Study on Hazard Identification, Risk Assessment

(HIRA system)

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Abstract- Hazard Identification, Risk Assessment or HIRA system can act as a risk assessment tool which will assist users in identifying hazard and estimating risk involved in each identified hazard. This risk assessment tool will identify possible hazard involved in each task in departments. Once the hazard has been identified, risks involved will be estimated and categorized. If the estimated risk falls in a category, which is higher than the low risk category, then possible control measures will be recommended. At the same time, the user can add new work plan, task, and control measures into the system to update existing information system.

CHAPTER 1INTRODUCTION

Hazard Identification Risk Assessment (HIRA) is a process of defining and describing hazards by characterizing their probability, frequency and severity and evaluating adverse consequences, including potential loses and injuries.

A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identical hazards. This risk assessment shall include:

i. A description of the type, location, and extent of all hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

ii. For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

1.1 HAZARD IDENTIFICATION

Hazard Identification (HAZID) is "the process of identifying hazards" which forms the essential first step of a risk assessment. There are two possible purposes in identifying hazards:

i. To obtain a list of hazards for subsequent evaluation using other risk assessment techniques. This is sometimes known as "failure case selection".
ii. To perform a qualitative evaluation of the significance of the hazards and the measures for reducing the risks from them. This is sometimes known as "hazard assessment".

During the hazard identification stage, the criteria used for the screening of the hazards will be established and possible hazards and accidents will be reviewed. For this purpose, the facility will be divided into several sections. Furthermore, the identified hazards will be classified into critical and non-critical hazards. It is of great importance that the hazards considered non-critical are clearly documented in order to demonstrate that the events in question could be safely disregarded. This failure case selection will be executed by generating checklists, accidents and failure statistics, hazard and operability studies (HAZOPs) or by comparison with detailed studies and experience from previous projects.

The Outcomes of The Hazard Identification Process Are To:

i. Identify all major incidents which could occur at the facility(irrespective of the existing control measures)
ii. Provide the employer and employees with sufficient knowledge, awareness and understanding of the causes of major incidents to be able to prevent and deal with them.
iii. Provide a basis for identifying, evaluating, defining and justifying the selection (or rejection) of control measures for eliminating or reducing risks.
iv. Show clear links between hazards, causes and potential major incidents.

v. Provide a systematic record of all identified hazards and major incidents, together with any assumptions.

The operator must base the hazard identification process on a comprehensive and accurate description of a facility, including all necessary diagrams, process information, existing conditions, modifications and material safety data sheets (MSDS). Prior to conducting the hazard identification, the operator should collect all relevant information, compile it and check it for accuracy.

The hazard identification may be supported by past risk assessments and historical incident data. The operator should refer to previous hazard studies, if they are relevant to identifying major incidents, and consider all issues discussed in this guidance note.

However, The Operator Must Ensure That Any Existing Studies:

i. Are fully understood by the hazard identification participants
ii. Are still relevant for the current operating conditions and condition of the facility
iii. Were conducted to an acceptable standard
iv. Addresses identified gaps.

While previous studies can be helpful, it cannot be assumed that they are correct the absence of hazards in previous risk studies should not be taken as an indication that there are no hazards to be identified. It may be that the previous hazard identification process was inadequate, hazards were screened out and/or there have been changes to the facility since the risk study.

It is useful to have a record of the facility and industry's incidents or near misses at the hazard identification workshop. Incidents or near misses, either at the facility or at similar facilities, provide a clear indication of what has gone wrong in the past and could go wrong again.

This information is best used as a quality check at the workshop to avoid missing potential hazards and major incident scenarios. The operator should review its own plant operating history and conditions for potential scenarios.

Work place safety requires effective identification, assessment and control of significant workplace hazards.

The Hazard Management Steps are:

1. Identification of hazards.
2. Determination of their significance.
3. Control of significant hazards by Elimination, Isolation or Minimization.
4. Training and advising staff of control measures in place.

A Hazard management system contains:

A systematic process for identifying existing hazards in workplace.

A systematic process for identifying new hazards in workplace.

A process to review hazards to determine their significance and adequacy of control.

A systematic process to ensure that the selected controlsin place or not only adequate but the controls are in keeping with industry standards.

1.2 RISK ASSESSMENT

Risk assessment is the process used to determine the likelihood that people may be exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process.

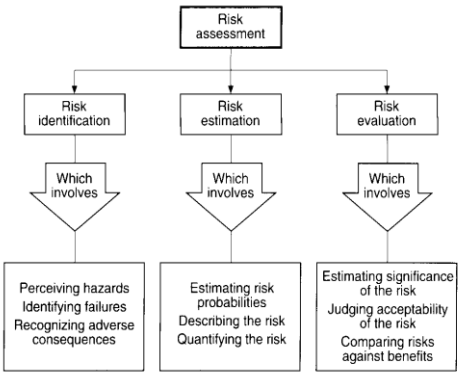

Figure:1.2.1: Procedure for risk assessment

There certain logical steps to take when carrying out a risk assessment

Step 1 - Identify the hazards

Step 2 -Decide who might be harmed and how

Step 3 - Evaluate the risks and decide on precautions

Step 4 -Record your findings and implement them

Step 5 -Review your assessment and update if necessary

1.3 TYPES OF RISK ASSESSMENTS

There are two types of risk assessments:

i. *QUALITATIVE*: Object probability estimate based upon known risk information applied the circumstances being considered.
ii. *QUANTITATIVE:* This type is subjective, based upon personal judgment backed by generalized data risk.

The two types of risk assessment (qualitative and quantitative) are not mutually exclusive. Qualitative assessments are easier to make and are the ones required for legal purposes. When there are types of work, whose hazards and risks are similar in different workplaces or physical areas, a general risk assessment can be made.

1.4 RISK ASSESSMENT CONCEPTS

Risk assessments should be include in the safety policy document.

a) Establish who in the ground has carried out the risk assessments.
b) Ask the ground who will be responsible for carrying out risk assessments in their places.
c) Assess knowledge of groups by asking then what has be assessed in terms of "risk".

The Health& Safety at work etc.Act,1974 has, for nearly 20 years,required employers to take "reasonably practicable" precautions in various areas to safeguard employees.

To do this and to ensure that "reasonably practicable" precautions are taken it is necessary to make a balanced judgment about the extend of the risk and its consequences against the time, trouble and cost of the steps needed to remove or reduce it.

It can be said that the steps are not necessary only if the cost is "grossly disproportionate". With the introduction of the Management of Health and Safety at Work Regulations 1992,employers now has to record significant results and the information based upon the assessments are given to employees in a much more specific way.

1.5 BENEFITS OR RISK ASSESSMENT

To enable control measures to be devised.

i. To gain an idea of relative importance of risks.
ii. To take decisions on controls which are cost effective and appropriate.

According to the Health and Safety Executive: "Risk assessment is not end to itself.It is a means to better management of safety. It is a thinking process which enables management of determined priorities and allocates resources in a way which will better control or eliminate risks to health and safety at work".

Risk assessments will help the mine operators to identify high, medium and low risk levels. Risk assessments will help to priorities risks and provide information on the probability of harm arising and severity of harm by understanding the hazard, combine assessments of risk as an aid to decision making. In this way, mine owners and operators will be able to implement safety improvements. Different types of approaches for the safety in mines various tools and appropriate steps have to be taken to make mining workplace better and safer.

A Hazard Identification and Risk (HIRA)analysis is a systematic way to identify and analyze hazards to determine their scope, impact and the vulnerability of the built environment to such hazards and its purpose is to ensure that there is a formal process for hazard identification ,risk assessment and control to effectively manage hazards that may occur within the workplaces.

1.6 PURPOSE OF THE HAZARD ANALYSIS AND RISK ASSESSMENT

The preparation of a hazard analysis and risk assessment is an important first step in the emergency planning process. The results of this research will be of value in helping Regional staff understand the probability and severity of emergencies that may occur in the Region. With this knowledge, the level of preparedness can be assesses and measures taken to enhance capabilities through training and preparation of a more effective response to such occurrences. Consequently, it is felt that a rigorous hazard analysis and risk assessment process represents a valuable emergency-planning tool for the Region.

i. Identify what hazards that could affect the place.
ii. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards.
iii. Estimate losses and prioritize the potential risks to the community.

Identification of hazards, will determine all the hazards that might affect the area. The hazards will be ranked to determine what happens are most likely to impact The communities.

Hazards that are determined to have significant impact will be analyzed in the greatest detail to determine the magnitude of future events and the vulnerability for the community and critical facilities. Hazards that receive a moderate impact ranking will be analyzed with available data to determine the risk and vulnerability to the specified hazard. The limited impacts hazards will be analyzed using the best available data determine the risk to the community.

1.7 HIERARCHY OF CONTROLS

Figure 1.7.1:HIERARCHY OF CONTROLS

Riskis defined as likelihood that a hazard will cause a specific bodily injury to any person. Upon identifying the hazards, risks related to such hazards are to be determined. Thereafter, risk controls are to be introduced where practicable to eliminate such risks where risk cannot be eliminated, the introduction of risk controls is to follow the principles of hierarchy of control.

That is, introducing risk controls should start with:

Firstly – Elimination
Secondly - Substitution
Thirdly - Engineering control
Fourthly - Administrative control
Lastly - Provision and use of suitable personal Protective Equipment

1.7.1. Elimination

Elimination of hazards refers to total removal of the hazards and hence effectively making all the identified possible accidents and ill health impossible.

This is a permanent solution and should be attempted in the first instance. If the hazard is removed, all the other management controls, such as workplace monitoring and surveillance, training, safety auditing, and record keeping will no longer be required.

1.7.2 Substitution

Substitution involves replacing the hazard by one that presents a lower risk.

1.7.3 Engineering Controls

Engineering controls are physical means that limit the hazard. These include structural changes to work environment or work processes, erecting a barrier to interrupt the transmission path between the worker and the hazard

1.7.4Administrative Controls

This reduces or eliminates exposure to a hazard by adherence to procedures on the instructions. Documentations should emphasis all the steps to be taken and the controls to be used in carrying out the activity safely.

CHAPTER 2RISK MANAGEMENT

2.1 HAZARD IDENTIFICATION

This is the process of examining each work area and work task for the purpose of identifying all the hazards which are "inherent in the job". Work areas include but are not limited to machine workshops, laboratories, office areas, agricultural and horticultural environments, stores and transport, maintenance and grounds, reprographics, and lecture theatres and teaching spaces. Tasks can include (but may not be limited to) using screen based equipment, audio and visual equipment, industrial equipment, hazardous substances and/or teaching/dealing with people, driving a vehicle, dealing with emergency situations, construction. This process is about finding what could cause harm in work task or area.

2.2 HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

The process of risk assessment involves following basic steps,

1. Identify and classify routine &non routine activities.
2. Identify hazards from activities.
3. Estimate the risk from each hazard and severity of harm.
4. Decide if the risk is acceptable.
5. Prepare risk control action plan, if necessary
6. Review adequacy of action plan.

2.3 RISK ASSESSMENT

Risk assessment is the process by which the results of a risk analysis (ie.., risk estimates) are used to make decisions, either through relative

ranking of risk reduction strategies or through comparison with risk targets. Risk assessment is the process used to determine the likelihood that people may be exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process. Risk assessment is the process where you:

1. Identify hazards.
2. Analyze or evaluate the risk associated with that hazard.
3. Determine appropriate ways to eliminate or control the hazard.

In practical terms, a risk assessment is a thorough look at your workplace to identify those things, situations, processes, etc that may cause harm, particularly to people. After identification is made, you evaluate how likely and severe the risk is, and then decides what measures should be in place to effectively prevent or control the harm from happening.

Risk assessments are very important as they form an integral part of a good occupational health and safety management plan. They help to:

1. Create awareness of hazards and risks.
2. Identify who may be at risk (employees, cleaners, visitors, contractors, the public, etc).
3. Determine if existing control measures are adequate or if more should be done.
4. Prevent injuries or illnesses when done at the design or planning stage.
5. Prioritize hazards and control measures.

The aim of the risk assessment process is to remove a hazard or reduce the level of its risk by adding precautions or control measures, as necessary. By doing so, you have created a safer and healthier workplace.

2.4 CONSEQUENCE OR SEVERITY

1. Low: May cause minor injury / illness or no lost time.
2. Medium: May cause lost time injury / illness.
3. High: May cause serious or fatal injury / illness.

2.4 RISK MANAGEMENT:

Risk management is the process of identifying, quantifying, and managing the risks that an organization faces. As the outcomes of business activities are uncertain, they are said to have some element of risk. These risks include strategic failures, operational failures, financial failures, market disruptions, environmental disasters, and regulatory violations. Risk is a statistical concept that is measured using statistical concepts that are related to the unknown future. Almost all investments are exposed to it.

Once a hazard has been identified, a series of steps have to be followed. This applies equally whether the risk is something easily rectified such as removing a simple tripping hazard or whether it is something major that needs policy changes or significant modification to the work environment.

Risk management involves identifying the types of risk exposure within the company, measuring those potential risks, proposing means to hedge, insure or mitigate some of the risks and estimating the impact of various risks on the future earnings of the company.

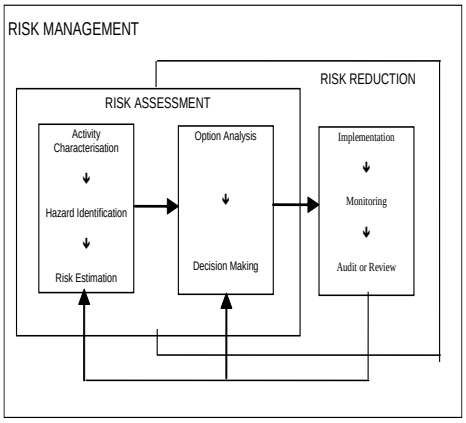

FIGURE 2.1 RISK MANAGEMENT METHOD

2.5 Risk management includes following steps:

Hazard Identification

Hazard Analysis

Hazard Assessment

Risk Analysis of high hazard assessed

Risk Assessment (low, medium & high risks)

Once a hazard has been identified, a series of steps have to be followed. This applies equally whether the risk is something easily rectified such as removing a simple tripping hazard or whether it is something major that needs policy changes or significant modification to the work environment.

Risk management involves identifying the types of risk exposure within the company, measuring those potential risks, proposing means to

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While it is impossible that companies remove all risk from the organization, it is important that they properly understand and manage the risks that they are willing to accept in the context of the overall corporate strategy. The management of the company is primarily responsible for risk management, but the board of directors, internal auditor, external auditor, and general counsel also play critical roles.

Risk can be managed in a number of ways: by the buying of insurance, by using derivative instruments as hedges, by sharing risks with others, or by avoiding risky positions altogether.

Risk management includes following steps:

1. Hazard Identification.
2. Hazard Analysis.
3. Hazard Assessment.
4. Risk Analysis of high hazard assessed.
5. Risk Assessment (low, medium & high risks)

2.6 PRELIMINARY HAZARD ANALYSIS (PHA)

Preliminary hazard analysis (PHA) is a semi-quantitative analysis that is performed to:

1. Identify all potential hazards and accidental events that may lead to an accident.
2. Rank the identified accidental events according to their severity.
3. Identify required hazard controls and follow-up actions.

Several variants of PHA are used, and sometimes under different names like

1. Rapid Risk Ranking
2. Hazard identification (HAZID)
3. Hazard Operability Study (HAZOP)

2.7 The PHA shall consider:

1. Hazardous components
2. Safety related interfaces between various system elements, including software
3. Environmental constraints including operating environments
4. Operating, test, maintenance, built-in-tests, diagnostics, and emergency procedures
5. Facilities, real property installed equipment, support equipment, and training
6. Safety related equipment, safeguards, and possible alternate approaches
7. Malfunctions to the system, subsystems, or software

CHAPTER 3 LITERATURE REVIEW

3.1 Duijm (2001) - DIFFERENT HAZARD TECHNIQUES FOR DISPOSING DECOMMISIONED AMMUNITION

Use has been made of functional modeling as a basis for hazard identification. Risk levels are estimated based on general accident rates in the chemical industry. The disposal techniques are “open burning” (OB),”open detonation”(OD),”closed detonation”(CD),”fluidized bed combustion”(FBC),”rotary kiln(RK) incineration”, “mobile incineration” and Comparative risk levels for alternative disposal techniques for ammunition have been derived using hazard identification based on functional modeling of the techniques in combination with the required manpower to perform the operations.

3.2 Khan et al. (2001) - OPTIMAL RISK ANALYSIS

Developed safety weighted hazard index (SWeHI). In quantitative terms, SWeHI represents the radius area under moderate hazard (50% probability of fatality/damage). In mathematical term it is represented as:

$$SWeHI = B/A$$

Where B = Quantitative measures of damage that can be caused by unit/plant.

A= credits due to control measures and safety arrangements.

3.3 Bell and Glade (2003) - RISK ANALYSIS FOCUSING ON RISK TO LIFE

They calculated land slide risk and occurrence of potential damaging events as well as the distribution of the elements at risk and proposed the following approach for risk evaluation:

RISK= HAZARD * CONSEQUENCE*ELEMENT OF RISK

3.4 Dziubinski et al. (2006) - BASIC INDIVIDUAL AND SOCIETAL RISK

Studied basic reasons for pipeline failure and its probable consequences taking individual and societal risk into consideration and

proposed methodology of risk assessment for hazards associated with hazardous substance transport in long pipelines. Taking that methodology as example, subsequent stages of risk analysis were considered paying special attention to applied techniques and calculation models. A specific feature of this methodology was a combination of qualitative and quantitative techniques, which offer a possibility of a full risk assessment for long pipelines.

3.7 SAFETY AND HEALTH IN WORK

Sabina Irimiea*, RaresMunteanua, MihaelaGhicajanua, Laura Maricaa (2014) The present paper approaches the problem of safety and health in work . The methodology of research implies the online questioning on a random sample. The main results of the research show the occupational range, the employees' perception on the workplace and on the risks

3.8 CORRELATING FAILURE MODE EFFECT ANALYSIS (FMEA) & OVERALL EQUIPMENT EFFECTIVENESS (OEE)

Chandrajit P Ahire, et,al., states that they had made an attempt relation between OEE & FMEA, all the parameters of OEE are evaluated with respect to FMEA, Total 32 hypothesis are considered to relation between OEE and FMEA. The performance and quality rate are to be calculated using the similar data from OEE and RPN and to be computed. The correlation and mini tab techniques are being used. Finally the author states to improve the OEE using RPN results.

3.9 RISK ASSESSMENT OF GASEOUS/PARTICULATE PHASE PAH EXPOSURE IN FOUNDRY INDUSTRY.

Hung-HsinLiub, et.al., in this journal discusses about the PAH exposure in the different zones of the foundry. He taken Thirty-seven air samplings in different working areas of two foundry industries were collected to assess polycyclic aromatic hydrocarbon (PAH) levels. The hazard rate in the each zone is being discussed and he suggests that the workers shall use appropriate respiratory masks in painting, melting and pouring areas to control and prevent their occupational exposure of PAHs upto to a certain limit and their disease occurrence due to PAH exposure also discussed.

3.10 Practical tool and procedure for workplace risk assessment: Evidence from SMEs in Estonia

Karin Reinhold et al., (2015) focused on risk assessment of hazards (physical, chemical and biological) from 18 industrial SMEs industries.The main identified hazards which exceeded occupational exposure limits were: wood dust in wood processing industry, chemicals and noise in wood processing and mechanical industry, and lighting in mechanical, plastic and printing industry. The authors' developed flexible risk assessment tool was successfully implemented in all investigated SMEs. To connect risk levels and health complaints, the FRA tool was used. The main target in this activity is the left side of the model, where the risk level is higher (intolerable, inadmissible and unjustified risks).The results of this study indicate that the proposed FRA tool can be used effectively as one possibility to perform risk assessment in SMEs.

3.11 Work Related Injuries and Associated Risk Factors Among Iron And Steel Industries Workers In Addis Ababa, Ethiopia

ManayKifle (2014) have demonstrated a high prevalence rate of work-related Injuries.To assess the prevalence of work related injuries and associated risk factors among production workers in iron and steel industries in Addis Ababa, Ethiopia. Four industries taken for this survey, 453 production workers were selected by simple random sampling. Data was collected by face to face interview using pre-tested and structured questionnaire, review of records and by check lists. Work-related injuries were high in the industries workers. Work stress, non use of PPE, consuming alcohol during working days, and excessive noise were observed as modifiable risk factors. The injury prevalence rate was 33.3% per year and most common causes of injury were splitting and flying objects (16.4%), hit by falling objects (13.7%) and machinery (12.6%). Workers were exposed to preventable workplace hazards such as to excessive noise, fumes and dusts and to old and unguarded machines, splitting materials and sparking of metals. Workers consuming alcohol during working days, without spouse, perceiving their work highly stressful and not using personal protective equipment (PPE) were more likely to be injured than their counterpart. The author suggested that the industries should display safety information at appropriate places, provide training and promote and enforce PPE use among workers being crushed when a box fell from the conveyor and he reached under the elevator while it was descending. For the remaining 104 accident risk assessment not carried out but OHS personnel and managers has carry out machinery risk assessment with the participation of workers because the advantages are numerous; hazards are identified effectively and better risk reduction measures can be implemented, injuries and deaths are prevented. It needs to (i) prioritize risk assessment or at least hazard identification, (ii) use fixed guards as well as interlocked moveable

guards to protect hazardous zones (moving parts of machinery), (iii) ensure that lockout procedures are applied, (iv) properly train and supervise new and/or inexperienced workers and (v) prevent the ypassing (defeating) of safeguards

3.1.1 THE FACTORIES ACT 1948

Section 38 Precautions in case of fire

In every factory, all practicable measures shall be taken to prevent outbreak of fire and its spread, both internally and externally, and to provide and maintain -

1. Safe means of escape for all persons in the event of fire, and
2. The necessary equipment and facilities for extinguishing fire.

Effective measures shall be taken to ensure that in every factory all the workers are familiar with the means of escape in case of fire and have been adequately trained in the routine to be followed in such cases.

The State Government may make rules, in respect of any factory or class or description of factories, requiring the measures to be adopted to give effect to the provisions of sub-sections (1) and (2).

Notwithstanding anything contained in clause (a) of sub-section (1) or sub- section (2), if the Chief Inspector, having regard to the nature of the work carried on in any factory, the construction of such factory, special risk to life or safety, or any other circumstances, is of the opinion that the measures provided in the factory, whether as prescribed or not, for the purposes of clause (a) of sub-section (1) or sub-section (2), are inadequate, he may, by order in writing, require that such additional measures as he may consider reasonable and necessary, be provided in the factory before such date as is specified in the order.

3.22.2 Tamil Nadu Factories Rules, 1950

Rule 61. Fire Protection:

(1) Processes, equipment, plant, etc involving serious explosion and serious fire hazards.-

1. All processes, storages, equipments, plants, etc. involving serious explosion and flash fire hazard shall be located in segregated buildings where the equipment shall be so arranged that only a mimimum number of employees are exposed to such hazards at any one time.
2. All industrial processes involving serious fire hazard should be located in buildings or work places separated from one another by walls of fire-resistant construction.
3. Equipment and plant involving serious fire or flash fire hazard shall, wherever possible , be so constructed and installed that in case of fire, they can be easily isolated.
4. Ventilation ducts, pneumatic conveyors and similar equipment involving a serious fire risk should be provided with flame-arresting or automatic fire extinguishing appliances, or fire resisting dampers electrically interlocked with heat sensitive/smoke detectors and the air-conditioning plant system.
5. In all workplaces having serious fire or flash fire hazards, passages between machines, installations or piles of material should be at least 90 com. wide. For storage piles, the clearance between the ceiling and the top of the pile should not be less than 2m.

(2) Access for fire fighting.

1. Buildings and plants shall be so laid out and roads, passageways etc. so maintained as to permit unobstructed access for fire fighting.
2. Doors and window openings shall be located in suitable positions on all external walls of the building to provide easy access to the entire area within the building for fire fighting.

(3) [Protection against lighting.] - Protection from lightning shall be provided for -

1. Building in which explosive or highly flammable substances are manufactured, used, handled or stored;
2. Storage tanks containing oils, paints or other flammable liquids ;

CHAPTER-4METHODOLOGY

4.1) IDENTIFICATION OF OCCUPATIONAL HAZARDS AND RISK TO HEALTH

(a) Activity/ Hazard &Risk Analysis is conducted for all activities considering following:

Listing of activities/ processes in the company.

Involving skilled /regular/contract workers depending upon the activities.

Studying of their activities/ behavior/reaction.

(b) Whenever new processes / activities are introduced or any of the existing process/activities is to be altered then the impact of the change is reviewed before incorporating the change .In addition once a year HIRA is reviewed to identify the changes.

(c) While identifying OH&S hazard and risk following issues are considered

All routine &non routine activities.

Activities of all personnel having access to the work place (includingSub-contractor and visitors.

Human behavior capabilities and other human factors.Identified hazard originating outside the workplace capable of adverselyaffecting the health and safety of person in the organization.

Hazards created in the vicinity of the workplace by work related activities.

Infrastructure equipment and materials at the workplace whether provided by the organization or other.Change or proposed change in the organization its activities material.

Modifications including temporary changes and its impact on operation.Process and activities.Legal requirements related to activities performed and related controls.

Design of work area processes installation machineries /equipment operating Procedures and activities performed including their adaption to human Capability.Investigation results of previous incident accidents.

Feedback suggestion observation form workman or any person.

4.2TYPE / CONDITIONS OF THE JOB

During the risk assessment following type of jobs /situations /conditions was considered

ROUTINE: Done by usual/regular method of procedure.

NON ROUTINE: Unusual / non regular method of procedure.

NORMAL CONDITION: Risks converted to tolerable condition by way of engineering control or by using PPE.

ABNORMAL CONDITION: deviation from normal condition which requires immediate attention.

*EMERGENCY CONDITION***:** Hazards and Risks which are contained or mitigated by invoking emergency procedures.

4.3 OH&S Risks

The whole process of Hazard identification, risk assessment and risk control shall be done under all the three conditions viz :

1. Normal operating conditions`.
2. Abnormal operating conditions.
3. Emergency conditions.

Control of Significant OH&S Risks

The Control of significant OH&Srisks involves three possible alternatives viz.

1. Termination
2. Treatment
3. Tolerance

Termination

Termination of the OHS risks by such actions, that they cease to exist. Usually these are specific actions that can be completed in short term.

Examples are eliminating water circulation for RHF, providing a platform in place of portable ladder.

Treatment

Improvement in OHS performance can be achieved through treatment of significant OHS risks of different activities. Specific projects shall be undertaken for performance improvement.

Examples are Provision of bund wall in converter to protect the cables (property damage) in case of spillage of hot metal, modifying the acid loading method to avoid exposure of personnel to acid.

Tolerance

Some of the OHS risks may not be so easily amenable for performance improvements or the present resources do not permit undertaking of improvement (Management) programs immediately. In such an event it may be necessary to tolerate the actions. However such activities shall be carried out in a prescribed manner to contain and maintain present level of performance.

4.4 EVALUTION OF OCCUPATIONAL HAZARDS & ASSOCIATED RISKS TO THE HEALTH AND IDENTIFGICATION OF SIGNIFICANT OCCUPATIONALHEALTHHAZARDS&RISKS

Criteria for risk assessment are developed through brainstorming and discussion by core item. The scoring is based on

1) Severity to health /safety : Type of injury or the effect of injury on the persons and type of intervention required / expected duration
2) Probability: Chances / likelihood of occurrences or past data on when it had occurred.
3) Control ranking: Type of control and issues related to implementation / adherence.

Table-3.3.1 PROBABILITY/ SEVERITY RATING

Rating	Severity				Probability of Occurrence
	Noise	Financial Loss	Injury	Health	
1	< 40 dB	> 100	Injury like small cut / abrasion which requires treatment only in the Department itself.	Momentary discomfort / Nuisance	More than six months
2	40 to 74 dB	> 1000	Injury which requires treatment only in the Occupational health center as a result of any accident / incident and immediately returning to duty	Prolonged discomfort / Nuisance	Once in a month to six months
3	75 to 89 dB	> 10000	Injury which requires treatment only in the Occupational health center as a result of any accident / incident and leading to suspension of work more than three hours.	Minor health impact / requiring nurse / Self attention	Once in a week to month
4	90 to 104 dB	> 100000	Minor accident causing injury requiring self / nurse / doctor attention (may be outside) leading to suspension of activity for more than a day or two	Major health impact / requiring doctor's attention / temporary disability	Once in a day to week
5	>= 105dB	> 1000000	Major accident like disability, amputation or even fatal.	Permanent disability	Multiple times a day or continuous

4.6 CRITERIA FOR SIGNIFICANCE

Hazard and associated risks are categorized as significant when

1. The risk having a score equal or more than 12
2. Severity equal or more than 3 irrespective of the total rating
3. All Emergency (No rating given)
4. Any Legal applicable (No rating given)

4.7 IDENTIFICATION OF SIGNIFICANT RISK

After identifying the various hazards the significant risk (i.e.) unacceptable risk after arriving the present control measures are filtered and tabulated separately for the easy reference. The priority of identification is chosen by RPN for the hazard.

4.8 PRELIMINARY ACTIVITY

A detailed study on control measure has been done. As figured earlier in fig 4.1hierarchy of control measures. This preliminary activity involves,

1. Health and safety instructions; and operational control procedure are prepared for different activities involved in machining operation.
2. Material safety data sheet (MSDS) for various chemicals used in process has been extracted.
3. PPE's are studies in depth and guidelines have been prepared for the project reference.

4.9 HEALTH AND SAFETYINSTRUCTION

Health and safety instruction are the set of written instructions that identify the health and safety issues that may arise from use of the machinery and equipment or be based on the task or process.

A safe work procedure should identify:

1. The steps are to be undertaken that pose risk.
2. Any control measures that have been built into these tasks.
3. Any training or qualification required to undertake the task.
4. Personal protective equipment to be worn.
5. Action to be under taken to reduce the risks in undertaking the task.

Health and safety instructions do not replace the requirement for training; they may however be used to supplement or guide the training process and provide remainders for employers and employee on the operating protocols and controls.

The purpose of these instructions is to ensure that safe work instructions are developed for all tasks, machinery and equipment where there are potential risks of harm to any persons, property or the environment.

The development of safe work instructions is to:

1. Outline a safe method for work for a specific task or use of machinery /equipment.
2. Provide an instruction document that students and staff must read and understand before starting an activity.
3. Meet legal requirements for hazard and risk assessment and control.
4. Provide evidence in audits and OHS workplace inspections.

4.10 OPERATIONAL CONTROL PROCEDURE

A standard operating procedure is a set of instructions having the force of a directive, covering those features of operation that lend themselves to a definite or standardized procedure without loss of effectiveness.

Operational controls are developed and implemented to ensure that the potential for

significant negative environmental impacts are minimized.

Operational controls describe specific operations for controlling and managing the activities, processes, products, and services associated with the significant environmental aspects .

Operational controls should;

1. prevent pollution
2. comply with legislation and regulations
3. continually improve
4. achieve objectives and targets

Operational controls are developed and implemented to ensure that the potential for significant negative environmental impacts are minimized.

An implementing procedure, physical control, checklist, training, employee expertise, or other means of controlling operations to manage significant environmental aspects and/or legal and other requirements.

4.11 MATERIAL SAFETY DATA SHEET

A material safety data sheet (MSDS)is an important component of product and occupational safety and health.

It is a document that contains information on the potential hazards and how to do work safely with the chemical products .the MSDS contains much more information about the material than the label

There are 16 categories of information that must be present on an MSDS. These categories are specified in the controlled products regulations and include:

1. identification of the material and supplier
2. hazardous identification
3. composition/information on ingredients
4. first aid measures
5. fire fighting measures
6. accidental release measures
7. handling and storage
8. exposure controls/personal protection
9. physical and chemical properties
10. stability and reactivity
11. toxicological information
12. ecological information
13. disposal consideration
14. transport information
15. regulatory information
16. other information

CHAPTER 5CONCLUSION

Thus hazard identification and risk assessment study were made and various hazards of different equipments and process were found. Safety instructions, material safety data sheet, and hierarchy of controls were updated.

Reference

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- Harremoës, Poul, ed. *Late lessons from early warnings: the precautionary principle 1896–2000*.
- John M. Lachin. *Biostatistical methods: the assessment of relative risks*.
- CFR, Title 29-Labor, Part 1910--Occupational Safety and Health Standards, § 1910.119 U.S. OSHA regulations regarding "Process safety management of highly hazardous chemicals" (especially Appendix C).
- FAA Order 8040.4 establishes FAA safety risk management policy