

SL.NO - 08/16

ON-SITE EMERGENCY PLAN



IFFCO - PARADEEP UNIT

AT: PARADEEP, DIST: JAGATSINGHPUR, ODISHA

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GENERAL INFORMATION ABOUT THE FACTORY



1.0 GENERAL INFORMATION ABOUT THE FACTORY:

SITE:

The Indian Farmers Fertiliser Co Operative Limited (IFFCO) was registered as a multi unit co-operative society, under the co-operative societies act on 3rd November, 1967, IFFCO, a pioneer in the co-operative sector, has been marking a steady progress in the field of Fertiliser production, marketing and rendering services to the farming community.

IFFCO is the federation of about 39877 co-operative societies from national to primary level spread over all states and union territories. IFFCO's five modern fertilizer plants, situated in Gujarat state at Kalol and Kandla, in Uttar Pradesh state at Phulpur & Aonla and in Odisha state at Paradeep, having installed annual capacity of 42.42 lakhs MT for Nitrogenous fertilizer and 43.35 lakhs MT for Phosphatic fertilizers.

IFFCO Paradeep unit has an installed annual capacity of 19.2 lakhs MT of complex Phosphatic fertilizer. This unit was earlier owned by Oswal Chemicals and Fertilizers Ltd. (OCFL) & it was taken over by IFFCO w.e.f 1st October, 2005.

PLANT:

The Phosphatic Fertilizers manufacturing complex of Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) is located at Musadia village, Paradeep in Odisha state, which is one of the deepest major ports along the east coast. Paradeep is located at a distance of about 120 km from the state capital Bhubaneswar, on the national highway No NH 5A in Odisha. Paradeep Port facilities are located on the South and South-east side of the Complex. While, Mahanadi River runs along with the North and North-East side of the boundary wall of the complex. IFFCO Township is located on the North-West of the site near the Plant Gate. The main gate of the complex opens to a 28 meter wide road leading to the Paradeep town & Port facilities. The major installations located in the vicinity of the complex include those of Paradeep Port Trust, Paradeep Phosphates Limited, Essar Steel Ltd and POL terminals of Oil Companies (IOCL, BPCL & HPCL). Paradeep is also accessible by Rail transport.



FEATURE	DETAILS
Longitude	86 ⁰ 40' 0" E
Latitude	20 ⁰ 18' 30" N
Village, Tehsil, District, State	At: Musadia, PO: Paradeep, Kujang Tehsil, Jagatsinghpur, Odisha
Max. Temp.	40 ⁰ C.

FEATURE	DETAILS
Min. Temp.	10 ^o C.
Average Relative Humidity	70-80%
Annual Rainfall	1475 mm
Land Availability	2075.677 acres
Topography	Plain with Sea Coast at 5 Km
Soil Type	Unconsolidated Sand with or without clay, silt
Nearest River	Mahanadi
Bay of Bengal	5 Km
Nearest Highway	NH 5A
Nearest Railway Station	Paradeep
Nearest Railway Junction	Cuttack - 85 Km.
Nearest Village	Musadia - 1 Km
Nearest Industries	Essar Steel -1 Km, Paradeep Phosphates Ltd. - 7 Km
Nearest Air Port	Bhubaneswar-120 Km
Nearest Forest	Hatmundia - 5 Km

Name & Address Of The Factory	IFFCO, Paradeep Unit At- Musadia, PO: Paradeep Tahasil- Kujang Dist- Jagatsinghpur, Odisha Tele fax No.- 06722-224112 License No. JS-54
Name & Designation Of Occupier	Name: Shri K.L. Singh Director(Technical) Cell: 9871146447 Telephone No. 011-42592604 E-mail: klsingh@iffco.in
Name & Designation Of Manager	Name: Shri A.K. Panda (Sr. General Manager) Cell: 09937289815 Telephone No. 06722-224001 E-mail: akpanda@iffco.in

BRIEF MANUFACTURING PROCESS:

Sulphuric Acid Plant (SAP)

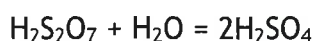
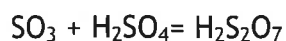
Imported sulphur is stored in Sulphur storage shed. From storage shed it is taken to two sulphur melting tanks. It is melted in the tanks, which are provided with heat from LP steam. The liquid 'Sulphur' is filtered and stored in the molten sulphur storage tank at 145⁰C. The molten sulphur is pump to the sulphur furnaces of two streams. The required air is supplied to furnace and sulphur is burnt in the Furnace at 1120⁰C. The resulting SO₂ of combustion gas is cooled down to 420⁰C in a water tube boiler and saturated steam at 61.2 kg/cm²g is generated. These gases pass through the Converters I & II, which contain V₂O₅. The part of the SO₃ generated in the converter layers 1 to 3 is absorbed in intermediate absorption tower to form 98.5% Sulphuric acid. This tower is a brick-lined packing tower operated at counter current with an approx. 98.5% Sulphuric acid trickling. To adjust the concentration of the circulated Sulphuric acid, 96% Sulphuric acid from the air drying tower is added via control valve. Part of the product generated in the intermediate absorber unit is pumped to the final absorber as a function of the level in the pump feed tank where the product is withdrawn from the final absorber. Another part which mainly originates from the exchange volume from the dryer is returned into the drying tower via the level control of the intermediate absorption tower. Two pumps are installed in Pump Tank for acid circulation in Tower.

Candle Filters are installed at the top of the trickling unit to separate acid droplets and mist from the gas downstream of the intermediate absorption tower.

The SO₃ generated in the layer 4 of the Converter is absorbed in the Final absorption tower in an approx. 98.5% sulphuric acid. Final Absorption tower is connected with a pump tank in which two vertical submersible pumps are installed for acid circulation in tower and one pump is installed for taking out the product acid and sending it to the Storage Tank.

Each circulation pump discharge acid is routed through two plate type heat exchangers for cooling acid prior to trickling in acid tower. To adjust this concentration in the final absorption circuit, 96% sulphuric acid from air drying tower is added via a Control Valve.

At the top of final absorption tower trickling system candle filters are installed. The gas leaving the candle filter of the final absorption with acid mist concentration of 40 mg. SO₃ per NM³ gas and SO₂ concentration of < 0.035% is routed through the tail gas stack to the atmosphere.

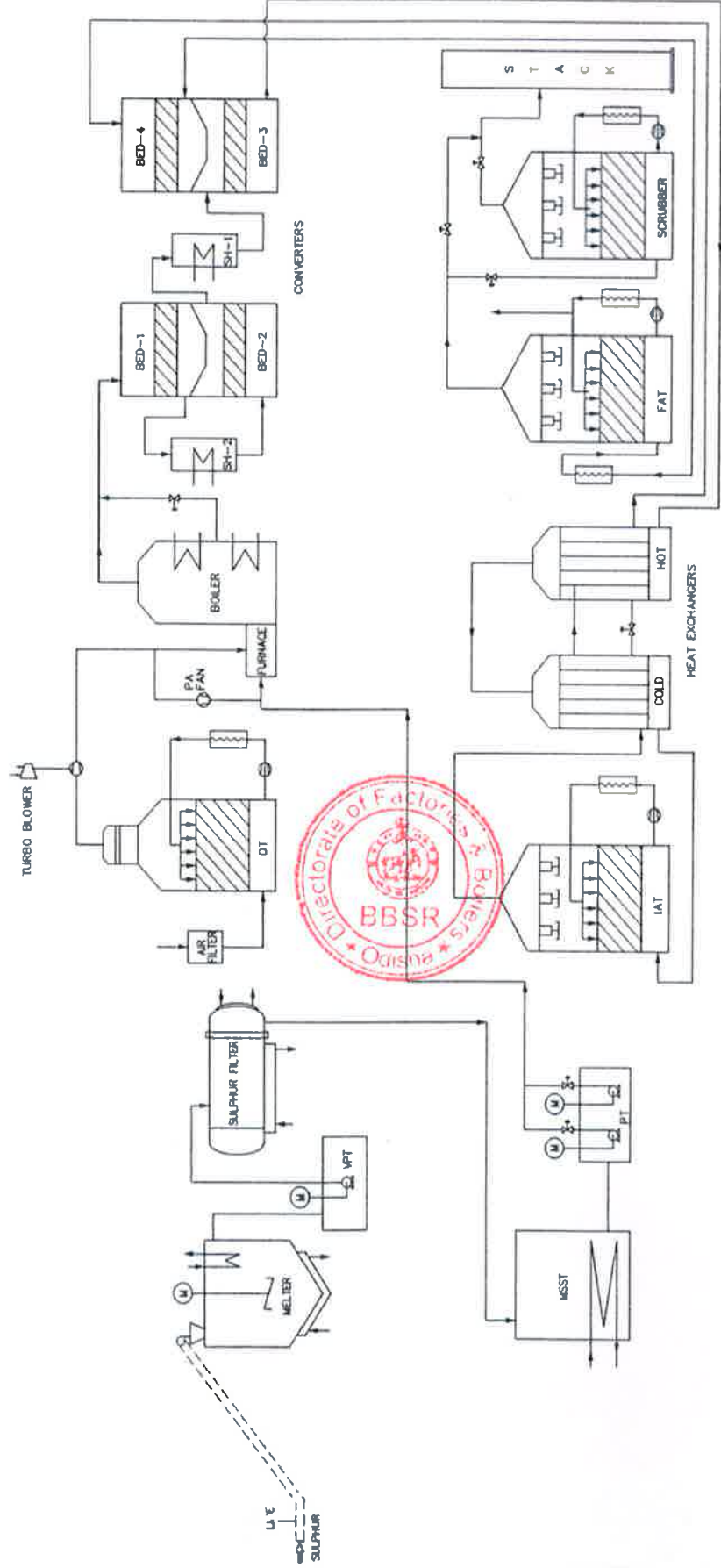


In each stream generates 185.3 MTPH of superheated steam at 61.2kg/cm^2 and 480°C , which is used to generate 55MW power each and some part of steam used to run Air Blower.

The Plant is equipped with Alkali Scrubber Unit which is designed by FACT Engineering and Design Organization, Kerala. The objective of the scrubber unit is to treat the effluent gas during start up and to control the sulphur dioxide concentration within the prescribed limits. This system guaranties SO_2 concentration in outlet gas during plant start up to maximum of 200 mg / NM^3 .



PROCESS FLOW DIAGRAM OF SULPHURIC ACID PLANT



PROCESS FLOW DIAGRAM SULPHURIC ACID PLANT

FIG-1.1

PROCESS DESCRIPTION OF PHOSPHORIC ACID PLANT

The Plant is based on wet process dehydrate route.

The main sections in the plant are:

- Grinding Reaction Section
- Filtration Section
- Concentration & Fluorine Recovery Section

Grinding & Reaction:

The designed plant capacity is 2650 MTPD of 100% P₂O₅. Rock Phosphate is reclaimed from three Rock silos and is transferred to the four Ball mills with weigh feeders. The slurry from the slurry surge tank at 68% solids is fed to the reaction compartment. This is diluted to facilitate dispersion. The Vacuum cooler circulating pumps circulate slurry through vacuum coolers.

Filtration & Gypsum Disposal:

In Filtration Unit, there are 7 Belt Filters for separating Phosphoric Acid & Gypsum. The filters pass through four flooded compartments. The vacuum system constitutes five sections. The initial filtrate is cloudy and not clear, it is taken into return acid section of Primary Filtrate Seal Tank. The balance filtrate from the first compartment is 28% product acid, which is taken into product acid section of Primary Filtrate Seal Tank. The other three flooded compartments are used for cake washing with counter current washing.

The washed Gypsum cake contain (0.7% wt) of water soluble P₂O₅ which is sluiced in the Gypsum Cake Hopper with pond water. This flows by gravity into Gypsum Slurry Tank where it is made into 20% solids slurry by adding additional pond water. This slurry is pumped to Gypsum pond.

Acid Storage and Clarification:

The filtered acid from the product acid section containing 2% solids is pumped to weak acid clarifier. It is provided with a rake system, which moves the settled solids to a central bottom discharge cone from which the sludge of 28% solids is pumped to the single tank reactor. The clarified acid with 0.2% solids is fed to Evaporators for concentration. Also 28% acid is transferred to the DAP / NPK plants for use.

Concentration Section:

28% acid from Evaporator Feed Tanks is fed to the eight Evaporators. Each evaporator is a single stage forced circulation unit constituting of a rubber lined Flashed Chamber. The concentrated acid at a temperature of 850°C overflows from the Flash Chamber to a concentrated Acid pumps, which delivers acid to 50% Clarifier Tank. Vapors leaving the flash chamber flow under vacuum to Fluorine Scrubber via Entrainment Separator. The separated acid from Entrainment separator returns to the flash chamber and the vapor flows to Fluorine Scrubber. Vapors leaving the Fluorine scrubber enter to a direct contact

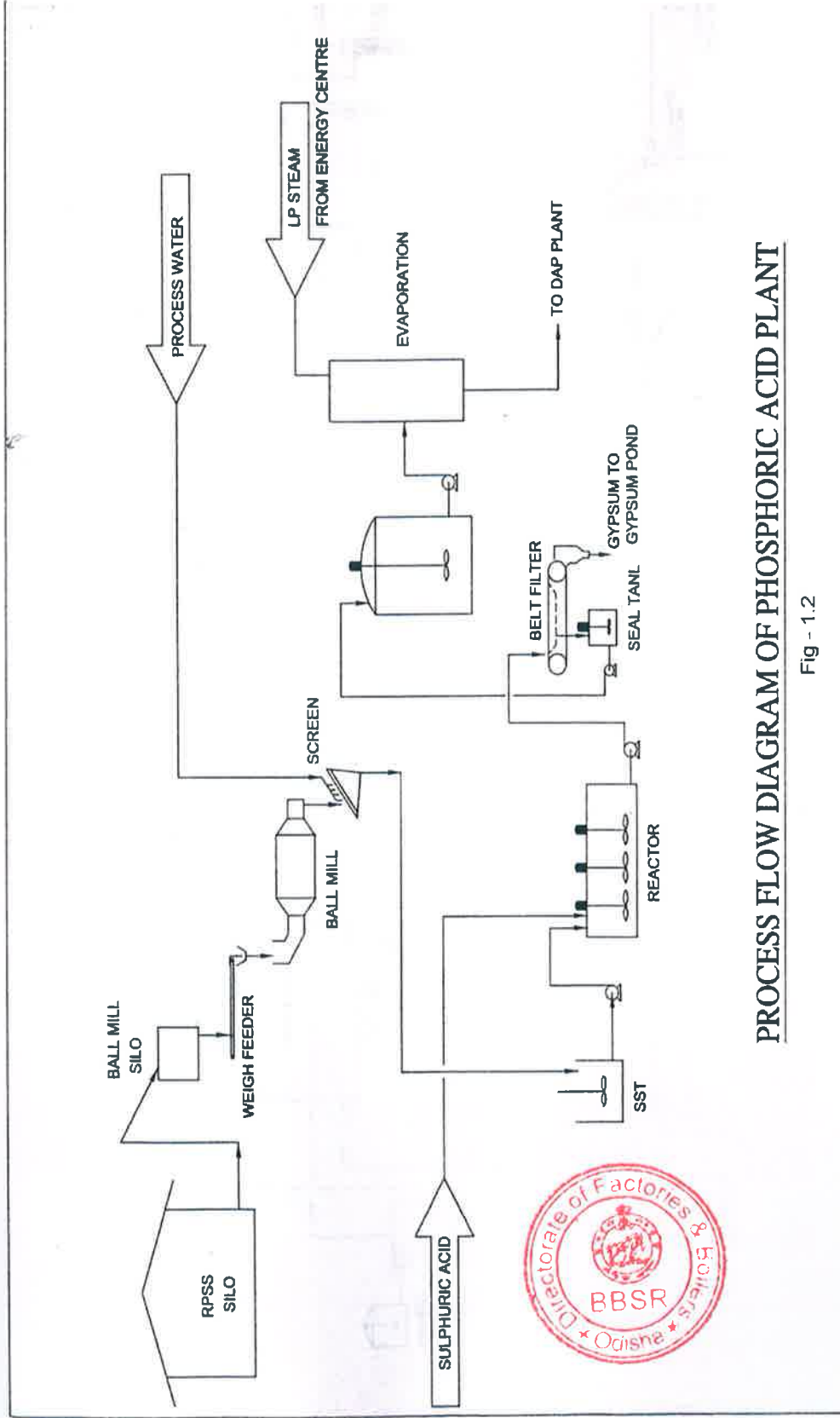
Barometric Condenser where a large flow of cooling tower water condenses all but a small amount of water vapor. This water vapor and any non-condensable gases are extracted by a two stage vacuum jet system consisting of two medium pressure steam ejectors and a water-cooled inter condenser. Pressure in the evaporator flash chamber is controlled by bleeding atmospheric air into the vacuum jet system through a pressure control valve. Water and steam from the Barometric Condenser and vacuum jet system pass through seal legs to Condenser seal tank, which overflows by gravity to cooling water return system.

Fume Scrubber:

Gas streams from various plant sections flow through three packing stages where they are brought into contact with cooling tower water. The demister stage eliminates droplet entrainment. The scrubber operates at a slight vacuum by Scrubber exhaust fan. Spray water drains to the scrubber sump, which seal the scrubber against vacuum. The 50% to 54% concentrated acid is clarified in the strong acid clarifier and is transferred to DAP / NPK plants.



PROCESS FLOW DIAGRAM OF PHOSPHORIC ACID PLANT



PROCESS FLOW DIAGRAM OF PHOSPHORIC ACID PLANT

Fig - 1.2



PROCESS DESCRIPTION OF DI-AMMONIUM PHOSPHATE PLANT (DAP)

The process utilizes an updated version of the standard Jacobs' Slurry process with Pre-Neutralizer and Pipe Reactor combination and dual mole scrubbing system. Normal capacity of each train is 95 MTPH for DAP (18:46:00).

The raw materials required are Phosphoric Acid, Ammonia, and Sulphuric Acid.

Process:

Phosphoric Acid and Ammonia react in the Pre-Neutraliser (PN) along with scrubber liquor from the scrubbing system. The feed rates of the acid, NH_3 and Scrubber Liquor are evolved due to the exothermic nature of the reaction is utilized to evaporate considerable quantity of water from Pre-Neutraliser. These fumes along with some ammonia slip pass through the scrubbing system. The reaction slurry of Ammonium Phosphate is pumped via "Slurry Pump" to Pipe Reactor (PCR) situated in granulator. Further, ammonia is added into Pipe Reactor to ensure the slurry at Mole Ratio 1.90. Slurry from the PCR is sprayed onto the Recycling Material that is passing through Granulator. The Slurry forms layer by layer on the recycling solids. The rolling action inside the Granulator ensures uniform distribution of slurry on the material and well-rounded granules are formed. The granulator wall is provided with flexible rubber panels to minimize build up and lumps formation. The Pipe Reactor can operate as PCR as well as slurry distributor. Different nozzles are used in the above modes. Due to exothermic reaction, the slurry is further heated up in the PCR and while being sprayed in Granulator; large quantity of water is maintained such that 1.4 to 1.5 Mole Ratio is achieved in the Pre-Neutralizer. The heat evaporated with some NH_3 escaping into fumes. The fumes pass through the scrubbing system. The wet material from Granulator discharges to the Dryer. The air from combustion air fan containing gases from combustion chamber travels co-current with the solids in Dryer. Lifters inside the Dryer, lift the solids and discharge across the hot gases, thereby a better solid-gas contact prevails for efficient drying. At dryer discharge, the large lumps are broken by means of autogenously lifting flights and pass through the grizzly. Solids dried to about 1.5% Moisture at 90°C temperature are fed to four oversize screens (4 mm size). The +4 mm size fraction is pulverized and fed to Fines Conveyor. The -4 mm size fraction containing product and fines gets collected in a Product Surge Hopper which feeds to the Variable speed Product Screen Feed Conveyor. Speed variation of this conveyor is controlled by Recycle quantity required. The discharge material from variable speed conveyor is elevated by Product Screen Elevator and fed to four Product Screens (2 mm size). The product - 4 mm to + 2 mm size from the Product Screens are cooled to 50°C in a Fluid Bed Cooler (FBC). FBC is supplied by cold air from Air Chiller, which uses liquid NH_3 for cooling the air. The cold product from cooler is elevated and fed to a double-deck Polishing Screen (4mm & 2mm) where any remaining over size (i.e. +4 mm) and undersize (i.e. -2mm) particles are removed. In case of DAP Product the product after polishing Screen is transported to Bagging Plant for bagging or to Bulk silo for storage.



Scrubbing:

Following are pick-up points for fumes and dust for scrubbers.

Reaction fumes from P.N. and Granulator

- De-dusting air
- Dryer Exit gases

De-dusting air

Reaction fumes are scrubbed initially in Pre-Scrubber with a solution of Mono & Di Ammonium Phosphates at 1.4 to 1.5 Mole Ratio. About 50% to 70% of the ammonia in the gases is scrubbed out. The outgoing gases are again scrubbed in the Dust & Fumes Scrubber with diluted mono ammonium phosphate and phosphoric acid and at 0.6 to 0.8 Mole Ratio. Such a two-stage scrubbing system is known as “Dual Mole” Scrubbing system. This system is known to be very efficient for ammonia and fluorine removal. The dust-laden air from various de-dusting points of the plant is fed to Dust Cyclones where 95% of the dust is recovered and fed to Fines Conveyor. The balance of dust with air is scrubbed in the Dust and Fumes Scrubber along with the reaction fumes passing out from Pre-Scrubber.

Dryer Exit gases

The Dryer exit gases containing fertilizer dust and NH_3 fed to Dryer Cyclones, where 95% of the dust is recovered and fed to Fines Conveyor. The remaining dust and air are scrubbed in the Dryer Scrubber with dilute solution of mono-ammonium phosphate and phosphoric acid at 0.6 to 0.8 Mole Ratio same like in Dust and Fumes Scrubber. The supply of scrubber liquor for these two scrubbers is from Primary Scrubber Tank. Dust laden Air from the product cooler containing dust is fed to the cooler cyclones where 95% of the dust is recovered and sent to Fines Conveyor. The balance of dust and air is scrubbed in the Tail Gas scrubber along with the gases out from dust & fumes scrubber and dryer scrubber. The T.G. Scrubber, the gases are scrubbed with re-circulating dilute scrubber solution to remove final traces of ammonia and to reduce fluoride contents further by additional cooling of the scrubber liquor. The cooling effect is enhanced by Tail Gas Vaporizer, which uses liquid ammonia. The final exit gases through stack are maintained well below the Environmental Norms.



MANUFACTURING PROCESS OF CAPTIVE POWER PLANT (TURBO-GENERATORS)

The steam turbine is a single cylinder, single shaft, 18 stage condensing type unit supplied by M/s- LMZ Russia. This prime mover continuously converts the energy of high pressure, high temperature steam supplied by the steam generator into shaft work with the low temperature steam exhausted to the condenser. The automatic regulation and protection system is intended for control of the turbine valves in all operating modes of the turbine, and for automatic cut-off of the steam supply to turbine when their maximum permissible limits or any other emergency situations requiring shut down of the machine. The power plant is supported with ABB make dual Channel AVR for better redundancy. The Protection Systems of M/s- ALSTOM and M/s- ABB is an art of technology in itself.

STEAM GENERATORS:

AFBC Coal fired Boilers (2 x 110 TPH)

The steam generator is a Bi-drum, natural circulation, water tube balance draft, top supported construction, equipped with Atmospheric Fluidized Bed Combustion system having in-bed evaporator & in-bed super heater coils with under bed fuel feeding system supplied by M/s-Thermax (India) Ltd. having an efficiency of 85.4 %. Fluidized bed combustion technology has distinct advantages for burning solid fuels and recovering the energy to produce steam.

The process features a mixture of particles suspended in upward flowing gas streams the combination of which exhibits fluid like properties. Combustion takes place in the bed with high heat transfer to the furnace at low combustion temperatures. Key benefits of this process are fuel flexibility and reduced emissions.

Coal handling plant:

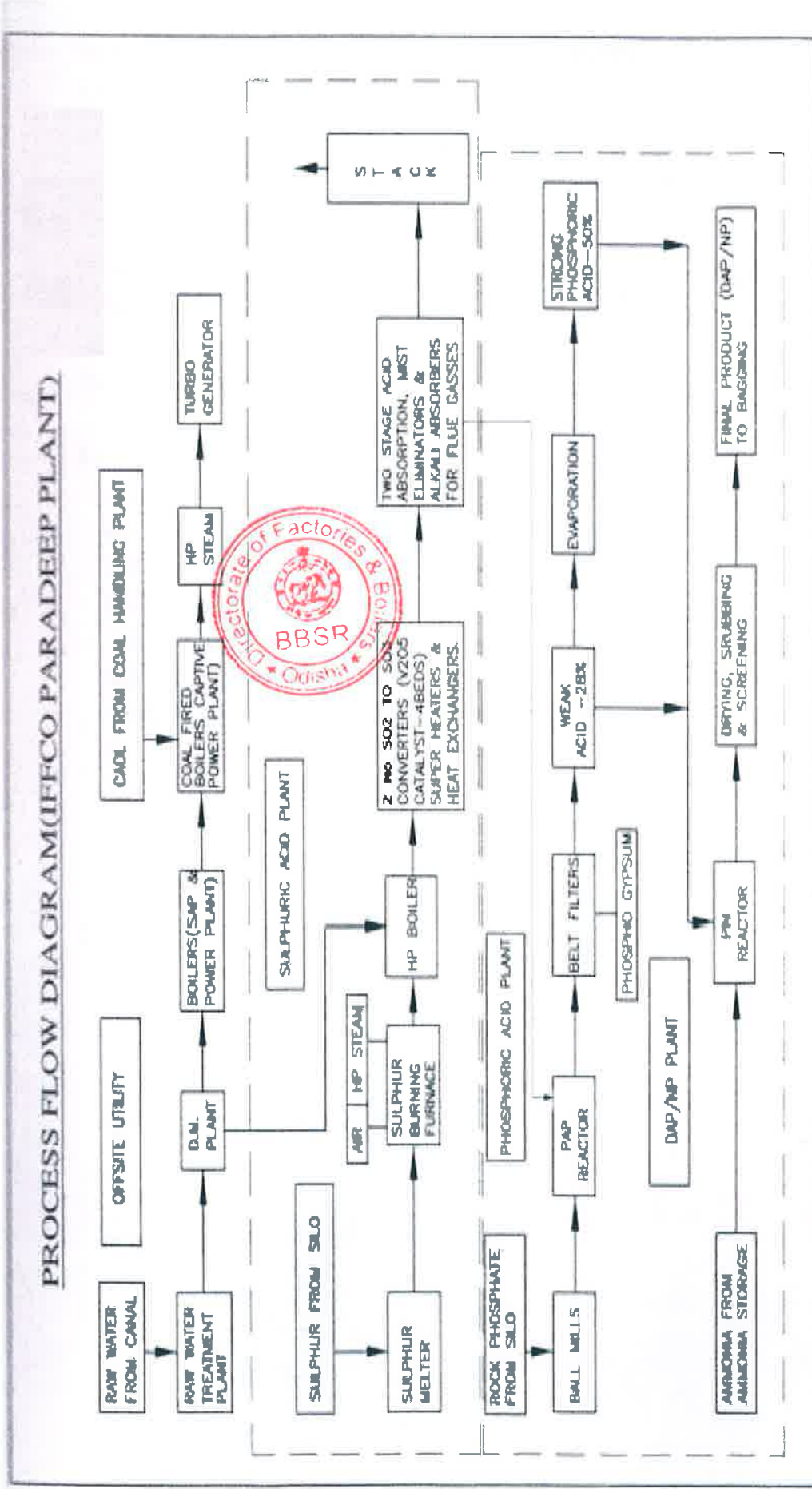
The solid fuel of (-6mm) size for the steam generators is achieved by the coal handling plant having a crushing capacity of 120 MT / Hr.

BAGGING PLANT

The bulk fertilizer produced taken either directly to the bagging unit or to the storage shed. There are two storage sheds of 20,000 MT capacities each. Fertilizer from storage is reclaimed with the help of reclaiming scrappers and conveyed to Bagging Unit for packaging in the HDPE bags of 50 kg capacity. There are 14 bagging slats each containing one sewing machine. The product is stored in 14 hopper of 50 tonne capacity above each slat. The material from each hopper is taken to feeders where load cells weigh the material for 50 kg and release for packing whenever bag is placed in the position to be filled. After filling the bags are stitched and taken for loading. The railway siding is situated at a distance of 8 kms (approx.) where rakes are loaded for dispatch to different parts of the country.



PROCESS FLOW DIAGRAM OF CPP



ORGANIZATION SETUP



LEGEND

ED	:	Executive Director		
SGM	:	Senior General Manager		
GM	:	General Manager		
JGM	:	Jt. General Manager	E&S	: Environment & Safety
JGM	:	Jt. General Manager	Elec.	: Electrical
DGM	:	Dy. General Manager.	Sec.	: Security
CM	:	Chief Manager	Tech.	: Technical
Sr. Mgr	:	Sr. Manager		
Mgr.	:	Manager	Prod.	: Production
Dy. Mgr	:	Deputy Manager	Pur.	: Purchase
P&A	:	Personal & Admn.	Mech.:	Mechanical
F&A	:	Finance & Accounts	SAP	: Sulphuric Acid Plant
Matls.	:	Material	Maint.:	Maintenance
PAP	:	Phosphoric Acid Plant	DAP	: Diammonium Phosphate Plant



MAN POWER



3.0 MAN POWER:

Manpower as per license is 5000 and shift wise distribution of employees is as follows:

SHIFT	PERIOD	NUMBER OF EMPLOYEE	
		IFFCO EMPLOYEE	CONTRACT WORKER
A	6 AM TO 2 PM	358	384
B	2 PM TO 10 PM	312	275
C	10 PM TO 6 AM	282	248
GENERAL & OFFICE	8.00 AM TO 5.00 PM	396	1697
Total = 3952		1348	2604



PRODUCT

&

BY-PRODUCT



4.0 PRODUCT:

Sl. No.	NAME OF PRODUCT	QUANTITY PRODUCED (T/Y) CAPACITY	QUANTITY OF ONETIME STORAGE	STORAGE CAPACITY	STORAGE TYPE	SIZE OF THE STORAGE AREA
1	Phosphatic Fertilizers (DAP/NP)	19,20,000 MT	32280 MT	20,000 MT x 2 No's	Silo 2 Nos.	L= 150 m D= 92.5 m

4.1 BY-PRODUCT:

Sl. No.	NAME	QUANTITY PRODUCED (P.A.)	QUANTITY OF ONE TIME STORAGE (P.A.)	STORAGE CAPACITY (P.A.)	STORAGE TYPE	SIZE OF THE STORAGE AREA	TYPE OF DISPOSAL/USE
1	Phosphogypsum	43,00,000 MT	2,52,83,106 MT	4,32,00,000 MT	Gypsum Stack 2 Nos. & Surge Pond	287 Acres	Sale to cement manufactures & agro cooperative for use as soil conditioners
2	Fluorosilicic Acid	20 MT Per Day (7200 MT per annum)	575 MT	2075 m ³ x 2 No's	Atmospheric Storage tanks	L= 11 m D= 15.5 m	Sale to aluminium fluoride plants



INVENTORY OF RAW MATERIAL



5.0 INVENTORY OF RAW MATERIALS:

SL. NO.	NAME OF THE RAW MATERIAL	MODE OF ARRIVAL AT THE PLANT	QUANTITY OF ONE TIME STORAGE PER MONTH MAXIMUM	STORAGE CAPACITY	TYPE OF STORAGE	SIZE OF THE STORAGE AREA
1	Ammonia	Through pipe line from ship, berthed at IFFCO jetty	18,000 MT	20,000 MT	Above Ground Tank	OD- 45 M H- 20 M
			18,000 MT	20,000 MT	Above Ground Tank	OD- 45 M H- 20 M
			9,000 MT	10,000 MT	Above Ground Tank	OD- 31 M H- 20 M
2	Sulphur	Through belt conveyor from ship, berthed at IFFCO jetty	54,000 MT	60,000 MT	Above Ground Silo	L- 150 Mtrs W- 59 Mtrs H- 14 Mtrs
			43,200 MT	48000 MT	Above Ground Silo	L- 160 Mtrs W- 40 Mtrs H- 14 Mtrs
3	Rock Phosphate	Through belt conveyor from ship, berthed at IFFCO jetty	68,000 MT	75,000 MT	Above Ground Silo	L- 204 Mtrs W- 37 Mtrs H- 16 Mtrs
			68,000 MT	75,000 MT	Above Ground Silo	L- 204 Mtrs W- 37 Mtrs H- 16 Mtrs
			90,000 MT	1,00,000 MT	Above Ground Silo	L- 228 Mtrs W- 40.4 Mtrs H- 16 Mtrs
4	Coal	Through trucks	13,077 MT	1,50,000 MT	Open Yard	20,000 Sq. M.



INVENTORY OF HAZARDOUS SUBSTANCES



6.0 INVENTORY OF HAZARDOUS SUBSTANCES

SL. NO.	NAME	QUANTITY OF ONE TIME STORAGE	STORAGE CAPACITY	TYPE OF STORAGE	SIZE OF THE STORAGE AREA	REMARKS
1	Ammonia	18,000 MT	20,000 MT	A/G Tank 3 Nos.	OD- 45 M, H- 20.5 M	Qty is stored at ATM pressure & -33°C temp in insulated tanks of (2x20,000 MT + 1 x10,000 MT) capacity
		18,000 MT	20,000 MT		OD- 45 M, H- 20.5 M	
		9,000 MT	10,000 MT		OD- 31.4 M, H- 20.5 M	
2	Chlorine	900 KG	900 KG	Tonners 5 Nos.	OD- 0.75 M, H-7 M	Raw Water Treatment Plant
		900 KG	900 KG		OD- 0.75 M, H-7 M	Raw Water Treatment Plant
		900 KG	900 KG		OD- 0.75 M, H-7 M	Raw Water Treatment Plant
		900 KG	900 KG		OD- 0.75 M, H-7 M	EC Cooling Tower
		900 KG	900 KG		OD- 0.75 M, H-7 M	Ammonia Storage Cooling Tower
3	Sulphur	54,000 MT	60,000 MT	A/G Silo 1 No's	L- 150 Mtrs, W- 59 Mtrs, H-14 Mtrs	Stored in Sulphur storage silo
		43,200 MT	48,000 MT		L- 160 Mtrs, W- 40 Mtrs, H-14 Mtrs	Stored in Sulphur storage silo
4	Sulphuric Acid	12,000 MT	20,000 MT	A/G Tank 3 No's	D- 40 Mtrs H-10 Mtrs	Qty is stored in tanks of (2x20,000 MT + 1 x25,000 MT) capacity
		12,000 MT	20,000 MT		D-40 Mtrs H- 10 Mtrs	
		16,000 MT	25,000 MT		D- 40 Mtrs H- 12.2 Mtrs	
5	Phosphoric Acid	2,600 MT	2600 MT	1 No of A/G Tank	D- 20 Mtrs H- 7.5 Mtrs	Tank is located at Phosphoric acid plant
		12300 MT	12300 MT		D- 20 Mtrs H- 13.5 Mtrs	Tank is located at Phosphoric acid plant

SL. NO.	NAME	QUANTITY OF ONE TIME STORAGE	STORAGE CAPACITY	TYPE OF STORAGE	SIZE OF THE STORAGE AREA	REMARKS
		7000 MT	7000 MT	1 no of A/G Tank	D- 20 Mtrs H- 14.5 Mtrs	Tank is located at Phosphoric acid plant
		25000 MT	25000 MT	1 No of A/G Tank	D- 40 Mtrs H- 12 Mtrs	Tank is located at Export tank area
		11982 MT	11982 MT	1 No of A/G Tank	D- 36 Mtrs H- 11 Mtrs	Tank is located at Export tank area
		1400 MT	1400 MT	1 No of A/G Tank	D- 12 Mtrs H- 11 Mtrs	Tank is located at Phosphoric acid plant
		22700 MT	22700 MT	10 No's of A/G Tanks	D- 14 Mtrs H- 11.2 Mtrs	Tank is located at Di Ammonium Phosphate plant
6	Sodium Hydroxide	15 M ³	15 M ³	1 No's of A/G Tank	D- 2.5 Mtrs H- 3 Mtrs	Vertical storage tanks located in Utility & off site
		13 M ³	13 M ³	1 No's of A/G Tank	D- 2.3 Mtrs H- 3.2 Mtrs	Vertical storage tanks located in Utility & off site
		50 M ³	50 M ³	1 No's of A/G Tank	D- 4 Mtrs H- 4 Mtrs	Vertical storage tanks located in Sulphuric acid plant
7	High Speed Diesel	450 KL	502 KL	1 No's of A/G Tank	D- 8 Mtrs H- 10 Mtrs	Vertical storage tanks located in Utility & off site
8	Furnace oil	810 KL	902 KL	1 No's of A/G Tank	D- 10 Mtrs H- 11.5 Mtrs	Vertical storage tanks located in Utility & off site
9	Transformer Oil	193 KL	193 KL	14 No's of Transformers	Rating 16 MVA to 80 MVA	Filled in transformers
	Transformer Oil	6.3 KL	6.3 KL	DRUM	Each drum 210 Lts	Store



Note: PAP: Phosphoric Acid Plant
DAP: Di-Ammonium Phosphate Plant
U&O: Utilities & Offsite
SAP: Sulphuric Acid Plant

**INVENTORY OF HAZARDOUS GASES
/ SUBSTANCES PRODUCED /
GENERATED DURING THE PROCESS**



7.0 INVENTORY OF HAZARDOUS GASES / SUBSTANCES PRODUCED / GENERATED DURING THE PROCESS

SL. NO.	NAME	QUANTITY PRODUCED (2013-14)	FLOW RATE IN STACK (NM ³ /HR)	MODE OF UTILIZATION
1	SO ₂ emission (Sulphuric Acid Plant)	SAP Tr-1: 1.24 kg per MT of 100% conc. Sulphuric Acid production (SAP Tr-1 H ₂ SO ₄ prodn. for the year 2013-14 = 837380 MT)	2,90,000 M ³ /Hr (single stream)	Used in the process
		SAP Tr-2: 1.16 kg per MT of 100% conc. Sulphuric Acid production (SAP Tr-2 H ₂ SO ₄ prodn. for the year 2013-14 = 624220 MT)		Used in the process
2	Acid Mist (Sulphuric Acid Plant)	SAP Tr-1: 30.8 Mg/Nm ³	2,90,000 M ³ /Hr (single stream)	Used in the process
		SAP Tr-2: 30.6 Mg/Nm ³		Used in the process
3	Fluoride (Phosphoric Acid plant)	14.4 mg / NM ³	1,62,000 M ³ /Hr	Used in the process
4	Fluoride (DAP/NPK Plant)	Tr-A: 9.0 mg / NM ³	5,82,000 M ³ /Hr (single stream)	Used in the process
		Tr-B: 8.6 mg / NM ³		
		Tr-C: 8.8 mg / NM ³		



IDENTIFICATION OF HAZARDS



8.0 IDENTIFICATION OF HAZARDS:

SL NO	HAZARD	PREDICTABLE HAZARD SCENARIO	IMPACT
1	Ammonia (NH ₃)	Toxic gas release	Damage/ loss of property, life and environment may occur
2	Chlorine (Cl ₂)	Toxic gas release	Damage/ loss of property, life and environment may occur
3	Sulphuric Acid	Spillage	Damage/ loss of property, life and environment may occur
4	Phosphoric Acid	Spillage	Damage/ loss of property, life and environment may occur
5	Sodium Hydroxide	Spillage	Damage/ loss of property, life and environment may occur
6	High Speed Diesel (HSD)	Fire	Fire may propagate to the nearby area which may cause damage / loss of property, life and environment
7	Furnace Oil (FO)	Fire	Fire may propagate to the nearby area which may cause damage / loss of property, life and environment
8	Sulphur	Fire	Damage/ loss of property, life and environment
9	Transformer Oil (TO)	Fire	Fire may propagate within the transformer area and damage / loss of property may occur due to Fire.



IDENTIFICATION OF MOST CREDIBLE HAZARD



9.0 IDENTIFICATION OF MOST CREDIBLE HAZARD

Case-1

Leakage of Ammonia from Ammonia Storage Tank

Health Hazard from Ammonia Storage Tank is considered as most Credible Scenario because of the following reasons;

Ammonia is a toxic gas as per schedule-1, Part-II (b) (v). Fire & Health classification as per NFPA, it comes under category Flammability-1* & Health Hazard-3**. The Threshold Limit Value (TLV) is 25 PPM, Short Time Exposure Limit (STEL) is 30 PPM & Immediate Danger to Life and Health (IDLH) is 300 PPM. The hazard assessment is done through modeling in different seasons as mentioned below.

Toxic Gas	Health Hazard Classification	Experience at distance in Kms			Indication
		Summer	Rainy	Winter	
Ammonia 20,000 MT	TLV (TWA) (8 Hrs Exposure) 25 PPM	5.6	6.2	7.5	No adverse effect
	STEL (15 Min Exposure) 30 PPM	5.1	5.6	6.9	No adverse effect
	IDLH (30 min Exposure) 300 PPM	1.5	1.6	2	Immediate nose and throat irritation

*Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature condition, before ignition and combustion can occur. This degree should include:

- Materials which will burn in air when exposed to a temperature of 1500°F (815.5°C) for a period of 5 minutes or less;
- Liquids, solids, and semisolids having a flash point above 200°F (93.4°C);
- This degree includes most ordinary combustible materials.

**Materials which upon short-term exposure could cause serious temporary or residual injury even though prompt medical treatment is given, including those requiring protection from all bodily contact. This degree should include:

- Materials giving off highly toxic combustion products;
- Materials corrosive to living tissue or toxic by skin absorption.

Case-2

Leakage of Chlorine gas from Chlorine Storage Tank

Leakage of Chlorine from Chlorine Storage Tank is considered as most Credible Scenario because of the following reasons;

Chlorine is a toxic gas as per schedule-1, Part-II (b) (v) non-flammable gas. Health classification as per NFPA, it comes under hazard Category-4*. The Threshold Limit Value (TLV) is 1 PPM, Short Time Exposure Limit (STEL) is 3 PPM & Immediate Danger to Life and Health (IDLH) is 10 PPM. The hazard assessment is done through modeling in different seasons as mentioned below.

Storage details	Significant heat level Kw/m ²	Experience at distance in Kms			Indication
		Summer	Rainy	Winter	
CHLORINE 900 KG	TLV (TWA) (8 Hrs Exposure) 1 PPM	7.3	4.8	4.6	No adverse effect
	STEL (15 Min Exposure) 3 PPM	4.9	3.1	3.0	Pungent, Choking, irritating Odor
	IDLH (30 min Exposure) 10 PPM	3.2	2.0	1.9	Irritation of eyes, mucous membranes, respiratory tract

*Materials which upon very limited exposure could cause death or major residual injury even though prompt medical treatment is given, including those which are too dangerous to be approached without specialized protective equipment. This degree should include:

- Materials which can penetrate ordinary rubber protective clothing;
- Materials which under normal conditions or under fire conditions give off gases which are extremely hazardous (i.e., toxic or corrosive) through inhalation or through contact with or absorption through the skin.



Case-3

Fire on HSD Storage Tank

Fire Hazard in HSD Storage Tank is considered as most Credible Scenario because of the following reasons;

HSD is a flammable liquid as per schedule-1, Part-II (b) (v) having flash point of > 66⁰C and auto ignition temperature of 225⁰C and explosive limit of 1.0% volume in air. Fire classification as per NFPA, it comes under category Flammability-2 (Moderate)*. So, it is susceptible to fire hazard. Whenever HSD catches fire it shall manifest in the form of pool fire. The Hazard assessment is done through modeling in different seasons as mentioned below.

Storage details	Significant heat level Kw/m ²	Experience at distance in Mtrs.			Indication
		Summer	Rainy	Winter	
HSD 502 KL	4.5	5.5	5.5	5	Causes pain if unable cover the body within 20 seconds. However blistering of the skin (2nd degree burn) is likely caused with no lethality
	12.5	4	3.5	3.5	Minimum energy required for melting of plastic
	37.5	3	2.5	2.5	Sufficient to cause damage to the equipment

* Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres with air. This degree should include:

- Liquids having a flash point above 100°F (37.8°C), but not exceeding 200°F (93.4°F);
- Solids and semisolids which readily give off flammable vapors.

Case-4

Fire on FO Storage Tank

Fire Hazard in FO Storage Tank is considered as Credible Scenario because of the following reasons;

FO is flammable liquid as per schedule 1, Part - II (v) having flash point of >43°C and auto ignition temperature of 220-300⁰ C and explosive limit of 1.0% volume in air. Fire classification as per NFPA, it comes under category Flammability-2 (Moderate)*. So, it is susceptible to fire hazard. Whenever FO catches fire it shall manifest in the form of pool fire. The Hazard assessment is done through modeling in different seasons as mentioned below.

Storage details	Significant heat level Kw/m ²	Experience at distance in Mtrs.			Indication
		Summer	Rainy	Winter	
FO 902 KL	4.5	6	6	6.5	Causes pain if unable cover the body within 20 seconds. However blistering of the skin (2nd degree burn) is likely caused with no lethality.
	12.5	3.5	3.5	4	Minimum energy required for melting of plastic
	37.5	2.5	2.5	3	Sufficient to cause damage to the equipment.

* Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres with air. This degree should include:

- Liquids having a flash point above 100°F (37.8°C), but not exceeding 200°F (93.4°F);
- Solids and semisolids which readily give off flammable vapors.

Note: PAC: Protective Action Criteria
ERPG: Emergency Response Planning Guidelines

PLOT PLAN



10.0 PLOT PLAN

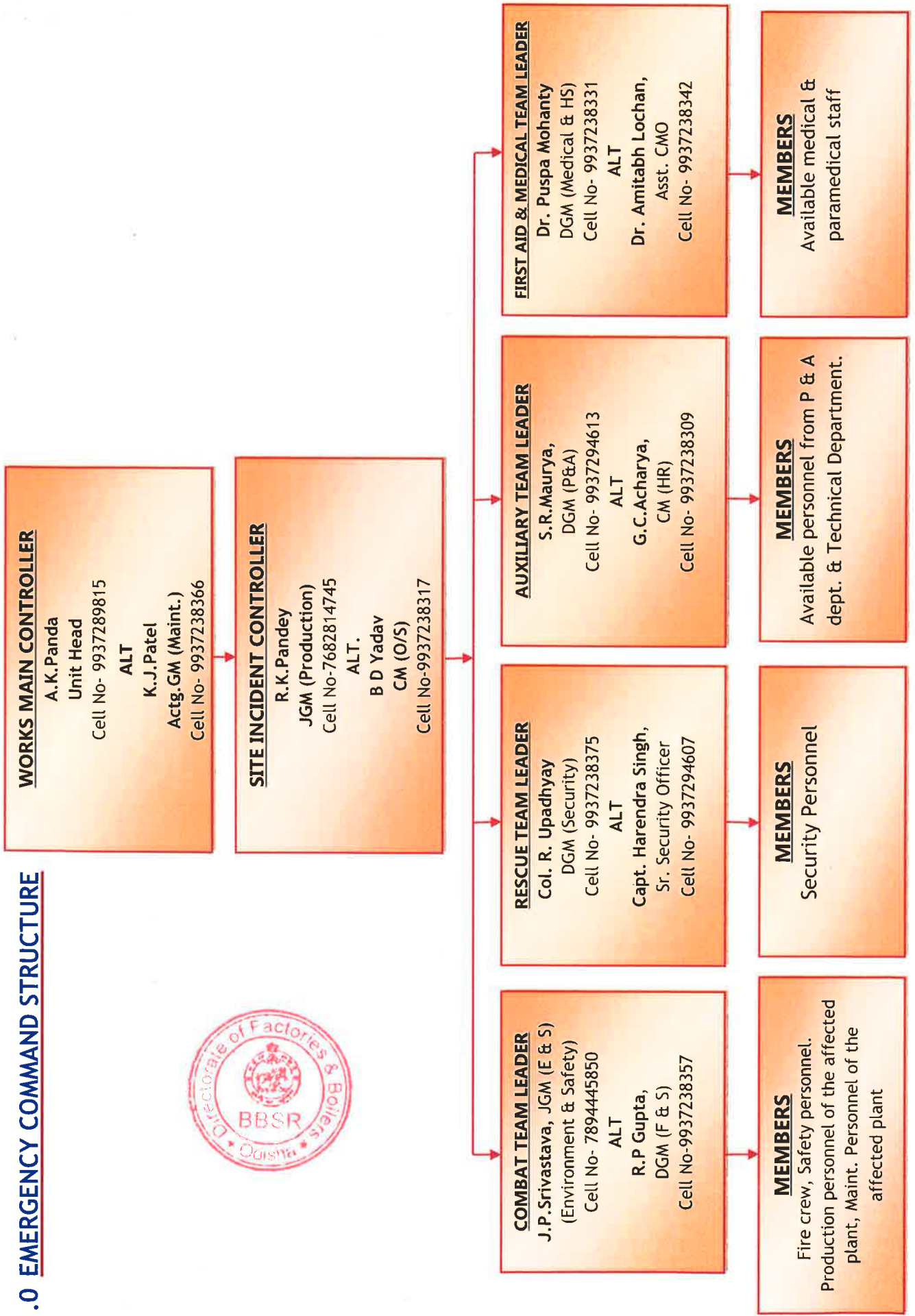
The plot-plan showing Hazard Zone, Iso-Risk Contour, Emergency Control Room, Assembly points, Main, Material & Emergency Exit and Fire Hydrant line along with its no. of Hydrant Points in different colour codes.



EMERGENCY COMMAND STRUCTURE



11.0 EMERGENCY COMMAND STRUCTURE





ROLE OF KEY PERSONS OF EMERGENCY COMMAND STRUCTURE

12.0 ROLE OF KEY PERSONS OF EMERGENCY COMMAND STRUCTURE:

12.1 WORKS MAIN CONTROLLER (WMC):-

- On being informed, rushes to the scene and takes overall charge of the situation.
- Makes quick assessment of the situation and decides declaration of emergency by blowing the emergency siren through Site Incident Controller (SIC), the message reaches to Emergency control room (ECR).
- Directs leaders of the Combat, Rescue & Auxiliary teams through Site Incident Controller to take control of the situation in the affected area.
- Makes continuous review and assess the possible developments to determine the extent of damage to plant and human beings.
- Directs shut-down of the plant, if necessary.
- Orders evacuation process by consulting with key persons.
- Ensures that casualties are receiving adequate attention.
- Liaises with the fire services, police services and other statutory authorities.
- Declares closure of the emergency by blowing the all clear siren after receiving the information from SIC regarding emergency is under control.
- Issues the authorized statements to the media services.
- Reports all statutory authorities in the prescribed manner.

12.2 SITE INCIDENT CONTROLLER:-

- On being informed by concerned/affected section, rushes to the scene and reports to the Works Main Controller, and communicate to security for blowing of emergency siren accordingly.
- Carries out the instructions of Works Main Controller.
- Makes quick assessment about the gravity of the situation and appraises Works Main Controller.
- Orders Combat Team Leader, Rescue Team Leader and Auxiliary Team Leader to discharge their responsibilities immediately.
- Extends all sorts of help through different agencies, to minimize the damage to human being, plant, property and environment.
- Reports the development of the situation, time to time to Works Main Controller.
- After situation under control, informs to WMC and communicate for all clear siren accordingly.
- Preserves the evidences for the subsequent inquiries.

12.3 COMBAT TEAM LEADER:-

- On hearing the emergency siren, rushes to the scene along with the firefighting team, with sufficient equipments in the minimum possible time and reports to Site Incident Controller time to time.
- Carries out the instructions of Site Incident Controller.
- Ensures that, the team members resume their position with appropriate equipments.
- Monitors the firefighting operation to control the situation.
- Ensures that, the situation is controlled by arresting spillage, shutting/closing of the valves etc. by the team, in consultation with Site Incident Controller.
- Assists the Site Incident Controller, till the situation is under control.

12.4 COMBAT TEAM MEMBERS:-

- On hearing the emergency siren, rush to the scene with firefighting equipments, in the minimum possible of time and report to their team leader.
- Carry out orders of the team leader.
- Operate the firefighting equipments for controlling the situation.

12.5 RESCUE TEAM LEADER:-

- On hearing the emergency siren, rushes to the scene and reports to the Site Incident Controller.
- Carries out the instruction of the Site Incident Controller.
- Ensures the arrival of his team members.
- Carries necessary arrangement to control traffic movement and emergency vehicles.
- Extend help and directs the ambulance to carry the injure persons to the hospital.
- Ensures the use of proper personal protective equipments by the team members, before the rescue operation.
- Informs the Works Main Controller about the development time to time.
- Guides and extend help to the Mutual Aid Partners for their course of action at the site.
- Guides the rescued /other workers to reach the assembly point as per wind direction.
- Searches the missing person(s) on the roll call basis with help of auxiliary team members.



12.6 RESCUE TEAM MEMBERS:-

- On hearing the emergency siren, rush to the scene with appropriate personal protective equipments and report to their team leader.
- Carry out orders of the team leader.

12.7 AUXILIARY TEAM LEADER:-

- On hearing the emergency siren, rushes to the Emergency Control Room (ECR) and reports to the Works Main Controller.
- Carries out the instruction of Works Main Controller.
- Ensures the arrival of his team members.
- Intimates statutory authorities over phone.
- Intimates nearest Fire Station over phone.
- Intimates Mutual-Aid Partners over phone.
- Keeps the first-aid trainers ready with essential medicines & dressing materials, to give first- aid to victims.
- Takes care of victims' family.
- Makes all arrangements like transport, other needs, finance etc.
- Ensures that all casualties are shifted to hospital for medical treatment.
- Keeps records of casualties and provide information of the matter to Works Main Controller time to time.

12.8 AUXILIARY TEAM MEMBERS:-

- On hearing emergency siren, rushes to the site and reports to their team leader.
- Carry out the orders of the team leader.



12.9 FIRST AID & MEDICAL TEAM LEADER:-

- On being informed / hearing the emergency siren, send ambulance to the site with adequate medical facility. Also reaches at First aid center for medical attention of victims.
- Arrange additional staff and medical equipments to control the situation.
- Liaise with nearby hospitals to extend medical help as per situation.


ACTION PLAN FOR ON-SITE EMERGENCY



13.0 ACTION PLAN FOR ON-SITE EMERGENCY:

STEP NO.	INITIATOR	ACTION TO TAKE
1.	The person noticing the emergency (Gas leak /Fire)	<ul style="list-style-type: none"> ➤ Informs the concerned Shift-in-charge who in turn informs Fire control Room, Sectional head, medical & security immediately regarding the emergency.
2.	Works Main Controller (WMC)	<ul style="list-style-type: none"> ➤ On being informed, rushes to the spot for combating the situation. Takes charge of the situation and arranges declaration of emergency. Then Moves to Emergency Control Room. ➤ Instructs SIC to organize key personnel to combat the situation. ➤ Start combating by shutdown plant & equipments and takes steps to mitigate the emergency. ➤ Finds out the root cause of emergency and to takes necessary action of its prevention. ➤ Advises the Auxiliary Team Leader to inform the statutory authorities and to seek help from Mutual- aid Partners, if required.
3.	Site Incident Controller (SIC)	<ul style="list-style-type: none"> ➤ Informs Works Main Controller (WMC) and rushes to site. ➤ Discusses with the Combat Team Leader (CTL), assesses the situation and call the Rescue Team Leader (RTL) & maintenance personnel to the site. ➤ Arranges to evacuate the unwanted persons and call for additional help. ➤ Passes information to the Works Main Controller (WMC) about the situation of site, time to time. ➤ Communicate for all clear siren after normalcy of emergency and after the situation is overcome.

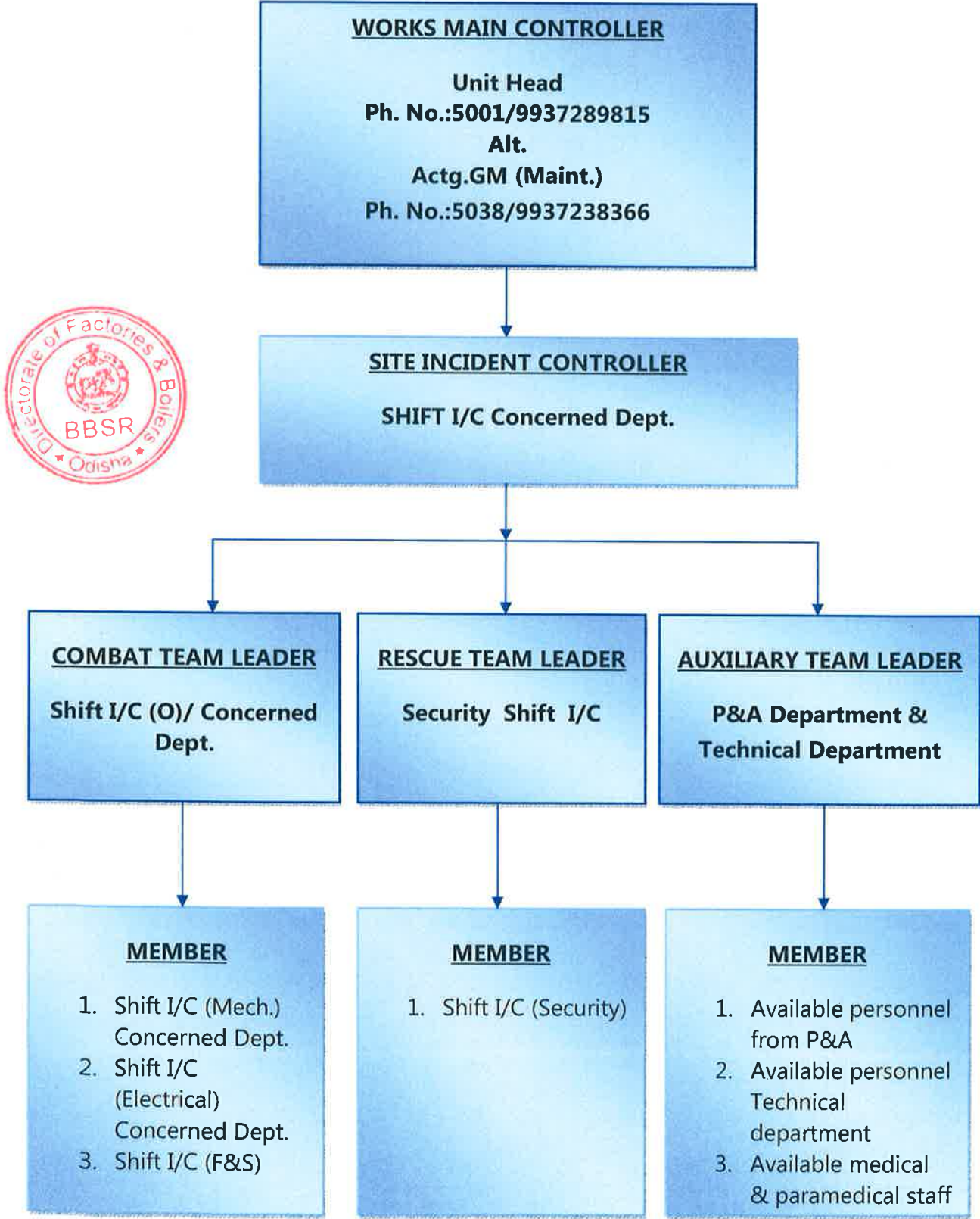


4.	<p>Combat Team Leader (CTL)</p>	<ul style="list-style-type: none"> ➤ Rushes to Emergency Site and observe the ongoing activities. ➤ Takes stock of the situation in consultation with the Site Incident Controller. ➤ Extend help to combat emergency and arrange for equipment and manpower. ➤ Ensures that the emergency operations are recorded chronologically. ➤ Guide maintenance team for attending the leakage if any.
5.	<p>Rescue Team Leader</p>	<ul style="list-style-type: none"> ➤ Consults with Site Incident Controller (SIC) and rushes to the emergency site through safe route along with the team members and starts rescue work. ➤ Shifts the injured persons to hospital by ambulance after necessary first aid. ➤ Informs the Auxiliary Team Leader for necessary help if required from Mutual Aid Partners.
6.	<p>Auxiliary Team Leader and Team Members</p> 	<ul style="list-style-type: none"> ➤ On being directed by Works Main Controller (WMC) informs about the emergency to Statutory Authorities. ➤ Seeks help from Mutual- Aid Partners and coordinate the Mutual Aid Partners to render their services, if required. ➤ Takes role call to find out the missing persons, if any. ➤ Arranges to inform the relatives of casualties. ➤ Takes care of visit of the Statutory Authorities to the emergency site. ➤ Each team member should follow the instructions of his team leader to mitigate the emergency.
7	<p>First aid & medical Team leader</p>	<ul style="list-style-type: none"> ➤ On being informed / hearing the emergency siren, send ambulance to the site with adequate medical facility. Also reaches at First aid center for medical attention of victims. ➤ Arrange additional staff and medical equipments to control the situation. ➤ Liaise with nearby hospitals .

SILENT HOUR COMMAND STRUCTURE



14.0 SILENT HOUR COMMAND STRUCTURE:



14.1 ROLE OF KEY PERSONS IN SILENT HOUR COMMAND STRUCTURE:

- Silent Hour is the time when General Shift people are not available.
- The command structure for the silent hour shall be same as during normal hour, however, during the silent hour the shift in-charge of concerned section/affected plant shall act as Works Main Controller-cum Site Incidence Controller, till the arrival of the Works Main Controller.
- Since during these hours Works Main Controller, Site Incident Controller, Combat Team Leader, Rescue Team Leader and the Auxiliary Team Leader may not be available inside the plant, they shall be informed by the shift in-charge of concerned section/affected plant (Works Main Controller during Silent Hour) either by telephone or by sending special messenger to their residences.
- On receiving the information the Works Main Controller, Site Incident Controller, Combat Team Leader, Rescue Team Leader and Auxiliary Team Leader shall reach the site at the earliest and simultaneously Combat Team Leader, Rescue Team Leader and Auxiliary Team Leader shall ensure the presence of their respective team members.
- Thereafter the action plan as well as the role of key persons shall be same as the normal hour execution of Command Structure.



ACTIVATION AND CLOSING PROCEDURE FOR ON-SITE EMERGENCY



15.0 ACTIVATION AND CLOSING PROCEDURE FOR ON-SITE EMERGENCY:

- Anybody notices FIRE/GAS LEAK, shout “FIRE, FIRE”, “FIRE”/”GAS GAS”, “GAS” and informs to the Shift-in-charge.
- Being informed about gas leak/fire, the Shift-in-charge informs concerned sectional head, Fire control room, First-Aid and security.
- On hearing about the gas leak/fire, the Works Main Controller and the Site Incident Controller rush to the site and make quick assessment of the situation.
- On quick assessment of the situation, the Works Main Controller rushes to the emergency control room and declares emergency by blowing appropriate siren through SIC.
- On hearing of Emergency siren, the key personnel of Emergency Combat Structure perform their duties and responsibilities as per the worksheet instruction.
- During the emergency operation, the Works Main Controller keeps records of activities carried on, supervises overall, maintains liaison with Mutual Aiders and Statutory Authorities
- After control of the situation, the Works Main Controller declares normalcy by blowing appropriate siren through site incident controller.



ANNEXURE

ANNEXURE	DESCRIPTION	PAGE NO
ANNEXURE-I	DETAILS OF FACILITIES AVAILABLE	52-58
ANNEXURE-II	MUTUAL AID	59
ANNEXURE-III	DETAILS OF TELEPHONE NUMBERS OF KEY PERSONNEL	60-61
ANNEXURE-IV	MATERIAL SAFETY DATA SHEET	62-97



ANNEXURE-I

DETAILS OF FACILITIES AVAILABLE

❖ **SIREN:**

Main emergency siren is installed above the security building in the factory; its audible range is 5 KM. Looking to the vast area, additional three sirens are also installed locally as below.

- In Ammonia Storage Area
- In Sulphuric Acid Plant
- Bagging Plant

Actuation of the entire siren can be done from the security office.

❖ **EMERGENCY SIREN CODE:**

In case of emergency the siren will be blown as below:

- *Toxic Release/ Major Fire -(On-site Emergency Plan)- High /Low*

----- OFF-----OFF-----OFF----- OFF-----OFF (Five Times)
(15/05 Sec) (05/05 Sec) (15/05 Sec) (15/05 Sec) (15/05 Sec)

- *Toxic Release- (Off-site Emergency Plan)-High / Low*

----- OFF-----OFF-----OFF----- OFF-----OFF----- OFF-----OFF-----OFF----- (10 times)
(15/05 Sec) (15/05 Sec) (15/05 Sec) (15/05 Sec) (15/05 Sec) (15/05 Sec) (15/05 Sec)

- ALL CLEAR: Continuous sound for two Minutes.
- TESTING: 1st day of every month at 11.00 Hrs.

❖ **PUBLIC ADDRESS SYSTEM (PAS) :**

- Public Address System (PAS) is provided in the control rooms of all the plants.

❖ **COMMUNICATION FACILITIES :**

- Satellite phone & Mobile Phones
- P&T Telephone
- Intercom
- Walkie- Talkie
- E-mail
- Messengers
- Vehicles



❖ **TRANSPORTATION:**

- Fire Jeep - 01
- Bus - 03
- Ambulance - 03
- Company's Car - 10
- Hired Car - 10
- Truck / Jeep - 03
- Truck - 70
- Crane - 08
- Hydra - 10
- Personal & Official vehicles of Employees.

❖ **MEDICAL FACILITIES**

- First Aid Centre
- 12 bed Dispensary at IFFCO Township
- Three numbers of ambulances

❖ **FIRE FIGHTING ARRANGEMENT**

Fire prevention and fighting have been given much importance in the factory. The salient features of the systems are:-

- Fire station manned by qualified, experienced and trained personnel round the clock.
- Mobile Fire Tenders
- Fire water storage
- Fire hydrant network with monitors and hydrant points
- Portable Fire extinguishers of different types including DCP, CO₂, & Clean Agent and mobile trolley monitors.



❖ **LIST AND TYPE OF FIRE EXTINGUISHER:**

Sl. NO	DEPARTMENT	ABC	CO ₂		QUANTITY	
		6 Kg	2 Kg	4.5 Kg		6.5 Kg
1.	DAP	33	07	04	06	50
2.	PAP	12	13	02	09	36
3.	SAP	22	05	07	13	47
4.	O&U	19	07	02	12	40
5.	NON PLANT	18	19	03	12	52
6	BOILER & CHP	09	03	05	03	20
7	POWER PLANT	08	05	-	08	21
8	BAGGING PLANT	15	08	02	05	30
9	PORT	16	09	02	14	41
	TOTAL	152	76	27	82	337

❖ **FIRE BUCKETS:**

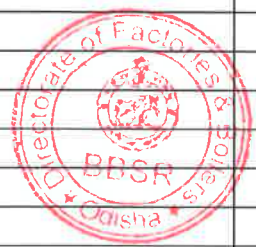
SL NO	NAME OF AREA	NUMBER OF FIRE BUCKETS
1.	Di-Ammonium Phosphate Plant	04 No's
2.	Phosphoric Acid Plant	04 No's
3.	Sulphuric Acid Plant	04 No's
4.	Off-Sites & Utilities	12 No's
5.	Non Plant	04 No's
6	Boiler	04 No's
7	Energy Center	12 No's
	Total	44 No's



❖ **FIRST AID BOXES:**

Company has provided First Aid boxes with required first aid medicines and dressing materials as per statute at different locations inside the plant. First aid boxes are being checked once in a month and medicines are replaced. The locations are mentioned below:

SL. NO.	LOCATION	NO OF BOXES
1	AMMONIA CONTROL ROOM	1
2	AMMONIA ELECTRICAL	1
3	UTILITY SUBSTATION	1
4	UTILITY OFFICE	1
5	UTILITY OFFICE (HOD)	1
6	D.M PLANT	1
7	M.H OFFICE	1
8	SAP FIRE CONTROL ROOM	1
9	SAP SUBSTATION	1
10	SAP PROCESS CONTROL ROOM	1
11	SAP CONTROL ROOM (HOD)	1
12	FIRE & SAFETY OFF OFFICE	1
13	FIRE EMERGENCY CONTROL ROOM	1
14	SAP MAINTAINANCE BUILDING	1
15	ENERGY CENTER (HOD)	1
16	ENERGY CENTER MACHANICAL CONTROL ROOM	1
17	ENERGY CENTER ELECTRICAL SUBSTATION	1
18	ENERGY CENTER CONTROL ROOM	1
19	BOILER CONTROL ROOM	1
20	BOILER CONTROL ROOM (HOD)	1
21	BOILER SUBSTATION	1
22	PAP REACTOR	1
23	PAP SUBSTATION	1
24	PAP BALL MILL	1
25	PAP FILTRATION	1
26	PAP PROCESS CONTROL ROOM	1
27	DAP TRAIN CONTROL ROOM-A	1
28	DAP TRAIN CONTROL ROOM-B	1
29	DAP TRAIN CONTROL ROOM-C	1
30	DAP TRAIN MCC-A	1
31	DAP TRAIN MCC-B	1
32	DAP SUBSTATION	1
33	DAP PROCESS HOD	1
34	DAP MECHANICAL HOD	1
35	BAGGING PLANT CONROL ROOM	1
36	BAGGING PLANT ELECTRICAL	1
37	BAGGING DESPATCH SECTION	1
38	CHP CONTROL ROOM	1



39	CHP ELECTRICAL	1
40	CENTRAL WORKSHOP HOD	1
41	CENTRAL WORKSHOP MECHANICAL	1
42	CENTRAL WORKSHOP ELECTRICAL	1
43	CENTRAL WORKSHOP PLANNING	1
44	DG ROOM	1
45	EMERGENCY POWER HOUSE DG	1
46	CENTRAL LAB	1
47	CENTRAL LAB HOD	1
48	STORE	1
49	CANTEEN	1
50	NON PLANT SUBSTATION	1
51	TRAINING HALL	1
52	PORT JETTY	1
53	PORT SHIPING OFFICE HOD	1
54	TOWNSHIP SUBSTATION	1
55	GUEST HOUSE	1
56	DAV SCHOOL	1
57	SECURITY BARRACK	1
58	SECURITY GATE-1	1
TOTAL		58

❖ **Fire Station**

A Fire Station, manned by qualified and experienced persons, is established to control any type of fire and releases of toxic gas. The following appliances are available at the fire station.

Portable water monitor

B.A. Set

Fire Proximity Suit (Aluminised)



40

25

03

Water Tender- Registration Number: OD-21-4723

Chassis (Make) : Tata LPT 1616/48
 Water Tank Capacity : 6500 Lts
 Monitor Discharge @ 7 Kg/cm² : 1800 LPM
 High Pressure Hose Reel @ 100 Kg/cm² : 150 LPM
 Diesel tank capacity : 350 Lts

Foam Tender- Registration Number: OR-21-7262

Chassis (Make)	: Tata LPT 1613/42
Water Tank Capacity	: 4000 Lts
Foam Tank Capacity	: 1000 Lts
Monitor Discharge @ 7 Kg/cm ²	: 1800 LPM
High Pressure Hose Reel @ 35 Kg/cm ²	: 250 LPM
Diesel tank capacity	: 310 Lts

Foam Tender- Registration Number: OR-04 B-4136

Chassis(Make)	: Tata LPT 1613/42
Water Tank Capacity	: 4000 Lts
Foam Tank Capacity	: 800 Lts
Monitor Discharge @ 7 Kg/cm ²	: 1800 LPM
High Pressure Hose Reel @ 7 Kg/cm ²	: 30 LPM
Diesel tank capacity	: 260 Lts

❖ Fire Hydrant System:

- ✓ There is one process water storage tank of 20,000 M³ capacity. During emergency water available in the above tank shall be utilized for fire water service. The source of water for the plant is from the Taladanda Canal, which originates from Mahanadi Barrage.
- ✓ No. of fire Hydrant point: 310 no's
- ✓ No. of fire Hydrant Hoze: 100 no's
- ✓ Size of the fire hydrant hose: dia-63 mm (15 Mtr length)
- ✓ Water Jet monitors: 05 no's
- ✓ Fire hydrant line pressure: 7 kg/cm²



❖ **Personal Protective Equipments (PPE) & Fire Fighting Equipments:**

Sl. No.	Equipment	Qty.
1.	Fire Tender	03 Nos.
2.	Portable Fire Pump	02 Nos.
3.	B.A. Set	25 Nos.
4.	Spare Cylinder of B.A. Set	10 Nos.
5.	B.A. Set Compressor	01 Nos.
6.	Airline with mask	15 Nos.
7.	Fire Proximity suit (Aluminised)	03 Nos.
8.	Gas Tight Suit	01 Nos.
9.	PVC Chemical suit (Disposable)	100 Nos.
10.	Multi Gas Detector/Explosimeter (LEL/O2)	01Nos.
11.	Ear Plug	400 Nos.
12.	Ear Muff	25 Nos.
13.	Dust Respirator	2000 Nos.
14.	Safety Belt	100 Nos.
15.	Safety Goggles	150 Nos.
16.	Wind Socks (with stand)	25 Nos.
17.	Chlorine Kit	03 Nos.
18.	Safety Net	20 Nos.
19.	Barricading Tape	100 rolls
20.	Gum Boot	6 pairs
21.	Heat Resistant Blanket	10 Nos.
22.	Walkie Talkie Set	04 Nos.
23.	Leather /chrome Hand Gloves	50 Nos.
24.	Kevlar hand gloves	10 Nos
25.	Acid alkali proof hand gloves	30 pairs
26.	PVC Hand Gloves	50 pairs
27.	Cotton Hand Gloves	50 pairs
28.	Fire Extinguisher	700 Nos.
29.	Safety Helmet	200 Nos.
30.	Torch	05 Nos.



ANNEXURE-II

MUTUAL AID

IFFCO Paradeep Unit, PPL & IOCL took an initiatives and organized a “Mutual Aid Scheme” meeting at Empires Hotel, Paradeep on 29th November 2012 with the active and wholehearted participation of all major industrial organizations of Paradeep region and Paradeep Port Trust. Senior officers from Indian Oil Corporation Ltd (both Refinery Division and Pipelines Division), Paradeep Port Trust, IFFCO, Paradeep Phosphates Ltd and several the members attended the meeting.

Details of Participants:

SL. NO.	NAME	ORGANIZATION	MOBILE NO.	E-MAIL ID
1	R L Kalita	IOCL, Paradeep Refinery	9437070382	kalitarl@indianoil.in
2	V C Sati	IOCL, PHBPL, Paradeep	9937299712	sativc@indianoil.in
3	R K Acharya	IOCL, PHBPL, Paradeep	9937270599	ranjanka@indianoil.in
4	Nihar K Rout	Paradeep Phosphates Ltd	9937297620	nkrou@paraphos.com
5	S K Kamble	IFFCO, Paradeep	9937238353	sureshkashinathkamble@iffco.in
6	B K Parida	Paradeep Port Trust	9861232235	basantakparida@yahoo.com
7	Venkatesh Bhat	Cargill India Pvt Ltd	9178457302	Venkatesh_bhat@cargill.com
8	P K Gupta	Essar Steel India Ltd, Paradeep	9777456100	Pramod.Gupta@essar.com
9	A S Prasad	Essar Steel India Ltd, Paradeep	7381007000	Asrinivasa.Prasad@essar.com
10	K Subba Rao	Essar Steel India Ltd	9879100499	Subbarao.kamma@essar.com



ANNEXURE-III

DETAILS OF TELEPHONE NUMBERS OF KEY PERSONNEL

SL. NO.	NAME & DESIGNATION	DESIGNATION AS PER EMERGENCY COMMAND STRUCTURE	TELEPHONE/ CELL NUMBER
1	A.K.Panda, Unit Head	WMC	9937289815
2	K.J. Patel, Actg.GM (Maint.)	Alt. WMC	9937238366
3	R.K. Pandey, JGM (Prod.)	SIC	7682814745
4	B D Yadav CM (O/S)	Alt. SIC	9937238317
5	J.P. Srivastava, JGM (Env. & Safety)	CTL	7894445850
6	R.P. Gupta, DGM (F&S)	Alt. CTL	9937238357
7	Col. R. Upadhyay DGM (security)	RTL	9937238375
8	Capt. Harendra Singh Sr. Security Officer	Alt. RTL	9937294607
9	S.R. Maurya DGM (P&A)	ATL	9937294613
10	G. C. Acharya, CM (HR)	Alt. ATL	9937238309
11	Dr. Puspa Mohanty DGM (Medical & HS)	First Aid & Medical Team Leader	9937238331
12	Dr. Amitabh Lochan, Asst. C.M.O	Alt. First Aid & Medical Team Leader	9937238342



DETAILS OF TELEPHONE NUMBERS OF STATUTORY AUTHORITY

SL. NO.	AUTHORITY	TELEPHONE NUMBER
1.	District Collector, Jagatsinghpur	06724-220379
2.	Addl. District Magistrate, Jagatsinghpur	06724-220147
3.	Superintendent Police, Jagatsinghpur	06724-220115/ 94370-94678
4.	Chief district Medical Officer, Jagatsinghpur	06724-220064
5.	District Fire Officer, Jagatsinghpur	06724-220099
6.	Police Station, Paradeep	06722-222027
7.	Paradeep Port Hospital, Paradeep	06722-222107,222101
8.	Kujanga Fire station, Kujanga	06722-236246
9.	Directorate of Factories and Boilers, Odisha, Bhubaneswar	0674-2396070 (Off)/ 2396130 (Res)
10.	Dy. Director of Factories & Boilers, Cuttack Division	0671-2505575/ 94373-57396
11.	Asst. Director of Factories & Boiler, Paradeep Zone	0671-2505575/ 94374-30292



MATERIAL SAFETY DATA SHEET



1. AMMONIA

1. CHEMICAL IDENTITY :

Product Name	AMMONIA
Chemical classification	Alkaline, Corrosive
Synonyms	Anhydrous ammonia
Trade Name	Ammonia
Formula	NH ₃
C.A.S. Number	7664-41-7
U.N. Number	1005
Regulated Identification	
Shipping name Codes / Label	Ammonia Anhydrous
HAZCHEM Code	1005-15
Hazardous waste Identification Number	
Hazardous Ingredients	

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Liquid / Gaseous
Appearance	Colourless
Odour	Pungent and irritating odour
Boiling Point (°C)	- 33.3
Melting / Freezing Point (°C)	- 77.7
Vapour pressure @ 35°C (mm-Hg)	> 1 atm.
Vapour Density(air =1)	0.6
Evaporation rate @ 30 °C	
Solubility in water @ 30°C	Highly Soluble
Specific Gravity (Water =1)	0.77
pH	11.7
Others	Mol Wt - 17



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	Yes
LEL (%)	16 v/v
UEL(%)	25 v/v
Flash Point (°C)	
Auto ignition Temperature (°C)	651
TDC Flammability (Classification)	
Combustible Liquids	
Flammable Material	
Pyrophoric Material	
Explosive Material	
Unstable Material	
Corrosive Material	
Oxidiser	
Organic Peroxide	

4. REACTIVE HAZARDS :

Impact(Hazardous Combustion Products)	Nil
Static Discharge(Hazardous Decomposition Product)	Nil
Reactivity (Conditions to avoid)	Reactive with chlorine, violent reaction with acids, strong oxidants, halogens, highly soluble in water generating heat.
Hazardous Polymerization	Nil
Incompatibility	Materials to avoid Strong oxidizers, hypo chlorite bleaches, mercury chlorine, nitrogen oxide, halogens, Aluminum, Zinc, Copper etc.

5. HEALTH HAZARD DATA:

Routes of Entry	Eyes, Respiratory tract and skin contact.
Effects of Exposure / Symptoms	<ul style="list-style-type: none"> • Liquid ammonia causes cold burns on contact. • 400-700 ppm causes upper respiratory tract irritation. • 1000-2000 ppm causes severe coughing, severe eye, nose and throat irritation. • 3000 - 4000 ppm could be fatal after 30 minutes exposure.
LD 50(rat) (mg / kg of body wt.)	
LC 50 (rat) Mg / ¼ hours.	
Permissible Exposure Limit (PEL)	25 ppm 17 mg/m ³

Short Term Exposure limit (STEL)	35 ppm	24 mg/m ³
Threshold Limit Value (TLV)	25 ppm	17 mg/m ³
Odour Threshold	Low - 0.0266 mg/m ³ High - 39.6 mg/m ³	
NFPA Hazard Signal	Health - 2-3, Flammability - 3. Stability - 0	

6. SAFE USAGE DATA

Ventilation	General / Mechanical	
	Local Exhaust	
Protective	Eyes (Specify)	
Equipment	Respiratory (Specify)	Breathing Apparatus Set
Required	Gloves (Specify)	Hand Gloves
	Clothing (Specify)	
	Others (Specify)	Body protective Suit
Precautions	Handling & Storage	To be stored in recommended vessels.
	Others (Specify)	Handle with the use of PPE only.

7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	Water, Alkaline Foam
	Special Procedures	Water Curtains
	Unusual Hazards	Spills
Exposure	First Aid Measures	Any person affected by ammonia should be taken immediately into fresh air. Eyes should be washed with an abundance of clean water for at least fifteen minutes.
		Any contaminated cloths with ammonia liquid should be drenched with water & be removed as soon as possible and affected point should be washed with copious amounts of water. Patient should be kept warm. Administer oxygen if available in case of difficulty breathing or give artificial respiration. Must be consulted with doctor.
Spills	Steps to be taken	To be contained and mitigated with alkaline. Foams for avoiding rapid evaporation.
	Waste Disposal Method	



8. ADDITIONAL INFORMATION :

Ammonia is used as an intermediate for Di-ammonium Phosphate or Mixed Fertiliser Production at IFFCO Paradeep.

2. CHLORINE

1. CHEMICAL IDENTITY :

Product Name	CHLORINE
Chemical classification	Acidic nature
Synonyms	
Trade Name	Chlorine
Formula	Cl ₂
C.A.S. Number	7782-50-5
U.N. Number	1017
Regulated Identification	
Shipping name Codes / Label	Ammonia Anhydrous
HAZCHEM Code	IMO class-2.3
Hazardous waste Identification Number	17
Hazardous Ingredients	

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Liquid / Gas
Appearance	Green Yellow Gas
Odour	Pungent
Boiling Point (°C)	- 34.5
Melting / Freezing Point (°C)	- 101
Vapour pressure @ 35°C (mm-Hg)	> 1 atm. (4800)
Vapour Density(air =1)	1.409
Evaporation rate @ 30 °C	
Solubility in water @ 30°C	
Specific Gravity (Water =1)	
pH	
Others	Mol Wt - 71



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	
LEL (%)	
UEL(%)	
Flash Point (°C)	
Auto ignition Temperature (°C)	
TDC Flammability (Classification)	

Combustible Liquids	
Flammable Material	
Pyrophoric Material	
Explosive Material	
Unstable Material	
Corrosive Material	
Oxidiser	
Organic Peroxide	

4. REACTIVE HAZARDS :

Impact(Hazardous Combustion Products)	Toxic product are generated and combustible burn in Chlorine
Static Discharge(Hazardous Decomposition Product)	Stable
Reactivity (Conditions to avoid)	Reaction with alcohol metals, Sulphites, tri-alhilboranes
Hazardous Polymerization	
Incompatibility	Combustible substances, Finally divided metals.

5. HEALTH HAZARD DATA :

Routes of Entry	Eyes, Respiratory tract and skin contact.
Effects of Exposure / Symptoms	Causes eye irritation, sneezing, copious salivation, general excitement and restlessness. High concentration causes respiratory distress and violent coughing. Often with retching. Death may result from suffocation. <ul style="list-style-type: none">• 30 ppm causes intense coughing fits & burning.• 40 ppm causes cardiac paralysis & bronchitis.• 1000 ppm danger to life even after few deep inhalations
LD 50(rat) (mg / kg of body wt.)	
LC 50 (rat) Mg / ¼ hours.	
Permissible Exposure Limit (PEL)	1 ppm 3 mg/m ³
Short Term Exposure Limit(STEL)	3 ppm 9 mg/m ³
Threshold Limit Value (TLV) of ACIGH	1 ppm 3 mg/m ³
Odour Threshold	3.5 ppm 10.2 3 mg/m ³
NFPA Hazard Signal	Health - 3 Flammability - 0



	Stability - 0 Special-
Emergency Treatment	Inhalation: Remove the victim to fresh air area, support respiration, and give oxygen, if necessary. Eyes: Flush with large amounts of water for at least 15 minutes. Seek medical aid immediately.

6. SAFE USAGE DATA

Ventilation	General / Mechanical	Well ventilated area preferably with a hood with forced ventilation.
	Local Exhaust	Tonnors should always be handled using a lifting clamp, cradle or carrier.
Protective Equipment	Eyes (Specify)	Head Mask
	Respiratory (Specify)	SCBA
Required	Gloves (Specify)	Hand Gloves PVC
	Clothing (Specify)	Rubber over Coat
	Others (Specify)	Gumboots
Precautions	Handling & Storage	Storage in well ventilated areas or outdoors.
	Others (Specify)	Protect against physical damage. Separation from combustible organic or easily oxidisable material. Isolate from Acetylene, Ammonia, Hydrogen, Hydrocarbons, Ether, Turpentine & finely divided material.



7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	Water
	Special Procedures	Water curtains
	Unusual Hazards	Poisonous gases emitted on burning
Exposure (Inhalation, skin, eye contact and ingestion)	First Aid Measures	Evacuate the contaminated zone Call a Doctor. Affected clothing should be removed and skin should be washed thoroughly with water. In case of unconsciousness transport him to a quiet place and keep him warm. Inhale oxygen or give artificial respiration till doctor arrive.

		Wash thoroughly on contaminated area of the body.
Spills	Steps to be taken	Shut off leaks if without risk. Contain liquid with sand or earth. Prevent the liquid from entering the sewer. Vapours create toxic atmosphere. Knock down vapours with water spray.
	Waste Disposal Method	Neutralize small liquid spillages with soda ash and drain with abundant water. Cover pool with protein foam. So that the release of vapour to atmosphere is low and under control.

8. ADDITIONAL INFORMATION :

In case of large gas escapes, the presence of cloud can be marked with ammonia with which it will turn into a mist. Run away from the gas clouds in a direction perpendicular to the wind direction. Avoid liquid chlorine from leaking and body contact. Person with pulmonary diseases should avoid the exposure. A concentration of 3.5 ppm produces a detectable odour .15 ppm causes immediate irritation of throat. Concentration of 50 ppm is dangerous for even short exposures.1000 ppm is fatal. Can react to cause fires / explosion on contact with turpentine, illuminating gas, polypropylene, Rubber, Sulfuric acid, Acetaldehyde, Alcohols. Bring the leaking portion of the cylinder to the uppermost position, so that only the gas escapes and not the liquid.



3. FUEL OIL

1. CHEMICAL IDENTITY:

Chemical Name	FUEL OIL
Synonyms	Furnace Oil, Residual Fuel Oil
Formula	FO
Chemical Classification	Low Sulphur Heavy Stock
Trade Name	LSHS
C.A.S. No.	N.A.
U.N. No.	1223
Regulated Identification	
Shipping Name :	
Codes / Label	3.3
Hazchem No.	NA
Hazardous Waste I.D. No.	NA
Hazardous Ingredients C.A.S. No.	NA



2. PHYSICAL AND CHEMICAL PROPERTIES:

Physical State	Thick Liquid
Appearance	Tar Odour
Odour	Black in Colour
Boiling Point / Range (°C)	212°C to 588°C
Melting / Freezing Point (°C)	- 4 to 13°C (Freezing Point)
Vapour Density (Air=1)	NA
Specific Gravity (Water = 1)	Liquid : 0.95 (approx.) at 20°C
Vapour Pressure (mm)	Not Pertinent
Solubility in water @ 20 °C	Floats on Water
pH	Data Not Available
Others	NA

3. FIRE AND EXPLOSIVE HAZARDS DATA:

Flammability Yes / No	Yes
LEL %	1
UEL %	5
Flash Point (°C)	150° F cc
Auto-Ignition Temperature °C	263°C
TDG Flammability	Not Pertinent
Explosion sensitivity to impact	Data Not Available
Explosion sensitivity to Static Electricity	Data Not Available

Hazardous Combustion Products	Data Not Available
Combustible Liquid	Yes

4. REACTIVE HAZARDS:

Chemical Stability	Yes, Stable
Incompatibility with other Material	No
Reactivity	No reaction with water and other common materials.
Hazardous Reaction Products	Data not available.

5. HEALTH HAZARD DATA :

Routes of Entry	Ingestion, Aspiration, skin and eye contact.
Effects of Exposure / Symptoms	Ingestion: Do not induce lavage or vomiting, Aspiration: Treatment probably not required, delayed development of pulmonary irritation can be detected by serial chest x-rays. Consider prophylactic antibiotic regime if condition warrants. Eyes: Wash with copious quantity of water. Skin: Wipe off and wash with soap and water.
TLV (ACGIH) ppm / mg/ m3	N.A.
STEL ppm mg / m3	NA
Permissible Exposure Limit Ppm / mg / m3	NA
Odour Threshold ppm mg / m3	Data Not Available
LD ₅₀	Data Not Available
LC ₅₀	Data Not Available
NFPA Hazard Signals	Health Flammability Reactivity Special 0 2 0



6. SAFE USAGE DATA:

Personal Protective Equipment	Use PVC / rubber gloves, goggles, overall rubber shoes & breathing apparatus if required.
Handling and Storage Precautions	Store in a cool, clean, well ventilated & fire proof storage area. Keep away from heat, sparks, open flame & incompatible materials (strong oxidizing agents).Protect container against damage.

7. EMERGENCY RESPONSE DATA:

Fire :	Class of Fire-B
Fire Extinguishing Media	Foam, Dry Chemical Powder & Carbon Dioxide
Special Procedures	Water is ineffective

Exposure : First Aid Measures	Eyes: - Wash with copious quantity of water. Skin: Remove contaminated clothing & wash affected skin with soap & water.. Inhalation: Remove victim to fresh air. If not breathing, give artificial respiration. Ingestion: If unconscious, do not induce vomiting. Obtain medical attention immediately.
Antidotes / Dosages	No specific anti dotes. Treat symptomatically.
Spills : Step to be taken	Stop leak, if safe to do so. Contain spillage absorb in sand or earth for disposal. Flush small spillage with plenty of water.

8. ADDITIONAL INFORMATION:

Engineering Controls :	Tanks & unloading installation are in the open & well ventilated area. Mechanical unloading & transportation is to be done. No manual handling is involved.
Sources Used	Hazardous Chemical Data Book, second edition by G. Weiss.



4. HIGH SPEED DIESEL

1. CHEMICAL IDENTITY:

Product Name	High Speed Diesel
Chemical classification	Fuel
Synonyms	Gas Oil
Trade Name	Diesel Oil
Formula	A Complex
C.A.S. Number	
U.N. Number	1202
Regulated Identification	
Shipping name	Diesel Oil
Codes / Label	30 /Class-3 Flammable Liquid
HAZCHEM Code	3
Hazardous waste Identification Number	6
Hazardous Ingredients	

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Liquid
Appearance	Oily Brown to Yellow
Odour	
Boiling Point (°C)	110 to 400
Melting / Freezing Point (°c)	0 - 18
Vapour pressure @ 35°C (mm-Hg)	1
Vapour Density(air =1)	
Evaporation rate @ 30 °C	NA
Solubility in water @ 30°C	
Specific Gravity (Water =1)	0.840
pH	Not Pertinent
Others	Sulphur content 1 % max.



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	
LEL (%)	0.5
UEL(%)	5.0
Flash Point (°C)	>32
Auto ignition Temperature (°C)	230 - 250
TDC Flammability (Classification)	3
Combustible Liquids	
Flammable Material	
Pyrophoric Material	
Explosive Material	
Unstable Material	
Corrosive Material	
Oxidiser	
Organic Peroxide	



4. REACTIVE HAZARDS:

Impact(Hazardous Combustion Products)	Acid/smoke/CO/CO2/NOx
Static Discharge(Hazardous Decomposition Product)	
Reactivity (Conditions to avoid)	Does not react with common materials but may react with oxidizing agents.
Hazardous Polymerization	Does not occur
Incompatibility	Incompatible with strong oxidizer.

5. HEALTH HAZARD DATA:

Routes of Entry	Inhalation ,Ingestion , eyes ,skin
Effects of Exposure / Symptoms	Inhalation : Dizziness , Headache Ingestion: Nausea and vomiting, irritation of mouth, and gastro intestinal tract may follow. Rapidly developing potentially fatal chemical pneumatics. Skin and Eye Contact: Irritation will remove natural fat from skin. Prolonged or repeated contact should be avoided; otherwise skin chapping, cracking or possible contact dermatitis may result. Dry skin, erythema, oil acne and oil folliculate & warty growth may occur which may become skin cancer.
LD 50(rat) (mg / kg of body wt.)	NA
LC 50 (rat)	NA

Mg / ¼ hours.	
Permissible Exposure Limit (PEL)	300 ppm
Short Term Exposure Limit(STEL)	500 ppm
Threshold Limit Value (TLV) of ACIGH	300 ppm
Odour Threshold	300 ppm
NFPA Hazard Signal	Health Flammability Stability Special 1 4 0 NIL

6. SAFE USAGE DATA

Ventilation	General / Mechanical	
	Local Exhaust	
Protective	Eyes (Specify)	
Equipment	Respiratory (Specify)	Gas Mask
Required	Gloves (Specify)	Hand Gloves
	Clothing (Specify)	PVC suit
	Others (Specify)	
Precautions	Handling & Storage	Avoid contact with liquid or vapours. Use flame proof equipments only. Stay upwind while gauging / sampling / handling. Do not wash / clean hands with the product. Earth all equipments & pipelines properly. Stored in an enclosed vessel in a cool, well ventilated area away from heat & flame. Gas free the tank before entering / cleaning. Change oil soaked clothing promptly. No smoking or open flames Provide adequate ventilation at work site.
	Others (Specify)	Safety Showers, Eye wash



7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	Foam,DCP,CO ₂
	Special Procedures	Keep containers cool by spraying water if exposed to flame or heat.
	Unusual Hazards	Flashback may occur along vapour trail.
Exposure	First Aid Measures	If inhaled removed victim to fresh air, if not breathing, give artificial

		respiration. If unconscious but breathing, place in unconscious (recovery) position. Give external cardiac massage if necessary. If ingested don't induce vomiting. Remove contaminated clothing, Wash all the affected skin thoroughly with soap and water. Irrigate affected eyes with copious amount of water. Administration of medical paraffin may reduce absorption through digestive tract. Gastric lavage should be done only after end tracheal intubation in view of respiration, which may cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.
Spills	Steps to be taken	Eliminate all sources of ignition. Ventilate the area. Stop leaks if no risk involved. Collect leaking product into closed container. Contain / absorb spillage in sand / earth bund. Use water sprays to disperse / dilute the vapours if necessary. Prevent run-off from entering into sewers.
	Waste Disposal Method	Collect all the waste in vapour tight plastic bags for eventual disposal.

**8. ADDITIONAL INFORMATION:
SOURCES USED**

Reference to books, journals, etc.



9. MANUFACTURERS / SUPPLIERS DATA:

Firms Name	Standard Packing
Mailing Address	
Telephone Number	Others
Telex Number	
Telegraphic Address	Others
Contact person in Emergency	
Emergency Telephone In Transit Areas.	Others

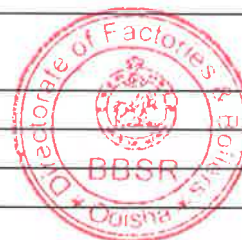
5. PHOSPHORIC ACID

1. CHEMICAL IDENTITY:

Product Name	PHOSPHORIC ACID
Chemical Classification	Inorganic Acid
Synonyms	Ortho Phosphoric Acid
Trade Name	
Formula	H ₃ PO ₄
C.A.S. No	7664-38-2
U. N. No	1805
Regulated Identification	
Shipping Name	Phosphoric Acid
Codes / Label	Corrosive, Class 8
Hazchem Code	2R
Hazardous Waste ID No	16
HAZARDOUS INGREDIENTS	

2. PHYSICAL AND CHEMICAL PROPERTIES:

Physical State	Thick Liquid / Solid
Appearance	Colourless
Odour	Pleasing
Boiling Point (°C)	130 ⁰ C
Melting / Freezing Point (°C)	42.4 ⁰ C
Vapour pressure @ 35°C (mm-Hg)	0.286 mm
Vapour Density(air =1)	
Evaporation rate @ 30 °C	
Solubility in water @ 30 ⁰ C	Soluble in water
Specific Gravity (Water =1)	1.89 at 25°C
pH	1.5 (0.1 N)
Others	soluble in Alcohol



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	NO
LEL (%)	Not pertinent
UEL(%)	Not pertinent
Flash Point (°C)	Not pertinent
Auto ignition Temperature (°C)	NA
TDC Flammability (Classification)	8
Combustible Liquids	NO
Flammable Material	NO

Pyrophoric Material	NO
Explosive Material	NO
Unstable Material	stable
Corrosive Material	Yes
Oxidiser	NA
Organic Peroxide	NA

4. REACTIVE HAZARDS :

Impact(Hazardous Combustion Products)	Stable
Static Discharge(Hazardous Decomposition Product)	NA
Reactivity (Conditions to avoid)	Reacts with Chlorides + Stainless Steel to form explosive reaction product- Hydrogen gas.
Hazardous Polymerization	Does not occur
Incompatibility	Explosive mixtures with Nitromethane

5. HEALTH HAZARD DATA :

Routes of Entry	Inhalation, Ingestion Eyes & Skin.
Effects of Exposure / Symptoms	Burns on mouth and lips, sour acid taste, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficulty in swallowing, severe abdominal pains, thirst, academia, difficult breathing, convulsions, collapse, shock and death.
LD 50(rat) (mg / kg of body wt.)	1530 mg / kg
LC 50 (rat) Mg / ¼ hours.	NA
Permissible Exposure Limit (PEL)	0.25 ppm / 1 mg/m ³
Short Term Exposure Limit (STEL)	0.75 ppm / 3 mg/m ³
Threshold Limit Value (TLV) of ACIGH	0.25 ppm
Odour Threshold	NA
NFPA Hazard Signal	Health Flammability Reactivity Special 2 0 0



6. SAFE USAGE DATA

Ventilation	General / Mechanical	Store in well ventilated area away from active material.
	Local Exhaust	
Protective	Eyes (Specify)	Provide face shield,

Equipment Required	Respiratory (Specify)	
	Gloves (Specify)	Rubber hand gloves,
	Clothing (Specify)	Protective over clothing
	Others (Specify)	
Precautions	Handling & Storage	Special Procedure: Keep the containers cool by spraying water if exposed to heat or flame.
	Others (Specify)	Flammable gas is produced on contact with metals.

7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	Not Flammable
	Special Procedures	
	Unusual Hazards	
Exposure	First Aid Measures	Ingestion: Do not induce vomiting; give water, milk or vegetable oil. Skin & Eyes: Flush with water for at least 15 minutes. Seek medical aid.
	Steps to be taken	Neutralize with alkali and dilute and drench with water.
Spills	Waste Disposal Method	Seal all waste in vapour tight plastic bags for eventuate disposal.

8. ADDITIONAL INFORMATION :

Poisoning by an unspecified route. Toxic by ingestion and skin contact. Used to manufacture of fertilizers, detergents, food beverages and for wate treatment.



6. SODIUM HYDROXIDE

1. CHEMICAL IDENTITY:

Chemical Name	SODIUM HYDROXIDE		
Synonyms	Caustic Soda, Sodium Hydrate, Lye solution, 50 % Liquid (NaOH), Caustic flake, Liquid Caustic.		
Formula	NaOH		
Chemical Classification	Alkali Hydroxide		
Trade Name			
C.A.S. NO	1310-73-2		
U.N. NO	1824		
Regulated Identification			
Shipping Name : Codes / Label	Sodium Hydroxide Corrosive Material		
Hazchem No.	NA		
Hazardous Waste I.D. No.	NA		
Hazardous Ingredients C.A.S. NO	1	2	4



2. PHYSICAL AND CHEMICAL PROPERTIES:

Physical State	Liquid
Appearance	Clear Liquid
Odour	Odourless
Boiling Point / Range (°C)	140°C
Melting / Freezing Point (°C)	12°C (Freezing Point)
Vapour Density (Air=1)	NA
Specific Gravity (Water = 1)	1.53 at (25°C)
Vapour Pressure @ 35 °C mm Hg	NA
Solubility in water @ 30 °C	Completely soluble in water
pH	13 (0.5 % solution)
Others	Soluble in alcohol, methanol, glycerol & insoluble in acetone and ether.

3. FIRE AND EXPLOSIVE HAZARDS DATA:

Flammability Yes / No	NA
LEL %	None Reported
UEL %	None Reported
Flash Point (°C)	None Reported
Auto-Ignition Temperature °C	None Reported
TDG Flammability	NA
Explosion sensitivity to impact	NA
Explosion sensitivity to Static Electricity	NA
Hazardous Combustion Products	NA
Hazardous Polymerisation	Hazardous polymerization can not occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since Sodium Hydroxide readily absorb water and carbon di-oxide from air, keep container tightly closed.
Combustible Liquid	NA
Explosive Material	NA
Corrosive Material	NA
Flammable Material	NA
Pyrophoric Material	NA
Organic peroxide	NA
Oxidizer	NA
Other	Institute pre-placement and periodic medical exams of exposed workers emphasizing the eyes, skin and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance inspection and evaluation. Educate employees to the possible hazards in using sodium hydroxide.

4. REACTIVE HAZARDS:

Chemical Stability	Sodium hydroxide solution is stable at room temperature in closed container under normal storage and handling conditions.
Incompatibility with other Material	Since it generate large amount of heat when in contact with water, sodium hydroxide may steam and splatter. It reacts with mineral acids to form corresponding salts, and with weak acid gases like hydrogen sulfide, sulfur dioxide and carbon dioxide. Sodium hydroxide can be very corrosive to metals such as aluminum, tin and zinc as well as alloys such as steel and may causes formation of flammable hydrogen gas.
Reactivity	An increase in temperature and pressure occurs in close containers when sodium hydroxide is mixed with acetic

	anhydride, Gaseous acetic acid, chlorohydrins, chlorosulfonic acid, ethylenesinohydrin, glyoxal, oleum, 36 % HCl, 48.7 % HF, 70 % Nitric acid or 96 % H ₂ SO ₄ .
Hazardous Reaction Products	Avoid generation of sodium hydroxide mists and contact with water, metals and the chemicals listed above. Hazardous product of decomposition. Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na ₂ O) and peroxide (Na ₂ O ₂) fumes.

5. HEALTH HAZARD DATA:

Routes of Entry	Ingestion, Inhalation, skin and eye contact.
Effects of Exposure / Symptoms	Ingestion causes immediate burning of mouth, esophagus and stomach, painful swallowing, excessive salivation, edematous, lips, chins, tongue and pharynx covered with exudates (fluid oozed from swollen tissue), esophageal edema.
Emergency Treatment	Emergency personnel should protect against contamination..
TLV (ACGIH) ppm / mg/ m3	Ceiling : 2 mg/m3
STEL ppm mg / m3	NA
Permissible Exposure Limit Ppm / mg / m3	NA
Odour Threshold ppm mg / m3	NA
LD ₅₀	2140 mg / Kg
LC ₅₀	NA
NFPA Hazard Signals	Health Flammability Reactivity Special 3 0 1



6. SAFE USAGE DATA:

Personal Protective Equipment	<p>Goggles:- Wear protective chemical safety goggles. Since contact lens use in industry is controversial, establish your own policy.</p> <p>Respirator:- Seek professional prior to respirator selection and use. For emergency or non routine operation (cleaning spills, reactor vessels or storage tanks) wear a SCBA.</p> <p>Warning: Air purifying respirators do not protect workers in oxygen deficient atmospheres.</p> <p>Other: - Wear impervious gloves, boots, aprons and gauntlets to prevent any skin contact.</p>
Handling and Storage Precautions	Avoid physical damage to containers. Store in dry, well ventilated area away from water, acids, metals, flammable liquid and organic halogens. Keep containers tightly closed since Sodium Hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 ⁰ F (60 ⁰ C) do not store or transport in aluminum or steel containers

	when temperature near this level. Store containers in room equipped with trapped floor drains, curbs or gutters.
--	--

7. EMERGENCY RESPONSE DATA:

Fire : Fire Extinguishing Media	Although non combustible, when contact with moisture or water sodium hydroxide, 50% liquid can generate enough heat to ignite surrounding combustibles. Use extinguishing agent suitable for surrounding fire. For small fire, use dry chemical carbon dioxide (CO ₂) or regular foam. Avoid using water spray since water react with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.
Special Procedures	Also, wear fully protective clothing. Structural fire fighters protective clothing provides limited protection. Apply cooling water to sides of fire exposed containers until fire is well out. Do not splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways with water.
Exposure : First Aid Measures	<p>Eyes: - Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transport to an emergency medical facility. Do not allow victim to keep his eyes tightly shut. Warning! Although splashed in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.</p> <p>Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of cold water for at least 15 minutes. Be aware that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.</p> <p>Inhalation: Remove exposed person to fresh air and support breathing as needed.</p> <p>Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, that have conscious and alert person drink 1 to 2 glasses of water followed by vinegar or fruit juice to neutralize the poison. Do not induce vomiting. After first aid get appropriate in plant, paramedic or community get medical support.</p>



Antidotes / Dosages	N.A.
Spills : Step to be taken	Notify personnel isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapor but do not spray directly on spills. Absorb small liquid spills with fly ash or cement powder. Neutralize spill with vinegar or dilute acid. Perlite and cello solvent WP 3H (hydroxy ethyl cellulose) are recommended for vapor suppression and containment of 50% sodium hydroxide solutions. Place material in suitable container (sodium hydroxide corrodes steel at temperature above 60 ^o C) for later disposal. Follow applicable OSHA regulation.
Waste Disposal Method	Contact your supplier or a licensed contractor for detail recommendation. Follow applicable federal, state and local regulations.

8. ADDITIONAL INFORMATION:

Engineering Controls :	To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous air borne contaminants and to maintain concentration at the lowest practical level..
For further detail please refer	MSDS, COLLECTION SHEET NO- 3 A, REVISION-B, 11/91, of GENIUM PUBLISHING CORPORATION, 1145 Catalyn street Schenectady, NY 12303-1836 USA (518) 377-8854.



7. SULPHUR

1. CHEMICAL IDENTITY:

Product Name	SULPHUR
Chemical classification	No-Metallic Element
Synonyms	Brimstone, Bensulfoïd, Colsul
Trade Name	
Formula	S
C.A.S. Number	7704-34-9
U.N. Number	1350/2448
Regulated Identification	
Shipping name	SULPHUR
Codes / Label	Flammable Solid, Class 4.1
HAZCHEM Code	2Z
Hazardous waste Identification Number	17
Hazardous Ingredients	Sulphur

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Solid or Molten Solid
Appearance	Yellow to reddish brown
Odour	Faint rotten egg
Boiling Point (°C)	444.6
Melting / Freezing Point (°C)	113 to 119
Vapour pressure @ 35°C (mm-Hg)	
Vapour Density(air =1)	8.9
Evaporation rate @ 30 °C	
Solubility in water @ 30°C	Not Soluble
Specific Gravity (Water =1)	1.8
pH	Not Pertinent
Others	Slightly soluble in alcohol, ether, soluble in benzene



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	
LEL (%)	
UEL(%)	
Flash Point (°C)	168
Auto ignition Temperature (°C)	230
TDC Flammability (Classification)	
Combustible Liquids	

Flammable Material	Yes,
Pyrophoric Material	
Explosive Material	
Unstable Material	Stable
Corrosive Material	
Oxidiser	
Organic Peroxide	

4. REACTIVE HAZARDS:

Impact(Hazardous Combustion Products)	stable
Static Discharge(Hazardous Decomposition Product)	Oxidizers, Halogens, carbides, active metals
Reactivity (Conditions to avoid)	Can react violently with Halogens, Carbides, Halogenites, Halogenates, Zinc, Tin, Sodium, Lithium, Nickel, Palladium, Phosphorus, Potassium, Iridium.
Hazardous Polymerization	NA
Incompatibility	NA

5. HEALTH HAZARD DATA:

Routes of Entry	Inhalation, Ingestion, Eyes & Skin
Effects of Exposure / Symptoms	Can cause eye irritation, may irritate skin. The molten solid may Cause skin burns.
LD 50(rat) (mg / kg of body wt.)	
LC 50 (rat) Mg / ¼ hours.	
Permissible Exposure Limit (PEL)	
Short Term Exposure Limit(STEL)	
Threshold Limit Value (TLV) of ACGIH	3 mg/m ³
Odour Threshold	6.6 mg/m ³
NFPA Hazard Signal	Health Flammability Reactivity Special 2 2 2



6. SAFE USAGE DATA

Ventilation	General / Mechanical	
	Local Exhaust	
Protective Equipment	Eyes (Specify)	Safety goggles or face shield,
	Respiratory (Specify)	Mask for the dust.

Required	Gloves (Specify)	Rubber hand gloves
	Clothing (Specify)	
	Others (Specify)	Gum boot
Precautions	Handling & Storage	Store in cool, dry well ventilated area away from heat flame and oxidizing materials.
	Others (Specify)	

7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	Flammable
	Special Procedures	Keep the containers cool by spraying water if exposed to heat or flame.
	Unusual Hazards	Burns with blue flame, difficult to see in daylight.
Exposure	First Aid Measures	Eyes: Wash with plenty of water for 15 minutes. Skin: Treat molten sulphur burns with petroleum jelly or mineral oil. Seek medical aid immediately.
Spills	Steps to be taken	Allow the molten liquid to solidify and then sweep and collect. Wash the surface with plenty of water.
	Waste Disposal Method	Seal all waste in vapour tight plastic bags for Disposal..



8. SULPHURIC ACID

1. CHEMICAL IDENTITY:

Product Name	Sulphuric Acid
Chemical classification	Inorganic Acid
Synonyms	Oil of Vitriol, Battery Acid, Chamber Acid
Trade Name	Sulphuric Acid
Formula	H ₂ SO ₄
C.A.S. Number	7664-93-9
U.N. Number	1830
Regulated Identification	
Shipping name Codes / Label	Sulphuric Acid Corrosive, Class 8
HAZCHEM Code	2P
Hazardous waste Identification Number	16
Hazardous Ingredients	

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Liquid
Appearance	Colourless Oily
Odour	Odorless
Boiling Point (°C)	290
Melting / Freezing Point (°C)	NA
Vapour pressure @ 35°C (mm-Hg)	1
Vapour Density(air =1)	3.4
Evaporation rate @ 30 °C	NA
Solubility in water @ 30°C	Visible
Specific Gravity (Water =1)	1.84
pH	<1
Others	NA



3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	NO
LEL (%)	NA
UEL(%)	NA
Flash Point (°C)	NA
Auto ignition Temperature (°C)	NA
TDC Flammability (Classification)	NA
Combustible Liquids	NA
Flammable Material	NO
Pyrophoric Material	NA
Explosive Material	
Unstable Material	
Corrosive Material	
Oxidiser	
Organic Peroxide	



4. REACTIVE HAZARDS:

Impact(Hazardous Combustion Products)	Emits toxic fumes of SO ₂
Static Discharge(Hazardous Decomposition Product)	Stable
Reactivity (Conditions to avoid)	Powerful Oxidiser
Hazardous Polymerization	May not occur
Incompatibility	Organic Chlorates, Carbides, Fulminates, Pirates and metals.

5. HEALTH HAZARD DATA:

Routes of Entry	Inhalation, Ingestion, eyes
Effects of Exposure / Symptoms	Inhalation of vapour from hot concentration acid may injure lungs. Swallowing may cause injury or death. Contact to skin or eyes causes severe burns. Dilute solution cause dermatitis. Exposure causes bronchitis.
LD 50(rat) (mg / kg of body wt.)	2140
LC 50 (rat) Mg / ¼ hours.	NA
Permissible Exposure Limit (PEL)	1 mg/cu.m
Short Term Exposure Limit(STEL)	NA

Threshold Limit Value (TLV) of ACIGH	1 mg/cu.m
Odour Threshold	1 mg/cu.m
NFPA Hazard Signal	Health 3 Flammability 0 Stability Special

6. SAFE USAGE DATA

Ventilation	General / Mechanical	
	Local Exhaust	Wall ventilated place away from oxidizer.
Protective Equipment	Eyes (Specify)	Safety goggles, face shield
Required	Respiratory (Specify)	Self contained or air line breathing apparatus
	Gloves (Specify)	Rubber
	Clothing (Specify)	Rubber apron
Precautions	Others (Specify)	Rubber shoes, Safety shower, Eye wash fountain
	Handling & Storage	Store in cool, well ventilated place away from oxidizes; acids of 98% are to be stored in MS or CI tanks / drums.
	Others (Specify)	Safety Showers, eye wash fountains.

7. EMERGENCY RESPONSE DATA

Fire	Fire Extinguishing Media	DCP / CO ₂ Do not use water
	Special Procedures	Keep containers cool by spraying water if exposed to flame or heat
	Unusual Hazards	Poisonous gases may be produced
Exposure	First Aid Measures	If inhaled, remove the victim to fresh air, provide artificial respiration or oxygen if required. If eyes are affected wash with plenty of water for 15 minutes or more.
		If skin is affected remove contaminated cloths and shoes & wash the affected area with plenty of water and soap. Seek medical help immediately.
Spills	Steps to be taken	Shut off leaks if without risk. Contain leaking liquid on sand or earth. Do not absorb on saw dust



		or other combustibles.
	Waste Disposal Method	

8. ADDITIONAL INFORMATION:

Sensitivities to Sulphuric acid mists or vapors vary with individuals. Normally 0.125 to 0.5 ppm may be mildly annoying 1.5 to 2.5 ppm may be definitely be unpleasant, 10 to 20 ppm unbearable. Contact with water violent reaction generating much heat and splattering of hot acid. Attacks many metals. Liberating hydrogen which is flammable & forms explosive mixture with air.



9. TRANSFORMER OIL

1. CHEMICAL IDENTITY:

Product Name	Transformer Oil
Chemical classification	
Synonyms	Insulating Oil for transformers
Trade Name	
Formula	
C.A.S. Number	
U.N. Number	
Regulated Identification	
Shipping name Codes / Label	
HAZCHEM Code	
Hazardous waste Identification Number	R 52/53. Harmful to aquatic organism
Hazardous Ingredients	Non-Hazardous substance. Non- Dangerous Goods

2. PHYSICAL AND CHEMICAL PROPERTIES :

Physical State	Liquid
Appearance	Yellow . Pale colour
Odour	Odourless
Boiling Point (°C)	>290
Melting / Freezing Point (°C)	NA
Vapour pressure @ 35°C (mm-Hg)	NA
Vapour Density(air =1)	NA
Evaporation rate @ 30 °C	NA
Solubility in water @ 30°C	Insoluble in water.
Specific Gravity (Water =1)	0.88
pH	NA
Others	

3. FIRE AND EXPLOSIVE HAZARDS DATA :

Explosion /Flammability	Flammable
LEL (%)	0.9
UEL(%)	7.0
Flash Point (°C)	145
Auto ignition Temperature (°C)	242
TDC Flammability (Classification)	NA
Combustible Liquids	Yes
Flammable Material	Yes
Pyrophoric Material	NA
Explosive Material	NA
Unstable Material	NA
Corrosive Material	NA
Oxidiser	NA
Organic Peroxide	NA

4. REACTIVE HAZARDS:

Impact(Hazardous Combustion Products)	NA
Static Discharge(Hazardous Decomposition Product)	NA
Reactivity (Conditions to avoid)	NA
Hazardous Polymerization	NA
Incompatibility	NA

5. HEALTH HAZARD DATA:

Routes of Entry	Ingestion, Inhalation, Skin contact, Eye contact.
Effects of Exposure / Symptoms	Ingestion: No significant health hazard identified. Inhalation: No significant health hazard identified. Eyes contact: No significant health hazard identified. Skin contact: Prolonged or repeated contact can defat the skin and lead to irritation and / or Dermatitis.
LD 50(rat) (mg / kg of body wt.)	NA
LC 50 (rat) Mg / ¼ hours.	NA
Permissible Exposure Limit (PEL)	5 mg/m ³
Short Term Exposure Limit(STEL)	NA
Threshold Limit Value	5 mg/m ³

		<p>Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if irritation develops.</p> <p>Inhalation: If inhaled, remove to fresh air. Get medical attention if symptoms appear.</p> <p>Ingestion: Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Get medical attention if symptoms occur.</p> <p>Advice to doctor: Treatment should in general be symptomatic and directed to relieving any effects.</p>
Spills	Steps to be taken	Stop leak if without risk. Move containers from spill area.
	Waste Disposal Method	Prevent entry in to sewers or confined areas.



DISPERSION MODELING



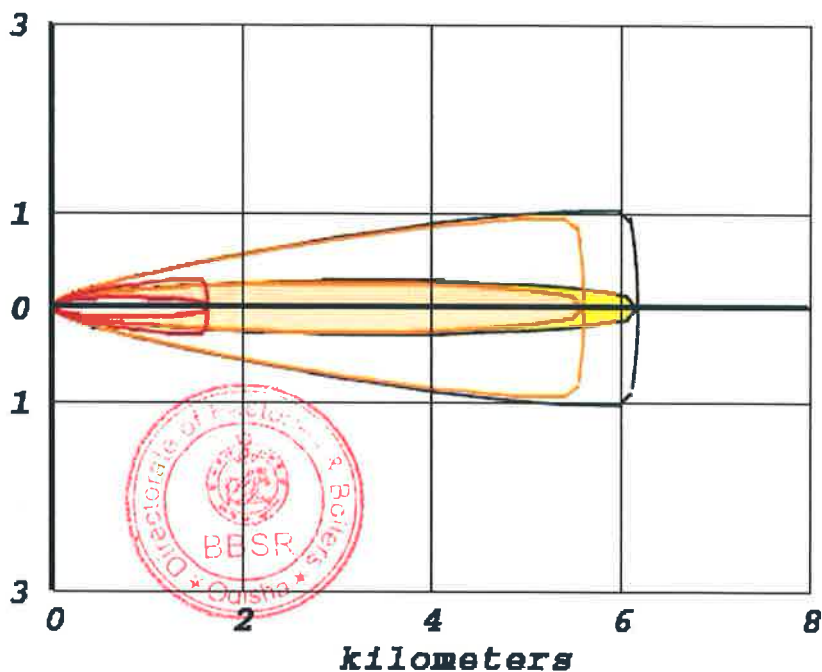
Toxic Threat Zone





ALOHA® 5.4.3



Time: May 1, 2014 1608 hours ST (using computer's clock)
Chemical Name: AMMONIA
Wind: 4 meters/second from S at 3 meters
THREAT ZONE:
Model Run: Heavy Gas
Red : 1.6 kilometers --- (300 ppm = IDLH)
Orange: 5.6 kilometers --- (30 ppm = PAC-1)
Yellow: 6.2 kilometers --- (25 ppm = ERPG-1)

kilometers



-  greater than 300 ppm (IDLH)
-  greater than 30 ppm (PAC-1)
-  greater than 25 ppm (ERPG-1)
-  Confidence Lines

Toxic Threat Zone

ALOHA® 5.4.3

Time: May 1, 2014 1602 hours ET (using computer's clock)

Chemical Name: AMMONIA

Wind: 6 meters/second from SW at 3 meters

THREAT ZONE:

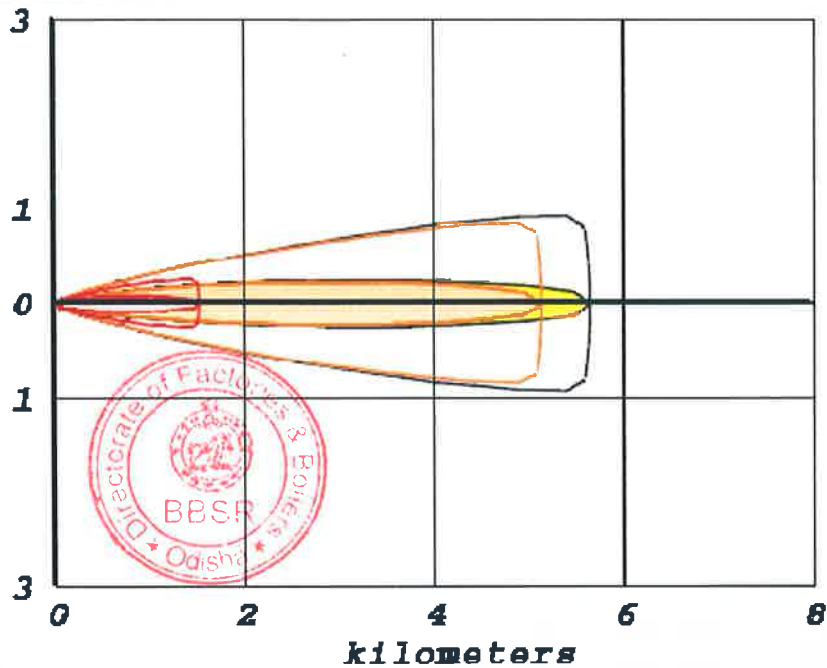
Model Run: Heavy Gas





Red : 1.5 kilometers --- (300 ppm = IDLH)

Orange: 5.1 kilometers --- (30 ppm = PAC-1)

Yellow: 5.6 kilometers --- (25 ppm = ERPG-1)

kilometers



-  greater than 300 ppm (IDLH)
-  greater than 30 ppm (PAC-1)
-  greater than 25 ppm (ERPG-1)
-  Confidence Lines

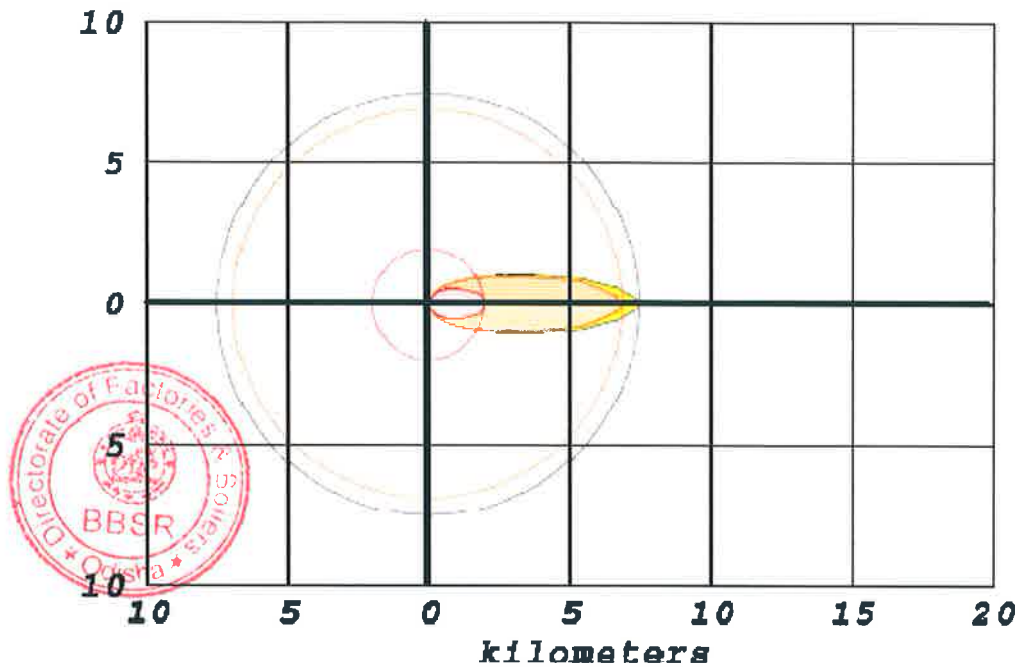
Toxic Threat Zone





ALOHA® 5.4.3



Time: May 1, 2014 1610 hours ST (using computer's clock)
Chemical Name: AMMONIA
Wind: 1 meters/second from NE at 3 meters
THREAT ZONE:
Model Run: Heavy Gas
Red : 2.0 kilometers --- (300 ppm = IDLH)
Orange: 6.0 kilometers --- (30 ppm = PAC-1)
Yellow: 7.5 kilometers --- (25 ppm = ERPG-1)

kilometers



-  greater than 300 ppm (IDLH)
-  greater than 30 ppm (PAC-1)
-  greater than 25 ppm (ERPG-1)
-  Confidence Lines

AMMONIA 20000 MT RAINY
SOURCE STRENGTH:
Leak from hole in horizontal cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 20.5 meters Tank Volume: 32,603,841 liters Tank contains liquid Internal Temperature: 24.6° C Chemical Mass in Tank: 18000 tons Tank is 83% full Circular Opening Diameter: 1 inches Opening is 2.70 meters from tank bottom Release Duration: ALOHA limited the duration to 1 hour Max Average Sustained Release Rate: 668 kilograms/min (averaged over a minute or more) Total Amount Released: 40,066 kilograms
AMMONIA 20000 MT SUMMER
SOURCE STRENGTH:
Leak from hole in horizontal cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 20.5 meters Tank Volume: 32,603,841 liters Tank contains liquid Internal Temperature: 39° C Chemical Mass in Tank: 18000 tons Tank is 86% full Circular Opening Diameter: 1 inches Opening is 2.70 meters from tank bottom Release Duration: ALOHA limited the duration to 1 hour Max Average Sustained Release Rate: 798 kilograms/min (averaged over a minute or more) Total Amount Released: 47,891 kilograms
AMMONIA 20000 MT WINTER
SOURCE STRENGTH:
Leak from hole in horizontal cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 20.5 meters Tank Volume: 32,603,841 liters Tank contains liquid Internal Temperature: 13.4° C Chemical Mass in Tank: 18000 tons Tank is 81% full Circular Opening Diameter: 1 inches Opening is 2.70 meters from tank bottom Release Duration: ALOHA limited the duration to 1 hour Max Average Sustained Release Rate: 575 kilograms/min (averaged over a minute or more) Total Amount Released: 34,504 kilograms

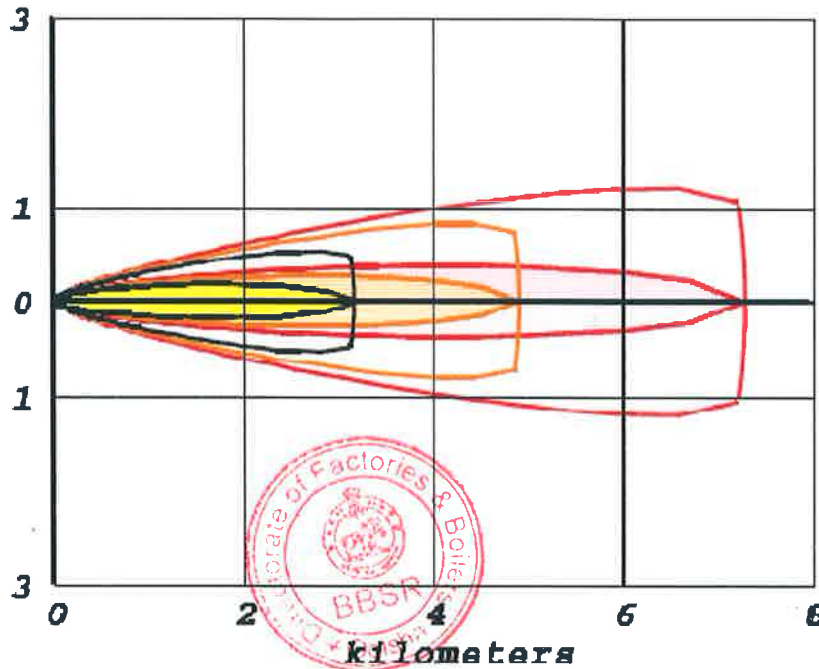






Toxic Threat Zone

ALOHA® 5.4.3 

Time: May 1, 2014 1924 hours *ST* (using computer's clock)
Chemical Name: CHLORINE
Wind: 6 meters/second from *SW* at 3 meters
THREAT ZONE:
Model Run: Heavy Gas
Red : 7.3 kilometers --- (1 ppm = ERPG-1)
Orange: 4.9 kilometers --- (3 ppm = ERPG-2)
Yellow: 3.2 kilometers --- (10 ppm = IDLH)

kilometers



-  **greater than 1 ppm (ERPG-1)**
-  **greater than 3 ppm (ERPG-2)**
-  **greater than 10 ppm (IDLH)**
-  **Confidence Lines**

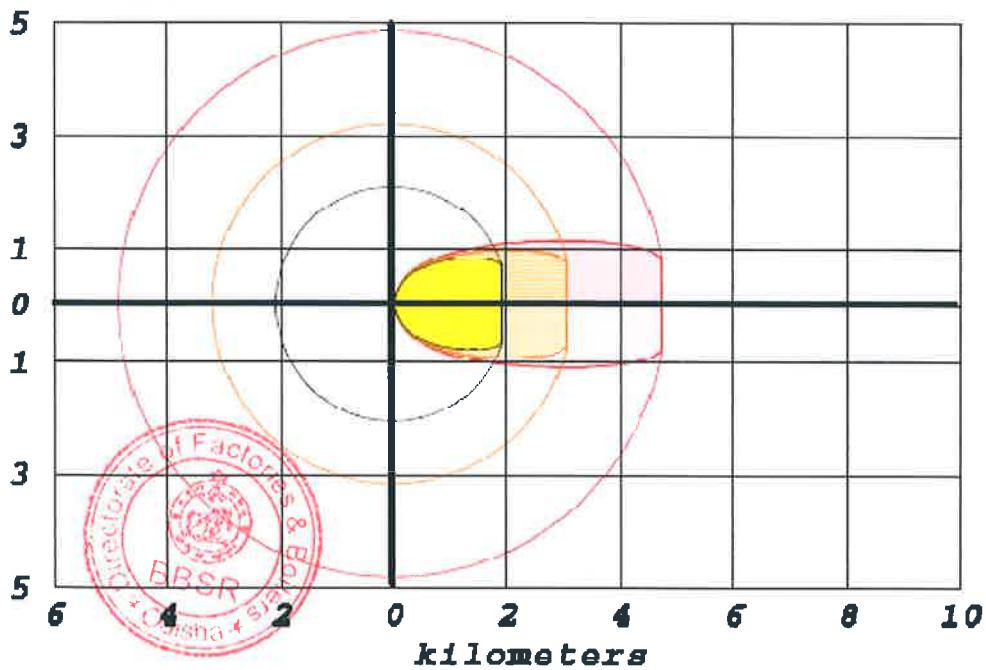
Toxic Threat Zone





ALOHA® 5.4.3



Time: May 1, 2014 1922 hours ST (using computer's clock)
Chemical Name: CHLORINE
Wind: 1 meters/second from S at 3 meters
THREAT ZONE:
Model Run: Heavy Gas
Red : 4.8 kilometers --- (1 ppm = ERPG-1)
Orange: 3.1 kilometers --- (3 ppm = ERPG-2)
Yellow: 2.0 kilometers --- (10 ppm = IDLH)

kilometers



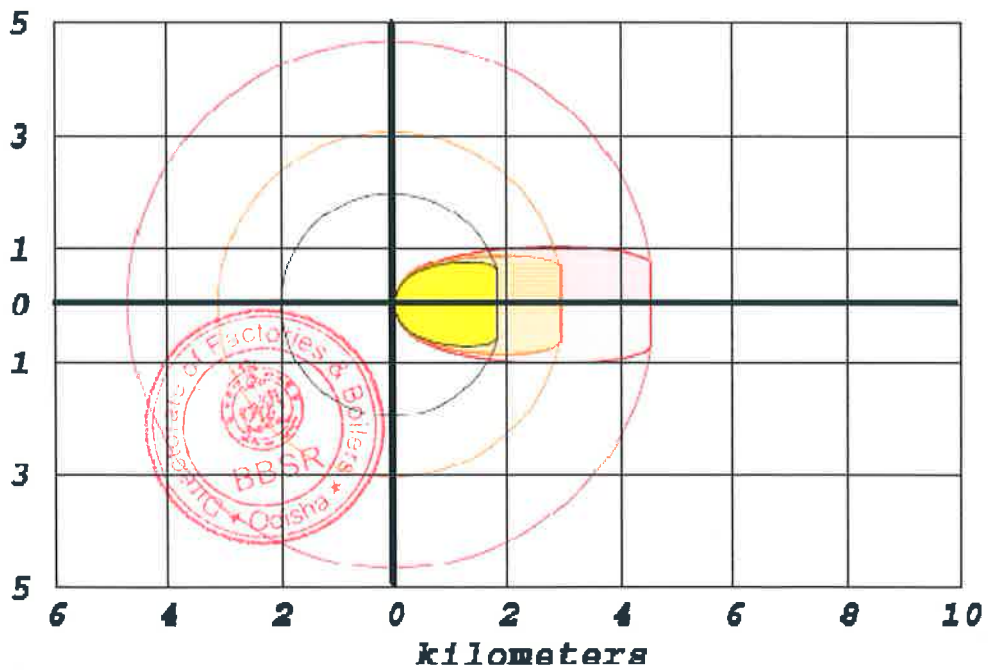
-  greater than 1 ppm (ERPG-1)
-  greater than 3 ppm (ERPG-2)
-  greater than 10 ppm (IDLH)
-  Confidence Lines





Toxic Threat Zone

ALOHA® 5.4.3 

Time: May 1, 2014 1854 hours ST (using computer's clock)
Chemical Name: CHLORINE
Wind: 1 meters/second from NE at 3 meters
THREAT ZONE:
Model Run: Heavy Gas
Red : 4.6 kilometers --- (1 ppm = ERPG-1)
Orange: 3.0 kilometers --- (3 ppm = ERPG-2)
Yellow: 1.9 kilometers --- (10 ppm = IDLH)

kilometers



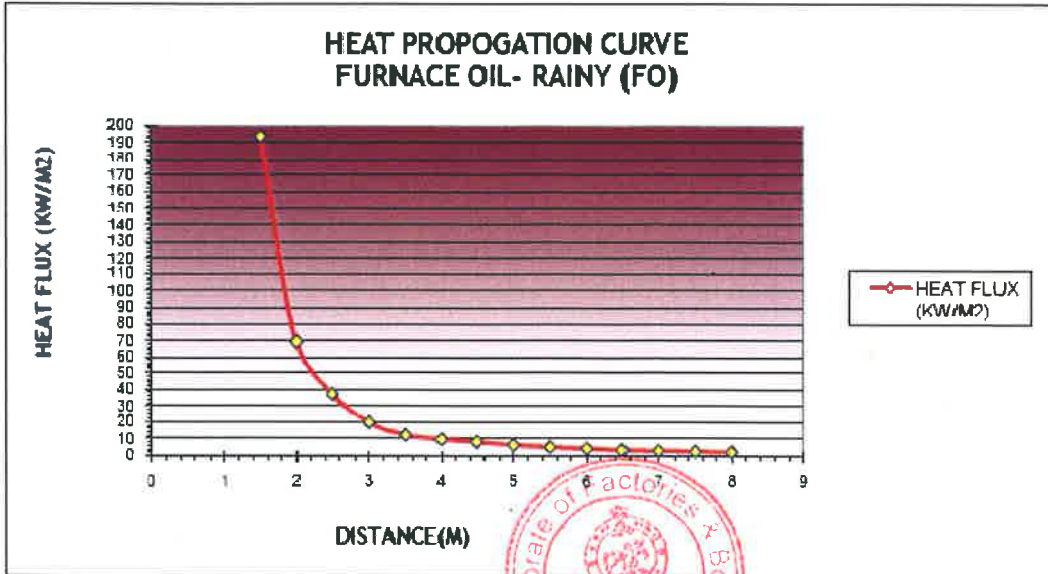
-  greater than 1 ppm (ERPG-1)
-  greater than 3 ppm (ERPG-2)
-  greater than 10 ppm (IDLH)
-  Confidence Lines



CHLORINE 900 KG MT RAINY
<p>SOURCE STRENGTH: Leak from hole in horizontal cylindrical tank Non-flammable chemical is escaping from tank Tank Diameter: 0.75 meters Tank Length: 7 meters Tank Volume: 3,093 liters Tank contains liquid Internal Temperature: 24.6° C Chemical Mass in Tank: 900 kilograms Tank is 19% full Circular Opening Diameter: 1 inches Opening is 0.038 meters from tank bottom Release Duration: 2 minutes Max Average Sustained Release Rate: 767 kilograms/min (averaged over a minute or more) Total Amount Released: 834 kilograms</p>
CHLORINE 900 KG MT SUMMER
<p>SOURCE STRENGTH: Leak from hole in horizontal cylindrical tank Non-flammable chemical is escaping from tank Tank Diameter: 0.75 meters Tank Length: 7 meters Tank Volume: 3,093 liters Tank contains liquid Internal Temperature: 39° C Chemical Mass in Tank: 900 kilograms Tank is 19% full Circular Opening Diameter: 1 inches Opening is 0.038 meters from tank bottom Release Duration: 3 minutes Max Average Sustained Release Rate: 832 kilograms/min (averaged over a minute or more) Total Amount Released: 846 kilograms</p>
CHLORINE 900 KG MT WINTER
<p>SOURCE STRENGTH: Leak from hole in horizontal cylindrical tank Non-flammable chemical is escaping from tank Tank Diameter: 0.75 meters Tank Length: 7 meters Tank Volume: 3,093 liters Tank contains liquid Internal Temperature: 13.4° C Chemical Mass in Tank: 900 kilograms Tank is 19% full Circular Opening Diameter: 1 Inches Opening is 0.038 meters from tank bottom Release Duration: 2 minutes Max Average Sustained Release Rate: 653 kilograms/min (averaged over a minute or more) Total Amount Released: 834 kilograms</p>



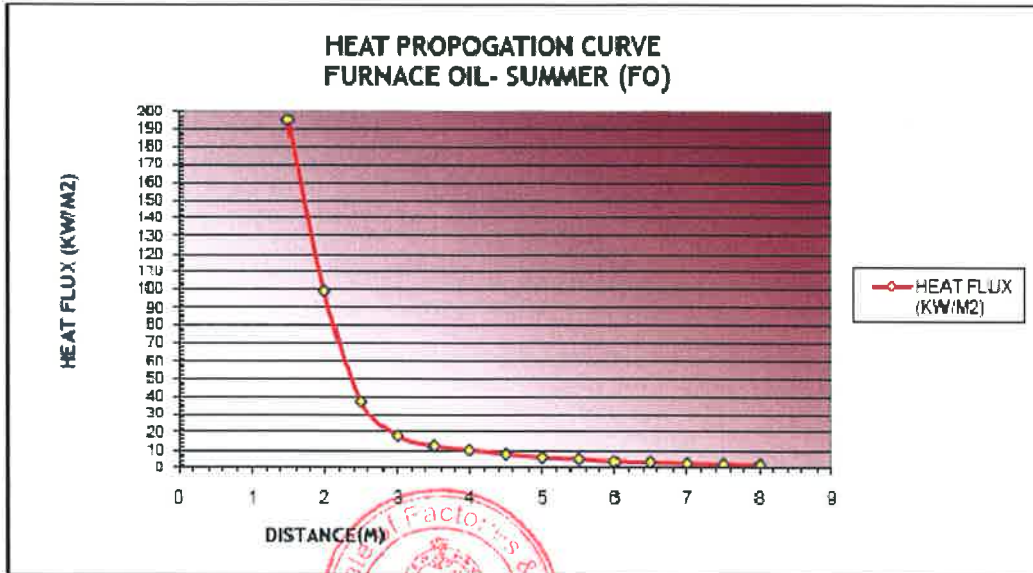
MODELING OF FURNACE OIL (FO) RAINY SEASON



POOLFIRE MODEL - FURNACE OIL- RAINY (FO)

DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	193.5
2	69.3
2.5	37.2
3	19.8
3.5	12.5
4	9.9
4.5	8.3
5	6.6
5.5	5.4
6	4.5
6.5	3.6
7	3.2
7.5	2.9
8	2.4

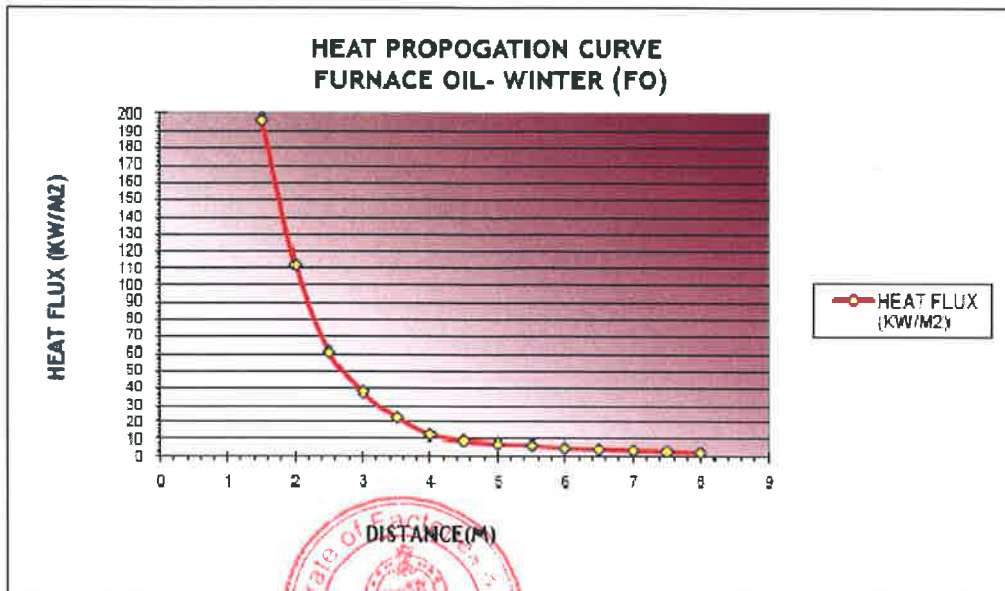
MODELING OF FURNACE OIL (FO) SUMMER SEASON



POOLFIRE MODEL - FURNACE OIL - SUMMER (FO)

DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	194.8
2	99.2
2.5	37.5
3	18.0
3.5	12.6
4	10.3
4.5	8.0
5	6.3
5.5	5.4
6	4.1
6.5	3.8
7	3.2
7.5	2.7
8	2.5

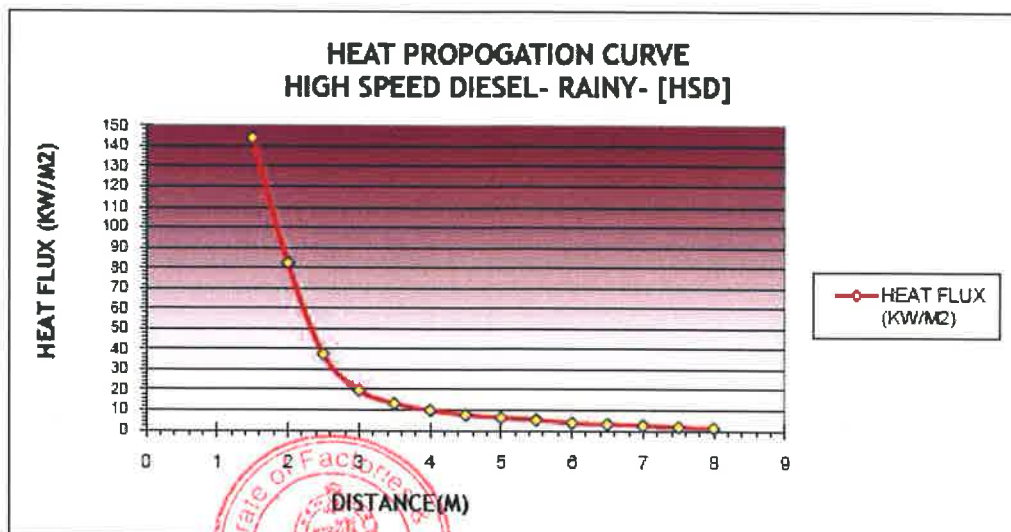
MODELING OF FURNACE OIL (FO) WINTER SEASON



POOLFIRE MODEL - FURNACE OIL- WINTER (FO)

DISTANCE (M)	HEAT FLUX (KW/M2)
1.5	196.8
2	112.0
2.5	61.0
3	37.5
3.5	22.8
4	12.5
4.5	9.1
5	7.5
5.5	6.6
6	5.1
6.5	4.5
7	3.7
7.5	3.2
8	2.4

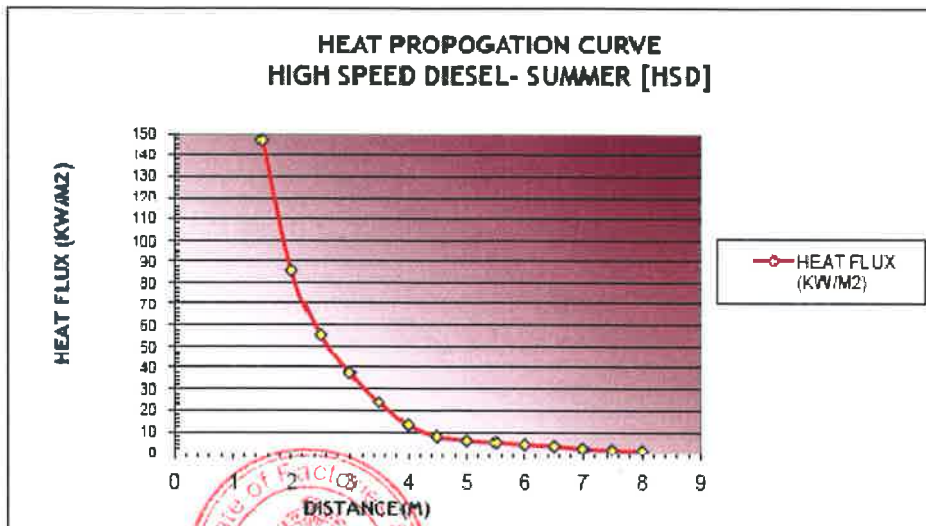
**MODELING OF HIGH SPEED DIESEL (HSD)
IN RAINY SEASON**



POOLFIRE MODEL - HIGH SPEED DIESEL- RAINY- [HSD]

DISTANCE (M)	HEAT FLUX (KW/M2)
1.5	143.8
2	82.3
2.5	37.5
3	19.7
3.5	13.2
4	9.8
4.5	7.8
5	6.4
5.5	5.3
6	3.8
6.5	3.1
7	2.6
7.5	1.7
8	1.2

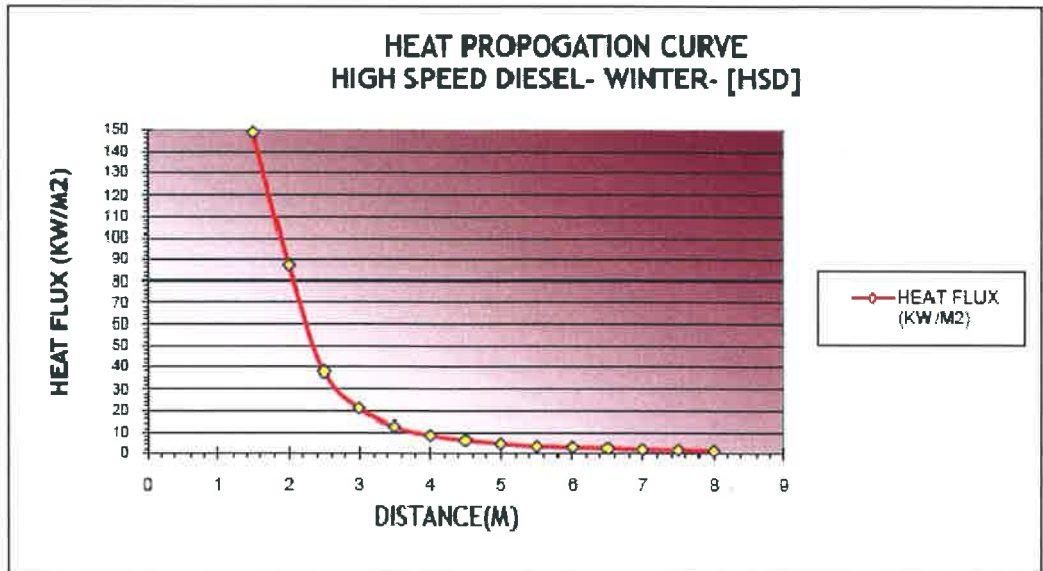
**MODELING OF HIGH SPEED DIESEL (HSD)
IN SUMMER SEASON**



POOLFIRE MODEL - HIGH SPEED DIESEL -SUMMER [HSD]

DISTANCE(M)	HEAT FLUX (KW/M ²)
1.5	147.8
2	86.7
2.5	55.8
3	37.5
3.5	23.7
4	12.9
4.5	7.8
5	5.8
5.5	4.0
6	4.0
6.5	3.3
7	2.0
7.5	1.3
8	1.0

**MODELING OF HIGH SPEED DIESEL (HSD)
IN WINTER SEASON**



POOLFIRE MODEL - HIGH SPEED DIESEL- WINTER- [HSD]

DISTANCE(M)	HEAT FLUX (KW/M ²)
1.5	148.9
2	87.2
2.5	37.8
3	20.8
3.5	12.5
4	8.4
4.5	8.2
5	4.5
5.5	3.3
6	2.9
6.5	2.4
7	1.8
7.5	1.6
8	1.1

STATION: PARADEEP								
Year	Month	Highest Max (Date)	Lowest Min (Date)	24hrs Highest Rainfall(mm)	Total Monthly Rainfall(mm)	Humidity	Wind direction	Average Wind Sped at 17.30
2009	JAN	30.2(20)	16.2(15)	0	0	74	C	4
	FEB	35(22)	19.8(17)	0	0	75	SSE	5
	MAR	33.6(6)	20.9(14)	0.1(22)	0.1	78	SW	6
	APR	34.5(9)	23.9(10)	35.1(17)	35.5	84	SW	8
	MAY	33.9(23)	21.6(15)	263.8(25)	342.4	83	SW	9
	JUN	39(03)	25(05)	12.4(30)	43.1	82	SW	6
	JUL	35.9(24)	24.1(3)	109.1(20)	727.7	87	W	5
	AUG	34.7(3)	34.6(25)	90.4(4)	380.4	83	C	3
	SEP	34(13)	24.6(9)	59(28)	266.9	83	C	4
	OCT	35.2(11)	20(27)	27.7(1)	82.1	71	C	1
	NOV	32.5(15)	14.6(30)	37.2(20)	37.2	71	C	2
	DEC	30(17)	13.4(25)	0	0	69	C	1



