CHAPTER – 6

RISK ANALYSIS AND DISASTER MANAGEMENT PLAN

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6.1 INTRODUCTION

Industries have a wide variety of process involving consumption, production and storage of chemicals. The condition that contributes to the danger, by these chemicals, are when these chemicals are not kept/stable at normal pressure and temperature. Hence these chemicals are kept at/or high pressure and temperatures; the gases are liquefied by refrigeration to facilitate storage in bulk quantities. Under these circumstances, it is essential to achieve and maintain high standards of plant integrity through good design, management and operational controls. Given the large quantities of potentially hazardous materials which are handled daily without incident, it is clear that the controls and safeguards which have been developed by the industry are effective. However, accidents do occur and these can cause serious injury to employees or to the public, and damage to property. Most disastrous events like the Bhopal tragedy have emphasized the need to address both on-site and off-site safety. The public concern at such events invariably leads to call for additional control at national and international levels. 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". This chapter explains the basis of Risk Assessment and its objectives.

6.2 OBJECTIVE OF THE STUDY

The main objectives of the Risk Assessment Studies are as given below:

1) To define and assess emergencies, including risk impact assessment.
2) To control and contain incidents.
3) To safeguard employees and people in vicinity.
4) To minimize damage to property and environment.
5) To inform the employees, the general public and the authority about the hazards / risk assessed, safeguards provided, residual risk if any and the role to be played in them in the event of emergency.
6) To be ready for mutual aid if need is arise to help neighboring unit. Normal jurisdiction of an OEP in the own premises only, but looking to the time factor in arriving the external help or off - site emergency plan agency, the jurisdiction must be extended outside the extent possible in case of emergency occurring outside.
7) To inform authorities and mutual aid centers to come for help.
8) To affect rescue and treatment of casualties. To count injured.
9) To identify and list any death.
10) To inform and help relatives.
11) To secure the safe rehabilitation of affected areas and to restore normalcy.
12) To provide authoritative information to the media.
13) To preserve records, equipments, etc., and to organize investigation into the cause of emergency and preventive measures to stop its recurrences.
14) To ensure safety of the workers before personnel re - enter and resume work.
15) To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.

6.3 PHILOSOPHY AND METHODOLOGY OF RISK ASSESSMENT

Major hazard installations have to be operated to a very high degree of safety; this is the duty of the management. In addition, management holds a key role in the organization and implementation of a major hazard control system. In particular, the management has the responsibility to

i. Provide the information required to identify major hazard installations;
ii. Carry out hazard assessment;
iii. Report to the authorities on the results of the hazard assessment;
iv. Set up an emergency plan;
v. Take measures to improve plant safety.

In order to fulfill the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents. This means that in order to control a major hazard successfully, the Management must have answers to the following questions:

a. Do toxic, explosive or flammable substances in our facility constitute a major hazard?
b. Which failures or errors can cause abnormal conditions leading to a major accident?
c. If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?
d. What can Management do to prevent these accidents from happening?
e. What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand why accidents occur and how they can be avoided or at least mitigated. A properly conducted assessment will therefore

i. Analyze the existing safety concept or develop a new one;
ii. Identify the remaining hazards; and
iii. Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

6.4 IDENTIFICATION OF HAZARDS

6.4.1 MAJOR HAZARDS

Hazard is the associated term with material,which is a measure or the likely hood of the human working with ,or studying the material in question. All the probable potential hazard is classified under different heads.

1. Fire hazards
2. Toxic gas release hazards
3. Explosion hazards
4. Corrosion hazards

6.4.1.1 FIRE HAZARDS

Since the Stone Age term ‘fire’ is associated with fear. It is very dangerous if occurs in uncontrolled manner. It should be clearly understood that when a liquid is used having flash point below the normal ambient temperature, it could, in suitable circumstances, liberate a sufficient quantity of vapour to give rise to flammable mixtures with air.

6.4.1.2 TOXIC HAZARDS

Toxic substances affect in three ways by ingestion, adsorption & inhalation which are describe below.

6.4.1.3 CORROSION HAZARDS

Corrosion is a chemical reaction-taking place at the surface of metal.

Potential Health Effects:

Eye Contact:

Airborn dust may cause immediate or delayed irritation or inflammation. Eye contact with large amounts of clinker dust and dry cement powder can cause moderate eye irritation, chemical burns and blindness. Eye contact with large amounts of gypsum can cause moderate eye irritation, redness, and abrasions. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.

Skin Contact:

Dust of clinker, gypsum and cement may cause dry skin, discomfort, irritation, severe burns and dermatitis. Clinker dust and cement dust are capable of causing dermatitis by irritation. Skin affected by dermatitis may include symptoms such as, redness, itching, rash, scaling and cracking. Irritant dermatitis is caused by the physical properties of clinker dust including alkalinity and abrasion.

Inhalation (acute):

Breathing dust may cause nose, throat or lung irritation, including choking, depending on the degree of exposure. Inhalation of high levels of dust can cause chemical burns to the nose, throat and lungs.

Inhalation (chronic):

Risk of injury depends on duration and level of exposure. This product contains crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica from this product can cause silicosis, a seriously disabling and fatal lung disease. Some studies show that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis may be associated with the increased incidence of several autoimmune disorders such as scleroderma (thickening of the skin), systemic lupus erythematosus, rheumatoid arthritis and diseases affecting the kidneys. Silicosis increases the risk of tuberculosis.

Ingestion:

Internal discomfort or ill effects are possible if large quantities are swallowed.

6.4.1.4 EXPLOSION HAZARDS

Release of energy in rapid and uncontrolled manner gives rise to explosion.

6.4.1.5 EXPOSURE LIMITS

The exposure limits for Portland cement, gypsum, crystalline silica and calcium carbonate are as given in the following table-6.1.

TABLE - 6.1 EXPOSURE LIMITS

SR.NO.	CHEMICALS	ACGIH TLV-TWA (MG/M3)
1	Portland Cement	10 mg total dust/m^3
2	Calcium Sulfate dehydrate (gypsum)	10 mg total dust/m^3
3	Crystalline Silica	0.05 mg respirable quartz/m^3
4	Calcium carbonate	10 mg total dust/m^3

6.5 FIRST AID MEASURES

Following first aid measures shall be taken.

Eye Contact:

Rinse eyes thoroughly with water for at least 15 minutes, including under lids, to remove all particles. Seek medical attention for abrasions and burns.

Skin Contact:

Wash with cool water and a pH neutral soap or a milk skin detergent. Seek medical attention for rash, burns, irritation and dermatitis.

Inhalation:

Move person to fresh air. Seek medical attention for discomfort or if coughing or other symptoms.

Ingestion:

Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention.

6.6 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Controls:

- Control of dust through implementation of good housekeeping and maintenance;
- The bag filters will be installed to control dust emission.
- Use of PPE, as appropriate (e.g. masks and respirators)
- Use of mobile vacuum cleaning systems to prevent dust buildup on paved areas;

Personal Protective Equipment (PPE):

- Respiratory Protection: When the dust level is beyond exposure limits or when dust causes irritation or discomfort use Respirator.
- Eye Protection: Wear Safety goggles to avoid dust contact with the eyes. Contact lenses should not be worn when handling the materials.
- Skin Protection: Wear impervious abrasion and alkali resistant gloves, boots, long sleeved shirt, long pants or other protective clothing to prevent skin contact.

6.7 OTHER SAFETY MEASURES

- Safety training to the workers will be given.
- PPE will be provided to the workers.
- The maintenance and cleaning of bag filters will be carried out regularly.
- The dust removal efficiency of bag filters will be check regularly.
- Work place environment monitoring will be carried out regularly and records will be maintained. The monitoring of cement dust and silica in the work place will be carried out.
- Good house keeping will be implemented in the plant.
- First aid box will be provided.
- The industry will provide adequate lighting facility inside the plant premises.
- General dilution ventilation will be provided to control dust levels below applicable exposure limits.
- Fire extinguishers will be provided to withstand the fire or explosion condition.
- Pre-employment and periodical medical examination of workers will be done by government approved medical practitioners and the details will be recorded as per the Regulations.
- The industry will prepare on-site emergency plan.
- In case any emergency, arrangement of ambulance van will be done from Guwahati.
- Two main gates will be provided for entry and exit of the workers.
- Work place environment monitoring for cement dust and silica will be carried out.

6.8 OCCUPATIONAL HEALTH OF THE WORKERS

Health hazards associated with the occupation are called occupational hazards. In Cement industry the major sources of emission are:

1. Raw material handling: Total Dust or Suspended Particulate Matter.
2. Raw Mill Section: Total Dust or Suspended Particulate Matter.
3. Cement Grinding Unit: Total Dust or Suspended Particulate Matter.

All precautions would be taken to avoid foreseeable accident like spillage, fire and explosion hazards and to minimize the effect of any such accident and to combat the emergency at site level in case of emergency. Some of the preventive safety measures to minimize the risk of accident with respect to Technical Safety, Organizational Safety and Personal Safety are listed below:

- The factory will take all reasonably practicable measures to minimize the risk of such accident in compliance with the legal obligation under the relevant safety.
- All building plans and installations are as per relevant acts and duly approved by competent government authorities.
- Process and Equipment will be designed by qualified and experienced professionals and fabricated to applicable national / international codes with stage wise inspection.
- Safety features such as fire extinguisher and suitable Personal Protective Equipment (PPE) shall be provided. Regular operations and testing of fire extinguishers shall be carried out.
- Periodic inspection and testing of pressure vessels, equipment, machineries and equipment handling substances.
- Training of workers and Staff for fire fighting, work permit system, first aid, safe handling of materials and integrating safety, in all activities.
- Accident / Incident reporting system and information of employees about the same for better awareness.
- Suitable notices / boards displayed at several locations indicating appropriate hazards warning as well as DOs and DON'T for ensuring operational and personal Safety for information of workers / staff and visitors.

For the safety of the workers, personal protective equipments like hand gloves, helmets, safety shoes, goggles, aprons etc. & Ear protecting devices like earplugs/earmuffs will be provided. Nose mask will be provided at places, where there is possibility of dust generation.

6.8.1 NOISE EXPOSURE

Sources:

Grinding mills, Compressors, Fans, Blowers, Material handlers, Crushers and DG sets

Effects:

Hearing impairment, Hypertension, Ischemic heart disease, Annoyance, Sleep disturbance

Attenuation And Conservation:

Tools for assessing noise levels A successful noise control program that focuses on engineering control of noise requires the institution of a hearing conservation plan and the use of proper monitoring equipment, surveys, maps, and modeling.

A thorough hearing conservation plan should be established where noise exposure exceeds a 85-dBA time weighted average for eight hours. A good program consists of the following components:

- Noise measurement and analysis;
- Engineering control of noise sources where feasible;
- Administrative controls and personal protection where noise control is not feasible;
- Audiometric testing;
- Employee training and education;
- Record keeping; and
- Evaluation

Control Measures:

- Introducing good acoustic design for the new production line
- Adopting proper scheduling of construction activities
- Scheduling noisy activities during the daytime periods
- Operating well-maintained mechanical equipment on-site
- Ensuring that equipment that may be intermittent in use should be shut down between work periods or should be throttled down to a minimum
- Installing rubber coating in dumpers and entry chutes
- Using personnel protection gear such as earplugs, muffs, etc.
- Developing a greenbelt around the quarry area
- Controlling air-flow generated noise by adopting adequate sizing of inlet/outlet ducts
- Installing noise barriers around air blowers, pumps, and generators to reduce noise impacts at nearby receptors
- Devising and implementing a rigorous inspection and maintenance program applicable to equipment on-site

6.8.2 HEAT STRESS

Aim is to maintain body core temperature within +1°C of normal (37°C). This core body temperature range can be exceeded under certain circumstances with selected populations, environmental and physiologic monitoring, and other controls.

Source:

- High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; inadequate tolerance for hot workplaces; and insufficient water intake can all lead to heat stress.

Different kind of heat disorders and health effects are possible and how should they be treated?

SR. NO.	DEFINITION	PRIMARY SIGNS AND SYMPTOMS	MEDICAL TREATMENT
1.	**Heat Stroke -** Most serious heat related disorder when the body's temperature regulation fails and body temperature rises to critical levels, It's a medical emergency may result in death	Confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature	Placed worker in a shady, cool area and the remove outer clothing; Provide the worker fluids (preferably water); circulate air to improve evaporative cooling
2.	**Heat Exhaustion -** Partly due to exhaustion; it is a result of the combination of excessive heat and dehydration	headache, nausea, dizziness, weakness, thirst, and giddiness; Fainting or heat collapse	Remove from the hot environment and give fluid replacement. Encourage getting adequate rest, and when possible, ice packs should be applied.
3.	**Heat Cramps -** Caused by performing hard physical labor in a hot environment.	electrolyte imbalance caused by sweating and are normally caused by the lack of water replenishment	Workers in hot environments drink water every 15 to 20 minutes and also drink carbohydrate-electrolyte replacement liquids
4.	**Heat Rashes** - the skin is persistently wetted by unevaporated sweat	a red cluster of pimples or small blisters mainly in neck and upper chest, in the groin, under the breasts, and in elbow creases	provide a cooler, less humid environment, powder may be used to increase comfort, avoid using ointments or creams

Administrative or work practice controls to offset heat effects:

- Provide accurate verbal and written instructions, annual training programs, and other information about heat stress
- Acclimatize workers by exposing them to work in a hot environment for progressively longer periods.
- Replace fluids by providing cool water or any cool liquid (except alcoholic and caffeinated beverages) to workers and encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area.
- Reduce the physical demands by reducing physical exertion such as excessive lifting, climbing, or digging with heavy objects. Use relief workers or assign extra workers, and minimize overexertion.
- Provide recovery areas such as air-conditioned enclosures and rooms and provide intermittent rest periods with water breaks.
- Reschedule hot jobs for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.
- Monitor workers who are at risk of heat stress, such as those wearing semi-permeable or impermeable clothing when the temperature exceeds 70°F, while working at high energy levels. Personal monitoring can be done by checking the heart rate, recovery heart rate, and oral temperature.

6.8.3 ILLUMINATION

SR. NO.	LOCATION	ILLUMINATION BY	ILLUMINATION IN LUX
1.	Low roof buildings	Fluorescent tube lights	100-150/300(control rooms)
2.	Shops/ High roof building	HPSV lamps	100-150
3.	High color rendering required(low color distortion)	Metal halide lamp fittings	-
4.	Open yard and area illumination	HPSV flood light fittings	15-30

The use of energy saving. Power factor lamp fittings shall be preferred.

6.8.4 ERGONOMICS

Ergonomics is the term applied to the field that studies and designs the human-machine interface to prevent illness and injury and to improve work performance. It attempts to ensure that jobs and work tasks are designed to be compatible with the capabilities of the workers.

Source:

Some physical agents play an important role in ergonomics such as Force, Acceleration and Thermal factors. Force is an "important causal agent in injuries from lifting. Other Important ergonomic considerations include work duration, repetition, contact stresses, postures, and psychosocial issues.

Work-Related Musculoskeletal Disorders:

Work-related musculoskeletal disorders (MSDs) are an important occupational health problem that can be managed using an ergonomics health and safety program. The term musculoskeletal disorders refers to chronic muscle, tendon, and nerve disorders caused by repetitive exertions, rapid motions, high forces, contact stresses, extreme postures, vibration, and/or low temperatures. Other commonly used terms for work-related musculoskeletal disorders include cumulative trauma disorders (CTDs), repetitive motion illnesses (RMIs), and repetitive strain injuries (RSIs). Some of these disorders fit established diagnostic criteria such as carpal tunnel syndrome or tendinitis. Other musculoskeletal disorders may be manifested by nonspecific pain. Some transient discomfort is normal consequence of work and is unavoidable, but discomfort that persists from day to day or interferes with activities of work or daily living should not be considered an acceptable outcome of work.

Control Strategies:

The incidence and severity of MSDs are best controlled by an integrated ergonomics program. Major program elements include:

- Recognition of the problem,
- Evaluation of suspected jobs for possible risk factors.
- Identification and evaluation of causative factors,
- Involvement of workers as fully informed active participants, and
- Appropriate health care for workers who have developed musculoskeletal disorders.

General programmatic controls should be implemented when risk of MSDs is recognized. These include:

- Education of workers, supervisors, engineers, and managers;
- Early reporting of symptoms by workers; and
- Ongoing surveillance and evaluation of injury, health and medical data, Job-specific controls are directed to individual jobs associated with MSDs. These include engineering controls and administrative controls. Personal protection may he appropriate under some limited circumstances.

Control Measures:

Among engineering controls to eliminate or reduce risk factors from the job, the following may be considered:

- Using work, methods engineering, e.g., time study, motion analysis, to eliminate unnecessary motions and exertions.
- Using mechanical assists to eliminate or reduce exertions required to hold tools and work objects.
- Selecting for designing tools that reduce force requirements, reduce holding time, and improve postures.
- Providing user-adjustable workstations that reduce reaching and improve postures.
- Implementing quality control and maintenance programs that reduce unnecessary forces and exertions, especially associated with non value-added work.

Administrative controls reduce risk through reduction of exposure time and sharing the exposure among a larger group of workers. Examples include:

- Implementing work standards that permit workers to pause or stretch as necessary but at least once per hour.
- Re-allocating work assignments (e.g., using worker rotation or work enlargement) so that a worker does not spend an entire work shift per forming high-demand tasks.

Due to the complex nature of musculoskeletal disorders, there is no "one size fits all" approach to reducing the incidence and severity of cases. The following principles apply to selecting actions:

- Appropriate engineering and administrative controls will vary from industry to industry and company to company.
- Informed professional judgment is required to select the appropriate control measures.
- Work-related MSDs typically require periods of weeks to months for recovery. Control measures should be evaluated accordingly to determine their effectiveness.

6.8.5 OCCUPATIONAL HEALTH SURVEILLANCE OF THE WORKER

M/s. Rudradev Cement Pvt. Ltd. shall carry out the following Health surveillance;

i) Pre - employment medical check up at the time of employment.

ii) Periodical medical check up shall be done for all employees as:

1. <30 Once in five years
2. 31-40 Once in four years
3. 41-50 Once in two years
4. Above >50 years once every year

iii) First aid training shall be given to the employees.

iv) Monitoring of occupational hazards like noise, Heat, chemical (Raw materials & Product) exposure shall be carried out at frequent intervals, the records of which shall be documented.

v) Evaluation of health of workers viz. chest x ray, Audiometry, Spirometry Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-employment and periodical examinations shall be carried out.

6.9 DISASTER MANAGEMENT PLAN

6.9.1 INTRODUCTION

An emergency is said to have arisen when operators in the plant are not able to cope up with a potential hazardous situation i.e. loss of control of an incident causes the plant to go beyond its normal operating conditions, thus creating danger. When such an emergency evolves, chain of events affect the normal working within the factory area and / or which may cause injuries ,loss of life, substantial damage to property and environment both inside and outside the factory and a disaster is said to have occurred. The various steps involved in the process of disaster management can be summarized as:

1. Minimize risk occurrence (Prevention)
2. Rapid control(Emergency Response)
3. Effectively Rehabilitate Damaged Areas(Restoration)

Disaster management plan is evolved by careful scrutiny and interlinking of:

(a) Types and causes of disaster.
(b) Technical know – how
(c) Resource availability

6.9.2 OBJECTIVES OF PLAN

This plan is developed to make best possible use of resources to:

- Rescue the victims and treat them suitably.
- Safeguard others (evacuating them to safer places).
- Contain the incident and control it with minimum damage.
- Identify the persons affected.
- Preserve relevant records and equipment needed as evidence incase on an inquiry.
- Rehabilitate the affected areas.

6.9.3 IDENTIFICATION OF MAJOR HAZARDS

- Fire hazard
- Earthquake hazard

6.9.4 SCOPE OF PLAN

The plan will set into action immediately after a fire occurs inside the plant. However, fire hazard will be restricted to fuel storage area only and hence no major disaster is envisaged.

6.9.5 BASIS OF PLAN

M/s. Rudradev Cement Pvt. Ltd. will prepare an onsite emergency plan. The basic guidelines of the plan are as given below:

1. Informative brochure on emergency will be distributed to each staff member of the plant and telephone numbers of key personnel to be contacted during an emergency will be placed at all the operator placement point in the plant.
2. Company will have a direct tele-link service line with the central control room as well as nearest fire station in case of severe emergency.
3. Workers would be trained regularly on fire hazard drill, which will be organized once in a month by the safety and fire department.
4. Various locations would be covered with fire hydrant system that would be tested and put into operation in such a manner that it remains operational during emergency.
5. 24 hours vehicle for service and in- plant first aid emergency kit would provide.

6.9.6 POST DISASTER ANALYSIS AND EVALUATION

When an emergency is over, it is desirable to carry out a detailed analysis of the causes of the accident to evaluate the influence of various factors involved and to propose methods to eliminate or minimize them in future simultaneously, the adequacy of the disaster preparedness plan will be evaluated and any short comings will be rectified.

6.9.7 THE AVAILABILITY, ORGANIZATION, AND UTILIZATION OF RESOURCES FOR EMERGENCIES

In order to maintain emergency response capability, certain facilities must be kept in a state of readiness, and sufficient supplies and equipment must be available. Typical examples are:

- Emergency operation center
- Communication equipment
- Alarm systems
- Personal protection Equipment
- Fire fighting facilities ,equipment and supplies
- Spill and vapour release control equipment and supplies
- Medical facilities ,equipment and supplies
- Monitoring systems
- Transportation systems
- Security and access control equipment

It is the responsibility of the plant management to ensure that the appropriate equipment and materials are available to respond to their very hazard- specific emergencies at the facility.

One of the most important objectives of emergency planning is to create a response organization structure capable of being deployed in the shortest possible time during an emergency. Command and control of an emergency condition encompasses the key management functions necessary to ensure safeguard of the health and safety of employees, as well as the public living in the vicinity. These primary functions are as follow:

- Detection of the emergency condition
- Assessment of the condition
- Classification of the emergency
- Mitigation of the emergency conditions
- Notification to management personnel
- Notification to local ,state and government agencies
- Activation and response of the necessary onsite and off- site support personnel
- Continuous assessment and reclassification, as necessary
- Initiation of protective actions
- Aid to affected personnel
- Recovery and re-entry

The key personnel shall be nominated with special responsibilities according to the laid down procedures and to make the best use of available resources, the key personnel are as under:

- Alarm raiser
- Incident controller
- Site main controller
- Essential workers
- Other key personnel

The responsibilities of the above key personnel are as described below:

6.9.7.1 INCIDENT CONTROLLER (IC)

His responsibilities include:

1. As soon as the sound of siren or bell is heard, he will arrive at the site of incident.
2. Take the charge of the scene of the incident
3. To assess the scale of emergency. If the emergency is minor, he will start to activate on – site plan.
4. As per the incident, direct the essential workers to prevent it by using extinguishers in case of fire; by covering the liquid spillage by sand or suitable materials in case of liquid.
5. Direct the shut down of the plant or part of the plant and evacuate the plant personnel to assembly point.
6. Direct all operations within the affected areas with the following priorities.
   (a) Secure the safety of personnel.
   (b) Minimize loss of material.
   (c) Minimize damage to plant, property and environment.
7. To search for casualties.
8. To brief site main controller and keep informed of development of situation.

9. To preserve evidence that will be necessary for subsequent inquiry into the cause of emergency and concluding preventive measures.

6.9.7.2 SITE MAIN CONTROLLER (SMC)

He is the head authority of the organization. He will have over all responsibility for directing operating and calling for outside help from emergency control centre.

The site main controller shall wear white helmet for his easy identification .the responsibilities and duties of the site main controller include:

1. Relieve the incident controller of his responsibilities of over all charge of main control.
2. On consultation with incident controller and other key personnel, decide about the type of emergency.
3. To ensure that key personnel are caller in.
4. To continuously review and assess possible developments to determine the most probable cause of events.
5. To direct the safe closure of the plant and evacuate the plant incident controller and other key person.

6.9.7.3 ESSENTIAL WORKERS (EW)

As soon as the essential workers hear the emergency siren or any emergency brought to the knowledge, they will first report to the incident controller. The team of essential workers trained in fire fighting and first –aid will be made available in the factory round the clock in all shifts.

Their responsibilities include:

1. To fight fire till a fire brigade takes the charge.
2. To help the fire brigade and mutual aid teams.
3. To do emergency engineering work like isolation of equipment, materials, process, providing temporary by-pass line for safe transfer of materials, urgent repairs and replacement, electrical work etc.
4. To provide emergency services like power, water, lighting, instrument, equipment etc.
5. To move equipment, special vehicles and transport to or from the scene of incident.
6. To provide first aid and medical help.
7. To carry out atmospheric tests and pollution control.

6.9.7.4 OTHER KEY PERSONNEL

Other key personnel are required to provide advice and to implement the decisions taken by the site main controller in the light of information received on the situation from the site emergency.

The responsibilities and duties of key personnel include:

(1) SAFETY:

The safety officer /supervisor will carry out the following:

a) To provide necessary equipment like Fire Fighting Equipment (FFE) and Personal Protective Equipment(PPE)
b) To accompany factory inspector during investigation of the emergency
c) To train workers /supervisors in safety and safe operating procedures.
d) To assist the site main controller, incident controller in preparing a brief report of the incidents.

(2) ASSEMBLY POINTS:

The assembly points for gathering non –essential workers / persons will be fixed and will be clearly marked as per the wind direction.

(3) FIRE CONTROL ARRANGEMENTS:

Fire fighting trained personnel will be made available in all the shift. The responsibilities and duties include:

(a) To fight the fire with available internal Fire Fighting Equipment.
(b) To provide personal protective Equipment to the team.
(c) To cordon the area and inform incident controller or site main controller about the development of emergency.
(d) To trained personnel (essential workers) to use Personal Protective Equipment and Fire Fighting Equipment.

(4) MEDICAL ARRANGEMENT:

The responsibilities and duties include:

a) To provide first aid to the affected persons, and if necessary, send them to hospitals for further treatment.
b) To keep a list of blood groupings ready and updated.

(5) TRANSPORTATION AND EVACUATION ARRANGEMENT:

For transportation of people, company's vehicles, cars, rickshaws etc. will be utilized.

The hazard in the proposed cement plant is mainly associated with cement production phases and results in the form of dust, noise and fire.

The main hazards during the transportation and storing of material are:

- The airborne dust created during the storage of material.
- The conveyor belts during their normal operation as well as during their maintenance

In order to reduce the risk from airborne dust:

- To use dust suction systems.
- To implement the necessary procedures for the routine cleaning of the settled dust

In material transport systems there are moving parts that are a constant source of hazard for any persons working near these conveyors during normal operation or during the maintenance activities. For the safe operation of material transportation system all the necessary guards are applied to isolate the moving parts. Additionally where personnel is working at a short distance from the guards, emergency stops are provided within short distance of these operators.

During the normal operation of the transportation systems:

- The removal of guards by unauthorized personnel must be prevented.
- Any maintenance work during the operation of the transportation system must be avoided.
- Removing material during the operation of the conveyors must be avoided.
- The cleaning of overflows during operation must be avoided unless the cleaning is done by the conveyor operatives.
- The use of unauthorized passageways either over or under the transportation system must be avoided because there is the risk of personnel getting trapped by the conveyor or overflowing material can fall from height.
- The overhead bridges must be clean in order to minimize the possibility of the tripping and falling of the personnel performing the checks on the conveyor belts.
- Any intervention on the conveyor belt overload systems must be done by authorized personnel.