:-

Hazard identification is the process of identifying all hazards in the workplace. There is no set method for grouping agricultural injury and illness hazards. Most production agriculture hazards overlap into different hazard categories. One way to group them would be by major hazards listed in the OSHA:

Dairy local emphasis program:

- Manure storage facilities and collections structures
- Dairy bull and cow behavior/worker positioning
- Electrical systems
- Skid-steer loader operation
- Tractor operation
- Guarding of power take-offs (ptos)
- Guarding of other power transmission and functional components
- Hazardous energy control while performing servicing and maintenance on equipment
- Hazard communication
- Confined spaces
- Horizontal bunker silos
- Noise

Risk Assessment Definitions:-

Risk has been defined in a number of ways. According to William and Heins risk is the variation in the outcomes that could occur over a specified period in a given situation. Risk is defined as, (1) the probability of unwanted event, (2) combination of hazard, (3) unpredictability, partiality of the actual result differ from expected result, (4) loss uncertainty, or (5) probability of loss. The Health and Safety Executive, HSE defined risk as the chance high or low that somebody will be harmed by the hazard. Thus, the best definition of risk in the context of this study is the chance or probability high or low of harm by the hazard actually being done.

The definition of risk assessment based on The Health and Safety Executive, is careful examination of what in the work that could cause harm to people, so it can be weigh up whether enough precaution have been taken or should do more to prevent harm. Risk assessment may be further defined as a systematic method of:

- Analysis work activities.
- Identifying hazards, hazardous situations and hazardous events.
- Estimating risk, by considering the likelihood of hazardous events and the nature and severity of the harm that ensues.
- Reviewing existing and possible control options and action priorities.
- Judging the 'acceptability and tolerability' of risk.

These risk assessment processes are an integral part of risk management as shows in Figure 2.1.

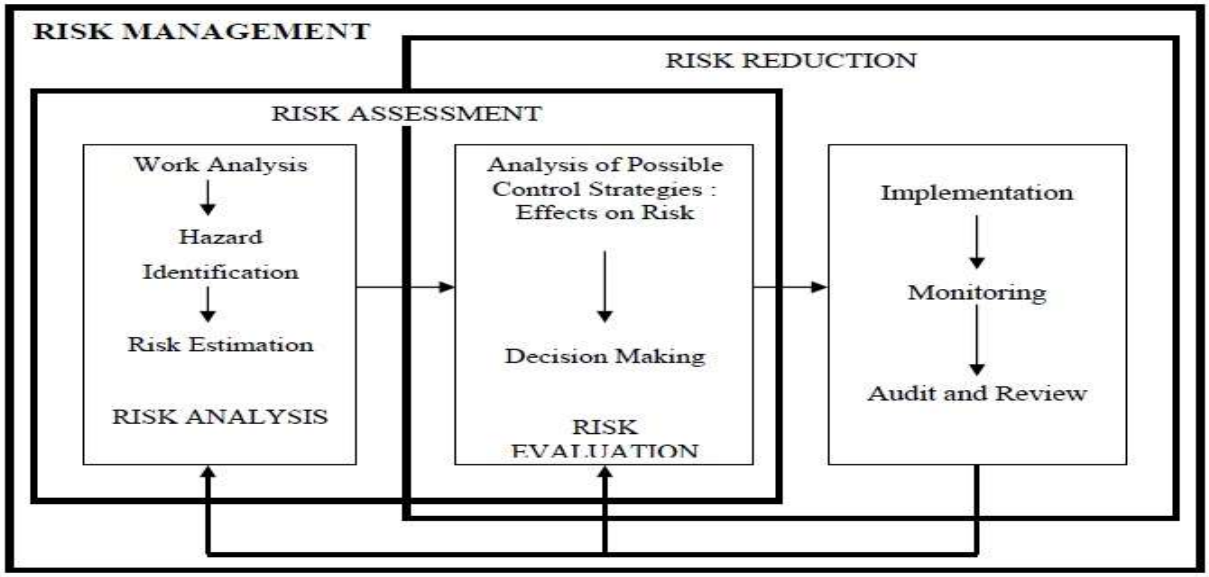

Figure 2.1: A risk management system

Purpose of Risk Assessment:-

The main purpose of risk assessment is as follows:

a) To identify and rank all potential risks that may arise from the construction of major projects.
b) The assessment is the first step in recognizing the hazards and risks that are found in particular work environment and leads the employer to identify :

- Arrangement to combat the risk / introducing arrangements for managing safety & health
- The need for health surveillance
- The level of competence needed by an employer's safety and health advisors
- Procedures for serious and imminent danger
- Information to be provided for employees
- Procedures to ensure cooperation with other employers
- Measures to protect non-employees working in undertaking
- Training needs
- Employees duties
- Measures to protect temporary workers

Risk Assessment Requirements:-

Risk assessment is more than just a paper exercise; it is a dynamic process which includes numbers of requirements as follows:

- Commitment at the highest level of the organization
- The competent and well trained assessors

- The involvement at all levels
- Methodical and systematic recording
- Logical and rational decision frameworks
- Involve practical compliance strategies
- Clear and meaningful communications
- Adequate resources

II. RISK ASSESSMENT OF CONSTRUCTION SITE

Risk Assessment Process:-

Process can be defined as a series of action that being done for a particular purpose. The risk assessment of a project can be defined as a unified procedure that includes identifying, analyzing, evaluating and managing of the associated risks. Generally, risk assessment process involve several procedures that need to be done in order to achieve the objectives namely identifying hazard, assessing the risk and controlling the risk.

Several researchers have developed risk assessment process to suit their requirements. In the UK, The Health and Safety Executive (HSE) initiated one of the early studies in the development of risk assessment process. HSE have introduced a Five Steps to Risk Assessment, which aims to help employers and self-employed people to assess risks in the workplace. According to HSE risk assessment approach, the important requirement need to decide are whether a hazard is significant and whether it have been covered by satisfactory precaution so that the risk is small. For instance, electricity can kill but the risk of doing so in an office environment is remote, provided that 'live' components are insulated and metal casing properly earthed. The Five Steps to Risk Assessment developed by HSE are as follow:

- Step 1: Look for the hazards
- Step 2: Decide who might be harmed, and how
- Step 3: Evaluate the risks and decide whether existing precautions are adequate or more should be done
- Step 4: Record of findings
- Step 5: Review the assessment and revise it if necessary

Incident Investigation Methodology:-

The process by which underlying causes of an incident are uncovered and steps are taken to prevent recurrence

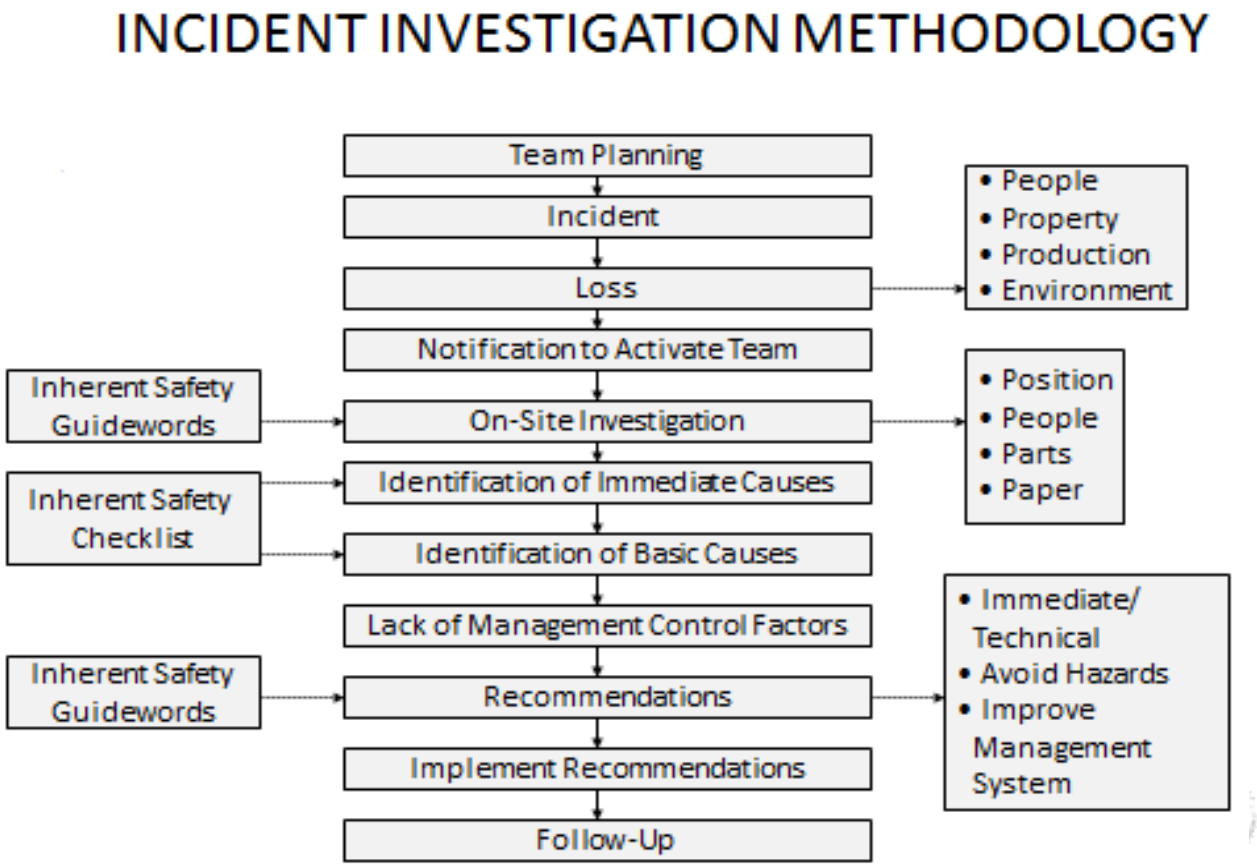

Fig: 2.2 Flow chart of incident investigation methodology

CASE STYDY-1

An unfortunate incident that had occurred at Hindustan power plant Anuppur site at around 10 PM on 15.05.13. The operator was operating the concrete pump for PCC work in ESP area; in the meantime one lumps (un-size) material appeared on the grating placed on the concrete pump hopper to protect the oversize material pour into the pump. The operator immediately moved to the hopper and tried to remove the lumps by pushing down with his leg. It was observed that the fastened bar on the grating was removed due to the applied force. The victim's right leg inserted into the hopper and trapped between hopper cashing and agitator shaft, hence resulted injury.

Root cause/likely cause:-

1. The operator entered into the hopper. The removed by stopping the pump or standing outside the hopper which is regular practice.
2. The bar used to reduce gap not tightly fastened.
3. Unsafe practice adopted by the operator.

Preventive/Corrective Measures:-

4. HIRA Reviewed.
5. Safety training conducted for operator and concrete gang.
6. Inspection of all pumps and other equipment.
7. Rectification of the grating and other parts of machine.

Why-Why Analysis:-

Based on the incident investigation study a why why analysis was performed and a fast track incident communication report was made shown in fig.no.4.2,which objective is to communicate and warn other sites of similar hazards and help them to prevent related incidents so that preventive action shall be raised if similar hazards are present.

Fast Track Incident Communication

Corporate Safety & Health Department
L&TCD Privileged and Confidential
Prepared For and Under the Direction of Legal Team

Site / Project Name:	Anuppur site
Business Unit:	EPC
Date of Incident:	15-05-2013
Date Reported:	17-05-2013

Fast Track objective:
This report is aimed to communicate and warn other sites of similar hazards and help them prevent related incidents. Preventive actions shall be raised if similar hazards are present.

Incident Type: *(check all that apply)*

- Recordable Injury or Illness (US OSHA) ☐
- Lost Time Incident (US OSHA) ☑
- Near Hit ☐
- Contractor ☑

Injury Type:	Crush
Body Part Injured:	Rt leg
Event or Exposure:	during concrete pouring
Direct Source of Incident:	Machinery
Hazard previously identified in risk assessment:	Yes

Circumstances:

Oversize material/cement lumps appeared on the grating in concrete pump hopper and operator tried to remove it.

Description of the Incident:

The operator Mr. SR Sheikh was operating the concrete pump for PCC work in ESP-1 on 15th may nightshift (10 PM). In the mean time one lumps (un-size) material appeared on the grating placed on the concrete pump hopper to protect the oversize material pour into the pump. The operator immediately moved to the hopper and tried to remove the lumps by pushing down with his leg instead of removing by hand. The grating was defective (one bar was broken) the extra gaps (shown in below picture) cause the victim's right leg inserted into the hopper and trapped between hopper washing and agitator shaft, hence resulted injury. Later he was taken to Anuppur hospital and again refers to Mundra Hospital Bilaspur for better treatment.

Root Cause Analysis:

Please analyze what caused the former circumstances. Write all 5 causes (Main branch) and branch to accommodate more causes to a particular circumstance or above question. Branching additional causes can happen at any level of "Why's" (i.e. multiple cause

	Write incident here →	Push and trap			
Main Branch	Why?	Why?	Why?	Why?	Why?
Circumstance or "Why" was the problem originated. No typing on this line →	Victim's right leg trapped between hopper and agitator shaft. The worker adopted the wrong approach to remove the lumps (moved on to the grating)	There is gap in the grating (defective)no rectification done.	He tried to removed lumps while pump was operational.	Lack of monitoring because no supervisor and engineer present in duty in nightshift.	Pump operational switches are not as per the standard practised.
Write "Because" answer to the above question. This "Cause" will be the following question	Helper was not available.	Poor maintenance the grating was not rectified/replaced.	When nobody is there to assist the operator, he should stopped the pump before enter in to the risk zone	Responsibility not designated.	Time taken to stop the pump lead to aggravated severe injury.
2nd Branch	Why?	Why?	Why?	Why?	Why?
No typing on this line →	Grating was not locked properly one side support missing	No need to go on to the grating to remove the oversize/lumps material.	Insufficient man power.	No emergency stop switch available in any of the pump.	Inadequate light
Additional "Cause" OR circumstance for the above "Why"	Poor maintenance of hopper.	This could be removed by hand using hook /hand tools(which they practiced)	Lack of training and awareness.	Layman can stop the pump.	
3rd Branch	Why?	Why?	Why?	Why?	Why?
No typing on this line →	He would have been stand on the pipe and remove with his hand by using tools			0	0
Additional "Cause" OR circumstance for the above "Why"					

Copy/paste as many branches as needed ↓

Short Term Corrective Actions:

1.All gratings to be rectified and with lucking arrangement to be done. 2. All pumps to be checked and rectification to be done. 3. Awareness training given to all the workers of concreting group. 4 .All non-functional and emergency switches to be installed and marked. 5. Helper must be deployed with the pump operator. 6. supervisor or engineer to be deployed at site during any activity in night shift. 7. monitoring by night shift safety stewards on regular basis. 8.Hira to be reviewed.

Long Term Corrective/Preventive Actions

1. Periodical training to the groups. 2. Ensure periodical maintenance of equipments. 3. Monthly inspection to all the equipments. 3. Daily observation by safety stewards. 4. Review and implementation of revised HIRA .

Photos, Visuals, Presentations or Video Re-creation:

The defective grating leads to insert of leg into the hopper
Rev 01

Three lock available one lock missing

Operating knob missing

Switch broken no repairing made

Figure 2.3 Why-Why Analysis for Case I

Conclusion

In conclusion, based on the investigation study, a framework of risk assessment process of hazards currently applied in construction sites has been developed. Based on the study analysis, a Guidelines of Risk Assessment Process of Hazards in Construction Sites have been proposed.

RECOMMENDATIONS:-

Apart from the study that has been carried out, the writer is suggesting furthering the area of study especially on the following area:

a) An analysis of cost benefits that can be achieved from risk assessment of hazards in construction sites implementation.
b) It was highlighted that the safety issue in construction site will improve, as the level of risk assessment of hazards implementation get higher. Since in this study there was indication of the actual impact on project safety, it is recommended that further study should be carried out to determine the safety benefits gained from risk assessment process of hazards in construction sites.
c) A further study regarding the national regulatory framework to safeguard the implementation and quality of risk assessment.

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[20] www.bocw.in/building&other/construction/works/act.