6 ADDITIONAL STUDIES

6.1 GENERAL

An additional study including Risk Assessment (RA) and Disaster Management has been carried out for the proposed project to identify main hazards, to review the effectiveness of selected safety measures and to expand the safety measures in order to achieve a zero risk culture at the company. The study has been incorporated in the Environmental Impact Assessment (EIA) report to support the Environmental Management Plan. The study for the project has been further divided into the following sections:

- Risk assessment
- Disaster Management Plan
- Occupational Health and Safety Management System

6.2 SCOPE OF THIS STUDY

The Qualitative Risk Assessment (QRA) study in this report has specifically been conducted considering the Terms of References (TOR) given by the State Expert Appraisal Committee for Environment Clearance (EC).

The study has been carried out with a view to comply the following TORs:

- Objectives and methodology of risk assessment
- Details of raw material and finished products storage facilities
- Process safety, fire-fighting systems, safety features and emergency capabilities to be adopted.
- Identification of hazards
- Consequences analysis
- Recommendations on the basis of risk assessment done
- Disaster Management Plan

The company shall deal with wood, sodium sulphite & sodium hydroxide of which are combustible in nature by virtue of their intrinsic chemical properties or their operating temperatures or pressures or a combination of them. Fire, explosion, combustion or combinations of them are the hazards associated with the unit. Comprehensive, systematic and sophisticated methods of Safety Engineering, such as, Hazard Analysis and Quantitative Risk Assessment have been developed to improve upon the integrity, reliability and safety of the industrial plant.

6.3 OBJECTIVES OF RISK ASSESSMENT

Risk analysis involves an extensive hazard analysis. It involves the identification and assessment of risks to which the plant personnel, neighboring populations and the surrounding environment are exposed as a result of the hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of

population etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies. It provides basis for what should be type and capacity of its on-site and off-site emergency plan and the types of safety measures to be required for the same.

Objectives of risk assessment are:

- To identify hazard and risks resulting from the hazards
- To study and foresee the effects of such risks on the workers, public, property and the environment
- To find out necessary control measures to prevent or minimize risk
- To comply the legal requirement by various safety and environment laws of the country.
- To get the necessary information for Emergency planning and evacuation.

The Risk Assessment presented in this report has been conducted with a view to cover risks arising from the following:

1. Storage and handling of combustible materials like hard wood and fuels like diesel etc.
2. Operation of DG Set, Boiler, ETP, Utility section etc.
3. Process operations carried out by personnel

6.3.1 Methodology Adopted

As a conservative approach, we have analyzed the risk qualitatively. In **Qualitative Risk Assessment**, risk has been analyzed using the Hazards Identification & Risk Assessment (HIRA) methodology. In HIRA, major manual activities carried out by the plant personnel as well as contract labors have been considered. For Qualitative Risk Assessment, the Risk Matrix has been used.

The comprehensive methodology adopted for various kinds of risks is summarized below:

Risk Source	Methodology Adopted for Risk Assessment
Storage and handling of combustible materials like waste paper, coal, etc.	Hazards Identification and Risk Assessment based on Risk Matrix
Operation of DG Set, Boiler, ETP, Utility section	Hazards Identification and Risk Assessment based on Risk Matrix
Process operations carried out by personnel	Mitigation measures have been suggested for the risks involved.

6.3.2 Risk Matrix

LIKELIHOOD/ PROBABILITY		SEVERITY				
		Catastrophic (Death/System Loss)	Major/ Critical (Serious injury/Illness)	Moderate (Less Serious Injury/Illness)	Minor/Marginal (Minor Injury/Illness)	Insignificant/Negligible (No injury/illness)
		1	2	3	4	5
Almost Certain	E					
Likely	D					
Possible	C					
Unlikely	B					
Impossible	A					

Risk Range	Risk Acceptability Criteria	Remarks
	Unacceptable/ High	Management's Decision/Action Plan Required. Potential off-site Impact.
	Medium	Generally Minor off-site Impact. Acceptable with Management's Review. Specific monitoring or SOP to be followed.
	Low	Acceptable without Review. Manage through Routine Procedure.

6.4 DETAILS OF STORAGE FACILITIES

The locations of storage of various chemicals have been marked on layout map (Figure-6.2). Details of the same have been given in the table no 6.1-A.

1. Finished Goods Storage Area
2. Hard Wood Storage Area (Raw Material)
3. Coal/Lignite Storage
4. Chemical storage tanks
5. Solid waste storage area

Sr. No	Item	Monthly requirement	Max. Storage capacity at site	Mode of Storage	Storage Location	Hazards	Mode of transfer from storage to process plant	Safety Features/Fire Fighting arrangements
1	Hard Wood	6000 MT	6000 MT	N.A.	Open Wood Storage Area	Combustible	Fork lift Manual handling	• Fire Hydrant • Fire extinguisher • Hot work permit policy • No smoking
2	Coal	7500 MT	1000 MT	Heaps	Coal Storage Yard	Combustible	JCB & Conveyor belt system	• Water sprinklers shall be used to control the dusts. • Greenbelt shall be provided in and around the coal stack.
3	HSD	-	-	Tank	Near DG set	Spillage of HSD leading to fire due to: Tanker Leakage Hose Failure Improper connections Transfer line leak	--	• Firefighting network shall be provided. • Diesel storage tank shall be earthed. • Dyke wall shall be provided. • Flame proof electrical fittings to be used.

4.	Chemical Storage Drums	-	-	Drum	Nr. Spray Dryer	Exposure due to leakage from joints, corroded lines failure etc. and spillage	Through pipeline	• NaOH shall be stored in well ventilated area. • Dyke wall shall be provided. • Periodic Inspection of flanges joints shall be carried out. • PPEs shall be used. • Corroded lines to be painted/replaced. • Eye wash station to be provided in nearby area.

6.5 QUALITATIVE RISK ASSESSMENT AND MITIGATION MEASURES

Risks involved in various process equipments and some processes cannot be addressed by consequence analysis. As a conservative approach, these risks have been considered separately under this topic. The approach is to identify hazards associated in the operation of equipments as well as processes, utilities, ETP etc., assessing its impacts, ranking the risk posed by it and finally to propose remedial actions/mitigation measures such that risk is minimized to tolerable level.

6.5.1 Manufacturing Process

[√] Risks and Recommendations:

SR. NO.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Various steps of paper manufacturing	Fire	• Risk of severe bodily injury • Possible fatality • Building/equipment damage	3	D		• It shall be ensured that, all work is carried out by qualified and trained engineers. • Availability of all the firefighting equipments as per the requirement shall be ensured. • Housekeeping shall be maintained properly. • All the combustible materials shall be handled with utmost care.
2.	Carrying out maintenance for different machines(cleaning, Repairing Greasing)	Mechanical Hazard	• Severe Body injury/cuts/fractures etc.	5	D		• Use of proper PPEs shall be ensured. • Personal vigilance shall be carried out strictly.
		Hot surfaces /Substances	• Possible severe bodily injury due to burns to skin or scalding from ill-fitting joints, hot surfaces and substances	3	D		• Proper training shall be imparted to the workers. • Before starting any maintenance work, complete safety of the work/equipment (from mechanical and process point of view) shall be ensured by following work permit

							system.
3.	Monitoring of rotary equipments	Noise Rotating part	• Hearing loss • Cuts/Severe bodily injury, may be fatal	3	D		• Use of proper PPEs shall be ensured. • Personal vigilance shall be carried out strictly. • Proper guarding of the rotating parts shall be ensured.
4.	Leakage, spillage, maintenance work from pumps, press machines etc.	Fire/Explosion, Slips, Trips and Falls	• Risk of severe bodily injury • Possible fatality • Building/equipment damage	4	D		• Use of proper PPEs shall be ensured. • All the works shall be carried out by fully qualified and highly trained operators/engineers. • Spillages shall be controlled immediately. • Fire fighting system shall be made available immediately.
5.	Electrical maintenance work/Generation of static electricity charge	Electricity	• Possible fatality due to Electric shock Possible burns/injury	3	D		• No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used. • Access to such unit under maintenance shall be restricted. • Use of proper PPEs shall be ensured. • Preventive maintenance of electrical equipments • Thermographic inspection of electrical equipments

							• Earthing shall be provided to all the required equipments.
6.	Maintenance of Dryer.	Steam/Hot dryer parts/	• Possible severe bodily injury due to skin burns.	4	B		• Use of proper PPEs shall be ensured. • Physical examination of dryers & Non Destructive test for Dryers • Steam valves and dryer parts shall be checked properly before carrying out maintenance. • Hot objects if left unattended, shall be labeled as "Hot".
8.	Finishing Section	Nip Points	• Injury to Human Body. • Damage to Internal Body parts.	4	C		• Use of PPEs like – Face mask, hand gloves, eye protection etc., shall be ensured. • Machine guarding for nip points and running equipments. • Personnel Vigilance shall be done periodically.
	Important Key Measures that shall be ensured are: • Pulping operations shall be automated to maximum extent possible, such that operators can monitor and operate the processes from control rooms isolated from potential chemical exposures as well as other health and safety hazards. • Effective process controls shall be implemented thereby minimizing the use of other chemicals. • Proper Implementation of an inspection and maintenance program shall be done to prevent and identify leaks, equipment failure, etc.						

6.5.2 Boiler

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Boiler feed pump, Suction Strainer cleaning	Water spillage Pressurized water	• Personnel injury	2	C		• Only after doing proper Isolation, draining shall be carried out.
2.	Working near Boiler	High noise	• Noise induced hearing loss	3	D		• Use of proper PPEs shall be ensured. • Periodic Noise Survey and medical examination of employees.
3.	Monitoring of rotary equipment	Noise Ash Rotating Parts	• Hearing loss • Dust exposure • Cuts/Severe bodily injury may be fatal.	3	D		• Use of proper PPEs shall be ensured. • Personal vigilance shall be carried out strictly. • Proper guarding of the rotating parts shall be ensured.
4.	Boiler maintenance (cleaning, Repairing Greasing)	Mechanical Hazard	• Body injury	5	D		• Use of proper PPEs shall be ensured. • Proper training shall be imparted to the workers. • Check for leaks/hotness of the body parts shall be ensured before starting work. • Work permit system shall be followed.
		Hot surfaces /Substances	• Possible severe bodily injury due to burns to skin or scalding from ill-fitting joints, hot	3	D		

			surfaces and substances				
5.	Leakage, spillage, maintenance work etc.	Fire/Explosion	• Risk of severe bodily injury • Possible fatality • Building/equipment damage	4	D		• It shall be ensured that full pre commissioning checks including dry run tests have been carried out. • Care shall be taken that the work is carried out by fully qualified and highly trained engineers only. • Leak detection equipment shall be used. • Liquid spills shall be cleaned immediately.
6.	Incomplete Combustion	Asphyxiation from carbon monoxide	• Possible fatality	3	D		• Ventilation and flue gases shall be checked / tested for the presence of carbon monoxide within the installation before commencing work. • Flue gases shall be passed through Electrostatic Precipitator to collect the fly ash associated with flue gases and there by discharging the clean flue gases in to an open atmosphere through the Chimney.
7.	Maintenance work	Slips, Trips and Falls	• Possible severe bodily injury	3	C		• It shall be ensured that access to and from the site is gained via designated routes only. • Spillages shall be treated immediately and cleaned up. • It shall be made mandatory for engineers/operators to wear suitable safety footwear at all times.

8.	Operator vigilance for feeding.	Noise Dust	• Hearing loss • Dust exposure	4	B		• Use of proper PPEs shall be ensured. •
9.	Electrical maintenance work	Electricity	• Possible fatality due to Electric shock Possible burns	3	D		• No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used. • Access to such unit under maintenance shall be restricted. • Use of proper PPEs shall be ensured. • Earthing shall be provided to all the required equipments.
10.	Changing packing material	Dust and Fibers from packing material	• Possible inhalation/skin irritation from Blast tube insulation packing material	3	D		• Use of proper PPEs shall be ensured. • MSDS shall be made available all the time to look for proper details.
11.	Maintenance of burner.	Withdrawal of pressure jet burner body on guide rails to access burner	• Possible severe bodily injury if stop pins are not in place and boiler body	3	D		• It shall be ensured that the guide rails stop pins are in place prior to withdrawing the burner body. • Burner information shall be made available to the concerned persons and shall be referred before
12.	Boiler Operation (Over pressure in the boiler, Water level indicator not working.	Burning, Physical injury , Explosion	• Minor Injury • Loss of human life • Loss of property	4	C		• Level/Temperature Indicators shall be checked regularly for proper functioning. • Good quality water shall be used. • Inter locking systems shall be provided on pumps, FD fan, ID fan.

6.5.3 DG sets

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Working near DG room	Apparently High noise	• Noise induced hearing impairment or hearing loss	3	D		• Use of proper PPE's like ear plugs, ear muffs etc. shall be made mandatory. • Acoustic enclosures shall be provided.
2.	Maintenance work	Electrocution	• Death, burns, serious • injury	3	D		• Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on. • No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used. • Access to unit under maintenance shall be restricted. • Earthing and flange-to-flange bonding shall be provided at required places.
		Slips, Trips and Falls	• Possible severe bodily injury	4	B		• Access to and from the site shall be gained via designated routes only. • It shall be made mandatory for

							engineers/operators to wear suitable safety footwear at all the times. • Proper Housekeeping shall be ensured.
3.	Charging of Diesel.	Fire	• Risk of severe bodily injury • Possible fatality • Building/equipment damage	3	D		• Fuels shall be stored in sealed containers, away from the source of ignition and generator. • Filling of generator shall be done using funnel or spout when generator is off and cold to touch. • It shall be ensured that generators are placed on firm ground, in well-ventilated areas free from obstructions, away from heat and ignition sources. • Fire extinguishers shall be made available in close proximity to the re-fueling activity; • Only fully qualified and highly trained engineers shall be allowed to do the work.
		Hot Parts of Generator. Inhalation of exhaust fumes	• Severe burns, • Injury, asphyxiation	4	D		• Proper insulation and guards shall be provided. • Exhaust shall be pointed away from public. • Leak detection systems shall be installed.
		Dermatitis from diesel and lube oil.		4	D		• Proper PPEs shall be used. • Spillages shall be treated immediately and practice shall be made to minimize the same by using funnels.

4.	DG set maintenance (cleaning, Repairing Greasing)	Mechanical Hazard.	• Body injury.	5	D		• Use of PPEs like - gloves, eye protection and possible FR clothing for refueling jobs shall be ensured. • Personal vigilance shall be carried out. • Proper training shall be imparted to the workers. • Temperature check shall be done before opening. • Hot parts shall be labeled as "HOT". • All joints shall be checked for leaks before starting work. • Adequate firefighting equipment and First aid kit shall be made easily available. • Area shall be identified as 'No Smoking' Zone.
		Hot surfaces /Substances	• Possible severe bodily injury due to burns to skin or scalding from ill-fitting joints, hot surfaces and substances	3	D		

6.5.4 ETP

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Maintenance of electric pumps, aerator, etc.	Electrocution/Short circuit	• Death, burns, serious Injury	3	D		• Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on. • Preventive maintenance of ELCB and RCB

							• No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used. • Access to the unit under maintenance shall be restricted.
		Slips, Trips and Falls in pits, clarifier, ponds etc	• Possible severe bodily injury. Drowning away.	3	C		• Access to and from site shall be gained via designated routes only. • It shall be made mandatory for engineers/operators to wear suitable safety footwear with non-slip soles at all times. • Grit cover shall be provided on top of ponds, clarifier, pits etc. • Screen shall be placed before the discharge pump to retain the fallen person.
		Open machine parts/blades of agitator/skimmer blades etc	• Cuts/Body Injury	2	C		• Use of proper PPEs shall be ensured.
2.	ETP routine operations (Sampling, pump change over, effluent line up, etc.)	Exposure to various hazardous chemicals/ reagents, fumes, gases etc	• Health impairment	5	D		• Use of PPEs like face mask, hand gloves, wear chemical resistant clothing, safety goggles shall be made mandatory etc. • Hazardous wastes shall be treated separately with great care.

6.5.5 Evaporator

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Maintenance of evaporator feed pump, vacuum pump, transfer pumps	Electrocution/Short circuit	• Death, burns, serious injury	3	D		• Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on. • Preventive maintenance of ELCB and RCB • No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used. • Access to the unit under maintenance shall be restricted.
		Hot surfaces /Substances	• Possible severe bodily injury due to burns to skin or scalding from ill-fitting joints, hot surfaces and substances	3	C		• Temperature check shall be done before opening. • Hot parts shall be labeled as “HOT”. • All joints shall be checked for leaks before starting work. • Adequate firefighting equipment and First aid kit shall be made easily available.

		Open machine parts/blades of agitator/skimmer blades etc	Cuts/Body Injury	2	C		• Use of proper PPEs shall be ensured.
2.	Evaporator routine operations (Pump change over, effluent line up, etc.)	Exposure to various hazardous chemicals/ reagents, fumes, gases etc	Health impairment	5	D		• Use of PPEs like face mask, hand gloves, wear chemical resistant clothing, safety goggles shall be made mandatory etc. • Hazardous wastes shall be treated separately with great care.

6.5.6 Material handling/transportation

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Loading /Unloading of goods	Dust exposure, Fire	• Damage to internal body parts/skin irritation etc. • Risk of severe bodily injury • Possible fatality • Building/equipment	3	C		• Closed conveyor belt system shall be provided. • House-keeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources. • Fire extinguishers shall be made available

			damage.				in close proximity. • Sprinkling of water on coal shall be done before unloading from truck to reduce the dust levels significantly.
2.	Storage & Transportation of coal/chemicals	Dust exposure Fire	• Injury to body. Health damage, impairment to internal body parts etc	4	C		• Dust suppression system shall be provided over storage of coal. • Use of proper PPEs like face mask, hand gloves, chemical resistant clothing and safety goggles shall be ensured. • Asphalt road network shall be provided in the whole area for truck movement to prevent dust emission. • Trucks used for transporting the goods shall be totally enclosed/covered by the tarpaulin and overloading in truck shall be avoided to prevent the dusting and spillage of goods from the truck.

6.5.7 Storage of combustible material (hard wood, coal, etc.)

[√] Risks and Recommendations:

Sr. No.	PROCESS OR ACTIVITY	ASSOCIATED HAZARDS	HEALTH & SAFETY IMPACT (RISK)	SEVERITY	LIKELIHOOD	RISK	PROPOSED MITIGATION MEASURES
1.	Finished Goods Storage/Coal storage	Fire	• Damage to building/equipments/nearby area. • Minor Injury to person.	4	B		• Housekeeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources. • Sufficient nos. of Fire extinguishers/Sprinklers shall be made available in the storage area. • Coal wetting shall be done at the storage area to reduce the dust levels significantly.
2.	Hard Wood Storage Area/Warehouse	Fire/Engine Exhaust	• Damage to building/equipment/ nearby area. • Minor Injury to person.	4	B		• Housekeeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources. • Sufficient nos. of Fire extinguishers/Sprinklers shall be made available in the storage area.
3.	Fuel (Like Diesel, Coal etc.) Storage Area	Spontaneous combustion in the stored fuel	• Severe body injury • Possible fatality	3	C		• Sprinkler system shall be employed in storage area. • Fire extinguishers and fire hydrant shall be made available in close proximity.

							• Fire/smoke detectors shall be made available to detect small fire so as to take immediate action. • Housekeeping shall be taken care. • Air monitoring shall be carried out to check for any dust/fume emissions.

6.6 RECOMMENDATIONS

Recommendations for the proposed project based on Risk Assessment are summarized as below along with other safety measures.

6.6.1 For manufacturing process:

- It shall be ensured that all works are carried out by qualified and trained engineers.
- Availability of all the firefighting equipments as per the requirement shall be ensured.
- Proper Housekeeping shall be maintained.
- Hazardous gas emissions and all the combustible materials shall be handled with utmost care.
- Personal vigilance shall be carried out strictly.
- Effective process controls shall be implemented thereby, minimizing the use of other chemicals.
- Proper Implementation of an inspection and maintenance program shall be done to prevent and identify leaks, equipment failure, etc.
- Proper training shall be imparted to the workers.
- Before starting any maintenance work, complete safety of the work/equipment (from mechanical and process point of view) shall be ensured.
- Automate pulping operations to the extent possible, such that operators can monitor and operate the processes from control rooms isolated from potential chemical exposures and other health - safety hazards.
- PPEs like Helmets, Non-slip sole Safety Shoes, Safety goggles, Acid-Alkali Proof Gloves chemical resistant clothing etc. shall be provided to the employees and the use for the same shall be made mandatory.
- Electrostatic precipitator shall be employed for handling the dust and emissions from the boiler stack.
- Water sprinkling system to suppress dust emission shall be employed wherever required.
- Proper guarding of the rotating parts shall be ensured to protect the employees from injuries.
- All the works shall be carried out by fully qualified and highly trained operators/engineers.
- No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used.
- Access to such unit shall be restricted.
- All the vessels and equipments shall be earthed appropriately and protected against Static Electricity.
- Safety measures shall be adopted from the design stage itself.
- Safety Valve and pressure gauge shall be provided on the machineries at required places.
- To control various parameters and avoid degradation of the product, utility like Chilling water, cooling water, vacuum lines, steam supply and its alternatives shall be made available.
- All emergency valves and switches and emergency handling facilities shall be made easily accessible.
- Material Safety Data Sheets of required Raw Materials & Products shall be made readily available on the shop floor.
- Steam valves and dryer parts shall be checked properly before carrying out maintenance.

- Hot objects/surfaces shall be labeled as "Hot".
- Regular preventive maintenance of all the equipments/machines shall be done and recorded.

6.6.2 For boiler

- Only after doing proper Isolation, draining shall be carried out.
- Proper guarding of the rotating parts shall be ensured.
- Proper training shall be imparted to the workers.
- Check for leaks/hotness of the body parts shall be done properly before starting work.
- It shall be ensured that full pre commissioning checks including dry run tests have been carried out.
- Care shall be taken that the work is carried out by fully qualified and highly trained engineers only.
- Leak detection equipment shall be used.
- Liquid spills shall be cleaned immediately.
- Ventilation and flue gases shall be checked / tested for the presence of carbon monoxide within the installation before commencing work.
- Flue gases shall be passed through Electrostatic Precipitator to collect the fly ash associated with flue gases and there by discharging the clean flue gases in to an open atmosphere through Chimney.
- It shall be ensured that access to and from the site is gained via designated routes only.
- Spillages shall be treated immediately.
- It shall be made mandatory for engineers/operators to wear suitable safety footwear at all times.
- Personal vigilance shall be carried out strictly.
- No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used.
- Access to such unit shall be restricted.
- Use of proper PPEs shall be ensured.
- Earthing shall be provided to all the required equipments.
- MSDS shall be made available all the time to look for proper details.
- It shall be ensured that the guide rails stop pins are in place prior to withdrawing the burner body.
- Burner information shall be made available to be referred before starting the work.
- Regular testing & certification of safety valve, rupture disc shall be done.

6.6.3 For DG sets

- Acoustic enclosures shall be provided for DG room (OR) generator shall be installed in open area away from the work site, for dispersal of noise.
- Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on.
- No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used.
- Access to the maintenance unit shall be restricted.
- Earthing and flange-to-flange bonding shall be provided at required places.

- Access to and from the site shall be gained via designated routes only.
- Proper Housekeeping shall be ensured.
- Fuels shall be stored in sealed containers, away from the source of ignition and generator.
- Filling of generator shall be done using funnel or spout when generator is off and cold to touch.
- It shall be ensured that generators are placed on firm ground, in well-ventilated areas free from obstructions, away from heat and ignition sources.
- Only fully qualified and highly trained engineers shall be allowed to do the work.
- Proper insulation and guards shall be provided.
- Exhaust shall be pointed away from public.
- Leak detection systems shall be installed.
- Spillages shall be treated immediately and practice shall be made to minimize the same by using funnels.
- Use of PPEs like - gloves, safety footwear, eye protection and possible FR clothing for refueling jobs shall be ensured strictly.
- Personal vigilance shall be carried out.
- Proper training needs shall be imparted to the workers.
- Temperature check shall be done before opening any equipment for maintenance.
- Hot parts left unattended shall be labeled as "HOT".
- All joints shall be checked for leaks before starting work.
- Adequate firefighting equipment and First aid kit shall be made available easily.
- Area shall be identified as 'No Smoking Zone'.

6.6.4 For ETP

- Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on.
- No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used.
- Access to the maintenance unit shall be restricted.
- Access to and from the site shall be gained via designated routes only.
- It shall be made mandatory for engineers/operators to wear suitable safety footwear with non-slip soles at all times.
- Guard rails with adequate height shall be provided for inspection on the unit.
- Grit cover shall be provided on top of ponds, clarifier, pits etc.
- Screen shall be placed before the discharge pump to retain the fallen person.
- Spills /Leaks shall be cleaned immediately or it shall be neutralized/soaked in sand.
- Housekeeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources.
- As per the requirement, sand buckets and fire extinguishers shall be made available in close proximity.

- Use of PPEs like face mask, hand gloves, wear chemical resistant clothing, safety goggles shall be made mandatory etc.
- Hazardous waste shall be treated/handled separately with great care.

6.6.5 For Evaporator

- Units shall be regularly tested for electrocution; care shall be taken not to plug any item with power on.
- No cables shall be unplugged with running unit. Flameproof and water proof fittings shall be used.
- Access to the maintenance unit shall be restricted.
- Access to and from the site shall be gained via designated routes only.
- It shall be made mandatory for engineers/operators to wear suitable safety footwear with non-slip soles at all times.
- Guard rails with adequate height shall be provided for inspection on the unit.
- Spills /Leaks shall be cleaned immediately or it shall be neutralized/soaked in sand.
- Housekeeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources.
- As per the requirement, sand buckets and fire extinguishers shall be made available in close proximity.
- Use of PPEs like face mask, hand gloves, wear chemical resistant clothing, safety goggles shall be made mandatory etc.
- Hazardous waste shall be treated/handled separately with great care.

6.6.6 For material handling/transportation/storage

- Closed conveyor belt system shall be provided.
- Housekeeping shall be maintained properly and surrounding area shall be made free from obstructions, heat and ignition sources.
- Coal wetting shall be done before unloading from truck to reduce the dust levels significantly.
- Use of proper PPEs like face mask, hand gloves, chemical resistant clothing, safety goggles shall be ensured.
- Asphalt road network shall be provided in the whole area for truck movement to prevent dust emission.
- Trucks used for transporting the goods shall be covered by the tarpaulin and overloading in truck shall be avoided to prevent the dusting and spillage of goods from the truck.
- Sprinkler system shall be employed in storage area.
- Fire extinguishers and fire hydrants shall be made available in close proximity.
- Fire/smoke detectors shall be made available to detect small fires so as to take immediate action.
- Air monitoring shall be carried out to check for any dust/fume emissions.

OTHER SAFETY MEASURES TO BE EMPLOYED DURING THE PROPOSED PROJECT:

To maintain high standards in Health, Safety and Environment, various activities shall be undertaken at the site.

The following key safety measures shall be a part of the proposed project to be implemented by RPIL

6.6.7 Personnel safety measures:

- Safety Training shall be regularly provided to the employees.
- Safety Sirens with Alarm System in case of emergency shall be provided.
- Emergency Control Room shall be established.
- Assembly point shall be predetermined and provided as per the requirement.
- Sprinkler Systems shall be provided as per the need.
- Fire Hydrant System shall be installed.
- Fire Extinguishers are also proposed to be provided.
- Mock drills shall be periodically conducted and factors like response time to be evaluated.
- Fire squad team shall be formed for handling any emergency situation.
- First Aid Facility and training shall be regularly provided.
- Personal protective gears and equipments shall be provided to the employees.
- Health checkups shall be organized at regular intervals.
- Safety / Health records and MSDS shall be maintained.

6.6.8 Fly ash handling system:

- The Fly ash collected in Economizer and APH shall be designed to collect fly ash in dry form in the Silo. From the silo, fly ash shall be dispatched to trucks. A vent bag filter is mounted on the silo to reduce the environment pollution.
- The ash collected in the hoppers of ESP is discharged in the silo by gravity. Level in the silo is controlled by level controllers provided on silo.
- Unit will provide the Dense Phase pneumatic ash conveying system under the ash discharge points of economizer, APH, and all ESP fields.
- At the discharge point of ash silo, ash conditioner shall be put where water spay shall be done for dust free loading of trucks/lorry under the ash silo.
- The complete system control is fully automated and shall be controlled by PLC.
- Fly ash generated from the proposed power plant shall be commercially utilized in industries like Cement and Brick or filling in low lying areas.

6.6.9 Noise environment:

- Use of PPE like ear plugs and ear muffs shall be made compulsory near the high noise generating machines.
- Moreover, the personnel shall be provided breaks in their working hours with the continuous exposure not increasing more than three (3) hours.

- The plant and equipments are designed with a view to minimize noise pollution.
- To reduce noise, pipe lines shall be liberally sized for low velocities.
- Safety blow off valves, discharge pipes, relief valves, etc. shall be equipped with silencers. Hearing Conservation program shall be imparted where noise level exceeds 90dB(A).

6.6.10 Coal handling system:

- A standard Coal handling system with screening, coal crushing and conveying system shall be installed for the CPP.
- Water sprinklers shall be used to control the fugitive dusts.
- All necessary equipments/machineries shall be maintained in good condition for proper operation.
- Enclosure for transport vehicles /storage vessel, spraying of water on road & ground shall be provided to control the coal dust problem. During the operation phase, proper EMP shall be in place for handling of Coal and/or Lignite.
- Asphalt Road Network shall be provided in the whole premises for truck movement in order to prevent dust emissions.
- Greenbelt shall be provided in and around the premises area, around the coal stack yard and along the roads to minimize the generation of fugitive coal dust.
- For transportation, loading & unloading of goods, closed conveyor belt system shall be provided.
- To control the fugitive dusts from coal and/or Lignite handling, adequate moisture content shall be provided.
- Enclosures for transport vehicles/storage vessel, spraying of water on road & ground shall be effectively implemented to control the coal dust problem. During the operation phase proper EMP shall be in place for handling of Coal and/or Lignite.
- Overloading in trucks shall not be allowed, to prevent the dusting and spillage of goods from the truck.
- A fire hydrant system line shall be provided for immediate response to the unlikely spontaneous combustion in the stored fuel.
- For the proposed plant, a water spraying system shall be provided for coal wetting before unloading from truck to reduce the dust levels significantly.
- Employees shall be given proper training as well as display of the summarized Environmental Management & Safety Procedures shall be made available at the site through signboard.
- Regular Air monitoring and inspection of the environmental management practices shall be carried out and the necessary documents/records shall also be maintained.

SAFETY MEASURES TO CONTROL ENVIRONMENTAL POLLUTION FOR THE PROPOSED PROJECT:

- For the proposed project, the flue gases from the boiler shall be continuously removed through Electrostatic Precipitator and the fly ash shall be collected.
- Domestic effluent shall be treated in the proposed septic tank/soak pit system.
- Adequate size of ETP shall be provided to treat the effluent generated from manufacturing activities.
- Air pollution control devices shall be provided to achieve regulatory norms of GPCB.
- The disposal of solid/hazardous waste for collection, storage and disposal shall be carried out as per the Hazardous Waste Management Rules, 2008.
- Wastewater originated from utilities (filtration plant, softening plant, blow down from boilers) shall be diverted to the ETP.
- Necessary green belt shall be developed in & around the proposed plot for abatement of air and noise pollution.

6.7 SYSTEMS FOR FIRE FIGHTING:

In the paper industry, management of risk arising from fire hazards is a critical part. Waste paper i.e the raw material is a combustible material. While solid blocks of paper may not be easily ignited but once they catch fire, flames can spread rapidly and it becomes difficult to extinguish them. Loose paper, shrink-wrap material and flammable liquids or gases can ignite easily and spread fire to other materials too. High-temperature steam pipes can also be a cause of fire, if not properly insulated.

The risk to people after a fire has started shall largely depends on the adequacy and maintenance of means to escape, the alarm system, training of the workforce in fire routine and evacuation procedures. At RPIL, management has proposed to employ well-resourced and adequate firefighting network.

Table 6-1: Details regarding the firefighting capacity of the unit are given below

Type of Fire Extinguishers	Number of Fire extinguishers	Fire cum fresh water Reservoir Capacity	Fire pump capacity	Hydrant Pressure	Details Deluge valve arrangement	Foam type and quantity	Other relevant details
• CO2 • ABC • Foam • Water CO2	70	1000 m3	173 m3/hr	7 Kg/m2	04	Mechanical Foam Concentrate 200 lit	Fire hydrant system covering Raw material storage, fuel & finish good storage area

Other firefighting measures proposed for the project are as follows:

The following safety measures shall be implemented for the proposed project:

- Safety Sirens with Alarm System in case of emergency shall be provided.
- Emergency Control Room shall be established.
- Assembly points shall be identified.
- First Aid Facility and training shall be provided for the proposed project.
- Personal protective gears and equipments shall be provided for the proposed project.
- Health checkups shall be organized at regular intervals.
- Safety Training shall be provided to the employees.
- Sprinkler Systems shall be provided as and when needed.
- Mock drills shall be periodically conducted and factors like response time shall be evaluated.
- Fire squad team shall be formed for handling any emergency situation.
- Safety / Health records and MSDS shall be maintained for the proposed project.
- Fire Hydrant System shall be installed which shall be used for the proposed project.
- Fire Extinguishers shall be provided.

6.8 DISASTER MANAGEMENT PLAN

The proponent shall develop an emergency management system to tackle the emergency situations (if any) arising at any stage of the proposed project. The details of Disaster Management System are discussed in the following sections.

6.8.1 Nature of the emergency

Level of emergency can be classified into three categories:

LEVEL - 1:

The leakage or emergency, which is confined within the plant premises.

It may be due to -

- Small fire in the plant
- Low toxic gas release for short duration.
- Collapsing of equipment that do not affect outside the premises.

LEVEL - 2:

The emergency, which is confined within the factory premises. It may arise due to -

- Major fire inside the factory premises.
- Medium scale explosion confined to the factory premises.
- Heavy toxic / flammable gas leakage for short duration.

LEVEL - 3:

The emergency, which is not confined within the factory premises and general public in the vicinity are likely to be affected. It may arise due to -

- Explosion of high magnitude affecting the adjacent area
- Natural Calamities like Tsunami/Cyclones/Storm Surges/Earthquakes
- Heavy / Profuse leakage of toxic / flammable gases for a long duration.

6.8.2 Objectives of emergency management system

The objectives of the emergency management system are summarized as under:

- To identify and assess type of emergencies arising due to different types of hazards.
- To work out plan with all provisions to handle emergencies and safeguard employees, people and the environment in the vicinity of the factory.
- To provide for emergency preparedness and the periodical rehearsal of the plan.
- To plan mode of proper communication and actions to be followed in the event of an emergency.
- To keep all necessary information with respect to hazard/accident control and emergency contacts in one document for easy and speedy reference.

- To inform employees, general public and the authorities about the hazards/risks (if any) and the role to be played by them in the event of an emergency.
- To control and contain the accident.
- To effect rescue and treatment of casualties.
- To inform and help relatives of the casualties.
- To secure rehabilitation of affected area and restore normalcy within a short period.
- To provide information to media and government agencies.
- To preserve records and equipments for investigating the cause of emergency.
- To be ready for "mutual aid" if need arises to help the neighboring units.

6.9 STRUCTURE OF EMERGENCY MANAGEMENT SYSTEM

The proposed structure of **Emergency Management System** includes the following personnel;

- Site Main Controllers
- Incident Controllers and Deputy Incident Controllers
- Key Personnel
- Essential Workers

An **On-site emergency plan** is prepared to deal with those incidents which have the potential to harm persons or the environment inside the boundary of the factory premises. A major accident, major emergency and disaster may affect areas inside the plant. These events can affect inside areas and the same can be dealt by the structure of the emergency management system.

6.9.1 Role of the site main controller

Plant head shall be the Site Main Controller (SMC). In absence of the Plant Head, Safety-In-Charge shall act as a SMC. His task shall be to co-ordinate all internal and external activities from the Emergency Control Centre at the Main Security Gate from where all operations shall be directed. He shall:

- Immediately on being informed of the emergency and its location, shall arrive at the site, review the situation and control further actions.
- Shall direct all Emergency Operations within the approved area with the following priorities:
  - Personnel Safety,
  - Plant, Property and Environment Safety and
  - Minimum loss of production.
- Co-ordination to avail services from external agencies like fire brigade, hospitals etc, if called for shall be done by them, following the declaration of major emergency. If necessary, major installations in the vicinity may also be informed of the situation.

- Shall exercise direct operational control of the unaffected section of the plant.
- In consultation with the advisory team, expedite the shutting down of loading / unloading operations of tankers and if necessary, instruct the supervisor / security personnel to evacuate the tankers.
- Ensure that all employees are evacuated from the affected area and the casualties (if any) are given necessary medical attention. Instruct P&A Assistant / Security for rushing casualties to the hospitals.
- Liaise with fire and police officials, pollution control board officials and other statutory bodies and advise them of all possible consequence effects outside the premises.
- Arrange for relief of personnel when emergency is prolonged.
- Issue authorized statement or press release to the news media.
- Ensure preservation of evidence for enquiries to be conducted by statutory authorities.
- Authorize the sounding of "All Clear" and "Evacuation Siren".
- Arrange for obtaining the head count of all personnel within the premises and cross-checking with the data from records available for no. of persons within the premises.
- Nominate a person from advisory team, to maintain chronological log of event during the entire period of emergency.

6.9.2 Role of incident controller and deputy incident controller

His primary duties are to take charge at the scene of the incident. In the initial stage, he may be required to take decisions involving the operation of the other plants or to stop or continue any process and to take technical decisions to control the incident. The deputy incident controller should take the charge of incident controller, if he is not available due to any reason.

Responsibilities/Duties of Incident Controller and Deputy Incident Controller are described below:

- Head of the concerned department shall act as incident controller.
- He shall take charge at the scene of incident.
- He shall immediately assess the gravity of risk, alert panel and field operators to start controlling their respective section.
- He shall work under the direction of the SMC, but till his arrival he may have to execute following responsibilities.
- Ensure that all the Key Personnel are called.
- Direct for evacuation of plant and areas likely to be affected by the emergency.
- He shall communicate to the SMC; the type of outside help needed.
- He shall direct all emergency operations within the affected area with the following priorities:
    - Personnel safety, including the surrounding community.
    - Minimum damage to the Plant, Property and Environment.
    - Appropriate actions to minimize loss of Production and Material.
- Give information to the head of firefighting & rescue team as well as other emergency services.

- Depending on the incident, instruct partial or total shut down, isolation, depressurization, Nitrogen purging, firefighting, rescue operations, etc.
- Instruct upstream/downstream units to take emergency shutdown /cutting off supply, other appropriate actions and emergency evacuation help, etc.
- Direct for search of casualties.
- Evacuate non-essential workers/visitors/contractors to safe assembly points.
- Brief site main controller and keep him informed about the developments.
- Preserve evidences. This shall be necessary to investigate the cause and concluding preventive measures.

6.9.3 Key personnel

Key Personnel are required to provide and to implement the decisions made by the SMC on the developing situation at the time of emergency. As necessary, they shall decide the actions needed to shutdown plants, evacuate personnel, carry out emergency engineering work, arrange for supplies of equipments, utilities, carry out environment monitoring, provide catering facilities, liaise with police, fire brigade and other local authorities, relative of casualties, hospital, press & neighboring industries. Action at assembly points, outside shelters and mutual aid center under the direction of the SMC. All the key personnel shall report to the ECC. They shall be available at any time on duty or on call or on holiday.

6.9.4 Essential workers

A task force of essential trained workers (team of experts) is available to get the work done by the Incident Controller and the Site Main Controller. Such works shall include:

- Firefighting and spill control till a Fire Brigade takes the charge.
- To help the Fire Brigade and mutual aid teams, if it is required.
- Shutting down plant and making it safe.
- Emergency engineering work e.g. isolating equipment, material, process, providing temporary by-pass lines, safe transfer of materials, urgent repairing or replacement, electrical work, etc shall be undertaken.
- Provision of emergency power, water, lighting, instruments, equipments, materials, etc shall be provided.
- Movement of equipments, special vehicles and transport to or from the scene of the accident shall be controlled.
- Search, evacuation, rescue and welfare operations to be undertaken.
- First Aid treatment to the injured.
- Carrying out atmospheric test and pollution control.
- Manning of assembly points to record the arrival of evacuated personnel. Manning for outside shelters and welfare of evacuated persons.
- Assistance for casualties, reception areas to record the details of casualties.
- Assistance at communication centers to handle outgoing and incoming calls and to act as messengers if necessary.

- Manning of work entrances in liaison with the police to direct emergency vehicles entering the work, to control traffic leaving the works and to turn away or make alternative safe arrangements for visitors, contractors and other traffic arriving at the works.
- Informing surrounding factories and the public as well as directed by the Site Main Controller.
- Any special help required.

The other elements of **Disaster Management Plan** are:

- Assembly points
- Emergency control center
- Fire control arrangements
- Medical arrangements
- Other arrangements

6.9.5 Assembly point

In affected & vulnerable plants, all nonessential workers (who are not assigned any emergency duty) shall be evacuated from the area & they shall report to the specified Assembly Points. Assembly Points shall be located at a safe place, well away from area of risk and least affected by the down wind direction. To ensure that workers do not approach the affected area and they reach the Assembly Point safely, proper exit routes shall be shown at appropriate places. Each Assembly Point shall be looked by a nominated person to record the names and respective departments. At each Assembly Point, duties of Assembly Point In-charge should be carried out properly. While reaching to an Assembly Point, if it is required to pass through an affected area, suitable PPEs including respirators, helmet etc., shall be issued & made available to the workers.

6.9.6 Emergency Control Center

The Emergency Control Center (ECC) is the place or room from where the operations to handle the emergency are directed and coordinated. Fire Control Room shall be earmarked/identified as the alternative Emergency Control Room to be operated in case of unfavorable wind direction. Adequate Telecommunication System shall be made available in the ECC.

The ECC center shall be equipped with the following facilities.

1. Internal and external telephone including STD facility
2. Telephone directory
3. Telephone nos. of mutual aid centers
4. Factory layout plan
5. Map of the area
6. Employee blood group and their addresses
7. Messengers / Runners for sending messages
8. Adequate numbers of PPEs

6.9.7 Fire control arrangements

FIRE FIGHTING, GAS LEAK CONTROL AND RESCUE OPERATION

A) Role of Manager (Fire and Safety) / Shift In-Charge (Fire & Safety)

Incident Controller shall be the only person to direct the Fire fighting and Emergency operation. His duties shall be as follow:

- Keep in constant touch with the SMC / Incharge - EHS.
- Direct the crew members to the scene of emergency and arrange replenishment of Manpower / equipment / extinguishing media etc.

B) Role of EHS Representative:

- On being notified about the location of fire/ gas leakage, immediately proceed to the help.
- Decide his line of action in consultation with Incident controller and take appropriate measures to handle the emergency.
- Assessing the severity of the incident, immediately report to emergency controller about the gravity of the situation.
- He shall assess the extra requirement, (if any) from the neighboring industry.

C) Fire crew members

- On hearing the fire alarm or emergency siren they shall immediately report to the control room and proceed to the scene of emergency and work under the directions of IC/ Dy IC.
- The personnel availability at the scene of incident shall be made optimum.

D) Emergency Squad Members

- Total three emergency squads shall be formed.
- On hearing Emergency Siren, they shall immediately report to Site Main Controller, Safety-In-Charge or the Incident Controller.
- They shall combat the emergency situation as per the directions of the Site Main Controller, Safety-In-Charge or Incident Controller.
- They shall work for safe evacuation and other actions as required.

6.9.8 Medical services

The role of Medical officer in case of an emergency shall be as follows:

- He shall report immediately to the SMC/IC.
- He shall render necessary treatment at the Occupational Health Center.
- He shall arrange for Hospitalization and Treatment at an outside hospital, if required.
- He shall mobilize in getting the services of External medical agencies, other Paramedical services and transportation services.

- He shall arrange for extra medical assistance/antidotes from outside agencies, if required.
- He shall arrange for first-aid trained volunteers for necessary help.
- He shall liaise with the Government Health Authorities for treatment of the affected persons nearby.
- The company shall engage full time qualified doctors who are trained in occupational health.

6.9.9 Role of security in-charge (security officer)

- On hearing the emergency siren, he shall find out the location of the incident (fire / gas leak / spill / explosion) and inform the location of the same to the key personnel of the plant.
- He shall depute the security guards for managing gates and traffic control at the incident site & send remaining guards to the site of incident.
- He shall prevent any unauthorized entry into the site.
- He shall render assistance as demanded by the Safety-In-Charge.
- He shall mobilize additional security force for help (if required).
- He shall direct ambulance(s) and emergency vehicle(s) to the scene of the incident.
- He shall help evacuate persons within the scene of incident.
- As directed by the Site Main Controller, he may be required to address the residents of surrounding villages for warning/evacuation.

6.9.10 Role of mutual-aid members

- On receiving the call, they shall proceed immediately with fire squad & fire tenders.
- They shall be guided to the place of the incident by the main gate security guard.
- The Fire Squad In-Charge shall report to the Safety-In-Charge of the unit in which the incident has occurred.

6.9.11 Other arrangements

Other arrangements include external transport, cranes, generator sets to supply emergency power, environment monitoring equipment, rescue items etc. when available resources do not meet the requirement.

STANDARD OPERATING PROCEDURE (EMERGENCY)

- As soon as emergency alarm is heard, all essential workers shall report to IC or SMC.
- They shall carefully listen to the instructions given by IC or SMC
- According to the type of emergency/accident, they shall get equipped with PPEs/Firefighting equipment and devices.
- The runner among the workers shall inform SMC/IC and key personnel if they are not at site.
- The messenger amongst the workers shall deliver messages to nearby units as per the instructions of SMC/IC.
- The In-Charge of medical arrangements shall prepare first-aid and other required facilities for the injured.
- The other essential workers shall try to control the emergency as per the instructions given by the IC.
- IC would keep SMC informed about the status of control measures being taken at the site and ask for other requirements e.g. Mutual aid, equipments, etc. (if necessary).

- SMC would co-ordinate with outside agencies regarding control measures being taken, need for external help, evacuation, medical treatment, etc.

6.10 COMMUNICATION SYSTEM

After the assessment of risk & their possible environmental impacts and after making an organization for the preparedness to control the emergency, the next most essential step is to make the Key personnel ready for Communication at the time of emergency. Communication System is a Crucial Factor while handling any emergency.

Company shall have a quick & effective Communication System through which, any situation, which can lead to emergency, can be informed or known to -

1. All persons working inside the plant
2. Key Personnel outside during normal working hours & during off-duty hours
3. Outside emergency services, Statutory and Local Authorities
4. Neighboring facilities and public living in the vicinity

Each and every section, Plant & Department of the Factory shall be connected by internal telephones. The Communication System begins with raising the alarm declaring the emergency, Telephone messages and Procedure to communicate the emergency to other persons & General Public.

6.10.1 Raising the alarm

As soon as incident takes place inside the factory and is noticed by someone, the first step shall be to raise the nearest manual emergency bell to alert the nearby people. Next, he/she shall inform the security persons to raise the emergency siren located at the factory gate. The security personnel shall ring the siren. The alarm sound informs the I.C and the S.M.C that an emergency has arose and emergency organization needs to be activated. The I.C. shall rush to the site and shall take charge of the scene.

Siren testing shall be done on every Monday at 17:30 Hrs (or any other designated day) with 30 second blow and shall be reported as per standard procedures defined in the HSE documents.

6.10.2 Declaring the major emergency

Major emergency has to be declared after sufficient and thorough check, because the declaration of major emergency puts many agencies on action and it may disturb the running system, which may be costly at times or its consequence may be serious. Therefore major emergency must not be decided on whims or immature judgment or without proper thought. Looking to all the above, the team shall declare the type of emergency on the basis of their knowledge & experience as well as the management shall take care to nominate responsible persons who can declare the emergency based on proper and correct judgment. These persons should be technically qualified and experienced. They shall advice the Incident Controller or Site Main Controller regarding the type of emergency. On being convinced, the Site Main Controller or Incident Controller shall declare an ON-SITE emergency. The decision about major emergency shall be taken as early as possible and without wasting time, so that control action can be started immediately.

6.10.3 Telephone messages

After hearing the emergency alarm, during emergency or even while just receiving the emergency message on phone, Telephone operator shall become attentive, precise, sharp and quick in receiving, noting the message and subsequently effective in further communication. A form to record emergency telephone calls shall be made available with telephone operator or Person available in the Emergency Control Center, who has to record such calls during emergency. Telephonic messages shall be given out by the telephone operator to the Site main Controller and key personnel as per the instructions of the Incident Controller. Telephonic messages shall also be given to authorities and external agencies to describe the type of emergency. All details of emergency shall be collected/ delivered according to this format and the same shall be made available with the telephone operator.

6.10.4 Communication of emergency & statutory information

A) COMMUNICATION OF EMERGENCY

An effective system to communicate emergency shall be made available to communicate about the emergency situation as mentioned below:

- Inside the factory i.e. workers including key personnel and essential workers, on duty & inside the premises during normal working hours.
- To key personnel and essential workers not on duty and outside during normal working hours.
- To the outside emergency services and the Government authorities.
- To the neighboring factories & the General Population in the vicinity.

B) STATUTORY INFORMATION

a) Information to Workers

Set of Statutory information regarding types of hazards and their prevention and control as directed in the Factories Act shall be prepared by the unit. This information shall be printed in the local language and shall be given in the form of booklet to all workers including contract workers.

b) To the outside emergency services and authorities

Statutory information in the form of booklet shall be given to outside emergency services and authorities.

c) To neighboring firms and the general public

Statutory information in the form of booklet shall be given to neighboring units and the general public of the villages in the vicinity of the unit.

6.11 ACTION ON SITE

The activities related to emergency time activities shall be divided into two parts. These are:

- Pre-emergency activities
- Post-emergency Activities

6.11.1 Pre-emergency activities

These activities are part of safe run of the plant and avoid emergency situation. They are considered as the preparatory part of the Disaster Management. The details of such activities are as follows:

A) INTERNAL SAFETY SURVEY

A safety committee shall be constituted as per the Factories Act. The nominated members of the committee shall be assigned the responsibility to conduct safety survey once in a month before safety meeting. The internal safety survey shall be carried out by undertaking the following steps–

- Identify various hazards in the factory
- Check whether protective equipments are in sound working condition
- Check various safety installations located at various plants for proper working
- Check sprinklers, showers, etc. in all plants
- Suggest extra modifications/ requirements to make systems more reliable
- Check the presence of toxic gases by the help of dragger tube

B) THIRD PARTY SURVEY

A third party safety survey shall be carried out once in a year by an external agency. It includes –

- Inspection of building, structures for strength and stability
- Identify and study the hazards inside individual plants and within the factory premises
- Check safety system for its adequacy
- Suggest modifications or additions in the operating practices and safety system, if necessary.

C) PRESSURE VESSEL TESTING/ EXAMINATION

- A list of pressure vessels in the plant with details of operating conditions and manufacturing details shall be prepared.
- Preventive maintenance of valves & fittings on all pressure vessels (valves, pipelines, pressure gauge, temperature recorders and emergency vent lines) shall be carried out.
- Testing and examination of all pressure vessels shall be done as per the rules of the Factories Act by govt. certified competent person on due date.
- Records of testing and certificates issued by competent person are maintained and shall be made available to Factory Inspector at the time of inspection.

D) NON-DESTRUCTIVE TESTING (NDT)

- A list of equipment and pipelines in the plant shall be prepared which require NDT as per the Factories Act shall be prepared.

- Non-Destructive Testing (NDT) shall be conducted as per the Factories Act by govt. certified competent person on due dates.
- Records of testing and certificates shall be issued by competent person.
- Frequency of Non-Destructive Testing : Once in a year

E) SAFETY RELIEF VALVES TESTING

- A list of Safety Relief Valves installed on various equipment and pipelines in the unit along with detailed specifications shall be prepared.
- A schedule for testing and calibration as per the rules under Factories Act by govt. certified agencies on due dates shall be made.
- Records of testing and certificates issued by competent person shall be maintained.
- Frequency : Once in a year

F) FIRE SYSTEM TESTING

- List of various fire-fighting equipments (Fire Extinguishers, etc.) installed at various locations in the unit shall be prepared along with detailed specifications.
- Schedule for testing of all these equipment and their operability check shall be prepared.
- Records of testing shall be maintained and the dates for the same shall be marked on the equipment.
- Repairs/replacement of defective equipments shall be carried out.

G) MUTUAL AID SCHEME

- Mutual Aid Scheme shall be prepared and shall be entered into agreement with the neighboring units for getting or extending help during emergency.
- Coordinator for follow-up under mutual Aid Scheme shall be appointed.
- The scheme shall be reviewed once in a year with coordinators of the neighboring units w.r.t. the scope of help, type of aid, contact persons, etc.
- The scheme shall be included in mock drills.

H) MOCK-DRILLS

- Minor mock drills shall be conducted to train the employees about their role / duties during emergency situation.
- Training to the employees for firefighting, spill control, use of Personal Protective Equipments etc. shall be refreshed at regular intervals.
- Checking shall be done whether various members of emergency control committee remember their role/duties properly, to find out the faults and points of improvement in their performance.
- Checking shall be done whether the various equipment for emergency control are operating satisfactorily and rectify the drawbacks if any.

- Major mock-drills with permission from the authorities shall be conducted.

Mock drills shall be regularly conducted by the Emergency Control Organization and the findings shall be analyzed to check whether employees are familiarized with the emergency control procedures and the sort of training that is required shall be provided.

I) SAFETY TRAINING

Regular training/ Awareness programme for workers/staff members/key personnel shall be organized for adverse impacts on their health due to working in non-conducive environment, handling of safety equipment, use of personal protective equipment, first-aid, etc. by internal/external faculty, as well as by sending persons outside to attend the same etc. Following major topics shall be covered in the safety training –

- Training on fire fighting
- Training on spill control
- Training on toxic release control
- Training on good housekeeping
- Training on use of PPE

The records of the training programs shall be maintained by the Safety Dept. New topics shall be included in the safety training programs year by year to upgrade safety knowledge among the workers.

J) PERSONAL PROTECTIVE EQUIPMENT

- Adequate number of personal protective equipment (aprons, hand gloves, safety goggles, helmets, nose masks, safety belts, gas cartridges, self-breathing apparatus, safety shoes etc.) suitable for plant operations shall be issued to concerned employees and workers.
- Workers shall be trained for proper use of PPEs.

K) COMMUNICATION

Following means of communication shall be made available:

- Telephones
- Mobiles
- Emergency Siren

L) EMERGENCY LIGHTS

- Emergency lights shall be provided in appropriate areas.
- Sufficient number of emergency torch/ batteries shall be kept in ECC as well as at the production site.
- For emergency purpose, DG sets shall be made available in the factory as stand-by unit in case of power failure.

- The D.G. sets shall be set to start functioning within two minutes of failure of electricity.

M) EMERGENCY CONTROL ROOM

Emergency Control Room shall be equipped with all necessary items, documents, telecommunication systems, PPE etc. required in case of an emergency.

N) ASSEMBLY POINTS

Assembly points shall be designated at appropriate locations.

O) LIAISON WITH STATE AUTHORITIES:

The procedure for liasoning with state authorities shall be prepared and responsibilities shall be assigned to concerned persons. Liasoning activities shall include the following:

- To liaison with civil authorities, local hospitals, Fire-Brigade, Collector, Factories Inspector, Police, etc. regarding emergency activities and need for external aid.
- To keep the details regarding name, address & telephone numbers of various govt. authorities and neighboring units available; and update the details from time to time.
- To inform about Mock-drill in advance and if required conduct mock-drill in presence of any of these authorities.
- To submit report of Mock-drill conducted and the out comings with photograph to the Factories Inspector.

P) HOSPITAL FACILITIES

- Occupational Health Centre shall be set up with First-Aid and medicines.
- Health records (esp. blood-group records) of all employees shall be maintained.
- List of blood donors shall be kept ready for reference.

Q) STATUTORY INFORMATION

Statutory Information about chemicals handled in the unit, manufacturing process, the hazards in the unit, methods of prevention and control, first aid measures etc. shall be given to

- Workers
- Public and Neighboring units
- Government authorities & outside emergency services

6.11.2 Post emergency activities

These activities shall be carried out after an emergency, so as to establish the cause of the emergency and to decide the measures to be taken to prevent its re-occurrence. These activities are

- Collection of records of accident, injury, damage to property, buildings, equipment, material and loss of production

- Conducting enquiries and concluding preventive measures.
- Making insurance claim for the materialistic loss / damage.
- Implementation of enquiry report's recommendations.
- Rehabilitation of affected persons within and outside the plant.
- Restarting the plant and normalizing the operations.

6.11.3 Emergency time activities

The probable emergency situation that can arise in the unit and the corresponding control actions are described below.

A) FLAMMABLE RELEASES

Source / Incident – Fire involving spilled combustible material near or in flammable storage areas

Control action –

1. Anyone who notices fire shall sound the emergency alarm.

2. SMC/IC who is at the site, shall immediately rush to the scene and assess the situation. For fire due to spillage of combustible material, he shall activate the on-site plan as follows -

- He shall cut off electric supply to that area and evacuate all the persons to safe assembly points.
- He shall call in DIC (if DIC is not present there) and asks essential workers to fight fire with dry chemical / CO2 fire extinguisher or sand.
- He shall inform fire brigade telling them in brief about the kind of fire and type of extinguishers required.
- He shall also inform mutual aid teams and ask for necessary help.
- He shall arrange first-aid/hospitalization for the affected persons.
- Fire officer on reaching the site, shall take charge of the fire-fighting operations.
- Mutual aid teams shall be asked for help in the form of first-aid, transport, etc.
- If fire is increasing, the fire officer shall inform IC who alerts neighboring units and through SMC shall try to get more fire-fighting help.
- Firefighting shall be continued till the fire is fully overcome.
- After extinguishing the fire, the fire officer shall cool the entire area with water spray and shall check that no re-ignition is likely to occur. After that, he shall declare the area safe.
- IC shall inform essential workers to sound all clear.
- The whole incident shall be recorded.
- SMC shall arrange to inform families / relatives of injured / dead.
- SMC shall issue authorized statement to press / media.
- SMC shall also inform Factories Inspector about the incident and related information.

B) TOXIC RELEASES

Source / Incident – Pressure release due to failure of

- Stuffing box gland packing
- Pressure release valve
- Vessel / pipeline failure

Control action –

1. Anyone who notices the release shall sound the emergency alarm.
2. SMC/IC who is at site, shall immediately rush to the scene and assess the situation. For toxic release from a reactor, he shall activate the on-site plan as -

- He shall evacuate all the persons to safe assembly point.
- He shall call in DIC (if DIC is not present there) and asks essential workers to wear self-breathing apparatus and if the reaction is exothermic, start cooling water flow in the reactor jacket and cool the reactor as soon as possible.
- He shall inform mutual aid teams and asks for necessary help.
- He shall arrange first-aid / hospitalization for the affected persons.
- Mutual aid teams shall be asked for help in the form of first-aid, transport etc.
- When the leak stops and the air is free of toxic elements, IC should tell essential workers to sound all clear.
- The vessel / rupture disc/gland packing shall be attended by maintenance department.
- The whole incident shall be recorded.
- SMC shall arrange to inform families / relatives of injured / dead.
- SMC shall issue authorized statement to press / media.
- SMC shall inform Factories Inspector about the incident and related information.

C) CHEMICAL SPILL

Most of the storage tanks shall be located in Storage Tank Yards. Dyke walls of sufficient size shall be connected around the tank yard. Neutralizing material shall be kept nearby. For dilution, water connection shall be provided on all sides of the tank farms. Sand buckets shall be provided for covering spillage of flammable / corrosive materials.

D) EVACUATION & TRANSPORTATION

All non-essential workers shall be immediately evacuated from the incident area and adjacent areas to safe assembly points. Assembly points shall be clearly marked and assembly point in-charge shall also be designated. The assembly point in-charge shall be a well-trained supervisor who shall keep record of persons arriving at the assembly point and direct them for proper gathering. He shall also inform the ECC about the persons gathered at the assembly point. Those in need of medical treatment shall be transported to first-aid center / hospital as the case may be. In case of major emergency, all non-essential workers shall be transported to the temporary shelter.

E) SAFE CLOSE-DOWN

As per the instructions from IC or SMC, some parts or full of the plant shall be closed down by the essential workers. The procedure for safe shut-down and start-up shall be given in safety manual provided to all workers.

F) USE OF MUTUAL AID

Mutual aid from neighboring units shall be called up as and when required. The aid shall be taken under the supervision of SMC.

G) HELP OF EXTERNAL AUTHORIES

Outside authorities such as Police, District Emergency Authority (DEA), Factory Inspector, Disaster Management Centre, GIDC officer, Industries Association, Regional Pollution Control Board, nearby hospitals etc. shall be informed of the on-site and off-site emergency plans and called in as per need.

H) MEDICAL TREATMENT

Injured workers shall be located and shall be given prompt first-aid by essential workers and key personnel. Those requiring medical treatment shall be taken to the hospital / outside medical center.

I) ACCOUNTING FOR PERSONNEL

Through daily muster rolls and with the help of shift-in-charge the head count shall be undertaken to find out whether persons are missing and if so immediate search shall be carried out to locate them. The list shall include company employees, contract workers as well as visitors. Help from local authority or fire-brigade shall be taken if required. This list shall be kept with time keeper / security officer at all the times and shall be used to account for personnel. Casualties would be identified; their families and local authority shall be informed.

J) ACCESS TO RECORDS

In order to inform families/relatives of injured/dead, an up-to-date list of names and addresses of all the workers shall be maintained in addition to the muster roll where shift-wise attendance shall be marked. Such list includes health records. This list shall be available at the ECC and one such copy shall be available at the unit's head office.

K) PUBLIC RELATIONS

The General Manager shall be the only nominated person to issue administrative statement about the accident or emergency to news/media. No other person shall divulge any information to any news / media person.

L) REHABILITATION

In case of Toxic release or chemical spillage, Senior Fire Brigade Officer would ensure that the incident area shall be safe and cleaned up of all mess. Then only, he would allow people to re-enter the location.

In case of fire of combustible material, the Senior Fire-Brigade Officer shall ensure that the area is cooled down and there are no chances of re-ignition. IC shall arrange for clean-up of the area and then only people shall be allowed to re-enter the area for work.

Even when the clearance has been given, great care shall be taken when re-entering affected areas and no work in connection with the salvage, collection of evidence or start up shall be taken up until a thorough examination of the area has been carried out. The statutory powers of the Factory Inspector shall be kept in mind before any evidence is disturbed. Particular care shall be taken to avoid the introduction of possible sources of ignition, such as diesel engines, hand or power operated tools, flame cutting equipment, etc. until it has been established that no flammable materials are present where they could be ignited.

6.12 OFF – SITE EMERGENCY PLAN

6.12.1 Need of the off – site emergency plan

An off-site emergency plan is also prepared to deal with those incidents which have the potential to harm persons or the environment outside the boundary of the factory premises. A major accident, major emergency and disaster may affect areas outside the plant. An explosion can scatter debris over wide areas and its effects of blasts can cover considerable distances. Wind can spread burning fumes of toxic gases. Thus the events like these can affect outside areas and combating those needs an Off-site Emergency plan.

Envisaging such a rare incident, an off-site emergency plan should be drawn up for the following purpose.

- To provide basic information about the risks and environmental impacts related to the unit to local / district authorities, police, fire-brigade, surrounding units, and the general public. To appraise them of consequences and the protection / prevention measures and control actions as well as to seek their help in order to communicate with the public in case of a major emergency.

The information from all industries shall enable district authorities to educate public about what could go wrong, and to train them of measures to be taken as an individual.

- To enable district authorities to prepare the off-site emergency plan (contingency) for the district or particular area and to organize rehearsals and initiate actions learnt from these incidents.

Our Emergency Plan shall be made after considering the all possible effects of incidents on the neighboring population and the remedial measures shall be devised in consultation with the local authorities and emergency services.

6.12.2 Structure of the off-site emergency plan

IC → SMC Essential Workers (Implementing action plan, Informing nearby Public)	District Authorities → (Collector, Factory Inspector, Police) Information, Evacuation	Mutual Aid teams, outside services, voluntary organizations (Fire-fighting, Gas leak control, First-aid, Shelter, Hospitalization, Transportation)

Role of factory management

The Off-Site emergency Plans are dovetail, so that the emergency services shall be summoned at the appropriate time and shall be provided with accurate information and a correct assessment of the situation. The responsibility for this is with the Site Main Controller. The Site Main Controller shall provide a copy of the On-Site and Off-Site Emergency Plan to the District authorities, the Factories Inspectorate and the Emergency Services, so that on the basis of such information, these authorities can make their emergency preparedness plan to formulate and execute the District / Area off Site Emergency Plan. Further, on the advice of the authorities we can also modify our plan to make our plan more effective and perfect.

Role of emergency co-ordination officer (eco)

The various emergency services shall be coordinated by the Emergency Co-ordination officer (ECO), who shall likely be a Collector. The ECO shall liaise closely with the Site Main Controller. The Emergency Control Centre of the factory shall be utilized by the ECO to keep liaisoning with the Site Main Controller.

Role of the fire authorities

The control of fire is normally the responsibility of the senior fire officer who would take over the handling of fire from the IC on arrival at the site.

- The senior fire brigade officer may also have similar responsibility for other events such as explosion and toxic releases. Fire authority having major hazard units in the area shall familiarize themselves with the location and site of all stages of flammable materials, water and foam supply points, firefighting equipment.
- Act as observer of an on-site exercise involving only site personnel

Role of the health authorities

Health authorities, including Doctors, Surgeons, Hospitals, and Ambulances so on, have a vital part to play following a Major Accident and they should form an integral part of any emergency plan. Health monitoring of the workers shall be conducted at periodic intervals and health records shall be maintained.

In case of major fires, injuries shall be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this type of injury cases may be generally available in most of the hospitals. But in case of major toxic releases, the effects vary according to the type of chemical, and it is important for health authorities that might be involved in dealing with the aftermath of a toxic release to be familiar with the treatment appropriate to such casualties. Major Off-Site incidents are likely to require medical equipment and facilities additional to those available locally and a Medical 'Mutual Aid' scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

Role of telephone department

The communication system between the factory and the various above role-playing authorities must be effective. The ineffective public telephone system shall not be useful in emergency. Therefore, telephone department should maintain the phone numbers and if required temporary telephone connection shall be provided to various above authorities to deal with the emergency.

Role of police and evacuation authorities

- To protect life and property
- To control traffic movement
- To inform people to remain indoors or evacuate
- To carry-out evacuation
- To identify dead persons, deal with casualties and inform relatives of dead or injured.

For evacuation, the following criteria are useful:

- In case of major fire, only houses close to fire and in the direction of smoke need evacuation.
- If fire is escalating and in turn threatening a store of hazardous material, it is necessary to evacuate people nearby if time is available; otherwise they shall be informed to keep themselves indoor and shield from the fire.
- For release of toxic gases, limited evacuation may be appropriate in downwind direction with windows closed and shall provide good protection. Toxic gases which are hazardous down to much lower concentration cover a long distance. This factor must be considered while deciding upon the need and extent of evacuation.

Role of the mutual- aid agencies

Mutual-aid arrangements shall be made in areas of fire & toxicity control, medical, transport & evacuation. All partners of mutual-aid shall extend all possible help in these areas.

6.13 OCCUPATIONAL HEALTH AND SAFETY

For large industries, where various activities are involved during construction, erection, testing, commissioning, operation and maintenance; the men, materials and machines are the basic inputs. Along with its boons, industrialization generally brings several problems like occupational health and safety.

The proponent therefore has properly planned and taken steps to minimize the impacts of industrialization and to ensure appropriate occupational health and safety including fire plans.

The key safety measures mentioned under shall be a part of proposed project.

6.13.1 Occupational health

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

6.13.2 Construction and erection

The occupational health problems envisaged at this stage can mainly be due to constructional accidents and noise generation. To overcome these hazards, in addition to arrangements to reduce it within the Threshold Limit Values (TLVs), necessary protective equipments shall be supplied to the workers.

6.13.3 Operation and maintenance

The problem of occupational health in the operation and maintenance phase is primarily due to noise which could affect consultation. The necessary personal protective equipments shall be given to all the workers exposed to high noise. The working personnel shall be given the following appropriate personnel protective equipments.

- Industrial Safety Helmet;
- Welders equipment for eye and face protection;
- Cylindrical type earplug;
- Ear muffs;
- Safety belt/line man's safety belt;
- Leather hand gloves;
- Asbestos hand gloves;
- Electrically tested electrical resistance hand gloves; and
- Industrial safety shoes with steel toe.

HOSPITAL FACILITIES

Client shall make formal agreements with nearby hospital having facilities to attend fire and toxic effect cases for attending the affected persons in the emergency arising out of accidents/ disasters, if any.

FACTORY MEDICAL OFFICER

The company shall engage full time qualified doctors as FMO on retainer ship basis, who are trained in occupational health. Apart from him, Paramedical Staff shall also be employed.

Proposed facility to be made available at OHC

A Room shall be provided to be operated as OHC. The centre shall be equipped with following medical equipments:—

1.	Examination Table	
2.	Dressing Tables	For performing Dressing
3.	Glucometer	For measurement of Blood Sugar
4.	Vision chart	To evaluate vision acuity
5.	Nebuliser	For relieving coughs & Breathing Difficulty
6.	Infra red light	For relieving muscular pain
7.	Suction machine	For cleaning airway
8.	Weighing Machine	For measuring body weight
9.	Medical Oxygen Cylinder kit	For assisting in breathing to the affected
10.	Sphygmomanometer	To measure blood pressure
11.	Refrigerator	To preserve medicines
12.	Thermometer	To measure body temperature

Ambulance Van

An ambulance van shall be made available 24 hours at the Fire Station.

First Aid Box

First Aid Boxes shall be made available at the different locations in the plant. Training shall be given to employees for First Aid.

PERIODIC MEDICAL EXAMINATION

Periodic Medical examination shall be conducted as per the following schedule;

1. Workers employed shall be examined by a qualified medical practitioner/ Factory Medical Officer, in the following manner:

- Before employment, to ascertain physical fitness of the person
- During employment, once in a period of 6 months, to ascertain physical fitness of the person to do the particular job;
- Once in a period of year, to ascertain the health status of all the workers in respect of occupational health hazards to which they are exposed and in cases where in the opinion of the Factory Medical Officer, it is necessary to do so at a shorter interval in respect of any workers;

- In periodic and pre-medical examinations, various parameters shall be checked. Viz., LFT, Chest X-rays, Audiometry, Spirometry, Vision testing (Far & Near vision, color vision and any other ocular defect) ECG and other parameters shall be tested as per the opinion of Factory Medical officer.

2. No person shall be employed for the first time without a certificate of fitness granted by the Factory Medical Officer.

EMP for the Occupational Safety & Health hazards so that such exposure can be kept within Permissible Exposure Level (PEL)/Threshold Level Value (TLV) so as to protect health of workers.

An EMP for Occupational Safety and Health shall be proposed to implement with the following objectives:

- To keep air-borne concentration of toxic and hazardous chemicals below PEL and TLV.
- Protect general health of the workers likely to be exposed to such chemicals.
- Providing training, guidelines, resources and facilities to the concerned department for occupational health hazards.
- Permanent changes to workplace procedures or work location to be done, if it is found necessary on the basis of findings from the Workplace Monitoring Plan.
- It is proposed that this EMP be formulated on the guidelines issued by the Bureau of Indian Standards on OH&S Management Systems: IS 18001:2000 Occupational Health and Safety Management Systems
- Proposed EMP shall be incorporated in Standard Operating Procedure also.
- The proposed EMP shall also include measures to keep air-borne concentration of toxic and hazardous chemicals below its PEL and TLV, like…
    - Leak Surveys
    - Separate storage for toxic chemicals
    - Exhaust Ventilation
    - Proper illumination
    - Close processes to avoid spills and exposures
    - Atomization of process operations to hazards of manual handling of chemicals
    - Supply of proper PPEs like Air mask, Berating canisters, SCBA sets, On-line breathing apparatus at the places where there is possibility of presence of toxic chemicals
    - Regular maintenance program for pumps, equipment, instruments handling toxic and corrosive chemicals
    - Display of warning boards
    - Training to persons handling toxic and combustible materials/chemicals.

Workplace Monitoring Plan

- It is proposed that a Workplace Monitoring Plan shall be prepared & implemented in consultation with FMO and industrial hygienists.
- Each workplace must be evaluated to identify potential hazards from toxic substances or harmful physical agents. Air-borne concentration of combustible/toxic chemicals shall be measured and record shall be kept.
- The current state-of-the-art exposure measurement model is as follows: For purposes of measuring workers exposure across a single shift, it is sufficient to place a reasonably accurate exposure measuring device on the worker, within the worker's breathing zone, and have it operated for nearly the full shift interval.

Health Evaluation of Workers

- It is proposed that management shall device a plan to check and evaluate the exposure specific health status evaluation of the workers.
- Workers shall be checked for physical fitness with special reference to the possible health hazards likely to be present where he/she is being expected to work before being employed for that purpose. Basic examinations/tests like Liver Function tests, chest x ray, Audiometry, Spirometry, Vision testing (Far & Near vision, color vision and any other ocular defects) ECG, etc. shall be carried out. However, the parameters and frequency of such examination shall be decided in consultation with Factory Medical Officer and Industrial Hygienists.
- While in work, all the workers shall be periodically examined for the health with specific reference to the hazards which they are likely to be exposed to during work. Health evaluation shall be carried out considering the bodily functions likely to be affected during work. The parameters and frequency of such examination shall be decided in consultation with Factory Medical Officer and Industrial Hygienists. Plan of monthly and yearly report of the health status of workers with special reference to Occupational Health and Safety.

6.14 SAFETY PLAN DURING PROJECT EXECUTION STAGE (CONSTRUCTION & COMMISSIONING)

Safety of both men and materials during construction and operation phases is of concern. Safety plan shall be prepared and implemented in the proposed project activity. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in the plant is possible due to collapse of structures and fire/explosion etc.

The proposed project would formulate safety policy keeping in view the safety requirement during the construction, operation and maintenance phases, with the following regulations:

- To allocate sufficient resources to maintain safe and healthy conditions of work;
- 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 ensure that adequate safety instructions are given to all employees;

- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use;
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety 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 instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- To ensure proper implementation of fire prevention methods and an appropriate firefighting service together with training facilities for personnel involved in this service;
- To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to take corrective, remedial and preventive action;
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
- To publish/notify regulations, instructions and notices in the common language of employees;
- To prepare separate safety rules for each type of occupation/processes involved in a plant; and
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

6.15 SAFETY ORGANIZATION

6.15.1 Construction and erection phase

A qualified and experienced safety officer shall be appointed. The responsibilities of the safety officer shall include identification of hazardous conditions, unsafe acts of workers; and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health. He shall also be responsible to ensure compliance of Safety Rules/Statutory Provisions.

6.15.2 Operation and maintenance phase

When the construction is completed, the posting of safety officers shall be done in accordance with the requirement of Factories Act; their duties and responsibilities shall be as defined as mentioned in the previously discussed clauses.

6.15.3 Safety circle

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving health and safety, safety circles would be constituted in each areas of work. The circle would consist of about five to six employees from that unit. The circle shall conduct a meet for about an hour every week and review on various health and safety measures undertaken for a time period of two years with an excellent follow up plan of action wherever required.

6.15.4 Safety training

Safety training shall be provided by the Safety Officers with the assistance of faculty members called from Professional Safety Institutions and Universities. In addition to the regular employees, awareness programme for workers likely to have adverse health impacts due to working in non-conducive environment shall be carried out and precautionary measures like use of personal equipments etc. shall be provided. To create safety awareness, safety films shall be shown to workers and leaflets shall be distributed.

Some precautions and remedial measures proposed to be adopted to prevent fires are:

- Compartmentalization of cable galleries, use of proper sealing techniques of cable passages and crevices in all directions would help in localizing and identifying the area of occurrence of fire as well as ensure effective automatic and manual firefighting operations;
- Spread of fire in horizontal direction would be checked by providing fire stops for cable shafts;
- Reliable and dependable type of fire detection system with proper zoning and interlocks for alarms are effective protection methods for conveyor galleries;
- Housekeeping of high standard shall be maintained that helps in eliminating the causes of fire and regular fire watching system strengthens the fire prevention and firefighting; and
- Proper fire watching by all concerned would be ensured.