7.3 RISK ASSESSMENT

7.3.1 INTRODUCTION

Risk analysis deals with the identification and quantification of risks, the plant equivalent and personnel are exposed to, due to accidents resulting from the hazards present in the factory. Hazard analysis involves the identification and quantification of the various hazards that likely to occur in the factory.

Both hazard and risk analysis very extensive studies, and require a very detailed design and engineering information.

The various hazard analysis techniques that may be applied are Hazard and Operability (HAZOP) studies, Fault - Tree Analysis (FTA), event –tree analysis and, failure and effects mode analysis.

Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighbouring populations are exposed to as result of hazard present. This requires a through knowledge of failure probability, credible accident scenario, vulnerability of populations etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum creditable accident studies.

7.3.2 SCOPE OF THE STUDY

The scope of work is to carry out risk analysis for the proposed plant covering all the hazardous chemicals to be handled and stored at the plant.

The risk assessment study will cover following aspects:

- Selection of credible scenarios
- Consequences Analysis of selected accidents scenarios both onsite and off-site

On-site

- Emission/spillage etc. from storage & handling
- Exposure to fugitive dust, noise, and other emissions
- Housekeeping practices requiring contact with solid and liquid wastes

Off-site

- Exposure to pollutants released from on site/ storage/related activities

- Contamination due to accidental releases or normal release in combination with natural hazard
- Deposition of toxic pollutants in vegetation / other sinks and possible sudden releases due to accidental occurrences

➢ Review of Safety at the plant

➢ Risk Mitigation Measures

7.3.3 FIRE PROTECTION SYSTEM

The following Fire Protection system is already been provided in the plant it will be expanded to proposed units also

- Hydrant system covering the entire plant including all important auxiliaries and buildings. The system will be complete with piping, valves instrumentation, hoses, nozzles and hydrants, valves etc.
- Sprinkler system for cable galleries / vaults / spreader room etc.
- Portable extinguisher such as pressurized water type, carbon dioxide type and foam type will be located at strategic locations through out the plant.
- Modular type carbon dioxide panel injection fire extinguishing system will be provided in control equipment room, cable space below control room and at other unmanned electrical and electronic equipment room.

The following pumps will be provided in the fire protection system.

Fire water pumps.

(Fire water reservoir is part of the main water reservoir)

a) AC motor driven fire water pumps for hydrant, medium velocity water spray system and foam system.
b) AC motor driven fire water pumps for high velocity water spray system.
c) Diesel engine driven pump as stand by for the above.
d) Jackey pump 1 no. (AC motor driven) for maintaining pressure.

7.3.4 FIRE ALARM SYSTEM

The fire alarm system proposed in the expansion project is given as following.

Cable areas, control room will be provided with Ionization and photo electric smoke detectors. The above system will be designed as per the requirements of Tariff Advisory Committee (TAC) of Insurance companies of India.

Suitable number of electric motor driven and diesel engine operated hydrant and spray pumps with automatic starting will be provided for the above systems. The fire water pumps will take suction from the fire water reservoir to be created in the plant area.

7.3.5 METHODOLOGY OF MCA ANALYSIS

The MCA Analysis involved ordering and ranking of various sections in terms of potential vulnerability. The following steps were involved in MCA Analysis.

- Preparation of an inventory of major storages and rank them on the basis of their hazard properties.
- Identification of potentially hazardous storage sections and representative failure cases from the vessels and the pipelines.
- Visualization of chemical release scenarios.
- Effect and damage calculation from the release cases through mathematical modeling.
- Inventory Analysis and Fire & Explosion and Toxicity Index (FETI) are the two techniques employed for hazard identification process.

7.3.6 FIRE & EXPLOSION AND TOXICITY INDEX

The role of Fire & Explosion Index (FEI) aids quantitative hazard identification. The FEI is calculated by evaluating the loss potential of all the units in the storage area and the hazardous areas were classified accordingly. The role of FEI is

- Identification of the equipment/areas that could likely contribute to the creation or escalation of incident and relatively rank the incidents.
- Quantification of the expected damage of potential fire and explosion incidents.
- Preparation of guidelines for mitigating fire hazards.

The loss potential which could actually be experienced under the most adverse operating conditions is quantitatively evaluated. The FEI is used for any operation in which a flammable, combustible or reactive material is stored, handled or processed.

FEI = MF * GPH * SPH

Where MF : Material factor

GPH : General Process Hazard

SPH : Special Process Hazard

TOXICITY INDEX

The Toxicity Index is calculated using the Nh, Ts, GPH and SPH. TI is calculated by the following formula.

$$TI = \frac{(Nh + Ts) * (1 + GPH + SPH)}{100}$$

7.3.7 ASSESSMENT OF RISK AT M/s. HSAPL [Std. ToR # 3 (ix)]

Based on the storage inventory the following areas are identified as potential safety risk areas are shown in table 7.3.1

TABLE NO. 7.3.1: HAZARD MATERIAL STORAGE

S.No.	Area	Capacity / quantity
1.	Coal handling plant	---
2.	Coal storage (for Coal Gasifier)	1200 tons (10 days)
3.	FO storage	2 x 50 KL

TABLE NO. 7.3.2: HAZARD IDENTIFICATION AND PROPOSED SAFETY SYSTEMS

Equipment	Process	Potential Hazard	Provision
Power Transformers	----	Fire and explosion	Automatic fire fighting system will be provided. Isolated with fencing and restricted entry.
IF	Converts charge into hot metal	Re-circulating water may come in contact with molten hot metal leading to spurting of metal or under extreme conditions explosion may also occur.	In built safety system is provided in the construction of furnace with suitable refractory walls.
		Charging materials being rusty and moisturized which may lead to spurting of metal	This may occur if raw materials are stored in open. However, raw material in the proposed steel plant will be covered
		Presence of oil and grease and other impurities, which may lead to unexpected	Fuel supply into the furnace will be regulated and will be controlled by PLC systems.

		fires.	
Continuous Casting Machine	Casting the hot metal into hot billets	hot metal liquid spillage during transfer of hot metal	effective care to be exercised while operating and handling ladle.
Reheating furnace	Billet will be reheated and converted into Rolled products	Fire at FO storage tank	FO storage tank will be provided with Dyke wall and all the OISD guidelines will be followed.
Switch Yard	transformer	Fire	All electrical fittings and cables are provided as per the specified standards.
Switch Yard control room	-	Fire in cable galleries and switch	
HSD / FO storage area	MS tanks (2 x 50 KL)	Fire & explosion	Precautions as per TAC and OISD will be implemented.
Coal storage shed	Storage of coal for 10 days requirement.	Fire and spontaneous combustion	Coal storage yard will be continuously sprinkled with water with garden type sprinklers.
Failure of APCS	Dust / Smoke	Air emission	Emergency alarm to be given to Villagers. Raw material input will be stopped to the system. Water sprinkling arrangements

7.3.7.1 COAL HANDLING PLANT - DUST EXPLOSION

Coal dust when dispersed in air and ignited will explode. Crusher houses and conveyor systems are most susceptible to this hazard. The minimum of explosive concentration of coal dust (33% volatiles) is 50 grams/m^3. Failure of dust extraction & suppression systems may lead to abnormal conditions and increasing the concentration of coal dust to the explosive limits. The sources of ignition are incandescent bulbs, electric equipment & cables, friction & spontaneous combustion in accumulated dust. Dust explosion may occur without any warning with maximum explosion pressure upto 6.4 bars. Another dangerous characteristic of dust explosions is that it sets off secondary explosions after the occurrence of initial dust explosion.

Stock pile area shall be provided with automatic garden type sprinklers for dust suppression as well as to reduce spontaneous ignition of coal stock piles, necessary water distribution net work will be provided for distributing water at all transfer points, crusher house, control room, etc.

A centralized control room with microprocessor based control system has been envisaged for operation of the coal handling plant. Except locally controlled equipment like travelling tripper, dust extraction / dust suppression / ventilation equipment, sump pumps, water distribution system all other in line equipment will have provision for local control as well. All necessary inter local control panels will be provided for safe and reliable operation of the coal handling plant.

Control measures for coal yard

The entire quantity of coal will be stored in separate stack piles, with proper drains around to collect washouts during the monsoon. Water sprinkling system will be installed on stocks of pile to prevent spontaneous combustion and consequent fire hazards. The stack geometry will be adopted to maintain minimum exposure of stock pile areas towards predominant wind direction temperature will be monitored in the stock piles regularly to detect any at normal rise in temperature inside the stock pile to be enable to control the same.

7.3.8 RISK & CONSEQUENCE ANALYSIS OF FIRE

The principle objective of this study is to identify the potential hazards estimate the effects of hazards to people both with in and outside the plant premises.

- Identification of possible failure cases of the facilities which might affect the population and property within the plant boundary.
- Assessment of consequential effect on surrounding population, property etc., due to onset of such failures.
- Suggest recommendations based on consequence analysis relevant to the situations.

7.3.8.1 METHODOLOGY

The hazards expected from this plant include the pool fire situation due to the leakage of FO from the storage tank. There will be 2 nos. of FO storage tanks each of 50 KL capacity. The tank will be made of Mild steel and will be provided with dyke around the tanks. The most credible failure is due to the rupture of the pipe connecting the storage tank. The worst case can be assumed as when the entire contents leak out into the dyke forming a pool, which may catch fire on finding source of ignition.

FO STORAGE TANK - POOL FIRE SCENARIO

The maximum quantity of FO stored at site will be 4 x 25 m^3 capacity. In the event of tank spilling its contents through a small leakage or due to rupture of pipeline connecting the tank and on ignition fire will ensue. As the tanks are provided with dyke, the fire will be confined within the dyke. Threshold limit for first degree burns is 4.5 kw/m^2. Based on these results it may be concluded that the vulnerable zone in which the thermal fluxes above the threshold limit for first degree burns (4.5 kw/m^2) is restricted to 23 m. The hazard distances for various radiation intensities are shown in table 7.3.3.

TABLE 7.3.3: HAZARD DISTANCES (Two Tanks on fire - scenario)

FO Quantity: 2 x 50 m^3

Radiation intensity		HAZARD DISTANCES
37.5 kw/m^2	(100% lethality)	3 m
25.0 kw/m^2	(50% lethality)	9 m
12.5 kw/m^2	(1% lethality)	16 m
4.5 kw/m^2	(1^{st} degree burns)	23 m

The hazard distances for Thermal radiation are confined to the plant premises only. Hence there will not be any thermal radiation impact on outside the population due to the pool fire scenario. The thick green belt to be developed will help to further mitigate the radiation intensity level outside plant boundary.

7.3.8.2 GENERAL FIRE HAZARDS WITHIN THE PROPOSED EXPANSION ACTIVITY

The potential hazardous operations and processes in the system are listed below.

1. Cable Galleries

For containment of fire and preventing it from spreading in the cable galleries, unit wise fire barriers with self - closing fire resistant doors with minimum fire rating of approximately 90 minutes are planned. The ventilation system provided in the cable galleries would be interlocked with the fire alarm system so that, in the event of a fire alarm, the ventilation system is automatically switched - off. Also to avoid spreading of fire, all cable entries / openings in cable galleries, channels, barriers etc. Will be sealed with non inflammable /fire resistant sealing material. Instrument cables will be fire Resistant low smoke type.

7.3.8.3 EFFECTIVE CONTROLS

Ignition sources in the vicinity. Pressurization of buildings not having explosion - proof fittings, switching off power supply from a central place, blanket ban on smoking, proper maintenance of flame proof fittings.

The thick green belt to be developed will help to mitigate the radiation intensity level outside plant boundary.

7.4 DISASTER MANAGEMENT PLAN [Std. ToR # 7(xiii)]

7.4.1 DISASTERS

A disaster is catastrophic situation in which suddenly, people are plunged into helplessness and suffering and as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, are Disasters resulting from natural phenomena like earthquakes, volcanic eruptions, cyclones, tropical storms, floods, avalanches, landslides etc. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract it depends to a large extent on the physical, economic and social environment in which it occurs. What would be considered a major disaster in developing country, will be equipped to cope with the problems involved, may not mean more than temporary emergency elsewhere. However all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless food, clothing and medical supplies, and the rapid reestablishment of essential services.

The site of existing plant & study area of 10 Km. falls in zone-II of Seismic Zone classification of India. Hence the chance of Tsunami / Cyclones / Storm Surges / Earthquakes etc, are negligible.

7.4.2 OBJECTIVES OF DISASTER MANAGEMENT OF PLAN

The disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of Disaster Management Plan, it will be widely circulated and personnel training through rehearsals.

The Disaster Management Plan would reflect the probable consequential severity of undesired event due to deteriorating conditions or through knock on effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of outside agencies.

To tackle the consequences of a major emergency inside the factory or immediate vicinity of the factory, a Disaster Management Plan has to be formulated and this planned emergency is called Disaster Management Plan.

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the Plant and the outside services to achieve the following:

- Pool fire scenario due to FO storage
- Minimise damage to property and the environment.
- Effect the rescue and medical treatment of causalities.
- Provide for the needs of relatives.
- Provide authoritative information to news media.
- Secure the safe rehabilitation of affected areas.
- Safeguard other people.

Initially contain and then ultimately bring the situation under the control.

Preserve subsequent records and equipment for subsequent enquiry the cause and circumstances leading to emergency.

7.4.3 EMERGENCIES

7.4.3 1 GENERAL, INDUSTRIAL, EMERGENCIES

The emergencies that could be envisaged in the Plant are as follows:

- Pool fire scenario at FO storage tank
- Contamination of food / water.
- Sabotage / social disorder.
- Structural failures.
- Slow isolated fires.

7.4.3.2 SPECIFIC EMERGENCIES ANTICIPATED

During the study of risk assessment, the probabilities of occurrence of hazards are worked out along with the nature of damage. This is the reason why one should study risk assessment in conjunction with DMP.

7.4.3.3 EMERGENCY ORGANISATION

It is recommended to setup an Emergency Organization. A senior executive who has control over the affairs of the Plant would be heading the Emergency Organization. He would be designated as Site Controller. In the case of stores, utilities, open areas which are the not under the control of production heads, executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controllers would be reporting to the site controller.

Each Incident Controller, for himself, organizes a team responsible for controlling the incident with the personnel under his control. Shift in-charge would be the reporting Officer, who would bring the incident to the notice of the Incident Controller and the Site Controller.

Emergency Coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and support services. For this purposes, Security in-charge, Personal Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electrical fitters, pump house incharge and other maintenance staff would be drafted for emergency operations. In the event of Power communication system failure, some of staff members in the office/ Plant offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

7.4.3.4 EMERGENCY COMMUNICATION

Whoever notices an emergency situation such as fire, growth of fire, leakage etc. would inform his immediate superior and Emergency Control Center. The person on duty in the Emergency Control Centre, would appraise the site controller. Site controller verifies the situation from the Incident Controller of that area or the shift incharge and takes a decision about implementing on Site Emergency. This would be communicated to all the Incident Controllers, Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

7.4.3.5. EMERGENCY RESPONSIBILITIES

The responsibilities of the key personnel are appended below

7.4.3.5.1 SITE CONTROLLER

On receiving information about emergency he would rush to Emergency Control Centre and take charge of ECC and the situation and assesses the magnitude of the situation on the advice of incident controller and decides.

- Whether affected area needs to be evacuated.
- Whether personnel who are at assembly points need to be evacuated.
- Declares Emergency and orders for operation of emergency siren.
- Organizes announcement by public address system about location of emergency.
- Assesses which areas are likely to be affected, or need to be evacuated or to be altered.
- Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other key personnel whether shutting down the Plant or any section of the Plant required and if evacuation of persons is required.
- Directs personnel of rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support systems locally available for meeting emergencies.

- Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to District Emergency Authority, Police, and Hospital and seeks their intervention and help.
- Informs Inspector of factories, Deputy Chief Inspector of factories, CECB and other statutory authorities.
- Gives public statement if necessary.
- Keeps record of chronological events and prepares an investigation report and preserves evidences.

On completion of onsite Emergency and restoration of normalcy, declares all clear and orders for all clear signal.

7.4.3.5.2 INCIDENT CONTROLLER

- Assembles the incident control team.
- Directs operations within the affected areas with the priorities for safety to personnel, minimise damage to the Plant, property and environment and minimise the loss of materials.
- Directs the shutting down and evacuation of Plant and areas likely to be adversely affected by the emergency.
- Ensures that all-key personnel help is sought.
- Provides advice and information to the Fire and Security officer and the local Fire Services as and when they arrive.
- Ensures that all non-essential workers / staff of the effected areas evacuated to the appropriate assembly points and the areas are searched for causalities.
- Has regard to the need for preservation of evidence so as to facilitate any enquiry into the cause and circumstances, which caused or escalated the emergency.
- Coordination on with emergency services at the site.
- Provides tools and safety equipments to the team members.
- Keeps in touch with the team and advice them regarding the method of control to be used.
- Keep the site Controller of Emergency informed of the progress being made.

7.4.3.5.3 EMERGENCY COORDINATOR - RESCUE, FIRE FIGHTING

- On knowing about emergency, rushes to Emergency Control Centre.
- Helps the incident controller in containment of the emergency.
- Ensure fire pumps in operating conditions and instructs pump house operator to be ready for any emergency.
- Guides the fire fighting crew i.e. Firemen trained Plant personnel and security staff.
- Organizes shifting the fire fighting facilities to the emergency site, if required.
- Takes guidance of the Incident Controller for fire fighting as well as assesses the requirements of outside help.
- Arranges to control the traffic at the gate and the incident area / Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision.
- Evacuates the people in the Plant or in the near by areas as advised by site controller.
- Searches for casualties and arranges proper aid for them.
- Assembles search and evacuation team.
- Arranges for safety equipments for the members of his team.
- Decides which paths the evacuated workers should follow.
- Maintains law and order in the area, and if necessary seeks the help of police.

7.4.3.5.4 EMERGENCY COORDINATOR - MEDICAL, MUTUAL AID, REHABILITATION, TRANSPORT AND COMMUNICATION

- The event of failure of electric supply and there by internal telephone, sets up communication point and establishes contact with the Emergency Control Center (ECC).
- Organizes medical treatment to the injured and if necessary will shift the injured to near by hospitals.
- Mobilizes extra medical help from outside, if necessary
- Keeps a list of qualified first aiders of the factory and seek their assistance.
- Maintains first aid and medical emergency requirements.
- Makes sure that all safety equipment are made available to the emergency team.
- Assists Site Controller with necessary data and to coordinate the emergency activities.
- Assists Site Controller in updating emergency plan.

- Maintains liaison with Civil Administration.
- Ensure availability of canteen facilities and maintenance of rehabilitation centre.
- He will be in liaison with Site Controller / Incident Controller.
- Ensures availability of necessary cash for rescue / rehabilitation and emergency expenditure.
- Controls rehabilitation of affected areas on discontinuation of emergency.
- Makes available diesel petrol for transport vehicles engaged in emergency operation.

7.4.3.5.5 EMERGENCY COORDINATOR – ESSENTIAL SERVICES

He would assist Site Controller and Incident Controller

- Maintains essential services like Diesel Generator, Water, Fire Water, Compressed Air / Instrument Air, Power Supply for lighting.
- He would plan alternate facilities in the event of Power failure, to maintain essential services such as lighting, etc.
- He would organize separate electrical connections for all utilities and during emergency be coordinates that the essential services and utilities are not effected.
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc to shift incharge and electricians.
- Ensure availability of adequate quantities of protective equipment and other emergency materials, spares etc.

7.4.3.5.6 GENERAL RESPONSIBILITIES OF EMPLOYEES DURING AN EMERGENCY

During an emergency, it becomes more enhanced and pronounced when an emergency warning is raised, the workers if they are incharge of process equipment should adopt safe and emergency shut down and attend any prescribed duty as an essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

7.4.3.6. EMERGENCY FACILITIES

7.4.3.6.1 EMERGENCY CONTROL CENTRE

For the time being office block is identified as Emergency control centre. It would have external Telephone, and Fax facility. All the Incident controller officers, senior personnel would be located here. The following information and equipment are to be provided at the Emergency control centre (ECC).

- Intercom, telephone
- P&T telephone
- Fire suit / gas tight goggles / gloves / helmets
- Factory layout, site plan
- Emergency lamp / torchlight
- Plan indicating locations of hazard inventories, Plant control room, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes.
- Hazard chart
- Safe contained breathing apparatus
- Hand tools, wind direction, wind velocity indications
- Public Address Megaphone, Hand bell, Telephone directories (Internal, P&T).
- Address with telephone numbers and key personnel, Emergency coordinator.
- Important addresses, telephone numbers such as experts from outside, government agencies neighboring industries etc.
- Emergency shut down procedures.
- Nominal roll of employees.

7.4.3.6.2 EMERGENCY POWER SUPPLY

Plant facilities would be connected to Diesel Generator and would be placed in auto mode.

7.4.3.6.3 FIRE FIGHTING FACILITIES

First Aid Fire Fighting equipment suitable for emergency should be maintained as per statutory requirements per TAC Regulations. Fire hydrant line converting major areas would be laid. It would be maintained as 6 kg / sq.cm. pressure.

7.4.3.6.4 LOCATION OF WIND SOCK

On the top of production block and on the top of administrative block wind socks would be installed to indicate direction of wind during emergency period.

7.4.3.6.5 EMERGENCY MEDICAL FACILITIES

Gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical centre as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help. Apart from Plant first aid facilities, external facilities would be augmented. Names of Medical Personnel, Medical facilities in **Hindupur Town** will be prepared and updated. Necessary specific medicines for emergency treatment of Burns patients and for those affected by toxicity would be maintained. Breathing apparatus and other emergency medical equipment would be provided and maintained.

7.4.3.7 EMERGENCY ACTIONS

7.4.3.7.1 EMERGENCY WARNING

Communication of emergency would be made familiar to the personnel inside the plant and people outside. An emergency warning system would be established.

7.4.3.7.2 EMERGENCY SHUTDOWN

There are number of facilities which can be provided to help in dealing with hazard conditions. The suggested arrangements are

Stop feed

Deluge contents

Remove heat

Transfer contents

Methods of removing additional heat include removal the normal cooling arrangements or use of an emergency cooling system. Cooling facilities which is vaporizing liquid may be particularly effective, since a large increase in vaporization can be obtained by dropping pressure.

7.4.3.7.3 EVACUATION OF PERSONNEL

The area would have adequate number of exits and staircases. In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time office maintains a copy of deployment of employees in each shift at Emergency Communication Centre. If necessary, persons can be evacuated by rescue teams.

7.4.3.7.4 ALL CLEAR SIGNAL

At the end of emergency, after discussing with Incident Controllers and Emergency Coordinators, the site controller orders an all clear signal.

7.5 OCCUPATIONAL HEALTH AND SURVEILLANCE [Std. ToR # 8 (i)]

Large industries where multifarious activities are involved during construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the booms, the industrialization generally brings several problems like occupational health and safety.

Significant Occupational Health & Safety Hazards

A. Fall Hazard

B. Fire Hazard

C. Electrical Hazards

D. Mechanical Hazards

E. Chemical Hazards

F. Occupational Health Hazards

7.5.1 OCCUPATIONAL HEALTH

Occupational health needs attention both during construction and operation phases. However the problem varies both in magnitude and variety in the above phases.

7.5.2 CONSTRUCTION & ERECTION

The occupational health problems envisaged at this stage can mainly be due to constructional and noise.

To overcome these hazards, in addition to arrangements required to reduce it within TLV'S, personnel protective equipments should also be supplied to workers.

7.5.3 OPERATION & MAINTENANCE

The working personnel should be given the following appropriate personnel protective equipments.

- Industrial Safety helmets
- Crash helmets
- Face shield with replacement acrylic vision
- Zero power plain goggles with cut type filters on both ends
- Zero power goggles with cut type filters on both sides and blue colour glasses
- Welders equipment for eye and face protection
- Cylindrical type earplug
- Ear plugs
- Canister gas masks
- Self contained breathing apparatus
- Leather apron
- Boiler suit
- Safety belt / line man's safety belt
- Leather hand gloves
- Asbestos hand gloves
- Canvas cum leather hand gloves with leather palm
- Industrial safety shoes with steel toe
- Electrical safety shoes without steel toe and gum boots

7.5.4 OCCUPATIONAL HEALTH [Std. ToR # 8 (iv)]

The usage of the chemicals will be in low quantities and exposure of these chemicals to the employees will be also very low. However all the precautionary measures are being taken while handling these chemicals.

The following are the details of the Occupational Health Surveillance

- Pre employment medical examination are being conducted same will be followed for expansion project also.
- Occupational Health Surveillance (OHS) is being under taken as regular exercise for all the employees specifically for those engaged in handling hazardous substances.
- All the first aid facilities are provided in the plant premises.
- The medical records of each employee are being maintained separately.
- All the basic facilities regarding Occupational health have been established with in the plant.
- The noise levels in critical area are being monitored regularly and the workers at high noise level generating areas will undergo audiometric tests once in six months.
- Liver function test is also being planned for the workers as a part of surveillance.
- Medical facilities are available in **Hindupur Town which is about 11 Kms. by road**.

Capital cost of **Rs. 10 lakhs** & recurring cost of about **Rs. 2.5 Lakhs /Annum** will be allocated for will be allocated for Occupational Health & safety.

Anticipated Occupational & Safety Hazards

- Heat Stress & Stroke
  - ✓ Physical activity
  - ✓ Extremes of age, poor physical condition, fatigue
  - ✓ Excessive clothing
  - ✓ Dehydration
  - ✓ Cardiovascular disease
  - ✓ Skin disorders
- Noise
- Dust Exposure
- Illumination
- Burns and shocks due electricity

EMP for the Occupational Safety & Health hazards

The health of workers can be protected by adopting the following measures:

- Proper Designing of building, Work area.

- Relaxation facilities to workers with good ventilation & air circulation. This will help in relieving of thermal stress.
- Good Housekeeping practices.
- Well engineered ventilation & exhaust system.
- Enclosure.
- Isolation of specific areas
- Enforcement of usage of Personal Protective Devices.
- Regular Work Environment Monitoring
- Statistical Monitoring
- Working hours
- Rotation of employees in specific areas to avoid continuous exposure
- Frequency Of Periodical Examination:
    a. For employees <30 Years once in five years
    b. Between 31-50 Years once in four years
    c. Between 41-50 Years once in two years
    d. Above >50 years once a year

Pre employment check up will be made mandatory and following test will be conducted:

- Plan of evaluation of health of workers
- Chest x rays
- Audiometry
- Spirometry
- Vision testing (Far & Near vision, color vision and any other ocular defect)
- ECG
- Haemogram (examination of the blood)
- Urine (Routine and Microscopic)
- Complete physical examination
    - Musculo-skeletal disorders (MSD)
    - Backache
    - Pain in minor and major joints
    - Fatigue, etc.

- Medical records of each employee will be maintained separately and will be updated as per finding during monitoring.
- Medical records of the employee at the end of his / her term will be updated.

7.6 SAFETY PLAN

Safety of both men and materials during construction and operation phases is of concern. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in Project is possible due to collapse of structures and fire / explosion etc. The details of fire fighting equipments to be installed are given below.

- Carbon dioxide
- Foam type
- DCP
- Soda acid type
- Fire buckets
- Fire hydrants

Keeping in view the safety requirement during construction, operation and maintenance phases, **M/s. HINDUPUR STEEL & ALLOYS PRIVATE LIMITED** has formulated safety policy with the following regulations.

- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of Plants, machinery and equipment.
- To allocate sufficient resources to maintain safe and healthy conditions of work.
- To ensure that adequate safety instructions are given to all employees.
- To provide where ever necessary protective equipment, safety appliances and clothing and to ensure their proper use.
- To inform employees about materials, equipments or processes used in the their work which are known to be potentially hazardous to health and safety.
- To keep all operations and methods of work under regular review for making necessary changes from the safety point of view in the light of experience and up to date knowledge.
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.

- To provide appropriate instructions, training and supervision to employees health and safety, first aid and to ensure that adequate publicity is given to these matters.
- To ensure proper implementation of fire preventive methods and an appropriate fire fighting service along with training facilities for personnel involved in this service.
- To publish / notify regulations, instructions and notices in the common language employees.
- To prepare separate safety rules for each type of process involved.
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

7.6.1 SAFETY ORGANISATION

7.6.1.1 CONSTRUCTION AND ERECTION PHASE

A highly qualified and experienced safety officer will be appointed. The responsibilities of the safety officers include identification of the hazardous conditions and unsafe acts of workers and advise on corrective actions, conduct safety audit, organize training programmes and provide professional expert advice on various issues related to occupational safety and health. In addition to employment of safety officer, every contractor, who employees more than 250 workers, should also employ one safety officer to ensure safety of the workers in accordance with the conditions of the contract.

7.6.1.2 OPERATION & MAINTENANCE PHASE

When the construction is completed the posting of safety officers should be in accordance with the requirement of factories act and their duties and responsibilities should be as defined there of.

7.6.1.3 SAFETY CIRCLE

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circles would be constituted in each area of work. The circle would consist of 5-6 employees from that area. The circle normally should meet for about an hour every week.