CHAPTER – 7
ADDITIONAL STUDIES

7.1 RISK ASSESSMENT [TOR # lix]

7.1.1 INTRODUCTION

Risk analysis deals with the identification and quantification of risks, the plant equivalent and personnel are exposed 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 proposed expansion project.

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. 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 expansion 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.

PLANT CONFIGURATION

Roquette Riddhi Siddhi Pvt. Ltd. is operating 6 MW coal based Cogeneration power plant since year 2001 in the starch plant premises. Now it has been proposed to increase the power generation capacity from 6 MW to 18 MW (additional 12 MW unit) in the same existing starch plant premises. Part of the power generated will be for captive requirement and the balance to be exported to the

grid. Coal and Biomass will be used as fuels in the proposed 100 TPH Boiler. The configuration the proposed co-generation power Plant (Expansion) is as follows:

Power generation capacity	:	12 MW (1 x 12 MW)
Boiler capacity	:	1 x 100 TPH

FUEL REQUIREMENT, AVAILABILITY AND TRANSPORTATION

The fuel for the power plant will be Coal (Imported coal / Indian coal (used only during exigencies) and Biomass (Bagasse). Imported coal will be sourced from Indonesia whereas Indian coal required for the proposed power plant will be sourced from SCCL, Telangana. Coal will be transported by Sea route, Rail, by road through road covered trucks.

FUEL OIL SYSTEM

The Fuel Oil system is provided for

A. Boiler start-up
B. Flame stabilization during low load operation with (or) without coal firing
C. DG set operation.

There are two nos. of HSD storage tank of 2 x 20 KL capacity. Fuel oil brought through authorized dealers to the site by tankers.

7.1.3 FIRE PROTECTION SYSTEM:

The firefighting hydrant system is available with water tank (above the ground) having capacity 480 m3. Pump house is having 3 pumps, electrical driven pump of capacity 340 m3/hr, diesel operated pump of capacity 340 m3/hr and Jockey pump of capacity 34 m3/hr.

Hydrant pipeline is covered for entire peripheral facility, high raise buildings and manufacturing blocks. Second phase of hydrant pipeline is on Coal yard, new warehouse, maize silos and extended up to periphery.

Sprinklers system installation at warehouses is in progress.

5 no's of trained and certified fire fighters are available at site round the clock.

A comprehensive fire detection and protection system is provided for the complete power station. This system confirms to the recommendations of TAC guidelines and NFPA.

The following fire detection and protection systems have been provided in the existing plant.

a) Hydrant system for complete power plant covering the entire power station including all the auxiliaries and buildings in the plant area. The system is complete with piping, hydrants, valves, instrumentation, hoses, nozzles, hose boxes/stations etc.

b) Automatic high velocity water spray system for all transformers located in transformer yard and those of rating 10 MVA and above located within the boundary limits of plant, main and unit turbine oil tanks and purifier, lube oil piping (zoned) in turbine area, generator seal oil system, lube oil system for turbine driven boiler feed pumps, consisting of detectors, deluge valves, projectors, valves, piping, instrumentation etc.

c) Automatic medium velocity water spray system for cable vaults and cable galleries of main plant, switchyard control room, CHP control room and ESP control room consisting of smoke detectors, linear heat sensing cable detectors, deluge valves, isolation valves, piping, instrumentation, etc.

d) Automatic medium velocity water spray system for conveyors, galleries, transfer points and crusher house consisting of QB detectors, linear heat sensing cables, deluge valves, nozzles, piping, instrumentation, etc.

e) Automatic medium velocity water spray system for un-insulated fuel oil tanks storing fuel oil having flash point 65 deg C and below consisting of QB detectors, deluge valves, nozzles, piping, instrumentation, etc.

f) For protection of control room, equipment room, computer room and other electrical and electronic equipment rooms, suitable “Halon substitutes” such as “INERGEN” or “AGRONITE” system would be opted.

g) Fire detection and Alarm system – A computerized analogue, addressable type early warning system will be provided to cover the complete power plant with compatible detection systems

h) Portable and mobile extinguishers, such as pressurized water type, carbon-dioxide type, foam type, dry chemical powder type, will be located at strategic locations throughout the plant.

i) Required fire tenders/engines of water type, DCP / foam type, trailer pump with fire jeep etc will be provided in the fire station. Horizontal/vertical firewater pumps will be installed in the pump house for hydrant and spray system and the same will be driven by electric motor and diesel engines as per TAC guidelines For the above firewater pumping station, automatic pressurization system consisting of jockey pumps and air compressors will be

provided. All necessary instrumentation & controls for the entire fire detection, alarm and protection system provided for safe operation of the system.

The same system is adequate after expansion also.

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.
- Visualisation 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 IDENTIFICATION OF DISASTER SCENARIOS

Disaster scenarios for the purpose of this study is defined as an accident viz., Fire, Explosion, Release of Toxic substances, etc.

The storage of raw materials, products are shown in Table - 7.1

TABLE 7.1

CATEGORY WISE SCHEDULE OF STORAGE TANKS

S. No.	Product	No. of tanks	Classification	Proposed Storage capacity
1.	HSD	2	B	2 x 20 kl

Where A - Dangerous Petroleum

B - Non Dangerous Petroleum

C - Heavy Petroleum

7.1.6 FIRE & EXPLOSION AND TOXICITY INDEX

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

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

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

FEI = MF x GPH x SPH

Where MF : Material factor

GPH : General Process Hazard

SPH : Special Process Hazard

TOXICITY INDEX

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

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

7.1.7 ASSESSMENT OF RISK AT M/s. RRSPL

Based on the storage inventory the following areas are identified as potential safety risk areas are shown in Table 7.2.

TABLE 7.2

POSSIBLE RISKS FROM THE PROPOSED POWER PLANT

S.No.	Area	Capacity / Quantity	Hazards identified
1.	Turbo Generator building	1 x 12 MW	Fires in a) Lube oil system b) Short circuit in control room / switch gears c) Cable galleries
2.	Transformer	-	Explosion & fire
3.	Boilers	1x100 TPH	Fire (mainly near oil burners steam explosion, fire explosion
4.	Coal Handling Plant	-	Fire and or dust explosion
5.	Coal storage	3,500 tons	Fire, spontaneous combustion
6.	HSD storage tanks	2 x 20 kl	Fire

Methodology

Thermal Radiation:

Thermal radiation effects on inanimate objects like piping, equipment or vegetation also need to be evaluated to assess their impact. Table 7.3 presents the damage effects due to thermal radiation intensities.

TABLE 7.3

DAMAGE DUE TO INCIDENT RADIATION INTENSITIES

S.No.	Incident Radiation (Kw/m^2)	Type of Damage intensity
1.	62.0	Spontaneous ignition of wood
2.	37.5	Sufficient to cause damage to process equipment
3.	32.0	Maximum thermal radiation intensity allowed on thermally protected adjoining equipment
4.	25.0	Minimum energy required to ignite wood at infinitely long exposure (non- piloted)
5.	12.5	Minimum energy required for piloted ignition of wood, melting of plastic
6.	8.0	Maximum thermal radiation intensity allowed on thermally unprotected adjoining equipment
7.	4.5	Sufficient to cause pain to personnel if unable to reach cover within 20 seconds, however blistering of skin (1st degree burns). Causes no discomfort on long exposures
8.	1.6	Causes no discomfort on long exposures
9.	0.7	Equivalent to solar radiation

7.1.7.1 COAL HANDLING PLANT - DUST EXPLOSION

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

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

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

Control measures for Coal storage yard:

The entire quantity of coal stored in separate stock piles, with proper drains around to collect washouts during the monsoon. Garland drains provided all round the storage area. Water sprinkling system will be installed on stocks of pile to prevent spontaneous combustion and consequent fire hazards. The stack geometry will be adopted to maintain minimum exposure of stock pile areas towards predominant wind direction temperature monitored in the stock piles regularly to detect any abnormal rise in temperature inside the stock pile to enable to control the same. The stock pile (indigenous coal) height will be limited to prevent self ignition.

7.1.8 RISK & CONSEQUENCE ANALYSIS OF FIRE

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

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

7.1.9 METHODOLOGY

After identification of major hazard locations at the Power Project site, disaster scenarios for each installation are described as below.

7.1.9.1 CHLORINATION PLANT

To prevent the growth of algae in cooling water system, Chlorine dosing in the CW fore bay is proposed. The system will be designed for 1ppm continuous dosing and 5ppm shock dosing. 2 x 100 % capacity vacuum type chlorinators (with evaporator) is provided along with the 2 nos. of chlorine tonne containers. However to tackle any chlorine leakage, chlorine absorption system has been provided.

7.1.9.2 FUEL OIL STORAGE

The hazards expected from this plant include the pool fire situation due to the leakage of HSD from the storage tank. There will be 2 no. of HSD storage tank each of 20 KL capacity. The tank will be made of Mild steel and will be provided with dyke around the tanks. The most credible failure is due to the rupture of the pipe connecting the storage tank. The worst case can be assumed as when the entire contents leak out into the dyke forming a pool, which may catch fire on finding source of ignition.

HSD STORAGE TANK - POOL FIRE SCENARIO

The maximum quantity of HSD stored at site will be 2 x 20 KL capacity. In the event of tank spilling its contents through a small leakage or due to rupture of pipeline connecting the tank and on ignition fire will ensue. As the tanks are provided with dyke, the fire will be confined within the dyke. Threshold limit for first degree burns is 4.5 kw/m^2. Based on these results it may be concluded that the vulnerable zone in which the thermal fluxes above the threshold limit for first degree burns (4.5 kw/m^2) is restricted to 18 m.

The hazard distances for various radiation intensities are shown in Table 7.4

TABLE 7.4
HAZARD DISTANCES (Two Tanks on fire - scenario)

HSD Quantity : 2 x 20 KL

Radiation Intensity		Hazard Distances
37.5 kw/m^2	(100% lethality)	1 m
25.0 kw/m^2	(50% lethality)	3 m
12.5 kw/m^2	(1% lethality)	6 m
4.5 kw/m^2	(1st degree burns)	10 m

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

7.1.10 EFFECTIVE CONTROLS

Ignition sources in the vicinity. Pressurization of buildings not having explosion - proof fittings, switching off power supply from a central place, blanket ban on smoking, proper maintenance of flame proof fittings. The thick green belt to be developed will help to mitigate the radiation intensity level outside plant boundary.

7.2 DISASTER MANAGEMENT PLAN [TOR # lx]

7.2.1 DISASTERS

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

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

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

7.2.2 OBJECTIVES 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 salvage operations in this same order of priorities. For effective implementation of Disaster Management Plan, it will be widely circulated and personnel training through rehearsals.

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

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

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

- Pool fire scenario due to HSD storage
- 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:

- Pool fire scenario at HSD storage tanks
- 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 probability of occurrence of hazards is 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

An Emergency Organization has been setup. A senior executive who has control over the affairs of the Plant heads 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 himself, organises 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 appointed would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and support services. For this purposes, Security in-charge, Personal Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electrical fitters, pump house incharge and other maintenance staff would be drafted for emergency operations. In the event of Power communication system failure, some of staff members in the office/ Plant offices would be drafted and their services would be 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 incharge and takes a decision about implementing on Site Emergency. This would be communicated to all the Incident Controllers, Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

7.2.3.5 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, SPCB and other statutory authorities.
- Gives public statement if necessary.
- Keeps record of chronological events and prepares an investigation report and preserves evidences.

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

7.2.3.5.2 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 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 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.
- Organises 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.

- 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 nearby 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).
- Organises medical treatment to the injured and if necessary will shift the injured to nearby hospitals.
- Mobilises extra medical help from outside, if necessary
- Keeps a list of qualified first aiders of the factory and seek their assistance.
- Maintains first aid and medical emergency requirements.
- Makes sure that all safety equipment are made available to the emergency team.
- Assists Site Controller with necessary data and to coordinate the emergency activities.
- Assists Site Controller in updating emergency plan.
- Maintains liaison with Civil Administration.
- Ensure availability of canteen facilities and maintenance of rehabilitation centre.
- He will be in liaison with Site Controller / Incident Controller.
- Ensures availability of necessary cash for rescue / rehabilitation and emergency expenditure.
- Controls rehabilitation of affected areas on discontinuation of emergency.
- Makes available diesel petrol for transport vehicles engaged in emergency operation.

7.2.3.5.5 EMERGENCY COORDINATOR – ESSENTIAL SERVICES

He would assist Site Controller and Incident Controller

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

7.2.3.5.6 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 incharge of process equipment should adopt safe and emergency shut down and attend any prescribed duty as an essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

7.2. 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
- Fire suit / gas tight goggles / gloves / helmets
- Factory layout, site plan
- Emergency lamp / torchlight
- Plan indicating locations of hazard inventories, Plant control room, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes.
- Hazard chart

- Safe contained breathing apparatus
- Hand tools, wind direction, wind velocity indications
- Public Address Megaphone, Hand bell, Telephone directories (Internal, P&T).
- Address with telephone numbers and key personnel, Emergency coordinator.
- Important addresses, telephone numbers such as experts from outside, government agencies neighboring industries etc.
- Emergency shutdown procedures.
- Nominal roll of employees.

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. Fire hydrant line converting major areas would be laid. It would be maintained as 6 kg / sq.cm. pressure.

7.2.3.6.4 LOCATION OF WIND SOCK

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

7.2.3.6.5 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. Medical facilities in Gokak 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 nearby 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

Remove heat

Transfer contents

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

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 [TOR # xlvii]

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

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

7.3.2 CONSTRUCTION & ERECTION

The occupational health problems envisaged at this stage can mainly be due to constructional and noise. To overcome these hazards, in addition to arrangements required to reduce it within TLV'S, personnel protective equipments should also be supplied to workers.

7.3.3 OPERATION & MAINTENANCE

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

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

7.3.4 OCCUPATIONAL HEALTH

Pre-employment medical examination will be conducted. Fully fledged Primary Health Centre facilities will be made available round the clock for attending emergency arising out of accidents, if any. Round the clock medical facility is available . Further a first aid centre will be provided within the plant. All workers will be medically tested once in a year and at the end of his term of employment. Medical examination would be carried out at the beginning of employment and at the time of leaving the organization. Medical records of all employees will be maintained.

Anticipated Occupational & Safety Hazards

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

EMP for the Occupational Safety & Health hazards

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

- Proper Designing of building, Work area.
- Relaxation facilities to workers with good ventilation & air circulation. This will help in relieving of thermal stress.
- Good Housekeeping practices.
- Well engineered ventilation & exhaust system.
- Enclosure.
- Isolation of specific areas
- Enforcement of usage of Personal Protective Devices.
- Regular Work Environment Monitoring
- Statistical Monitoring

- Working hours
- Rotation of employees in specific areas to avoid continuous exposure
- Frequency Of Periodical Examination:

  For all employees once in a year.

- Pre employment check up will be made mandatory and following test will be conducted:
  - Plan of evaluation of health of workers
  - Lungs test
  - Audiometry
  - Vision testing (Far & Near vision, color vision and any other ocular defect)
  - ECG
  - Haemogram (examination of the blood)
  - Urine (Routine and Microscopic)
  - Complete physical examination
    - Backache
    - Pain in minor and major joints
    - Fatigue, etc.
  - Medical records of each employee will be maintained separately and will be updated as per finding during monitoring.
  - Medical records of the employee at the end of his / her term will be updated.

7.4 SAFETY PLAN

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

- Carbon dioxide
- ABC
- Foam type
- DCP
- Fire buckets
- Fire hydrants

- Fire tender

Keeping in view the safety requirement during construction, operation and maintenance phases, **M/s. Roquette Riddhi Siddhi 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 their work which are known to be potentially hazardous to health and safety
- To keep all operations and methods of work under regular review for making necessary changes from the safety point of view in the light of experience and up to date knowledge.
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.
- To provide appropriate instructions, training and supervision to 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

A highly qualified and experienced safety officer is appointed in the existing plant. The responsibilities of the safety officers include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organise training programmes and provide professional expert advice on various issues related to occupational safety and health.

In addition to employment of safety officer, every contractor, who employees more than 500 workers, should also employ one safety officer to ensure safety of the workers in accordance with the conditions of the contract.

7.4.1.2 OPERATION & MAINTENANCE PHASE

In the existing plant safety officer has been appointed in accordance with the requirement of factories act and their duties and responsibilities should are as defined thereof. The same safety officer will be the in charge after the expansion also.

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 fully fledged training centre is established in the plant premises of **M/s. Roquette Riddhi Siddhi Pvt. Ltd.** Safety training will be provided by the safety officers with the assistance of faculty members called from professional safety institutions and universities. In addition to regular employees, limited contractor labours will also given safety training.

To create safety awareness safety films will be shown to workers and leaflets etc. will be distributed.

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

7.4.3 HEALTH AND SAFETY MONITORING PLAN

All the potential occupational hazardous work places will be monitored regularly. The health of employees working in these areas will be monitored once in a year

7.5 SOCIAL IMPACT ASSESSMENT

The local areas are already benefited due to the existing plant by way of generation of employment opportunities, increased demand for local products and services. There will be an overall improvement in the income level of the local people.

The proposed expansion project creates employment to 200 people during construction and existing staff are adequate for operation of the proposed expansion project also.

The project proponent intends to provide welfare activities & recreational facilities in the surrounding villages. The project proponent intends to conduct regular health checkups in the surrounding villages. Therefore there will be a certain enhancement of educational and medical standards of people in the study area. There will be generally positive and beneficial impacts by way of economic improvements, transportation, aesthetic environment and business generation.

7.6 R & R ACTION PLAN [TOR # xxii]

The existing plant is having 97 Acres of land which was already acquired. The proposed expansion will be taken up in the existing plant premises only. Hence no Rehabilitation & Resettlement Action Plan has been envisaged.

7.7 PUBLIC HEARING: (TOR # xv)

Roquette Riddhi Siddhi Pvt. Ltd, is proposed for expansion of coal based Power Plant from 6 MW to 18 MW in the existing plant premises and Form – I along with proposed TOR & Pre-Feasibility Report were submitted to the Ministry of Environment, Forest & Climate Change, New Delhi. Presentation has been made before the Expert Appraisal Committee (EAC) of MOEF&CC on 15th July 2016 for the approval of Terms of Reference (TOR) for EIA study. Subsequently the TOR has been issued by MOEF&CC vide letter No. J-13012/06/ 2016- IA.I(T) dated 26th July 2016.

Later, we have prepared Draft EIA report and submitted to Karnataka State Pollution Control Board for conduct of Public Hearing. Karnataka State Pollution Control Board (KSPCB) has conducted Public Hearing on 23-10-2017 for proposed expansion of coal based co-generation power plant from 6 MW to 18 MW. Copy of the Public Hearing issues and management compliance report is shown below.

Compliance to issues raised during Public Hearing held on 23/10/2017 of Roquette Riddhi Siddhi Private Limited in Sy. Nos. 250, 259, 260, 262, 263, 471 and 473 of Gokak Village & Taluk, Belagavi District, Karnataka.

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
1.	Sri Kadappa Durgappa Mestri, Resident of Gokak	➢ Requested industry to provide electricity to the Gokak city under expansion project.	It is not possible to give power to the Gokak Town, as it is a captive power plant to meet the existing & expansion of maize processing plant.	---	---
2.	Sri Yallappa Halappa Sannanayak, Resident of Gokak falls	➢ Wished the industry to continue the social service in the interest of public and workers in near future also.	In the existing plant CSR activities are being carried out. As part of the proposed expansion, CSR activities will be taken up in phased manner as per the need based assessment carried out in consultation with District Administration and local panchayats.	Every year	Budget of Rs. 35 Lac/yearhas been allocated for CSR activities
3.	Sri. V. Sunanda Reddy Resident of Nalgonda District, Telangana	➢ Requested the company authorities to explore rain water harvesting and to make arrangements to store rain water.	In the existing plant, rain water harvesting tank has been constructed to store rain water.	---	---
		➢ Suggested to conduct industrial skill development trainings and practices to the youth of local.	Industrial skill development programs will be taken up in coordination with the Government training institutes.	1st Year	Rs 5 Lakhs allocated.

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		➢ Requested to form coordination committee to implement CSR activities by involving industry officials, local officers, KSPCB officials and villagers.	CSR activities will be taken up in coordination with District Collector and panchayat heads.	Every year	Budget of Rs. 35 Lakh/yearhas been allocated for CSR activities
		➢ Requested company to take care of ground water levels, health condition of residents, developing medicinal plants with in 10 Km surrounding area.	Water required for existing plant and proposed expansion will be taken from Ghataprabha river. Rain water harvesting measures have already been implemented in existing plant and similar practice will be continued after expansion also. All emission control systems such as ESP, Bagfilters, covered conveyers, interlocking system to ESP, dust suppression system, etc. will be installed and operated duly complying with the stipulated norms in the proposed expansion. Zero liquid effluent discharge system will be followed in the expansion. Ash disposal from the expansion will be in accordance with the MOEF&CC notification and its subsequent amendments. With all the aforementioned measures there will	1st year Before commencement of operation of Expansion project.	Budget of Rs 1145 lakhs has been earmarked for environment protection.

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
			not be any adverse impact on health of the villagers due to the proposed expansion of power plant. Medicinal plants suitable to the soil condition will be planted in the area.		
		➢ Requested the industry to take all proper pollution control measures to safeguard Air, Water and Land.	All emission control systems such as ESP, Bagfilters, covered conveyers, interlocking system to ESP, dust suppression system, etc. will be installed and operated duly complying with the stipulated norms in the proposed expansion. Zero liquid effluent discharge system will be followed in the expansion. Ash disposal from the expansion will be in accordance with the MOEF&CC notification and its subsequent amendments.	Before commencement of operation of Expansion project.	Budget of Rs 1145 lakhs has been earmarked for environment protection
		➢ Requested public hearing panel committee to recommend to MOEF to issue permission to the company.	---	---	---
4.	Smt. Kavita Patil, Resident of Konnur	➢ Expressed her happiness towards the youth around the company are engaged in doing work in industry and as a result the unemployment in the area has reduced.	---	---	---

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		➢ Wished the company to grow to higher levels.			
5.	Sri Mahesh Kumbar Resident of Gokak	➢ Welcomed the project ➢ Sustainable growth of Gokak and environmental friendly project, it is taking care of water resources and since 4 years he has not experienced any environmental harms in terms of air, water and noise. ➢ He expressed the proposed project will definitely enhance indirect employment of Gokak society.	---	---	---
6.	Sri Sunil Bhagat, Resident of Gokak	➢ Informed that after installation of this project, it will provide direct labor and indirect labor employment. ➢ He opined that company has spent sufficient budget to develop greenery and for many social activities.	Priority will be given to local people in employment. Additional greenbelt with 100 m wide along the boundary is developing where the river is abutting the plant.	Before commencement of operation of expansion ---	---
7.	Sri Udaykumar Patil, Resident of Konnur	➢ Informed the company has installed sufficient Solar lamps across the streets and company renovated nearby Government schools by	---	---	---

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		providing basic amenities. ➢ 3000 employees are working in the industry and indirectly 9000 people maintaining their livelihood.			
8.	Sri Madhu Babu, Resident of Telangana	➢ Requested to collect crop production details from near agriculture land for baseline data.	CTO for existing plant is being renewed periodically by KSPCB. Till date no complaints have been registered with KSPCB or any other department pertaining to pollution due to the existing plant. In the expansion also all environment protection measures such as ESP, Bagfilters, dust suppression system, Zero liquid effluent discharge system, Ash utilization as per MOEF&CC notification & its amendments thereof. Hence there will not be any crop damage due to the proposed project.	Before commencement of operation of Expansion project	Budget of Rs 1145 Lakhs has been allocated for environment protection measures in the expansion project.
		➢ Suggested to improve rain water harvesting schemes within premises to improve the ground water levels and it will compensate the	In the existing plant, rain water harvesting tank has been constructed to store rain water. Similar practices will be continued after expansion also.	1st year	Investment of Rs. 25 Lakhs is done and further it will be

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		deficiencies of water in Ghatprabha river during summer.			explored.
		➢ Suggested to improve the greenbelt to 50% and to plant (fruit and Medicinal) trees in nearby villages and along the road sides.	In the existing plant greenbelt has already been developed in an area of 37 acres (38.1% of total area). Additional 100 m wide greenbelt is developed along side of the plant boundary where Ghataprabha river is abutting the plant.	--	_____
		➢ Employment preference has to be given to the local people and give good drinking water and education facilities to the villagers.	Will give priority to local people in employment in the proposed expansion project. CSR activities will be continued after expansion also in consultation with the district Administration and village panchayats.	Every year	Budget of Rs 35 Lakhs/year has been allocated for CSR activities
		➢ Requested the public hearing panel committee to recommend to MOEF to issue permission.	---	---	---
9.	Sri Niyaz Desai, Resident of Gokak	➢ Expressed the concern for ozone layer protection.	Ozone layer will deplete due to CFCs. In the proposed expansion of power plant there will notbe anyCFC generation that can contribute to Ozone layer depletion. .	---	---
		➢ Expressed the best practices and the RO technologies	In the proposed power plant Zero liquid effluent discharge system will	immediately upon	Budget of Rs 1145lakhs

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		adopted in the company for reuse of about 80 % of waste water in the process.	be adopted.	commencement of operation of expansion project	has been earmarked for environment protection
		➢ Requested to the company authorities to improve the solar energy systems.	Solar systems will be installed as part of expansion project	1-3 years	Budget of Rs.60 Lakhs has been allocated.
		➢ Welcomed the project for many indirect benefits for the society.	---	---	---
10.	Sri Rayappa Adiveppa Bagoji, Resident of Mahalingeshwar nagar, Gokak	➢ Requested the company to install RO unit near Dy.Sp office to facilitate the nearby citizens to get safe drinking water.	RO unit will be installed near Dy.Sp office	1-2 years	Budget of Rs Rs1.5 lakhs has been allocated.
11.	Sri Prakash Lakshetti, Resident of Gokak	➢ Suggested to improve the greenbelt in nearby two hillocks of Kadabagatti to Mallikarjun to mitigate possible dust emission.	Greenbelt will be developedbetween 2 hillocks of Kadabagatti to Mallikarjun	1-2 years	Budget of Rs Rs.5.0 lakhs has been allocated.
		➢ Suggested to reduce and to maintain minimum fly ash	There will be no open storage of fly ash within the plant premises. Fly	---	---

S. No.	Name of the person	Issue raised	Reply by Management	Time schedule	Budgetary allocation
		stock within the premises to avoid dust emissions.	ash in expansion will also be stored in silo only.		
		➢ Appreciated the 80% waste water recycle schemes adopted in the company.	In the proposed expansion, zero liquid effluent discharge system will be adopted	immediately upon commencement of operation of expansion project	Budget of Rs 1145 lakhs has been earmarked for environment protection