



# HAZARD IDENTIFICATION AND RISK ASSESSMENT IN FOUNDRY

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**ABSTRACT:** Foundry work is the process of making a metal casting of an object by pouring molten metal into a mould. The mould is made using a pattern of the article required. In some cases, the mould contains a core that determines the dimensions of any internal cavities. There are two types of foundries. Ferrous foundries produce iron and steel castings. Non-ferrous foundries produce castings of copper-based alloys (brass, bronze and copper), aluminum-based alloys (lead, zinc, nickel, magnesium) and other alloys. Foundry industry deals with hazardous operations which are resulted as high risk area for past 10 decades. Identifying the risk and controlling the risk within the standards in Occupational health and safety aspect is more difficult in foundry. The purpose of this project is to describe the steps involved and the method of identifying and controlling various health and safety Risks, defining a method to prioritize the identified risk and identify the significant ones, related to manufacture and supply of castings and related support activities. The overall purpose of the study to identify the hazards and risks, then remove/minimize the hazards by providing recommendation control measures. And Create danger free zone workplace. I have analyzed and examined the work/process locations is has more hazards to work more difficult even though in good housekeeping and preventive measure, more automation to be provided for more human intervention and to avoid physical injury.

**Key words:** Control Measures, Foundry, Hazard, Identification, Risk Assessment.

## 1. INTRODUCTION

1.1 My project is to find out various hazards and suggest action plan and recommendations associated with the Foundry using the hazard evaluation technique. For any industry to be successful it should meet not only the production requirements, but also maintain the highest safety standards for all concerned. The industry has to identify the hazards, assess the associated risks and bring the risks to tolerable level on a continuous basis. Foundry operation being a hazardous operation has considerable safety risk to foundry. Unsafe conditions and practices in foundry lead to a number of accidents and causes loss and injury to human lives, damages the property, interrupt production etc.



Figure-1.1 .Foundry Melting Process

1.2 Process Flow Diagram of the foundry process:

The Raw material is basic here is the iron scrap which has been sent to induction furnace for charging of the metal, and on the other side The sand which has been sent to core shop for mould making and hot molten metal is poured in to the mould for making the casting after that shaking out process is being carried out for sand recovery and recycling process and after that it has been send to shot blasting machine for removing the extra metals and after that it has been sent for chipping and the quality department to make the casting smooth in quality dept the casting are smoothed by grinding process and the final casting is produced and dispatched to the customer.

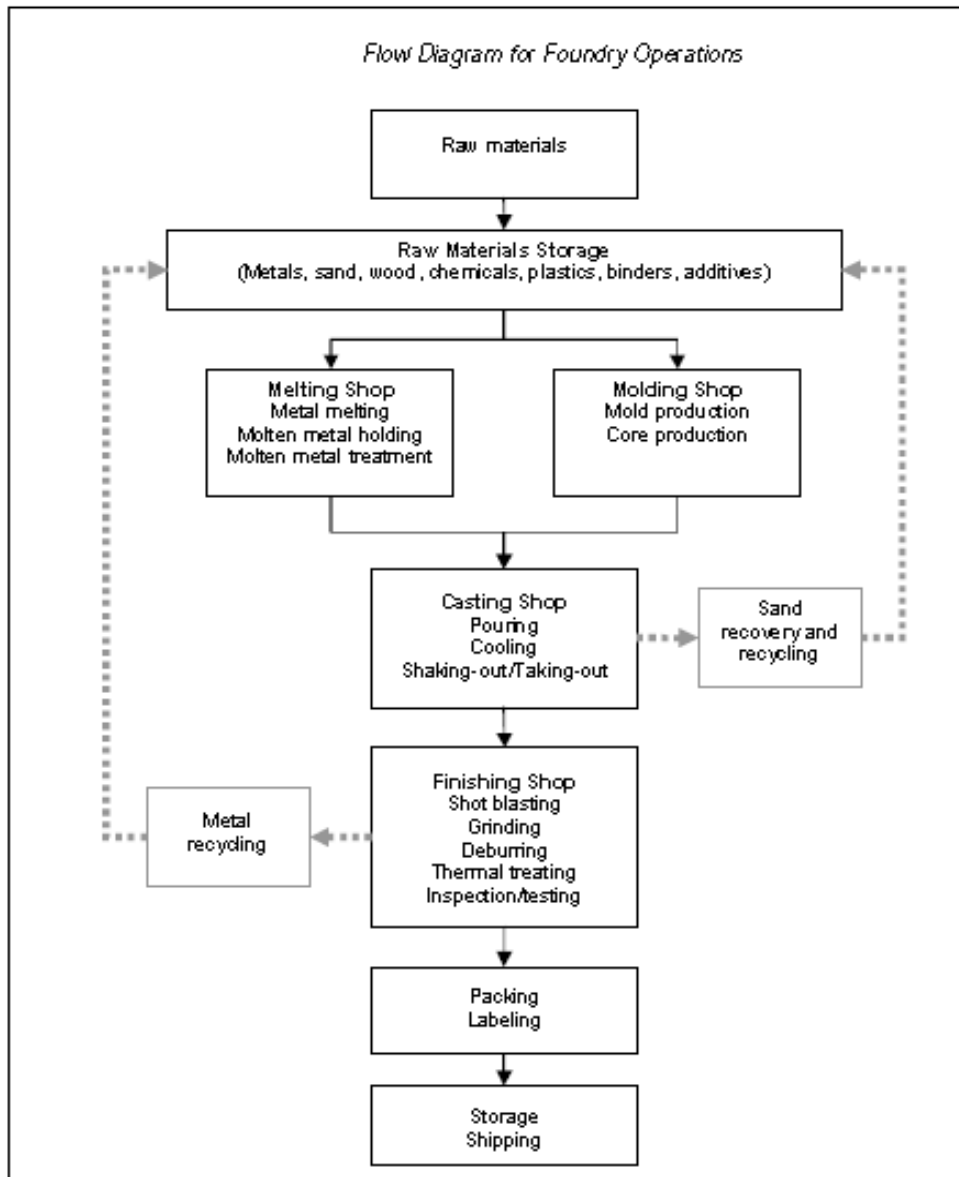


Figure 2.Process Flow Diagram of the foundry

## 2. HAZARD IDENTIFICATION IN FOUNDRY



Figure:3 Hazop Process

## 2. HAZOP STUDY AND RISK ASSESSMENT

### HAZARD IDENTIFICATION

#### 2.1 INTRODUCTION

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

- To obtain a list of hazards for subsequent evaluation using other risk assessment techniques. This is sometimes known as “failure case selection”
- 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”.

#### 2.2 PRINCIPLE

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 check lists, accident and failure statistics, hazard and operability Studies (HAZOPs) or by comparison with detailed studies and experience from previous projects.

#### 2.3 STUDY SCOPE

The outcomes of the hazard identification process are to:

- Identify all major incidents which could occur at the facility (irrespective of existing control measures).
- Provide the employer and workers with sufficient knowledge, awareness and understanding of the causes of major incidents to be able to prevent and deal with them.
- Provide a basis for identifying, evaluating, defining and justifying the selection (or rejection) of control measures for eliminating or reducing risks.
- Show clear links between hazards, causes and potential major incidents.
- 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 the 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 then 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 the issues discussed in this guidance note. However, the operator must ensure that any existing studies:

- Are Fully understood by the hazard identification participants.
- Are still relevant for the current operating conditions and condition of the facility.
- Were conducted to an acceptable standard.
- Addresses identified gaps.

The operator should review its own plant operating history and conditions (eg corrosion, breakdowns and maintenance) for potential scenarios.

However, major incidents are rare and historical incidents are unlikely to represent the full range of potential incidents. Incident data should be used to supplement more systematic hazard identification techniques.

Another useful source of information on the hazards associated with storage and handling of hazardous materials are MSDS.

It is also worth referring to the technical literature provided by material suppliers on their products. Workplace safety requires effective identification, assessment and control of significant workplace hazards.

The Hazard Management steps are:

- Identification of Hazards
- Determination of their significance.
- Control of significant hazards by Elimination, Isolation or Minimization.
- Training and advising staff of the control measures in place.

A Hazard Management system contains:

- A Systematic process for identifying existing hazards in the workplace.
- A process to review hazards to determine their significance and adequacy of control
- A systematic process to ensure that the selected controls in place are not only adequate but the controls are in keeping with industry standards

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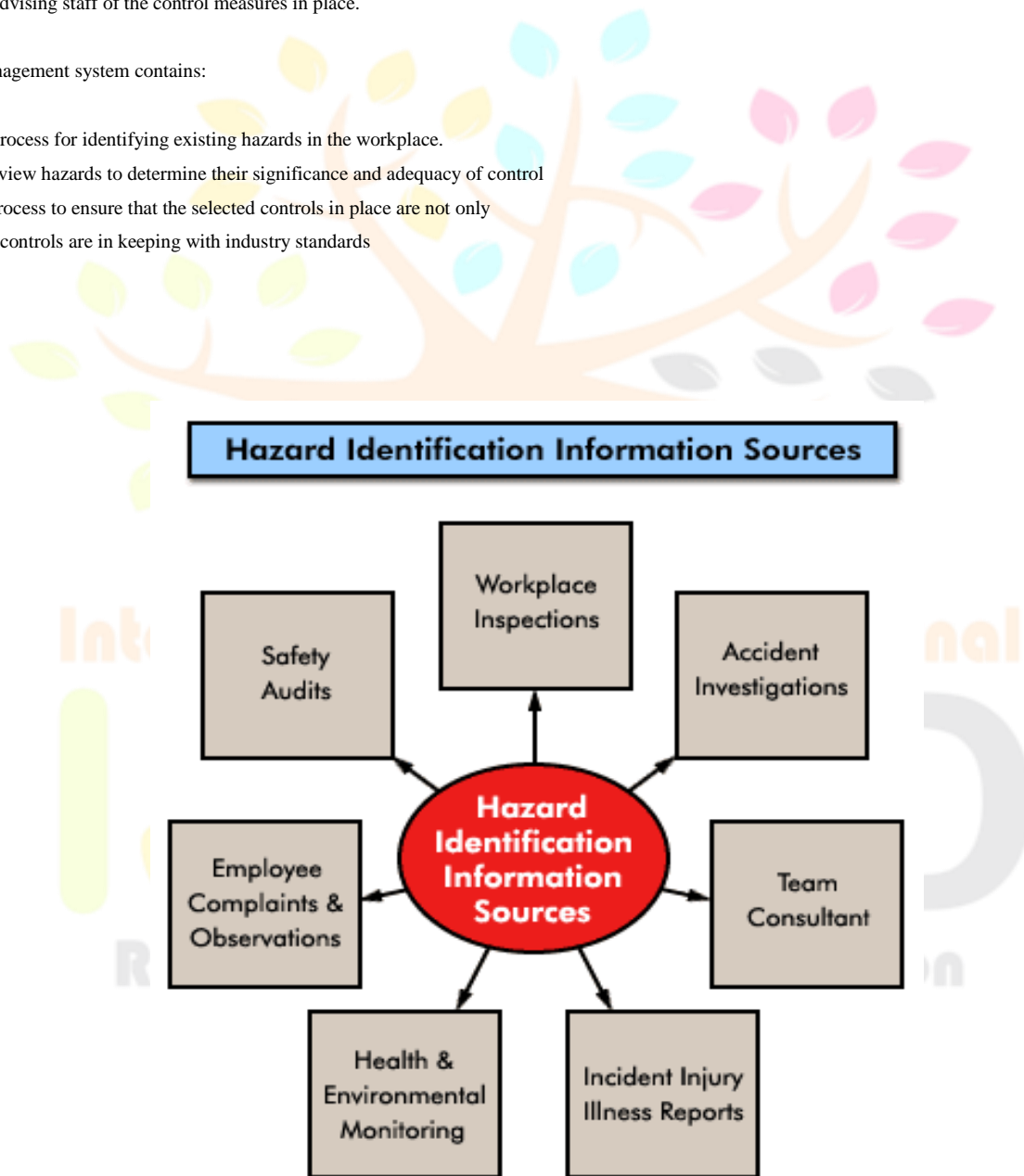


Figure 3.1 hazard Identification information sources process

## 2.4 RISK ASSESSMENT

**RISK ASSESSMENT** :Identification of hazards present in any undertaking and evaluation and the extent of the risks involved, taking into account whatever precautions are being undertaken.

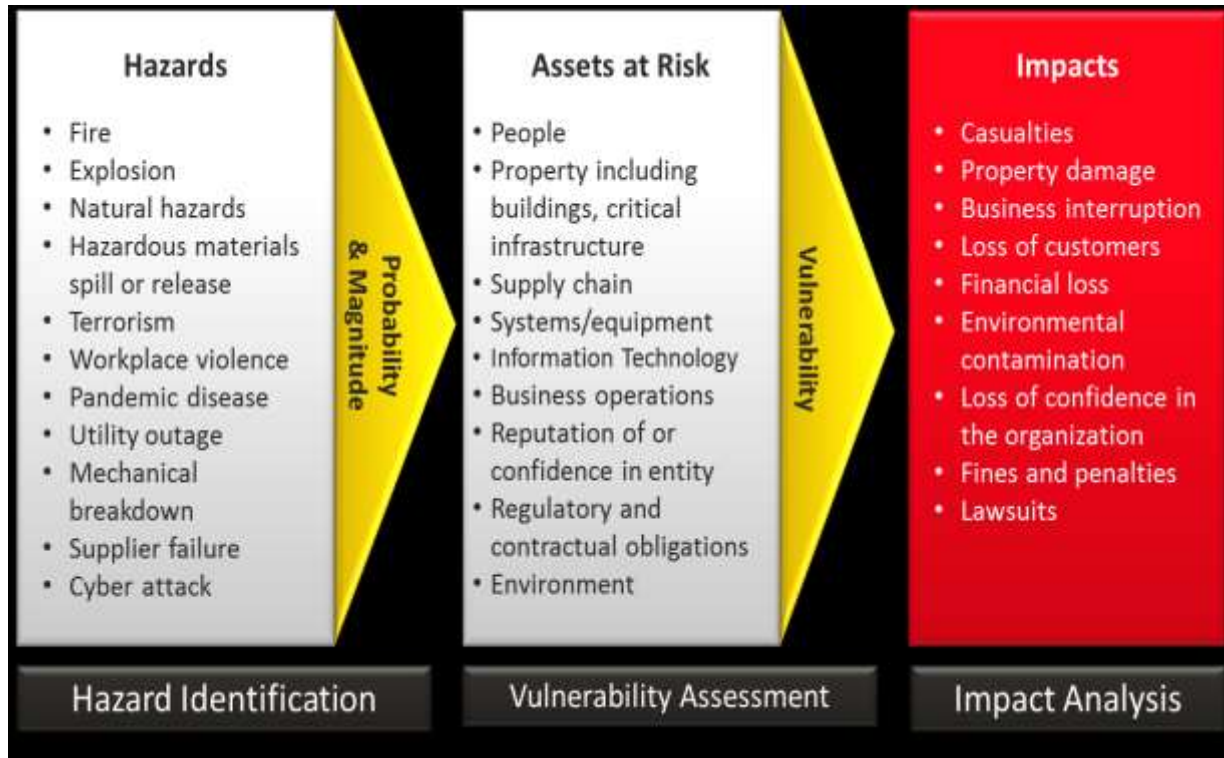


Figure – 3.2 Risk Assessment process

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

- Look for the Hazard
- Decide who might be harmed and how.
- Evaluate the risks arising from the hazards and decide whether existing precautions are adequate or more should be done
- Record the findings.
- Inform colleagues of your findings
- Review your assessment from time to time and revise it if necessary

There are two types of risk assessments:

- Qualitative :Object Probability estimate based upon known risk information applied the circumstances being considered.
- 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. To enable control measures to be devised.

- To gain an idea of the relative importance of risks
- To take decisions on controls which are cost effective and appropriate?

#### 4.METHODOLOGY

##### A. Identification of Occupational Hazards and Risk to Health:

1. Activity / Hazards & Risks Analysis is conducted for all activities considering followings :  
Listing of activities/ processes in the company.

Involving skilled/ regular / contract workers depending upon the activities. Studying of their activities / behavior / reactions.

2. 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.

3. While identifying OH&S hazards and risks following issues are considered

- All routine & non routine activities
- Activities of all personnel having access to the work place (including subcontractors and visitors)
- Human behavior, capabilities and other human factors.
- Identified hazards originating outside the workplace capable of adversely affecting the health and safety of person in the organization/within the workplace
- 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 others.
- Changes or proposed changes in the organization, its activities or material.
- Modifications , including temporary changes and its impact on operation, processes and activities.
- Legal requirements related to activities performed and legal controls.
- Design of work areas, processes, installation, machineries / equipment, operating procedures and activities performed including their adaption to human capabilities.
- Investigation results of previous incident, accident
- Feedback, suggestion, observation from workmen or any person

##### B. Type /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

**C. Evaluation of Occupational Hazards & Associated Risks to Health and Identification of Significant Occupational Health Hazards & Risks**  
Criteria for Risk assessment is developed through brain storming and discussion by core team. The scoring is based on three factors:

- Probability of occurrence
- Severity rate
- Hierarchy of controls.

Table 3.3 : Probability of Occurrence

Rating	Description	Examples of Description
5	Almost certain	Event occurs often and constant exposure to hazard. Very high probability of damage.
4	Likely	Event might probably occur and known history of occurrence. Frequent exposure to hazard. High probability of damage.
3	Possible	Event could occur at some time and history of single occurrence. Regular or occasional exposure to hazard. Moderate probability of damage.
2	Unlikely	Event is not likely to occur and known occurrence. Infrequent exposure to hazard. Low probability of damage.
1	Rare	Event may occur occasionally and no reported occurrence. Rare exposure to hazard. Very low probability of damage.

Figure 3.3. Probability of occurrence

Table 3.4: Severity Rate

RATING	INJURY/RISK COMPLEX ISSUES	NOISE	TEMPERATURE/HEAT	FUMES/VAPOUR & GASES	DUST
1	First aid cases	51 to 74dBA	Frequent Perspiration at work	Odour, itching	Sneezing, cough
2	Minor injury/Cuts, Return back to work within 24 hours	75 to 84dBA	Heat Stroke (Mental or psychological strain or transient Heat Fatigue)	Suffocation, Respiratory tract damage, Eye irritation, Sneezing, Temporary Headache	Prolonged exposure / Temporary Headache, eye or respiratory tract irritation
3	Back/Lambar pain, Exceed more than 24 hours to return	85 to 94dBA	Heat Exhaustion (Unconsciousness or Fainting, Eye disorder, Nausea & vomiting)	Unconsciousness, Faint or collapse, Vomiting	Unconsciousness, Faint, Eye disorder, Vomiting
4	Laceration, Permanent Damage, Burn injury	95 to 104dBA	Heat Cramps, Throbbing Headache, Sweating/ perspiration	Prolonged exposure, Chronic Respiratory failure or other occupational diseases	Major Health impact which leads to chronic Respiratory
5	Fatal or Death	>= 105dBA	Heat Stroke / Exhaustion lead to death or permanent damage	Over exposure which may lead to immediate death	Over exposure which may lead to immediate death

**Table 3.5: Other Conditional Criteria to Evaluate the Risk**

a	The combined score (multiplication) is calculated for each Hazard. If the score is 6 or less then it is considered as <b>Acceptable risk Area /Activity</b> . If the score is above 6 it is considered as <b>Unacceptable risk Area/Activity</b> .
b	In addition to this any of the risk having severity / probability rating as “4” or 5 will also be considered as <b>Unacceptable risk Area/Activity</b> .
c	All legal issues related to work are identified, listed and considered for all maintaining required controls.

## 5.CONCLUSION

Hazard Identification and Risk Assessment (HIRA) study were made on the Foundry and various hazards of different equipment's and process were found. Recommendations are provided to avoid the occurrence of such hazards. Applicable legal requirements are studied and provided in detail. Safety Instructions, Extract of MSDS, PPE matrix and SOP- Safe Operating Procedures, Human Intervention can be avoided and we can implement automation to avoid physical damage to employees.

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