7.3 Risk Assessment

General Assessment

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. The common terms used in risk assessment are elaborated below:

Risk: Risk is defined as the combination of Chance or Frequency or Probability of Occurrence of an Accident and its damage consequences to life and property. So Risk has two parameters:

i. Frequency of Occurrence of an accident,
ii. Damage Consequences to life and Property.

Risk Analysis: A systematic approach for describing and/or calculating risk. Consequence Analysis determines the damage consequences to life and property from an accident. And QRA determines the following: Frequency of occurrence, Risk of Fatality to employees, Individual Risk-Risk of Fatality to neighboring population, Acceptability of Risk through ALARP at Least as Low as Reasonable Practical.

Risk analysis follows an extensive hazard analysis. This requires a thorough knowledge of probability of failure, credible accident scenario, vulnerability of population to exposure 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 preparation of site and off-site emergency plan and also to incorporate safety measures.

7.3.1 Identification of types of Hazards in Sugar Mill

Disaster at Sugar Mill may occur due to following hazards:

- Fire Electric Panels, Oil room and storage area
- Explosion in Boiler house etc
- Electrocution
- Cleaning of barrels, which have held chemical substances
- Fall of material etc

The potential hazardous areas and the likely accidents with the concerned area have been enlisted below Table below ;

Sugar Mill Areas with Hazard Possibility

Areas	Hazard Possibility
Boiler Section	Explosion
Turbine Area	Explosion
Electrocution	Lose fitting
Electrical room	Fire and electrocution
Transformer area	Fire and electrocution
Cable tunnel	Fire and electrocution
Storage yard (Bagasse)	Sliding, fall of material
Chimney	Air Pollution
Molasses Storage	Odour

List of Damages Envisaged at Various Heat Loads

S. No.	Heat loads (kW/m^2)	Type of Damage Intensity	
		Damage to Equipment	Damage to People
1.	37.5	Damage to process equipment	100% lethality in 1 min. 1% lethality in 10 sec
2.	25.0	Minimum energy required to ignite wood	50% Lethality in 1 min. Significant injury in 10 sec
3.	19.0	Maximum thermal radiation intensity allowed on thermally unprotected equipment	--
4.	12.5	Minimum energy required to melt plastic tubing	1% lethality in 1 min
5.	4.0	--	First degree burns, causes pain for exposure longer than 10 sec
6.	1.6	--	Causes no discomfort on long exposures

7.4 Risk Mitigation Measures

7.4.1 Electricity Hazard

a. All electrical equipment is to be provided with proper earthing. Earthed electrode are periodically tested and maintained.

b. Emergency lighting is to be available at all critical locations including the operator's room to carry out safe shut down of the plant
c. Easy accessibility of fire fighting facilities such as fire water pumps and fire alarm stations is considered.
d. All electrical equipment are to be free from carbon dust, oil deposits, and grease.
e. Use of approved insulated tools, rubber mats, shockproof gloves and boots, tester, fuse tongs, discharge rod, safety belt, hand lamp, wooden or insulated ladder and not wearing metal ring and chain.
f. Flame and shock detectors and central fire announcement system for fire safety are to be provided.
g. Temperature sensitive alarm and protective relays to make alert and disconnect equipment before overheating is to be considered
h. Danger from excess current due to overload or short circuit is to be prevented by providing fuses, circuit breakers, thermal protection

7.4.2 Bagasse Storage

a) Bagasse storage unit is provided with paved approach road.
b) Compound wall with adequate height is constructed around the bagasse storage area
c) Adequate dust suppression measures are provided to prevent fugitive emission and also risk of fire. Similar measures are also adopted for loading/unloading operations.
d) Boiler ash transported in tankers is to be covered and closed and so that there is no chance of spillage during transportation.
e) Fire fighting measures are provided to avoid any fire case.
f) Measures are taken to control the air pollution during loading/handling of bagasse.

7.4.3 Falling Material

a. Safety helmets to be used to protect workers below against falling Material
b. Barriers like a toe boards or mesh guards is to be provided to prevent items from slipping or being knocked off the edge of a structure
c. An exclusion zone is to be created beneath areas where work is taking place.
d. Danger areas are to be clearly marked with suitable safety signs indicating that access is restricted to essential personnel wearing hard hats while the work is in progress.

7.4.4 Other methods to reduce hazard exposure include:

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respiratory protection should be mandatory.

- Always ensure that proper protective clothing is worn when using chemical substances.

- Hazard warning information and safety sign boards should be posted in the work area. In addition, as part of an on-going education and training program, all information on the health and safety hazards should be communicated to all potentially exposed workers.

Risk involves occurrence or potential occurrence of some accidents due to an event or sequence of events. The risk assessment study covers the following: Identification of potential hazard areas;

- Identification of representative failure cases;
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion;
- Assess the overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios;
- Assess the overall suitability of the site from hazard minimization and disaster mitigation points of view;
- Furnish specific recommendations on the minimization of the worst accident possibilities;
- Preparation of On-site and Off-site Emergency Plan, which includes Occupational and Health Safety Plan.

There is always possibility of occurrence of incidents in an industry which requires proper risk assessment and proper safety preparedness. Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

On-site

- Exposure to fugitive dust, noise, and other emissions

- Housekeeping practices requiring contact with solid and liquid wastes
- Emission/spillage etc. from storage & handling

Off-site

Exposure to pollutants released from offsite/ storage/related activities. Contamination due to accidental releases or normal release in combination with natural hazard. Deposition of toxic pollutants in vegetation / other sinks and possible sudden releases due to accidental occurrences**.**

7.5 Recommended Risk-Reduction Measures

Company attorneys, safety and health professionals, and environmental specialists should be involved in the development of any procedures or policies intended to manage the use of chemicals in the workplace. A company official should be predesignated as a public relations officer with specific training in dealing with the press. Corporate plans and policies should be developed, approved, and implemented long before any need for such arises.

Area in the factory where potential and major fire hazard can take place as follows.

i. Storage of molasses.

ii. Boiler operation.

iv. Others.

7.5.1 Storage of Molasses: -

1. Molasses should be stored in good quality and leak proof steel tanks.
2. Continuous mixing of molasses should be done.
3. If there is increase in temperature beyond 30^{o}C external cooling of tanks should be provided. A temperature recorder should be provided to the tanks.
4. If there is leakage –
   - Leakage should be washed out and diluted. Replacing of leaky gaskets, joints, strictly.
   - Leakage of pipelines, welding repairs should be attached out side the plant.
   - Leakage through gland should be regularly attached. It should be perfectly stopped by adopting improved techniques such as mechanical seals.

- To attend all major leakage in tanks the following procedure should be followed -
  - Transfer the material to other tank.
  - Prepare the tank for welding repairs and skilled workers should do this.

7.5.2 Boiler operations: -

1. Personnel protective equipment's should be given to workers.

2 Pilot lights should be provided on electrical panel boards.

3. Hand operable fire fighting cylinders should be provided.

Others: -

- Frequent checking of pipelines and storage units should be done.
- Welding should not be done near combustible material storage.
- Ash generated from fire should always be placed in metal receptacles and removed as soon as possible.

7.5.3 Safety Measure For Co-gen plant:

Fully automated with interlocks, alarms are incorporated in Co-gen plant is being installed and has following standard safety features.

- Turbine is interlocked with high and low steam inlet pressure
- Turbine is interlocked with high and low steam inlet high and low pressure
- Turbine is interlocked with high vibration of any bearing of turbine, gear box, and alternator.
- Turbine is interlocked with any bearing high temperature.
- High axial displacement of the rotor
- Turbine is interlocked with high lube oil temperature
- Separate Turbine over speed protection has been provided and interlock has been incorporated for turbine to trip on high speed.
- For reducing noise, all stem out lets have been provided with silencers.
- Pressure safety relief valves have been provided on stem drum and stem lines.
- In addition to mechanical SRVs electrometric safety relief valve is provided.
- Smoke leak detector alarm has been provided with alarm.

- Jockey pump with auto start has been provided for firefighting with low pressure interlock to automatically start main pump on low pressure.

7.6 Disaster Management Plan & Social Impact Assessment and Action Plans

7.6.1 Disaster

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

Disaster can be divided into two main groups. In the first are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, landslides and forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are war, industrial accidents, factory fires, radiation accidents, explosions and release of toxic gases or chemicals, river pollution, mining or other structural collapses etc.

There can be no set criteria for assessing the gravity of a disaster since this depends to a large extant on the physical, economic and social environment where it occurs.

Objective of Disaster Management Plan

The disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and the salvage operation in the same order of priorities. For effective implementation of Disaster Management Plan, it should be widely circulated and personnel training through rehearsals/ drills. To tackle the consequences of major emergencies inside the factory or immediate vicinity of the factory, a Disaster Management Plan has to be formulated and the planned emergency document is called "Disaster Management Plan".

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

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

The pre-requisites for a good disaster management plan have been given below:

- Management's commitment to safety.
- Emergency organization.
- Written guidelines for the duty team members.
- List of key personnel, experts, doctors, village leaders, authorities with their locations and telephone numbers (both office and residence).
- Clear-cut definition of role of individuals.
- Adequate means of communication with good back-up facility for telephone system. Also, alternative methods of communication like wireless, messengers etc. should be available
- Training, Regular rehearsals including alarms at least once / quarter.
- Fire and safety manuals (Both common and plant wise).
- Operating and Maintenance Manuals.
- Strong conviction that "the prevention is better than cure". Therefore, more emphasis should be made to prevent disasters.
- Warehouse safety manual.
- Chemical Information Sheets (CIS) or Material Safety Data Sheets (MSDS) or
- Work Practice Data Sheet (WPDS) for all the hazardous substances handled.
- Transport emergency cards (Tremcards) for the products transported by road.
- Disaster Management Plan (both On-site and Off-site)

- Mock Drill of the disaster management plan and modifying/ updating it.
- Division of each large factory into 'Safety Districts' for better safety
- Rehearsals of the disaster management plan (disaster control plan) and modifying / updating the same, if necessary. The timing of events, communication failures etc. should be noted and analyzed for improvement. The plan may therefore, have to be regularly discussed and updated.
- Availability of emergency 'Install light' (emergency light) to take care of power failures.
- Mutual aid scheme, if feasible
- Provision of antidotes, emergency medicines and beds in nearby hospitals
- Liaison with outside agencies and civic and government authorities for mitigation of the effects of a disaster. Round- the- clock availability of trained first-aid personnel.
- Standby communication system in case the telephone system is affected. e.g. Walkie-talkie, radio telephone, mobile phone etc.

7.6.2 Elements and Essentials of Disaster Management Plan

- Vulnerable areas of the plant where disasters are likely to originate should be identified and planned measures to deal with the same should be decided.
- Organization, i.e. appointment of key personnel with their duties and responsibilities should be done. This should cover personnel by their designation and it should not only consider the normal working but shifts and holiday work.
- Communication mechanism for raising the alarm as well as that for the interaction within and outside works should be provided.
- Roles and responsibilities of other individuals, as mentioned below, need to be defined clearly.

    - FIRE FIGHTING
    - MEDICAL
    - RESCUE
    - ENGINEERING SUPPORT

- All others not taking part in emergency handling operations.
- Location of emergency control center and assembly points should be precise and carefully planned.
- Check -list for sequence of operations to be followed should be prepared.

7.6.3 Identification / Assessment of Situation

It is essential that the situation is identified at the earliest possible time and judged correctly and if necessary, the emergency is to be declared. The Shift In-charge, who is at all times in the production house, shall identify situation of the hazard or calamity and report immediately the same to Plant Manager and shall also sound the alarm bell provided in each of the sections. Under this plan, the CGM takes charge of the situation. No sooner, he gets the information from Shift In-charge, he shall move to the place of hazard / calamity. He shall assess the situation and decide to declare emergency either in that particular section or the entire plant and sound alarm bells accordingly. If the emergency is to be declared only in one plant, the other plants will work. Normally, he shall take immediate steps to control the situation.

7.6.4 Action Plan

He (CGM) shall initiate all such actions that are essential at the production house / storage / shop floor etc. which would include- Evacuation of all the personnel on the shop floor who are not required for controlling the situation or hazard. Immediate grasping of gravity of the problem / hazard and issue or giving of instructions to the concerned teams as laid down to act in a manner required to control the situation.
In case of fire, the help of fire force should be immediately sought and put into action. Simultaneously, the workman trained in the fire fighting procedures shall be called to extinguish the fire.

7.6.5 Emergencies

General & Industrial Emergencies

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

- Slow isolated fires;
- Fast spreading fires;

- Structural failures;
- Natural Calamities;
- Contamination of food/ water; and
- Sabotage/ social disorder.

7.6.6 Specific Emergencies Anticipated in Sugar Mill Plant

Chemical spills

Chemicals are stored in bunded areas and any spills will be contained in a controlled area. Safety gear and training is provided to all staff who handles chemicals or dangerous goods and the likelihood of injury to person is very low due to training and procedures. The chemicals and dangerous goods are kept away from moving machinery to reduce the risk of fire. The mill has a first aid officer on every shift.

Injury to person:

Safety gear and training will be provided to all employees. Affected employees will be trained in safe handling of chemicals, dangerous goods, machinery (fixed and moving), their surrounding and their work environment. Safety guards, light curtains and other safety measures will be implemented and the likelihood of injury to person is very low due to training and procedures.

Damage to machinery and property

Whilst the likelihood is very low, there is always a small risk of fire. Our site is fitted with fire sprinklers, has several fire extinguishers fire hoses and emergency fire warnings. Our fire system is linked to the fire brigade and all employees will be trained to follow emergency procedures.

Fire & Explosion

Fire consequences can be disastrous, since they involve huge quantities of fuel either stored or in dynamic inventory in open yard. Preliminary Hazard Analysis has provided a basis for consequence estimation. During the study of risk assessment, the natures of damages are worked out and probability of occurrence of such hazards is

also drawn up. Therefore the risk assessment report is to be essentially studied in conjunction with the Disaster Management Plan.

Emergency Organization

An Emergency Organization is working in the plant. The CGM of the factory is heading this organization. He is also designated as site controller. The person not below the designation of General Manager and who are working as department heads are designated as Incident Controllers. Each Incident Controllers are reporting to the Site Controller. Each Incident Controller, for himself, organized a team responsible for controlling the incidence with the personnel under his control. Shift In charge in each department is the Reporting Officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller. Emergency coordinators are appointed who would take the responsibilities like fire fighting, rescue and rehabilitation, transport and provide essential & support services. All these personnel are designated as Key Personnel. In case of power or communication failure during any incident, some of the staff members in the office or plant offices and their services would be utilized as messengers for quick passing of the communications. All these personnel would be declared as essential personnel. A flow diagram of Emergency Organization is shown in Figure 7.1.

Emergency Communication

Whoever notices an emergency situation such as fire, growth of fire, leakage of chemicals etc. would inform his immediate superiors and emergency control centre. The person on duty in the emergency control centre would appraise the Site controller. Site Controller verifies the situation from the Incident controller of that area or the shift In charge and takes a decision about an impending On-Site Emergency. This would be communicated to all the Incident Controllers and Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instruction of the Site Controller.

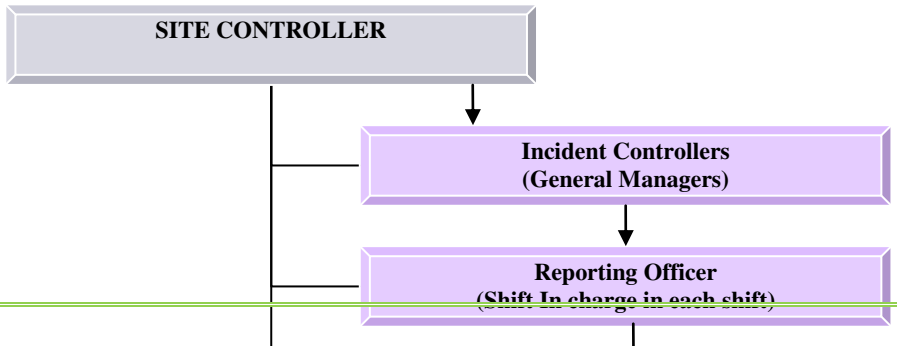

Figure 7.1: Emergency Organization Chart

7.6.7 Emergency Responsibilities

Site Controller

- On receiving information about emergency, he would rush to the emergency control centre and take charge of ECC and the situation and;
- Assesses the magnitude of the situation on the advice of the Incident Controller and decides;
- Whether the affected area needs to be evacuated;
- Whether personnel who are at assembly points need to be evacuated;
- Declares emergency and order for operation of emergency siren;
- Organizes announcement by public address system about location of emergency;
- Assesses which area are likely to be affected, or need to be evacuated or are to be alerted;
- Maintains a continuous review of possible development and assesses the situation in consultation with incident controller and other key personnel as to whether shutting down the plant or any section of the plant required and if evacuation of persons is required;
- Direct personnel for rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support system locally available for meeting emergencies;
- Control evacuation of affected areas, if the situation is likely to go out of control or affects are likely to go beyond the premises of the factory, inform to district emergency authority, police, hospital and seeks their intervention and help;
- Informs inspector of factories, deputy chief inspector of factories, PCB and other statutory authorities;
- Gives a public statement, if necessary;

- Keeps record of chronological events and prepares an investigation report and preserve evidence;
- On completion of On-Site Emergency and restoration of normalcy, declares all clear and order for all clear warning.

Incident Controller

- Assembles the incident control team;
- Directs operation within the affected areas with the priorities for safety to personnel minimize the damage to the plant, property and environment and minimize the loss of materials;
- Directs the shutting down and evacuation of the plant and areas likely to be adversely affected by the emergency;
- Ensures that all key personnel's help is sought;
- Provides advise and information to the fire and security officer and the local fire
- services as and when they arrive;
- Ensure that all non-essential workers/ staff of the affected areas are evacuated to the appropriate assembly points and the areas are searched for casualties;
- Has regard to the need for preservation of evidence so as to facilitate any inquiry into the causes and the circumstances which caused or escalated the emergency;
- Co-ordinates with emergency services at the site;
- Provides tools and safety equipments to the team members;
- Keeps in touch with the team and advices them regarding the method of control to be used;
- Keeps the site controller of emergency informed of the progress being made.

Emergency Co-ordinators – Rescue, Fire Fighting

- On knowing about emergency, rushes to ECC;
- Help the incident controller in containment of the emergency;
- Ensure fire pumps in operating conditions and instruct pump house operator to be ready for any emergency with stand-by arrangement;
- Guides the fire fighting crew i.e. firemen, trained plant personnel and security staff;
- Organizes shifting the fire fighting facilities to the emergency site, if required;

- Takes guidance of the incident Controller for firefighting as well as assesses the requirements of outside help;
- Arrange to control the traffic at the gate and the incident area;
- Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;
- Evacuates the people in the plant or in the nearby areas as advised by Site Controller;
- Searches for casualties and arrange proper aid for them;
- Assembles search and evacuation team;
- Arrange for safety equipments for the members of his team;
- Decides which paths the evacuated workers should follow;
- Maintains law and order in the area, and if necessary, seeks the help of police.

Emergency Co-ordinator – Medical, Mutual Aid, Rehabilitation, transport and Communication

In the event of failure of electric supply and thereby internal telephones, sets up communication points and establishes contact with the Emergency Control Centre (ECC).

Organizes medical treatment to the injured and if necessary, will shift the injured to nearby hospitals;

- Mobilizes extra medical help from outside, if necessary;
- Keeps a list of qualified first aiders of the factory and seeks their assistance;
- Maintains first aid and medical emergency requirements;
- Makes sure that all safety equipments are made available to the emergency team;
- Assist Site Controller with necessary data and in coordinating the emergency activities;
- Assist site controller in updating the emergency plan, organizing mock drills,
- verification of inventory of emergency facilities and furnishing report to Site Controller;
- Maintains liaison with civil administration;
- Ensure availability of canteen facilities and maintenance of rehabilitation centre;
- He will be in liaison with site controller/ incident controller;

- Ensures transportation facilities;
- Ensure availability of necessary cash for rescue/ rehabilitation and emergency expenditures;
- Controls rehabilitation of affected areas on discontinuation of emergency.

General Responsibilities of employees during an emergency

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

7.6.8 Emergency Facilities

Emergency Control Centre

An office at the administrative block on main gate is working as Emergency Control Centre. The internal and external telephone facilities, fax etc. will be provided in the block. During an incident, Site Controller and all the Incident Controllers are to be assembled here. The materials available in the ECC are:

- Internal & External telephone facility;
- Hand tools;
- Telephone directories;
- Factory layout and site plan;
- Emergency lamp/ torch light/ batteries;
- Plan indicating locations of hazard inventories, plant control room, sources of safety equipments, work road plan, assembly points, rescue location vulnerable zones, escape routes;
- Hazard chart;
- Emergency shut-down procedures;
- Nominal role of employees;
- List of key personnel, list of essential employees, list of emergency co-ordinators;

- Duties of key personnel;
- Address with telephone numbers and key personnel, emergency co-ordinators,
- essential employees;
- Important address and telephone numbers including government agencies,
- Neighboring industries and sources of help, outside experts, chemical fact sheets, population details around the factory.

Assembly Point

Numbers of assembly points depending upon the plant location are to be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus minimize facilities like water etc. are provided.

In view of the size of plant, different locations are ear marked as assembly points. Depending upon the location of the hazards the assembly points are to be used.

Emergency Power Supply

Water pumps, plants lighting and emergency control centre, administrative building and other auxiliary services will be connected to emergency power supply. Also, in case of turbine failure, DG sets will be carried or available to illuminate the area. There is plan to procure the flame proof emergency lighting system for each of the sections.

Fire Fighting Facilities

First Aid fire fighting equipment suitable for emergencies will be maintained in each section in the plant. This would be as per statutory requirements.

Emergency Medical Facilities

First aid facilities are provided at Emergency Control Centre and at main gate of the mill to deal with chemical burns and fire burns etc. Private and government medical

hospital's help would be sought in case of emergency. Apart from first aid facilities, external facilities would be augmented. Names of the medical personnel and details like phone number etc. will be displayed at main gate of the mill and the details of facilities will be maintained and updated at main gate of the mill.

7.6.9 Emergency Actions

Emergency Warning

Communication of emergency is familiar to the personnel inside the plant and people outside. An emergency warning system will be provided at the main gate.

Emergency Shutdown

Whenever a given method is appropriate depends on that particular case, cessation of the process is the best action in some instances but not in all. Emergency shutdown switches are to be provided to all those machinery that pose hazard in any condition.

Evacuation of Personnel

There could be more number of persons in the storage area and other areas in the vicinity. The area would have adequate number of exits, stair cases. In the event of an emergency, unconnected personnel have to escape to assembly point. Operators, if needed, have to take emergency shutdown procedure and escape. Based on these requirements, evacuation of the personnel through emergency exits are provided in the plant. Time office maintains a copy of deployment of employees in each shift. If necessary, persons can be evacuated by rescue teams.

Accounting of Personnel

It shall be the responsibility or the Team to immediately take stock of the personnel on duty and cross-check the personnel who have come out of the plant or have got stuck up. This team shall co-ordinate with Team to ensure that all the personnel are accounted for. It is also essential for Team to counter check the security if any visitor or transport workers have entered the plant and if so they should also be accounted.

All Clear Signal

Also, at the end of an emergency, after discussing with Incident Controllers and Emergency Co- ordinators, the Site Controller orders an all clear signal. When it becomes essential, the Site Controller communicates to the District Emergency Authority, Police and Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

Controlling the Disaster

The declarer / controller of Disaster shall take steps to train all the teams and shall draw up an "Action Plan" forthwith. The CGM is earmarked as "INCIDENT CONTROLLER" and shall act as an in-charge at the site of the hazard to control entire operations.

Implements for Repairs and Safety Gears:

The declarer / controller of disaster along with the incident controller shall immediately prepare a list of safety gear, tools and other implements required to control the emergency situations in respect of-

1. Fire
2. Bursting of Boiler
3. Short Circuiting

This list shall be submitted to the Managing Director for approval and the material should be brought immediately. Also, It shall be the responsibility of "Incident Controller" to ensure that a separate set of implements, safety gear and tools are;

7.7 General

Employees Information

During an emergency, employees would be warned by raising siren in specific pattern. Employees are given training on escape routes, taking shelter, protecting from toxic effects. Employees are provided with information related to fire hazards, and first aid measures. The key personnel and essential employees are to be given training in responding to emergency (emergency response).

Public Information and Warning

The industrial disaster effects related to this plant may mostly be confined to the plant area. The detailed risk analysis has indicated that the pool fire effects would not be felt outside. However, as an abundant precaution, the information related to chemicals in use would be furnished to District Emergency Authority for necessary dissemination to general public and for any use during an off-site emergency.

Mutual Aid

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facilities would be sought from neighboring industrial establishments.

Mock Drills

Emergency preparedness is an important task in planning of Industrial Disaster Management. Personnel in the mill are trained suitable and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential employees are to be trained in the operations.

Important Information

Important information such as names and address of key personnel, essential employees, medical personnel outside the plant etc. are to be maintained in the mill.

An on-site emergency organization chart for various emergencies is shown in Figure below.

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

The industrial planner, therefore, has to properly plan and take steps to minimize the impacts of industrialization and to ensure appropriate occupational health and safety including fire plans. All these activities again may be classified under construction & erection and operation & maintenance. Tirupati Sugars Ltd. (TSL) has prepared its own safety plan which will be implied during construction & erection and operation & maintenance phases. The safety plan is as follows:

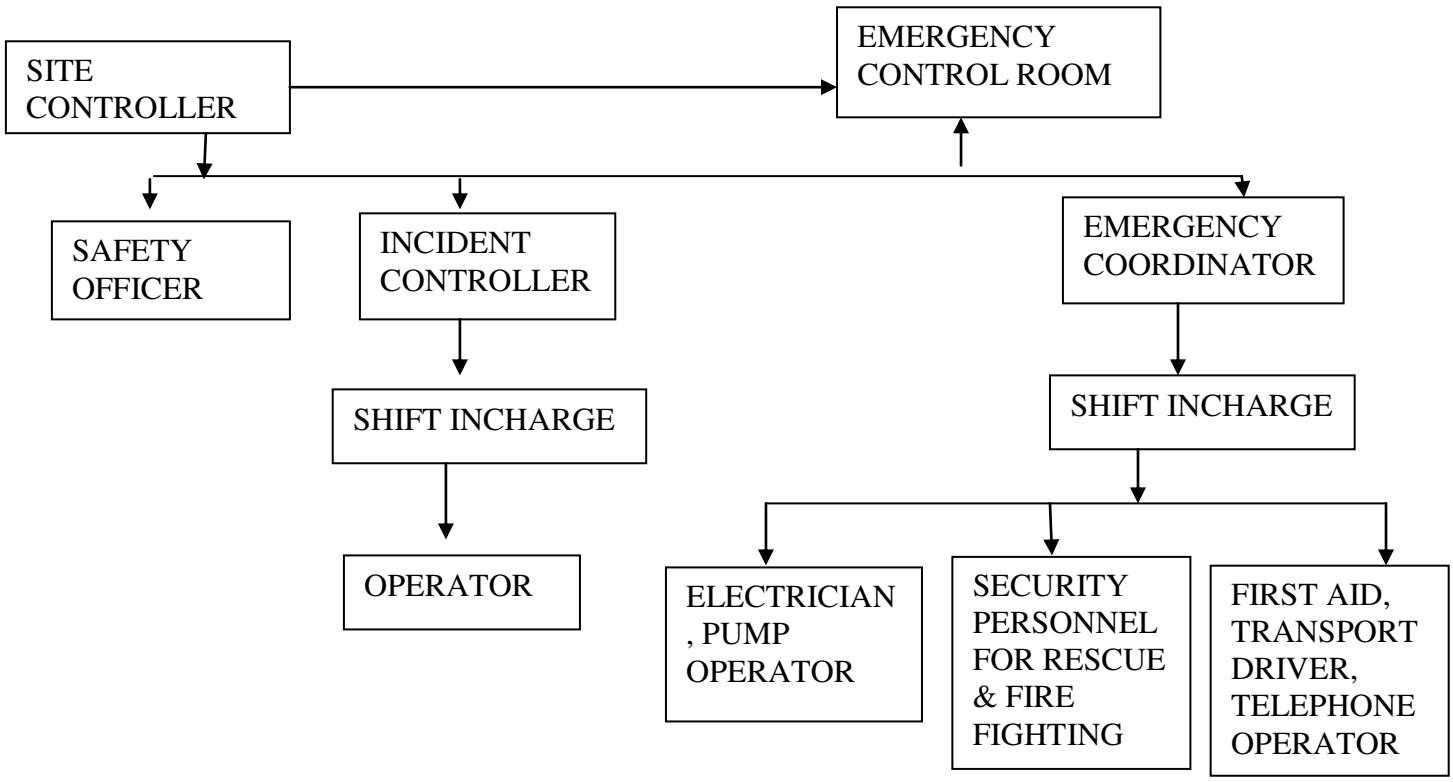

Figure 7.2: On Site Emergency Organization

7.8 On-site Emergency Plan:

Functions of Designated Persons

In addition to the specific responsibilities, assigned to various employees following are the general functions to be performed by the designated persons

a. To communicate & report the clear position of a Disaster to Key Persons of the Sugar Mill.
b. To communicate & co-operate with other departments / aspects like security, safety of victims etc.
c. To minimize the extent of Disaster by taking all possible measures which, are in control.
d. To minimize the exposure of Disaster to human beings.
e. To save property and valuable things as far as possible.

Special Handling Requirement

During handling of the above materials equipment such as- electrical motor pumps, mechanical mixers, automatic weighing arrangement, automatic dosing arrangement, pressure release and safety accessories on steam generating, handling as well as conveyance systems, heat exchangers, condensers and cooling as well as chilling machinery, temperature and pressure gauges are used.

The concerned workers are provided with adequate operation and safety tools /equipment. Sufficiently trained and qualified workers are employed in all sections of the Sugar Mill.

Notification Procedures & Communication Systems

Communication Equipment like Telephone, Wireless System and Personal messaging would be employed. The families of injured employees would be notified by Telephone, Personal messaging and through Verbal Communication.

Emergency Equipment and Facilities-

The following emergency equipment & facilities would be provided.

Emergency Cupboard:

An emergency cupboard will be available in all plant areas. This cupboard should contain certain number of various personal protective equipment (PPE) for use in case of disaster. These items kept in the cupboard should be used only during an emergency and not under normal working conditions. A printed or typed list of items available in the cupboard should be displayed on the cupboard.

The following items may be kept in the Emergency Cupboard

1. Air line mask set
2. Self-containing breathing apparatus
3. Safety belt with life time
4. PVC gloves
5. Leather gloves
6. Flextra or asbestos gloves
7. PVC Suit
8. Electrical rubber gloves
9. Safety torch
10. Safety goggle
11. Face- shield
12. Ear-muff
13. Flextra or asbestos blanket
14. Manila Rope 100 meter long bundle
15. Resuscitator
16. Safety helmet

This item shall be examined once a week by the safety observer to ensure that all the items are available and that they are in good condition and defective must be replaced immediately.

A) Requirement of Equipments and Other Materials-

1. Helmets for the Incident Controller and others.
2. Megaphone (workable hand-held PA system).
3. Walkie- Talkie/ mobile phones/ pagers.

4. Stock of fire fighting material.

5. Note books/pads and pens/ pencils.

6. Sign boards.

-Assembly point

-Emergency control center

-Road closed

Emergency Medical Supplies:

Sufficient number of First Aid Boxes would be located at appropriate and easily accessible locations. The First Aid Box would contain Bum Relief Sprays and Ointments, Bandages, Antiseptic as well as Pain Relief Medicine.

Training and Drills

Knowledge of Chemicals

Every worker, working in a particular section, would be given a thorough knowledge of all the chemicals involved/ handled in that section, their reactions as well as properties etc. Also they shall be instructed regarding the chemical spillage and its waste disposal practices**.**

Location of Fire Fighting Equipment

Every worker would be given clear-cut information regarding the 'location of Fire Extinguishers, Fire Buckets, and Water Points etc.

Use of Fire Fighting Equipment

Every worker would be trained with respect to nature and utility of Fire Fighting Equipment, its type and class of fire for which it is to be used**.**

Use of Personal Protective Equipment (PPE)

Every worker would be trained in using the PPE such as safety helmets, hand gloves, nose mask, goggles etc.

Off-site Emergency Plan

Since only hazard that is expected in the Sugar Mill industry is fire and is normally contained within the premises no OFF-SITE EMERGENCY PLAN is needed. However, in case the hazard spreads out-side the premises employees shall communicate to the District Magistrate, Commissioner of the Police, Control Room and inform the situation as OFF- SITE EMERGENCY. It shall be the responsibility of the Police Personnel to look after the law and order, traffic control, evacuation of workers and other personnel. They should also advise, through public address system, the localities that are likely to get affected and the steps to be taken.

Information to Local Authorities.

It shall be the responsibility of declarer / controller of emergency to inform the Local Panchayat Official regarding the likely hazards from the industry and the steps to be taken when there is an Off-Site Emergency. It is preferable that the Local Panchayat Officials are also trained, on simple protective methods, through demonstrations**.**

7.9 Occupational Health

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

Construction and Erection

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

To overcome these hazards, personal protective equipments (PPEs) are provided to all the employees. These includes helmets, gum boots, dust masks, ear plugs, safety goggles, rubber and asbestos gloves, safety belts etc. Depending upon the work an employee is doing and the location where he is working, necessary PPEs are provided to them.

Operation and Maintenance

The problem of occupational health, in the operations and maintenance phase, is due to many factors. It may be chemical or toxic gas leakages from any tank or vessel, heat, fire, noise etc. Following is a list of PPEs that are / will to be provided to the employees working in the factory premises:

- Industrial Safety Helmets
- Face Shields with Replaceable Acrylic Vision
- Punk Type Safety Goggles for Dust Protection
- Chemical Splash Proof Goggles
- Welder's Equipments for Eye and Face Protection
- Cylindrical Type Earplugs
- Ear Muffs
- Canister Gas Masks
- Self Contained Breathing Apparatus
- PVC Aprons
- Aluminized Fiber Glass Fix Proximity Suits with Hood, Gloves & Boots
- Boiler Suits
- Safety Belts
- Asbestos and Rubber Hand Gloves
- Acid/ Alkali Proof PVC Hand Gloves
- Electrically Tested Electrical Resistance Hand Glove
- Eye/ Face Shower
- Gum Boots
- Eye Wash Bottles

One number of vehicles will be available for attending emergencies arise due to accidents round the clock in the factory.

7.10 Safety Plan

Safety of both men and materials during construction and operation phases is of concern. The preparedness of any industry for the occurrence of possible disasters is known as emergency plan. The disaster in Tirupati Sugars Ltd. (TSL) is possible due to leakage of hazardous chemicals, collapse of structures and fire/ explosion etc.

Keeping in view the safety requirement during construction, erection, operation and maintenance phases, Tirupati Sugars Ltd. (TSL) has formulated a safety policy 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, equipments 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 upto- 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 and first aid
- To ensure proper implementation of fire prevention methods and an appropriate fire
- fighting 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 personal 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 processes involved in a project
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipment, work places and operations.
- In operation, the safety guidelines are framed in consultation with department heads and are tested under their guidance.

7.10.1 Safety Circle

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circle is constituted in the mill. The circle consists of equal representation of workers & staff members of the mill and comprise of 14 members headed by GM (HR & Admin.).

7.10.2 Safety Training

A full-fledged training centre with proper sitting capacity, overhead projector etc. is constructed in the mill and the trainings are given by the GM (HR & Admin.) with the assistance of subject matter expert from different departments. In addition to regular employees, contract laborers are also to be provided with safety training. To create safety awareness among all members, competition among safety circles are organized, during the celebration of National Safety Day/Week.

7.11 Social Impact Assessment. R&R Action Plans

Impact during Construction

- *Impact on Demography* ---

The peak workforce strength during construction would rise-up to hundred persons. Though the technical persons and skilled labors would by and large, be imported from outside the study area, bulk of the labor force would comprise of unskilled and semi-skilled workers, a substantial number of whom would presumably be recruited from the surrounding areas itself. Since majority of the unskilled workforce would be from surrounding areas, they would settle in the villages.

Therefore, the demographic scenario including population, sex-ratio, literacy level etc. would undergo certain local changes within a limited peripheral zone. The overall impact over the study area would be marginal.

- *Impact on Socioeconomic* ---

Construction of any major industrial project invariably results in socioeconomic changes. The influx of material and money lends to change the economic status of the community. Markets, workshops and commercial centers would develop in the area.

Construction of the proposed project will involve a substantial unskilled labor force. Since most of the unskilled labor force will be from nearby village, unplanned and haphazard development of slums would not be significant. However, labour camps with provision of basic amenities of water supply and sanitation etc. would be provided which would go long way in curbing the degradation of the physical and aesthetic environment.

- *Project Affected Persons (PAP)* ---

There will not be any project affected person, due to the fact that the entire land required for the proposed project is vacant and owned by project proponent on lease hold basis.

- *Rehabilitation and Resettlement Programme* ---

As mentioned earlier the land belongs to the project proponent, rehabilitation or resettlement problem do not exist.

Impact during Operation

- *Impact on Demographic Pattern* ---

The proposed expansion of project will generate employment opportunities both in direct and indirect manner. In direct mode people will get additional jobs in proposed expansion project and in indirect mode people will be appointed as company authorized dealers & sellers. The total Contractor's manpower approx. 100 Nos. including, Managerial Staff, Technical Staffs and labours will be employed / engaged temporarily during plant erection and commissioning only in proposed Tirupati

Sugars Limited project. However all existing manpower will be adequate for operations.

Moreover, a sizeable number of service class people who are directly connected with the operating personnel of the plant, e.g. house servants, washer man, barbers, shopkeepers etc. will flow in from the neighboring areas. As the plant and its ancillary facilities act as an active nucleus of activity, a shift of population towards this center will also occur within the study area. This would result in an alteration of the local demographic pattern. The literacy level of people and their families involved in the operation of the plant would certainly enhance the overall literacy rate within the study area. The population density in the peripheral zone will also tend to rise, though very marginally.

- *Impact on Socioeconomic* ----

This project will definitely alter the simple and quiet rural nature of the locality, which exists today.

As there will be flow of financial and material resources, there remains a large possibility of growth of population in the business, trade, commerce and service sector. The large inflow of financial and material resources accompanied with the urban culture complete with technological inputs as modern housing, water closets, radio, television, synthetic fibers, use of steel and aluminum, use of LPG/electricity for domestic cooking would all contribute towards changing the socioeconomic environment of the areas as this would introduce a mixed culture emphasizing urban traits in place of traditional, prevalent rural customs. The economic, cultural and technological changes are likely to induce social stress and ethical changes. All these would change the local life style.

Thus, a simple rural community may be transformed into a semi-urban complex within a short time frame. Such impacts are inevitable, that could also be felt in case of the proposed project; however, these would be attempted to be controlled and minimized by ensuring suitable human management, stable working conditions, security and the provision of adequate compensation.

- *Growth Dynamics and Stress Areas* ---

It has been observed that people always have a propensity to settle at locations where civic amenities as transportation, postal service, educational institutions, drinking water, market, medical treatment, electricity etc. are easily available within a short distance, as well as the working place being within a reasonable distance.

Therefore, some migrated people would settle in the peripheral zone / proximate of the proposed project site.

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