CHAPTER 7

ADDITIONAL STUDIES

7.0 INTRODUCTION

Industrial activities including process, production, storage, handling, transportation and operational practices presents levels of hazards to workforce, population and environment at large due to accidents, spills, leaks etc. These accidents results in personal and financial loss. The assessment of the threat posed, its control and prevention through good design, management and operational controls is of primal importance. Events like the Bhopal tragedy have emphasized the need to address both on-site and off-site safety. It is against this background that the various Section and Rules under the Environment Protection Act, 1986, the Factories Act, 1948 and other Acts specify the requirements for a safe and reliable working of an industry. These require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as "Risk Assessment Studies". Risk assessment refers to the technical, scientific assessment of the nature and magnitude of risk and uses a factual base to define the health effects of exposure of individuals or populations or ecological receptors to hazardous contaminants and situations.

This chapter explains the basis of Risk Assessment and its objectives.

7.1 Public Consultation

The CBWTF project is located at Tehsil Barwala, District Panchkula, hence it is exempted from public hearing as provided for under para 7(i) III. Stage (3)(i) (b) of EIA notification, 2006. Also letter regarding the exemption from the public hearing has been granted by SEIAA, Haryana on 14.09.2017.Copy of the same is enclosed as **Annexure VI.**

7.2 Risk Assessment and Hazards

A risk is an integrated assessment of likelihood and severity of an undesired event. Risk assessment is the determination of quantitative or qualitative estimate of risk related to a well-defined situation and a recognized hazard. Risk Assessment aims at assessing the effects of hazards on the local environment and personnel at the hazard.

7.2.1 Risk and Hazard Analysis

Risk analysis provides severity of harm from particular type of hazard and follows an extensive hazard analysis. It involves the identification and assessment of risks the neighboring population or environment is exposed to as a result of hazards present.

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the CBWT facility. On the other hand, risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards present in the complex.

7.2.2 Scope of Present Study

The principal objective of the present risk assessment study is to identify and quantify the major hazards and the risks associated with the various operations of the CBWTF project which may lead to emergency consequences affecting the employees of the facility, public safety and health. Based on this information, an emergency preparedness is developed to mitigate the consequences:

a) Identification of the biological, chemical, electrical, thermal and mechanical hazards associated with the facility and the auxiliary operations;
b) Short-listing of the major accident scenarios with potential off-site consequences for consequence analysis; and
c) Development of an emergency preparedness plan for the mitigation of consequences.

7.2.3 Hazard Identification

Identification of hazards is of primary significance in the analysis, in presence of any analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the CBWTF project.

The bio medical management activity includes the storage, processing, recycling, treatment of bio medical waste through incineration, autoclaving, shredding and sharp pit.

Typical methods for hazard identification employed are:

a) Identification of hazardous substances based on Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 of Government of India as amended there under
b) Identification of hazardous segments of the process and storage units and
c) Bio-Medical Waste Management Rules, 2016.

Hazardous substances at a common bio medical waste treatment facility may be classified as:

a) Infectious biological hazards
b) Flammable substances
c) Unstable substances and
d) Toxic substances

7.2.4 Hazard Assessment and Evaluation

7.2.4.1 Infectious Biological Hazards

The waste handlers at CBWTF are at immediate risk of needle-stick injuries and exposure to toxic or infectious materials. As per World Health Organization, a person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV.

The hazardous nature of bio medical waste may be due to one or more of the following characteristics:

a) contains infectious agents
b) genotoxic
c) contains toxic or hazardous chemicals or pharmaceuticals
d) radioactive and
e) contains sharps.

All individuals exposed to bio medical waste are potentially at risk, including those within health care facility that generate hazardous waste, and those outside these sources who either handle such waste or are exposed to it as a consequence of careless management.

Hazards from infectious waste and sharps

Infectious waste may contain any of a great variety of pathogenic microorganisms. Pathogens in infectious waste may enter the human body by a number of routes:

a) through a puncture, abrasion, or cut in the skin
b) through the mucous membranes
c) inhalation and
d) ingestion

Concentrated cultures of pathogens and contaminated sharps (particularly hypodermic needles) are probably the waste items that represent the most acute potential hazards to health. Sharps may not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens. Because of this double risk of injury and disease transmission sharps are considered as a very hazardous waste class.

The principal concerns are infections that may be transmitted by subcutaneous introduction of the causative agent, e.g. viral blood infections. Hypodermic needles constitute an important part of the sharps waste category and are particularly hazardous because they are often contaminated with patient's blood.

Hazards from pharmaceutical waste

Many of the chemicals and pharmaceuticals used in the health-care establishments are hazardous (e.g. toxic, genotoxic, and corrosive, flammable, reactive, explosive, and shock-sensitive). These substances are commonly present in small quantities in the

health-care waste; larger quantities may be found when unwanted or outdated chemicals and pharmaceuticals are disposed of. They may cause intoxication, either by acute or by chronic exposure, and injuries, including burns.

Intoxication can result from absorption of a chemical or pharmaceutical through the skin or the mucous membranes, or from inhalation or ingestion. Injuries to the skin, the eyes, or the mucous membranes of the airways can be caused by contact with flammable, corrosive, or reactive chemicals (e.g. formaldehyde and other volatile substances).

7.2.4.2 Physical Hazards

a) Noise
b) Extreme temperature
c) Vibration

7.2.4.3 Mechanical Hazards

a) Trucks and transport vehicles
b) Scaffolding and portable ladders
c) Impact by tools, sharp edged tools
d) Failure of machinery and equipment
e) Poor maintenance of machinery and equipment
f) Structural failure

The possible hazard sources, reason and place effect in the project are provide below in **Table 7.1**

Table 7.1 Hazard Source, Impact and Control Measures

S. No.	Possible Hazard	Source / Reason	Impact	Control measure
1	Biological	Bio medical waste bags received from the generators	Infection	Use appropriate personal protective equipment like gloves, mask

2	Physical and flammable	Incinerator	Fire, explosion, burn, extreme temperature	Fully Automatic PLC & SCADA Control Emergency Local Stop Fire Extinguisher (CO_2) PPE Emergency provision for Fire Brigade from outside source
3	Physical and flammable	Autoclave	Fire and extreme temperature	PPE
4	Physical (Noise)	Shredder	Loss of hearing	PPE
5	Mechanical	Building / structural collapse	Injury, death	Regular inspection to check corrosion in the steel structure. Regular maintenance of building and structure
6	Flammable (Diesel)	Diesel storage area	Fire	Emergency provision of Fire Extinguisher (CO_2)

Based on the preliminary hazard analysis, the following conclusions are made:

The biological hazards can be prevented if proper personal protective equipment were used and necessary precautions were taking during the collection, transport and handling of the bio medical waste.

The electrical and mechanical hazards present in the various sections of the plant do not lead to any emergency consequences. They are mostly localized;

The internal explosion hazard for the incinerator is unlikely to lead to any major consequences owing to the built-in fail-safe protective system;

The fire hazard is minimal as the storage quantity of diesel is restricted to only 100 litres at the site.

7. 3 Disaster Management Plan

7. 3.1 Disasters

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.

Disasters can be divided into two main groups. In the first, the disasters are resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, and forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. What would be considered a major disaster in a developing country, ill equipped to cope with the problems involved, may not mean more than a temporary emergency elsewhere. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless food, clothing and medical supplies, and the rapid re-establishment of essential services.

7. 3.2 Objectives of Disaster Management Plan [DMP]

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

The Disaster Management Plan shall reflect the probable consequential severalties of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management shall be able to demonstrate that their assessment of the consequences uses good supporting evidence and is based on currently available and reliable information,

incident data from internal and external sources and if necessary the reports of out side agencies.

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

1. Minimize damage to property and the environment;
2. Initially contain and ultimately bring the incident under control;
3. Identify any dead;
4. Provide for the needs of relatives;
5. Provide authoritative information to the news media;
6. Secure the safe rehabilitation of affected area; and
7. Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.
8. Effect the rescue and medical treatment of causalities;
9. Safeguard other people;

In effect, it is to optimize operational efficiency for rescue, rehabilitation and render medical help and to restore normalcy.

7. 4 Emergencies

7. 4.1 General and Industrial Emergencies

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

1. A situation of fire;
2. Explosion;
3. Structural failures;
4. Contamination of food/water; and
5. Sabotage/Social disorder.

7. 4.2 Emergency Organization

As per the General Organization chart, General Manager (Plant) is designated as the Site Controller. The Senior Managers are designated as Incident Controller. All the Incident Controllers would be reporting to the Site Controller.

All the staff at the CBWTF report to Incident Controller in an event of emergency. This team is responsible for controlling the incidence with the personnel under their control. Shift In charge is the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller. The team co-ordinates during eventualities and responsible for fire fighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In charge, Personnel Department, Essential services personnel are engaged. All these personnel are designated as Key personnel.

In the event of power or communication system failure, some of staff members in the office/plant offices are drafted and their services would be utilized as messengers for quick passing of communications.

7. 4.3 Emergency Communication

Whoever notices an emergency situation such as fire, growth of fire, leakage etc. informs his immediate superior and appraises 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. Simultaneously, the emergency warning system is activated on the instructions of the Site Controller.

7. 4.4 Emergency Responsibilities

The responsibilities of the key personnel are appended below:

7. 4.4.1 **Site Controller**

On receiving information about emergency he rushes to Emergency Control Center / Administration Office (ECC) and takes charge of ECC and the situation and:

- Assesses the magnitude of the situation on the advice of incident Controller and decides;
- Whether the effected area needs to be evacuated;
- Whether personnel who are at assembly points need to be evacuated;
- Declares Emergency and orders for operation of emergency siren;
- Organizes announcement by public address system about location of emergency;
- Assesses which areas are likely to be affected, or need to be evacuated or 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;
- Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
- Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to District Emergency Authority, Police, 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 preserves evidence; and
- On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

7. 4.4.2 Incident Controller

- Assembles the incident control team;
- Directs operations within the affected areas with the priorities for safety to personnel, minimize damage to the plant, property and environment and minimize the loss of materials;

- Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;
- Ensures that all key personnel help is sought;
- Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
- Ensures that all non-essential workers/staff of the affected areas evacuated to the appropriate assembly points, and the areas are searched for causalities;
- Has regard to the need for preservation of evidence so as to facilitate any inquiry into the cause and 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 advise them regarding the method of control to be used; and
- Keeps the Site Controller of Emergency informed of the progress being made.

7.4.4.3 Emergency Coordinator-Medical, Mutual Aid, Rehabilitation, Transport and Communication

In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the ECC.

- Organizes medical treatment to the injured and if necessary shifts the injured to nearby hospitals.
- Mobilizes extra medical help from outside, if necessary.
- Maintains first aid and medical emergency requirements.
- Makes sure that all safety equipment is made available to the emergency team.
- Assists Site Controller with necessary data and to coordinate the emergency activities.
- Assists Site Controller in updating emergency plan, organizing mock drills verification of inventory of emergency facilities and furnishing report to Site Controller.
- Maintains liaison with Civil Administration.

- He is in liaison with Site Controller/Incident Controller.
- Ensure transportation facility.
- Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure.
- Controls rehabilitation of affected areas on discontinuation of emergency.
- Makes available diesel/petrol for transport vehicles engaged in emergency operation.

7.14.5 Emergency Coordinator-Essential Services

- He assists the site controller and incident controller.
- Maintains essential services like diesel generator, water, fire extinguisher, power supply for lighting.
- He plans alternate facilities in the event of power failure, to maintain essential services such as lighting, refrigeration plant etc.
- He organizes separate electrical connections for all utilities and emergency services so that in the event of emergency or fires, essential services and utilities are not affected.
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians.
- Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

7.14.6 General Responsibilities of Employees during an Emergency

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

7. 5 Emergency Facilities

7. 5.1 Emergency Control Center (ECC) / Administration Office

Administration office is identified as Emergency Control Center. It has external Telephone, Fax and Telex facility. All the Site Controller/ Incident Controller Officers, Senior Personnel are located here. Also, it is an appropriate place. Various other materials that are to be maintained in the ECC are:

The following information and equipment are provided at the ECC:

- Telephone and telephone directories;
- First aid box;
- Safe contained breathing apparatus;
- Fire suit/gas tight goggles/gloves/helmets;
- Hand tools, wind direction/velocities indications;
- Emergency lamp/torch light/batteries;
- Hazard chart;
- Emergency shut-down procedures;
- Nominal roll 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 coordinator, essential employees; and
- Important address and telephone numbers including Government agencies, neighboring industries and sources of help, out side experts, chemical fact sheets population details around the factory.

7.5.2 Assembly Point

In view of the size of plant, Administration office & main gate is ear marked as assembly points. Depending upon the location of hazard, the assembly points are to be used. The same assembling points can be considered during emergencies in future. Designated persons would take charge of these assembly points and mark presence of

the people assembling at the point. Department & shift wise, list of employees, are available at these points and roll call is taken by the designated person.

7.5.3 Emergency Power Supply

Plant facilities are connected to Diesel Generator and are placed in auto mode. Thus plants lighting, administrative building and other auxiliary services are connected to emergency power supply. In all the sections, flame proof type emergency lamps are provided.

7. 5.4 Fire Fighting Facilities

First aid and firefighting equipment suitable for emergency are maintained in each section in the plant.

7. 5.5 Emergency Medical Facilities

Gas masks and general first aid materials for dealing with chemical burns, fire burns etc. are maintained in the in the emergency control room. Private medical practitioners help would be sought. Government hospital is approached for emergency help.

Apart from plant first aid facilities, external facilities are augmented. Names of Medical Personnel, Medical facilities in the area are prepared and updated. Necessary specific medicines for emergency treatment of Burns patients and for those affected by toxicity are maintained.

Breathing apparatus and other emergency medical equipment are provided and maintained. The help of nearby industrial management's in this regard is taken on mutual support basis.

First aid center with trained First Aid Assistants is available round the clock. Besides this, Government Hospital nearby is also consulted in case of emergency.

****