

RISK ASSESSMENT

INTRODUCTION

It is presumed that the expansion of cement plant at Sanghipuram will be designed and engineered with all possible safety measures and standard code of practices of engineering. In spite of this, some design deficiency or operation and maintenance fault may lead to accidental events causing damage to the life and property. This chapter presents an overview of risks associated with the production facilities, suggested remedial measures and a model outline of the emergency preparedness plan. The objectives of environmental risk assessment are governed by the following, which excludes natural calamities:

- To identify the potential hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.
- To manage the emergency situation or a disastrous event, if any, from the plant operation.

Managing a disastrous event will obviously require prompt action by the operators and the crisis management personnel using all their available resources like alerting the people and other plant personnel remaining inside, deployment of firefighting equipment, operation of emergency shut off valves, opening of the escape doors, rescue etc. Minimizing the immediate consequences of a hazardous event include cordoning off, evacuation, medical assistance and giving correct information to the families of the affected persons and local public for avoiding rumors and panic. Lastly, an expert committee is required to probe the cause of such events and the losses encountered and suggest remedial measures for implementation so that in future such events or similar events do not recur.

1.1 Identification of Hazards

The hazards are attributable due to raw materials used in cement making and the plant operation. A list of major raw materials used in the plant and the process units with their hazard potential is presented in below table.

Table 1- Hazard Identification of Proposed Cement Plant

S.No.	Group	Item	Hazard Potential	Remarks
1	Raw materials and products	Limestone, Pozzolona clay, Silica, Coal, lignite, etc.	None Moderate None Major Moderate	-Fire - - -
2	Processing			
i	Kilns	Dust Kiln off gas	Moderate None	Environmental Pollution
ii	Raw material Grinding	Dust	Moderate	Environmental Pollution
iii	Cement Grinding	Dust	Moderate	Environmental Pollution

3	Utilities			
	Electric power Supply	Short circuit	Major	Fire

From the Table, it may be observed that the major on-site emergency situation may occur from the raw material storage and handling, fuel gas handling and electrical short-circuit. The off-site environmental disaster may occur if large-scale fire and explosion occurs, the effect of which extends beyond the plant boundary. The off-site environmental disaster may occur due to significant environmental degradation for a sustained period.

1.1 Environmental Risk Evaluation

From environmental hazards point of view for the raw materials and processing of the same in various production units, relative risk potential analysis is made on the following three factors:

- Likelihood of occurrence
- Likelihood of detection
- Severity of consequences

Each of these factors is graded and compiled to determine the risk potential. The factors governing the determination of relative risk potentials are presented in the **Table 2**.

Table 2- Determination of Risk Potential

Likely hood of occurrence		Likelihood of detection		Severity of consequences	
Criteria (A)	Rank	Criteria (B)	Rank	Criteria (C)	Rank
Very High	5	Very High	1	None	2
High	4	High	2	Minor	4
Moderate	3	Moderate	3	Low	6
Low	2	Low	4	Moderate	8
Very low	1	Very low	5	High	10

$$\text{Risk Potential (RP)} = (\text{A+B}) \times \text{C}$$

Based on the above stated criteria for assessing the risk, each probable event has been evaluated by addressing several questions on the probability of event occurrence in the view of the in-built design features detection response, operational practice and its likely consequence. A summarized list of environmental risk potential for the likely events is presented in **Table 1.2**. This evaluation has been done with the presumption of common events as observed from the past experience in the operation of different industries and best practicable designs for the proposed project. The present risk potential evaluation is primarily based on human errors or faulty operation or failure of the control systems.

Table 1.2: Environmental Risk Potential Evaluation

S. No.	Event	Likelihood of Occurrence	Likelihood of Detection	Severity of Consequence	Risk Potential

1.	Fire at the coal Stockyard	Very low (1)	High (2)	High (10)	30
2.	Uncontrolled dust emissions/ failure of Emission control System	High (4)	High (4)	Moderate (8)	64
3.	Occurrence of static Electricity/electric spark in the preheater/Kiln	Very low (1)	Very Low (5)	High (10)	60
4.	Accidental Release of Steam	Low (2)	High (4)	Moderate (8)	48
5.	Machinery Movement	Low (2)	Moderate (3)	High (10)	50

From the table above, it appears that some events carry risk potential above 50. These events will be considered as risk prone and hazardous events and need adequate safe design operation and maintenance in order to reduce the risk.

1.1.2 Risk Management Measures

The Risk management measures for the expansion activities require adoption of best safety practice at the respective construction zones within the Works boundary. In addition, the design and engineering of the proposed facilities would take into consideration of the proposed protection measures for air and water environment.

1.1.3 Nature of Hazard

After going through the different process, it was observed that fire hazard is considered as high risk and most probable reason for emergency. The onsite emergency plan is prepared to deal with fire hazard inside the plant in order to save the life and property.

Causes of Fire: Short circuit, Welding operation, Lightening and ignition due to the inherent heat in coal stack yard during summer are the probable causes of fire disaster.

1.1.4 Electrical Safety

Adequately rated and quick response circuit breakers, aided by reliable and selectively digital would be incorporated in the electrical system design for the proposed project. The metering and instruments would be of proper accuracy class and scale dimensions.

1.2 DISASTER MANAGEMENT PLAN

In a plant like this one, it is imperative that accidents occurring due to unforeseen acts and events will not affect the surrounding areas. Therefore an onsite emergency plan for prevention and mitigations of accidents will be enough to cater for unforeseen acts and events that may occur. Apart from onsite, off-site emergency plan is also required to prevent any mis-happening.

Industrial Safety and Fire Fighting: For protection of working personnel, equipment and machineries from any damage or loss and to ensure uninterrupted production, adequate safety and firefighting measures are being/will be planned for the expansion. Important provisions are as follows:

- Provision of adequate personal safety appliances to workers engaged in hazardous installations

- Provision of detection and alarm system to allow a developing fire to be detected at an early stage.
- Provision of water spray fire extinguishing system and portable extinguishers using carbon dioxide or chemical powder.

Portable Fire Extinguishers: All plant units, office, buildings, stores, laboratories, etc. will be provided with adequate number of portable fire extinguishers. The distribution and selection of extinguishers will be done in accordance with the requirement of fire protection manual.

Fire Hydrant System: Internal hydrants are being/will be provided in all major plant units at suitable locations and in different levels inside the plant buildings. Yard hydrants will be provided in the vicinity of each plant unit, normally along the road to meet the additional requirement of water to extinguish fire. The proper pressure of water in the hydrant network of the road level will be maintained.

Fire Station: There are two existing fire station which extend the necessary assistance required for fighting fire in any of the plant units and associate premises with requisite augmentation. The equipment like water tender, portable pump, Wireless set, Hoses will be provided in fire station. The safety appliances like, Industrial safety boots, Industrial helmets, Hand gloves, Ear muffs, Welders screens and aprons etc. will be provided for the personnel exposed to the different types of hazards in various plant units.

1.2.1 On Site Emergency Preparedness Plan

An accident, which takes place in a plant and its impacts, are confined to plant premises acting only the people working inside the factory. The hazard and risk assessment of plant brings out improvements to eliminate or reduce the hazard. This plan is specific to the needs of the plants *i.e.* size, complexity, nature and quantum of hazard. Instruction and information are being inculcated among SIL employees to be strictly followed during emergencies as per the situational demand.

Objective of Onsite Emergency Plan

The main objective of the plan is to take immediate actions to meet any emergency situation for speedy and efficient rescue and relief operations. The major steps during an onsite emergency plan are described below:

- i.To define the hazards and assess the risk and identify the Maximum Credible Loss Scenario (MCLS);
- ii.To outline facilities provided and the organizational response to control and containment risks arising out of loss of containment of flammable liquids and resultant fire;
- iii.To outline the responsibilities and functions of the key members of the emergency response team, to safeguard other employees, the people living in the surrounding area and environment.
- iv.To conduct regular emergency response drills to train employees as per the responsibilities assigned to them to ensure prompt emergency response.
- v.Rescue and treatment of the casualty;
- vi.Safeguard people; (both at site and neighborhood);
- vii.Rehabilitate the areas affected;
- viii.Provide information to media and government agencies;
- ix.Preserve records/equipment for subsequent inquiry;

x.Ensure rapid return to normal operation after emergency.

Alarm and Communication System: In case of emergency, the Plant Manager shall declare emergency after assessing the situation. The evacuation, head count and other necessary arrangements will be performed under the guidance of safety Officer. Alarm (Sirens) will be raised by the Security personnel on the main gate of each site after receiving instructions from Plant Manager.

Table 1.3: Alarming System at Plant Site

S.No.	Type	Duration
1.	Normal Plant Siren (Shift Siren)	Continuous 30 Seconds
2.	In case of Fire and Other Emergency	15 Seconds ON 5 Seconds OFF, same shall be repeated for a continuous period of 3 minutes. Thus, 9 times ON and 8 times.
3.	In case of Gas Release	5 Seconds ON 5 Seconds OFF, same shall be repeated for a continuous period of 3 minutes. Thus, 18 times ON and 17 times OFF
4.	All Clear Signal	Continuous 1 Minute

Besides, to alert other people during the emergency and also during situation of power failure, people have been instructed to run to / send messengers to various departments shouting emergency. A reliable and prompt communication system is extremely important in controlling a major emergency. Corrective action can be initiated in time only, if information can be passed on to key personnel quickly.

Equipment Checks: All firefighting equipment like valves, fire hydrants, pumps, monitors, etc., will be checked weekly to detect defective parts and such parts would be immediately replaced.

Mock Drills and Rehearsing: Emergency plan is regularly communicated to all personnel in order to clarify ones roles and responsibility during emergency and accident situations. The plan is tested by simulating probable emergency situations, wherever practicable; the Frequency of carrying out the mock drills is at least once in a quarter. These mock drills bring out improvement opportunities in the plan and ensure that appropriate actions are taken in real li situation. Observers are posted at different sites who verify the effectiveness of the emergency preparedness like communication, response actions, roll call, mitigation etc. Records pertaining to the same are maintained.

Medical Center: The plant is equipped with a medical center (OHC) with necessary instrument medicines and trained manpower.

Emergency Planning for Disaster due to Fire: Coal/Pet-coke/ lignite storage, cable rooms, transformer unit, auxiliary transformers, oil tanks, coal/Pet-coke bunkers including all conveyor belt etc., within the plant are the likely area for which plan is outlined to deal with any eventuality of fire. Stores, workshop, canteen and administration building have also been included.

Classification of Fires

Class A - Fire due to combustible materials such as wood, textiles, paper, rubbish and the like.

Class B - Fire in flammable liquids like oil, petroleum products, elements, paint etc.

Class C - Fire arising out of gaseous substances.

Class D - Fire from reactive chemicals, active metals and the like.

Class E - Fire involving electrical equipment and delicate machinery and the like.

Fire Fighting Methods: To deal with fires - other than carbonaceous fires, which can be dealt with by water-suitable fire extinguishers is required to do the job effectively. Adequate number of fire stations is to be established with the following types of equipment and arrangements:

- CO₂ Extinguishers,
- Dry chemical powdered type,
- Foam type extinguishers,
- Fire buckets,
- Fire hydrant hoses.

SIL has a fully equipped two fire stations one is at Main Plant and another at TPP with trained firemen to take care round the clock and to instantly react the eventualities due to fire hazards. Plant-wise list of firefighting equipment is as furnished below:

Table 1.4: List of Firefighting Equipment

S. No.	Description	Total
1.	Fire Station Stand by Fire Fighting Chemicals stock at fire store room Dry Chemical Powder 500 Kgs. Aqueous Film Forming Foam 3%	1 No.
2.	Fire Tender (Water Tender type B) 4500 L. Water & 1800 LPM Pump capacity. With all safety gears and accessories	1 No.
3.	Electrical operated Fire Pump Cap 171 m ³ /hr.	1 No.
4.	Electrical operated Jockey Pump Cap. 10 m ³ /hr.	1 No.
5.	Diesel Engine Operated Fire Pump Cap. 273 m ³ /hr.	1 No.
6.	Fire Water Tank Capacity 3333 m ³	1 No.
7.	Fire Hydrant Point	41 Nos.
8.	Fire Hydrant Point at sun drying yard (Coal Yard)	15 Nos.
9.	Fire Hydrant Riser	3 Nos.
10.	Fire Water Monitor	1 No.
11.	Fire Hydrant Hose Reel (60 M Length)	4 Nos.
12.	Spray System on Coal Conveyor Belt	1 No.
13.	Fire Bucket	30 Nos.
14.	Fire Extinguishers (DCP, ABC, CO ₂ , FOAM)	139 Nos.
15.	Emergency Siren 3.5 KM Range	1 No.
16.	Self-Contained Breathing Apparatus Set 30 Min. Duration	1 Set.
17.	Fire Proximity Suit	2 Sets.
DG Power Plant		
1.	Fire Water Tank Capacity 1700 m ³	1 No.
2.	Fire Hydrant Point	13 Nos.
3.	Fire Water Monitor	3 Nos.
4.	Fire Bucket	16 Nos.
5.	Fire Extinguishers (DCP, ABC, CO ₂ , FOAM)	54 Nos.

SIL are/ will be provided below mentioned firefighting equipment and fire hydrant system for the expansion and Fire Layout plan is mentioned in **Figure 1.0**.

Table 1.5: Proposed Fire Hydrant Points and Risers

Particulars	Integrated Unit	Clinker Grinding-Grinding Unit
Total Fire Hydrant Points	30	8
Total Fire Hydrant Riser Points	37	11
Total	67	19
Grand Total	86	

Table 1.6: Fire Extinguisher Statement for Expansion

Summary for Fire Extinguishers			
Type	Integrated Unit	Grinding Unit	Total
CO ₂	47	9	56
DCP	53	17	70
Foam	18	9	27
Total	118	35	153

Key personnel and Responsibilities: These are individuals nominated to take specific responsibilities during an emergency:

Emergency coordinator: Takes full charge at the site of the incident and directs all the efforts. His main responsibilities during an emergency shall be to:

- Assess the situation, decide and activate the emergency procedure;
- Take actions for controlling the incident, securing the safety of personnel and minimizing damage to environment, plant and material;
- Direct the rescue and firefighting operations at site;
- Co-ordinate with emergency services at site;
- Search for casualties and arrange for proper first aid for them;
- Evacuate non-essential persons from site to safe location;
- Ensure good communication with Emergency Control Centre;
- Preserve evidence for inquiry.

Rescue Operations coordinator: takes decisions affecting the whole works. Overall responsibility of directing emergency actions from the Emergency Control Centre.

Main responsibilities are:

- Assess situation and decide and initiate actions if not done already;
- Ensure proper communication to inside and outside emergency services including
- Fire services and Ambulance;
- Take direct operational control of works area not affected by the incident;
- Determine probable course of events and review the situation to initiate actions
- accordingly;

- Direct shutting down of plants and evacuation of personnel;
- Control traffic movement;
- Arrange to keep a record of incidents;
- Arrange communication with media and government agencies;

Other Key personnel and Essential workers nominated to play an active role during an emergency.

- **Senior Executives** to assist rescue operation coordinator in his various responsibilities and report to the Emergency Control Centre.
- **Operators** required for shutting the plants safely within stipulated time
- **Emergency Engineering Staff** including Safety Executives
- **Public relations staff**
- **Roll call leaders**
- **Traffic controllers**
- **Running messengers**

Emergency Control Center: The Building adjacent to Main Store has been designated as the Central Control Room and is a safe place from where the Rescue Operation Coordinator directs emergency actions. The Reception Hall of the Administration Building is the Alternate Emergency Control Center in case arrangements at the Main Control Center fails / is also under emergency. The Main Center Following facilities have been provided in the emergency control center:

- Important external and internal telephones numbers and address;
- Wireless sets;
- Nearby area location map;
- A detailed plan of the works showing hazardous area,
- Location of safety equipment, layout of firefighting system, assembly points, possible escape routes.
- Adequate writing pad, paper and pen;
- List of key personnel, first aiders, fire fighters and other essential personnel;
- Shift schedule of employees;
- Action and co-ordination plan on site.

To control and contain an incident it is necessary to take appropriate decisions at site and act accordingly. Following aspects have been considered for this purpose:

1.2.1.1 Action and Coordination at Site

Evacuation: In order to evacuate non-essential personnel, assembly points have been made in safe areas. A final decision on evacuation will be taken depending on type and location of the incident. Necessary safety communication system is available at these points. Persons have been designated in the plan to take roll call in these assembly points, keep in touch with the Rescue Operation Controller to decide course of action and guide personnel at the point accordingly.

Accounting for personnel: Though is a difficult task in large installations, it is important to ensure safety of people inside works. A key person at the Emergency Control Center is responsible to contact various Assembly points and account for all the people in the works.

Rehabilitation: After bringing the incident under total control, care is required while recentering the affected area. Government agencies also may require that nothing be disturbed till they have done their inquiry. Safety committee members will take a leading role in the above areas.

1.2.1.2 Post Disaster Management

In case of Fire emergency, the same shall be extinguished using the appropriate type of fire extinguisher and the debris shall be collected and buried at a safe site. In case water is used, then the firewater will be re-used after necessary treatment e.g. diverting to soak-pits etc. The people in the assembly area shall also be informed for resuming work and normal operation. Besides, a meeting of the Management and Safety Committee, the outcomes is being convened to analyze the actions taken and loss encountered, suggesting/ incorporating any corrective and preventive mechanisms and for modifying the Emergency Plan.

1.2.1.3 Mutual aid and Communication with External Agencies

In a major emergency situation the resources available at the internal source may not be sufficient and external help may be required. The resources, with the emergency services like fire department, hospitals etc. are also generally limited. These services may not have enough special equipment like breathing apparatus, special foams, etc. to fight emergency. This constrain on resources, can be overcome in an area where other industries are situated, by a mutual aid scheme. These industries can set up a good communication system among them and assist each other during an emergency. Resources available with external agencies like fire services, hospitals and police, local administration, voluntary service agencies etc. could also be availed of proper liaison is maintained to obtain the resources available with external agencies like fire services, hospitals and police, local administration, voluntary service agencies etc.

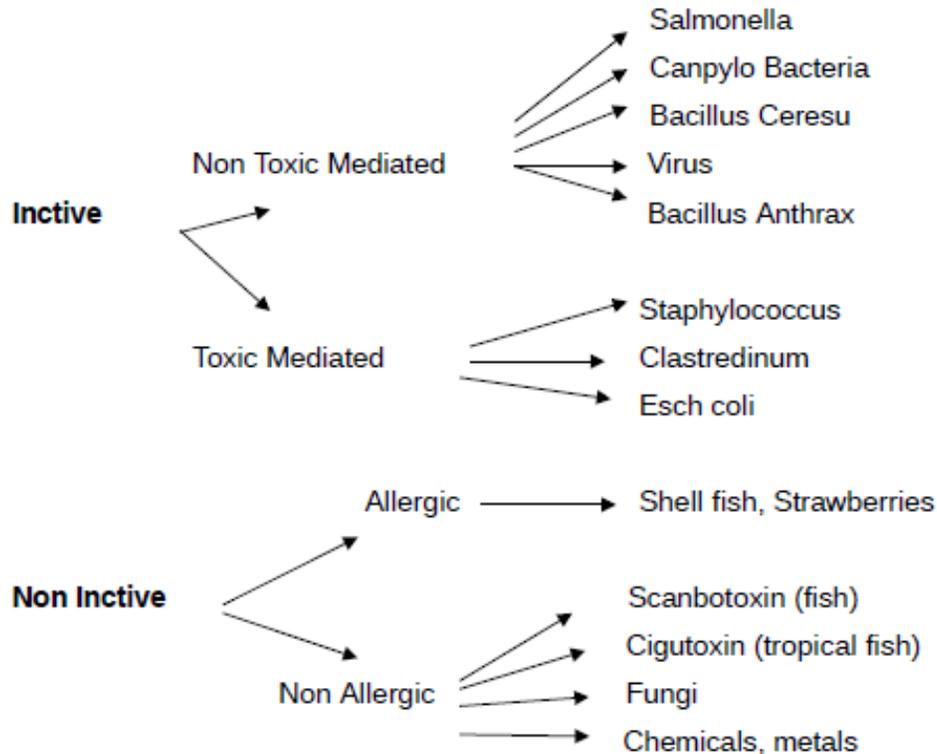
1.2.1.4 Emergency Planning for Food Poisoning

Food Poisoning: This may be caused by eating food that is contaminated, either by bacteria or by toxins produced by bacteria that were present in the food at same stage.

Types of Food Poisoning: Bacterial food poisoning is often caused by the salmonella group of bacteria (associated with farm animals, particularly poultry). Symptoms may appear within a hours, or be delayed for a day or so. Toxic food poisoning is frequently caused by toxins produced by the bacteria group staphylococcus. Symptoms usually develop rapidly – possibly within two to six hours of consumption.

Recognition: There may be: Nausea and vomiting, cramping abdominal pains, Diarrhea (possibly bloodstained), Headache, features of shock, Collapse.

It is classified in to inactive and non-inactive.



Purpose: To establish a system for minimizing the severity due to food poisoning on employees after eating food in canteen and to establish smooth treatment for faster recovery.

Scope: Applicable to employees developing symptoms such as nausea, vomiting, headache, stomachache, diarrhea after eating food in canteen.

Responsibility: Shift in-charge will initiate actions as Rescue Operation Coordinator till Plant Manager or his deputy arrives at site.

Activities

- On hearing the information of symptoms of food poisoning shift in-charge will have to order canteen supervisor to stop serving food and to stop all others eating food further.
- Inform security phone no. 257 / 444
- Security to inform Plant Manager and other HODs.
- Shift the effected immediately to clinic for necessary First Aid.
- Summon Plant medical officer and First Aiders to attend on victim.
- Canteen supervisor should see that the evidences of possible contaminations are not lost and is preserved.
- Canteen supervisor should inform Plant Medical Officer about the possible source of food poisoning
- Shift in-charge will collect information from victims and canteen supervisor about the type of
- Food that has caused the illness and inform the findings to Plant Medical Officer and Plant Manager.

1.2.1.5 Rescue Operation Coordinator

Plant Manager on hearing the information will come to clinic and take charge from shift in-charge. He will assess the situation in consultation with medical officer decide and order for shifting of victims to outside hospitals for immediate treatment or call outside Doctors for help. He will also inform the situation to at least one safety Committee Executive Member. To liaise with outside hospitals, police and district authorities for necessary immediate help and to inform statute authorities like inspector of factories and inspector of police in case of serious incidents.

Plant Medical Officer: Medical Officer on arrival to clinic discuss with canteen supervisor about the food served and assess the condition of victims with para medical team and if necessary give immediate correction of dehydration either by oral dehydration fluid or by intravenous fluids. Antibiotics therapy if the poisoning is due to inactive food material. He will also alert Doctors in nearby hospitals for keeping beds and medicines ready for immediate treatment. He will also appraise the conditions to Rescue Operation Coordinator and advice for shifting of victims to different hospitals or call other doctors to extend help.

Security Officer: To control traffic and see that the rail gate is kept open for traffic till the situation comes under control. He will control all unwanted elements entering the plant during the emergency.

Safety Engineer: Co-ordinate with Welfare Officer and supervisor to search for possible evidences and to collect samples of food and raw material for further analysis if required.

All Other Staff: Will assemble near clinic along with first aiders to help site controller for shifting victims to hospitals and informing the family members of victims.

Medical Management: Immediate correction of dehydration either by oral dehydration fluids or by intravenous fluids. Antibiotic therapy if the poisoning is due to inactive material.

1.2.1.6 Instructions for Handling Emergencies

Shock

- Lay the patient on his back
- Stop bleeding, if any
- Relieve pain by supporting injured part
- Keep the patient comfortable, but not hot. Do not cause sweating
- Fluids may be given in small amounts unless the patient is nauseated, unconscious, likely to be operated on, or has an abdominal wound
- Reassure and cheer up the patient

Wounds

Stop the bleeding by any one of the following method:

- direct pressure
- direct finger pressure into the wound in cases of large bleeding wounds
- tourniquet (seldom needed) use only as a last resort
- Avoid touching the wound with hands or unsterile material
- Clear the wound with running water and surrounding area with soap or spirit with clean gauze washing away from the wound. Apply readymade adhesive gauze bandage or sterile gauze and roller bandage as needed

- Keep the patient quiet, raising the extremity if it is the bleeding part. Give no stimulants
- Never apply antiseptic ointment, lotion or iodine or germicide to the wound.

Abdominal Wounds

- No time must be lost in sending the patient to the hospital,
- Keep the patient flat,
- Maintain warmth,
- Give nothing by mouth,
- If intestine protrude from the wound, do not attempt to touch or replace them,
- Apply sterile dressing and binder on the wounds,
- Provide careful, immediate transportation to the hospital.

Eye Wounds

- Removal may be attempted if foreign body is not embedded.
- Do not apply oil or ointment.
- If there is a foreign body embedded in the eye ball, send the worker immediately to the doctor after applying pad and loose bandage.

Suffocation

- Remove the patient from the source of danger.
- Make a rapid examination to ensure that the air passages are free and to clean them if necessary.
- Restore natural breathing by artificial respiration, if breathing has ceased.

Electric Shock

- Remove the patient from the source of danger.
- Make a rapid examination to ensure that the air passages are free (clean them as necessary).
- Restore natural breathing by artificial respiration, if breathing has ceased.

Insensibility

- Send a doctor if possible, pending his arrival.
- Where the patients face is pale, lay him flat and face downwards with his head turned to one side. If his face is flushed or blue, raise and support the head and shoulders.
- Control any serious bleeding.
- Loosen any tight clothing and let him have plenty of air.
- Do not give anything by mouth.
- If doctor is not available send the casualty to hospital.

Back Bone (Spinal) Fracture

- Transport on a rigid frame. This frame may be improvised by using boards on a door
- The rigid frame may be placed on a stretcher for transportation.
- If a frame cannot be improvised, transport patient on abdomen on a stretcher made of canvas or blanket.
- In neck fracture cases try to get a doctor to the scene, as the danger is high.

Bruises

- Cold applications at first, 24-48 hours, Later hot, after 24-48 hours.

Burns

- Act quickly.

- Put the affected part in cold water.
- Pour the water over burns that can't be immersed (Cold water relieves pain, reduces fluid loss).
- Cover with a sterilized dressing.

Snake Bite

- Calm and reassure the patient.
- Immobilize the bitten limb by splinting it.
- Wash and cool the wound with soap and water.
- Do not cut, rub or suck the bite.
- Take to a doctor.
- Press hard over the wound for up to 15 minutes.
- Do not remove cloth if it has been placed.

Table 1.7: List of Phone Numbers of Company Departments

S. No.	Name / Location/ Dept.	Intercom/ Telephone Numbers
1.	Receptionist	9, 74131/32/35/36/39
2.	CCR	234 / 235/267
3.	safety	153, 500,100, 257
3.	Production	219
4.	Power Plant	8611 / 8615
5.	Electrical	226 / 240
6.	P & A Dept	197 / 198 / 127 / 152
7.	Environment, & Resource Management	153 / 162
8.	Civil	203
9.	Mechanical	207
10.	Mines	243
11.	Project Office	207
12.	Instrument Dept	240
13.	D.GJ Electrical	212 /226/214
14.	Hospital	444/502
15.	Shipping Dept.	190 / 8632 / 8646
16.	Stores	205 / 206/ 216
17.	Petrol Pump	276
18.	Garage	254
19.	Staff Canteen	388
20.	Hostel	380
21.	Tele. Exchange SIL	100
22.	Tel Exchange P&T	294
23.	Sec Gate No 1(South)	256
24.	Sec Gate No 2 (East)	255

25.	Sec Gate No 3 (J)	8616
26.	Sec Gate Adm.	257
27.	Sec Gate Jetty	8616
28.	STD Booth	380

Table 1.8: List of Phone Numbers of External Agencies

#	Name/ Office	Phone Number	
		Office	Residence
Bhuj		STD 02832	
1.	Dist. Collector	50020	50060
2.	D.S.P	50444	50444
3.	G.M. (Telecom)	53000	52222
4.	Civil Hospital	50544	
5.	Military Hospital	22450	
6.	Fire Station (GMDC)	22590	
7.	Ambulance	20850 / 102	
8.	Home Guard	250161	53651
9.	Air Force Station	254550, 223450	-
10.	D.C.F. - Kachchh	250236	50753
11.	D.F.O. -West	231500 / 250600	51054
12.	B.S.F.	251199	20529
13.	S.S.F	221450	23052
14.	Plant Inspector / Gdham	260020	-
15.	Gidc	220194	221302
Naliya		STD 02831	
16.	Mamlatdar	222131	222132
17.	T.D.O	222069 -	-
18.	C.H.O	222127	222128
19.	G.E.B	222081	
20.	Tel. Exch./ J.T.O	222056	222198
21.	Air Force Stn.	222315	222345
22.	Army Unit	222145	-
23.	Officer-in-charge (Meteorological)	222201	-
Dayapar		STD 02839	
24.	Mamlatdar	233341	233340
25.	T.D.O.	233334	233335
26.	C.H.O	233326	-
27.	G.E.B - Panandhro (02839)	284222	284441
28.	Fire Station- Panandhro (02839)	284432	284428
Nakhatrana		STD 02835	
29.	Dy. Collector	222122	222121
30.	Dy. S. P.	02832-222242	222248
31.	Civil Hospital	222328	-
32.	G.E.B.	222143	222164
33.	IFFCO - KANDLA - 02836		

34.	C.G.M.	234612/21461	-
35.	Manager (Admn.)	270640	-
36.	Guest House	270381	-

Emergency Services Available

Table 1.9: List of Medical Facility

#	Place	Medical Facilities	Contact No.
1.	Company Hospital (OHC)	24 Hrs Doctor and staff available at site	444/502
2.	P.H.C. Vayour	18 KM	85334
3.	P.H.C. Nalia	45KM	22127
4.	G.M.D.C Pannadro	39KM	82237
5.	Govt. Hospital, Bhuj	135KM	22850/20552
6.	Air Force, Nalia	55KM	78221
7.	Sarvodaya Hospital	145 KM	44444

Table 1.10: Rest House Facilities

#	Place	Distance (km)
1.	Ramwara Temple Dharmsala	10
2.	Public High School Vayour	18
3.	Narayan Sarovar Temple Dharmsala	35
4.	G.M.D.C Rest House Panandro	39

Table1.11: Ambulance Services

#	Location	Contact no.
1.	Company Ambulance	24 hr Admin Gate/ 444
2.	Govt. Hospital, Nalia	222127
3.	G.M.D.C., Pannandro	231610

Table 1.12: Emergency Fire Services Available

S. No.	Location	Contact no.
1.	Company Fire Fighter	499, 500 (24 hr. available)
2.	G.M.D.C., Pannandro	231610
3.	Air Force, Nalia	278221

1.2.2 Off-Site Emergency Preparedness Plan

If an accident takes place in an industry and its effects are outside the plant area, the situation thus generated is called an Off -Site Emergency. A major emergency may affect areas outside the works also and hence off-site emergency plan is an essential part of a major hazard control system. In case of an offsite emergency, The Emergency coordinator will report to the Collector of the District who is chairman of the District Emergency Committee.

An off-site plan must clearly identify an Emergency coordinating Officer as overall in-charge of all off-site actions. Well-equipped Emergency Control Centers are an essential feature of a plan.

The Emergency Control Center of SIL is well equipped with the following essential documents and procedures to combat with any eventualities. These are:

- Organization Structure,
- Command system,
- Warning procedure,
- Operational Emergency control center,
- Communication system,
- List of specialized equipment,
- List of organization and people concerned,
- Detail list of Emergency Services available nearby,
- Assembly point with evacuation plan & safe route,
- List and contact address of Medical & rehabilitation facilities available,
- System to inform public media,
- Education & Rehearsal schedule:

1.2.2.1 Aspects Proposed to be considered in the Off-Site Emergency Plan

The main aspects, which shall be included in the emergency plan, are:

Organization

Names and appointments of incident controller, site main controller, their deputies and other key personnel.

Communications

Identification of personnel involved, communication center, call signs, network, lists of telephone numbers.

Voluntary organizations

Details of organizers, telephone numbers, resources etc.

Meteorological information

Arrangements for obtaining details of weather conditions prevailing at the time and its forecasts.

Humanitarian arrangements

Transport, evacuation centers, emergency feeding treatment of injured, first aid, ambulances, temporary mortuaries.

Public information

Arrangements for dealing with the media press office; and informing relatives, etc.

Assessment of emergency plan

Arrangements for:

- (a) Collecting information on the causes of the emergency;
- (b) Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

1.2.2.2 Role of the Emergency Co-coordinating Officer

The various emergency services are being coordinated by an emergency coordinating officer (ECO), who will be designated by the district collector. The ECO shall liaise closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control shall be passed to a senior local authority administrator or even an administrator appointed by the central or state government.

1.2.2.3 Role of the Local Authority

The duty to prepare the off-site plan lies with the local authorities. The Emergency Planning Officer (EPO) appointed is to do his duty in preparing for a whole range of different emergencies within the local authority area. Rehearsals for off-site plans are being organized by the EPO.

1.2.2.4 Role of Police

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements. Their functions shall include controlling bystanders evacuating the public, identifying the dead and dealing with casualties, and informing relatives of dead or injured.

1.2.2.5 Role of Fire Authorities

The control of fire shall be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer shall also have a similar responsibility for other events, such as explosions and toxic release. Fire authorities in the region shall be apprised about the location of all stores of flammable materials, water and foam supply points, and fire-fighting equipment. They shall be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

1.2.2.6 Role of Health Authorities

Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, shall have a vital part to play following a major accident, and they shall form an integral part of the emergency plan. For major fires, injuries shall be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally be available in most hospitals. Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical mutual aid scheme shall exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

1.2.2.7 Role of Government Safety Authority

There will be the plant inspectorate available in the region. Inspectors are likely to want to satisfy themselves that the organization responsible for producing the offsite plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well-documented procedures and evidence of exercise undertaken to test the plan. In the event of an accident, local arrangements regarding the role of the plant inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations in case of involvement in advising on operations.

1.3 NATURAL DISASTERS

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering, 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, disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical

storms, floods, avalanches, landslides, forest fires etc. Natural Hazard identification map of Gujarat is shown in **Figure 7.3, 7.4 and 7.5** below. The second group includes disastrous events occasioned by man or mans impact upon the environment. All disaster brings 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 and removal of debris and social care, the provision of temporary shelter to the homeless food, clothing and medical supplies, and the rapid re-establishment of essential services.

The objective of the industrial disaster management plan is to make use of the combined resources of the plant and the outside services to achieve the following:

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

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

There are no records of cyclone hazard since last 10 years in the study area .There are no any records of flood hazard in the study area found date back to 30 years. The area is drought prone area. There is no major perennial river and no heavy rainfall since 1987 till date.

1.4 OCCUPATIONAL HEALTH AND SAFETY

Large industries, in general where multifarious activities are involved during construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the boons, the industrialization generally brings several problems like occupational health and safety. The industrial planner, therefore, has to properly plan and take the steps to minimize the impacts of industrialization and to ensure appropriate occupational health, safety including fire plans. All these activities again may be classified under construction and erection, and operation and maintenance. The proposed safety plan is given below:

1.4.1 Occupational Health

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

Sanghi Industries Limited (SIL) is providing free medical consultation in OHC and round-the-clock medicinal disbursement with emergency management at Health Center to all employees,

their dependents and nearby area residents with free ambulance provision to all. The health checkup of all the workers is being done regularly by the OHC.

• **Construction and Erection**

The occupational health problems envisaged at this stage can mainly be due to constructional accident and noise. To overcome these hazards, in addition to arrangements to reduce it within TLVs, personal protective equipment shall also be supplied to workers.

• **Operation and Maintenance**

The problem of occupational health, in the operation and maintenance phase is due to noise hearing losses. Suitable personnel protective equipment shall be given to employees. The working personnel shall be given the following appropriate personnel protective equipment.

1.4.2 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 proposed plant is possible due to leakage of fuels, collapse of structures and fire/explosion etc.

Keeping in view the safety requirement during construction, operation and maintenance phases, the plant has formulated safety policy with the following regulations:

- To allocate sufficient resources to maintain safe and healthy conditions of working environment.
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment.
- To ensure that adequate safety instructions are given to all employees.
- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use.
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety.
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and upto date knowledge.
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.
- To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters.
- To ensure proper implementation of fire prevention methods and an appropriate firefighting service together with training facilities for personnel involved in this service.
- To organize collection, analysis and presentation of data on accident, sickness and incident involving personal injury or injury to health with a view to taking corrective, remedial and preventive action.
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees.

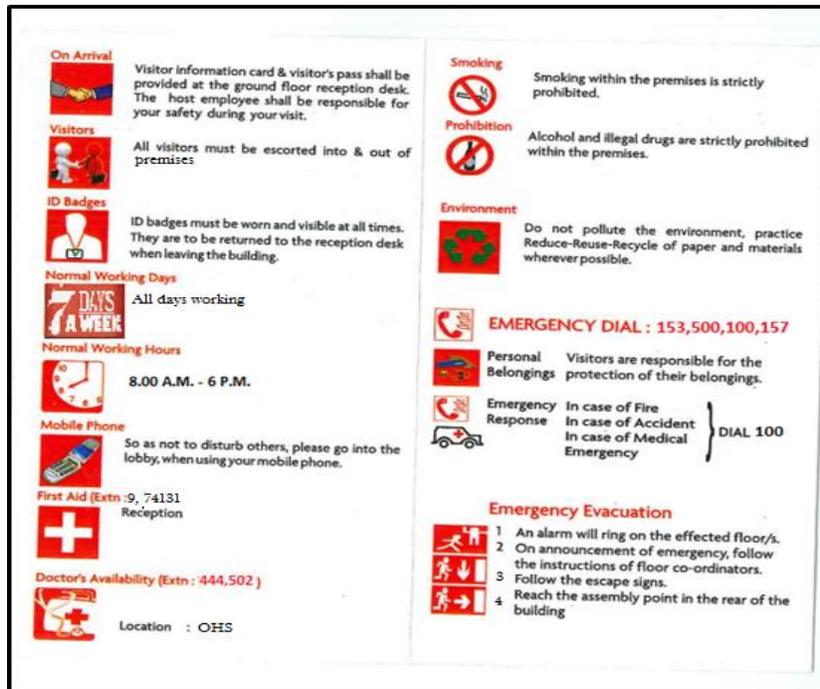
1.4.3 Safety Training

A full-fledged training center is available at the plant. Safety training is being provided by the Safety Officers with the assistance of faculty members called from Corporate Center. In addition to regular employees, contractor labors are also being provided safety training. To create safety awareness safety films and leaflets shall be shown to workers. Some precautions and remedial measures proposed to be adopted to prevent fires are:

- Compartmentation of 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 firefighting 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 firefighting;
- Proper fire watching by all concerned would be ensured.

1.4.4 Safety Plan for Visitors

To ensure the health and safety of visitor, there will be provision of safety signs and signals in and around plant premises and visitor information card. The use of illuminated signals, hand and acoustic signals and marking of different colors is being implemented.



Sample Visitor Information Card (VIC)