

ANNEXURE-

Risk Assessment Report

The risk assessment for the proposed secondary metallurgical industry is based on hazard identification followed by precautionary measures. The most common incidents or hazards that cause injuries, ill health and loss of property are mentioned as follows;

- (i) Falls from height;
- (ii) Unguarded machinery;
- (iii) Falling objects;
- (iv) Moving machinery, on-site transport, forklifts and cranes;
- (v) Exposure to controlled and uncontrolled energy sources;
- (vi) Inhalable agents (gases, vapours, dusts and fumes);
- (vii) Contact with hot metal;
- (viii) Fire and explosion;
- (ix) Extreme temperatures;
- (x) Noise
- (xi) Electrical burns and electric shock;
- (xviii) Inadequate accident prevention and inspection;
- (xix) Inadequate emergency first-aid and rescue facilities;
- (xx) Lack of medical facilities and social protection.

The hazards identified are discussed with respect to the nature and control strategies as follows;

- Noise

Hazard description: Exposure to noise levels exceeding those set by the EP act and factories act may result in noise-induced hearing loss. Exposure to high noise levels may also interfere with communication and may result in nervous fatigue with an increased risk of occupational injury.

Assessment of risk: The assessment shall, as appropriate, consider:

- (a) The risk of hearing impairment;
- (b) The degree of interference to communications essential for safety purposes; and
- (c) The risk of nervous fatigue, with due consideration to the mental and physical workload and other non-auditory hazards or effects.

In order to prevent adverse effects of noise on workers, employers shall:

- (a) Identify the sources of noise and the tasks that give rise to exposure;

(b) Occupational health service about exposure limits and other standards to be applied

(c) Seek the advice of the supplier of processes and equipment about expected noise emission.

Control Strategies: Based on the assessment of the exposure to noise in the working environment, the employer shall establish a noise-prevention programme with the aim of eliminating the hazard or risk, or reducing it to the lowest practicable level by all appropriate means.

Workers' health surveillance, training and information:

1. Workers who may be exposed to noise levels exceeding occupational standards shall receive regular audiometric testing.
2. The industry shall ensure that workers who may be exposed to significant levels of noise are trained in the effective use of hearing-protection devices and the role of audiometric examination.
3. If the elimination of noisy processes and equipment as a whole is impracticable, their individual sources shall be separated out and their relative contribution to the overall sound pressure level identified.
4. If reducing the noise at source or intercepting it does not sufficiently reduce workers' exposure, then the final options for reducing exposure shall be to:
 - a. Install an acoustical booth or shelter for those job activities where workers' movement is confined to a relatively small area;
 - b. Minimize by appropriate organizational measures the time workers spend in the noisy environment;
 - c. Provide hearing protection;
 - d. Offer audiometric testing.

- Heat and Cold Stress

Hazard Description: Risks arise when temperature and humidity are unusually high, high temperatures and humidity occur in combination with heavy protective clothing or a high work rate, or when the workers are exposed to high radiant heat.

If workers are exposed in all or some of their tasks to any of above conditions and the hazard cannot be eliminated, employers shall assess the hazards and risks to safety and health from extreme temperatures, and determine the controls necessary to remove the hazards or risks or to reduce them to the lowest practicable level.

The assessment for the thermal environment shall take into account the risks arising from working.

(a) A hot environment that makes respiratory protectors un-comfortable and less likely to be used, and necessitates re-structuring of jobs in order to reduce the risks.

Control Strategies:

1. Workers exposed to heat will be trained to recognize symptoms which may lead to heat stress or hypothermia, in themselves or others, and the steps to be taken to prevent onset and/or emergencies, in the use of rescue and first-aid measures; and in action to be taken in the event of increased risks of accidents because of high or low temperatures.
 2. The importance of physical fitness for work in hot environments.
 3. The importance of drinking sufficient quantities of suitable liquid and the dietary requirements providing intake of salt and potassium and other elements that are depleted due to sweating.
 4. When the assessment reveals that the workers may be at risk of heat stress or hypothermia, employers shall eliminate the need for work in such conditions or take measures to reduce the risks from extreme temperatures.
 5. Where workers are at risk from exposure to radiant heat by working near hot surfaces the employer may increase the distance between the equipment to reduce the temperature of the surface by changing plant-operating temperatures, insulating the surfaces or reduce the emissivity of the surface.
 6. The industry shall take particular care with ventilation design where work is undertaken in enclosed spaces or areas. When fail-safe systems are not in operation, there will be adequate supervision of workers at risk to ensure that they can be removed from danger.
- Inhalable agents (gases, vapors, dusts and fumes)

Hazard Description: The production of billets/ingots & bars involves dusts, fumes, smokes and aerosols. The pulmonary system (lungs) can be affected by exposure to harmful agents through acute (short-term) injury to lung tissue, the development of pneumoconiosis, pulmonary dysfunction

Specific agents that may be found in the iron and steel industry include heavy metals (e.g. lead, chromium, zinc, nickel and manganese) in the form of fumes, particulates and adsorbates on inert dust particles.

Control Strategies:

1. Where it is not possible, exposure to harmful inhalable agents with which they work or may come in contact shall be minimized.

- Control of Energy

Hazard Description: The industry uses electrical energy. The safe control of energy shall be addressed by procedure and carried out by appropriately trained personnel in accordance with the nature of the energy source and the characteristics of the facilities. Energy sources for equipment shall be turned off or disconnected or de-energized and the switch locked or labeled with a warning tag.

Control Strategies:

1. All electrical installations shall be appropriately designed and shall include appropriate protection systems, such as automatic shut-off systems, interlocks and emergency controls.
2. Energy sources and facilities shall be appropriately labelled.
3. A risk assessment shall be conducted before isolating the energy source to ensure that the consequences have been evaluated.

- Work equipment and machinery guarding

Hazard Description: The use of work equipment, including machinery may result in accidents, many of which are serious and some fatal. Of the many factors that can cause risk, particular areas of concern include:

A lack of guards or inadequate guards on machines which can lead to accidents caused by entanglement, sheering, crushing, trapping, cutting, etc.; Insufficient strength of materials and inappropriate design of machines; failure to provide the right information, instruction and training for those using the equipment; All power tools shall be used with appropriate shields, guards and attachments and in accordance with the recommendations of the manufacturers. Workers shall be trained in the use of

power tools and safety requirements.

Control Strategies: Controlling risks often means guarding those parts of machines and equipment that could cause injury. Many accidents happen because of the failure to select the right equipment for the work to be done.

1. The industry shall ensure that fixed guards are used wherever necessary, and properly fastened in place with appropriate fasteners including, screws or nuts and bolts which need tools to remove them; workers will be trained to operate equipment before they are directed to do so;
2. Regular maintenance of machinery and equipment is required to ensure that they are in a safe condition, and maintenance records are kept;
3. Workers shall be authorized to immediately stop the machine if it is not working safely or if any guards or protective devices are faulty, and inform the supervisor as soon as possible.

- Hazards in operating the furnace

Preventing fires and explosions

Fires and explosions in 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. Following precautions shall be taken to prevent fires:

- a. 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.
- b. Regular safety audits shall be undertaken to ensure that hazards are clearly identified and risk-control measures maintained at an optimum level. Furnaces shall not be operated beyond their safe lives.

- Dusts and Fibres

When a furnace is stripped for maintenance purposes, particular care shall be taken to avoid inhaling dusts or fibres from the insulating material. Dust and fume collectors shall be incorporated into the furnace design.

- Preventing steam explosion

Molten slag and metal shall be prevented from coming into contact with water, which will cause a steam explosion. Equipment and piping for furnace gas cleaning, and piping carrying gas in the air preheating system of the dry dust catchers, shall be built in such a way that they can be ventilated and cleaned.

- Handling molten metal, dross or slag

Hazard Description: Burns may occur at many points in the steel-making process: at the front of the furnace during tapping from molten metal or slag; from spills, spatters or eruptions of hot metal from ladles or vessels during processing, teeming (pouring) or transporting; and from contact with hot metal as it is being formed into a final product.

Assessment of risk: The likelihood of injury in the handling of molten metal shall be assessed at all stages in the process. This includes the integrity, stability and use of the furnace and transport ladles, the nature and use of vehicle/crane transport, and the systems in place for pouring molten metal.

Control Strategies:

1. Personnel handling molten metal shall be trained in the proper procedures to adopt, and in the relevant safety and health precautions, including use of appropriate PPE.
2. Only essential personnel shall be in the vicinity of pouring operations.
3. Moulds and tundishes shall not be damp, nor shall there be any means whereby water may enter the melt because of the risk of explosion.
4. The area will be cordoned off prior to the transport of molten metal if there is a possibility of spillage.
5. A competent person shall regularly inspect ladle buckets and their supporting, locking and tipping mechanisms.
6. Corrective repair measures that are recommended shall be planned and implemented on a timely basis.

- Rolling Mill

Hazard Description: In any rolling mill, there is a risk of trapping between the rolls. Severe injuries may be caused by shearing, cropping, trimming and guillotine machines,

unless the dangerous parts are securely guarded. Injuries may occur, especially in hot-rolling, if workers attempt to cross roller conveyors at unauthorized points. Even in automated works, accidents occur in conversion work while changing heavy rollers in the stands. In hot-rolling, burns, eye injuries or other injuries may be caused by flying mill scale and dust particles or by whipping of cable slings. Eyes may also be affected by glare.

Control Strategies:

1. Nips of rolls shall be effectively guarded based on an appropriate risk assessment, and strict supervision exercised to prevent any work which is in motion.
2. Dangerous parts shall be securely guarded to prevent severe injuries caused by shearing, cropping, trimming and guillotine machines.
3. Good planning often reduces the number of roll changes required. The change of heavy rollers in the stands shall not be done with time pressure and without suitable tools.

- Internal Transport

Hazard Description: The hazards can be caused by interaction between vehicles, vehicles and other objects and personnel, or by loads falling off or from the vehicle.

Control strategies:

1. Operators shall have the necessary knowledge of the hazards and potential risks concerning the transportation of cargo.
2. Operators of certain types of vehicles may require regular medical surveillance.
3. Contractors and other visitors shall be appropriately instructed about the hazards and potential risks. They shall be instructed about the rules of how to move in the area.
4. Transport routes shall be planned and constructed to minimize the risk of collision and with sufficient safe clearance to allow for aisles and turns, or other types of control area.
5. The safe operating speed for vehicles shall be posted and enforced. The operator shall be protected from cargo, such as molten metal splashes, chemicals and

unsecured cargo. Loads shall be lowered slowly and smoothly.

6. Lifting devices shall be made of steel that is not prone to hydrogen embrittlement and shall be shielded from radiant heat. Workstations shall not be located underneath the path of molten material.

- Personal Protective Equipment (PPE)
- General provisions

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.

PPE shall be examined periodically to ensure that it is in good condition. Employer 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.

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. Before reissuing the clothing or equipment, employers shall provide for the laundering, cleaning, disinfecting and examination of protective clothing or equipment which has been used and may be contaminated by materials that are hazardous to health.

Employers shall ensure that workers do not take contaminated clothing home and shall provide for the cleaning of such clothing at no cost to the worker.

- Head protection

Helmets intended for use in the metallurgical industry shall be subjected to a test for resistance to splashes of molten metal. If splits or cracks appear, or if a helmet shows signs of ageing or deterioration of the harness, the helmet shall be discarded.

- Face and eye protection

Goggles, helmets or shields that give maximum eye protection for each welding and cutting process shall be worn by operators, welders and their helpers. Welding and cutting processes of furnaces emit radiation in the ultraviolet, visible and infrared bands of the spectrum, which are all able to produce harmful effects upon the eyes. In welding operations, helmet type protection and hand shield type protection shall be used. Protection is also necessary for the welder's assistant and those who may be exposed to the hazards shall be appropriately protected.

- Leg Protection

Shoes or boots shall be without tongues and trouser legs shall be pulled over the top of the boot and not tucked inside. Slip-resistance properties shall be taken into account when choosing footwear. Rubber or metallic spats, gaiters or leggings shall be used to protect the leg above the shoe line, especially from risks of burns. Knee protectors may be necessary, especially where work involves kneeling. Aluminized heat-protective shoes, boots or leggings shall be used near sources of intense heat. All professional footwear shall be kept clean and dry when not in use and shall be replaced as soon as necessary.

- Hearing protection

Hearing loss of speech frequencies may occur with elevated long-term exposure to noise. The use of hearing protectors gives the best results to users who are well informed of the risks and trained in their use. If earplugs are used, special attention shall be paid to the proper fitting technique.

Hearing protectors shall be made available at the entrance to the noisy area and they shall be put on before entering the noisy area. Noisy areas shall be indicated by appropriate signs.

- Work clothing

Where required on the basis of a risk assessment, workers shall wear the appropriate protective clothing provided by the employer.

The selection of protective clothing shall take into account:

- (a) The adequacy of the design and the fit of the clothing, allowing freedom of movement to perform tasks, and whether it is suitable for the intended use;
- (b) The environment in which it will be worn, including the ability of the material from which it is made to resist penetration by chemicals, minimize heat stress, release dust, resist catching fire and not discharge static electricity; and
- (c) The special requirements of workers exposed to molten metal and associated hazards, such as the need for reflective clothing or insulated clothing with reflective surfaces during exposure to high radiant heat and hot air.