

CHAPTER VII

ADDITIONAL STUDIES

(SAFETY, RISK & DISASTER MANAGEMENT)

7.1 SAFETY

Definition: Safety is the state of being “safe”, the condition of being protected against physical, social, spiritual, financial, or other types or consequences of failure, damage, error, accidents, harm or any other event which could be considered non-desirable.

7.1.1 Safety plan/Policy

DSKL has proposed health and safety policy to achieve the following objectives:

- Well defined organization setup for implementation of Health and safety policy
- Encouraging participation of all employees, contractor employees and facility providers in safety related activities
- Ensuring competence by imparting adequate training and education to all employees
- Evaluate all the health and safety performance
- Compliance of all statutory requirements
- Periodic risk assessment and safety audits will be carried out

The following safety provisions will be made in the plant

- Providing PPE to all employees wherever necessary
- Frequent checking of pipelines and storage units will be done
- Prohibiting welding or similar maintenance activities near combustible material storage
- Pumps of reliable quality will be installed
- Lightening protecting system as per Indian electricity rules
- Keep safe distance between fuel storage area and main unit
- Corrosion protection methods for pipelines
- All locations where the above ground pipelines are close to traffic movement, protection like crash guards will be provided
- ‘Flame arresters’ will be provided in gas lines to protect the digester from back fire from the flame and / or the boiler burner
- Over / under pressure release device will be provided on biogas digester for its safety from over pressure / vacuum
- Transfer of alcohol only mechanically
- Providing flame arrestors on the top of all the storage tanks

- Flame proof fitting to all the systems which handle alcohol
- Transfer of alcohol will be by pipes only
- All the lightings are to be flame proof
- Water sump with a holding capacity
- Foam Extinguishers inside the warehouse

7.2 RISK ASSESSMENT AND RISK MANAGEMENT

Risk associated with any activity or project can be assessed and managed in terms of their effect on human health, environment and business operations, in general. Risk is the probability that the hazard will occur (i.e. that an adverse effect or/event will result from a given set of exposure condition).

$$\text{Risk} = \text{Hazard} \times \text{Exposure}$$

More importantly, the proper assessment and management of risks, which may be pose by the use, transport, storage, or disposal of hazardous chemical can be laterally save lives, prevent illness and injury and preserve the precious environmental resources.

Risk assessment studies are conducted to ensure safety and reliability of plant operation, through systematic and scientific methods to identify possible failure and prevent their occurrence before they cause disasters and loss of production. Risk analysis deals with identification and quantification of risk.

7.3 HAZARD IDENTIFICATION

Hazard identification involves identification of hazard prone areas, transportation risk, storage risk, risk of air/water pollution etc. Following are the hazardous areas identified along with the accidents likely to occur in a molasses based distillery

Table 7.1: Hazardous areas in a molasses based distillery attached to sugar mill.

Sr. No.	Hazardous Area	Likely Accident
1	Boiler	Explosion
2	Turbine room	Explosion
3	Electrical room	Fire and electrocution
4	Bagasse yard	Fire
5	Alcohol storage tank	Fire
6	Biogas holding tank	Fire

7.4 PROBABLE RISK FACTORS

Following scenarios fall under maximum credible accident scenario

- Fire in fuel storage yard (bagasse yard)
- Fire and explosion at storage yard (molasses and alcohol storage tanks)
- Fire due to short circuits
- Injury to body and body parts (mechanical)

7.4.1 Fire in fuel storage yard

The storage area is most vulnerable for fire and includes storage tanks of alcohol and molasses. This is the most common accident known to occur in any plant, while storing and handling fuel. Since such incident takes sufficient time to spread, enough response time is available for plant personnel to get away to safer distance. An elaborate fire hydrant network and firefighting system including trained crew and facilities will be provided to mitigate the risk of such incidents. In addition, as per requirement fire alarm system and smoke detectors will be installed.

Table 7.2 NFPA (NATIONAL FIRE PROTECTION ASSOCIATION) Rating

Chemical	NFPA Ratings		
	Health Hazard	Fire	Reactivity
Ethanol	2	3	0

(Least-0, Slight-1, Moderate-2, High-3, Extreme-4)

Gas holder

- Pressure in gas holder should be always more than 100 mm.wg. If pressure falls below the biogas blower should be switched off and isolating valve in flare line should be closed.
- Moisture eliminator is provided at inlet & outlet of gas holder. These should be drained at least once in a day to drain the water. Drain valve should be operated such that it is closed tightly before gas can escape.
- In case of maintenance of gas holder, on roof top should be opened and gas holder should be properly purged before starting maintenance. Gas mask should be used for entering the gas holder.
- Continuous water supply to gas holder should be maintain for providing water seal.

Gas Handling System

- Gas Blower is provided with flame proof motor, cable connection should be maintained accordingly

- Safety valve on blower discharge side should be properly adjusted to provide desired gas
- Moisture is likely to collect in the gas pipe line to Boiler. Drain points should be provided at interval and drained at least once in a day. Precaution should be taken while operating drain valve so that gas does not escape while draining water
- Flame arresters provided in the gas line should be cleaned periodically so that gas pressure at boiler end is maintained
- At the time of lighting the burner, if burner does not light up within 15 to 20 sec. close the shut off valve in gas line, and purge the furnace before trying to light up burner again
- Do not light up burner from hot brick work.

7.4.1.1 Mitigation Measures for Fire Hazards

A. Storage

- Alcohol (RS, ENA or AA) and molasses will be stored in leak-proof MS tanks, gauges of MOC will be strictly as per IS or relevant standards
- Storage area will be well ventilated with adequate spacing between units
- Lightening arresting system
- Provision of alcohol vapor condensation system
- Strictly declared 'No Smoking Zone' and prohibition of use of any ignitable material (e.g. even cell phones, etc.)
- Electrical fittings of good quality that comply national or international standards

B. Fire fighting system

The mill management is vigilant on the issues of safety of workers and plant. It has planned following fire fighting system for the proposed distillery unit

- a. Guidelines of OISD-STD-117 will be implemented
- b. Lightening arresting system for the plant as well as storage
- c. Alcohol vapors condensing system for storage tanks
- d. The fixed water spray system will be provided on all tanks, fire water flow rate will be calculated at a rate of 25 lpm/m² as per OISD-STD-117
- e. Fire water system will be designed for a minimum residual pressure of 7 kg/cm²(g) at hydraulically remotest point in the installation considering single largest risk scenario

- f. Water for the fire fighting will be stored in easily accessible surface or underground tanks of RCC/steel with minimum four hours aggregate rated capacity of pumps. There will be one or two standby diesel engine driven pumps of the same type, capacity & head as the main pumps will be provided; Jockey pump (one in number -AC motor driven) for maintaining pressure
- g. Hydrant system covering the entire plant including all important auxiliaries and buildings is proposed. The system will be complete with piping, valves instrumentation, hoses, nozzles and hydrants, valves etc.
- h. High velocity water spray system near storage tanks
- i. Portable extinguisher such as pressurized water type, carbon dioxide type and foam type will be located at strategic locations throughout the plant
- j. The diesel engines will be quick starting type with the help of push buttons located on or near the pumps or located at a remote location.
- k. Portable foam and/or water-cum-foam monitors will be provided for suppression of pool fire in tank farm area.
- l. Fire water pumps & storage will be located at 30 m (minimum) away from equipment or where hydrocarbons are handled or stored.
- m. Fire water pumps will be exclusively used for firefighting purpose only
- n. Fire water mains, hydrant & monitor stand posts, risers of water spray system will be painted with "Fire Red" paint as per IS: 5.
- o. Hose boxes, water monitors and hydrant outlets will be painted with "Luminous Yellow" paint as per IS: 5
- p. Electric audible fire siren will be to the farthest distance in the installation and also in the surrounding area up to 1 km from the periphery of the installation that will sound differently with respect to shift alarm with continuous power supply
- q. Communication system like Telephone, Public Address System, etc. to be provided in non-hazardous areas of the installation
- r. Concerned officer/employees will be trained to handle the fire fighting system

7.4.1.2 Boiler Operations

1. Provision of adequate sets of Personnel protective equipment's
2. Pilot lights will be provided on electrical panel boards
3. Provision of hand operable fire fighting cylinders at strategic locations

7.5 QUALITATIVE RISK ASSESSMENT

Table 7.3: Probability of occurrence of hazard

#	Hazard	Probability	Severity	Mitigation Measure
Mechanical Hazard				
1.	Physical injury to hand/legs during process	Frequent Once per month or more	Minor	Use PPE/PPA
2.	Boiler Explosion	Remote	Catastrophic	Layers of Protection area(LOPA)
3.	Fingers nipping in between moving part Eg. Belt	Probable Once per year	Major	Fixed/Movable Guards at probable sites
4.	Steam pipe leakages	Frequent Once per month or more often	Major	Proactive Maintenance/PPE
5.	Working on height Impact /falling down	Probable Once per year	Critical	Work permit system Life belts/Helmet
6.	Water feeder pump failure	Occasional Once per 10 years	Critical	Alarming/communication arrangements
Electrical Hazard				
7.	Contact of persons with parts which have become live under faulty conditions (indirect)	Occasional Once per 10 years	Major	PPE/PPA/Permits
8.	Approach to live parts under high voltage	Occasional Once per 10 years	Catastrophic	Guards/ authorization Enter Restriction
9.	Electrostatic phenomena	Remote	Major	Earthing, avoid Dust Explosion
10.	Thermal radiation or other Short circuits, overloads, etc.	Probable Once per year	Major	PPE/Checking /Inspection
Thermal Hazard				
11.	Burns, scalds and other injuries by steam	Occasional Once per 10 years	Major	Safe working distance PPA/protective dress code
12.	Damage to health by hot working environment	Frequent Once per month or more often	Critical	Minimum exposure Ventilation /Humidity control
Hazard generated by Noise				
13.	Belt movement, Pump/Motor Turbo generator	Frequent	Critical	Confinement of source Use Ear Muff/Plugs
Hazard generated by Vibration				
14.	Whole body vibration, during working on feeder platform	Remote	Major	Engineering solutions

Table 7.4: Hazard Warning Information for Ethyl Alcohol

SECTION I	
Product Name	Ethyl Alcohol
Synonyms	Anhydrous Ethyl Alcohol, Dehydrated Alcohol
Chemical Family	Alcohol
Molecular Weight	46.07
Formula	C ₂ H ₅ OH

Health	Fire	Reactive	Other	Degree of Hazard	Colour Coding	Other Codes
0	3	0	-	0 = Minimum	Health = Blue	Ox = Oxidizer
				1 = Slight	Fire = Red	Acid = Acid
				2 = Moderate	Reactivity =	Alk = Alkaline
				3 = Serious	Yellow	COR = Corrosive
				4 = severe	Other = White	W = No use water

SECTION II - INGREDIENTS

Composition	Cas Rn.	Nominal Wt/Wt%	PEL/TLV	Hazard
Ethyl Alcohol	64-17-5	100.0	1000 ppm	Flammable/Nervous System Depressant

PEL = Personal Exposure Limit

TLV = Threshold Limit Value

SECTION III - HEALTH INFORMATION

Inhalation	Exposure to over 1000 ppm may cause headache, drowsiness and lassitude, loss of appetite, and inability to concentrate. Irritation of the throat
Ingestion	Can cause depression of central nervous system, nausea, vomiting, and diarrhea
Eye Contact	Liquid or vapor may cause irritation
Skin Contact	May cause irritation and defatting of skin on prolonged contact

SECTION IV - OCCUPATIONAL EXPOSURE LIMITS

PEL (OSHA Permissible Exposure Limit): Mixture	See Section II
TLV (ACGIH Threshold Limit Value): Mixture	See Section II

SECTION V – EMERGENCY FIRST AID PROCEDURE	
For Overexposure By Swallowing	If victim is conscious and able to swallow, have victim drink water or milk to dilute. Never give anything by mouth if victim is unconscious or having convulsions. Call a Physician Or Chem-Trec (Poison Control) Immediately. Induce vomiting only if advised by physician (Poison Control)
Inhalation	Immediately remove victim to fresh air. If victim has stopped breathing, give artificial respiration, preferably mouth-to-mouth. Get Medical Attention Immediately
Contact With Eyes Or Skin	Immediately flush affected area with plenty of cool water. Eyes should be flushed for at least 15 minutes. Remove and wash contaminated clothing before reuse. Get Medical Attention Immediately
SECTION VI – PHYSICAL DATA	
Boiling Point	173° F (78 °C)
Melting Point	-173° F (-114 °C)
Vapor Pressure	44.6 mm Hg @ 68° F (20 °C)
Specific Gravity	0.7940 @ 60°/60° F
Vapor Density (Air =1)	1.59
Solubility In Water	Complete in water, chloroform, acetone, ether, benzene and methanol
Appearance And Color	Clear and colorless, volatile liquid with a weak, vinous, alcohol odour and bitter taste. Odour threshold = 84 ppm
SECTION VII – FIRE AND EXPLOSIVE HAZARDS	
Flash Point	56° F ASTM D-56 (Tag Closed Cup)
Auto-Ignition Temperature	685° F
Flammable Limits In Air, % By Volume	LOWER: 3.3 UPPER: 19
NFPA (National Fire Protection Association) RATING	HEALTH (0) FIRE (3) REACTIVITY (0)
Fire Fighting Procedures	(Note: Individuals should perform only those fire-fighting procedures for which they have been trained) Use dry chemical, “alcohol” foam, or carbon dioxide; water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposures and to dilute spills to nonflammable mixtures.

	Firefighters should wear self-contained breathing apparatuses in the positive pressure mode with a full-face piece when there is a possibility of exposure to smoke, fumes, or hazardous decomposition products.
SECTION VIII – REACTIVITY	
STABILITY	Generally stable
HAZARDOUS POLYMERIZATION	Not likely
CONDITIONS & MATERIALS TO AVOID	Contact with acetyl chloride and a wide range of oxidizing agents may react violently
SECTION IX – EMPLOYEE PROTECTION	
Control Measures	Handle in the presence of adequate ventilation.
Respiratory Protection	Where exposure is likely to exceed acceptable criteria, use NIOSH/MSHA approved respiratory protection equipment. Respirators should be selected based on the form and concentration of contaminant in air and in accordance with OSHA (29 CFR 1910.134)
Protective Clothing	Wear gloves and protective clothing, which are impervious to the product for the duration of the anticipated exposure if there is potential for prolonged or repeated skin contact
Eye Protection	Wear safety glasses meeting the specifications of ANSI Standard Z87.1 where no contact with the eye is anticipated. Chemical safety goggles meeting the specifications of ANSI Standard Z87.1 should be worn whenever there is the possibility of splashing or other contact with the eyes.
SECTION X – ENVIRONMENTAL PROTECTION	
Environmental Precautions	Avoid uncontrolled releases of this material Where spills are possible, a comprehensive spill response plan should be developed and implemented
Spill Or Leak Procedures	Wear appropriate respiratory protection and protective clothing as described in Section IX. Contain spilled material. Transfer to secure containers. Where necessary, collect using absorbent media. In the event of an uncontrolled release of this material, the user should determine if the release is reportable under applicable laws and regulations
Waste Disposal	All recovered material should be packaged, labeled, transported, and disposed off, or reclaimed in conformance with applicable laws and regulations and in conformance with good engineering practices

SECTION XI - HANDLING AND STORAGE

Precautions

Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis, and moisture.

Storage

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 23°C (73.4°F).

7.6 RISK ASSESSMENT: HEALTH

7.6.1 Acute Health Effects

The following acute (short-term) health effects occur immediately or shortly after exposure to alcohol.

Skin	Causes dryness and cracking leading to dermatitis and possible infection.
Eye	Severe irritation with burning and possible damage to the cornea and conjunctiva
Lung	Irritation of the eyes, nose, throat, and respiratory tract
Central Nervous System (CNS)	High concentrations can cause depression the CNS with symptoms of sleepiness and I of concentration

7.6.2 Chronic Health Effects

The following chronic (long-term) health effects occur at some time after exposure to ethyl alcohol can last for months or even years:

Cancer	Known to cause liver cancer in humans, primarily due to ingestion. Industrial exposures through ingestion are not likely but are possible
Reproduction	Can affect human reproduction by ingestion. It causes changes in the female fertility index. Effects on newborns include changes in the apgar score, neonatal measures or effects, and drug dependence.
Other Chronic Effects	Very high or prolonged exposure may result in mucous membrane irritation, head- ache, and depression of the CNS with symptoms of somnolence and lack of concentration. Prolonged skin contact can cause dermatitis.

7.7 RISK ASSESSMENT: ENVIRONMENT

7.7.1 General Assessment

The environment is at risk of exposure during transportation, storage, disposal, or destruction of ethyl alcohol. In almost every scenario, the threat of environmental exposure is contingent upon the proper handling of the chemical substance. Accidental spills, large or small, can result in fire, explosion, and possible contamination of the surrounding environmental mediums (water, soil, and air).

7.7.2 Acute Ecological Effects

Acute (short-term) toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen 2 to 4 days after exposure. This chemical has moderate acute toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term effects.

7.7.3 Chronic Ecological Effects

Chronic toxic effects may include shortened life span, reproductive problems, lower fertility, and changes in appearance or behavior in exposed animals. These effects can be seen long after first exposure(s) to toxic chemicals. Ethyl alcohol has moderate chronic toxicity to aquatic life. Insufficient data are available to evaluate or predict the long-term effects.

7.7.4 Persistence in the Environment

Ethyl alcohol is slightly persistent in water, with a half-life of between 2 to 20 days. The half-life of a pollutant is the amount of time it takes for one-half of the chemical to be degraded. About 90% of ethyl alcohol will eventually end up in the air; the remainder will end up in water.

7.7.5 Bioaccumulation in Aquatic Organisms

Some substances increase in concentration, or *bioaccumulate*, in living organisms as they breathe contaminated air, drink contaminated water, or eat contaminated food. These chemicals can become concentrated in the tissues and internal organs of animals as well as humans. The concentration of ethyl alcohol found in fish tissues is expected to be about the same as the average concentration of ethyl alcohol in water from which the fish was taken.

7.7.6 Recommended Risk-Reduction Measures

Proper training of all transporters will reduce the likelihood of a mishap or accident resulting in a leak or spill to the environment. The correct labeling while transportation on all transporting vehicles should be able emergency responders to react properly and

quickly to any disaster thereby reducing the potential risk to the environment and to personnel.

Storage of ethyl alcohol should be segregated from incompatible chemicals to minimize the risk of cross contamination or contact. Buildings designated for storage should be equipped with appropriate fire protection systems (alarms, sprinklers, emergency lighting, portable extinguishers). Equipment should be designed to meet explosion-proof standards.

If a spill or leak to the environment has occurred, fire department, emergency response, and/or hazardous materials spill personnel should be notified immediately. Cleanup should be attempted only by those trained in proper spill containment procedures. Contaminated soils should be removed for incineration and replaced with clean soil. If ethyl alcohol should contact the water table, aquifer, or navigable waterway, time is of the essence. It is highly soluble in water and, therefore, total containment and remediation may not be entirely possible. When such spills occur, the local and/or state emergency response authorities must be notified. A comprehensive emergency response of disaster preparedness/recovery plan should be in place prior to any operations involving the use, transportation, storage, or disposal of ethyl alcohol. If ethyl alcohol is spilled or leaked, the following specific steps are recommended:

- a. Restrict persons not wearing protective clothing from area of spill or leak until cleanup is complete and area can be opened for normal work.
- b. Ventilate area and remove ignition sources.
- c. Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. Use non-sparking tools.
- d. It may be necessary to dispose off ethyl alcohol as a hazardous waste. The SPCB should be contacted for specific recommendations.

Table 7.5: Summary of risk assessment and damage control

High risk equals 16 to 25	High risks activities should cease immediately until further control measures to mitigate the risk are introduced
Medium risk equals 9 to 15	Medium Risks should only be tolerated for the short-term and then only whilst further control measures to mitigate the risk are being planned and introduced, within a defined time period.
Low risk equals 1 to 8	Low risks are largely acceptable, subject to reviews periodically, or after significant change etc.

General Risk Assessment

1. **Responsibility:** Site Controller: Head- Production

Incident Controller: Shift- In charge

Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action recommended in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR=LxS
Furnace/boiler- Fire hazard caused by fuel/ignitable substances	Persons working near the furnace area- Burns may be possible if directly come in contact	<ul style="list-style-type: none"> Emergency alarm to be put on to signal the emergency Emergency kit to be kept ready near the work place Fire fighting equipments power/ foam type extinguishers on vehicles and mounted on walls to be kept readily available Provision of water hose Strictly 'No smoking zone' and prohibition of ignitable activities Plant workers to be trained to fight fire 	<ul style="list-style-type: none"> Switch off the system Fire extinguishers are to be used immediately Water hose to be operated to set out the fire depending on the situation Outside fire brigade is to be called if the fire cannot be extinguished immediately Inform the in-charge/ manager and activate the onsite emergency plan Immediate first aid to victims and sent to hospital for treatment 	2	3	6

2. **Responsibility:** Site Controller: Head- Electrical

Incident Controller: Shift- In charge

Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action taken in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR=LxS
Electrical Transformer- Electrical shock and fire	Person near the transformer	Shock proof insulated PCC platform	<ul style="list-style-type: none"> • Cut off power supply • Treat the injured for electrical shock • If fire is caused, immediately fight fire with available resources, summoning outside help if necessary 	2	3	6

3. **Responsibility:** Site Controller: Head- Laboratory

Incident Controller: Shift- In charge

Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action recommended in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR=LxS
Lab chemicals- in case of bottle breakage, causes burns and damage to respiratory	Persons working in the lab	<ul style="list-style-type: none"> • Proper care to be taken while handling the chemicals. • First aid box to be made available on site with all required medicines and devices • Fire fighting equipments like fire extinguishers, sand buckets should 	<ul style="list-style-type: none"> • Immediately treat the persons as guided in the MSDS • Hospitalize the affected person if necessary 	3	2	6

systems due to inhalation.		<p>be always available</p> <ul style="list-style-type: none"> • Instruction boards to be displayed for knowledge of other workers to care of the situation in the event of occurrence 				
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4. **Responsibility:** Site Controller: Manager- Services
Incident Controller: Shift- In charge
Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action taken in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR=LxS
Cooling Tower- Burns from returning hot water	Persons working with cooling tower	<ul style="list-style-type: none"> • All workers are not permitted near the tank and hot water line. Railing is to be provided all around the tank • Always precautionary measures should be taken and adopted 	<ul style="list-style-type: none"> • Victims are first aided by trained persons and then referred to doctor/ hospital • If any worker get injured/hurt, then immediate first aid should be provided to him and he should be referred to the hospital/ doctor for further treatment 	2	3	6

5. **Responsibility:** Site Controller: Manager
Incident Controller: Shift- In charge
Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action taken in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR=LxS
Water tank- Drowning of personnel	Persons near the water tank	Water tank will be fenced/ covered The tank will not be permitted for domestic utility	Drowned person should immediately be given first aid	2	2	4

6. **Responsibility:** Site Controller: Head- Production
Incident Controller: Shift- In charge
Emergency Coordinators: Departmental Heads

Hazards and details	Persons at risk	Control measures	Action taken in case of emergency	Risk		
				Likelihood	Severity	Risk rating
				L	S	RR= LxS
Control rooms- electrical shocks	Persons working in the control room	Earth leakage circuit breaker installed.	Main supply will be immediately shut off	2	2	4

7.9 DISASTER MANAGEMENT PLAN

7.9.1 INTRODUCTION

“A **Disaster** is a sudden, calamitous event that causes serious disruption of the functioning of a community or a society involving widespread human material economic or environmental losses and impact which exceeds the ability of the affected community or society to cope using its own resources.”

Disaster Management is –“an action taken to prevent Hazard from converting into Disaster. A well-planned and well-rehearsed response system can deal with the exigencies of calamities and also put up a resilient coping mechanism. Optimal utilization of scarce resources for rescue, relief and rehabilitation during times of crisis is possible only with detailed planning and preparation. Keeping in view these factors, preparation of Disaster Management Plan (DMP)

The geographic region of the proposed project may face probable hazards such as earthquake, drought, thunder storms, accidents and environmental hazard such as pollution. So, considering these probabilities, the following disaster management plan is being recommended.

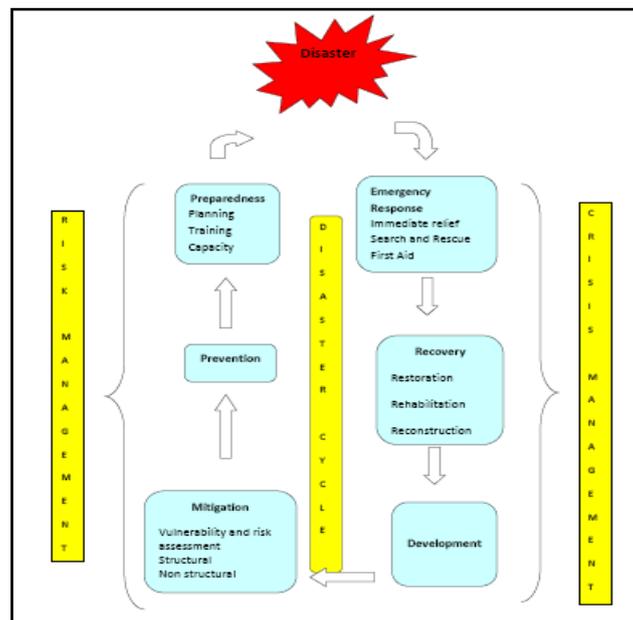


Figure 7.3: Schematic of Disaster Management Process

7.10 Disaster vulnerability for Nashik District

The outline of hazards and vulnerability is mentioned here and details have been analyzed subsequently.

Nashik District Hazard Vulnerability Risk Analysis												
Taluka	E Q	Landslide	Flood	Cyclon	Drought	CBRN	Industrial	Fire	Road Accident	Stamped	Epidemics	Terrorist Attack & Bomb Blast
Dindori	Low	Low	High	Low	Low	Low	High	High	High	Low	Medium	Low
Kalvan	High	High	High	Low	Low	Medium	Low	High	High	High	Medium	Medium
Peth	High	Medium	Low	Low	High	Low	Low	High	Medium	Low	Medium	Low
Surgana	High	Medium	Low	Low	High	Low	Low	High	Medium	Low	Medium	Low
Baglan	Low	Low	High	Low	High	Low	Low	High	High	Low	Medium	Low
Deola	Low	Low	High	Low	High	Low	Low	High	High	Low	Low	Low
Malegaon	High	Low	High	Low	High	High	High	High	High	High	High	High
Chandwad	Low	Low	Low	Low	High	Low	Low	High	High	Medium	Medium	Low
Niphad	Low	Low	High	Low	High	Low	Low	High	High	Low	Medium	Low
Nandgaon	Low	Low	Low	Low	High	High	High	High	High	Low	Medium	Low
Yeola	Low	Low	Low	Low	High	Low	Low	Medium	Medium	Low	Medium	Low
Sinner	Low	Low	Low	Low	High	High	High	High	High	Low	High	Medium
Nashik	High	Medium	High	Low	High	High	High	High	High	High	High	High
Trimbakeshwar	High	High	Low	Low	Low	Low	Low	High	High	High	High	High

Source: Disaster Management Plan, Nashik

The site is situated in Baglan (Satana) taluka and with reference to above table, this area is susceptible to flood, drought, fire and road accidents and probability of epidemics is medium.

Identification of flood prone areas

Dam	Capacity (m.c.ft)	flood level (m.c.ft)	Flood prone villages
Chankapur	2714	2714	Chankapur, Gorasane, Bhadwan, Bagdu, Pilkos, Kahmkheda, Sawki, Abhona, Dahyane, Pale, Eklahare, Bej, Lohner, Mahalpatne, Nimbola, Thengona, Dhandri, Patne, Tehre, Malegaon.
Kelzer	572	572	Kelzer, Ttani, Nikwel, Chaundhane, Munjawad, Malgaon, Dangsaudane, Budhate.
Haranbari	1166	1166	Eklahare, Askheda, Nampur, Malegaon, Jaukheda.

Source: Disaster Management Plan, Nashik

- **Flood**

Baglan region is coming under Giranariver catchment area. There are two main dams constructed in this taluka, namely Kelzer and Haranbari. The villages likely to get affected due to

flood have been identified in the Disaster Management Plan of the district and village Shevre is not listed in the same. These villages are listed in the following table.

- **Drought**

The sugar mill has constructed seven micro reservoirs in their own premises, where they are storing the rain water. Since, its establishment the sugar factory has never faced water shortage problem due to these reservoirs. Hence, it is anticipated that the existing provision will be adequate even for the proposed project.

- **Fire and accidents**

Disaster management for fire and accidents within the factory premises is explained and discussed in detail in this part of the report.

- **Earthquake and Landslides**

Nashik's geography/ geology is such that it is in Seismic Zone 3 and has hills of Sahyadri ranges so close that the population bases have touched the hill slopes. The hazards of earthquake and landslides exist in the city. The vulnerability due to landslides is minimal at present with only a few slums located on the slopes. However, an EQ of magnitude 7.0 on the Richter scale is possible.

Source:

http://mahafireservice.gov.in/Site/PDFs/NewsEvents/FireHazardResponseMitigationPlan/MillenniumCityMitigationPlan/nashik_mitigation_plan.pdf

7.11 DISASTER MANAGEMENT PLAN (DMP) CYCLES

Disaster management is a methodology to understand and face disaster and take appropriate measures to minimize the losses of life, property and environment. This can be represented in 3 sections viz., Pre disaster phase, During disaster and Post disaster situations.

a. Pre disaster activities

b. Emergency activities

1. Warning (beginning before the actual event)
2. Evacuation, search and rescue
3. Emergency assistance (relief) – food, water, shelter, medical aid

c. Post disaster activities

1. Repair and restoration of life lines (power, telecommunications, water transportation)
2. Reconstruction and rehabilitation

7.11.1 Pre-disaster

Preventive measures

- Earthquake resistant construction as per National Building code and considering the mill is located in seismic zone III
- Analyze soil type before construction and do not build structures on soft soil. To accommodate on weak soils adopt safety measures in design.
- Follow Indian Standard Code for construction of buildings/structures
- Land use control and restriction on density and heights of buildings
- Strengthening of important buildings, which need to be functional after a disaster. Upgrade level of safety of buildings
- Reduce possible damages from secondary effects. e.g. identify potential sites and restrict construction in those areas
- In earthquake prone areas, insurance should be obtained for buildings under construction and those in use. Insurance policies under PLI Act, 1991 as well as for natural disasters are mandatory and priced specifically on available scientific data of hazards in the region. Preparation of disaster related literature in local languages with do's and don'ts for construction
- Getting communities involved in the process of disaster mitigation through education and awareness
- Networking of local NGOs working in the area of disaster management

It is realized that investment on Preparedness, Prevention and Mitigation is more cost-effective compared to expenditure on relief and rehabilitation. The basic characteristic of disaster management is 'proactive' prevention, preparedness and mitigation rather than the prevalent 're-active' relief and rehabilitation approach. Management of risks as a prelude to crisis management has now gradually gained importance.

Disaster management planning is not a substitute for good operative/maintenance/ design practice. It is an aspect of safety management. Industry should minimize risk by adherence to safe practice and meeting all legislation.

On-site disaster management planning is responsibility of project management (i.e. occupier). The district authorities and the Directorate of Industrial Safety and Health have the responsibilities for off- site Disaster management plan of the district.

The proposed distillery unit needs to have a round-the-clock team to manage disaster. The team shall include several members. Their functions depend on size of the organization and it shall be headed by a technically qualified as well as a trained individual.

7.11.2 Response

The response phase includes the mobilization of the necessary emergency services and first responders in the disaster area. This is likely to include a first wave of core emergency services, such as firefighters, police and ambulance crews. In some instances, it is termed **Disaster Relief Operation (DRO)** and can be a follow-up to a Non-combatant evacuation operation (NEO). They may be supported by a number of secondary emergency services, such as specialist rescue teams.

A well rehearsed emergency plan developed as part of the preparedness phase enables efficient coordination of rescue.

Requirements for Response Phase

- Well designed Disaster Management Plan (both On-site and Off-site)
- Strong commitment of Management towards safety
- A good Public Address (PA) System in the complex with one or two jeeps with PA system for use in surrounding areas also
- Emergency alarms, and approved emergency control centers and assembly points
- List of key personnel, experts, doctors, village leaders, authorities with their locations and telephone numbers (office, residence as well as cell/mobile phones)
- Written guidelines for the duty team members and well-defined roles of individuals mainly for following sections/activities
 1. Fire fighting
 2. Medical
 3. Rescue
 4. Engineering support

Others not needed to take part in emergency handling operations.

- Standby communication system in case the telephone system is affected
- Division of each mill into 'Safety units' for better safety. Rehearsals of the disaster management plan (disaster control plan) and modifying/ updating the same, if necessary. The timing of events, communication failures etc. should be noted and analyzed for improvement. The plan may therefore, have to be regularly discussed and updated by the management
- Availability of emergency 'Install light' (emergency light) to take care of power failures
- Mutual aid scheme, if feasible
- Provision of antidotes, emergency medicines and beds in nearby hospitals

- Liaison with outside agencies - civic and government authorities for mitigation of effects of a disaster
- Round- the- clock availability of trained first-aid personnel at site and volunteers in the nearby areas
- Vulnerable areas of the plant where disasters (accidental) are likely to originate should be identified and plan measures to deal with the same
- Communication mechanism for raising the alarm as well as that for the interaction within and outside works should be provided.
- Checklist for sequence of operations to be followed should be prepared
- Updating Fire and Safety manuals (Both common and plant wise); Operating and Maintenance Manuals, Warehouse safety manual.
- Chemical Information Sheets (CIS) or Material Safety Data Sheets (MSDS) or Work Practice Data Sheet (WPDS) for all the hazardous substances handled
- Transport emergency cards (Trem-cards) for the products transported by road..

7.11.3 Situation Identification/Assessment

The shift in-charge, who is available in the unit all times, shall identify situation of the hazard or calamity and report immediately the same to the Management. The emergency may be declared in entire unit or part of it, depending upon the situation/nature of disaster. Accordingly, shift in-charge shall also sound the alarm bell to be provided in each of the section.

Under such situation, the shift in-charge or higher authority such as General Manager/Managing Director shall take charge of the situation. He shall initiate all such actions that are essential at each of the sub-unit; which would include-

- Evacuation of all the personnel on the top floor who are not required for controlling the situation, or hazard
- Immediate grasping of gravity of the problem / hazard and issue or giving of instructions to the concerned teams as laid down to act in a manner required to control the situation
- In case of fire, the help of fire force should be immediately sought and put into action. Simultaneously, the workman trained in the fire fighting procedures shall be called to extinguish the fire

7.12 EMERGENCY MANAGEMENT PLAN (ON-SITE)

7.12.1 Emergency Organization Structure

7.12.1.1 Designated persons functions

In addition to the specific responsibilities, assigned to various Team Members, mentioned earlier following are the general functions to be performed by the designated persons-

- To communicate & report the clear position of a disaster to Key persons of the Industry
- To communicate & co-operate with other departments / aspects like security, safety of victims etc.
- To minimize the extent of disaster by taking all possible measures which are in control
- To minimize the exposure of disaster to human beings
- To save property and valuable things as far as possible

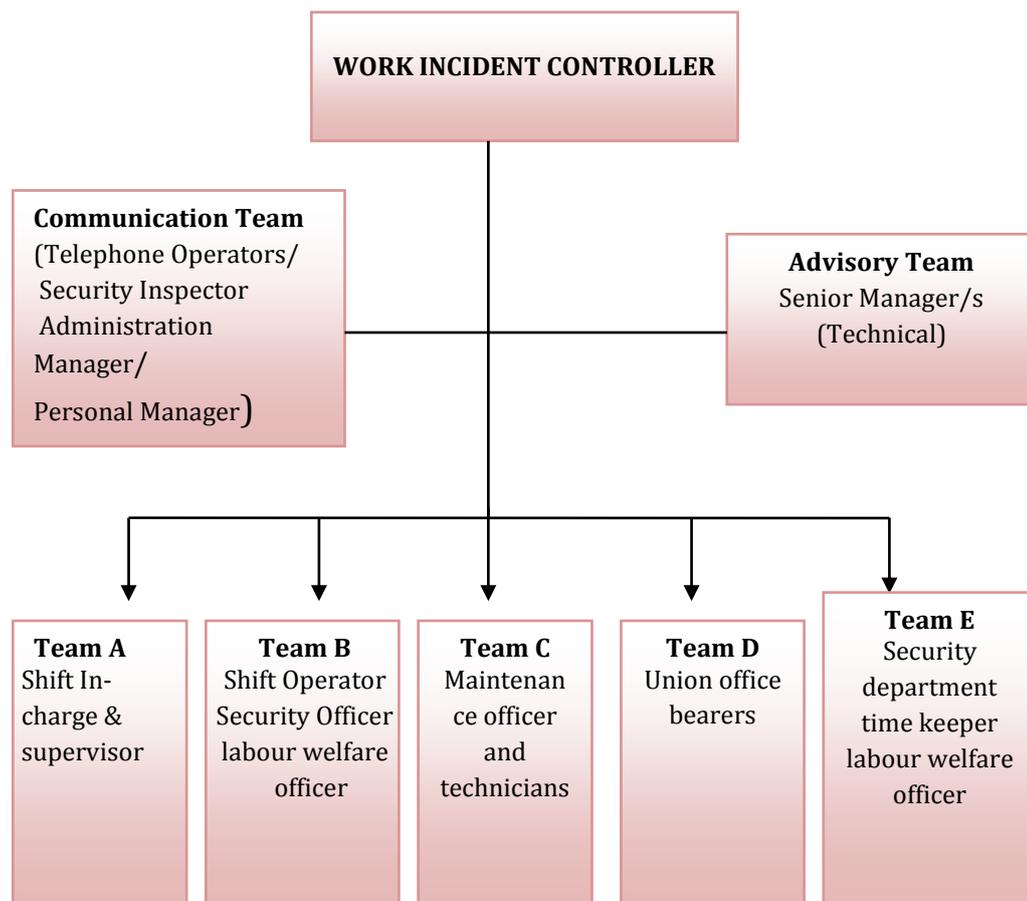


Figure 7.4: Emergency Organization Structure

7.12.2 Shut down in emergency

The probability of fire hazard is presumed to be maximum, in case of proposed unit. The following steps may be followed in such cases.

- Put off the main supply
- **Boiler section**
Shut down the boiler section and control the steam supply/movements.
- **Control room**

The security office shall function as a control room as the same is ideally situated nearer to the main gate and away from the plant. Thus, there shall be no risk as regard to the fire affecting the security office. However, if there should be a situation where / when the entire premises has to be declared as emergency, the control room will operate from the premises, which is outside the main gate.

7.12.3 Personnel evacuation

When a major accident occurs and if there are cases of workmen or supervisory personnel fainting or losing consciousness or any other type of accident, it shall be the responsibility of Team D to evacuate them and to take them to the nearest dispensary after providing necessary first aid. There are well-planned roads in and around the plant and within the mill premises and they should choose the safest and shortest route to come out from the unit. The selected route should be kept clear by Team E at all the times.

7.12.4 Personnel accounting

It shall be the responsibility of the Team E to immediately take stock of the personnel on duty and take a head count. This team shall co-ordinate with Team D to ensure that all the personnel are accounted for. It is also essential for Team E to counter check the security if any visitor or transport workers have entered inside the plant and if so they should also be accounted.

7.12.5 Controlling disaster

The declarer/controller of Disaster shall take steps to train all the teams and shall draw up an "Action Plan" forthwith.

The Shift In-charge shall be designated as "Work Incident Controller" and he shall act as an in-charge at the site of the disaster to control entire operations.

7.12.6 Repairs and safety implements

The declarer / controller of disaster along with the work incident controller shall prepare a list of safety gear, tools and other implements required to control the emergency situations in respect of-

- Fire
- Bursting of Boiler
- Short Circuiting

This list shall be submitted to the respective authorities for approval and the material should be brought immediately. Also, it shall be the responsibility of "Work Incident Controller" to ensure that a separate set of implements, safety gear and tools are placed in a cupboard easily accessible at the work place and these shall be used only when emergency is declared in the plant.

7.12.7 Medical treatment arrangements

The workers need to be trained for first aid and fire fighting procedures, then shifted to the nearest dispensary or treated in the mill dispensary as the case may be.

7.12.8 Training and Rehearsals

It is essential for all the teams to act in uniform and with patience. They are required to be trained to obviate any confusion that might arise due to emergency.

7.12.9 Law and order

The declarer/controller of emergency shall inform Police immediately to ensure that law and order situation will be kept under control. The Joint Director/Assistant Director of Industrial Safety and Health as well as Pollution Control Board authorities shall also need to be informed. In case of casualties, information should be sent to the nearest relatives of the affected people. If, information is to be given to public or press, the public relation manager of the industry is authorized to do the same.

7.12.10 All clear signal

Once the disaster is controlled and the normalcy is restored completely and when the declarer/controller of disaster is of the opinion that there is no further hazard involved and the work can go on normally, he shall then declare all clear signal.

7.12.11 Special handling requirement

- a. Following machines/equipment need to be handled/operated carefully - electrical motor-pumps, mechanical mixers, automatic weighing arrangement, pressure release and safety accessories on steam generating, handling as well as conveyance systems, heat exchangers, condensers and cooling as well as chilling machinery, temperature and pressure gauges
- b. The concerned workers shall be provided with adequate operation and safety tools/equipment.
- c. Adequately trained and qualified workers shall be employed in all sections

□ Risk prone areas

- a) The Distillery Unit
- b) Nearby Residence - Villages located nearby the unit

□ Notification Procedures & Communication Systems

- Communication through Telephone, public address system and Personal Messaging would be employed.

7.12.12 Equipment and facilities in emergency

An emergency cupboard shall be made available at work place. This cupboard should contain certain number of Personal Protective Equipment (PPE), for use in case of disaster. These items kept in the cupboard should be used only during an emergency and not under normal working conditions. A printed or typed list of items available in the cupboard should be displayed on the front of cupboard. The key of emergency cupboard should be available with the Shift In-charge.

This item should be examined once in week/month by safety observer to ensure that all the items are available and that they are in good condition, Items, defective must be replaced immediately.

Use of sign boards in mill premises and allocation/provision of areasuch as -

- Assembly point
- Emergency exit door/Stair case
- Fire alarms
- Fire extinguishers
- Water hydrants
- Emergency control center
- Road closed

7.12.12.1 Firefighting equipment

The firefighting equipment -viz. (1) Fire Buckets, (2) Fire Extinguisher Cylinder; CO₂ Water Expelling type; Class-A, (3) Fire Extinguisher Cylinder; Dry Chemical Powder Type; Class-B & C, (4) Water Connections in sufficient numbers and a 200 Ft. Emergency Water Hose would be provided at required places. Here, various vulnerable locations in the Unit, probable causes & chances of occurrence of fire, its Class, etc. would be given in-depth consideration.

7.12.12.2 Emergency medical supplies

Sufficient number of First Aid Boxes would be located at appropriate and easily accessible locations. The First Aid Box would contain Burn Relief Sprays and Ointments, Bandages, Antiseptic as well as Pain Relief Medicine.

7.12.12.3 Training and Drills

❑ Knowledge of Probable Inflammable Spots

Every worker, working in a particular section, should be given a thorough knowledge of that section. So as to control the spread of accidental fires

❑ Location of Fire Fighting Equipment

Every worker should be given clear-cut information regarding the 'location of Fire Extinguishers, Fire Buckets, Water Points, etc.

❑ Use of Fire Fighting Equipment

Every worker should be trained with respect to nature and utility of Fire Fighting Equipment, its type and class of fire for which it is to be used.

❑ Use of Personal Protective Equipment (PPE)

Every worker would be trained in using the PPE such as safety helmets, hand gloves, nose mask, goggles etc.

7.13 OFF-SITE EMERGENCY MANAGEMENT PLAN

Since the only hazard that expected in the distillery is fire and normally contained within the premises. Hence, no specific Off-site emergency plan is required in this case. However, in rare case if the fire hazard spreads out-side the premises Team E shall communicate to the District Magistrate, Commissioner of the Police, Control Room and inform the situation as Off- Site Emergency. It shall be the responsibility of the Police Personnel to look after the law and order, traffic control, evacuation of workers and other personnel. They should also advise, through public address system, the localities that are likely to get affected and the steps to be taken.

7.13.1 Information to local authorities

It shall be the responsibility of declarer/controller of emergency to inform the local panchayat official regarding the likely hazards from the industry and the steps to be taken when there is an off-site emergency. It is preferable that the local panchayat officials are also trained, on simple protective methods, through demonstrations.