CHAPTER – VII
ADDITIONAL STUDIES

7.1 RISK ASSESSMENT [TOR # 44]

7.1.1 INTRODUCTION

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

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

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

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

7.1.2 SCOPE OF THE STUDY

The scope of study includes the study of proposed operations, storage and handling of raw materials with respect to Hazard Identification. Risk Assessment and preparation of Disaster Management plan. Based on the Hazard Identification and analysis, the major disaster scenarios would be worked out to estimate the consequence of failure. A Disaster Management Plan (DMP) would also be evolved to meet the emergency situation including the occupational health and safety.
7.1.3 FIRE PROTECTION SYSTEM
The following Fire Protection systems have already been provided in the proposed plant.
- Portable extinguisher such as pressurized water type, carbon dioxide type and foam type is located at strategic locations throughout the plant.

7.1.4 METHODOLOGY OF MCA ANALYSIS
The MCA Analysis involved ordering and ranking of various sections in terms of potential vulnerability. The following steps were involved in MCA Analysis.
- Preparation of an inventory of major storages and rank them on the basis of their hazard properties.
- Identification of potentially hazardous storage sections and representative failure cases from the vessels and the pipelines.
- Visualization of chemical release scenarios.
- Effect and damage calculation from the release cases through mathematical modeling.
- Inventory Analysis and Fire & Explosion and Toxicity Index (FETI) are the two techniques employed for hazard identification process.

7.1.5 FIRE & EXPLOSION AND TOXICITY INDEX
The role of Fire & Explosion Index (FEI) aids quantitative hazard identification. The FEI is calculated by evaluating the loss potential of all the units in the storage area and the hazardous areas were classified accordingly. The role of FEI is
- Identification of the equipment/areas that could likely contribute to the creation or escalation of incident and relatively rank the incidents.
- Quantification of the expected damage of potential fire and explosion incidents.
- Preparation of guidelines for mitigating fire hazards.

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

\[
\text{FEI} = \text{MF} \times \text{GPH} \times \text{SPH}
\]

Where MF: Material factor
GPH: General Process Hazard
SPH: Special Process Hazard

**TOXICITY INDEX**

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

\[
TI = \frac{(Nh + Ts) \times (1 + GPH + SPH)}{100}
\]

7.1.6 **ASSESSMENT OF RISK AT M/s. NERPL**

Although asbestos industry will not cause any disastrous emergencies, control measures due to accidental discharge, spillages of asbestos. Based on the storage inventory the following areas are identified as potential safety risk areas are shown in table 7.1

TABLE 7.1

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Area</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Asbestos dust exposure During storage and manufacturing process</td>
<td>Vacuum cleaning, wet mopping, sealing, re-bagging.</td>
</tr>
</tbody>
</table>

7.1.7 **RISK & CONSEQUENCE ANALYSIS OF FIRE**

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

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

There is no storage of highly inflammable substances like Furnace oil, HSD in the proposed plant. Hence risk analysis on those substances will not be required.
7.2 DISASTER MANAGEMENT PLAN

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

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

7.2.2 OBJECTIVES OF DISASTER MANAGEMENT OF PLAN

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

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

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

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

- Minimize damage to property and the environment.
- Effect the rescue and medical treatment of causalities.
- Provide for the needs of relatives.
- Provide authoritative information to news media.
- Secure the safe rehabilitation of affected areas.
- Safeguard other people.

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

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

7.2.3 **EMERGENCIES**

7.2.3.1 **GENERAL, INDUSTRIAL, EMERGENCIES**

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

- Contamination of food / water.
- Sabotage / social disorder.
- Structural failures.
- Slow isolated fires.

**7.2.3.2 SPECIFIC EMERGENCIES ANTICIPATED**

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

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

Each Incident Controller for him organizes a team responsible for controlling the incident with the personnel under his control. Shift in-charge would be the reporting Officer, who would bring the incident to the notice of the Incident Controller and the Site Controller. Emergency Coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and support services. For this purposes, Security in-charge, Personal Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

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

7.2.3.4 EMERGENCY COMMUNICATION

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

The responsibilities of the key personnel are appended below

7.2.3.5.1 SITE CONTROLLER

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

- Whether affected area needs to be evacuated.
- Whether personnel who are at assembly points need to be evacuated.
- Declares Emergency and orders for operation of emergency siren.
- Organizes announcement by public address system about location of emergency.
- Assesses which areas are likely to be affected, or need to be evacuated or to be altered.
- Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other key personnel whether shutting down the Plant or any section of the Plant required and if evacuation of persons is required.
- Directs personnel of rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support systems locally available for meeting emergencies.
- Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to District Emergency Authority, Police, and Hospital and seeks their intervention and help.
- Informs Inspector of factories, Deputy Chief Inspector of factories, APCCB and other statutory authorities.
- Gives public statement if necessary.
- Keeps record of chronological events and prepares an investigation report and preserves evidences.

On completion of on-site Emergency and restoration of normalcy, declares all clear and orders for all clear signal.
7.2.3.5.2 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 effected areas evacuated to the appropriate assembly points and the areas are searched for causalities.
- Has regard to the need for preservation of evidence so as to facilitate any enquiry into the cause and circumstances, which caused or escalated the emergency.
- Coordination on with emergency services at the site.
- Provides tools and safety equipments to the team members.
- Keeps in touch with the team and advice them regarding the method of control to be used.
- Keep the site Controller of Emergency informed of the progress being made.

7.2.3.5.3 EMERGENCY COORDINATOR - RESCUE, FIRE FIGHTING

- On knowing about emergency, rushes to Emergency Control Centre.
- Helps the incident controller in containment of the emergency.
- Ensure fire pumps in operating conditions and instructs pump house operator to be ready for any emergency.
- Guides the fire fighting crew i.e. Firemen trained Plant personnel and security staff.
- Organizes shifting the fire fighting facilities to the emergency site, if required.
- Takes guidance of the Incident Controller for fire fighting as well as assesses the requirements of outside help.
– Arranges to control the traffic at the gate and the incident area / directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision.

– Evacuates the people in the Plant or in the near by areas as advised by site controller.
– Searches for casualties and arranges proper aid for them.
– Assembles search and evacuation team.
– Arranges for safety equipments for the members of his team.
– Decides which paths the evacuated workers should follow.
– Maintains law and order in the area, and if necessary seeks the help of police.

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

– The event of failure of electric supply and there by internal telephone, sets up communication point and establishes contact with the Emergency Control Center (ECC).
– Organizes medical treatment to the injured and if necessary will shift the injured to near by hospitals.
– Mobilizes extra medical help from outside, if necessary
– Keeps a list of qualified first abiders of the factory and seek their assistance.
– Maintains first aid and medical emergency requirements.
– Makes sure that all safety equipment are made available to the emergency team.
– Assists Site Controller with necessary data and to coordinate the emergency activities.
– Assists Site Controller in updating emergency plan.
– Maintains liaison with Civil Administration.
– Ensure availability of canteen facilities and maintenance of rehabilitation centre.
– He will be in liaison with Site Controller / Incident Controller.
– Ensures availability of necessary cash for rescue / rehabilitation and emergency expenditure.
– Controls rehabilitation of affected areas on discontinuation of emergency.
– Makes available diesel petrol for transport vehicles engaged in emergency operation.
7.2.3.5.5 EMERGENCY COORDINATOR – ESSENTIAL SERVICES

He would assist Site Controller and Incident Controller

- He would plan alternate facilities in the event of Power failure, to maintain essential services such as lighting, etc.
- He would organize separate electrical connections for all utilities and during emergency be coordinates that the essential services and utilities are not affected.
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc to shift in charge and electricians.
- Ensure availability of adequate quantities of protective equipment and other emergency materials, spares etc.

7.2.3.5.6 GENERAL RESPONSIBILITIES OF EMPLOYEES DURING AN EMERGENCY

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

7.2.3.6 EMERGENCY FACILITIES

7.2.3.6.1 EMERGENCY CONTROL CENTRE

For the time being office block is identified as Emergency control centre. It would have external Telephone & Fax facility. All the Incident controller officers, senior personnel would be located here.

The following information and equipment are to be provided at the Emergency control centre (ECC).
- Intercom, telephone
- P&T telephone
- Gas tight goggles / gloves / helmets
- Factory layout, site plan
7.2.3.6.2 EMERGENCY POWER SUPPLY

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

7.2.3.6.3 FIRE FIGHTING FACILITIES

First Aid Fire fighting equipment suitable for emergency should be maintained as per statutory requirements per TAC Regulations. Since the proposed manufacturing process is wet process & asbestos has got high insulation property, possibility of fire hazard is negligible.

7.2.3.6.4 LOCATION OF WIND SOCK

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

7.2.3.6.5 EMERGENCY MEDICAL FACILITIES

Gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical centre as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.
Apart from Plant first aid facilities, external facilities would be augmented. Names of Medical Personnel, Medical facilities in the nearby town would be prepared and updated. Necessary specific medicines for emergency treatment of Burns patients and for those affected by toxicity would be maintained. Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of near by industrial managements in this regard would be taken on mutual support basis.

7.2.3.7 EMERGENCY ACTIONS

7.2.3.7.1 EMERGENCY WARNING

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

7.2.3.7.2 EMERGENCY SHUTDOWN

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

# Stop feed
# Deluge contents
# Transfer contents

7.2.3.7.3 EVACUATION OF PERSONNEL

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

7.2.3.7.4 ALL CLEAR SIGNAL

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

7.3 OCCUPATIONAL HEALTH AND SURVEILLANCE

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

7.3.1 OCCUPATIONAL HEALTH [TOR # 13 (iii) & 45]

A comprehensive pre-employment Medical examination is being carried out, which include a complete history of the personnel’s health and respiratory system. Training programs are being arranged for Employees in health and general safety. Health Insurance coverage is being provided for every worker.

The fund allocation towards Occupational Health & Safety for employees in the existing factory is Rs. 10,00,000/- per Annum.

The same will be carried out in expansion project also.

i. Pre-employment check up as medical examination is being carried out.
   - X-ray of chest
   - Lung/Pulmonary function test (Spirometry – FVC & FEV 1)
   - Sputum Examination
   - Blood test
   - Urine test
   - Complete Physical examination

ii. Health records during & after cessation of employment are maintained as per factory act.

iii. Periodicity of health checkups done for yearly for workers working in asbestos related work such as bag handling upto BOD & for other workers & employees.
   - X-ray of chest (once in 3 years)
   - Lung/Pulmonary function test (once in a year)
   - Sputum Examination (once in a year)
   - Blood test (once in a year)
   - Urine test (once in a year)
   - Complete Physical examination (once in a year)

iv. Health education information on risk related to asbestos & other fibres & smoking are being frequently given to all the workers.
v. Within one month of medical examination the information are being given to respective worker or employee.

vi. Regular checking of Exposure areas are being done by Environment department with trained staff.

vii. Regular medical examination of workers and health monitoring of the employees are being carried out and records maintained upto minimum 40 years from the beginning of employment or 15 years after retirement or cessation of employment whichever is later.

viii. Competent occupational health physicians have already been appointed to carry out medical surveillance.

ix. BIS code of practices specified are being followed.

x. The noise levels in the critical areas are being monitored regularly and the workers at high noise generating areas will undergo audiometric tests once in six months.

7.3.2 CONSTRUCTION & ERECTION

There will not be any Construction activities proposed in the expansion project. Hence there will not be any occupational health problems envisaged at this stage.

7.3.3 OPERATION & MAINTENANCE

Workers employed in collection, transport or disposal of asbestos waste who may be at risk of exposure to airborne asbestos, have been provided with suitable protective clothing and respiratory equipment like

- Nose Masks made of cotton clothing material
- Coveralls or similar full-body work clothing;
- Gloves, head coverings, and foot coverings
- Welders equipment for eye and face protection
- Cylindrical type earplug
- Ear plugs
- Canister gas masks
- Leather apron
- Safety belt / line man’s safety belt
- Canvas cum leather hand gloves with leather palm
7.4 SAFETY PLAN

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

- Fire Extinguishers
- Fire buckets

Keeping in view the safety requirement during construction, operation and maintenance phases, North East Roofing Pvt. Ltd. has formulated safety policy with the following regulations.

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

- To publish / notify regulations, instructions and notices in the common language employees.
- To prepare separate safety rules for each type of process involved.
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

7.4.1 SAFETY ORGANISATION

7.4.1.1 CONSTRUCTION AND ERECTION PHASE

There will not any construction activities proposed for expansion project.

7.4.1.2 OPERATION & MAINTENANCE PHASE

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

7.4.1.3 SAFETY CIRCLE

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

7.4.2 SAFETY TRAINING

A full fledged training centre is being established at North East Roofing Pvt. Ltd. Safety training is being provided by the safety officers with the assistance of faculty members called from professional safety institutions and universities. In addition to regular employees, contractor laborers are also being given safety training.

To create safety awareness safety films are being shown to workers and leaflets etc. are being distributed. Housekeeping of high standard helps in eliminating the causes of fire and regular fire watching system strengthens fire prevention and firefighting.
7.4.3 HEALTH AND SAFETY MONITORING PLAN [TOR # 13 (iii)]

All the required personal protective equipment is being given to the workers to prevent them from Mesothalmia, Lung cancer and Asbestosis related problems. Nose mask & protective cloths are regularly given to concerned workers working in hazardous area. These clothing’s are cleaned with vacuum cleaners in a cabin before & end of the workers duty, Separate bathrooms have been provided for washing of cloths. All the potential occupational hazardous work places are being monitored regularly. The health of employees working in these areas is being monitored once in a year. The same will be continued after expansion also.

7.4.4 ACTION PLAN FOR THE IMPLEMENTATION OF OHS STANDARDS AS PER OSHAS/USEPA

All the OHS standards as per OSHAS / USEPA are being implanted / will be implemented in the existing / proposed expansion project.

7.5 SOCIAL IMPACT ASSESSMENT

The local areas will be benefited by way of generation of direct / indirect employment opportunities due to the increase in Production capacity of the plant, increased demand for local products and services. There will be an overall improvement in the income level of the local people. The project creates employment to about 100 persons after the enhancement through indirect employment.

7.6 R & R ACTION PLAN

No Rehabilitation & Resettlement Action Plan has been envisaged in the proposed expansion project. As the proposed expansion project will be taken up in the existing plant premises only.