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HAZARD IDENTIFICATION AND RISK ASSESSMENT

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ABSTRACT: When used as a risk assessment tool, a Hazard Identification, Risk Assessment (HIRA) system can help users find potential dangers and weigh the pros and cons of each one. This risk assessment tool will help find any possible threats linked to each department's job. When a threat has been located, the next step is to catalog all of the associated hazards. If the anticipated risk is determined to be higher than the low risk category, then the different control strategies will be taken into consideration. Concurrently, the user can update the current information system by adding new work plans, tasks, and control measures to the system.
Keywords: Hazard Identification, Risk Assessment or HIRA system.

1. INTRODUCTION

The term "Hazard Identification Risk Assessment" (HIRA) refers to a process in which potential threats are characterized and described, together with the possibility, frequency, and severity of any adverse outcomes, such as injuries or losses. The results of a risk assessment serve as the basis for the measures that are planned to be taken by the strategy in order to reduce losses that are caused by recognized risks. It is necessary for local risk assessments to provide sufficient information in order to identify and prioritize appropriate mitigation methods in order for a jurisdiction to be able to reduce losses caused by the same threats. As part of this risk assessment, you are required to have all potential threats to the jurisdiction, together with descriptions of those threats, locations of those threats, and severity levels of those threats. There is a requirement that the strategy incorporate information regarding the frequency and severity of dangers, as well as their anticipated occurrences in the future. According to the risk assessment component of a plan that encompasses more than one jurisdiction, it is necessary to determine the extent to which the risks in each jurisdiction are distinct from the concerns of the overall planning area.

HAZARD IDENTIFICATION

The first stage of any risk assessment is Hazard Identification, or HAZID for short. The act of danger identification can fulfill two functions:

- To develop a list of probable hazards, which can then be evaluated using various risk assessment methodologies. "Failure case selection" is another term for this.
- To conduct a qualitative assessment of the risks posed by the hazards, as well as the effectiveness of mitigation solutions. This is also known as a "hazard assessment".

During the hazard identification step, potential risks and accidents will be investigated, and screening criteria will be established. Several places will be built within the facility to suit this purpose.

Received: February 04, 2024 / Revised: February 27, 2024 / Accepted: March 06, 2024 / Published: March 11, 2024
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Furthermore, we will categorize the observed threats as critical or non-serious. To demonstrate that the occurrences in question might be safely ignored, it is necessary to properly document the threats that are considered non-serious. To carry out this failure case selection, HAZOPs will be developed, checklists will be created, and data on accidents and failures will be gathered. Alternatively, significant research and learning from previous initiatives will be compared.

Goals of the Risk Assessment Procedure Are to

- Regardless of the current control methods, make a list of all possible big incidents that could occur on the site.
- To prevent and handle severe incidents, both the employer and the employees must be educated about the causes.
- Provide a beginning point for identifying, assessing, defining, and justifying the selection (or lack thereof) of control methods to eliminate or decrease risks.
- Make direct linkages between threats, their sources, and potentially catastrophic events.
- Document all known hazards, major events, and assumptions in a systematic manner.

The hazard identification process must begin with an accurate and detailed description of the facility, which includes all pertinent schematics, process details, existing conditions, changes, and material safety data sheets (MSDS). Before proceeding with the danger identification, the operator must collect, arrange, and double-check all of the essential information.

Previous risk evaluations and occurrence records may lend credibility to the danger identification. Prior hazard studies should be evaluated by the operator if they are relevant to identifying serious accidents, and all issues raised in this advice note should be carefully explored. However, it is the operator's responsibility to ensure that all prior research

- Are fully understood by those concerned in identifying hazards
- Are still relevant for the current operational conditions and condition of the facility?
- Were performed to a suitable quality.
- Fills in defined gaps.

Although related research can be enlightening, it does not guarantee accuracy. Just because no threats have been identified in previous risk evaluations does not imply that none exist. Reasons for this could include facility alterations since the risk study was performed, deficiencies in the previous hazard identification approach, or the eradication of some hazards through screening.

Keeping note of incidents and near-misses at the site and at the industry's hazard identification workshop is an invaluable resource. Incidents or near misses at the plant or similar facilities provide a clear picture of what went wrong and what could go wrong again.

To avoid overlooking any potential hazards or major incident scenarios, this data is best used as a quality check in the workshop. To prepare for any eventuality, the operator should review the facility's previous and current operating conditions. To create a safe working environment, it is vital to identify, assess, and eliminate any hazards.

Here are the steps to manage hazards:

- Identifying possible dangers.
- Their importance will be assessed.

- Managing large risks by eliminating, isolating, or mitigating their impact.
- Instructing and mentoring personnel about the control measures that have been implemented.
- A system for managing dangers comprises the following:
- Methods for methodically identifying potential hazards in the workplace.
- A rigorous strategy to identifying unknown workplace concerns.
- A strategy for determining risk and the efficacy of mitigation strategies.
- A rigorous technique for ensuring that the chosen controls are adequate and in accordance with industry standards.

RISK ASSESSMENT

After a danger has been identified, the next step is to conduct a risk assessment to find out how likely it is that workers could get hurt or sick on the job.

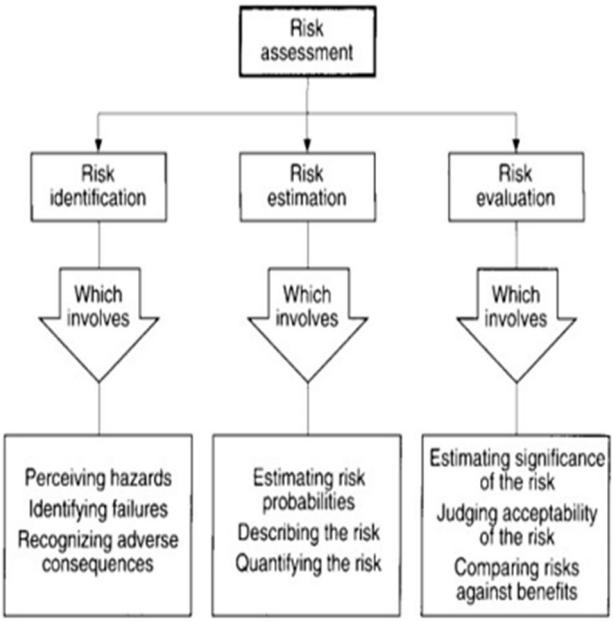

Figure:1: Procedure for risk assessment

When doing a risk assessment, it is prudent to follow a certain process.

- First thing to do: Locate Potential Dangers
- The second stage is to determine who could be hurt and how.
- Third, decide what steps to take after considering the dangers.
- Fourth, take note of your results and put them into action.
- The fifth step is to analyze your assessment and make any necessary modifications.

TYPES OF RISK ASSESSMENTS

QUALITATIVE:

An assessment of the likelihood of an event occurring given the current set of parameters, using data on previously identified risks.

QUANTITATIVE:

This is subjective, depending on generalized data risk and personal assessment. Quantitative and qualitative risk assessment are compatible. Making qualitative judgments is easier and mandated by

law. A broad risk assessment can be done for work with similar hazards and risks in different workplaces or locations.

RISK ASSESSMENT CONCEPTS

- The safety policy document ought to contain risk evaluations.
- You need to find out who did the risk evaluations down there.
- Determine on the spot who is responsible for carrying out risk assessments in each area.
- Use the question "what has been assessed as risk?" to gauge the level of group understanding.
- Businesses have been required to take "reasonably practicable" measures to ensure the safety of their employees for almost 20 years now, thanks to the Health and Safety at Work Act of 1974.
- This can only be achieved by comparing the severity of the threat and its consequences to the effort, expense, and time needed to eliminate or mitigate it. Only then may "reasonably practicable" protections be put in place.
- Whenever the expense is "grossly disproportionate" is when the measures might be eliminated as being needless. The Management of Health and Safety at Work Regulations 1992 mandate that companies document important results and provide employees with information based on evaluations in a far more transparent way.

BENEFITS OR RISK ASSESSMENT

- So that control strategies can be devised.
- To gain a sense of how significant the threats are.
- To make appropriate and cost-effective decisions on controls.
- The Health and Safety Executive maintains that risk assessments cannot be stopped. The purpose is to improve the safety management system. This mode of thinking enables the management of defined priorities and the allocation of resources in order to better control or eliminate workplace safety hazards.
- Mine operators can utilize risk assessments to classify danger as high, medium, or low. Together, risk assessments and hazard knowledge can help prioritize risks, provide information on the likelihood and severity of harm, and, ultimately, advise decisions. This approach allows mine owners and operators to improve safety measures. To improve and protect the mining workplace, a variety of strategies, tactics, and procedures must be adopted.
- It is critical to have a structured procedure in place for hazard identification, risk assessment, and control in order to effectively manage potential workplace risks. A Hazard Identification and Risk Analysis (HIRA) is a systematic approach to accomplishing this. It entails systematically detecting and studying hazards in order to establish their scale, effect, and the vulnerability of the built environment to them.

GOAL OF HAZARD ANALYSIS AND RISK ASSESSMENT

Creating a risk assessment and hazard analysis is an important first step in disaster planning. Staff in the Region will benefit from this research since it will shed light on the possibility and potential effect of regional emergencies. With this knowledge, we can assess our current level of preparedness and take actions to improve our skill sets in order to respond to such events more effectively. As a result,

it is felt that the Region would considerably benefit from undertaking a comprehensive risk assessment and hazard analysis method.

- Determine what types of threats may exist in the area.
- Evaluate potential hazards and identify the community resources that may be most impacted.
- Make a loss assessment and prioritize the community's potential threats in order of severity.
- Once all possible hazards in the area have been identified, they can be handled. We shall prioritize the hazards according to their possible impact on the community.

The most pressing dangers will be thoroughly examined in order to determine the sensitivity of the community and critical facilities to future events and their potential severity. The risk and vulnerability to hazards with moderate impact ratings will be assessed by assessing the available data. The community's risk will be calculated by examining the limited impact hazards with the best available data.

CONTROLS OF HIERARCHY

Figure: 2 Hierarchy of Controls

The possibility that a threat may cause a certain type of physical injury to any given individual is referred to as risk. It is vital to identify the hazards before assessing the risks that come with them. Then, if complete risk elimination is not attainable, the principles of the hierarchy of controls should be followed while adopting new measures to alleviate the situation. To put it simply, the first stage in introducing risk controls is:

- First, remove. Then, replace.
- Finally, technology management Last but not least, management oversight.
- Finally, provide and utilize adequate PPE.

1. LITERATURE REVIEW

As said by Duijm in 2001 Several functional modeling-based hazard identification methodologies have been developed for the disposal of deactivated munitions. The chemical industry's average accident rate is used to assess risk. We determined comparative risk ratings for alternative ammunition disposal procedures using hazard identification based on functional modeling of the approaches and the

required manpower to carry out the operations. These technologies include: "open burning" (ob), "open detonation" (od), "closed detonation" (cd), "fluidized bed combustion" (fbc), "rotary kiln (rk) incineration," and "mobile incineration".

Authors Khan & colleagues (2001) Optimal Risk Evaluation The Safety Weighted Hazard Index (SWeHI) was established. The SWeHI is a quantitative measure of the area within a radius that is moderately hazardous, with a 50% likelihood of death or injury. SWeHI = B/A demonstrates it mathematically. B represents the quantifiable measures of damage that a unit or plant is capable of causing. Accrual credits are the consequence of precautionary measures and control systems.

Glade & Bell (2003) After estimating the possibility of land slides, the frequency of potentially hazardous occurrences, and the distribution of the elements in danger, they proposed the following method for risk assessment:

Dziubinski & colleagues (2006) Fundamental Personal and Community Danger Developed a system for assessing the risks associated with the transit of hazardous substances over long pipelines; studied the underlying causes of pipeline failure and its potential consequences, taking into account both individual and societal risk. Using that approach as an example, the next steps in the risk analysis process were investigated, with an emphasis on the applied techniques and calculation models. This approach's mix of qualitative and quantitative methodologies was unique, since it may allow for a full evaluation of risks associated with long pipelines.

Laura Maricaa, Mihaela Ghicajanua, Sabina Irimiea* and Rares Munteanua (2014) This article focuses on workplace health and safety. The research approach requires conducting online surveys with a randomly selected sample. The study's major findings reflect the diversity of jobs, as well as workers' perceptions of workplace risks and conditions.

According to Chandrajit P. Ahire et al., they attempted to create a link between OEE and FMEA by assessing all OEE indicators in relation to FMEA. A total of 32 hypotheses were tested for this association. The performance and quality rate must be calculated using comparable OEE and RPN data. Minitab and correlation analysis are being used. Finally, the author advises using RPN results to improve OEE.

Hung-Hsin Liub et al.'s article discusses PAH exposure in several foundry zones. He stepped down. Polycyclic aromatic hydrocarbon (PAH) levels were determined by collecting 37 air samples from various work sites at two foundry firms. Workers in the painting, melting, and pouring zones should wear breathing masks to restrict their occupational exposure to PAHs to a safe level; he also recommends doing so to avoid the spread of PAH-related diseases. The hazard rates for each zone are being discussed.

Karin Reinhold et al. (2015) focused on risk assessments of physical, chemical, and biological risks in their study of 18 distinct industrial SMEs. The principal recognized risks that exceeded occupational exposure limits included wood dust in the wood processing sector, chemicals and noise in the wood processing and mechanical businesses, and lighting in the mechanical, plastic, and printing industries. All of the small and medium-sized firms (SMEs) evaluated successfully used the authors' adaptive risk assessment methodology. Health complaints were connected to risk levels using the FRA tool. This intervention primarily targets the higher-risk, left-side of the model (intolerable, unacceptable, and

indefensible dangers).The study's findings indicate that SMEs can benefit from adopting the proposed FRA tool for risk assessment.
ManayKifle (2014) found a considerable prevalence of work-related injuries. This study was carried out in Addis Ababa to assess how frequently work-related injuries occur and what factors put production workers in Ethiopia's iron and steel sectors at risk. Four hundred and fifty-three production workers from four different industries were randomly selected to participate in this study. Data was gathered through interviews using pre-tested and standardized questions, record reviews, and checklists. Workers in the industry suffer from a high percentage of job-related injuries. Work stress, failure to use personal protective equipment (PPE), workplace alcohol consumption, and excessive noise were all modifiable risk factors. Splitting and flying objects (16.4%), falling objects (13.7%), and equipment (12.6%) were the primary causes of injury, with a 33.3% annual occurrence. Workers had to deal with unnecessary dangers such as excessively noisy machinery, hazardous fumes and dusts, older, unsecured machinery, material splitting, and metal sparking on a daily basis. Workers who did not wear personal protective equipment (PPE), had a history of excessive alcohol use on the job, did not have a spouse present, or reported high levels of stress at work were more likely to be injured. The author advocated for more prominent safety signage, greater training, and the promotion and enforcement of personal protective equipment (PPE) to avoid industrial tragedies like the one in which a box fell from the conveyor and crushed the author as he reached under the falling elevator. The remaining 104 accidents were not subjected to risk assessments, but OHS staff and managers have begun conducting machinery risk assessments with employee input because of the numerous benefits, including the ability to implement better risk reduction measures, identify hazards more accurately, and reduce injuries and fatalities. The first step is to prioritize risk assessment or hazard identification. Second, dangerous zones (moving elements of machinery) must be protected with both permanent and interconnected moveable guards. Third, it must implement lockout procedures. Fourth, it must provide enough training and supervision for new and/or inexperienced employees. Finally, it must prevent safeguards from being bypassed (or defeated).

2. BACKGROUND WORK

IDENTIFICATION OF OCCUPATIONAL HAZARDS AND RISK TO HEALTH

We consider the following factors for each activity while conducting our activity/hazard/risk analysis:

- Listing of the company's activities and procedures.
- Using professionals, regular employees, or independent contractors as needed.
- The investigation of their acts, behaviors, and responses.
- We constantly think about the potential consequences of a change before adopting it, whether it's a new process or a tweak to an existing one. We also review HIRA every year to see if anything has changed.

  The following factors are considered when identifying occupational health and safety hazards and risks:

  Any and all regular or irregular tasks.
- Any employee, subcontractor, or visitor to the workplace may take action.

- Human behavioral capabilities and other human variables. A known external threat to employee safety and health that could have a negative impact on the company's operations.
- Employee-caused hazards in the workplace environment.
- Infrastructure tools and resources are used by employees or provided by third parties in the workplace. Material change or projected change in an organization's activities.
- Short-term modifications and their impact on functioning. Method and execution. Regulatory obligations governing operations and related controls.
- Workplace processes and machinery are designed, installed, and operated, including modifications to accommodate human capabilities. Investigate the outcomes of previous accidents.
- Any individual or group may submit feedback, recommendations, or observations.

EVALUATION AND IDENTIFICATION OF SIGNIFICANT OCCUPATIONAL HEALTH HAZARDS AND RISKS

- Criteria for risk assessment are developed through a process of brainstorming and discussion based on core items. The overall score is calculated by A significant risk to health and safety: Kind of harm or the impact of the injury on the individuals, as well as the type of intervention that is necessary and the expected length of time
- The term "probability" relates to the likelihood or potential of an event occurring, as well as historical data on when it existed.
- Control ratings take into account both the type of control and the issues that arise during implementation and adherence.

Table-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

CRITERIA FOR SIGNIFICANCE

- Regardless of the overall rating, hazards and related risks with a severity rating of 3 or higher and a score of 12 or higher are considered significant.
- All Serious (No Evaluation Offered)
- No rating given for any legally applicable

IDENTIFICATION OF SIGNIFICANT RISK

Following the identification of all potential threats, we exclude those that provide an unacceptable risk and tabulate them individually for your convenience. This is done in order to ensure consistency. The identification priority is determined by RPN based on the level of danger to the individual.

PRELIMINARY ACTIVITY

- A detailed assessment of the control measure was done. Figure 4.1 depicts a hierarchy of control measures. As the initial phase in the machining process, you must develop health and safety rules and operational control methods.
- The technique extracted material safety data sheets (MSDS) for a variety of chemicals.
- PPEs have been widely researched, and project criteria have been established.

HEALTH AND SAFETYINSTRUCTION

- Health and safety instructions are written instructions that outline how to utilize machinery and equipment safely.
- A safe work method should describe the risky actions to be carried out.
- Whether or not these jobs include any built-in controls.
- Whatever education or experience is required to complete the assignment.
- Wear personal protective equipment.
- Something needs to be done to reduce the likelihood of the task going wrong.
- Health and safety instructions should not be viewed as a replacement for training, but rather as a tool to supplement or guide training, providing both employers and employees with more information about the controls and processes to be followed.
- These principles are in place to ensure that whenever there is a risk of injury to anyone, anywhere—whether it be people, property, or the environment—proper safety practices are implemented.
- Well-written instructions can help define a safe working method for a specific operation or piece of equipment.
- Before commencing any project, ensure that everyone, including students and teachers, has read and understands the directions.
- Complete the risk and hazard assessments and management measures mandated by law.
- During OHS workplace inspections and audits, provide proof to support your assertions.

OPERATIONAL CONTROL PROCEDURE

- Standard operating procedures (SOPs) are a collection of directive-like instructions that detail operating features that can be reduced to a clear or consistent approach while maintaining efficacy.
- Operational controls are established and implemented to decrease the possibility of significant adverse environmental consequences.
- Operational controls explain specific operations for managing and controlling activities, processes, goods, and services that have an impact on the environment.
- The goals and objectives of operational controls should be to avoid pollution, comply with all applicable laws and regulations, and achieve these goals and targets through continuous improvement.
- Operational controls are established and implemented to decrease the possibility of significant

adverse environmental consequences.

- Implementing processes, physical controls, checklists, training, or employee knowledge can help control operations to handle key environmental issues as well as legal and other needs.

MATERIAL SAFETY DATA SHEET

- Material safety data sheets (MSDSs) are used to ensure product safety and worker health.
- Here you may find information about the chemical goods, as well as how to handle them safely on the job. The MSDS contains much more information about the chemical than the label does.
- An MSDS is needed to contain 16 different categories of information. The regulated products regulations specify the following forms of information: material and supplier hazard identification, ingredient composition and information, and hazard identification.
- Emergency medical help and firefighting methods
- accidental discharge protocols.
- Considerations for processing and warehousing include exposure measures, safety equipment, chemical and physical qualities, and responsiveness and stability.
- Details on garbage management, transportation, regulations, and more

3. CONCLUSION

A research project that was concentrated on the identification and evaluation of risks was carried out as a consequence of this, and the findings showed that there were a number of dangers that were related with a variety of methods and pieces of equipment being used. The hierarchy of controls, the safety instructions, and the material safety data sheet have all been subjected to extensive revisions with the same level of attention to detail. These adjustments have been made.

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