Accident Investigation at work place

Mr. Nizam Ali, B.E (Instrumentation & Control Engineer.) from Anna University, MBA from IIBMS, DIS from Annamalai University, MIIRSM (UK), SMISE (IN), NEBOSH-IGC, Lead Auditor in ISO 9001:2015, ISO 1400:2015, ISO 45001:2018 & Lead - Department of HSEQ, Power Economy Middle East Co LLC, Abu Dhabi, United Arab Emirates.

Email id: nizam.raziya@gmail.com

Abstract

Every day several accidents occur in this world due to human failure, Mechanical failure or poor work environment. To prevent similar accident or incident, A effective accident investigation must be carry out. Accident investigation is a Techniques used to analyse and find root cause of any accident. Accident investigation is also known as hazard identification techniques. In this articles details information are included about investigation method & reporting procedure. This article is very helpful to learn and use effective approach to investigate any incident and accident.

Objective:

» To find out cause of an accident

» Identify cost of accident

» Fulfilling Legal requirements

» To identify failure and seeking opportunities to improve Safety management system

» Implementing to recommendation within whole organization to prevent similar future accident

Key word: Accident Investigation, Cause of Accident, Chain of event, immediate cause and root cause, Accident investigation procedure, Accident investigation report Preparation method.

1. Types of accident:

♣ Lost Time Injury:

» Fatality

» Permanent Total Disability

» Permanent Partial Disability

» Lost Work Days Case

International Journal of Institution of Safety Engineers India
"Published by Zeenat Jhan Educational & Welfare Trust"

Volume 2, Issue 3, Jul-Sept. 19   Available online at **www.iseindia.in**

- ♣ Serious Injury

- ♣ Serious Occupational illness / Diseases

- ♣ Serious Dangerous Occurrence

- ♣ Restricted Work Case

- ♣ Medical Treatment Case

- ♣ First Aid Injury

- ♣ Equipment / Property Damage

2. **Accident Investigation:**

Accident investigation is a process used to identify causes of accident and ensuring their corrective measure to prevent similar future accident. Accident Investigation always helps to control work place risk to learn from past Accident. Based on Accident investigation report, organization take necessary action to minimise workplace risk As Low as Reasonable Practicable (ALARP). Accident Investigation is effective Method used to determine the underlying causes of accidents and such information used to ensure effective recommendation for taking preventive action to avoid any future accident.

Accident investigation should be carried out by competent person as per regulatory requirement and in consultation with relevant stakeholder. The accident investigation report should be submitted to the organization for their effective implementation. Investigation not carried out to blame any person, it is carried out to identify gaps of failure and improve safety management system within organisation. Blame culture always develop negative behaviour among employees and it create poor safety culture. Accident Investigation is ineffective unless all causes are determined and corrected. So accident investigation should be carry out effective manner to find out all root cause and ensuring adequate recommendation to prevent similar future accident. Immediate and root cause are two major factor of cause of accident or incident. Effective investigation will help to identify immediate and root causes of accident and ensure their corrective measure to prevent future accident.

3. **Term & Definition**

Near Miss	:	Near misses (or near hits) are any form of incident that could have resulted in injuries or loss but did not. Example A worker runs into the workshop and stumbles, but regains his balance and carries on unharmed.

Hazard	:	Source or situations that have potential to harm. Naked Power cable, Un-Guarded rotating parts, Slippery floor are few example of Hazard.
Incident	:	Hazardous event where no harm occur.
Accident	:	Any undesired event that create injury, Fatality, property damage, Environment damage, Harm to environment or combination of these.
Injury	:	Harm to a person or living thing due to accident. It include cuts, fracture, bruises, wound, punctured skin etc.
Occupational Disease	:	An occupational disease is a disease or disorder that is caused by the work or working conditions. Noise induce hearing loss, Silicosis, Asbestosis are few example of occupational diseases.
Disaster:	:	Accident or a natural catastrophe that causes huge damage, destruction, loss of life or Environmental loss. Disaster may be man-made or natural. Major Fire, Floods, Tsunami, Bursting of Chemical tank, Huge losses due to sudden toxic gas release are few example of Disaster.
Dangerous occurrence:	:	Any occurrence of serious nature that could have the potential of death or serious injury but did not.
Environmental damage	:	Any activity that effect (either directly or indirectly) to environment and it cause of Pollution, deforestation, overconsumption, overexploitation of natural resources.

4. **Accident causation Theory:**

Underline Unsafe Act & unsafe Condition is basic cause of any accident. When both conjugate at one point, accident happened. In other words, Human and mechanical failure are cause of an accident.
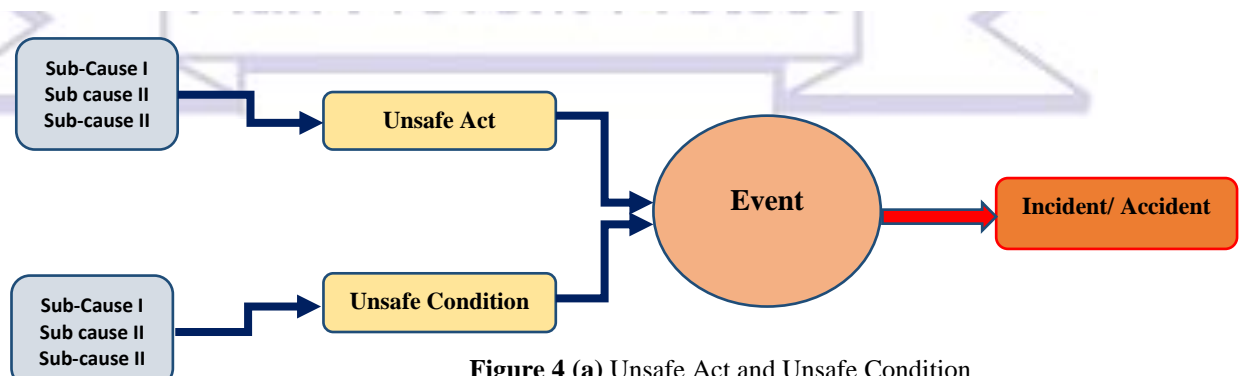

Figure 4 (a) Unsafe Act and Unsafe Condition

It is very important to investigate Near-miss case, to minimize or control accidents in future. The accident ratio studies and their limitations are defined in the below accident triangle.
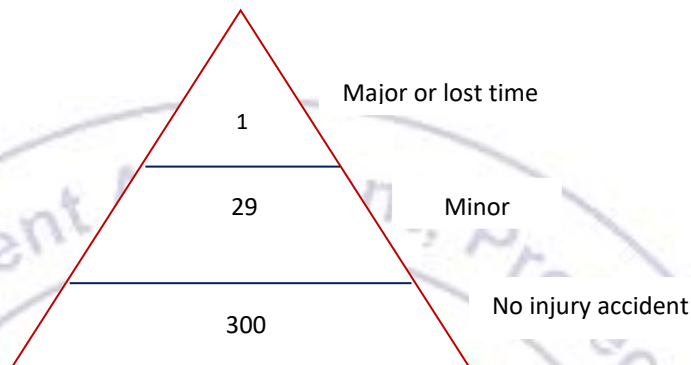

Figure 4 (b) Heinrich Triangle

4.1 Chain of Event

Lack of Control

Unsafe Act + Unsafe condition

Event

Consequences

Accident, Property/ Environment damage, Organizational loss

5. What to investigate during investigation?

Any Accident that caused personnel injury, Property damage or harmed to organization must be investigate. Near miss like incident also investigates to find causes and taking necessary action to avoid any future similar accident. Following are few category of Incident/accident that should be investigated.

    » Near Miss

    » Injury

» Accident (Minor, Major & Fatal)

» Occupational Disease/ Illness

» Disaster

» Dangerous occurrence

» Environmental damage

5. Who should investigate?

Accident can be investigate by any people that have good knowledge and adequate experience in field of Accident investigation & reporting field. Major accident should be investigate by group of people of organisation. Organisation should form Committee for effective Accident Investigation.

Members of the Accident investigation team can include:

» Employees with good knowledge & experience in field of investigation

» Supervisor of the work area

» safety officer/Manger

» Safety committee Member

» "Outside" experts

» Representative from respective state government authority

» union representative, if applicable

Some Investigation must be conducted jointly with Organization team and government authority. Organisation must follow safety rules of respective state or country and on based on this they should conduct investigation.

6. Stage of Accident investigation

Stage I: Immediate action

In case of Accident Happen, Immediate action must be taken and it include, making the area Safe, Preserving the scene, Notifying to relevant authority/ Person and Sending the victim for Aid.

Stage II: Plan the investigation

In second step, plan for investigation and Team to be formed to investigate the accident. We consider all resources that required for investigation and time required to complete investigation. For Major Accident, form Team of Two or more people for effective investigation.

Stage III: Data collection/ Gathering information

Collect Data from different sources to visit & capture Accident Location, Witness and Checklist. For gathering information Ask, question with witness. We can ask question with victim.

Investigation Team ask Question in similar way

- » What happen?
- » When did happen?
- » Why did happen?
- » How did happen?
- » Where did happen?
- » Who was involve?

Investigation Team can collect Incident related information through different sources like checklist, Operation safety manual, Manufacturer manual, MSDS etc.

Stage IV: Data analysis

In this step, we analyse the data. Accident is chain of event investigation team identify the sequence of event and identify human and mechanical failure in each event. Identify all influencing factor that lead to cause of human error. When asking question always uses correct way and it should not show that Failures happen by themselves/victim. So avoid asking such question that raise blame like statements. Need to identify root & underlying causes in effective ways and it should be record.

Stage V: Corrective actions

Corrective action must be ensuring on based of identified cause of accident. Adequate corrective action must be use as recommendation.

Stage VI: Report Preparation, Reporting& Follow up

Prepare report with finding and effective corrective/ Preventive action to avoid similar future accident. Communicate to investigation report within organisation through

International Journal of Institution of Safety Engineers India
"Published by Zeenat Jhan Educational & Welfare Trust"

Volume 2, Issue 3, Jul-Sept. 19   Available online at **www.iseindia.in**

email, discuss in meeting, share case study in training to aware to the organisation people. Report section should be including:

Section I	: Brief Details of Incident/Accident	In this section Write down Name of Victim, Date & Time of Accident, Age, Designation, Location of Accident, Type of Accident (First Aid, Minor, Major, Fatality, Near miss, Dangerous occurrence etc), Injured body parts (such as head, hand, foot or multiple injury) etc. If any point not applicable, Write down not applicable.
Section II	: Accident Summary	In this section, brief summarise to accident. Summary Include how accident happen and What was person doing during accident.
Section III	: Sketches	Draw Sketch of Accident Location, equipment and Victim body parts.
Section IV	: Cause of Accident	Identify cause of Accident. Causes of accident should be categorized in Immediate cause and Root cause. Team must be clearly identified to Immediate & Root cause of accident.
	Immediate cause	The cause that directly resulted in an accident An immediate cause is defined as acts (Unsafe act) or conditions (Unsafe Condition) that lead directly to the accident. These might be unguarded rotating part of machine, Employee error, Non-use of personal protective equipment, lack of concentration, Fatigue, stress and poor housekeeping.
	Root Cause	The root or underlying cause is a

International Journal of Institution of Safety Engineers India
"Published by Zeenat Jhan Educational & Welfare Trust"

Volume 2, Issue 3, Jul-Sept. 19   Available online at **www.iseindia.in**

		condition that allowed to developed immediate cause such as poor safety culture, Poor management commitment.
Section V	Witness	Write down Witness name, Designation and their statements.
Section VI	Recommendation	Write down effective recommendation as per observed cause and strictly implementation to be ensure to prevent similar future accident.

Investigation team can add additional section such as name of Investigation team members, their finding and comments etc in the report.

7. Summary

Every day several accidents occur in this world due human failure and Mechanical failure and to prevent similar future accident, need to carry out effective accident investigation.

Organisation should use effective approach to identify all causes of accident. For effective investigation Team member must be good knowledge and experience in field of accident investigation. Effective investigation determines many factor such as what happened, how happened and how to control similar future accident. An accident investigation technique involves gathering and analyzing facts of accident and developing plan with recommendation to prevent similar accident. Accident Investigation is ineffective unless all causes are determined and corrected.

References

- Evelyn Ai Lin Teoa and Florence Yean Yng Linga (2006) "Developing a model to measure the effectiveness of safety management systems of construction sites", Building and Environment 41, pp.1584–1592.
- Natassia Goode et al. "Injury causation during hiking activities: a systems analysis of reports from the NZ National Incident Database". In: Future faces: Outdoor education research innovations and visions (2013)
- Safety Management system in construction industries, Shahnawaz Rampuri, IJSEI, International Journal of Institution of Safety Engineers (India) Volume 1, Issue 1,Jan-Mar 2018

- Choudhry, R.M.; Fang, D; Lingard, H. Measuring safety climate of a construction company. J. Constr.Eng. Manag. 2009, 135, 890-899.

- Study & analysis of occupational health safety management system (OHSMS) in organisation: a review nair. J sindhu, 2shahnawaz rampuri, International Journal of Exploring Emerging Trends in Engineering (IJEETE) vol. 04, issue 01, Jan-Feb, 2017 pg. 34 - 39 www.ijeete.com , ISSN - 2394-0573

- Fluorouracil Incident Root Cause Analysis. Tech. rep. Institute for safe medication practices Canada, May 2007.

- Rachel A. Haga, Joseph H. Saleh, and Cynthia C. Pendley. "Reexamining the titanic with current accident analysis tool: Multidisciplinary eduation and system safety primer for engineering students". In: IEEE Global Eng Edu Conf , EDUCON IEEE Global Engineering Education Conference, EDUCON (2013).

- Jonas Lundberg, Carl Rollenhagen, and Erik Hollnagel. "What-You-Look-For-Is-What- You-Find – The consequences of underlying accident models in eight accident investigation manuals". In: Safety Science 47.10 (Dec. 2009), pp. 1297–1311. issn: 0925-7535.

- Andreas Lumbe Aas. "Probing Human Error as Causal Factor in Incidents with Major Accident Potential". In: 2009 Third International Conference on Digital Society. 2009.

- Daniela Karin Busse. "Cognitive error analysis in accident and incident investigation in safety-critical domains". PhD thesis. University of Glasgow, 2002.

- A. Herrera and R. Woltjer. "Comparing a multi-linear (STEP) and systemic (FRAM) method for accident analysis". In: Reliability Engineering and System Safety 95.12 (2010), pp. 1269–1275. issn: 0951-8320.

- Jacques Leplat. "Accident analyses and work analyses". In: Journal of occupational accidents 1.4 (1978)

- ISEI manual, Wikipedia

- XueYuan Niu et al. "An accident analysis of a smart substation". In: China Int Conf Elect Distrib , CICED China International Conference on Electricity Distribution, CICED 2014-December (2014), pp. 992–994. issn: 2161-7481.