ENVIRONMENTAL RISK ASSESSMENT

The safety and protection of people, equipment and the environment are a serious concern in the manufacturing industries. Steel Plants have also recognized the significance of safe working environment and are progressively trying to prevent hazardous events, avoid production & manpower losses and other fallouts associated with industrial accidents by conducting risk assessment, onsite & off-site management plan and adopting the safety measures as proposed. This also assists industries to enhance employee knowledge of operations, improve technical procedures, maintain accurate process safety information and increase overall facility productivity. This Chapter, accordingly, gives an outline of the associated environmental and other risk prone hazards, their assessment and remedial measures. It also describes an approach to emergency planning to be adopted by the Plant management.

The objectives of environmental risk assessment are governed by the following which excludes for measure.

- Identifying the potentially hazardous areas so that adequate design safety measures can be adopted to reduce the likelihood of accidental events.
- Identifying the stakeholders and evaluating their risk along with proposing adequate control techniques.
- Identifying the probable areas of environmental disaster which can be prevented by appropriate design of the installation and its controlled operation.
- Managing emergency or a disastrous event if any, during the plant operation.

Environmental risk assessment is a systematic approach for identification, evaluation, mitigation and control of hazards that could occur as a result of failures in process, procedures, or equipment. Increasing industrial accidents, loss of life & property, public scrutiny, statutory requirements and intense industrial processes, all contribute to a growing need to ensure that risk management is conducted and implemented.

Managing a disastrous event would require prompt action by deployment of area specific emergency plans by the operators and plant emergency staff using all their existing

resources like deployment of firefighting equipment, operation of emergency shut off valves, water sprays etc. Minimizing the immediate consequences of a hazardous event include cordoning off, evacuation, medical assistance and providing correct information to the families of the affected persons and local public to avoid rumors and panic.

The following terms related to environmental risks are defined before reviewing the environmental risks.

Terms	**Environmental Risk**
Harm	Damage to person, property or environment
Hazard	Situation that poses a level of threat to life, health property or environment. A hazardous situation that has come to pass is called incident. Hazard and possibility interact together to create risk. An environmental hazard is thus going to be a set of circumstances which leads to direct or indirect degradation of environment and damage to the life and property.
Risk	The probability of harm or likelihood of harmful occurrence and its severity. Environmental risk is a measure of the potential threats to the environment, life and property.
Consequence	Effect due to occurrence of the event which may endanger the environment permanently or temporarily and, or, loss of life and property.
Environmental Disaster	The consequence is so severe that it can extensively damage any one or all the four components of the environments of the environment, namely (a) Physicochemical, (b) Biological, (c) Human, and (d) aesthetics.

IDENTIFICATION OF HAZARDS

This is an early check of major hazards, which are of high-risk potential - including the potential for disastrous interactions of the various plant operational activities. The checklist, though not strictly speaking a Hazard and Operability Study (HAZOP) but would facilitate a full-scale HAZOP Study for final drawing up of risk management measures when the 'design-freeze' stage commences. Hazard is the associated term with material, which is a measure or the likely hood of the human working with or studying the material in question.

The entire probable potential hazard is classified under different heads.

- Fire hazards
- Toxic gas release hazards
- Explosion hazards
- Corrosion hazards

Fire Hazards

Since the Stone Age term, fire" is associated with fear. It is very dangerous if occurs in uncontrolled manner. It should be clearly understood that when a liquid is used having flash point below the normal ambient temperature, it could, in suitable circumstances, liberate a sufficient quantity of vapour to give rise to flammable with air.

Toxic Hazards

Toxic substances affect in three ways by ingestion, adsorption & inhalation which are describe below.

Corrosion Hazards

Corrosion is a chemical reaction-taking place at the surface of metal.

POTENTIAL HEALTH EFFECTS:

Eye Contact:

Airborne dust may cause immediate or delayed irritation or inflammation. Eye contact with large amounts of clinker dust and dry cement powder can cause moderate eye irritation,

chemical burns and blindness. Eye contact with large amounts of gypsum can cause moderate eye irritation, redness, and abrasions. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.

Skin Contact:

Dust of clinker, gypsum and cement may cause dry skin, discomfort, irritation, severe burns and dermatitis. Clinker dust and cement dust are capable of causing dermatitis by irritation. Skin affected by dermatitis may include symptoms such as, redness, itching, rash, scaling and cracking. Irritant dermatitis is caused by the physical properties of clinker dust including alkalinity and abrasion.

Inhalation (chronic):

Risk of injury depends on duration and level of exposure. This product contains crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica from this product can cause silicosis, a seriously disabling and fatal lung disease. Some studies show that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis may be associated with the increased incidence of several autoimmune disorders such as scleroderma (thickening of the skin), systemic lupus erythematous, rheumatoid arthritis and diseases affecting the kidneys. Silicosis increases the risk of tuberculosis.

Ingestion:

Internal discomfort or ill effects are possible if large quantities are as allowed.

Explosion Hazards:

Release of energy in rapid and uncontrolled manner gives rise to explosion

ENVIRONMENTAL RISK EVALUATION

From environmental hazards point of view, risk analysis (RA) acts as a scrutinizing vehicle for establishing the priority in risk management that concerns human health and environmental quality in general. Though the proposed facilities are not manufacturing, storing or handling any potentially hazardous/toxic chemicals as scheduled in the Manufacture, Storage and Import of Hazardous Chemicals (MSHC) Rules, 1989 and its amendments thereof, the proposed facility would have installations, such as, storage and handling of coal, fuel oil, and fuel gases. An Environmental Qualitative Risk Analysis Flow Chart Procedure is given below.

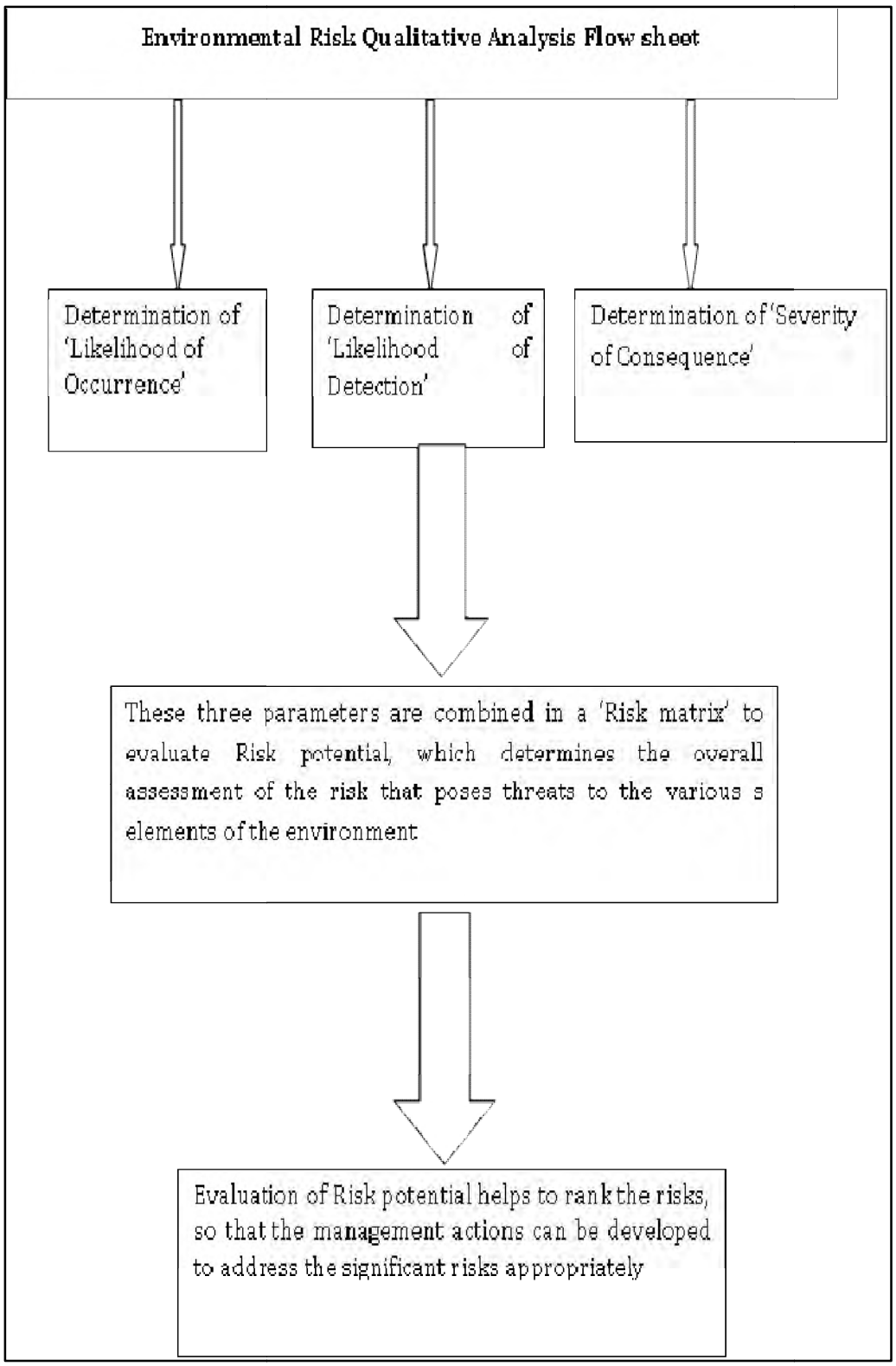

Figure Error! No text of specified style in document.**-1 : Environmental Risk Qualitative Analysis Flow Sheet**

RISK MANAGEMENT MEASURES

The risk management measures for the proposed project activities require the adoption of best safety practice at respective construction zones within the Works boundary. In addition, the design and engineering of the proposed facilities will take into consideration proposed protection measures for releases to air, land and water environment as outlined in earlier Chapter.

Electrical safety: Adequately rated quick-response circuit breakers, aided by reliable, selective digital/microprocessor-based electro-magnetic protective relays would be incorporated in the electrical system design for the proposed Project. The metering instruments would be of proper accuracy class and scale dimensions. Appropriate use of ELCBs shall be ensured for all construction related low voltage work.

Fire Prevention: In addition to the yard fire hydrant system, each individual shop and offices are provided with fire and smoke detection alarm system along with the portable fire extinguishers. Fire detection system would be interlocked with automated water sprinklers. M/s Vardhman Ispat Udyog will has an on-site full-fledged fire brigade department with 13 fire tenders which also provide the services to the town in emergency situations.

CO detection and prevention: M/s Vardhman Ispat Udyog will install more than 1000 carbon monoxide detectors/alarms to detect the presence of carbon monoxide (CO) and sound an alarm to alert personnel in case there is CO concentration beyond 50 ppm. The plant personnel always carry a portable CO detector as part of their personal protective equipment.

ON-SITE EMERGENCY PLAN

Emergency planning is an integral part of the environment and safety management of TSL. Emergencies may arise due to manmade reasons and/or natural causes resulting in fire, explosion, failure of critical control system, etc. It is crucial for effective management of an accident to minimize the losses to the people and property, both in and around the facility, termed as on-site and off-site emergency plan.

Accident Statistics: The safety and ergonomics department deal with emergency records, events of both minor and major accidents, listing all the details such as place, date & time, duration, probable cause, extent of damage, personnel affected, man-hours lost, medical assistance provided etc to analyze these data for drawing up necessary corrective measures.

Safety Inspections: The respective Department carries out monthly safety inspection of all departments. Additionally, half-yearly Environmental, Health and Safety Audit will be performed including all aspects of Environment, Occupational Health & Safety for all the areas.

OFF-SITE EMERGENCY PLANNING

The off-site emergency plan is also an integral part of any major hazard control system. This particular plan relates to only those accidental events, which could affect people and the environment outside the plant boundary. Incidents, which would have very severe consequences, yet have a small probability of occurrence, would be in this category.

Emergency preparedness and disaster management plan covers the following:

- Identification of local authorities like civil defence, police, district commissioner, their names, addresses and communication links.
- Details of availability and location of heavy-duty equipment like bull dozers, fire-fighting equipment etc.
- Details of specialist agencies, and stakeholders upon whom it may be necessary to call.
- Details of voluntary organization.
- Meteorological information.
- Humanitarian arrangements like transport, evacuation centers, first aid, ambulance, community kitchen etc.
- Public information and communication through media, informing relatives, public address system etc.

OCCUPATIONAL AND SAFETY HAZARDS AND PREVENTIVE MEASURES

FIRST AID MEASURES

Following first aid measures shall be taken:

- **Eye Contact**

  Rinse eyes thoroughly with water for at least 15 minutes, including under lids, to remove all particles. Seek medical attention for abrasions and burns

- **Skin Contact:**

  Wash with cool water and a pH neutral soap or a milk skin detergent. Seek medical attention for rash, burns, irritation and dermatitis.

- **Inhalation:**

  Move person to fresh air. Seek medical attention for discomfort or if coughing or other symptoms.

- **Ingestion:**

  Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention.

EXPOSURE CONTROLS AND PERSONAL PROTECTION

EXPOSURE CONTROLS

- Control of dust through implementation of good housekeeping and maintenance;
- Proper fume and dust extraction system to control fume/dust emission in work zone.
- Use of PPE, as appropriate (e.g. masks and respirators)
- Use of mobile vacuum cleaning systems to prevent dust build up on paved areas;

PERSONAL PROTECTIVE EQUIPMENT (PPE)

As a supplementary protection against exposure to hazardous conditions in the production of iron and steel where the safety of workers cannot be ensured by other means, such as eliminating the hazard, controlling the risk at source or minimizing the risk, suitable and sufficient PPE, having regard to the type of work and risks, and in consultation with workers and their representatives, shall be procured and used by the workers and provided and maintained by the employer, without cost to the workers.

- Items of PPE provided shall comply with the relevant BIS standards and criteria approved or recognized by the competent authority. Where BIS standards are not available, PPEs meeting international standards may be procured
- Those responsible for the management and operation of the personal protection programme shall be trained in the selection of the proper equipment, in assuring that it is correctly fitted to the people who use it, in the nature of the hazards the equipment is intended to protect against, and provide adequate comfort, and in the consequences of poor performance or equipment failure.
- PPE shall be selected considering the characteristics of the wearer and additional physiological load or other harmful effects caused by the PPE. It shall be used, maintained, stored and replaced in accordance with the standards or guidance for each hazard identified at the facility and according to the information given by the manufacturer.
- PPE shall be examined periodically to ensure that it is in good condition.
- Different PPE & their components shall be compatible with each other when worn together.
- It shall be ensured that the procured PPEs are ergonomically designed and, to the extent practicable, should not restrict the user's mobility or field of vision, hearing or other sensory functions.
- Employers shall ensure that the workers who are required to wear PPE are fully informed of the requirements and of the reasons for them, and are given adequate training in the selection, wearing, maintenance and storage of this equipment
- When workers have been informed accordingly, they shall use the equipment provided throughout the time they may be exposed to the risk that requires the use of PPE for protection
- Items of special PPE for use in proximity to molten metal shall be so procured that they should protect the wearer from heat and should withstand splashes of molten metal. It should be possible to remove these items easily if molten matter gets between the body and the protective clothing.
- The PPE shall not be used for longer than the time indicated by the manufacturer

- Workers shall make proper use of the PPE provided, and maintain it in good condition, consistent with their training and be provided with the proper means for doing so.
- Respiratory Protection: When the dust level is beyond exposure limits or when dust causes irritation or discomfort use Respirator.
- Eye Protection: Wear Safety goggles to avoid dust contact with the eyes. Contact lenses should not be worn when handling the materials.
- Skin Protection: Wear impervious abrasion and alkali resistant gloves, boots, long sleeved shirt, long pants or other protective clothing to prevent skin contact.

FIRE FIGHTING FACILITIES

Keeping in view the nature of fire and vulnerability of the equipment and the premises, following fire protection facilities have been envisaged for the plant.

- Safety training to the workers will be given.
- PPE will be provided to the workers.
- The maintenance and cleaning of bag filters will be carried out regularly.
- The dust removal efficiency of bag filters will be check regularly.
- Work place environment monitoring will be carried out regularly and records will be maintained. The monitoring of dust in the work place will be carried out.
- Good housekeeping will be implemented in the plant.
- First aid box will be provided.
- The industry will provide adequate lighting facility inside the plant premises.
- General dilution ventilation will be provided to control dust levels below applicable exposure limits.
- Fire extinguishers will be provided to withstand the fire or explosion condition.
- Pre-employment and periodical medical examination of workers will be done by government approved medical practitioners and the details will be recorded as per the Regulations.
- The industry will prepare on-site emergency plan.
- In case any emergency, arrangement of ambulance van will be done from nearest Hospital.

- Two main gates will be provided for entry and exit of the workers.

OCCUPATIONAL HEALTH& SAFETY

M/s Vardhman Ispat Udyog believes in Safety First and is concerned with protecting safety, health & welfare of the people engaged in work or employment.

The following safety measures for the employees shall be implemented:

- Safety training is provided to the employees.
- Manual call bell in case of emergency are provided.
- Fire alarms are provided.
- First aid facility and trainings are provided.
- Personal protective gears and equipment's are provided to the employees.
- Health check-ups are organized at regular intervals and records are maintained.
- Fire Protection System by means of providing Fire hydrants, Fire Extinguisher at vulnerable points within the plant has been envisaged.
- Cleanliness facilities, rest room, plenty Plant Lightning is also envisaged for the proposed project.

MAJOR HAZARDS

INDUCTION FURNACE:

- Cooling water meeting molten metal or slag causing explosion
- Moist scrap being charged causing explosion
- Radioactive scrap being charged spreading radio activity
- Scraps having explosive materials like abandoned bombs being charged causing explosions.

CONTINUOUS CASTING MACHINES:

- Strand is hardened only superficially and is still liquid inside
- Spillage of molten metal can occur with damage by radiant heat to mechanical and civil structures, electric cables and hydraulic equipment etc.

PREVENTING FIRES & EXPLOSIONS

- Fires & explosions in induction furnaces most often result from water coming into contact with molten metal. The water may be present in scrap material, damp moulds, from leaks in the furnace cooling systems or leaks in the building
- Fires & explosions in can also result from the ignition of volatile materials and fuels. The most hazardous procedures are during the firing- up and shutting-down procedures
- Operators shall be trained in safe systems of work. The building shall be designed to be non-combustible, with automatic fire suppression engineered or designed into the process where appropriate.
- Risk assessments shall be carried out to consider the potential dispersal of toxic chemicals from non-furnace processes & combustion products, and the potential impact of an explosion on the surrounding areas
- Regular safety audits shall be undertaken to ensure that hazards are clearly identified, and risk-control measures maintained at an optimum level
- Refractories (e.g. crucibles, troughs, ladles) and tools shall be preheated and dried before use to minimize the risk of explosion Refractory linings should be regularly inspected for wear.
- Furnaces shall not be operated beyond their safe lives

A budget of Rs.2.00 Lakhs has been kept for occupational health & safety.

DISASTER MANAGEMENT PLAN (DMP)

A disaster is a catastrophic event that causes serious injuries, loss of life & extensive damage to plant & property. It is a situation that goes beyond the control of the available resource of any authority or organization. Several factors could trigger accidents leading to a disaster, e.g. process and safety system failures (technical errors, human errors), natural calamities (earthquake, tsunami etc.) The DMP is formulated with an aim of taking precautionary measures to control the hazard propagation and to take such action that the damage following a disaster is minimized and controlled.

The objective of the DMP is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effective rescue and medical treatment of casualties.
- Safeguard other people.
- Minimize damage to property and the environment.
- Initially contain and ultimately bring the incident under control.
- Identify any dead.
- Provide for the needs of relatives.
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected area
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

In effect, DMP helps to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

The following hazards for disaster management have been considered:

- Fire
- Explosion & Toxic release
- Oil spillage/liquid metal spillage
- Electrocution
- Accident

These hazards and potential causes have already been discussed in the preceding sections. A selective disaster management measures to prevent disaster due to the above-mentioned hazards are as follows:

- Design, manufacture, operation and maintenance of all plant machineries/structures as per applicable national and international standards as laid down by statutory authority,
- Intelligent formulation of layout to provide 'Assembly Point' and safe access way for personnel in case of a hazardous event/disaster, as can be inferred from Risk & Consequence modelling.

- Proper emergency (both on site & off-site) preparedness plan, emergency response team, emergency communication, emergency responsibilities, emergency facilities, and emergency actions shall be developed.
- Proper Alarm system and training the personnel for appropriate response during disastrous situation.
- Complete fire protection coverage for the entire plant as per regulatory stipulations.
- Creation and maintenance of Disaster Management cell with adequately trained personnel who can handle all sorts of emergency.
- Provision of funds for prevention of disaster, mitigation, capacity-building and preparedness.

OBJECTIVES

Objectives of the disaster control/management plan for the proposed plant are:

- To identify type of major disasters this may occur in the plant
- To collect data on type of disasters this has happened already in other iron & steel plants.
- An action plan to handle disaster.

Identification of Hazardous Process/Area

- Induction Furnace/Ladle Refining Furnace: Hot metal spillage, steam explosion, Fire & Electrocution
- Continuous Casting Plant: Hot metal spillage
- Re-heating Furnace: Fire and explosion
- Rolling Mills: Hot metal spillage
- Fuel Oil tanks: Fire & Spillage
- Electrical Rooms: Fire & Electrocution
- Transformer area: Fire & Electrocution

LEVEL OF ACCIDENTS

If there is any disaster in any part of the plant/work place due to any reason, the area, which may be affected, can be classified in the following four classes:

1. Level I - Operator level
2. Level II - Local/community level
3. Level III - Regional/ national level
4. Level IV - International level

Level I, II and III class of accidents have been considered for the plant.

Level I

Under this level, disasters may happen due to fire, explosion, oil spillage and spontaneous ignition of inflammable materials. This level has probability of occurrence affecting persons inside the plant. The various shops, which have been mentioned as potential hazard areas, will be affected during this level of accident.

Level II

In case of sabotage/complete failure of all automatic control/warning systems; fuel oil storage area (the oil kept in tanks and covered by tank bund) which may leak out. However, the probability of this is very low due to adequate instrumentation, security and training of persons of the plant operating such system.

Level III

In case of sabotage/complete failure of all automatic control/warning systems, undetected leakage from the furnace; the resultant leakage of the flammable gases is a potential threat that can affect the region. However, with the proposed instrumentation, gas detection and alarm system, security and training of persons such a situation is unlikely.

RESETTLEMENT & REHABILITATION (R&R)

No dislocation of people is involved in any of the villages, the industry is located within an existing industrial area, properly earmarked for this purpose namely Tahliwal Industrial area. More over this is an existing industrial unit being expanded and its capacity being enhanced for more efficient use.

The manpower is mainly drawn from nearby villages and employment exchanges. As such no rehabilitation and resettlement is involved.