RISK ASSESSMENT REPORT &

DISASTER/EMERGENCY MANAGEMENT PLAN

1.1 GENERAL

A risk assessment is simply a careful examination of what, in work/operation, could cause harm to people/employee or surrounding, so that one can weigh up whether the system/management have taken enough precautions or should do more to prevent harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures. Accidents and ill health can ruin lives and affect company's business too if output is lost, machinery is damaged, insurance costs increase or it have to go to court. Any company is required to assess the risks in its workplace so that it put in place a plan to control the risks.

Risk assessments include detailed quantitative and qualitative understanding of risk, its physical, social, economic and environmental factors and consequences. It is a necessary first step for any serious consideration of disaster reduction strategies. Risk assessment encompasses the systematic use of available information to determine the likelihood of certain events occurring and the magnitude of their possible consequences. As a process, it is generally agreed that it includes:

- Identifying the nature, location, intensity and probability of a threat;
- Determining the existence and degree of vulnerabilities and exposure to those threats;
- Identifying the capacities and resources available to address or manage threats; and
- Determining acceptable levels of risk.

1.2 OBJECTIVE, SCOPE & METHODOLOGY OF RISK ASSESSMENT

1.2.1 OBJECTIVE :

The key objectives of the present Hazard Identification & assessment and Risk Assessment (RA) study is to establish probable damages as a result of major hazards associated with various component of the proposed project of manmade fibre production through continuous polymerization. The primary objective of the present study is to identify major hazards & associated risks due to operations production of manmade fibre, storage & use of raw materials/chemicals, use of fuel for utilities of proposed project and to evaluate consequences of identified hazards. Lastly the object of the present study is to suggest general &effective mitigation of hazards identified, designing /updating of disaster & emergency management plan, minimum preventive and protective measures etc. to ensure safety.

1.2.2 SCOPE:

As the project is of manmade fibre the scope of the work has been determined with following details of probable hazards & associated risk:

A. Probable fire incident, mainly Pool Fire, in HSD storage area.
B. In general, the chemicals listed above may have risk of employee health as any chemicals may have more or less health effects due to dispersion in atmosphere (as gaseous or as particulate) if not managed properly

Considering the above facts of proposed project the scope of present study has been determined as described below.

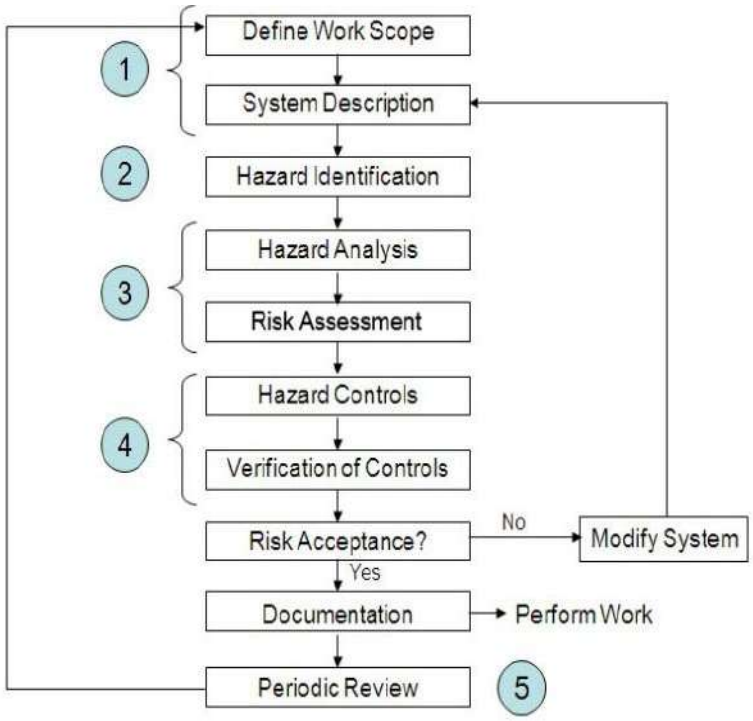
The primary scope of the present study is limited to identification of major areas of hazards, Hazard identification/Identification of failure cases, Consequence analysis of probable risks / failure cases, chemical risk assessment and plant risk assessment/evaluation for proposed expansion & backward project based on Continuous polymerization process. The scope of the present Risk assessment study is on the basis of the above evaluation & risk acceptability as well as preventive, protective & control measures provided in existing plant.

Secondarily, the scope of study is to suggest general hazard specific minimum control, preventive & protective measures to be taken to minimize risks to maximum possible extent. As an integrated part of risk management, the scope of the present report is also to modify the existing Disaster management plan including emergency action plan by suggesting other measures to further lower the probability of risk.

1.2.3 METHODOLOGY

The procedure used for carrying out the Quantitative Risk Assessment (QRA) Study for risk management in industrial unit includes various tasks, which starts from defining scope & then system study, hazards identification & assessment, consequence analysis, risk assessment and planning of risk management system as well as emergency plan. The process is illustrated below in pictorial form for ready guide for methodologies adopted and level of various tasks associated with QRA.

Figure 1. Flowchart of Methodology Adopted For Risk Assessment



1.3 ABOUT THE COMPANY

1.3.1 THE COMPANY

M/s. Geelon Industries Pvt. Ltd. is the venture of Gandhi Group if industries. The company operates its plant in Silvassa at Village- Athal, Naroli, U.T. of Dadra and Nagar Haveli. The companies' office is based in Surat. Gandhi Group of industries commenced business in the year of 1987 in the textile business specializing in polyester clothes. The year 1990 was the year when our company started manufacturing texturized yarn. 1994 was the year when our company started export of fabrics and also increased the manufacturing capacity of texturized yarn. 1998 was another important turning point in our company when the company started importing polyester yarns from various countries after which in year 2000 the company started importing raw material of polyester yarn (polyester chips).

The Gandhi Group of industries is promoted by Gandhi Family that has rich history in the field of textiles and yarns. They have been in the current business more than 20 years and have thus acquired extensive experience in the sector. This helps them make optimal decisions in the interest of the company, and also sustain its competitive advantage. The Company has transformed from a family managed company into a best-in-class professional company. The entire top management and middle management are highly experience and come from excellent backgrounds. This provides an edge to the company in this highly competitive world. To sum up, the company is strong footed and

charting an aggressive path of growth through continuous innovation, backward and forward integration and addition of new capacities.

M/s. Geelon Industries Pvt. Ltd. is an existing Company having its unit located at Survey no. 255/1/16 & 255/1/17P, B/h IPCA Labs, Industrial Zone, Village- Athal, Naroli, U.T. of Dadra and Nagar Haveli -396230, engaged in manufacturing of "Synthetics Filaments Yarns(i.e., Partially Oriented Yarn (POY), Texturised and Twisted Yarn). All our products go through strict quality control process before it reaches the customer and our team ensures that quality control is being practiced throughout the plant. We possess an in-house hi-tech quality control lab with all modern equipment required to measure quality of the product as per international standards. The company recently appointed an ISO 9001-2008 certificate for accrediting the quality standards maintained by the company and take our quality controls to next level. Quality of our products is well recognized in national as well as international markets and is thus able to fetch us better price compared to our competitors. Approximately 10 percent of the company's production exported to various countries including Egypt, Turkey, Syria and Korea.

Now we are going for expansion by capacity enhancement in the same products "Synthetics Filaments Yarns (i.e, Partially Oriented Yarn, Polyester Filament Yarn, (POY) Textured Yarn and Twisted Yarn)" within the existing premises. The company will start its operation for proposed project after obtaining the EC and other statutory clearances/ consents/ permissions.

1.3.2 NUMBER OF EMPLOYEES EMPLOYED

The company will provide employment to 150 people in different categories for operation of proposed project in addition to the existing employment of 175 Person. The details of the proposed employment structure are presented below in tabular form.

Human Resource:

Table 1: Details of Human Resources

Sr. No.	General	1st Shift	2nd Shift	3rd Shift	Total
Skilled	7	10	10	10	**37**
Semi-Skilled	0	27	27	27	**81**
Un-Skilled	0	7	7	7	**21**
Managerial	11	0	0	0	**11**
Total	**18**	**44**	**44**	**44**	**150**

(**Note:** Figure out side bracket shows existing Manpower whereas figures in bracket shows total manpower after proposed project)

1.3.3 TIMING & WORKING HRS (SHIFT WISE)

The existing & proposed unit is/will be operated in with proper & adequate shift timing required to maintain smooth operations of the manufacturing process. Details of shift & shift timing are shown below.

Table 2: Details of Employee

Shift	Timing	Working Hrs.
General	9.00 A.M To 6 P.M	8 Hrs
1st Shift	8.00 A.M To 8.00 P.M	12 Hrs
2nd Shift	8.00 P.M To 8.00 A.M	12 Hrs

1.4 PROPOSED PROJECT & PRODUCTS

1.4.1 PRODUCTS

M/s. Geelon Industries Pvt. Ltd. is an existing unit manufacturing Synthetic Filaments Yarn (i.e., Partially Oriented Yarn, Textures and Twisted Yarn) @ 45 MT/Day with valid CC&A. The NOC (No. - PCC/DDD/O-2098/AT/WA/03-04/700) for the existing unit was obtained in 27/03/2004 as in name of M/s. Pamis Tex Pvt. Ltd.

The consented (existing) products along with the production capacity with the proposed enhancement capacity of existing products are presented below in tabular form.

Table 3: List of Products

Sr. No.	Name of the Products (Existing, Proposed & After Expansion Scenario)	Quantity (in MT/Day)
Existing		
1.	Synthetics filaments yarn (i.e., Partially Oriented Yarn (POY), Texturised and Twisted Yarn)	45.00
Proposed Expansion Scenario		
2.	Synthetics filaments yarn (i.e., Partially Oriented Yarn(POY), Polyester Filament Yarn (PFY), Textured Yarn and Twisted Yarn)	255.00
After Expansion Scenario (Total)		
1.	Synthetics filaments yarn (i.e., Partially Oriented Yarn(POY), Polyester Filament Yarn (PFY), Textured Yarn and Twisted Yarn)	300.00

1.4.2 COST OF PROPOSED PROJECT

The capital of proposed new project has been estimated & budgeted with costs of Rs. 77 crores. The proposed capital cost includes Rs. 1 crore for environmental protection measures. The details of proposed capital costs estimation including land, buildings, plant machineries & equipment, environmental protection measures etc. is presented below in tabulated form.

Table 4: Capital Cost Projection

Sr.	Purpose	Project Cost (Rs. In crore)

No.		Existing	Proposed	Total Cost
1.	Land	1.37	--	1.37
2.	Building and Civil Works	7.51	1.00	8.51
3.	Plant & Machinery and other fittings	32.31	75.00	107.31
4.	Environmental protection measures	0.52	1.00	1.52
	TOTAL :	**41.71**	**77.00**	**118.71**

1.5 PROJECT LOCATION & PROFILE OF SURROUNDING AREA

The existing company is located at Survey no. 255/1/16 & 255/1/17P , B/h IPCA Labs, Industrial Zone, Village- Athal, Naroli, U.T. of Dadra and Nagar Haveli -396230. and the expansion activities will be accommodated in the existing premises. As the project is an expansion project within the notified industrial zone, no alternative site has been considered for the proposed project.

The key development plan of town planning department of UT of Dadra & Nagar Haveli indicating proposed site & map covering the project area is shown in subsequent figures. The copy of approved map of forest duly authenticated by authority of local forest & WLS department showing distances of various wild life/protected area from site.

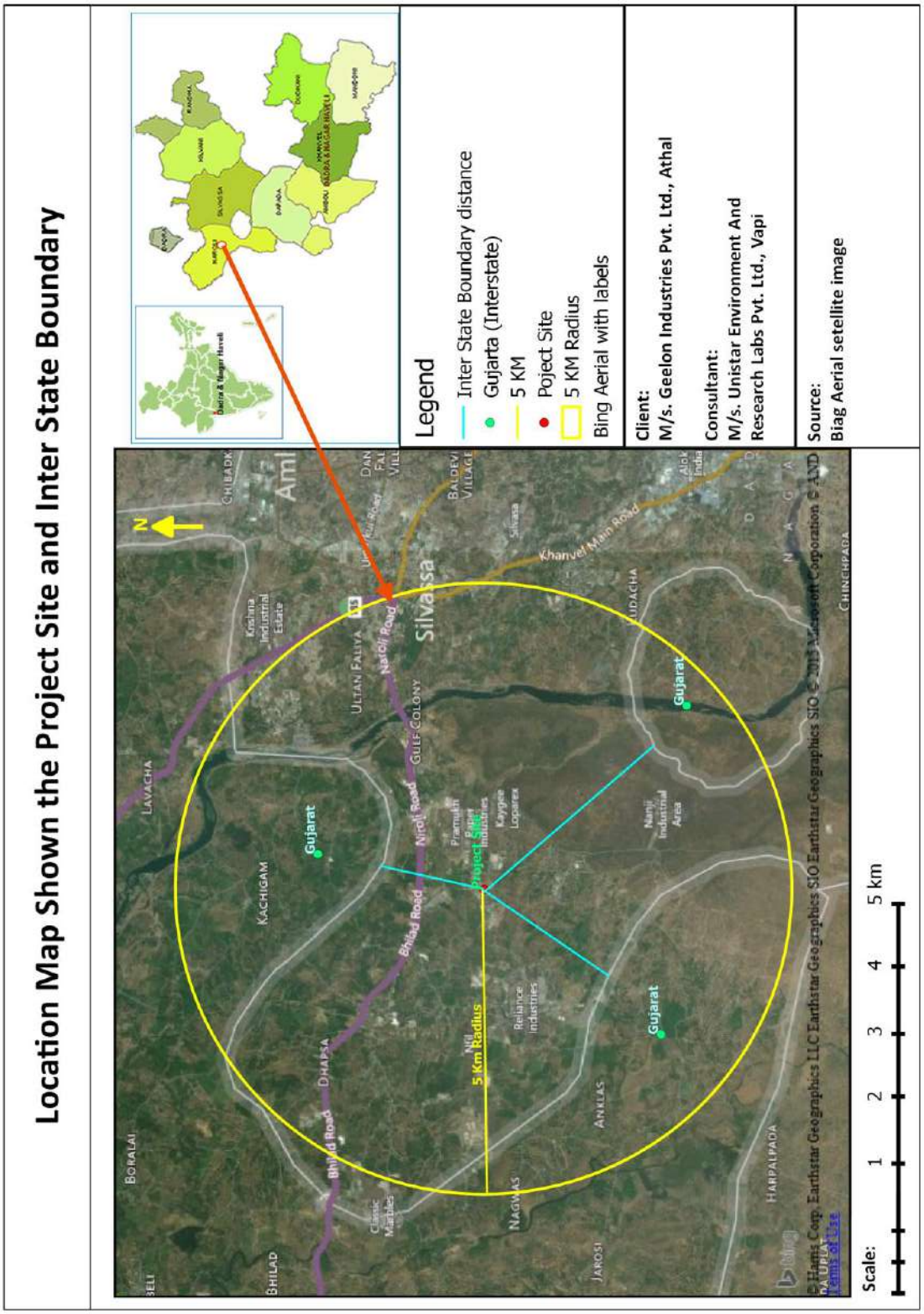
The map showing general location, specific location and project boundary and project site layout of M/s. Geelon Industries Pvt. Ltd. located at Survey no. 255/1/16 & 255/1/17P, B/H IPCA Labs, Industrial Zone, Village- Athal, Naroli, U.T. of Dadra and Nagar Haveli -396230.The latitude and longitude of the project site is 20.259151°N and 72.961092°E

The proposed expansion project of M/s. Geelon Industries Pvt. Ltd. will be within the existing unit located at Survey no. 255/1/16 & 255/1/17P, B/h IPCA Labs, Industrial Zone, Village- Athal, Naroli, U.T. of Dadra and Nagar Haveli -396230. The Athal is situated in western most part of Dadra and Nagar Haveli. The Arabian Sea is situated in west direction, which is about 26 Km W away from the GIDC industrial Estate. The nearest railway station – Bhilad is about 4 kms away from project site. The project site is well connected with state & national Highway network and the nearest National Highway (NH8) is about 5.6 kms NW away from project site. The nearest interstate boundary (Gujarat- about 2KM & Maharashtra- about 5KM) is situated at distance of about 6.0 Km. Nearest wildlife sanctuary (D & NH Wild Life Sanctuary) Vasona , Lion safari 9.0 km W(Approx.) & Dapada, Satmaliya Deer Park 12.00 Km NE (Approx.) are situated.

Figure 2: Layout plan of Project Site


8.50 MT. WIDE ROAD
ENTRANCE GATE
S.NO.255/1P
PARKING
2843.34 SQ.MT.
GARDEN
2583.99 SQ.MT.
ETP
5.50 MT. WIDE ROAD
FACTORY
1247.74 SQ.MT.
8.50 MT. WIDE ROAD
T/F
FACTORY
983.81 SQ.MT.
SHED
8.00 MT. WIDE ROAD
GIPL
S.NO.255/1P
GATE
FACTORY
805.99 SQ.MT.
FACTORY
1074.77 SQ.MT.
8.80 MT. WIDE ROAD
5.50 MT. WIDE ROAD
7.80 MT. WIDE ROAD
TOILET
BORE
S.NO.255/1P
ROAD
sarang ARCHITECTS

Figure 3: Map of Project Area



1.5.1 MACHINERIES & EQUIPMENT, TECHNOLOGIES & INFRASTRUCTURE

- Within the existing premises with required minor civil work for manufacturing of additional capacity of products.
- Within the existing premises and infrastructure the installation of some additional plant and machineries will be required.

1.5.2 RAW MATERIALS

The raw materials consumed for the manufacturing of products "Textured Yarn" are Polyester Oriented Yarn (POY). The primary raw material used for manufacturing of POY is Polyester Chips. The detail of raw-materials is as given in Table 5.

The details of raw-materials for proposed product are as given in Table 5.

Table 5: Raw-materials and its consumption

Name	Quantity			Source of Supply and mode of transport
	Existing (MT/Day)	Proposed (MT/Day)	MT/MT	
Polyester/PP Chips & Granules	47.25	267.75	1.05	Indigenous manufacturer by road
Finish oil	0.36	2.04	0.008	Indigenous manufacturer by road
Antistatic oil	0.23	1.30	0.005	Indigenous manufacturer by road

1.6 BRIEF DESCRIPTION OF THE PLANT OPERATION:

Partially oriented yarn (POY) and fully drawn yarn (FDY) will be made from Polyester chips (granule). Polyester chips are procured from other chips manufacturing industries. The details of manufacturing process are described in earlier chapter-2.

1.6.1 OTHER SAFETY & EMERGENCY DETAILS:

The company has provided all basic facilities as per requirement of Factory Acts. Similar arrangement for safety & emergency management will be adopted for proposed project. The key safety & emergency facilities are listed below:

A. Employee conveyance area
B. Proper sanitation facilities
C. Medical & First Aid facilities
D. SOP for works & Operations with necessary provision for PPEs
E. Isolated storage for fuel & raw materials storage

F. Material of MOC & Storage conditions for chemicals & fuel has been determined & provided with respect to their properties and regulatory/safety recommendations to prevent any accidental release or leak.
G. Adequately planned methodologies & facilities for chemical storage & handling with SOPs
H. Technology with intrinsic safety measures
I. All hazardous area, equipment & materials etc. with relevant & required Placards
J. MSDS for all chemicals available with all concern personnel & department
K. Pre-recruitment & post recruitment health employee check up program
L. Safety induction & training to all employees
M. Fire fighting equipment &Fire Hydrant system with Fire Water Pond
N. Trained Team for Fire Fighting & First Aid
O. Emergency control room
P. Evacuation route with two assembly points& facilities
Q. Emergency management plan
R. Emergency Management team
S. Emergency warning system- Siren
T. Defined chemical risk management & waste disposal methods with SOPs
U. Regular workplace monitoring to ensure hygienic & safe conditions in all work area having/using chemicals
V. Regular training programs for safety & necessary actions as well as Mock drills

Beside these many other arrangements, facilities and measures have been adopted for managing safety in the existing plant. For proposed project, all necessary measures & facilities will be provided to prevent any risk beyond acceptable level as required/cited timely.

1.7 HAZARD IDENTIFICATION (HAZID)

Safety risk assessment is one of the functions in a Safety Management System and an important element of safety risk assessment is the identification of hazards. A hazard can be considered as a dormant potential for harm which is present in one form or another within the aviation system or its environment. This potential for harm may be in the form of a natural hazard such as terrain, or a technical hazard such as wrong runway markings.

The use of the term ‘hazard’ in the formal risk assessment context originated in the nuclear and chemical industries for which a wide range of different types of ‘hazards’ are present all of the time (e.g. nuclear material, flammable gases, toxic chemicals etc.). The ‘control’ of these hazards

(containment, separation etc.) and the 'mitigation' of their consequences (gas detection, plant shutdown etc.) should a failure condition arise is the subject of safety risk assessment and safety risk management processes.

Hazards identification is the act of recognising the failure conditions or threats (Safety Events), which could lead to Undesirable Events and defining the characteristics of theses undesirable events in terms of their potential Safety Outcomes and of the magnitude of these safety outcomes' Consequences. This gives rise to the following definitions:

Safety Event: A condition, object, activity or event with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform prescribed function. A failure condition, causal factor, threat or precursor event which in isolation or in combination with other safety events could result in an undesirable event.

Undesirable Event: A stage in the escalation of an accident scenario where the accident will occur, unless an active recovery measure is available and is successfully used.

Outcome: A potential end point of an accident scenario which can be assigned a consequence severity.

Consequence: The degree of injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function arising from an outcome. Consequences have a magnitude.

Risk Controls (Barriers and Mitigation): A system, activity, action or procedure that is put in place to reduce the risks associated with a hazard. Mitigation may include:

- elimination of the hazard (preferred),
- reduction in the frequency of the hazard (barriers),
- reduction in the likelihood of the outcomes of the hazard (outcome mitigation),
- Reduction of the severity of the outcomes of the hazard (consequence mitigation).

A number of specific tools and techniques for hazards identification are summarised and their advantages and disadvantages noted. These tools and techniques of Hazard Identification & assessment include:

- Brainstorming
- Checklists & Audit
- Hazard and Operability Studies (HAZOPS)
- Cause effect Network

- Event Tree Analysis (ETA)
- Fault Tree Analysis (FTA)
- Failure Modes and Effects Analysis (FMEA)
- Structured What-if (SWIFT)
- Dynamic Models

1.8 SCREENING FOR PROBABLE HAZARDS

The task of identification of hazards is associated with the day-to-day operations of an organisation, or associated with changes to the operations of an organisation; the assessment of the risks associated with those hazards; and the implementation and management of measures to reduce those risks to an acceptable level (hazard removal; or the application of barriers and/or mitigations – i.e. risk control).

For the purpose of Hazard Identification & Analysis checklist, Brainstorming and Event tree analysis has been adopted. The key severity consideration assigned for the task is shown below.

1.8.1 IDENTIFICATION OF HIGH HAZARDOUS AREAS & OPERATION:

As indicated & described in section of project details; the production & storage will be practiced with enclosed system with latest safety measures. Further the area of material storage has been planned with safe distance consideration & necessary safety measures like lining of floor & provision of drain in area susceptible to hazards due to spill &leak. Adequate ventilation, fire prevention & control measures, provision of PPEs etc. are also planned and will be implemented. Besides, the probability of hazards in operation / production area is not anticipated as it will be an automated plant with control by DCS & control room. The manufacturing process will be based on closed loop process system. Manual handling or charging of raw material will also not take place or required as all transfer / charging of major raw materials in process will be done through closed system .These closed system of materials charging & production will not have higher pressure. Any kind hazardous material will not be stored in the process area as it has been provided in designated separate area with necessary isolation distance. Inherent safety system &devices of process technologies and storage will be provided. Process parameters control and interlocking will be provided and full proof safety interlocking and logics will has been confirm at design level for whole process area including all equipment having potential of hazards or operation failure. Thus the chances of hazards in the storage & production area are not anticipated. However, spill & leak in activities of materials transportation, storage & handling may have chance of hazards due to mishap. The mishap can have considerable effects on occupation health & safety in case of PTA, and antimony trioxide. Hence, the

area is identified as hazardous area susceptible to chemical risk assessment.

Natural gas will be used as a fuel in proposed HTMs and dual fired power engines. Natural gas will be received through pipeline and will not be stored. After PRV station at inlet point within premises, NG will be used in utilities at lower pressures through gas pipeline. Thus natural gas skid area and PRV station has been identifies as hazardous area for further studies of hazards evaluation & risk assessment.

1.8.2 IDENTIFICATION OF VULNERABLE GROUP & FACILITIES:

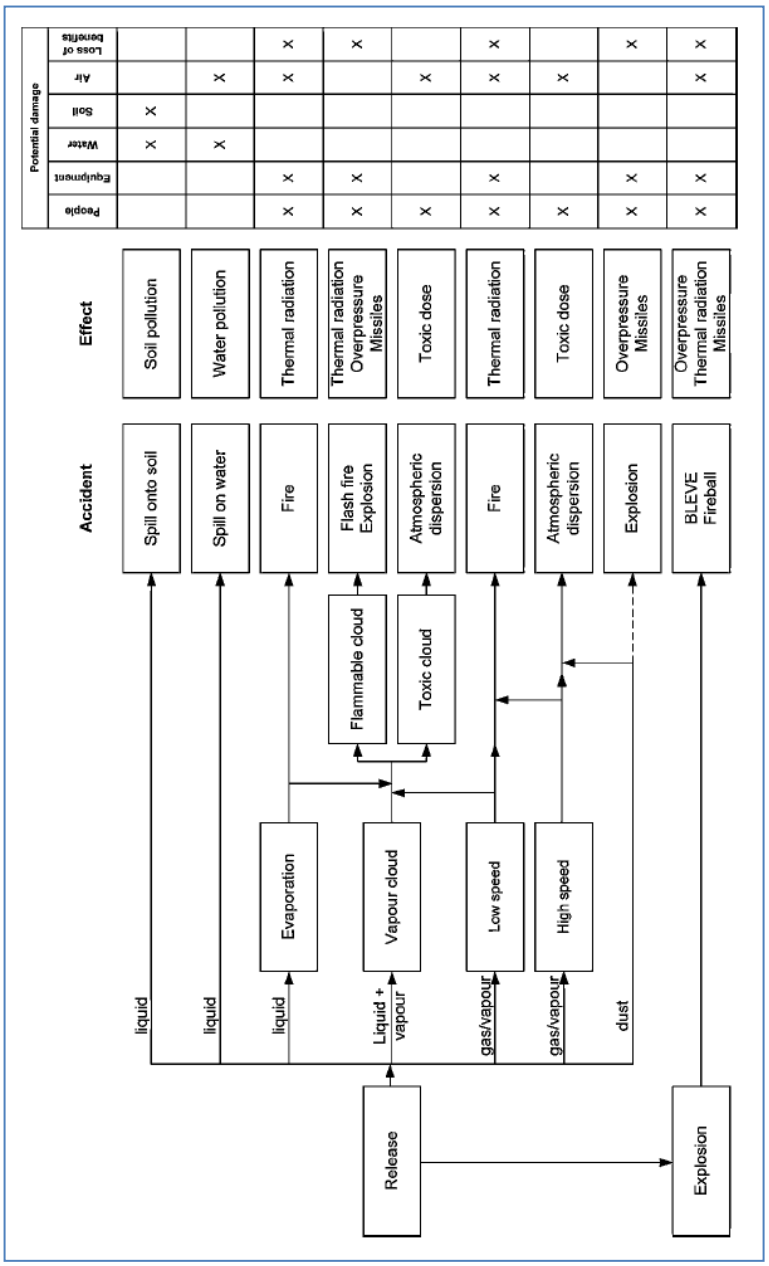
As it has been mentioned in above paragraphs, the hazardous area identified are NG skid & PRV station which will be control by restricted access to prevent any casualty up on occurrence of hazardous event. However, the effects of hazards in this area, especially fire & explosion, may occur up to an undefined distance. So the persons engaged in other area around the PRV station & Gas Skid Area are identified as the vulnerable group of people. Further, the buildings & properties around the area are identified as vulnerable facilities.

A. IDENTIFICATION & EVALUATION OF HAZARDS:

As it has been described above, major hazards are associated with storage area, PRV station and Gas skid area. The cause of hazards is thus determined to be leak from storage area, storage vessel/containers or pipeline.

Hence, for further evaluation of hazards, identification of probable hazards from leakage has been studied from cause effect network diagram. The details of identification of hazards as schematic diagram of cause & effects relation are presented below.

Figure 4: Probable route of hazards & consequences



(Image source: Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants, by JoaquimCasal; Elsevier)

1.8.3 CHEMICAL HAZARDS:

There are no hazardous chemicals used in the existing manufacturing process. Also, there will be no hazardous chemicals involved in the process in the proposed expansion project.

Table.6: Properties & the probable hazards of materials

Diesel, CAS# 68334-30-5						
Max. Storage Quantity		**Transportation**		**Storage Mode**		**Probable Hazards**
400Lts/Hr.		Through Road Tanker		MS tanks		Fire, Explosion, Toxic, Pollution
Physical Properties						
Density / Specific Gravity	**BP**	**MP**	**Flash Point**	**Auto Igni. Point**	**LEL/UEL**	**Vapour Pressure**
0.841 at 16°C	282-338° C at Atm.	-17.7 ° F	51.67°C	177 to 329.4°C	1.3%/6.0%	2.17 mm Hg At 21 °C
Chemical Properties						
Formula	**MW**	**Stability**	**Reactive**			**Solubility**
Not Known	Not Known	Stable	Not Available			<1 mg/mL at 19° C
Toxicity						
Inhalation, LC50	**Dermal, LD50**	**Oral, LD50**	**Carcinogen**	**Ecological**		
NA	NA	NA	NO	Not Available		
IDLH, mg/m^3	**Ceiling: ppm**	**TWA: ppm**	**STEL: ppm**			
Not Available	Not Available	Not Available	TEEL1: 100mg/m3 TEEL 2: 100mg/m3 TEEL 3: 500mg/m3			
PPEs &Safety Measures			**Other Specific; if any**			
Goggles or face shield, Breathing Apparatus for emergency, Fire fighting System, Fire proof Suit for Fire fighters.			Leak detection system &Alarm, Fire detection System & Alarm, Cathodic Protection to storage tank, No source of Ignition in storage area			

(Sources: CRIS Codes, CAMEO chemical, NIOSH Chemical Database)

B. CONTROL MEASURES FOR HAZARDS

The hazards from a particular operation can be significantly reduced through good design and operation of the plant. Typical techniques to minimise hazards are:

- Minimising amount of hazardous materials stored on site
- Physical protection of the more vulnerable items of equipment
- Locating bulk storages in areas away from the process in properly bunded tank farms
- Providing properly designed bunds or containment facilities for collecting large volumes of contaminated water which may be generated when fighting fires in warehouses, process equipment etc.
- Constructing items of equipment to recognised national/international codes using the correct materials of construction
- Using pressure/vacuum relief systems properly designed to relieve to a safe location

- Obtaining a thorough understanding of material properties, reaction chemistry and process conditions at the design stage
- Minimising sources of potential leak
- Maintaining good security throughout the site
- Conducting proper safety reviews (e.g. HAZOPS) at all stages during the design of the process and maintaining the necessary safety systems there after
- Introducing appropriate safety control measures such as engineering controls, the use of personal protective equipment and provision of emergency equipment.
- Ensuring that equipment is well maintained and tested
- Emergency shut-down procedures and shut off/isolation points need to be identified and communicated to all those concerned

C. CONSEQUENCES ANALYSIS

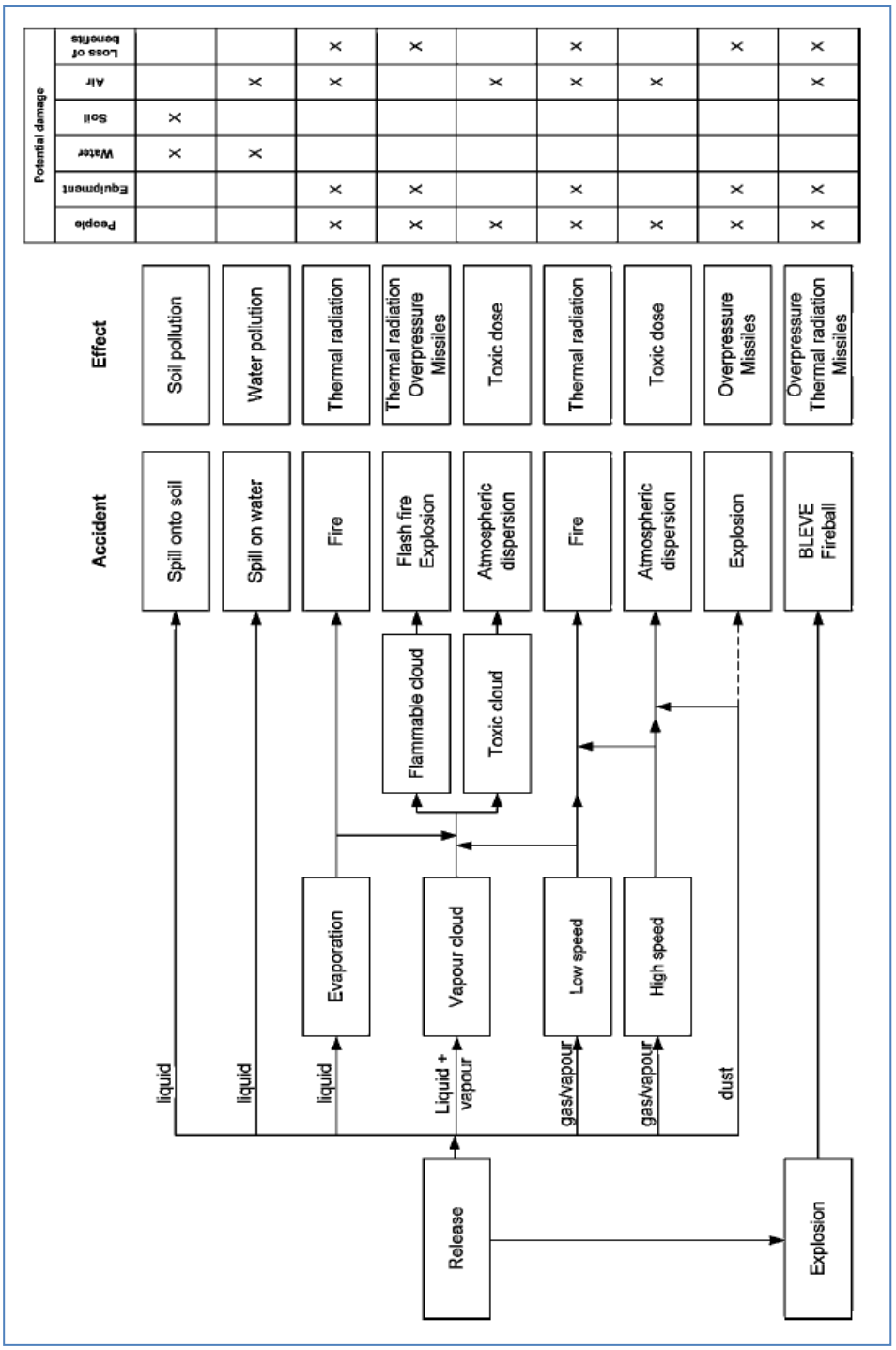
The most dangerous hazards in industries associated either or all of storage, handling, transportation and production facilities are undoubtedly those associated with the loss of containment of volatile products and their subsequent dispersion &ignition. These hazards can have minor to serious consequences based on the quantity & quality of materials released in to the atmosphere/air. Hence, to determine the probable loss due to the hazards, necessary & suitable analysis are required to be done for determination of severity of consequences resulted from the hazards. Such analysis is known as Consequences analysis. Consequence analysis provides quantitative information on the risk and potential hazards that could be caused by dispersion, fire and blasts. With this information, itis possible to improve the original design, incorporate mitigation measures, or devise hazard and management strategies to keep the risk at acceptable levels.

Toxicity of the chemical is very well know hazardous properties for almost all chemicals. Besides, numbers of chemicals used in industries are *flammable*, in addition their toxic and volatile properties and considered for various potential air hazards. For such chemicals, modeling is required not only for the toxic threat posed by the release of that chemical, but also the fires and/or explosions that the chemical could potentially cause. If a flammable and toxic chemical modeling for toxic gas dispersion scenario need to be run first and then other appropriate modeling for fire and explosions scenarios requires to be done. Finally, the outcome for LOC with respect to either all or any of concentration of chemical in air, level of over pressure & heat flux/radiant heat, are considered for determination of respective the threat zone based on damage potentials of LOC determined. In many situations involving a flammable and toxic chemical, the area encompassed by the toxic threat zone

will be greater than the threat zones associated with fire and explosion scenarios. Hence, it is most essential requirement to evaluate all of the scenario options before developing emergency response plan.

D. MAJOR HAZARDS PREFERRED FOR CONSEQUENCE ANALYSIS/MODELS

The typical diagrams showing probable hazards along their sequence of occurrence & probable effects are shown below.



1.8.4 FIRE

Most chemicals fires will be triggered by one of the following ignition sources: sparks, static electricity, heat, or flames from another fire. Additionally, if a chemical is above its auto ignition temperature it will spontaneously catch on fire without an external ignition source. When doing modeling for fire; three type of fire are considered which are Jet Fire, Flash Fire & pool fire. Primary effects of all type of fire are same and know to be heat /thermal radiation. However, in some case secondary effects of fire are noticed in many cases which include domino effects causing secondary fire, BLEVE & fireball. Secondary fire may also occur due to exposure of combustible or flammable materials for a particular time at particular thermal dose.

1.8.5 EXPLOSIONS

The most basic definition of an explosion is a sudden, intense release of energy that often produces a loud noise, high temperatures, and flying debris, and generates a pressure wave. There are many types of explosions and the causes and effects will vary. Intentional explosions will generally—but not always—result in greater hazard damage. Generally, three primary hazards are considered when dealing with an explosion; these are thermal radiation, overpressure, and hazardous fragments (flying debris or Missile effects). All three of these hazards are not present in every explosion and the severity of the hazard will depend on the explosion. These hazards typically last only for a brief period directly following the explosion. However, it is important to consider the potential for secondary explosions and fires to occur before deciding that these hazards no longer exist. In normal case of small explosions effects of over pressure due to explosion is evaluated to determine the severity of consequence.

1.8.6 DISPERSION

With or without both of above, i.e. fire & explosion; the dispersion of chemical in air and eventually in environment may have toxic hazards and the effects of the dispersion vary from one to other chemicals depending on the toxicity & concentration resulting in toxic effects. Generally the effects likely occur on human health is estimated through modelling for consequence analysis in form of level of concentration of chemical released in environment directly or indirectly due to fire & explosion. The level of concentration in terms of IDLH, TWA, TEEL, AEGL etc. is used to determine the severity of consequences of dispersion.

E. HAZARD SCENARIOS SELECTED FOR CONSEQUENCE ANALYSIS

The present study of consequence analysis includes models for three types of hazards, viz.; fire, explosion & toxic dispersion scenarios that are most frequently associated with chemical releases.

The type of fire covered in the modeling are: *Jet* Fires& Flash Fire. Besides, the type of explosion covered in the present study is Unconfined *Vapor Cloud Explosions (UVCE). Toxic dispersion has also been studied for determination of threat zone as per concern LOC*. Each of the selected scenarios selected are described on below for easy understanding.

1.8.7 JET FIRES

A jet fire, also referred to as a flame jet, occurs when a flammable chemical is rapidly released from an opening in a container and immediately catches on fire—much like the flame from a blowtorch. A two-phase jet fire occurs when a gas that has been liquefied under pressure is released. Because the liquid evaporates as it escapes, the chemical is released as an aerosol spray—that is a mixture of gas and tiny liquid droplets. Potential hazards associated with a flash fire include thermal radiation, smoke, and toxic byproducts from the fire.

1.8.8 FLASH FIRES

If material is released for considerable time without ignition cloud of flammable vapour is formed. When a flammable vapor cloud encounters an ignition source, the cloud can catch fire and burn rapidly in what is called a flash fire. Potential hazards associated with a flash fire include thermal radiation, smoke, and toxic byproducts from the fire. If the fuel-air concentration is below the LEL, there is not enough fuel in the air to sustain a fire or an explosion—it is too lean. If the fuel-air concentration is above the UEL, there is not enough oxygen to sustain a fire or an explosion because there is too much fuel—it is too rich. (This is similar to an engine that cannot start because it has been flooded with gasoline.) If a flash fire occurs, the part of the cloud where the fuel-air concentration is above the UEL may continue to slowly burn as air mixes with the cloud.

1.8.9 VAPOR CLOUD EXPLOSIONS

When a flammable chemical is released into the atmosphere, it forms a vapor cloud that will disperse as it travels downwind. If the cloud encounters an ignition source, the parts of the cloud where the concentration is within the flammable range (between the LEL and UEL) will burn. The speed at which the flame front moves through the cloud determines whether it is a deflagration or a detonation. In some situations, the cloud will burn so fast that it creates an explosive force (blast wave). The severity of a vapor cloud explosion depends on the chemical, the cloud size at the time of ignition, the type of ignition, and the congestion level inside the cloud. The primary hazards are overpressure and hazardous fragments.

1.8.10 TOXIC/HAZARDOUS DISPERSION

Dispersion is a term used by modelers to include advection (moving) and diffusion (spreading). A dispersing vapor cloud will generally move (advect) in a downwind direction and spread (diffuse) in a*cross wind* and vertical direction (crosswind is the direction perpendicular to the wind). A cloud of gas that is denser or heavier than air (called a heavy gas) can also spread upwind to a small extent. When dispersion modeling is done for toxic effects of any chemical it is known as toxic dispersion and when the dispersion modeling is done with respect to other hazardous properties, like fire, its known as hazardous dispersion.

1.8.11 TERMINOLOGIES OF LOC USED FOR MODELING

Overpressure, also called a blast wave, refers to the sudden onset of a pressure wave after an explosion. This pressure wave is caused by the energy released in the initial explosion—the bigger the initial explosion, the more damaging the pressure wave.

Thermal radiation Heat released during a fire and explosion that may pose a hazard to people and structures. The effects people experience will depend on both the level of thermal radiation and the length of time they are exposed to it.

The Immediately Dangerous to Life or Health (IDLH) level is a limit originally established for selecting respirators for use in workplaces by the National Institute for Occupational Safety and Health (NIOSH). A chemical's IDLH is an estimate of the maximum concentration in the air to which a healthy worker could be exposed without suffering permanent or escape-impairing health effects.

Acute Exposure Guideline Levels (AEGLs) are Toxic Levels of Concern (LOCs) that is use in modeling or assessment of chemical risk to determine the area where a toxic gas concentration might be high enough to harm people. The AEGLs are under development by the National Research Council's National Advisory Committee on AEGLs. AEGLs take into account sensitive individuals and are meant to protect nearly all people.

Level of concern *(LOC)* A threshold value of a hazard (toxicity, flammability, thermal radiation, or overpressure); the LOC is usually the value above which a threat to people or property may exist.

Temporary Emergency Exposure Limits (TEEL) are temporary Toxic Levels of Concern (LOCs) similar to ERPGs, and defined by the U.S. Department of Energy for use when ERPGs aren't available. Unlike AEGLs and ERPGs, TEELs are not peer reviewed, and are intended as temporary guidance.

- **TEEL-3** is "the maximum *concentration* in air below which it is believed nearly all individuals could be exposed without experiencing or developing life-threatening health effects."

- **TEEL-2** is "the maximum *concentration* in air below which it is believed nearly all individuals could be exposed without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action."
- **TEEL-1** is "the maximum *concentration* in air below which it is believed nearly all individuals could be exposed without experiencing other than mild transient health effects or perceiving a clearly defined objectionable odor."

1.8.12 CRITERIA SELECTED FOR LOC OF DAMAGE

1. Thermal Radiation Levels Of Concern

A Thermal Radiation (radiation intensity as kW/m^2) Level of Concern (LOC) is a threshold level of thermal radiation, usually the level above which a hazard may exist. While modeling a fire scenario, the threshold values (measured in kilowatts per square meter and denoted as kW/m2) considered to create the default threat zones are as below:

The thermal radiation effects that people experience depend upon the length of time they are exposed to a specific thermal radiation level. Longer exposure durations, even at a lower thermal radiation level, can produce serious physiological effects. However for plotting the hazards contour three level of thermal radiation have been selected, which are 10 kW/m^2indicating lethality within 60 seconds, 5 kW/m^2indicating 2^{nd} degree burn within 60 seconds and 2 kW/m^2indicating pain within 60 seconds. After preparing the threat zone probable effects of other potential thermal radiation level have also been studied and tabulated.

2. Overpressure Levels of Concern.

An Overpressure Level of Concern (LOC) is a threshold level of pressure from a blast wave, usually the pressure above which a hazard may exist. For unconfined vapor cloud explosion scenario, various LOC values have been selected with respect to the level of overpressure & severity of respective effects at the level of over pressure. The threat zones have been determined based on the scaled distance data for TNT explosion published by Blastic Research Laboratories. For plotting risk/hazard contour three threshold values 1 psi, 3 psi & 10.0 psi are used. Other level of overpressure has been studied with reference to the damage information described by Lee's Loss prevention in process industries.

F. RISK ASSESSMENT

The next step after consequence analysis is to evaluate the risk arising from each hazard. This can be done by considering:

- How likely it is that a hazard will cause harm (e.g. whether it is improbable, possible but not very likely, probable, or inevitable over time)
- How serious that harm is likely to be (e.g. resulting in minor damage, a non-injury incident, a minor injury (bruise, laceration), a serious injury (fracture, amputation, chronic ill-health), a fatality, or a multiple-fatality)
- How often (and how many) workers are exposed.

A straightforward process based on judgement and requiring no specialist skills or complicated techniques could be sufficient for many workplace hazards or activities. These include activities with hazards of low concern, or workplaces where risks are well known or readily identified and where a means of control is readily available. This is probably the case for most businesses (mainly small and medium-sized enterprises – SMEs).

In some other cases it may not be possible to identify the hazards and evaluate risks without professional knowledge, support and advice. This may arise in respect of the more complex processes and technologies in the workplace, or hazards, such as those related to health, which may not be readily or easily identifiable, and may require analysis and measurements.

G. RISK MITIGATION & MANAGEMENT

A Risk Management Plan is a document prepared by a project manager to foresee risks, to estimate the effectiveness, and to create response plans to mitigate them. It also consists of the risk assessment matrix.

A risk is defined as "an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives." Risk is inherent with any project, and project managers should assess risks continually and develop plans to address them. The risk management plan contains an analysis of likely risks with both high and low impact, as well as mitigation strategies to help the project avoid being derailed should common problems arise. Risk management plans should be periodically reviewed by the project team in order to avoid having the analysis become stale and not reflective of actual potential project risks.

Most critically, risk management plans include a risk strategy. Broadly, there are four potential strategies, with numerous variations. Projects may choose to:

- Accept risk; simply take the chance that the negative impact will be incurred
- Avoid risk; changing plans in order to prevent the problem from arising
- Mitigate risk; lessening its impact through intermediate steps
- Transfer risk; outsource risk to a capable third party that can manage the outcome

Considering the outcome of consequence analysis & risk assessment, some of the risk control & mitigation measures are suggested as described below under respective heading.

1.8.13 CHEMICAL SAFETY MEASURES

From the Risk Analysis studies conducted, it is observed that by and large, the risks will be confined within the factory boundary walls in case of fire & explosion, it will create On site emergency situations for which it will require more attention and emergency preparedness to combat such situation. To minimize the consequential effects of the risk scenarios, following steps are recommended.

Plant should meet provisions of the Manufacture, storage & Import of Hazardous Chemicals Rules, 1986 & the factories Act, 1948. The existing fire hydrant system needs to be extended in new project area as per TAC/NFPA Norms. Safe operating procedure and chemical information brochure/sheets should be prepared for hazardous material handling process. All necessary PPEs & safety equipments as mentioned in chemical information table in earlier sections shall be provided and kept in updated condition. Pre-employment &post-employment Employee health check-up programs shall be properly scheduled & conducted and records of same shall be regularly maintained. Safety devices

and control instruments should be calibrated at least once in a year. Emergency management plan with necessary details & action plan shall be prepared for all hazardous chemical and made available in all areas of chemical handling, storage & use. Necessary induction & safety training schedule & procedures shall be prepared and implemented. Special training for safety, emergency requirement and emergency action plan for chemical risk shall be provided to all employees working with the chemicals or in area of chemical storage/handling /use/application.

1.8.14 EMERGENCY MANAGEMENT

Periodic On Site Emergency, Mock Drills should be conducted, in order to train the staff and make them mentally prepared to tackle any emergency. Emergency handling facilities should be maintained in upstanding condition at time of operation of the plant. The emergency equipments along with emergency management plan & emergency management cell shall be provided. Manual call points & alarm system for fire & toxic hazards location identification shall be provided/ installed in all identified hazardous areas within plant premises.

H. DISASTER MANAGEMENT & ON-SITE EMERGENCY PLAN

An onsite emergency in the industries involving hazardous processes or hazardous installations in the plant is one such situation that has potential to cause serious injury or even loss of life. It may cause extensive damage to property and serious disruption in the work area. It effects are usually, confined to factory or in several departments of factory premises. An emergency begins when operator at the plant or in charge of storage plant cannot cope up with a potentially hazardous incident, which may turn into an emergency.

I. PREVENTIVE MEASURES TO AVOID ANY ONSITE & OFF SITE EMERGENCY

1.8.15 SAFETY REGULATIONS

All applicable HSE legal regulation will be followed from initial stage of the project. And it will be maintained throughout the life of the plant. As per new regulation every approval will be taken in definite time.

8. SAFETY IN DESIGN

Most appropriate standards and codes of practice have been followed in the design and construction of the plant. Fail safe consideration: lower inventories of toxic materials, provision of safety valves, feedback controller, alarm system, relief valves, bund walls etc are provided.

9. SAFETY IN OPERATION

Following aspects will be considered during all operations:-

1. Selection of competent manpower on the basis of Qualification, Experiences etc
2. Procedure Development for Safe operation
3. Training and awareness for Occupational Health & Safety
4. Regular review and revision of procedures
5. Review of onsite activities.

1. Procedure For Safe Operations

Following guidance is available within the plant premises in consistence with the standards or practices accepted worldwide.

a) Plant Manual incorporating emergency instructions related to service failures
b) Operating instructions
c) Manuals related to shutdown, start-up and maintenance
d) Checklist and routine schedules
e) Permit to work System
f) Drawing and documents
g) Pressure vessels, hoists, lifting tackles inspections
h) Regular inspections of Boilers and storage tanks as per the legislative requirement.

2. Training And Awareness

Besides the availability of documents all the senior and junior level employees are required to undergo Fire fighting training programme conducted by External Agencies like Loss Prevention association, Mumbai. Advanced Fire fighting programme is also conducted for specific employees involved in the operations inside any confined space or excavations.

The employees are retrained / refreshed by the training programme imparted by the HSE department. A safety booklet will be issued to all new joined employees during Induction Training programme.

The training is imparted for the following:-

a) Usage of Personal protective equipments
b) First Aid
c) Basic fire fighting

Awareness programmers also conducted by the each department in terms of implementation of the standard operating procedures / work instructions w.r.t specific job profile to all newly joined employees.

Awareness programme will be imparted by HSE department for the following –

a) Work Permit System
b) Working inside the Confined Space
c) Working at height
d) Basic Safety standards
e) Fire Fighting
f) Chemical Handling
g) Loading & Unloading
h) System Procedures

Periodic Mock drills will be conducted at interval of six month to ensure that the laid down procedures and systems are effective at the time of any major emergency. And involvement of all level employees will be must.

J. CLASSIFICATION OF EMERGENCY

Depending upon the magnitude of the incident the Emergencies are classified into Minor and Major Emergencies. If an Emergency can be controlled within the premises with the available captive resources – Fire fighting and First aid equipments or other available defensive measures – Such an emergency is termed as **Minor Emergency.** Hazardous incidences associated with chemicals of the proposed unit are identified as minor emergency.

While any involvement of external agencies for controlling the emergency related with **onsite & off site** Fire Brigade, Ambulance or other related services to tackle the situation within our premises would be termed as **Major Emergency**.

Emergency handling should have a thorough co–ordination and a prompt understanding of what is required at the time of incident to control the emergency situation. Pre-planned and well-exercised plan will help in combating incident and also reduce the severity.

Following are the major anticipated emergency situations

K. INITIATION OF MAJOR (ONSITE & OFF SITE) EMERGENCY CONTROL

The control mechanism for emergencies is developed on the following basis:-

a) Fast information relaying in assessment for potential danger and actions needed
b) Quick actions on isolations, containment for incident controlling
c) Prompt availability of support services
d) An Overall authority directly in charge of the situation for better control and coordination.

8. DECLARATION OF EMERGENCY

On getting direct information or on hearing the fire alarm siren, the Shift in-charge of the respective department will immediately visit the spot of incident and ascertain the situation. Depending upon the severity and the potential of the incident any one of the following situations may be declared:-

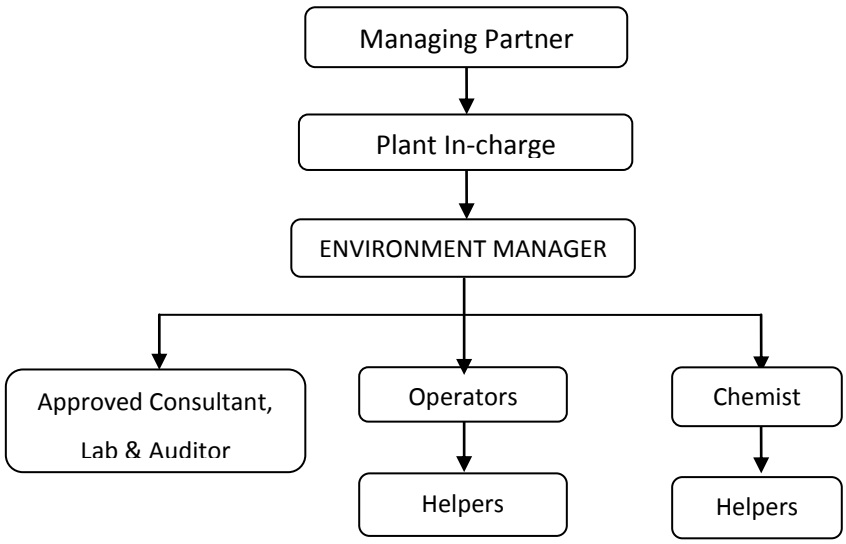
a) Incident is large, severe and in the opinion of the Shift Manager cannot be controlled by utilizing the captive resources, will be declared as Major Emergency or **Red Emergency.** E*xternal* support from the Govt Agencies – Fire Brigade, Ambulance, Fire Monitors, Evacuation team etc. will be required to counter such incidents.

b) Incident is serious but can be brought under control involving own employees and captive resources will be termed as minor emergency. Though the incident will be controlled *with the* available Fire fighting systems inside the premises .External support may be required for the evacuation and the treatment of causalities

L. EMERGENCY MANAGEMENT CELL

The emergency management cell includes three level management systems. Emergency Controller is the head having the top level position and below him site incident controller will operate during emergency situation. A well trained emergency team is formulated which comes in action under guidance of site incident controller. The details of Emergency management cell with roles & responsibility of members of cell is described herein after under respective headings & illustrated as organisation diagram below.

Figure 6. Emergency Management Cell



8. EMERGENCY CONTROLLER

At the start of the Emergency, the Emergency controller shall carry out the following tasks.

a) Taking a decision to take a full or partial shutdown of the plant / plants or mode of running the same
b) Need to evacuate
c) Actions pertaining to the incident controlling

During a major (**on site & off site**) emergency, difficult decisions will have to be made which may affect the whole or a substantial part of the site. The decisions will be taken in consultation with other senior managers in accordance with the standard operating procedures. Head-CP Division will assume the charges of Emergency Controller, Immediately upon his arrival on site. In his absence, HOD in situ will assume the responsibility, depending upon the location of Emergency. The Emergency Controller will operate from Time Office, to be referred as emergency control room, hereinafter. At least one deputy from Process, Utility, Security and the Administration departments will be deputed to assist the Emergency Controller. In the absence of Head-POY/PFY, the following Officers with their respective relevance to the area and location of the incident will act as the Emergency Controller.

a) Mr. Pushpendra Rai –HOD, Texturising and POY Division
b) Mr. Rajeev Sharma – HOD, Mechanical and Utilities
c) Mr. Naveen Mishra – HOD-Packing & Dispatch Dept.
d) Mr. Sujit Thai – HOD-Security
e) Mr. Prabir Mandal – HOD-Administration

Mr. Alpesh A. Gandhi (Director) and his full team will extend support for all the activities to be performed.

Other employees will provide the necessary support for smooth performance of the role of Emergency controller.

1. Recommended Duties Of Emergency Controller

Immediately he is aware of the emergency, the Emergency Controller will proceed to the Emergency Control Centre. On arrival he will:

1. Put on fluorescent clothing and hard hat so that he is readily distinguishable in the emergency.
2. Relieve the Site incident controller of responsibility for overall control.
3. Ensure that the emergency services have been called in and, where required, that nearby firms have been informed. The relevant authorities for public facilities such as railways, rivers etc. must also be contacted as appropriate.
4. Inform the necessary external agencies and the details of head office of the emergency.

5. Ensure that key personnel have been called in.
6. Exercise direct operational control of those parts of the site outside the affected area.
7. Liaise with meteorological offices where weather conditions could have a strong influence on the development of the incident.
8. Direct the shutting down and evacuation of plants in consultation with the Site incident controller.
9. Ensure that casualties are receiving adequate attention. Arrange for additional help if required. Ensure that relatives are advised.
10. Liaise with the chief officers of the Fire and Police services, and Health and Safety Authorities. Provide advice of possible effects on areas outside the works.
11. Ensure personnel are accounted for.
12. Arrange traffic control on site.
13. Liaise with the media spokesperson.
14. Arrange for a chronological record of the emergency to be maintained.
15. Where the emergency is prolonged, arrange for the relief of personnel and the provision of catering facilities.
16. Control rehabilitation of the affected areas on cessation of the emergency.

9. SITE INCIDENT CONTROLLER

A part of the Operations Group, The Site incident controller will be the shift in-charge handling the shift operations, in the affected area at the time of incident. The Shift in-charge as the Site Incident Controller is available during odd hours and is also well conversant with the plant operations .The Site is divided into following areas w.r.t the process of controlling any emergency. The Site incident controller shall nominate a second site incident controller as his deputy as following.

Department	Area of Scope
CP Process	Burn Out, Dryer, Take up area, sections of CP divisions and Any emergencies triggered within the plant battery limits except, within the scope of Mechanical, and Electrical areas.
Texturising Process	All Texturising Machines, Draw Winders, TFOS & Packing area.
Mechanical & Utility	Compressor house, Chillers, HTMs & NG PRV station & gas skid area
Electrical	DG room, Power house, Transformer yard & HSD Yard
Security	Overall monitoring of various areas including toilets, Canteen etc.

The Shift Engineer of the plant in the nearest vicinity will act as site incident controller. All department shift in-charge will be responsible for declaring and controlling an emergency. He shall ensure safe shutdown of operations that may aggravate the emergency situation in his assessment. He shall

execute his duties with the assistance of his nominated subordinates. Other departmental shift in charges on knowing about the site of incident of the emergency shall depute their trained Fire fighters and First Aiders to the affected site.

During the Working Hours (09:00 to 18:00 Hrs)

The role of incident controller will be adopted by the Shift In-charge who will evaluate the initial situation or intensity of the incident and will start taking measures as per this procedure. The presence of his superiors will be almost simultaneous during the general shift working hours. Concerned HOD or the person in situ will take over from the duties of the Site Incident Controller from shift in-charge, immediately up on his arrival.

After the Working Hours (i.e.., 18:00 Hrs and before 09:00Hrs)

The Shift In charge shall be the Site Incident controller who shall be responsible to handle emergencies. However he will ensure the transmission of information through his Second in Command, and will hand over the responsibilities of the site incident controller immediately upon the arrival of the concerned production head.

1. Recommended Duties Of Site Incident Controller

It is the duty of the Site incident controller to reach the scene of the incident as quickly as possible and assess the situation. On arrival he will:

1. Assess the scale of the emergency and decide if a major emergency does or could exist (and activate the emergency plan accordingly).
2. Direct the safe shutting down of operations and try to minimise the damage to plants, property and the environment involving the Operational team .
3. Ensure that the affected area is searched for casualties.
4. Coordinate operations on-site until the emergency services arrive and then relinquish overall incident control to the designated emergency services officer.
5. Assume duties of Emergency Controller until he is in position. In particular, ensuring that emergency services and key personnel on-site are informed of the situation.
6. Communicate continually with the Emergency Controller and inform of all developments via radio, telephone or messenger as appropriate.
7. Liase with emergency services during the incident providing information as required to the officer in charge.
8. Ensure that any evidence which may be required for further investigation is preserved.

2. **Recommended Duties Of Dy. Site Incident Controller**

1. Inform other departmental shift In charges about the emergency
2. Inform the Security Officer / Security Supervisor.
3. Assist the Site Incident controller in the process of handling an Emergency

10. EMERGENCY TEAM

With a purpose to exercise proper administrative control over the machinery being utilized to combat the emergency, Head of CP Division will be the Emergency Controller. There will be an Entire Emergency Control team working under him for the purpose of Management of the Emergency, which will be divided in three teams as under

a) Operations Group
b) Administrative Support Group
c) Technical Support Group

i Operations Group : This group will comprise of all the Senior & Junior Staff members of the department getting affected by the emergency .

ii Technical Support Group : will comprise of all the Senior & Junior Staff members of the Plant not affected along with the Staff of all the Support Engineering Areas viz. Mechanical, Electrical, Instrument , Civil , All the Fire Fighters , Rescuers & First Aiders.

iii Administrative Support Group : Headed by Mr Prabir Mandal HOD Administration, the Administrative support Group will comprise of the Staff members belonging to the following departments

Personnel
Security
Stores
Packing & despatch
Medical Officer

1. Head – Administrative Support Group

Head –Support Group shall ensure the following in coordination with Dy. Head:-

a) Station himself in the Head – Security cabin
b) Direct the Emergency team.
c) Request / arrange for external help
d) Safe evacuation, assembling, roll call
e) Transportation of the affected persons to the nearest hospital

f) Access to the documentation, reports and returns w.r.t to the emergencies.

g) Briefing the govt. official and media personnel about the emergencies.

2. Deputy Head – Support Group

Deputy Head – Support group can be any of the following:-

HOD – Personnel

HOD – Security

HOD – POY Process

HOD – Texturizing Process

HOD - HSE

HOD – Packing & Dispatch

HOD – Electrical &

HOD – Mechanical & Utility

On hearing the siren and knowing the exact location of the Incident the Site Incident controller shall visit the site affected and assess the magnitude and severity. The concerned shift in charge will declare a Major Emergency, by actuating the Emergency Wailing Siren if the situation warrants so. Simultaneously the role of Emergency team shall come into existence.

The Emergency team shall involve the following personnel during the Emergency such as Fire and Explosion

1) Fire Fighters
2) First Aiders
3) Security Personnel shall play the following roles
    i. Assembly Officer
    ii. Record Keeper
    iii. Traffic officer

3. Fire Fighters And First Aiders

Those employees well trained in the Fire fighting techniques and the systems will immediately report to the site of incident on knowing the exact location of the incident. The same is communicated by the indication panel placed at the entrance of each building or may be communicated by the site incident controller or the Security personnel. They shall also be assisted by the Site incident controller of that department / location. It is also important to inform the Fire pump house for effective and nonstop operation of the Fire Pumps.

Any injured person shall be immediately evacuated to the nearest assembly area where he will be administered the First Aid. The names of the trained Fire fighters and First Aiders are displayed at various locations for easy identifications.

4. Assembly Officer

The Security Officer shall depute Security personnel (2No.s) who shall be acting as the Assembly Officer. He shall ensure that the employees are safely evacuated from the site of the incident and are assembling in the nearest Assembly Point

5. Security Officer

Security Officers hall ensures the following:-

1) One guard is deputed to the nearest point for guiding the emergency vehicles
2) Instruct both gate – security personnel not to allow any vehicle inside the premises except the Emergency vehicle such as Ambulance and Fire brigade
3) To direct other security personals to play the roles of T.O , R.K. and A.O
4) Inform the Security Agency in case of more requirement of security personnel to deal with the emergency

6. Press Spokesperson

Mr. **Alpesh A. Gandhi** – Director will be responsible for the press briefing. Apart from the press briefing, he will also be responsible for leading the Support group. No other employee is authorised to share any details pertaining to the incident with the press.

7. Head - Concerned

Any emergency falling under the purview of any department, the concerned departmental head shall immediately inform their nearby departmental heads. Also he shall visit the site of incident and shall guide the site incident controller.

M. EMERGENCY CONTROL FACILITIES

1. EMERGENCY CONTROL CENTRE

The emergency control room shall be equipped with the following:

1) Emergency Contact & Other Important phone numbers
2) Personal protective equipments – Nose masks, helmet and torches
3) First aid materials
4) Effective communication media – phone, mobile etc
5) Plant lay out indicating the location of the Fire hydrants and extinguishers
6) Lay out showing emergency exits & storage of hazardous material storage area Transformer

and Utility section, Fire Pump house exclusively.

7) Set of Safety belts, Manila rope and stretcher.

2. **FIRE PUMP HOUSE**

The unit will require 393.00 KLD freshwater, which will be met through existing borewell. The industrial operation of the unit will require 368.00 KLD, whereas the domestic activities will require 25.00 KLD.

3. **EMERGENCY CONTACTS**

The Company has prepared a list of emergency contact numbers which includes important contacts of in-house as well as external contact persons/offices/department. The emergency contact list is tabulated in below.

Table 7: Emergency Contact Details

Sr.No	Internal	Phone No.
01	**Mr. Alpesh A. Gandhi** (Director)	**9825837339**
02	**Mr. Pushpendra Rai** (AVP)	**9825837339**
03	**Mr. Pushpendra Rai** (Plant Head- POY-PTY)	**9825837339**
04	**Mr. Prabir Mandal** (Head (Commercial))	**09825837339**
05	**Mr. Naveen Mishra** (Head POY)	**09825837339**
06	**Mr. Sujit Thai** (Head (Security))	**09825837339**
07	**Mr. N.A** (Head Textrising)	**09825837339**
08	**Mr. Rajeev Sharma** (Head Utility)	**09825837339**
09	**Mr. Pancham RajBhar** (Head Electrical)	**09825837339**
10	**Mr. Sujit Thai** Main Gate(Security)	**09825837339**
11	Police Station Silvassa	**2642033,2642057**
12	Fire & Emergency Services, Silvassa	**2640022**
13	Yogi Hospital – Silvassa	**2642301,2642302**
14	Cottage Hospital – Silvassa	**2642120,2642940**
15	Flood control Room	**2642106**
16	Fire & Emergency Services, Alok Industries,Rakholi	**2632102/107**
17	Fire & Emergency Services, Hindalco, Khodali	**2677024/25**
18	Fire & Emergency Services.RIL,Khardapada	**2650705/709**
19	Police Station ,Surangi	**2699300**
20	Police Stations/Department	

	Police Control Room Silvassa Surangi Khanvel Rakholi Fire Station	**100** **2642033** **2699300** **2677233** **2633004** **101**
21	Fire & Emergency Services, Silvassa	**2640022**
22	Yogi Hospital – Silvassa	**2642301**
23	Cottage Hospital – Silvassa	**2642120**
21	Haria Hospital	**2426153**
25	Ambulance	**102**
26	Blood Banks Vapi Silvassa (Red Cross)	**2430654** **2640577**
27	Flood control Room	**2642106**

N. EMERGENCY ACTION GUIDELINES

8. GENERAL GUIDELINES

1. No non-emergency vehicle will be allowed to enter the site.
2. The TO will ensure that roads are free for easy and rapid movement of Ambulance and Fire Engines.
3. Telephones will be used only for emergency plan communications. All incoming/outgoing call not connected with the emergency will not be permitted.
4. The AO will count heads of all people on duty (incl. Contract labour)
5. The people not connected with emergency duty who have collected at the assembly point will remain there and not be allowed near the accident site.
6. Use of lift is to strictly prohibit at the time of Emergency.
7. During emergency situation visitors will be taken care of by concerned person being visited.
8. The Tech. Director will be responsible for reporting the emergency to the management & media.
9. After thorough checks of the affected areas and discussions with the appropriate authority, the emergency should be declared over by the EC and routine operations can be commenced.
10. A company car will be maintained for use in emergency on all the days of the year.
11. Search of personnel at certain locations like – toilets, terraces, contractor workshop and any isolated areas, areas under the work permit system shall also be checked for.

9. FIRE

Sources of fire can be due to Electrical short circuits, by conduction / convection from the external sources (fire pit, communal waste disposal by open air incinerations etc), Friction or increase Vapour pressure in the transportation vehicle of flammable Liquid, sudden rise in the atmospheric temperature, volatile vapours of chemicals in contact with heat sources like hot plates or processing locations, Flames in the Welding torch, Gas stove in canteen.

Following are the possible types of Fires in an Emergency situation.

- **A class Fire** due Organic materials like Paper and Cardboard boxes. Extinguishing media – Water type fire extinguishers, sand and water.
- **B class fire** due to Light / Heavy Liquid chemical, storage and transportation, Diesel storage tanks, Organic solvents in the lab. Extinguishing media AFFF (Aq. foam film forming media) and the Fire Monitor operated with AFFF and Fire hydrant System.
- **C class** fire due to LPG, acetylene, ammonia and Oxygen Gas cylinders used for Domestic & Industrial purposes respectively. Dry chemical Powder type fire extinguisher or CO2 extinguisher can be used to extinguish the C class Fire.
- **E class Fire** due to electricity. Preferably use CO2 and in the absence of CO2 use DCP type fire extinguisher. Electrical Panels, Transformer Yard and other electrical installations / connections are the sources of E Class Fire.

The details of fire fighting in chemical storage area are described in emergency response plan for all chemicals. The procedures of fire fighting with the suggested media, as suggested, shall be similar to the NG fire. According to the nature of an emergency situation for Natural gas pipeline & PRV Station, following steps to be taken:

1. In Case Of Fire

- As soon as a fire is seen in our premises or office, break the glass of manual call point (MCP) that will give fire alarm in control room & security office or as soon as a fire is seen in our premises or office, immediately call for help.
- Alert all employees.
- Extinguish the fire by using appropriate fire extinguisher.
- Do not use DCP type fire extinguisher on computer fire, use CO_2 type.
- Use fire hydrant system available in the premises.
- Follow all instruction of 'INCASE OF FIRE' board displayed at all offices.
- If it is a major fire, call Fire Brigade.

If the fire spreads and becomes uncontrollable the office premise is evacuated the employees vacate the place by following safe escape routes marked in premises or coordinator taking charge directs the safe evacuation of the premises. Fire Brigade carries out the further fire fighting operation. The employees get assembled at safe assembly point earmarked in the premises.

- Informs the Control room and Emergency Controller in case of further help.
- In case of collapse of building, immediately inform to the control room and Emergency Controller, call fire brigade and police to control the situation, evacuation of the premises and shifting of the injured.
- If it is safe and possible, shift the important documents, files valuable data, cash etc. to safer place.
- Direct the external agencies on safe escape route. Details on fire, building plan, drawings of the buildings, nearby facilities and hazards etc.
- Ensure that the relatives of the injured persons are informed.
- The visitors are guided properly up to the place of Assembly Points by security or the employee to whom visitor has come to meet.
- The emergency exits gate made known to visitors, and in case of emergency where to assemble is informed.

2. Evacuation Of The Persons

- The decision to evacuate the persons is to be taken by the incident controller, in consultations with Emergency Controller.
- The persons to be informed about the reason for evacuation prior to evacuation as information given to them will result in safe & easy evacuation.

Annexure-I: Safety & Emergency Response Guideline for Chemicals

1. Diesel (Fuel Oil)

A. General Details

- **Synonyms:** Diesel Fuel Oil
- **Density Specific Gravity:** 0.8654 @ 15 deg C/15 deg C
- **Flash Point:** 136 deg F (closed cup)
- **Autoignition Temperature:** 494 deg F
- **Viscosity:** 268 cSt @ 37.8 deg C.

B. NFPA Classification

Health: 1 (Slight)

Materials that, on exposure, would cause significant irritation, but only minor residual injury, including those requiring the use of an approved air-purifying respirator. These materials are only slightly hazardous to health and only breathing protection are needed.

Flammability: 2 (Moderate)

This degree includes materials that must be moderately heated before ignition will occur and includes Class II and IIIA combustible liquids and solids and semi-solids that readily give off ignitable vapors. Water spray may be used to extinguish fires in these materials because the materials can be cooled below their flash points.

Instability: 0 (Minimal)

This degree includes materials that are normally stable, even under fire exposure conditions, and that do not react with water. Normal fire fighting procedures may be used.

C. Hazardous Property

- FLAMMABLE LIQUIDS (Non-Polar/Water-Immiscible)
    - HIGHLY FLAMMABLE: Easily ignited by heat, sparks or flames
    - CAUTION: Very low flash point; use of water spray when fighting fire may be inefficient

D. Health Effects

0.1.1 SUMMARY OF EXPOSURE

- 0.1.1.1 ACUTE EXPOSURE
    - A) USES: Hydrocarbons are a diverse group of organic compounds that are made up of primarily carbon and hydrogen atoms. Hydrocarbons are derived from petroleum, coal tar and natural gas, as well as from plants and animals. They may be classified as aliphatic (including the paraffins, olefins, acyclic terpenes, and acetylenes) and cyclic (including the alicyclics, aromatics and cyclic terpenes). Examples range from gasoline to essential oils to solvents. They are used as fuels and solvents, and are found in many household and commercial products.
    - B) PHARMACOLOGY: Pharmacology of hydrocarbons varies according to the specific substance. Some have sites of action in the CNS, namely increasing

neurotransmitter binding and potentiating nicotinic blockade by interacting with acetylcholine receptors. Others stimulate GABA A activity. Glutamate release may be stimulated or transmission inhibited, depending on the specific agent. Glycine receptor activity may be augmented with certain hydrocarbons, and hydrocarbons are used as general anesthetics. In addition, alpha-2 adrenergic receptor activation can occur.

- C) TOXICOLOGY: Hydrocarbons are a large and diverse group of substances with toxicity varying according to specific substance and route of exposure. Pneumonitis after aspiration is common and is the main route of injury from hydrocarbons. The exact mechanism of pulmonary toxicity is unclear but is likely due to direct toxicity to lung tissue as well as destruction of surfactant. Low viscosity, low surface tension and high volatility of a hydrocarbon (gasoline, for example, has all of these properties) increase the aspiration potential of that particular compound. Pulmonary toxicity can also occur after IV injection of hydrocarbons. Acute systemic toxicity is primarily due to CNS depression, reflecting the inhalational anesthetic effects of hydrocarbons. Inhalational abuse of hydrocarbons can cause simple asphyxiation. Chronic exposure in industrial settings or after long-term inhalational abuse can lead to chronic nervous system effects. Chlorinated hydrocarbons may cause cardiac sensitization to catecholamine's, predisposing patients to cardiac dysrhythmias. Halogenated hydrocarbons may also cause heap to toxicity, nephrotoxicity, and electrolyte disturbances. Hydrocarbons can destroy lipid bilayers and this can lead to "defatting" dermatitis following prolonged skin exposure. Capillary endothelium can be severely damaged in any organ system exposed to hydrocarbon. Hemolysis is rarely reported after hydrocarbon ingestion. Benzene is a bone marrow toxin.
- D) EPIDEMIOLOGY: Poisoning is relatively common as these products are widely available in homes and industrial settings. Populations at highest risk include children with unintentional exposure (often ingesting pleasant-smelling oils), workers with occupational exposures, and those who intentionally abuse solvents via inhalation (often referred to as "sniffing" or "huffing"). Toxicity is primarily due to aspiration, but may occur via oral, parenteral, dermal or inhalational routes depending on the substance and nature of exposure.
- E) WITH POISONING/EXPOSURE
  - 1) ACUTE EFFECTS OF INGESTION by SIMPLE PETROLEUM DISTILLATES: Low viscosity, highly volatile hydrocarbons (eg, kerosene, gasoline, liquid furniture polish) is chiefly aspiration hazards. Pulmonary damage, transient CNS depression or excitement, and secondary effects of hypoxia, infection, pneumatocele formation, and chronic lung dysfunction can occur. Cardiac complications are rare. These hydrocarbons are poorly absorbed from the gastrointestinal tract and do not cause appreciable systemic toxicity by this route unless aspiration has occurred.
  - 2) ACUTE EFFECTS OF INGESTION by CHLORINATED AND AROMATIC HYDROCARBONS: Many chlorinated, aromatic and other substituted hydrocarbons can produce systemic toxicity following ingestion. CNS, respiratory depression, dysrhythmias, gastrointestinal disturbances, and other effects may occur depending on the agent and amount ingested.

- 3) ACUTE EFFECTS OF INHALATION: Cardiac dysrhythmias and CNS depression are major concerns of acute exposure. Straight chain hydrocarbons with few carbon atoms (eg, methane, ethane, propane gases) can cause asphyxiation if exposure occurs in poorly ventilated spaces.
    - a) INHALATIONAL ABUSE ("sniffing") of some hydrocarbons can result in sudden death, encephalopathy, residual neurological impairment, nephrotoxicity, hepatotoxicity, acid-base disturbances, and rhabdomyolysis.
- 4) INJECTION of kerosene, naphtha, turpentine, gasoline, or hydrocarbon insecticides has resulted in febrile reactions, local tissue inflammation and systemic effects, including pulmonary edema, pneumonia, and mild CNS depression. Severe cases have resulted in multiorgan dysfunction syndrome. Injection of pressurized hydrocarbons has caused severe tissue damage.
- 5) DERMAL/EYE: Mild to moderate eye irritation and reversible ocular injury may occur after contact with most hydrocarbons. Acute but prolonged exposure to some hydrocarbons can result in dermal burns and occasionally, systemic effects. Frostbite can result from contact with some liquefied gases (eg, propane, methane, ethane).
- 6) TYPES OF HYDROCARBONS INCLUDE:
    - a) LOW VISCOSITY, UNSUBSTITUTED: Hydrocarbons with low viscosity (less than 100 S.U.S.), low surface tension, and high volatility are most likely to cause aspiration pneumonitis. Vapor inhalation can cause CNS depression or excitation and other effects. Examples: kerosene, mineral seal oil, gasoline, petroleum naphtha.
    - b) HIGH VISCOSITY, UNSUBSTITUTED ALIPHATIC: Hydrocarbons with high viscosity and low volatility are less likely to be aspirated after ingestion and are generally poorly absorbed from the gastrointestinal tract. Petroleum jelly may cause a mild laxative effect. Oil mist inhalation may cause lipoid pneumonia. Examples: motor oil, petroleum jelly.
    - c) TERPENES: In addition to aspiration, these tend to produce a mild CNS depression after ingestion. Examples: turpentine oil, pine oil. Pine oil cleaners may contain approximately 10% isopropyl alcohol and other additives which may contribute to the observed toxic effects.
    - d) AROMATICS: These have a high potential for CNS depression, a mild tendency to cause cardiac irritation, and little risk of aspiration. Adverse effects can result from vapor inhalation, ingestion, or skin exposure. Examples: benzene, xylene. Many polyaromatic hydrocarbons are potential carcinogens.
    - e) HALOGENATED-CHLORINATED: These can produce CNS effects, dysrhythmias, renal and hepatic effects. Aspiration is a small risk. Adverse effects can result from vapour inhalation, ingestion, or skin exposure. Examples: chloroform, carbon tetrachloride, trichloroethylene.

- f) NOTE: Brominated hydrocarbons, fluorinated hydrocarbons, alcohols, esters, ethers, chlorinated hydrocarbon pesticides, and other hydrocarbons are covered in other managements.
- 7) MILD TO MODERATE POISONING: The primary effect seen in mild to moderate inhalational poisoning is euphoria and intoxication followed by CNS depression. This should resolve quickly with removal from the source of inhalational exposure. Patients with oral exposure usually have some gastrointestinal upset and then can develop systemic symptoms as the hydrocarbon is absorbed if a large quantity is ingested. Patients who have vomiting are at increased risk of aspiration. Aspiration may cause minimal respiratory symptoms (eg, an intermittent cough) initially but progress to severe respiratory injury. Ensure that medical staff uses personal protective equipment.
- 8) SEVERE POISONING: Severe effects may include coma and dysrhythmias. Severe pneumonitis from aspiration may require prolonged intubation. Patients that aspirate will often display a systemic inflammatory response including fever. Chlorinated hydrocarbons can cause ventricular dysrhythmias, and can cause hepatic necrosis that may progress to liver failure.
- 9) CHRONIC POISONING: Long-term or repeated exposure to certain aromatic and chlorinated hydrocarbons can result in hematologic (eg, benzene), hepatotoxic (eg, chlorinated hydrocarbons), renal (eg, chlorinated hydrocarbons), neuropsychiatric (eg, toluene), neurological (eg, n-hexane) and carcinogenic (eg, benzene, vinyl chloride) effects. Some effects have occurred primarily in chronic solvent abusers or glue sniffers (eg, neuropsychiatric, renal, and hepatic effects of toluene). Chronic or repeated exposure can result in skin irritation due to defatting of the skin. Greases, coal pitch, and cutting oils can produce acne and folliculitis. Chlorinated aromatic hydrocarbon exposure can result in chloracne.

0.1.5 CARDIOVASCULAR

- 0.1.5.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Dysrhythmias may occur following inhalation.

0.1.6 RESPIRATORY

- 0.1.6.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Coughing, choking, tachypnea, dyspnea, cyanosis, rales, hemoptysis, pulmonary edema, pneumatoceles, lipoid pneumonia, or respiratory arrest may develop following ingestion and aspiration.
    - 2) Respiratory arrest can occur secondary to CNS depression following vapor inhalation. Intravenous injection of turpentine immediately resulted in pulmonary edema and hypoxia in 1 case.

0.1.7 NEUROLOGIC

- 0.1.7.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Mild central nervous system depression or excitation may occur after ingestion or vapor inhalation. CNS effects can occur secondary to

hydrocarbon pneumonitis and hypoxia, or from additives and contaminants (aniline, heavy metals, camphor, or pesticides). Some hydrocarbons are simple asphyxiants (e.g., methane, ethane, propane gasses) which can produce CNS effects secondary to hypoxia.

0.1.8 GASTROINTESTINAL

- 0.1.8.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Nausea, vomiting, diarrhea, and abdominal pain may occur following ingestion.

0.1.9 HEPATIC

- 0.1.9.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Elevated transaminases may occasionally occur following ingestion or vapor inhalation of some hydrocarbons. Carbon tetrachloride is a potent hepatotoxin which can produce potentially fatal hepatorenal damage following ingestion, inhalation or dermal exposure.

0.1.10 GENITOURINARY

- 0.1.10.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Renal effects (acute renal tubular necrosis, proteinuria, or hematuria) occur infrequently following acute exposure to petroleum distillates and other unsubstituted hydrocarbons.
    - 2) Some studies have reported an increased risk of glomerulonephritis following long term inhalation and/or dermal exposure to various hydrocarbons. Acute renal failure and other renal effects have been reported in some chronic glue, solvent, or paint sniffers. Exposures in addition to hydrocarbons can not be ruled out in many of these reports.
    - 3) Many halogenated hydrocarbons are nephrotoxic. Examples of potentially nephrotoxic halogenated hydrocarbons include chloroform, carbon tetrachloride, ethylene dichloride, tetrachloroethane, 1,1,1-trichloroethane, trichloroethylene (infrequently reported) and tetrachloroethylene (weakly nephrotoxic).

0.1.13 HEMATOLOGIC

- 0.1.13.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Disseminated intravascular coagulation, hemolytic anemia and pancytopenia have occasionally been reported following vapor inhalation, aspiration, or ingestion of hydrocarbons. Benzene is a bone marrow toxin. Chronic benzene exposure has been associated with acute leukemia.
    - 2) Contaminants or additives can cause hematologic abnormalities. Examples include aniline and nitrobenzene (methemoglobinemia).

0.1.15 MUSCULOSKELETAL

- 0.1.15.1 ACUTE EXPOSURE
  - A) WITH POISONING/EXPOSURE
    - 1) Subcutaneous injection of paint, lacquer or other material via high pressure spray guns is a surgical emergency. High-pressure injection injuries can result in necrosis and thrombosis with amputation required in 60% to 80% of cases.

- 2) High pressure injection of paints and solvents can cause significant tissue injury despite a relatively benign initial presentation.
- 3) Rhabdomyolysis has occasionally been reported in chronic glue or paint sniffers and in a case of prolonged inhalational exposure to mineral spirits. Muscle necrosis, compartment syndrome and/or sterile abscess have been reported following hydrocarbon injection.

0.1.20 REPRODUCTIVE HAZARDS

- A) In a prospective study in Toronto, major congenital malformations were noted in 13 of 125 fetuses of mothers exposed to organic solvents during pregnancy.

E. Laboratory Test

- Monitor vital signs and mental status.
- Blood concentrations are not readily available or useful to guide management.
- Obtain an ECG and institute continuous cardiac monitoring in patients with moderate to severe toxicity or chlorinated hydrocarbon exposure.
- Obtain CBC, basic chemistry panel, serum creatinine and liver enzymes in severe overdoses or in patients with chronic exposures.
- Monitor arterial blood gases, pulse oximetry, and pulmonary function tests and obtain chest radiograph in patients with any respiratory symptoms. NOTE: The chest radiograph may be normal early in the clinical course.
- Standard urine toxicology screen does not detect hydrocarbons.
- Monitor fluid and electrolyte status in patients with significant diarrhea and vomiting.
- Head CT should be obtained in patients with altered mental status.
- Monitor for methemoglobinemia in cyanotic patients who do not respond to supplemental oxygen, and who may have been exposed to hydrocarbons which contain nitrobenzene or aniline.

F. Treatment Overview

0.1.2 ORAL EXPOSURE

- A) MANAGEMENT OF MILD TO MODERATE TOXICITY
  - 1) Remove the patient from the source of exposure. When a patient is removed from an inhalational exposure, the symptoms should quickly resolve. Adolescents may present without symptoms after responsible adults find them abusing hydrocarbons via inhalation. Provide oxygen and symptomatic and supportive care. After assuring that the patient is medically stable, remove contaminated clothing and wash exposed skin with soap and water.
- B) MANAGEMENT OF SEVERE TOXICITY
  - 1) Orotracheal intubation for airway protection should be performed early if a patient exhibits respiratory distress. Prophylactic antibiotics and steroids are of no proven benefit in hydrocarbon pneumonitis. Animal studies suggest that artificial surfactant via orotracheal tube may be of benefit. Monitor and treat for dysrhythmias.
- C) DECONTAMINATION
  - 1) PREHOSPITAL: GI decontamination is not recommended because of the risk of aspiration. Remove contaminated clothing and wash exposed skin with soap and water.
  - 2) HOSPITAL: Studies fail to show if gastric emptying improves outcomes in patients with oral hydrocarbon ingestions. However, if a patient has ingested a large amount of a hydrocarbon that causes significant systemic toxicity shortly

prior to presentation, it is reasonable to insert a small NG tube and aspirate gastric contents. Activated charcoal should NOT be used; it does not adsorb hydrocarbons well and increases the likelihood of vomiting and aspiration.

- D) AIRWAY MANAGEMENT
  - 1) Perform early in patients with severe intoxication (coma, dysrhythmias, respiratory distress).
- E) ANTIDOTE
  - 1) None.
- F) HYPERTHERMIA
  - 1) Consider antipyretics. Evaluate for secondary pneumonia and other infectious causes.
- G) COMA
  - 1) Treatment is symptomatic and supportive. Perform orotracheal intubation to protect airway. Assess oxygenation, evaluate for hypoglycemia, and consider naloxone if coingestants are possible.
- H) TACHYCARDIA
  - 1) Tachycardia may occur from a combination of agitation and catecholamine release. Treat with IV fluids and benzodiazepine sedation if agitation is prominent.
- I) DYSRHYTHMIAS
  - 1) Initiate ACLS protocols. Some solvents appear to sensitize the myocardium to catecholamines. Epinephrine and other sympathomimetics should be used with caution as ventricular dysrhythmias may be precipitated.
- J) RESPIRATORY DISTRESS
  - 1) Administer oxygen. Intubate early if patient has respiratory symptoms. Consider the use of a surfactant. Endotracheal instillation of 2 doses of 80 mL/m(
  - 2) calfactant (35 mg/mL of phospholipid suspension in saline) in infants, children, and adolescents with acute lung injury resulted in acute improvement in oxygenation and lower mortality in one study.
- K) RESPIRATORY FAILURE
  - 1) Partial liquid ventilation, high frequency jet ventilation, extracorporeal membrane oxygenation (ECMO) and high frequency chest wall oscillation have all been used with apparent success in cases of severe hydrocarbon pneumonitis.
- L) ENHANCED ELIMINATION
  - 1) Hemodialysis and hemoperfusion are not of value.
- M) PATIENT DISPOSITION
  - 1) HOME CRITERIA: Asymptomatic patients with inadvertent exposures may be monitored at home, with particular attention to the development of any respiratory symptoms. Patients who develop symptoms during home monitoring should be referred to a medical facility.
  - 2) OBSERVATION CRITERIA: Patients with deliberate ingestions and symptomatic patients should be sent to a health care facility for observation for 6 to 8 hours. Although patients can develop a delayed pneumonitis, they are unlikely to do so if they have been completely asymptomatic during that time period.
  - 3) ADMISSION CRITERIA: Patients with significant persistent central nervous system toxicity (somnolence, delirium), or respiratory symptoms of cough or tachypnea should be admitted. Patients with coma, dysrhythmias, or respiratory distress should be admitted to an intensive care setting.

- 4) CONSULT CRITERIA: Consult a poison center or medical toxicologist for assistance in managing patients with severe toxicity (dysrhythmias, coma or respiratory distress), or in whom the diagnosis is not clear.

- N) PITFALLS
  - 1) Failure to aggressively manage the airway can result in death. Patients with minimal respiratory symptoms may progress to severe toxicity over several hours. Patients with altered mentation should be ruled out for intracranial hemorrhage, infection, metabolic disturbance and other toxicologic causes.
- O) DIFFERENTIAL DIAGNOSIS
  - 1) Hypoglycemia, central nervous system infection, pulmonary infection, rheumatologic or endocrine etiology, other sedative poisoning (ethanol/benzodiazepine/barbiturate for example), mental illness.

0.1.3 INHALATION EXPOSURE

- A) INHALATION: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer oxygen and assist ventilation as required. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids.

0.1.4 EYE EXPOSURE

- A) DECONTAMINATION: Irrigate exposed eyes with copious amounts of room temperature water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist, the patient should be seen in a health care facility.

0.1.5 DERMAL EXPOSURE

- A) OVERVIEW
  - 1) DECONTAMINATION: Remove contaminated clothing and wash exposed area thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists.
  - 2) Some chemicals can produce systemic poisoning by absorption through intact skin. Carefully observe patients with dermal exposure for the development of any systemic signs or symptoms and administer symptomatic treatment as necessary.

G. EMERGENCY ACTION GUIDELINES:

- **Fire Fighting Procedure:**
  - If material on fire or involved in fire: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide.
- **Protective Equipment & Clothing:**
  - Wear appropriate chemical protective gloves, boots and goggles.
- **Disposal Method:**
  - SRP: At the time of review, criteria for land treatment or burial (sanitary landfill) disposal practices are subject to significant revision. Prior to implementing land disposal of waste residue (including waste sludge), consult with environmental regulatory agencies for guidance on acceptable disposal practices.

- **ERPG GUIDE.:**

ERG2012
GUIDE 128
FLAMMABLE LIQUIDS (Non-Polar / Water-Immiscible)

POTENTIAL HAZARDS

FIRE OR EXPLOSION

· HIGHLY FLAMMABLE: Will be easily ignited by heat sparks or flames.
· Vapors may form explosive mixtures with air.
· Vapors may travel to source of ignition and flash back.
· Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
· Vapor explosion hazard indoors, outdoors or in sewers.
· Those substances designated with a **(P)** may polymerize explosively when heated or involved in a fire.
· Runoff to sewer may create fire or explosion hazard.
· Containers may explode when heated.
· Many liquids are lighter than water.
· Substance may be transported hot.
· For UN3166, if Lithium ion batteries are involved, also consult GUIDE 147.
· If molten aluminum is involved, refer to GUIDE 169.

HEALTH

· Inhalation or contact with material may irritate or burn skin and eyes.
· Fire may produce irritating, corrosive and/or toxic gases.
· Vapors may cause dizziness or suffocation.
· Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

· CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
· As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.
· Keep unauthorized personnel away.
· Stay upwind.
· Keep out of low areas.
· Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

· Wear positive pressure self-contained breathing apparatus (SCBA).
· Structural firefighters' protective clothing will only provide limited protection.

EVACUATION

Large Spill

· Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire

· If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

Fire

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

Small Fire

· Dry chemical, CO2, water spray or regular foam.

Large Fire

· Water spray, fog or regular foam.

· Do not use straight streams.

· Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads

· Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

· Cool containers with flooding quantities of water until well after fire is out.

· Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

· ALWAYS stay away from tanks engulfed in fire.

· For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

· ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

· All equipment used when handling the product must be grounded.

· Do not touch or walk through spilled material.

· Stop leak if you can do it without risk.

· Prevent entry into waterways, sewers, basements or confined areas.

· A vapor suppressing foam may be used to reduce vapors.

· Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

· Use clean non-sparking tools to collect absorbed material.

Large Spill

· Dike far ahead of liquid spill for later disposal.

· Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

· Move victim to fresh air.

· Call 108 or emergency medical service.

· Give artificial respiration if victim is not breathing.

· Administer oxygen if breathing is difficult.

· Remove and isolate contaminated clothing and shoes.

· In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

· Wash skin with soap and water.

· In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.

· Keep victim warm and quiet.

· Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

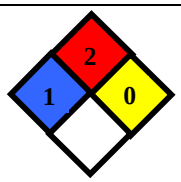
Annexure-II: MSDS OF HIGH SPEED DIESEL

MATERIAL SAFETY DATA SHEET

HIGH SPEED DIESEL

Section 1 – Chemical Product and Company Identification

Chemical Name :	High Speed Diesel
Chemical Formula :	Complex mixture of hydrocarbons
CAS Number :	
Synonyms :	Diesel, Gas oil, High Flash HSD (HF HSD)
General Use :	Motor Fuel and in Defence aircrafts
Manufacture's Name :	Bharat Petroleum Corporation Limited
Address :	Refinery, Mahul, Chembur, Mumbai 400074
Telephone Number for Info :	25533888 /25533999 / 25524888 / 25524999
MSDS No. :	
Date Prepared :	June 2011
Revision # :	2



NFPA 704 (Sec 16)

Section 2 – Composition / Information on Ingredients

Composition :	Complex mixture of hydrocarbons
Hazardous Components :	
ACIGH TLV TWA :	Not listed

There are two basic types of HSD depending on the flash points - the Normal HSD and the High Flash HSD

Section 3 – Hazards Identification

Primary Entry Routes :	Ingestion, inhalation, skin and eyes
Acute Effects :	Inhalation can cause dizziness, headache and nausea, depresses central nervous system and has an anesthetic effect. Breathing of liquid droplets may lead to chemical pneumonia. Ingestion can lead to nausea, diarrhea and affect central nervous system. Skin irritant. Prolonged contact can result in skin drying and dermatitis. Eye irritant.
Carcinogenicity :	Not listed as carcinogenic
Chronic Effects :	No data available

Section 4 – First Aid Measures

Eyes :	Flush with water for 15 min. Get medical attention.
Skin :	Wash with warm water & soap.
Inhalation :	Remove to fresh air. Consult a physician if irritation persists.
Ingestion :	Do not induce vomiting. Do not give liquids. Get medical help at once.

Section 5 – Fire Fighting Measures

Flash Point :	>35 ^{o}C and > 66 ^{o}C for HF HSD
Flash Point Method :	Abel / Pensky Marten
Auto ignition Temperature :	230 ^{o}C to 250 ^{o}C (highly variable)
LEL :	0.5%
UEL :	5.0%
Flammability Classification:	Flammable
Extinguishing Media :	Foam, Dry Chemical Powder, CO2
Unusual Fire or Explosion Hazards :	Heat produces vapours and can cause violent rupture of containers.
Hazardous Combustion Products :	Carbon di oxide, carbon mono oxide, benzene
Fire-Fighting Instructions :	Small fires can be extinguished by hand held extinguishers. Major fires may require withdrawal and allowing the tank to burn. Fire fighters should wear self breathing apparatus while fighting fire.

Section 6 – Accidental Release Measures

Small Spills :	Shut off leaks without risk. Absorb on sand or earth.
Containment :	Prevent spillage from entering drains or water sources
Cleanup :	After spills wash area with soap and water preventing runoff from entering drains.

Section 7 – Handling and Storage

Handling Precautions :	Do not use/store near heat/open flame. Use gumboots, gloves while handling the product. Do not inhale. Stay upwind while handling the product. Product should never be used to remove oil or grease from skin. It should not be siphoned by mouth. It should be stored in closed containers away from heat & source of ignition. Avoid contact with skin and eyes. Wash thoroughly after handling
Storage Requirements :	Do not use/store near heat/open flame/water/acids

Section 8 – Exposure Controls / Personal Protection

Engineering Controls :	Provide proper ventilation for environment to be below TWA
Respiratory Protection :	Use respiratory protection if ventilation is improper
Protective Clothing / Equipment :	Use face shield, PVC gloves, safety boots while handling. Contaminated clothing to be immediately removed

Section 9 – Protection Physical and Chemical Properties

Physical State :	Liquid
Appearance and Odour :	Straw yellow or dark yellow liquid. Characteristic hydrocarbon like odour
Vapor Pressure :	0.5 mm of HG AT 38 ^{O}C (RVP)
Specific Gravity :	0.82 to 0.86 gm/ cc
Water Solubility :	Insoluble
Boiling Point :	110 ^{o}C to 375 ^{o}C

Freezing Point :	< 15 ^{o}C
Vapour Density :	3 to 5 (Air = 1)
Sulphur Content :	50 ppm(BS-IV) to 350(BS-III) ppm and < 0.2% for HF HSD

Section 10 – Stability and Reactivity

Stability :	Chemically stable.
Chemical Incompatibilities :	Incompatible with oxidizing agents & chlorine. Reacts vigorously with oxidising materials.
Conditions to Avoid :	
Hazardous Decomposition Products :	Carbon di oxide, carbon mono oxide

Section 11 – Toxicological Information

ACIGH TLV TWA :	Data not available
Toxicity Data :	Data not available
Acute Inhalation Effects :	

Section 12 – Ecological Information

Prevent spillage from entering drains or water sources. After spills wash area with soap and water preventing runoff from entering drains. Can burn with lot of heat producing CO2 and CO.

Section 13 – Disposal Considerations

Disposal :	Seal all the waste in vapour tight plastic bags for eventual disposal or incineration.

Section 14 – Transport Information

Shipping Name :	High Speed Diesel, High Flash Diesel

Section 15 – Regulatory Information

Non - Toxic/Flammable Substance

Section 16 – Other Information

Technology, Process Safety Section

Disclaimer: This M.S.D.S and the information it contains is offered to you in good faith as accurate. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents.