Chapter 6. ADDITIONAL STUDY & DISASTER MANAGEMENT PLAN

6.1. Introduction

Industrial plants deal with materials, which are generally hazardous in nature by virtue of their intrinsic chemical properties or their operating temperatures or pressures or a combination of these. Fire, explosion, toxic release or combinations of these are the hazards associated with industrial plants using hazardous chemicals. More comprehensive, systematic and sophisticated methods of Safety Engineering, such as, Hazard Analysis and Quantitative Risk Assessment have now been developed to improve upon the integrity, reliability and safety of industrial plants.

The primary emphasis in safety engineering is to reduce risk to human life, property and environment. Some of the more important methods used to achieve this are:

Quantitative Risk Analysis: Provides a relative measure of the likelihood and severity of various possible hazardous events by critically examining the plant process and design.

Work Safety Analysis: The technique discerns whether the plant layout and operating procedures in practice have any inherent infirmities.

Safety Audit: Takes a careful look at plant operating conditions, work practices and work environments to detect unsafe conditions.

Together, these three broad tools attempt to minimize the chances of accidents occurring. Yet, there always exists, no matter how remote, probability of occurrence of a major accident. If the accident involves highly hazardous chemicals in sufficiently large quantities, the consequences may be serious to the plant, to surrounding areas and the populations residing therein. It may happen usually as the result of a malfunction of the normal operating procedures. It may also be precipitated by the intervention of an outside force such as a cyclone, flood, earthquake or deliberate acts of arson or sabotage. This chapter deals with the risks associated with the Plant, its mitigation and the Disaster Management Plan.

6.2. Scope of Work

The scope of the study is to model and appraise the risks associated with all toxic and flammable hazards resulting from potential loss of containment accident scenarios from **M/s Sunlight Fuels Pvt. Ltd. (henceforth SLFL)** Operations and developing a Disaster Management Plan.

6.3. Objectives

The specific objectives of the study are to identify:

- Hazardous materials associated with the project
- Potential consequences of identified threats
- Recommend risk prevention and reduction measures to ensure that all risks are within ALARP.
- Defines the actions to be taken in case of emergencies.

6.4. Methodology of HIRA

Hazard Identification and Risk Assessment:

Hazard is defined as a chemical or physical conditions those have the potential for causing damage to people, property or the environment. In this chapter the hazards associated with only the proposed Greenfield project have been discussed.

The primary step of the Hazard identification is the risk analysis and entails the process of collecting information on:

- the types and quantities of hazardous substances stored and handled at the plant,
- the location of storage tanks & other facilities, and potential hazards associated with the spillage and release of hazardous chemicals.

6.5. Identification of Hazards

The main hazard potentials in the proposed Plant, Plant are categorized as below:

- Material hazards; Associated with Hazardous Materials Storage Facilities.
- Process hazardsdue to loss of containment during handling of hazardous materials or processes resulting in fire, explosion, etc.
- Mechanical hazardsdue to "mechanical" operations such as welding, maintenance, falling objects etc. - basically those NOT connected to hazardous materials.
- Electrical hazards: electrocution, high voltage levels, short circuit, etc.

Out of these, the material and process hazards are the one with a much wider damage potential as compared to the mechanical and electrical hazards, which are by and large limited to very small local pockets.

6.6. Hazardous Materials Bulk Storages at the Sunlight Project

The major hazardous chemical to be stored at the SLFL site will be LPG, other Biofuels and other organic/inorganic hazardous chemicals etc. as given below in the Table:

Table 6.1 : Bulk Storages

Sl. No.	FEED/Product Storage	Storage Size (KL)	Please provide the Volume of each Tank
1.	Petrol Day Tank	140	Tank
2.	Petrol Product Tank	950	Tank
3.	Ethanol Blending Tank	50	Tank
4.	Diesel Tank	75 X 2 Nos	Tank
5.	Diesel Product Tank	500	Tank
6.	LPG Bullets	34 X 2 Nos	Tank
7.	Char Storage	275 X 2 Nos	Bins
8.			

6.6.2. Hazardous Analysis of Bulk Storage Materials

SLFL will be usingsome raw materials and LPG as fuels/raw material also, but only few are stored in bulk. Onlysome of theseare listed under “List of hazardous and Toxic Chemicals” category under MSIHC Rules, 1989. The main products are namely Biogasoline and Biodiesels The raw materials and products coming under hazardous category as specified by MSIHC Rules, 1989 (including subsequent amendments) is given in Table below

Table 6.2 : Hazard Analysis of Bulk Storage Materials

S No	Material	S. No & Threshold Quantity (TQ in Kg) as per MSHIC Rules			Chemicals Hazards Potential		Remarks
		Schedule-1, Part-II	Schedule-2, Part-I	Schedule-3, Part-I	Hazards	Toxic DT->---mg/Kg; OT----mg/Kg; IT----mg/l; (Rats)	
	LPG [Mixture of Propane , Butane and other Chemicals] BP:--40 0C; FP (CC):--104 0C LEL:1.9%; UEL:9.5%	----	6 TQ-1: 50 MT TQ-2: 300 MT	Part II ; Group:5 1 TQ-1: 15 MT TQ-2: 200 MT	Concentration in air greater than 10% causes dizziness in few minutes. 1% conc. Symptoms gives the same symptoms in 10 mts.	TLV (ACGIH) : 1000 ppm STEL: 500—1500 mg/m3	Inflammable gas may explode; emits Co & CO2 Flammable gas as per MSIHC Rules
	Diesel CAS No ---- UN No: 1202 Inflammable Light brown Liquid with Diesel like odour BP: 150 -- 400 0C; FP (CC): > 32 0C LEL:0.6 %;	----	----	Part II ; Group:5 5 TQ-1: 2500 MT TQ-2:	Inhalation, Ingestion, Skin Dizziness and headache. Aspiration – Rapidly developing potential fatal chemical pneumonities.	DT->-200 mg/Kg; OT---2800 mg/Kg (Rat); IT----mg/l; (Rats	Inflammable liquid Class 3; Auto ignition temp:257 0C UN No: 1203; Highly Flammable liquid as per MSIHC Rules

	UEL 7.5%			20000 MT			
	Gasoline/ Motor Spirit CAS No 86290-81-5 Inflammable colourless Liquid with gasoline like odour BP: 32--2150C; FP (CC):--43 0C LEL:1.3%; UEL 7.6%	---	7 TQ-1: 5000 MT TQ-2: 50000 MT	Part II ; Group:52 TQ-1: 1000 MT TQ-2: 5000 MT	Toxic vapour/ gas; In high concentration loss of consciousness; coma Vapour Pressure: 300—600 mm (Hg) at 20 0C	TLV (ACGIH) : 300 – 900 mg/m3 STEL: 500—1500 mg/m3	Extremely Inflammable liquid Class 3; Auto ignition temp:2570C UN No: 1203; Extremely Flammable liquid as per MSIHC Rules
	Naphtha CAS No 8052-41-3 Inflammable colourless Liquid with gasoline like odour BP: 35—2050C; FP (CC):50C LEL:1.1%; UEL 5.9%	---	29 TQ-1:10000 MT TQ-2:10000 MT	Part II ; Group:53 TQ-1: 1500 MT TQ-2: 10000 MT	In very high concentration causes loss of consciousness, coma and sudden death. In less severe causes, headache, nausea	DT->---500—5000 mg/Kg (Rat); OT----mg/Kg; IT----mg/l; (Rats)	Very Highly inflammable liquid Class 3; Auto ignition temp:257 to 293 0C UN No: 1255; Very Highly Flammable liquid as per MSIHC Rules

Item	**Physical**		**Impact on Man, Animal & Eco-System**
	Physical	**Chemical**	
Motor Spirit UN No.-1203 Flammable Liquid-Class-3 Hazardous Waste ID No.-17	BP- 32 – 215°C Vapour Pressure (35°C)- 300 - 600 mm at 20°C Specific Gravity- 0.66 – 0.77 at 15°C	LEL -1.3% (V/V) UEL – 7.6% (V/V) Flash Point -- 43°C Auto ignition Temp.- 257°C Stable Compound	Entry through inhalation, ingestion and skin; In high concentration causes loss of consciousness, coma, and sudden death. In low concentration causes headache, nausea, mental

Item	Physical		Impact on Man, Animal & Eco-System
	Physical	Chemical	
Hazchem Code-3Y*E NFPA Hazards Signals Health-1 Flammability-3 Reactivity/ Stabilty-0			confusion and depression. Moderately toxic by inhalation
	Insoluble in water	Incompatible with oxidizing agents.	TLV- 300 ppm; 900 mg/m3 STEL – 500 ppm; 1500mg/m3
	Vapour Density (Air-1)-3 to 4		Contaminated sand, earth or other materials to be moved to safe area.
HSD UN No.-1202 Flammable Liquid-Class-3 Hazardous Waste ID No.-17 Hazchem Code-3Y* NFPA Hazards Signals Health-0 Flammability-2 Reactivity/ Stabilty-0	BP- 150 – 400°C Vapour Pressure (35°C)- <1 mm at 38°C Specific Gravity-0.81 – 0.91 at 20°C	LEL -0.6% (V/V) UEL – 7.5% (V/V) Flash Point > 32°C Auto ignition Temp.-256°C Stable compound	Entry through inhalation, ingestion and skin; Inhalation Effects: Dizziness and headache, Aspiration – Rapidly developing, potential fatal chemical pneumonities Ingestion Effect: Nausea and Vomiting; Contact Effects: Irritation, Eyes-Irritation; Dermatitis may develop on prolonged contact.
	Solubility in water-Insoluble	Incompatible with oxidizing agents.	LD50 (oral rat)- 2800 mg/kg; LD50 -200;TLV(ACGIH)- 5 mg/kg; STEL-10 mg/kg
	Vapour Density (Air-1)-3 to 5		
Naphtha UN No.-1255 Flammable Liquid-Class-3 Hazardous Waste ID No.-17 Hazchem Code-3Y*E NFPA HazardsSignals Health-1 Flammability-3 Reactivity/ Stabilty-0	BP- 35 – 205°C Vapour Pressure (35°C)- 0 - 67 mm at 38°C Specific Gravity-0691 – 0.78 at 15°C	LEL -1.1% (V/V) UEL – 5.9% (V/V) Flash Point 5°C (Typical) Auto ignition Temp.-229 - 293°C Stable compound	Entry through inhalation, ingestion and skin; Inhalation Effects: In very high concentration causes loss of consciousness, comma and sudden death In less severe case causes dizziness, headache, depression and mental confusion. Ingestion Effect: Irritation of gastrointestinal tract with Vomiting, colic and diarrhea; Fatal dose for children-10 to 15gms and adults-350 gms. Contact Effects: Dry and defat skin with dermatitis; Splash in Eyes-Pain and slight transient corneal epithelial disturbances.
	Solubility in water-Insoluble	Incompatible with oxidizing agents.	LD50 (oral rat)- 500 to 5000 mg/kg; LD50 -200;TLV(ACGIH)-500 ppm; 200 mg/kg; STEL- 10 mg/kg
	Vapour Density (Air-1) 2.5 to 4.8		

Hazardous Characteristics of Materials	
Characteristics	L.P.G
Colour / Odour	Colourless / Odourless (but odorized to detect leakage)
TLV (8 hrs. exposure)	1000 PPM
Explosive Range (% v/v in air)	4.9 – 9.5
Mode of entrance	Inhalation
Signs, Symptoms & health hazards	Irritation of eyes & respiratory tract Burning action on skins
PPE	Chemical gloves; PVC Suit; Goggles; Face Shield
First aid	Evacuate to fresh air Flush affected parts with water
Fire Fighting	Cut off supply Use enough water

Both the SLFL products have been mentioned in MSHIC Rules and as such are considered hazardous.

Among the two raw materials (bagasse/ Wheat, Paddy Straw, Millets, Wood Waste, Saw dust, MSW, Elephant grass etc. and.LPG) stored in bulk and these have not been mentioned in MSIHC Rules. LPG is the only gas and is hazardous. The other materials namely Ethanol, Gasoline/Naphtha and Dieselhazardous (flammable) .

The solid raw materials will be received as non-packaged (in bulk) and will be stored in open. The products (liquid) will be stored in tanks and loaded in trucks for dispatch to users. The bulk storages of liquid hazardous materials are given in the Table 7.1.

The solid materials powder or granules spillage can results in polluting small area only. The damage to personnel can be through ingress- dermal (if individual come in contact), oral (if individual food gets infected through fugitive dust) or inhalation (fugitive dust). The main route is fugitive dust which in covered area will move to short distance only.

The risk is through liquid and gaseous materials which are volatile material. The toxic vapours due to spillage of such material can travel to some distance (as they are stored in covered godowns) and cause damage.

6.7. Detailed QRA Approach: Rule Sets and Assumptions

Identification of hazards and likely scenarios (based on Level-1 and Level-2 activities) calls for detailed analysis of each scenario for potential of damage, impact area (may vary with weather conditions / wind direction) and safety system in place. Subsequently each incident is classified according to relative risk classifications provided in Table below as Table 7.3:

Table 6.3 : Risk Classification

Stage	Description
High	A failure which could reasonably be expected to occur within the expected life

Stage	Description
(> 10^{-2}/yr.)	time of the plant. Examples of high failure likelihood are process leaks or single instrument or valve failures or a human error which could result in releases of hazardous materials.
Moderate (10^{-2} --10^{-4}/yr.)	A failure or sequence of failures which has a low probability of occurrence within the expected lifetime of the plant. Examples of moderate likelihood are dual instrument or valve failures, combination of instrument failures and human errors, or single failures of small process lines or fittings.
Low (<10^{-4})	A failure or series of failures which have a very low probability of occurrence within the expected lifetime of plant. Examples of 'low' likelihood are multiple instruments or valve failures or multiple human errors, or single spontaneous failures of tanks or process vessels.
Minor Incidents	Impact limited to the local area of the event with potent for 'knock – on- events'
Serious Incident	One that could cause: 1. Any serious injury or fatality on/off site; 2. Property damage of $ 1 million offsite or $ 5 million onsite.
Extensive Incident	One that is five or more times worse than a serious incident.

Assigning a relative risk to each scenario provides a means of prioritising associated risk mitigation measures and planned actions.

6.7.2. Thermal Hazards

In order to understand the damages produced by various scenarios, it is appropriate to understand the physiological/physical effects of thermal radiation intensities. The thermal radiation due to tank fire usually results in burn on the human body. Furthermore, inanimate objects like equipment, piping, cables, etc. may also be affected and also need to be evaluated for damages. Tables 7.4, 7.5 and Table 7.6 (below), respectively give tolerable intensities of various objects and desirable escape time for thermal radiation.

Thermal hazards could be from fires or explosion. Fire releases energy slowly while explosion release energy very rapidly (typically in micro seconds). Explosion is rapid expansion of gases resulting in rapidly moving shock wave. Explosion can be confined (within a vessel or building) or unconfined (due to release of flammable gases).

BLEVE (boiling liquid expanding vapour explosion) occurs if a vessel containing a liquid at a temperature above its atmospheric boiling point ruptures. The subsequent BLEVE is the

explosive vaporisation of large fraction of its vapour contents; possibly followed by combustion or explosion of the vaporised cloud if it is combustible range.

Thermal hazards have been considered for various scenarios including: Fire in fuel storage tank.

Table 6.4 : Effects due to Incident Radiation Intensity

Incident Radiation kW/m^2	Damage Type
0.7	Equivalent to Solar Radiation
1.6	No discomfort on long duration
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burn are likely).
9.5	Pain threshold reached after 8 sec. Second degree burn after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing etc.
25	Minimum Energy required for piloted ignition of wood, melting, plastic tubing etc.
37.5	Sufficient to cause damage to process equipment.
62.0	Spontaneous ignition of wood.

Table 6.5 : Thermal Radiation Impact to Human

Exposure Duration	Radiation Energy {1% lethality; kW/m^2}	Radiation Energy for 2^{nd} degree burns; kW/m^2	Radiation Energy for 1st degree burns; kW/m^2
10 sec	21.2	16	12.5
30	9.3	7.0	4.0

Table 6.6 : Tolerable Intensities for Various Objects

Sl. No	Objects	Tolerable Intensities (kw/m^2)
1	Drenched Tank	38
2	Special Buildings (No window, fire proof doors)	25
3	Normal Buildings	14
4	Vegetation	10-12
5	Escape Route	6 (up to 30 sec.)
6	Personnel in Emergencies	3 (up to 30 sec.)
7	Plastic Cables	2
8	Stationary Personnel	1.5

6.7.3. Damage due to Explosion

The explosion of a dust or gas (either as a deflagration or detonation) results in a reaction front moving outwards from the ignition source preceded by a shock wave or pressure front. After the combustible material is consumed the reaction front terminates but the pressure wave continues its outward movement. Blast damage is based on the

determination of the peak overpressure resulting from the pressure wave impacting on the object or structure.

As a safety measure SLFL is storing highly hazardous raw materials in isolated places with full safety measures. Damage estimates based on overpressure are given in Table 7.7 below:

Table 6.7 : Damage due to Overpressure

Sl. No	Overpressure (psig / bar)	Damage
3.	0.04	Loud Noise / sonic boom glass failure
4.	0.15	Typical pressure for glass failure
5.	0.5 - 1	Large and small windows usually shattered
6.	0.7	Minor damage to house structure
7.	1	Partial demolition of houses, made uninhabitable.
8.	2.3	Lower limit of serious structure damage
9.	5 – 7	Nearly complete destruction of houses
10.	9	Loaded train box wagons completely demolished
11.	10	Probable total destruction of houses
12.	200	Limits of crater lip

In SLFL case explosion possibility is there due to LPG and other products.

6.7.4. Toxic/ Inflammable Materials Release

Hazardous materials (as per MSIHC Rules) handled and stored in bulk inSLFL proposed complex are Flammable Gas (LPG), Extremely inflammable liquid (Biogasoline) and Highly inflammable liquid (BioDiesels) and other chemical (as detailed in Table 7.1).These materials are stored in bulk (in tank farm).

Damage criteria: For toxic release the damage criteria considered is IDLH concentration (if data are available). In the absence of non-availability of IDLH, 'Inhalation Toxicity (IT) data for rats' are considered.

The Inflammable/Explosive Materials Release& fire--- will cause damage to human and materials due to radiation. The situation will become more complex if thermal radiation on other tanks /materials results in domino effect--- fire or explosion.

6.7.5. Data Limitations

It is also observed that little data or information (regarding physicalproperties required for modelling) is available about for some of the chemicals / mixtures.

6.8. Effect & Consequence Analysis

As a part of risk assessment study, maximum credible accident analysis (MCA) is carried out to determine the maximum loss scenario from this analysis. It is an eventuality, which is possible and will have maximum consequential distances for the particular hazardous chemicals under evaluation.

The selection of the accident scenarios is based on the engineering and professional judgment, accident descriptions of the past in similar type of plants & the expertise in risk analysis studies.

6.8.1. Likely Failure Scenarios

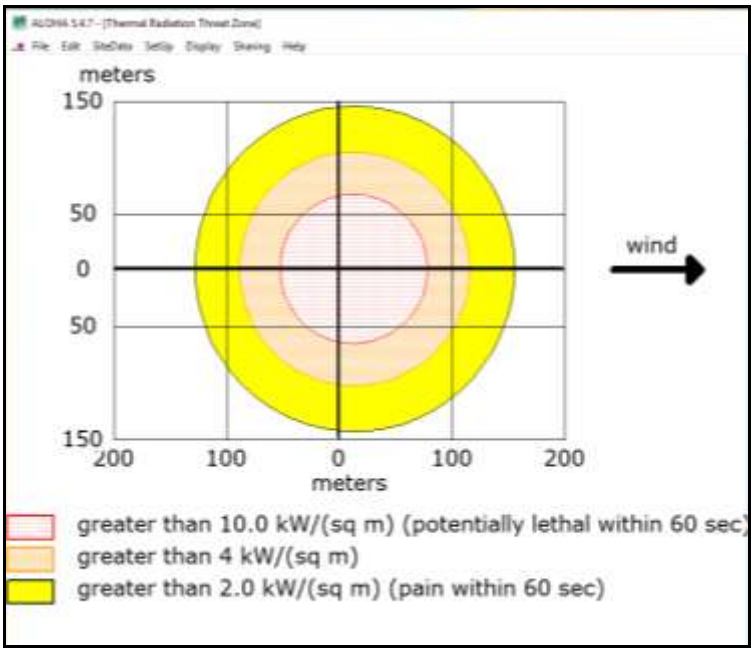
Few likely failure scenarios have been selected after critical appraisal of raw materials and storage inventories. Failure scenarios selected are as given in Table 7.8 below:

Table 6.8 : Different Failure Scenarios

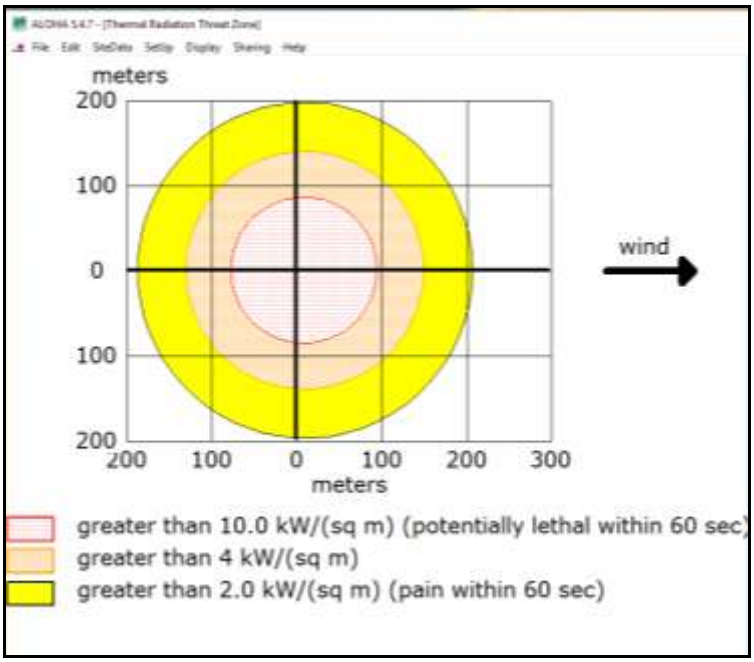
S. No.	Scenario	Remark
Case-1	Petrol Heavy Spillage- Fire	Thermal
Case-2	Diesel Spillage & Fire	Thermal
Case-3	Ethanol Spillage & Fire	Thermal
Case-4	LPG heavy Leakage and Fire	Thermal

Table 6.9 : Hazards Scenario Impact

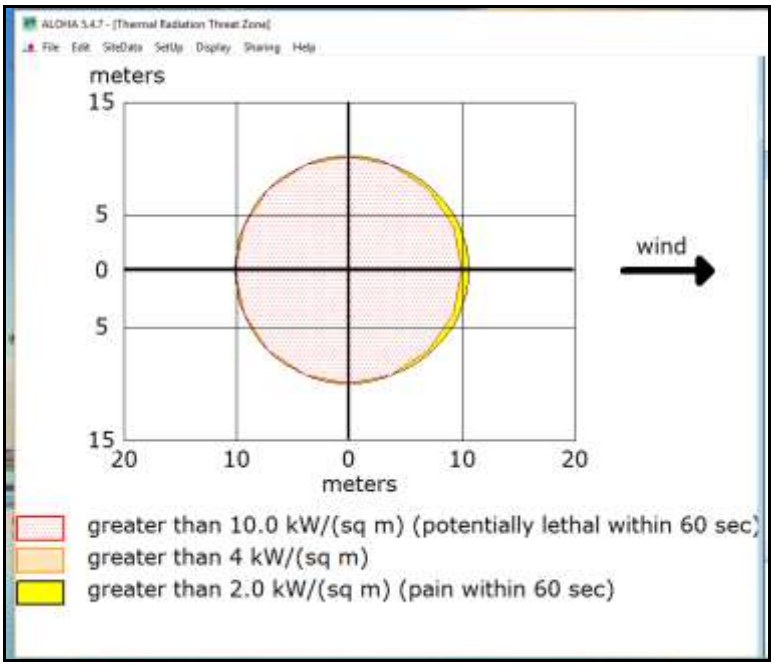
Scenario No.	Scenario	Impact Zone (m)	Remarks
Scenario Raw Material			
Case-1	Petrol Heavy Spillage- Fire	❖ 116	1st Degree Burn; Template- 1
Case-2	Diesel Spillage & Fire	❖ 151	1st Degree Burn; Template- 2
Case-3	LPG Bullet heavy Leakage and Jet Fire	❖ 10	1st Degree Burn Template- 3
Case-4	LPG Bullet Very heavy Leakage- Pool Fire	❖ 26	1st Degree Burn; Template- 4



Template-1 Gasolene Pool Fire---Thermal Impact Zone



Template-2 Diesel Pool Fire---Thermal Impact Zone



Template-3 LPG Jet Fire (~ 3 cm Pipe)—Thermal Impact Zone

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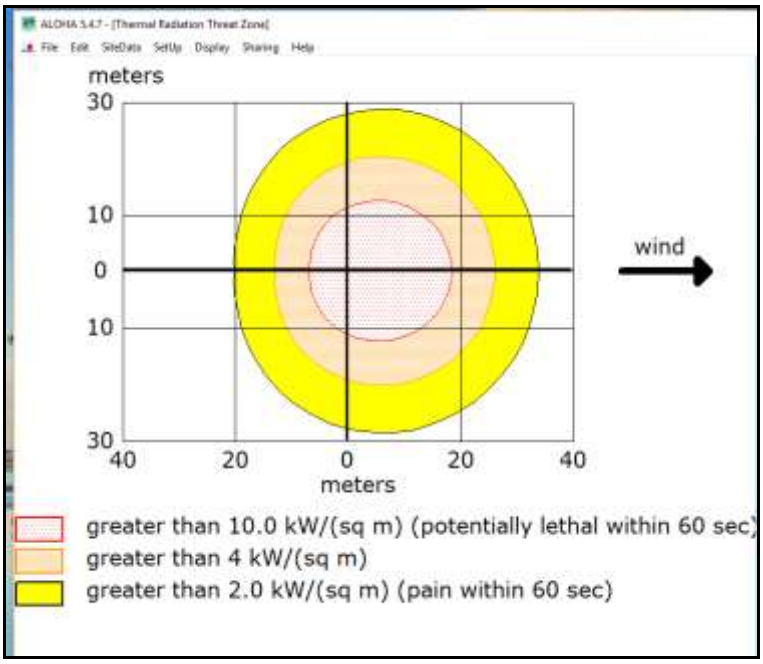

Template-4 LPG Heavy Spillage Pool Fire—Thermal Impact Zone

6.9. Consequence Analysis

Since the materials involved in this study are mostlyinflammable, the possible scenarios are pool fire and Jet fire. Orange colour (IDLH) in the pictures shows predominant effect due to wind direction. Template shows proposed storage tanks failures / hazardous incidents and consequential impact zone.

6.9.1. Toxicity

Toxic hazards are mainly due to toxic chemicals leakage (gas / liquid)and the impact can cross the plant boundary depending upon wind direction.In-case of SLFL the possibilities are remote.

Other hazardous chemicals including products their impact will be limited to spillage area. The acid spillage if comes in contact with metal parts will produce hydrogen which is highly flammable gas. Any person moving in area and getting splash will get the injury. In addition, the spillage will cause pollution problem. The spillage is to be collected and neutralized for toxic contents before disposal.

6.9.2. Thermal Hazards

Thermal hazards are mainly due to solvents/ fuel and other organic chemicals storage which are limited within plant boundary. Thermal impacts are limited to ~ 26 m only (due the LPG pool fire) i.e. within the plant boundary limit. However, the thermal impact can go further due to domino effect.

6.10. Conclusions and Recommendations

Risk Assessment is carried out with the objective to identify the potential hazards from bulk storage facilities. Important conclusions and recommendations arising out of the Risk Analysis for Proposed SLFL project are listed below.

- Thermal radiation from pool fires are well within the boundary.
- It is recommended that the adjacent tanks shall be thermally protected by firewater.
- Use corrosion-resistant structural materials and lighting and ventilation systems in the storage area.
- Storage tanks should be above ground and surrounded with dikes capable of holding entire contents.
- Limit quantity of material in storage up to 80 %.
- Restrict access to storage area.
- Post warning signs when appropriate.
- Keep storage area separate from populated work areas.
- Inspect periodically for deficiencies such as damage or leaks.
- Have appropriate fire extinguishers available in and near the storage area.

The following measures are suggested for reducing the risk involved in pipeline systems.

Preventive Maintenance
Routinely inspect and conduct preventive maintenance of equipment / facilities at the unit.

Instruments:
All the instruments like pressure, temperature transmitters/gauges and alarms switches and safety interlocks should be tested for their intended application as per the preventive maintenance schedule. Similarly, the emergency shutdown system should be tested as per the preventive maintenance schedule.

6.11. Occupational Health and Safety

Safety in the workplace is critical to the success of running a business, no matter what size it is.

All safety gears will be provided to workers and care will be taken by EMC that these are used properly by them. All safety norms will be followed.

Preventing Fires & Explosions

- Fires & explosions in boiler / furnaces can also result from the ignition of volatile materials and fuels. The most hazardous procedures are during the firing- up and shutting-down procedures. The fuel supply to boiler should be fitted with an automatic shut-off mechanism.
- Operators should be trained in safe systems of work. The building should be designed to be non-combustible, with automatic fire suppression engineered or designed into the process where appropriate.
- Risk assessments should be carried out to consider the potential dispersal of toxic chemicals from non-furnace processes & combustion products, and the potential impact of an explosion on the surrounding areas.
- Regular safety audits should be undertaken to ensure that hazards are clearly identified and risk-control measures maintained at an optimum level.
- Boiler/Furnaces should not be operated beyond their safe lives/ safety limits (pressure / temperature).

6.12. Personal Protective Equipment (PPE)

General Provisions
As a supplementary protection against exposure to hazardous conditions in the industry where the safety of workers cannot be ensured by other means, such as eliminating the hazard, controlling the risk at source or minimizing the risk, suitable and sufficient PPE, having regard to the type of work and risks, and in consultation with workers and their representatives, should be used by the worker and provided and maintained by the employer, without cost to the workers.

- Items of PPE provided should comply with the relevant national standards and criteria approved or recognized by the competent authority.
- Those responsible for the management and operation of the personal protection programme should be trained in the selection of the proper equipment, in assuring that it is correctly fitted to the people who use it, in the nature of the hazards the equipment is intended to protect against, and provide adequate comfort, and in the consequences of poor performance or equipment failure.
- PPE should be selected considering the characteristics of the wearer and additional physiological load or other harmful effects caused by the PPE. It should be used,

maintained, stored and replaced in accordance with the standards or guidance for each hazard identified at the facility and according to the information given by the manufacturer.

- PPE should be examined periodically to ensure that it is in good condition.
- Different PPE & their components should be compatible with each other when worn together.
- PPE should be ergonomically designed and, to the extent practicable, should not restrict the user's mobility or field of vision, hearing or other sensory functions.
- Employers should ensure that the workers who are required to wear PPE are fully informed of the requirements and of the reasons for them, and are given adequate training in the selection, wearing, maintenance and storage of this equipment.
- When workers have been informed accordingly, they should use the equipment provided throughout the time they may be exposed to the risk that requires the use of PPE for protection.
- The PPE should not be used for longer than the time indicated by the manufacturer.
- Workers should make proper use of the PPE provided, and maintain it in good condition, consistent with their training and be provided with the proper means for doing so.

Head Protection

- Any helmet that has been submitted to a heavy blow, even if there are no evident signs of damage, should be discarded.
- If splits or cracks appear, or if a helmet shows signs of ageing or deterioration of the harness, the helmet should be discarded.
- Where there is a hazard of contact with exposed conductive parts, only helmets made of non-conducting material should be used.
- Helmets for persons working overhead should be provided with chin straps.
- In addition to safety, consideration should also be given to the physiological aspects of comfort for the wearer.
- The helmet should be as light as possible, the harness should be flexible and should not irritate or injure the wearer and a sweatband should be incorporated.
- All protective headgear should be cleaned and checked regularly.

Face & Eye Protection

- Face shields or eye protectors should be used to protect against flying particles, fumes, dust and chemical hazards.
- Face shields should be used in boiler operations and other hot work involving exposure to high-temperature radiation sources. Protection is also necessary against sparks or flying hot objects. Face protectors of the helmet type and the face-shield type are preferred.
- With the use of face and eye protectors, due attention should be paid to greater comfort and efficiency.
- The protectors should be fitted and adjusted by a person who has received training in this task.

- Comfort is particularly important in helmet and hood type protectors as they may become almost intolerably hot during use. Air lines can be fitted to prevent this.
- Face and eye protectors should give adequate protection at all times even with the use of corrective vision devices.
- Eye protectors, including corrective lenses, should be made of appropriate high-impact material.

Respiratory Protective Equipment

- When effective engineering controls are not feasible, or while they are being implemented or evaluated, respirators, appropriate to the hazard and risk in question, should be used to protect the health of the worker.
- When the hazard and risk cannot be assessed with sufficient accuracy to define the appropriate level of respiratory protection, employers should make positive pressure airsupplied respiratory protective devices available.
- When selecting respirators, an appropriate number of sizes and models should be available from which a satisfactory respirator can be selected. Different sizes and models should be available to accommodate a broad range of facial types. Workersshould be fit-tested for respirators.
- Respirators should be cleaned and sanitized periodically. Respirators intended for emergency use should be cleaned and sanitized after each use.
- The user should be sufficiently trained and familiar with the respirator in order to be able to inspect the respirator immediately prior to each use to ensure that it is in proper working condition. Inspection may include the following :
- tightness of connections;
- the condition of the respiratory inlet and outlet covering;
- head harness;
- valves;
- connecting tubes;
- harness assemblies;
- hoses;
- filters;
- cartridges;
- end of service life indicator;
- electrical components;
- shelf life date;
- The proper function of regulators, alarms and other warning systems.
- Respirators should be properly stored. Damage may occur if they are not protected from physical and chemical agents such as vibration, sunlight, heat, extreme cold, excessive moisture or damaging chemicals.
- Each respirator should be used with an understanding of its limitations, based on a number of factors such as the level and duration of exposure, the characteristics of the chemical and the service life of a respirator.
- Workers should be medically evaluated for their ability to wear a respirator safely before they are required to do so.

Hearing Protection

- When effective engineering controls are not feasible or while they are being implemented or evaluated, hearing protection should be used to protect the health of workers.
- Hearing loss of speech frequencies may occur with elevated long-term exposure to noise. The use of hearing protectors gives the best results to users who are well informed of the risks and trained in their use. If earplugs are used, special attention should be paid to the proper fitting technique.
- Hearing protectors should be comfortable, and the users should be trained to use them properly. Special attention should be paid to possible increased risk of accidents due to the use of hearing protectors. Earmuffs reduce the capacity to locate sound sources and prevent warning signals from being heard. This is especially true for workers with considerable hearing loss.
- No model is suitable for all persons. Those wearing hearing protectors should be able to choose from alternative products that meet the attenuation criteria. Earplugs should not be the only solution as not all people can wear them.
- Hearing protectors should be made available at the entrance to the noisy area and they should be put on before entering the noisy area. Noisy areas should be indicated by appropriate signs.
- The attenuation of hearing protector's works well only if they are well maintained. Good maintenance consists of cleaning, changing replaceable parts such as cushions, and overall monitoring of the state of the hearing protector.
- Hearing protectors should be evaluated through an audiometric test programme for exposed workers.

Protection from fall

- When other measures do not eliminate the risk of falling, workers should be provided with and trained in the use of appropriate fall protection equipment, such as harnesses and lifelines. Workplaces and traffic lanes in which there are fall hazards or which border on a danger zone should be equipped with devices which prevent workers from falling into or entering the danger zone.
- Devices should be provided to prevent workers from falling through floors and openings.
- Safety harnesses should be worn where required and the lifeline should be attached to an adequate anchor point.
- Harnesses should be chosen that are safely used with other PPE that may be worn simultaneously.
- Appropriate and timely rescue should be provided when using fall-arrest equipment to prevent suspension trauma.

6.13. Occupational Health – Proposal for Surveillance

- The choice and the implementation of specific measures for preventing workplace injury and ill health in the work-force depend on the recognition of the principal hazards, and the anticipated injuries and diseases, ill health and incidents. Below are the most common causes of injury and illness:

- Slips, trips and falls on the same level; falls from height; unguarded machinery; falling objects;
- Engulfment; working in confined spaces; moving machinery, on-site transport, forklifts and cranes;
- Exposure to controlled and uncontrolled energy sources; exposure to mineral wools and fibers; inhalable agents (gases, vapors, dusts and fumes);
- Skin contact with chemicals (irritants acids, alkalis), solvents and sensitizers); contact with hot objects;
- Fire and explosion; extreme temperatures; radiation (non-ionizing, ionizing);
- Noise and vibration; electrical burns and electric shock;
- Manual handling and repetitive work; failures due to automation; ergonomics;
- Lack of OSH training; poor work organization;
- Inadequate accident prevention and inspection; inadequate emergency first-aid and rescue facilities; lack of medical facilities and social protection
- Dust may enter into the systemic circulation and thereby reach the essentially all the organs of body and affects the different tissues.
- Working near heavy noise generating equipment may cause hearing and blood pressure related diseases
- Continuous working and improper working position leading to pain & exhaustion.

Plan of evaluation of health of workers

- By pre designed format during pre-placement and periodical examinations.
- Proper schedule will be devised and followed with help of occupational health experts and doctors.
- Health effects of metals used and health hazard plans based on monthly correlation of these metal related diseases and people affected.

Schedule of medical check-up during operational phase

- Comprehensive Pre-employment medical check-up for all employees
- General check-up of all employees once every year.
- Medical examination will be done for all the employees after retirement and all those employees with more than 5 years of service leaving the company. After retirement, medical examination facility will be provided for a period of 5 years.
- Dispensary and ESI facility will be provided to all workers as applicable
- All safety gears will be provided to workers and care will be taken by EMC that these are used properly by them. All safety norms will be followed

6.14. Disaster Management Plan

SLFL isstoring hazardous Chemicals namely LPG (34 T ;Threshold Quantity~15 MT) and Petrol/Gasoline (1090 Mt—Threshold Quantity ~ 1000 Mt) in quantities more than Threshold Limitas specified in MSIHC Rules as shown in Table above.SLFLis to prepare Disaster Management Plan (DMP) and submit it to State authorities (State Pollution Board, Factory Inspector etc.) for approval

This DMP shall be designed based on the range, scales and effects of "Major Generic

Hazards" described in the Risk Assessment and prediction of various hazardous scenarios. The DMP addresses the range of thermal and mechanical impacts of these major hazards so that potential harm to people onsite and off-site, plant and environment can be reduced to a practicable minimum. The scenarios of loss of containment are credible worst cases to which this DMP is linked.

Capabilities of DMP

The emergency plan envisaged will be designed to intercept full range of hazards specific to hazards such as toxic, fire, explosion, major spill etc. In particular, the DMP will be designed and conducted to mitigate the losses of containment situations, which have potentials to escalate into major perils.

Another measure of the DMP's capability will be to combat small and large fires due to ignition, of flammable materials either from storage or from process streams and evacuate people from the affected areas speedily to safe locations to prevent irreversible injury.

Emergency medical aids to those who might be affected by incident heat radiation flux, shock wave overpressures and toxic exposure will be inherent in the basic capabilities.

The most important capability of this DMP will be the required speed of response to intercept a developing emergency in good time so that disasters such as explosion, major fire etc. are never allowed to happen.

Disaster Control Philosophy

The principal strategy of DMP is "Prevention" of identified major hazards. The "Identification" of the hazards will employ one or more of the techniques [e.g. Hazard and Operability Study (HAZOP), accident consequence analysis etc.]. Since these hazards can occur only in the eventof loss of containment, one of the key objectives of technology selection, project engineering, construction, commissioning and operation is "Total and Consistent Quality Assurance". The

Project Authority will be committed to this strategy right from the conceptual stage of the plant so that the objective of prevention can have ample opportunities to mature and be realised in practice.

The DMP or Emergency Preparedness Plan (EPP) will consist of:

- On-site Emergency Plan
- Off-site Emergency Plan

Disaster Management Plan preparation under the headlines of On-site Emergency Plan andOff-site Emergency Plan is in consonance with the guidelines laid by the Ministry ofEnvironment and Forests (MOEF) which states that the "Occupier" of the facility is responsible for the development of the On-site Emergency Plan. The Off-site Emergency Plan should be developed by the Governments district emergency authorities/district collector.

6.14.1. On-Site Emergency Plan

Objectives

The objective of the On-site Emergency Plan should be to make maximum use of the combined resources of the plant and the outside services to

- Effect the rescue and treatment of casualties
- Safeguard other personnel in the premises
- Minimise damage to property and environment
- Initially contain and ultimately bring the incident under control
- Identify any dead
- Provide for the needs of relatives
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected areas
- Preserve relevant records and equipment for the subsequent enquiry into thecause and circumstances of emergency

EMERGENCY LEVELS

Emergencies have been classified into two categories i.e. Nature - I & Nature - II.

Nature - I

Incidents likely to endanger the human lives, plant and equipment within the factory premises and can be controlled by the internal resources and in certain cases with help of Mutual Aid Scheme.

Nature - II

Incidents likely to endanger the human lives, plant and equipment within the factory premises and surrounding area but cannot be controlled by local resources and requires help from the

Collector’s Office, Police Commissioner, Civil Defense Control Room, State Transport Office, Medical help etc. as laid down in the District Contingency Plan.

NATURE - I EMERGENCY

Probable Nature I Emergencies can occur due to:

- Hazardous gas release from plant installations.
- Uncontrollable dry grass fire in the open area.
- Huge fire in factory premises

Occurrence of emergencies shall be made known to all through siren codes. The detailed emergency organisation (ON-SITE) chart is provided below.

CRITERIA FOR NATURE - II EMERGENCY

Plant Manager and & above shall declare Nature - II emergency in consultation with Main Incident Controller based on their experience and criteria as mentioned below:

- Quantity of released liquid/gases either flammable or toxic, depending upon size of vessel and failure mode.
- Effectiveness of measures like

- ✓ Isolation of process
- ✓ Fire propagation and probability of subsequent events.

- Need for Evacuation of neighbouring population and Medical help from the District Contingency Plan Resources.

Nature-II Emergencies may occur due to

- Uncontrollable heavy leakage of from storage Cylinder.
- Severe natural calamities like earthquake & heavy cyclone.

Action Plans

The Action Plan should consist of:

- Identification of Key Personnel
- Defining Responsibilities of Key Personnel
- Designating Emergency Control Centres and Assembly Points
- Declaration of Emergency
- Sending All Clear Signal
- Defining actions to be taken by non-key personnel during emergency

A sample DMP is attached to prepare On site Disaster Management Plan before commissioning the Plant and send to authorities for approval.

6.15. Disaster Management Plan

Disaster/ Emergency Management Plan is essential for a chemical plant as the processes adopted for manufacturing are classified under Factory Act as Hazardous due to handling and storage of toxic, flammable and explosive hazardous materials. Over the years, the chemical process plant has created adequate infrastructure and adopted risk mitigation measures to tackle any emergency that may arise during the manufacturing process. The important aspect in emergency planning is to control an emergency by technical and organizational means, minimize accidents and consequent losses. Emergency planning also brings to light deficiencies, such as, lack of resources necessary for effective emergency response. It also demonstrates the organization's commitment to safety of employees and physical property as well as increases the awareness among management and employees.

Disaster Management Plan for the plant is necessarily a combination of various actions which are to be taken in a very short time but in a pre-set sequence to deal effectively and efficiently with any disaster, emergency or major accident with an aim to keep the loss of men, material, plant/machinery etc. to the minimum.

A major emergency in a hazardous chemical plant is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption of both inside and outside the plant. Sometimes, it would require the assistance of outside emergency services to handle it effectively. Although the emergency at the plant may be caused by a number of different factors, e.g. leakage of toxic and flammable materials from piping/tanks, total/partial power failure, earthquake or sabotage, it will normally manifest itself in fire/toxic release.

Primarily, DMP is prepared to furnish details which may require at the time of the emergency, to delegate responsibility, to estimate the consequences in advance and to prepare ourselves to control any type of emergency. The plan explains basic requirements as follows:

- Definition,
- Objectives,
- Organization set up,
- Communication System,
- Action on site,
- Link with Off-site Emergency Plan,
- Training rehearsal and record aspect.

6.15.1. Definitions

Various definitions on different analogy used on On-site & Off-site Emergency Plan are as follows:

Accident: An accident may be defined as “an undesirable and unplanned event with or without or major damage consequence of life and /or property.

Major Accident: It is a sudden, unexpected, unplanned event resulting from uncontrolled developments during an industrial activity, which causes or has the potential to cause, death or hospitalization to a number of people, damage to environment, evacuation of local population or any combination of above effects.

Emergency: This can be defined as any situation, which presents a threat to safety of person's or/and property. It may require outside help also.

Major Emergency: Occurring at a work is one that may affect several departments within and/or may cause serious injuries, loss of life, extensive damage to properly or serious disruption outside the works. It will require the use of outside resources to handle it effectively.

Disaster: Disaster is a sudden calamitous event, bringing great damage, loss or destruction.

Hazards: Hazard may be defined as “the potential of an accident”. Hazard exists in man and the system of materials and machines.

Chemical Hazards: It is a hazard due to chemical(s) (including its storage, process, handling, etc.) and it is realized by fire, explosion, toxicity, corrosively, radiation, etc.

Risk: Risk may be defined as the combination of consequence and probability or likelihood of an accident being caused in a given man-material – machine system.

On-Site Emergency plan: It deals with measures to prevent and control emergencies within the factory and not affecting outside public or environment.

Off-Site Emergency plan: It deals with measures to prevent and control emergencies affecting public and the environment outside the premises.

6.15.2. Objective of the Disaster Management Plan

The primary purpose of this Disaster Management Plan is to equip the Plant with required resources and information for prompt implementation of the set of actions to be undertaken in the event of an accident posing hazards to the people and community after commissioning of the plant.

The objective of Disaster Management Plan (DMP), for the plant is to be in a state of perceptual readiness through training, development and mock drills, to immediately control and arrest any emergency situation so as to avert a full fledge disaster and the consequence of human and property damage and in the event of a disaster still occurring, to manage the same to that the risk of the damage consequences to life and property are minimized and thereafter, proper rehabilitation, review and revisions of the DMP to overcome the shortcomings noticed are undertaken.

The DMP document is prepared keeping in view and to conform the requirements of the provisions of The Factories Act 1948 under section 41 B (4), Guidelines issued by the Ministry of Environment and Forests, Govt. of India and Manufacture, Import and Storage of Hazardous Chemicals Rules, 1989 amended in 2000, Schedule 11 under Environmental Protection Act 1986.

Following are the main objectives of the plan to:

- Defined and assess emergencies, including hazards and risk
- Control and contain incidents.
- Safeguard employees and people in vicinity.
- Minimize damage to property and/or the environment.
- Minimization of risk and impact of event accident.
- Preparation of action plan to handle disasters and to contain damage.
- Inform employees, the general public and the authority about the hazards/risk assessed and to provide safeguard, and the role to be played by them in the event of emergency.
- Be ready for 'mutual aid' if need arises to help neighbouring unit.
- Inform authorities and mutual aid centres to come for help.
- Effect rescue and treatment of casualties.
- Effective rehabilitation of the affected persons and prevention of damage to the property.
- Identify and list any fatalities.
- Inform and help relatives.
- Secure the safe rehabilitation of affected areas and to restore normalcy.
- Provide authoritative information to the news media.

6.16. Emergency Organization

6.16.1. Incident Controller

Incident Controller's role will be to control the emergency at the incident site

6.16.1.1 *Duties of Incident Controller*

Incident Controller will proceed to the place of emergency after hearing siren/announcement. He will:

- Assess the scale of emergency and decide if a major emergency exists or is likely, accordingly activate emergency procedure.
- Immediately give his feedback to Emergency Control Centre (ECC) regarding emergency.
- Direct all operations within the area with following priorities.
  - Secure the safety of personnel
  - Minimize damage to plant property and environment.
  - Minimize loss of material.
- Direct rescue and firefighting operations till the arrival of the outside Fire Brigade, he will relinquish control to Sr. Officer of Fire Brigade.
- Ensure that the affected area is searched for causalities.
- Ensure that all non-essential workers in the affected area evacuate to the appropriate assembly point.
- Set up communication point to establish Radio/Telephone/Messenger contact as with emergency control centre.
- Pending arrival of works site controller, assume the duties of the post in particular to:
  - Direct the shutting down and evacuation of plant and areas likely to be threatened by emergency.
  - Ensure that the outside emergency services have been called in.
- Ensure that the key personnel have been called in.
- Report all significant development to the Site Main Controller.
- Provide advice and information, as required to the Senior Officer of the Fire Brigade.
- Preserve evidence that would facilitate any subsequent inquiry into the cause and circumstances of emergency.

Dy. Incident Controller will carry out above said duties in absence of Incident Controller.

6.16.2. Site Main Controller

Site Main Controller will be overall in-charge of emergency organization:

6.16.2.1 *Duties of Site Main Controller:*

- Relieve the Incident Controller of responsibility of overall main control.
- Co-ordinate ECC or if required, security for raising evacuation siren and also all clear siren, in case emergency is over.
- Declaration of major emergency ensures that outside emergency services will be called and when required nearby firms will be informed.
- Ensure that key personnel will be called in.

- Exercise direct operational control on parts of the works outside the affected area.
- Maintain a speculative continuous review of possible development and assess these to determine most possible cause of events.
- Direct the shutting down and evacuation of plants in consultation with key personnel.
- Ensure causalities are receiving adequate attention; arrange for additional help if required. Ensure relatives are advised.
- Liaison with Chief Officers of the Fire and Police services for providing assistance in tackling the emergency.
- Ensure the accounting of personnel.
- Control traffic movement within the work.
- Arrange for a chronological record of the emergency to be maintained.
- During prolonged emergency, arrange for the relief of the personnel and provision of catering facilities.
- Contact the local office to receive early notification of impending changes in weather conditions, in case of prolonged emergency.
- Issue authorized statements to the news media and informs H.O.
- Ensure that proper consideration is given to the preservation of evidence.
- Control rehabilitation of affected areas after control of the emergency.

6.16.3. Other Key Personnel

The key personnel required for taking decision about further action for shutting down the plant, evacuate the personnel, and carry out emergency engineering works in consultation with Site Main Controller in light of the information received.

HOD's /Senior Managers/ Section Heads will be responsible for safety, security, fire, gas and pollution control, spillage control, communication system including telephone, wireless etc. Also medical services, transport, engineering, production, technical services, will form part of advising team.

6.16.3.1 *Emergency Response Team*

The role of Emergency Response Team members is to actually combat the emergency at the site and control the emergency situation and carry out rescue operations.

All team members will be thoroughly trained to deal with fires, explosions, chemical spills and atmospheric releases, first aid. As per priority list during emergency, the activities will be carried out as per emergency control plan.

6.16.3.2 *Emergency Personnel's responsibilities Outside Normal Working Hours of the Factory.*

The duties of Shift In-charge & **team members** have been brought out in emergency control plan. **All team members** after evacuating the area shall report to ECC/ Incident Place. The non-essential workers shall be evacuated from the plants if need arises and this will be determined with the forcible rate with which incident may escalate. Non-essential workers shall assemble at the earmarked/specified point of assembly.

6.16.3.3 *Assembly Points*

At the proposed plan, at least 2 assembly points will be identified and marked properly.

6.16.4. Emergency Control Centre

It will be headed by Site Main Controller, HOD – PD, HOD- P&A and it is sited in **Office of Site Main Controller in Admin Building** & **New security office** (after office hours), which is readily accessible & with minimum risk, equipped with telephone facilities and other announcements extra communications facilities needed. It has enough means to receive and transmit information and directions from site main controller to incident controller and other areas. In emergency control center due to its safer location and advantage of easier accessibility, all necessary personnel protective equipment's firefighting extinguishers will be stocked in sufficient quantity.

6.16.4.1 *Role of Emergency Control Centre*

In case of mishap or accident like fire, toxic gas leakage, explosion in the factory, The Emergency Control Center will be Office of Head- Operations

- The plot plan indicating all the activities in the factory premises including that of storage's utility services, production area, administration, will be kept for ready reference, showing the location of fire hydrant and firefighting aids.
- Normal roll of employees, work permits, gate entries and documents for head count, employees blood group, other information and addresses will be available and the person, who will handle this operation will HOD P & A.
- Stationery required is available in the Control Centre (ECC) and HOD (P & A) looks after it
- The requirement of personnel protective equipment and other material, like torches, have been worked out and the quantity required during emergency will be kept in the Control Room (ECC). The responsible person for maintaining the said requirement/inventory will be HOD- HSE.

6.16.5. Fire & Toxicity Control Arrangements

The plant will be well equipped with suitable numbers of firefighting and personnel protective equipment. The staff will be trained regularly to handle the various emergency situations.

6.16.6. Medical Arrangements

Availability of first aid facilities in sufficient quantity will be always ensured. In case of emergency arrangements will be made to avail outside medical help immediately. Emergency transport facility will be available.

6.16.7. Transport & Evacuation, Mutual Aid Arrangements:

Transport & Evacuation and Mutual Aid arrangements will be available in the factory.

6.17. Communication System

6.17.1. Declaring the Emergency

In case of any emergency in the plant, speedy and effective communication of the same to all concerned in least possible time is the most important aspect of any emergency-handling plan. An early communication increases the chances of control of emergency in the bud stage. Blowing siren will be adopted as method of communication of emergency, to all employees in the plant.

6.17.1.1 *Types of Sirens*

Three different types of sirens have been identified for communication of emergency.

Alert Siren: Single Continuous Siren for One Minute. This indicates that there is some accidental happening in the plant. All have to become alert. Incident controller will be rush to the site of emergency. Plant area people have to start safe shut down. Rescue team and other emergency control teams have to reach at the site of emergency.

Siren for evacuation: wailing & waning siren for three minutes. This siren indicates that emergency is of serious proportion and everybody has to leave his work place. All people having their role in emergency control have to assume their assigned role. All non-essential workers have to proceed immediately to assembly area and wait for further instruction.

All clear siren: Long continuous siren for two minutes. This is a sign of return of normalcy. On hearing this siren everybody should go back to his or her respective workplace.

6.17.1.2 *Location of Siren*

Siren will be located in center of the pant for wide coverage of the whole campus. Switch for siren will be provided at security gate. The switch at Security gate should be operated only as a general rule.

Emergency manual call bell will be installed which will be used in case of total failure of electricity. It is responsibility of HOD (HSE) to maintain the upkeep of electric call bell and HOD-Security and administration to maintain manual and Hand operated siren.

6.17.1.3 *Raising Alarm*

Any person noticing any emergency situation in the plant should immediately call security gate with following information:

- Identify oneself
- State briefly the type of emergency i.e. whether fire, explosion, toxic gas release etc.
- Give the location of the incident
- Estimated severity of the incident.

Security personnel after ensuring genuineness of the call shall raise the ALERT SIREN. At the same time he will also contact the incident controller and ECC in order and inform about the incident. He will keep the gate open and rush his two security personnel at the site of emergency.

ECC will be located at the office of Head- Operations on normal working hours and at Security gate after normal working hours (during night). ECC shall be immediately manned on hearing alert siren. If the authorized people to handle ECC are not available, any senior most people out of the available person nearby shall occupy ECC till authorized person comes.

Incident controller, on hearing alert siren or by any other way of information of the emergency, will immediately reach at the site of incident and assess the situation. He will immediately give his feed back to ECC. ECC shall direct security gate to raise evacuation siren, if the need arise.

SIREN FOR EVACUATION shall be raised on instruction from Site Main Controller or any Manager of the plant in the ECC.

Security gate person will be authorized to raise ALL CLEAR SIREN on instruction from Site Main Controller or ECC, after the emergency is over.

Incident controller shall assume the responsibility of site main controller in his absence

6.17.2. Internal Communication

It shall be responsibility of ECC to communicate to all employees in the plant. They may take help of telephone operator for such communication. However, telephone operator can directly communicate information about emergency to all internal departments, if such message comes from incident controller or site main controller. Telephone operator will continue to operate the switchboard advising the callers that staffs are not available and pass all calls connected with the incident to ECC.

6.17.2.1 *Availability of Key Personnel outside Normal Working Hours*

The details of key personnel availability after working hours will be made available at Security Gate, ECC, telephone operator as well as production units. Security personnel shall call required key personnel from their residence in case emergency occurs outside normal working hours. Availability of emergency vehicle / Ambulance will be ensured to fetch the key personnel residing outside. It will be the responsibility of HOD (P & A) to maintain it.

6.17.2.2 *To the Outside Emergency Services*

Decision to call outside help to deal with emergency like fire brigade, ambulance, police, etc., shall be taken by Site Main Controller. However, in absence of Site Main Controller, if the incident controller realizes the situation going out of control, he may ask for immediate help from outside. ECC will be responsible for calling help from outside. A list of emergency services available in the area with their telephone numbers will be provided at ECC, at Security gate and with telephone operator. Facilities such as phones, emergency vehicle, and security personnel will be available to help calling outside emergency services and authorities.

6.17.3. Communication to the Authorities

The emergency will be immediately communicated to the government officers and other authorities such as SPCB, police, district emergency authority, Factory Inspectorate, hospital etc. by Emergency Control Centre.

6.17.3.1 *To Neighbouring Firms & the General Public*

In case of emergency having its outside impact, public will be cautioned regarding the same. Co-ordination of police will be sought for speedy action. This is to be ensured by ECC.

6.18. Pre-emergency activities

Internal Safety survey with regard to identification of hazards, availability of protective equipment's, checking for proper installation of safety devices will be carried out periodically.

- Periodic pressure testing of equipment
- Periodic pressure testing of lines.
- Periodic safety/relief valve testing
- Periodic fire hydrant system testing.
- Mock drill to check up level of confidence, extent of preparedness of personnel to face emergency is being contemplated.
- Regular training is being imparted to all personnel to create awareness.
- Adequate safety equipment will be made available.
- Periodic check-up of emergency lights.
- Safer assembly points will be identified.
- Storage of adequate first aid treatment facilities.
- Statutory information is imparted to workers.
- Post emergency activities:

Following post emergency actions will be carried out to study in detail and preventive measures to be taken.

- Collection of records.
- Inquiries
- Insurance claims
- Preparation of reports comprising suggestion and modification.
- Rehabilitation of affected personnel.
- Normalization of plant.

6.18.1. Evacuation and Transportation

In case of emergency, evacuation and transportation of non-essential workers will be carried out immediately. The affected personnel will be transported for medical aid.

6.18.2. Safe Close Down

During emergency plant shut down will be carried out if situation warrants. This will be as per the instruction of site main controller under guidance of incident controller.

6.18.3. Use of Mutual Aid

Mutual aid agreement with nearby industries will be ensures to provide help to each other in the emergency,

6.18.4. Use of External Authorities

As and when necessary, statutory authorities, police, pollution control personnel, medical aid/ center, ambulance etc. will be contacted.

6.18.5. Medical Treatment

The affected personnel will be brought to safer place immediately to give them first aid. Immediate medical attention will be sought.

6.18.6. Accounting for Personnel

Proper accounting for personnel will be laid down in all the shifts. The number of persons present inside the plant premises, their duty etc. will be available with the P & A. This record will be regularly updated and will be made available.

6.18.7. Access to Records

The relatives of affected personnel will be informed. The details regarding all employees will be made available to Administration building.

6.18.8. Public Relations

In case of emergency, Manager P & A will be available for official release of information pertaining to the incident.

6.18.9. Rehabilitation

The affected area will be cleared from emergency activities only after positive ascertaining of the system in all respects. The entry to affected area will have to be restricted until statutory authorities visit and inspect the spot of incident. Nothing should be disturbed from the area till their clearance. The site main controller will be in charge of the activities to be undertaken.

The plan will cover emergencies, which can be brought under control by the works with the help of emergency team/fire services. The DISASTER CONTROL PLAN for gas leak and fire will be prepared for entire factory.

6.19. Causes of Emergency:

6.19.1. Risk

6.19.1.1 *Nature*

In the plant, the nature of dangerous events could be of the following:

- FIRE : Chemical/Electrical
- TOXIC RELEASE : From chemicals & Chlorine gas.
- LEAKAGES : Equipment, pipe lines, valves, etc.

Release of vapors like chlorine / bromine gas or hexane can result in highly toxic environment or in fire or explosion.

- Improper handling of products (raw materials/finished products)
- Large spillage to ground floors resulting in pollution & fire.

- Failures of Equipment / Instruments.
- Release of safety valves or ruptures of vessels due to excessive pressures.

6.19.1.2 *Various Emergency Actions*

a. Onsite

- Safe shut down of the plant and utilities.
- Emergency control measures.
- To attempt with the help of trained crew in firefighting to contain the fire spread up/gas emission and limit within limited space.
- To cut off source of oxygen by use of firefighting appliances/to cut off source of gas emission.
- Cut off fall sources of ignition like electrical gadgets.
- To protect fire prone area from the fire.
- To remove material which can catch fire to the extent possible from fire prone area.
- Evacuation of non-essential persons.

b. Medical Facilities/Treatment

- The Plant will have a Health centre which is manned with trained male nurse on continuous basis who can render medical first aid. Doctor will visit two times a week for two hour each time. The Plant is searching for a full time medical officer and will appoint as and when available.
- Depending on seriousness the injured person shall be shifted to any other hospital.
- Vehicle will be available round the clock for transportation. Ambulance will be also made available in the campus on regular basis.

c. In the event of Fatal Accidents

The information shall be given to following authorities:

- Inspector of Police
- Inspector of Factories
- Mamlatdar
- Corporate Office
- Regd. Office
- Insurance the plant
- Regional Officer, SPCB

d. Emergency Siren

Emergency siren shall be blown for announcing the emergency which shall have different sound for identification/differentiation than the normally used for commencement of factory working etc.

- Location of Siren — Above Plant.
- Type of Siren — Industrial Siren
- Position of siren switch — Located at Main Gate

e. Seeking Help From Neighbouring Industries / Sources For Fire Engine

f. Advise for vacation of other areas

Since the effect of fire/gas emission shall be contained within the area of the plant advice of vacation of other areas is not necessary.

6.19.1.3 *Response Time-Minutes*

Hazard	**Fire Fighting**	**Police**	**Medical Services**
Fire & Explosion	Immediate with whatever facilities available with the plant	10 minutes	10 minutes
	External Help within 15 minutes		

6.20. Off-Site Emergency Plan

6.20.1. Need of the Site Emergency Plan

Depending upon the wind direction and velocity of the effects of accident in factory may spread to outside its premises. To avert major disaster it is essential to seek guidance/assistance of statutory authorities, police and health department. The movement of traffic may have to be restricted.

Required information will be given to the authority and consultation will be sought for remedial measures.

A purpose of the off-site emergency plan is:

- To provide the local/district authorities, police, fire, brigade, doctors, surrounding industries and public the basic information of risk and environmental impact assessment and appraise them of the consequences and the protection/prevention measures and to seek their help to communicate with public in case of major emergency.
- To assist district authorities for preparing the off-site emergency plan for district or particular area and to organize rehearsals from time to time and initiate corrective actions on experience.

6.20.2. Structure of the Off-Site Emergency Plan

Available with concerned authorities.

6.20.3. Role of the Factory Management

The site main controller will provide a copy of action plan to the statutory authorities in order to facilitate preparedness of district/area off-site emergency plan.

6.20.4. Role of Emergency Co-ordination Office (ECO):

He will be a senior police or fire officer co-ordination with site main controller. He will utilize emergency control center.

6.20.5. Role of Local Authority

Preparation of Off Site Plan lies with local authorities. An emergency-planning officer (EPO) works to obtain relevant information for preparing basis for the plan and ensures that all those organization involved in offsite emergency and to know their role and responsibilities.

6.20.6. Role of Fire Authorities:

The fire authorities will take over the site responsibility from incident controller after arrival. They will be familiarized with site of flammable materials, water and foam applies points, firefighting equipment.

6.20.7. Role of the Police and Evacuation Authorities:

Senior Police Officer designed, as emergency co-ordination officer shall take over all control of an emergency. The duties include protection of life, property and control of traffic movement.

Their functions include controlling standards, evacuating public and identifying dead and dealing with casualties and informing relatives of dead or injured.

There may be separate authorities/agencies to carry out evacuation and transportation work.

Evacuation depends upon the nature of accident, in case of fire only neighboring localities shall be alerted. Whole areas have to be evacuated in case of toxic release.

6.20.8. Role of Health Authorities

After assessing the extent of effect caused to a person the health authorities will treat them.

6.20.9. Role of Mutual Aid Agencies

Various types of mutual aid available from the surrounding factories and other agencies will be utilized.

6.20.10. Role of Factory Inspectorate

In the event of an accident, the Factory Inspector will assist the District Emergency Authority for information and helping in getting Neighboring Industries/mutual aid from surrounding factories.

In the aftermath, Factory Inspector may wish to ensure that the affected areas are rehabilitated safely.

6.21. Mock Drills and Records

6.21.1. Need of Rehearsal & Training

Regular training and rehearsal program of emergency procedures shall be conducted with elaborate discussions and testing of action plan with mock drill. If necessary, the co-operation/guidance of outside agencies will be sought.

6.21.2. Some Check Points

- The extent of realistic nature of incidents.
- Adequate assessment of consequences of various incidents.

- Availability of sufficient resources such as water, firefighting aids, personnel.
- The assessment of time scales.
- Logical sequences of actions.
- The involvement of key personnel in the preparation of plan.
- At least 24 hour's covers to take account of absences due to sickness and holiday, minimum shift manning.
- Satisfactory co-operation with local emergency services and district or regional emergency planning offices.
- Adequacy of Site.

6.21.3. Records and Updating the Plan

All records of various on-site and off-site emergency plans of the factory will be useful alone with those of the factors by which statutory authorities draw a detailed plan for the whole area/district. The records of the activity will be updated regularly.

6.22. Public Hearing

Public Hearing for proposed Biomass based Renewal Fuel Plant of M/s Sunlight Fuel Pvt. Plant at Village-Bhikhpur, Tehsil-Hargaon, distt Sitapur U.P. was organized by Uttar Pradesh Pollution Control Board on 12th April 2019 as per the EIA Notification 2006, amended on till date. Public hearing was conducted at project site, Village Bhikpur, Tehsil Hargaon, District Sitapur, UP.

Additional District Magistrate - Sitapur presided over the Public Hearing (PH). Assistant director, District Industry Center, Sitapur, Regional Officer and other officials of Uttar Pradesh Pollution Control Board were also present in the public hearing.

Village people and representatives attended the public hearing. Relevant details about land, process, pollution control measures, CSR and environmental management plan were read out at the beginning of the public hearing. No written complaint was received by the SPCB before and during the public hearing. No objections were raised by the people present during the public hearing. About 8 people spoke and put their queries / views and suggestions during public hearing. The Proceedings of the Public Hearing is attached. as **Annexure- IV**. Following queries / views and suggestions were raised by the public and the response of the project promoter is presented below:

S.N	Name and address of person	Objections/suggestion	Reply by company representative
1.	Shri Ram Chandra S/O Sita Ram, Village Kewatikhurd, Bhikhpur	What type of benefits will we get due to establishment of the project,	The project will generated permanent employment which will be given to local peple as per their skill and experience. Beside this indirect employment opportunity will also generated in the area.

2.	Shri Munna S/O Parmeshwar, Village Kewatikhurd, Bhikhpur	How local people will get benefitted due to establishment of the project,	The establishment of the project will generate permanent employment which will be given to local peple as per their skill and experience. Further undr Company CSR policy health checkup of the local people, Community plantation etc. shall be done by the project proponent,
3.	Sh. Lalta Prasad S/o Sh. Chhote Lal Verma, Village-Bhikhpur, Tehsil-Hargaon, District-Sitapur, U.P.	He said that, what control measures will be followed to control the waste water pollution from the proposed new project activities.	Environmental Consultant replied that Treatment Plant of adequate capacity will be installed for the proposed new project. Treated effluents will be used for irrigation purpose for gardening within the plant premises. No effluents shall be allowed to discharge outside the plant premises as the proposed new project will follow the 'Zero Liquid Discharge' (ZLD) System.
4.	Sh. Puran Lal S/o Sh. Ram Avtar, Village-Bhikhpur, Tehsil-Hargaon, District-Sitapur, U.P.	He said that our land is being acquired for the new project, so the justified compensation must be given to us for our acquired land.	Project representative Sh. Chand Verma replied that compensation shall be given more than the Circle rate for their acquired lands and a justified compensation amount will be paid to the farmers for their lands.
5.	Sh. Moti Lal S/o Sh. Badda, Village-Bhikhpur, Tehsil-Hargaon, District-Sitapur, U.P.	He said that what type of health facilities shall be provided to the nearby villagers	Project representative replied that one Hospital facility will be provided in the industrial premises and the medical treatment facilities will be provided to the nearby villagers on minimum charge basis.
6.	Sh. Ram Chandra S/o Sh. Sitaram, Village-Kewati Khurd Bhikhpur, Tehsil-Hargaon,	He said that what mitigation measures will be followed to control the stack emissions in the proposed new project.	Project representative replied that a Boilers of 26.5 TPH capacity of each will be installed in the proposed new project and a 72 M high stack for the gaseous emission discharge and

	District-Sitapur, U.P.	He also said that the roads are narrow in the area and people are facing traffic congestion during their movement. He also asked about any proposal for road expansion in the proposed new project activities.	Electrostatic Precipitator (ESP) will be installed to control the air pollution. Stack emission will be controlled as per the prescribed Board Standards. Traffic congestion may be occurring due to narrow roads in the proposed project premises; the company will undertake the road expansion so the local people will not face such type of problems.
7.	Sh. Ram Karan-Regional Officer-UPPCB	He said that ambient air quality (AAQ) might be affected due to the movement of trucks and other vehicles in the industry premises so, what air pollution control measures will be followed during the proposed new project activities.	Project representative Sh. Chand Verma replied that a pucca vehicle parking platform will be constructed and water sprinkling will be undertaken regularly to minimize the air pollution due to the vehicular movement in the new project premises.
8.	Sh. Nadir S/o Sh. Nazim Khan, Village-Bhikhpur, Tehsil-Hargaon, District-Sitapur, U.P.	He said that, whether the company will provide the electricity to the local people.	Project representative replied that captive Power generation is proposed to be installed for their own uses initially the electricity will be taken from State Power Grid for the project. D.G. Set of 2.0 MW is proposed to be installed for emergency power shut downs and it is not possible to facilitate the nearby villagers for power supply from proposed project.