DIRECTORATE OF FACTORIES & BOILERS, ODISHA, BHUBANESWAR-751001
PH-2396070

No IV(IH)(3)-76/15/ 11164 /Dt. 25/8/2016

To

The occupier,
M/s.. Amritesh Industries (P) Ltd,
At/P.O- TS-3/6,7,8,9 &10, Plot No.-24, IDCO Industrial Estate
Dist- Angul, Odisha-759122

Sub:- Acceptance of Up-dated on-site emergency plan

Sir,

In supersession to this office letter No. 11980 dt. 29.06.2010, the updated On-Site Emergency Plan submitted to this office vide your letter No. AIPL/F&B/15-16/136 dated 25.09.2015 for mitigation of identified **HAZARD** due to **HSD, FO & TRANSFORMER OIL** stored/handled in the factory bearing serial number **203/15** is provisionally accepted this day **25th of August, 2016** and copy thereof is sent here with for your record.

Conditions:

1. The occupier shall ensure that the document is updated taking into account any modification in the industrial activity/changes in inventory of hazardous substances/changes in key personnel before it is taken up and submitted for acceptance
2. The occupier shall put up prominent hoarding adjacent to the entrance gate (s) indicating the possible hazards associated with the factory and the "Dos" and "Don't" And also display at conspicuous places inside the factory together with measures to be taken in case of such incident.
3. The occupier shall ensure that every key personnel of the emergency command structure is provided with a "**WORKSHEET**" containing his duties & responsibilities.
4. The occupier shall ensure that a **MOCK DRILL** of the On -Site Emergency Plan is conducted involving zonal Asst. Director of Factories and Boilers once in every six months to review the activation and closing procedure laid down therein and also shall ensure that a **MOCK DRILL** is reviewed by the District Administration in the month of May every year.

You are requested to forward a accepted copy of the updated On-Site Emergency Plan to each of the following authorities under intimation to this office.

- Asst. Director of Factories and Boilers, Angul zone-I
- Deputy Director of Factories & Boilers , Angul Division

Receipt of this letter may be acknowledged.

Yours faithfully,

25/8/16

Director of Factories & Boilers, Odisha

Memo No_____/Dt_____

Copy forwarded to the Asst.Director of Factories & Boilers , Angul Zone-I / Dy. Director of Factories & Boilers, Angul Division for information and necessary action.

Director of Factories & Boilers, Odish

25/8/16

SLND. 203/15

ON-SITE EMERGENCY PLAN

DIRECTORATE OF FACTORIES & BOILERS
ACCEPTED
Date. 25.08.16
ORISSA, BHUBANESWAR

25.8.16
Director of Factories & Boilers
Odisha, Bhubaneswar

OF

M/s. AMRITESH INDUSTRIES PRIVATE LIMITED

TS-3/6,7,8,9 &10,PLOT NO.-24,

IDCO INDUSTRIAL ESTATE ,

DIST.-ANGUL, ODISHA-759122

FACTORY AT A GLANCE

1. **Name & address of the factory** : M/s. AMRITESH INDUSTRIES PVT. LTD.
   TS 3/6,7,8,9 & 10, PLOT NO.- 24
   INDUSTRIAL ESTATE ,DIST-ANGUL,
   ODISHA-759122
2. **Manufacturing Process (s)** : CALCINED PETROLEUM COKE & CARBON ELECTRODE PASTE
3. **Manpower** : 100
4. **Installed Power (KW)** : 213. 356
5. **Details of the Occupier :**

Name	:	Sri Gautam Kumar Das
Age	:	52 Years
Designation	:	Director
Father's Name	:	Late Amar Chandra Das
Permanent address	:	Ghoshpara Spoting Club, Paulpara, Bally, Howrah, Kolkata-711227
Email	:	amriteshindustries@gmail.com
Phone/ Mobile	:	9339646008

AMRITESH INDUSTRIES PVT. LTD.
G.K. Das
Signature
DIRECTOR

6. **Details of the Manager :**

Directorate of Factories & Boilers
BBSR
Odisha

Name	:	Sri Rajendra Prasad Behera
Age	:	51 Years
Designation	:	General Manager
Father's Name	:	Sri P.M. Behera
Permanent address	:	209/21, Padmavati Vihar, C.S Pur, BBSR
Email	:	amriteshindustries@gmail.com
Phone/ Mobile	:	06764-236630 / 9556393252

AMRITESH INDUSTRIES PVT. LTD.

For AMRITESH INDUSTRIES PVT. LTD.
Signature
RAJENDRA BEHERA
General Manager

CONTENT

Directorate of Factories & Boilers BBSR Odisha

AMRITESH INDUSTRIES PVT. LTD.

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1.0 GENERAL INFORMATION ABOUT THE FACTORY

M/s Amritesh Industries Private Limited , is located at Angul Industrial Estate, in the District of Angul, Odisha at a Latitude of ...20.833 degree..... N and Longitude of ...85.100 degree..... E near Angul Township.

Nearest Highway	:	N.H.- 55 , at a distance of 2km
Nearest Railway station	:	ANGUL , at a distance of 5km
Nearest Airport	:	BHUBANESWAR , at a distance of 150km

Name & address of the Factory : **M/s AMRITESH INDUSTRIES PRIVATE LIMITED.**
TS-3/5,7,8,9 & 10, PLOT NO.-24, ANGUL INDUSTRIAL ESTATE ,DIST- ANGUL (ODISHA)-759122
PHONE: 06764-236630
FAX NO: 06764-236565

Name & address of Occupier : **Sri Gautam Kumar Das**
(Director)
S/O- Late Amar Chandra Das
Ghoshpara Spoting Club, Paulpara, Bally
Howrah, Kolkata-711227

Name & address of Manager : **Sri Rajendra Prasad behera**
(General Manager)
S/O- Sri P.M. Behera
209/21,Padmavati Bihar, C.S Pur, BBSR

Directorate of Factories & Boilers BBSR Odisha

AMRITESH INDUSTRIES PVT. LTD.

2.1 MANUFACTURING PROCESS:

Raw petroleum coke is crushed to required size in double roll crusher and conveyed to raw petroleum coke hopper through hoist and then fed to the rotary kiln through feed pipe.

Calcinations of raw petroleum coke takes place within the kiln where moisture, volatile matter impurities in raw petroleum coke are liberated and molecular change takes place to produce calcined petroleum coke (CPC)

The hot and calcined petroleum coke coming out from the kiln is cooled by spraying water in a screw conveyor. The calcined petroleum coke coming out is sent to the calcined petroleum coke bunker through bucket elevator for bagging.

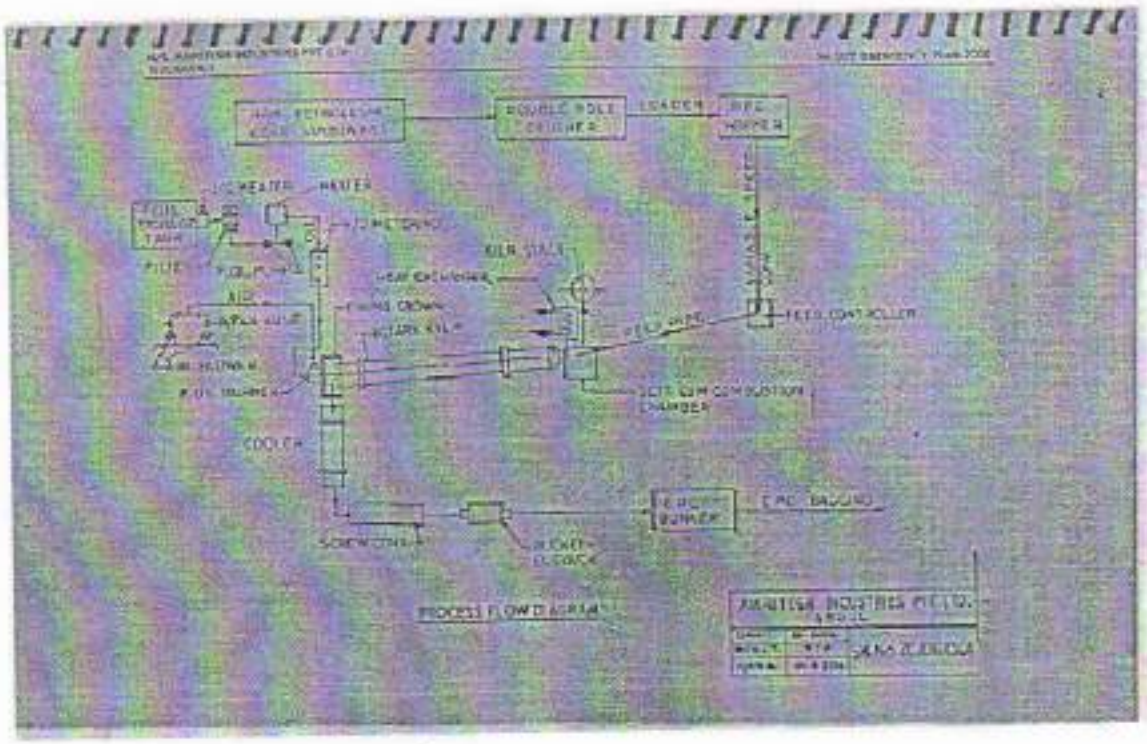
Vertical shaft kilns have a battery of vertical shafts and intricate flue passages to utilize the heat generated by the evolving volatiles efficiently. The process does not require any additional fuel and is self-sustaining except the initial heating up of the kiln. The raw coke is fed from the top of the kiln in measured amount. The coke gets heated up at a regulated rate while it slowly travels through the shaft under gravity. A series of thermocouples are inserted in the shaft, which give the temperature of the coke as it progresses. The calcinations take place at $1200^0c - 1300^0c$.

The volatiles evolved in the process are fully utilized for heating the shaft externally through a maze of ducts in the system. The flue gas is exhausted through a natural draft chimney. The temperature of the flue gas is bellow 200^0c as it enters the chimney.

Calcined coke is cooled in the lower part of the shaft indirectly by external circulating water. The calcined coke is discharged in a conveyor for transporting to a storage bin from where it is bagged and stored in the warehouse for dispatch to the customers.

The kiln is mainly constructed from high quality high temperature refractory bricks with reinforced cement concrete foundation. The flue system is connected to a 46-meter natural draught chimney to discharge the gases to atmosphere. The water for cooling the coke is circulated and is cooled in large tanks. Since it is a cooled circuit cooling system, the water is cooled and circulated and there is no liquid effluent from the plant.

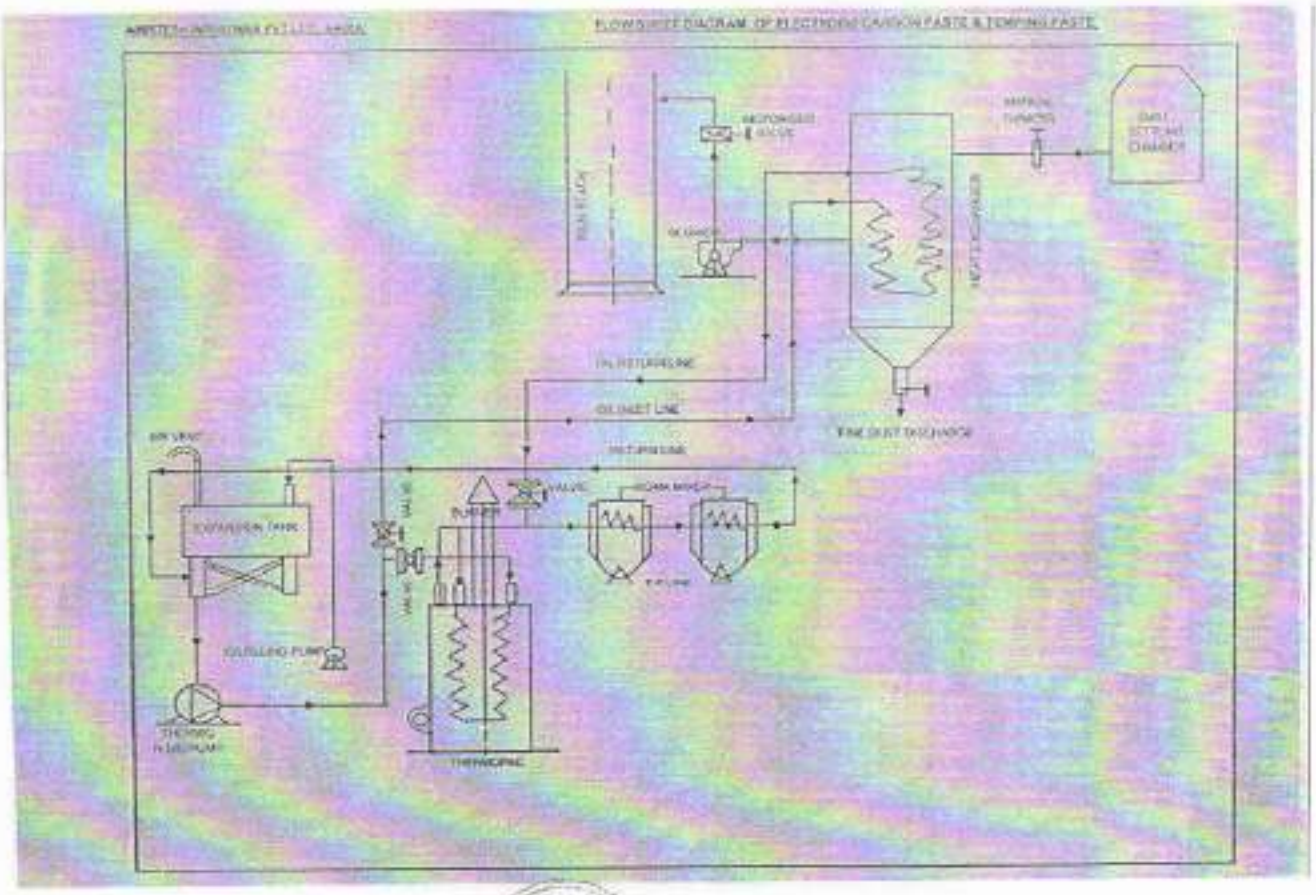
PROCESS FLOW CHART



2.2 ELECTRODE CARBON PASTE &TEMPING PASTE

Calcined Petroleum Coke produced in the calcinations plants are subjected to screening and various fraction sizes are produced. The different fraction sizes used for a batch of 982kgs are as follows :-

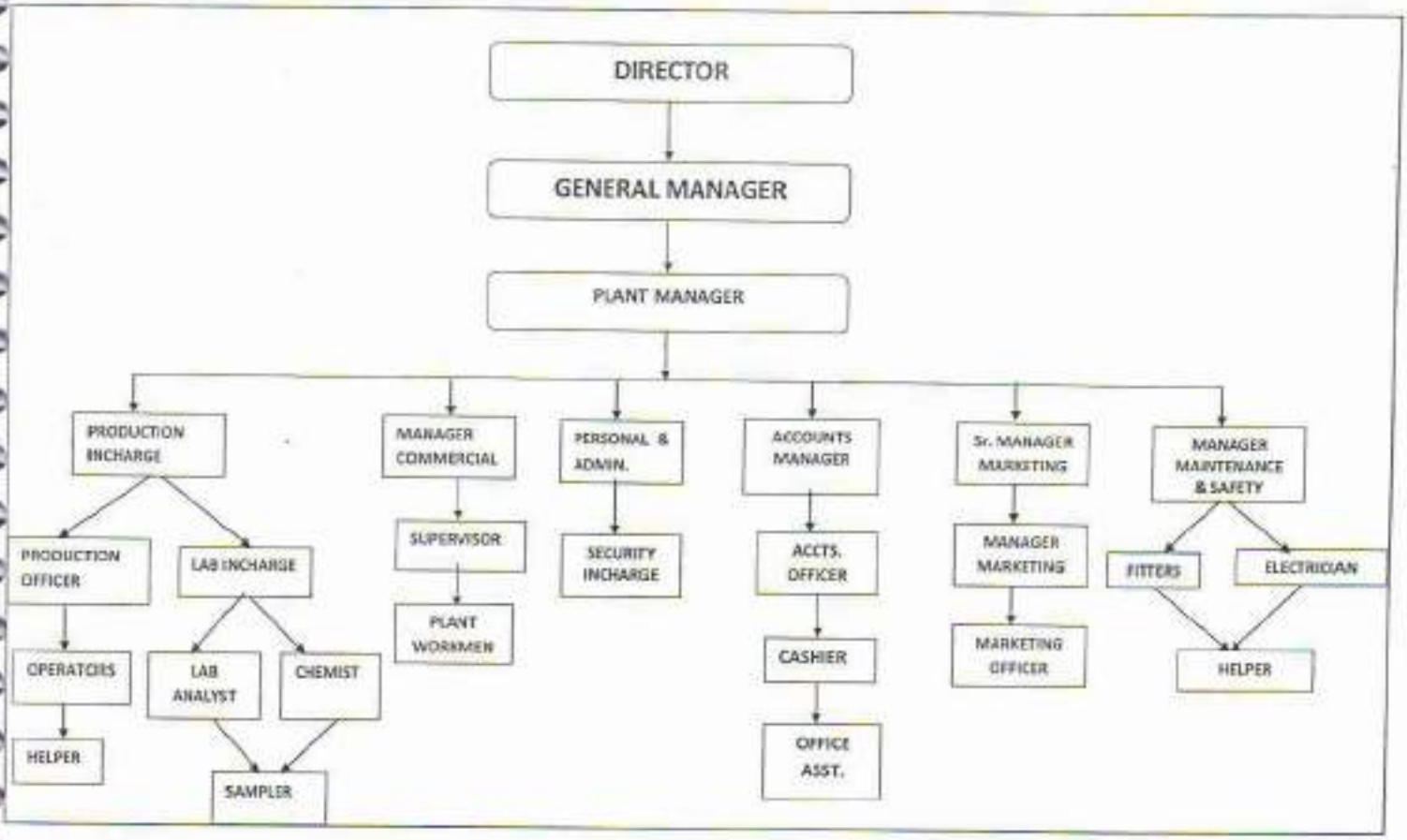
CPC fractions available at the source is proportioned and mixed with the milled fractions. The total charge is weighed and transferred to Sigma Type Mixture pneumatically or by electric hoist. Anthracine oil in desired quantity is added to dry mass. The mixtures are jacketed and heated to 18° C in dry condition with the help of thermic fluid at a temperature of 220° C circulated through pipeline and mixer jacket. The hot oil is returned to expansion tank and from there through circulating pump pass through a thermic fluid heater where the temperature of the fluid is raised to original temperature by fuel injection and combustion system. Binder pitch is coarse fractions is weighed and added to the hot mass of coke in the mixer after 15 minutes of heating. After addition of binder pitch the mass now changes its character. The mixer is operated for a constant time cycle to obtain the homogeneity of the hot mass.
The hot mass in the mixer becomes a thick mass having plasticity character. The coke gets fully coated with binder pitch and becomes adhesive. On completion of the hot mixer operation, the hot product is discharged through pneumatically operated door of mixer into a paste trolley on rails. Paste trolley is pushed into the moulding area and the hot paste is transferred to moulding boxes for ramming to the block sizes as customer's requirements. The moulded blocks are released from boxes and when air cooled the carbon Blocks becomes a dense hard mass easy to handle.



AMNITESH INDUSTRIES PVT. LTD.

G.F. Factories & Boilers
66SR
Chhattisgarh

2.0 ORGANISATION SET UP



3. MATERIAL BALANCED SHEET

RPC FEED = 100 Kg			
S.No	Parameters (Characteristics)	%	Qty in (Kg)
1	VM	14	14
2	Moisture	7	7
3	Ash	1	
4	FC	85	21

CPC Recovery = 75Kg				
Sl. No	Parameters (Characteristics)	%	Material Lost in Kg	Material Recovered in Kg
1	VM	0.5	13.5	
2	Moisture	0.5	6.5	
3	Others (Kiln Loss)	5	5	
4	Ash	1		
5	FC	98.5		
		Total	25	75

3.0 MANPOWER:-

Manpower as per license is- 100.

SHIFT	TIMING	No. of persons engaged
"A"SHIFT	0600 – 1400 hrs.	10
"B"SHIFT	1400 – 2200 hrs	10
"C"SHIFT	2200 – 1600 hrs.	10
"G"SHIFT	0800 – 1700 hrs.	5
	TOTAL	35

1.0 PRODUCT:

SL.NO.	NAME OF PRODUCT	ONE TIME STORAGE QUANTITY	STORAGE TYPE
1	Calcined Petroleum Coke	500 MT	Covered shed 18.3 meter * 12.2 meter *5.5 meter (4Nos) Storage Capacity – [700 MT Each]
2	Electro Carbon Paste	40 MT	Covered shed 5 .3 Meter * 4.5 Meter *5.5 meter Storage Capacity –[80 MT]

1.1 BYE-PRODUCT: NO BYE- PRODUCT

SL. NO.	NAME	ONE TIME STORAGE QUANTITY	STORAGE TYPE
	NA	NA	NA

5.0 INVENTORY OF RAW MATERIALS:

SL. NO.	NAME	ONE TIME STORAGE QUANTITY	TYPES OF STORAGE
01	Raw Petroleum Coke	1200 MT	Covered shed 73 meter * 55 meter * 6.8 meter Storage Capacity- 4150 MT 35.7 meter * 29.2 meter * 6.8 meter Storage Capacity – 940 MT 30.35 meter * 34.2 meter *6.8 meter Storage Capacity --- 700 MT
02	Pitch	20 MT	Covered Shed 5.3 meter * 4.5 meter *5.5 meter Storage Capacity – 60 MT
03	Furnace Oil	15 KL	Cylindrical MS Tank above The Ground [Horizontal] – Size (6.1 meter length * 2.1 meter diameter)
04	Furnace Oil	1 KL	Cylindrical MS Tank above The Ground [Horizontal] – Size (1.5 meter Length * 1 meter diameter)

6.0 INVENTORY OF HAZARDOUS SUBSTANCE:

SL. NO	NAME	MAXIMUM CAPACITY	MAXIMUM OF ONE TIME STORAGE	TYPES OF STORAGE
1	**Furnace Oil**	20 KL	15 KL	CYLINDRICAL MS TANK ABOVE THE GROUND [HORIZONTAL] Size (6.1 meter length * 2.1 meter diameter)
2	**Furnace Oil**	2 KL	1 KL	Cylindrical MS Tank above The Ground [Horizontal] – Size (1.5 meter Length * 1 meter diameter)

3	HSD	400 L	200 L	Rectangular MS Tank above the ground Size (1.2 meter *0.6 meter * 6 meter)
4	TRANSFORMER OIL IN 250 KVA TRANSFORMER	10 L	5 L	At Transformer Site of Length – 4.5 meter and Width 1.5 meter
5	LPG	1 Cylinder	19.2Kg	MS Cylinder stored in work shop .

7.0 INVENTORY OF HAZARDOUS GASES / SUBSTANCES PRODUCED / GENERATED:

SL. NO.	NAME	QUANTITY OF ONE TIME STORAGE	TYPE OF STORAGE
	NIL		

8.0 IDENTIFICATION OF HAZARDS:-

Hazards are mostly manifested in the form of Poolfire or Fire. Anticipated hazards scenario associated in the unit is described along with its assessment of impact on plant in the following table:

Sl.	Area / Hazard Zone	Hazard	Impact
1	Storage and Handling of Furnace Oil	Pool fire/ Fire ball may occur in case of direct contact with flame.	Fire may propagate to the nearby stores.
2	LPG	Pool fire/ Fire ball may occur in case of direct contact with flame.	Fire may extend to nearby area.
3	HSD	Pool fire/ Fire ball may occur in case of direct contact with flame.	Fire may extend to nearby area.
4	Transformer Oil	Pool fire/ Fire ball may occur in case of direct contact with flame.	Fire may extend to nearby area.
5	Calcined Petroleum Coke	It has no auto ignition properties	Fire may damage to nearby area.

9.0 IDENTIFICATION OF MOST CREDIBLE HAZARD SCENARIO:

MOST CREDIBLE SCENARIO:

Credible Scenario A: **Pool Fire In Furnace Oil Storage Tank.**

BASIS OF DETERMINATION OF MOST CREDIBLE SCENARIO:

As discussed previously, modeling is done for most credible scenario and is identified on the basis of following reasons.

- **Fire Hazards in Furnace Oil Storage Tank.**

Fire Hazard in Furnace Oil Storage Tank is considered as Credible Scenario because of the following reasons.

Furnace Oil is flammable liquid as per schedule 1, Part – II (b) (v) having flash point of 66°C and auto ignition temperature of 407° C and explosive limit of 5% volume in air. So, it is susceptible to fire hazard. When-ever Furnace Oil catches fire it shall manifest in the form of pool fire. Hence, pool fire modeling of Furnace oil storage tank is done for different situations (summer Day Time, Summer Night Time, Rainy Day Time, Rainy Night Time, Winter Day Time, Winter Night Time) using fire equation the results are tabulated followed by Heat propagation Curve.

Study of all the six situations indicates that the effect of pool fire shall be maximum in summer season at night time as indicated in the following table:

Significant Heat Level	Heat Flux Value	Experience at Distance of	Indication
SHL – 1	4.5 KW/m²	4.3 m	Causes pain if unable to cover the body with in 20sec
SHL – 2	12.5 KW/m²	2.8 m	Minimum energy required for meting of plastic.
SHL – 3	37.5 KW/m²	1.8 m	Sufficient to cause damage to the equipment.

Sl. No.	Description	Summer		Rainy		Winter	
		Day	Night	Day	Night	Day	Night
a.	Average Wind Speed m/ sec.	3.2	2.7	2.4	2.2	1.6	1.4
b.	Average Wind Direction (from)	SW	SW	NW	NW	N	NE
c.	Humidity	65	45	85	80	73	47
d.	Average Ambiant air temperature °C	40	26	31	25	27	13

As there are other establishments, such as stores nearby, the fire from Furnace Oil tank can easily reach the store causing extensive damage to the materials stored and ultimately the situation will lead to disaster.

On the basis of above consideration the pool fire due to fire hazard in the Furnace oil storage tank is considered as most credible scenario.

- Fire Hazard From LPG Tank

Dispersion modeling is done for toxic release of LPG Gas during storage and handling in bullets. The dispersion modeling is done on the basis of Gaussian model.

Gaussian Model is used to predict the way gas disperses in the atmosphere. According to this model, "Wind" and "atmospheric Turbulence' are the main forces that move the molecules of a released gas through the air, as an escape cloud is blown down the wind. The "turbulent mixing" causes it to spread over in the crosswind and upward directions. According to the Gaussian model, any crosswind slice of a moving pollutant cloud looks like a bell – shaped curve, high in the center and lower on the sides.

- Credible Hazards: Fire Hazard Due To HSD Storage Tank

In this case it has not considered as credible hazard due to availability of storage tank under the ground also at time the availability of HSD in storage tank is approximately 200lts only which is a very scanty.

- Calcined petroleum Coke has been considered hazards

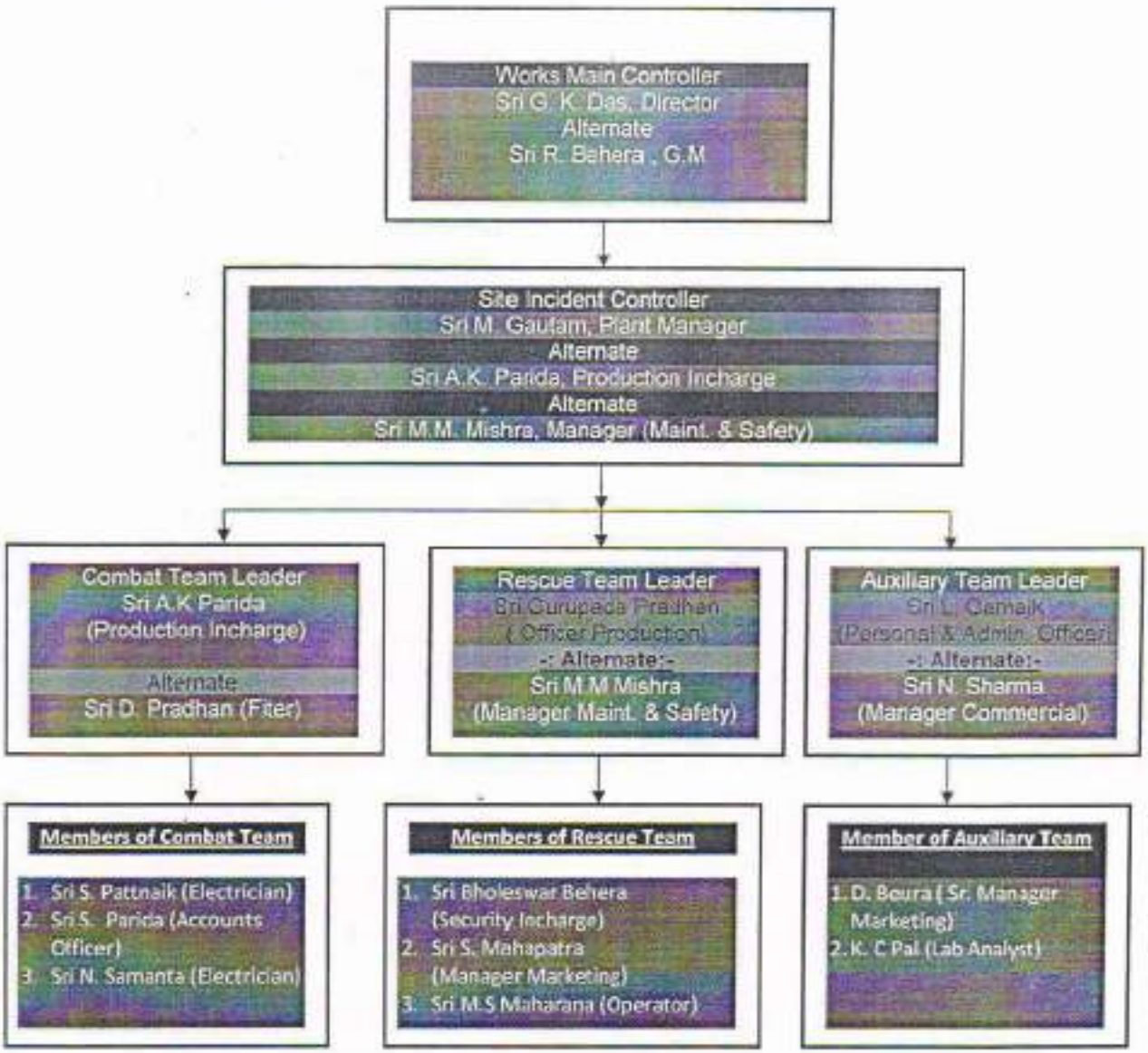
It has been no auto ignition prepare ties to cases measure damage however all precautionary measures has been adopted to mitigate any emergency situation Fire hydrants, suitable fire extinguishers have been available to meet eventualities.

10.0 PLOT PLAN:

The plot plan showing the followings is given in **Annexure**.

1. Hazard Zone (HZ)
2. Emergency Control Room (ECR)
3. Assembly Point (AP)
4. Emergency Exit (EE)
5. Fire Hydrant line

11.0 EMERGENCY COMMAND STRUCTURE:



12.0 ROLE OF KEY PERSONS OF EMERGENCY COMMAND STRUCTURE

12.1 WORKS MAIN CONTROLLER (WMC):-

- On being informed, rush to the scene and take overall charges of the situation
- Make quick assessment of the situation and decide declaration of emergency by blowing the siren in appropriate code [**intermittent three times with half minutes interval**]
- Make continuous review and assess the possible developments to determine the extent of damage to plant and human beings
- Shut-down the plant, if necessary
- Ensure that casualties are receiving adequate attention
- Liaise with the fire services, police services and other statutory authorities
- Declare closure of the emergency by blowing the siren [only once long siren for 25 seconds]
- Issue the authorized statements to the media services
- Report all statutory authorities in the prescribed manner
- Communicate to employees about the mishap, measures taken and giving confidence to employees for avoiding recurrence of the incident by investigation and ordering preventive measures to be implemented

12.2 SITE INCIDENT CONTROLLER:-

- On hearing Emergency siren, rush to the scene and report to the Works Main Controller
- Make quick assess about the gravity of the situation and appraises Works Main Controller
- Extend all sorts of help through different agencies to minimize the damage to human beings, plant, property and environment
- Shutdown of Plant & Machinery
- Undertake continuous review of the situation time to time and appraise to Works Main Controller
- Provide the required information to the fire brigade team for fire fighting
- Preserve the evidences for the subsequent inquiries
- He will liaison between the various working teams.
- He will extend all possible help needed during the Emergency.
- Organize various teams by calling the team leader

12.3 COMBAT TEAM LEADER:-

- On hearing the emergency siren, rush to the scene with fire fighting team with sufficient equipment in the minimum possible time.
- Ensure the team members resume their position with appropriate equipment
- Monitor the fire fighting operation to control the situation
- Ensure that the situation is controlled by arresting, spillage, fighting fire, shutting of the valve and equipment by the team in consultation with Site Incident Controller

- Alert the entire employees through PA System
- Command fire fighting activities. Also review and decide fire-fighting strategies

12.4 COMBAT TEAM MEMBERS:-

The team members will assist the team Leader to ensure.

- Shutdown the Plant and Machinery & Isolate the affected area.
- Arrange of Isolation of Electrical Power Supplier all around the affected area.
- Alert the entire employees through PA System
- Operating the fire fighting equipments and materials and also to shift to effected site

12.5 RESCUE TEAM LEADER:-

- On hearing the emergency siren, rush to the scene
- Ensure the arrival of his team members
- Keep necessary equipments of first-aid for preliminary treatment
- Keep the ambulance ready to carry the injure persons to the hospital
- Ensure the proper personal protective equipments lead the team for rescue operation
- Guide the mutual aid partners for their course of action at the site
- Guide the non-essential persons to reach assembly point
- Search the missing person on the roll call basis
- Rescue all the effected persons.
- Search for casualties and evacuate non-essential person from spot.

12.6 RESCUE TEAM MEMBERS:-

- On hearing the emergency siren, rush to the scene with appropriate personal protective equipments
- Rescue all the effected persons.
- Search for casualties and evacuate non-essential person from spot.
- Arrange to send emergency case to hospitals.

12.7 AUXILIARY TEAM LEADER:-

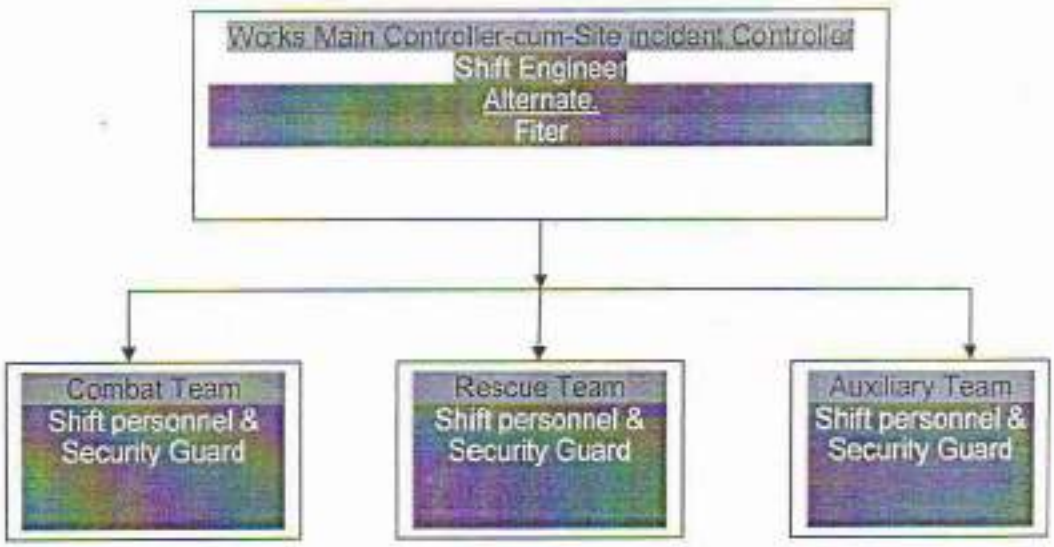
- On hearing the emergency siren rush to the scene
- Ensure the arrival of his team members
- Intimate mutual-aider over phone
- Keeps the first-aid and primary health center staff, equipment ready to take care of immediate medical needs
- Takes care of victims' family
- Make all arrangement like transport, other needs, arrange finance
- Ensure all casualties are shifted to hospital for medical treatment
- Keep records of casualties and provide information of the matter to Works Main Controller

AMRITESH INDUSTRIES PVT. LTD.

12.8 AUXILIARY TEAM MEMBERS:-

- On hearing emergency siren, rush to the scene
- Carry out the orders of the team leader
- Provide immediate first-aid treatment to the victims
- Ensure ambulance vehicle ready
- Coordinate with combat team, rescue team, statutory authorities and mutual-aid partners
- Takes care of victims' family

13.0 SILENT HOUR COMMAND STRUCTURE-



13.1 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 Engineer / Shift Foreman shall act as Works Main Controller-cum Site Incidence Controller , till the arrival of the Works Main Controller**
- **Works Main Controller-cum Site Incidence Controller (Silent Hour) shall inform** Works Main Controller, Site Incident Controller, Combat Team Leader, Rescue Team Leader and the Auxiliary Team Leader 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

14.0 ACTION PLAN FOR ON-SITE EMERGENCY:

STEP NO.	INITIATOR	ACTION TO TAKE
1.	The parson noticing the emergency	➢ Inform the Security Gate and the concerned Shift-in-charge who in turn will inform Works Main Controller immediately regarding the fire hazard.
2	Works Main Controller (WMC)	➢ On being informed, rush to the Emergency Control Room. ➢ Declare of emergency by blowing the siren in appropriate code **[intermittent three times with half minutes interval]** ➢ Make continuous review and assess the possible developments to determine the extent of damage to plant and human beings ➢ Shut-down the plant, if necessary ➢ Ensure that casualties are receiving adequate attention ➢ Liaise with the fire services, police services and other statutory authorities ➢ Declare closure of the emergency by blowing the siren [only once long siren for 25 seconds] ➢ Issue the authorized statements to the media services ➢ Report all statutory authorities in the prescribed manner ➢ Communicate to employees about the mishap, measures taken and giving confidence to employees for avoiding recurrence of the incident by investigation and ordering preventive measures to be implemented
3.	Site Incident Controller (sic)	➢ On hearing Emergency siren, rush to the scene and report to the Works Main Controller ➢ Make quick assess about the gravity of the situation and appraises Works Main Controller ➢ Extend all sorts of help through different agencies to minimize the damage to human beings, plant, property and environment ➢ Shutdown of Plant & Machinery ➢ Undertake continuous review of the situation time to time and appraise to Works Main Controller ➢ Provide the required information to the fire brigade team for fire fighting ➢ Preserve the evidences for the subsequent inquiries ➢ Make liaison between the various working teams. ➢ Extend all possible help needed during the Emergency.
4	Combat Team	➢ On hearing Emergency siren, rush to the scene ➢ Shutdown the Plant and Machinery & Isolate the affected area. ➢ Arrange of Isolation of Electrical Power Supplier all around the affected area. ➢ Alert the entire employees through PA System ➢ Operating the fire fighting equipments and materials and also

to shift to effected site

5.	Rescue Team	➢ On hearing Emergency siren, rush to the scene ➢ Guide the non-essential persons to reach assembly point ➢ Search the missing person on the roll call basis ➢ Rescue all the effected persons. ➢ Search for casualties and evacuate non-essential person from spot.
6.	Auxiliary Team	➢ On hearing Emergency siren, rush to the scene ➢ Inform about the emergency to Statutory Authorities depending upon the situation. ➢ Shift the injured persons to hospital by ambulance after providing necessary first aid. ➢ Seek help of Mutual Aid Partners and Coordinate with Mutual Aid Partners to render their service if required. ➢ Arrange to inform the relatives of Casualties. ➢ Take care of visit of the authorities to the Emergency Site.

15.0 ACTIVATION AND CLOSING PROCEDURE FOR ON-SITE EMERGENCY

⇒ Anybody notices FIRE, shout "FIRE, FIRE", "FIRE" and informs to Shift-in-charge [or Smoke detector indicates fire alarm installed in the emergency control room]

⇒ Being informed about fire, the **Shift-in-charge** informs **Works Main Controller** and **Site Incident Controller**

⇒ On hearing about the fire, Works Main Controller and Site Incident Controller rush to the scene and make quick assessment of the situation

⇒ On quick assessment of the situation, the Works Main Controller rush to the emergency control room and declare emergency by blowing appropriate siren code [**intermittent three times with half minutes interval**]

⇒ On hearing of Emergency siren the key personnel of Emergency Combat structure perform their duties and responsibilities as per the worksheet

⇒ During the emergency operation, the Works Main Controller keeps records of activities carried on, supervises overall, maintain liaison with mutual aiders, statutory authorities

⇒ After being controller the situation, the Works Main Controller declares normalcy by blowing appropriate siren [three minutes continuously]

Directorate of Factories & Boilers BBSR Odisha

AMRITESH INDUSTRIES PVT. LTD.

ANNEXURE-I

DETAILS OF FACILITIES AVAILABLE

A. EMERGENCY CONTROL ROOM:

- P&T phone - (06764 – 236565 ,9090774201 , 9556393252 , 9778232325,8338858031)
- Wind direction and speed indicator- Top of the administrative building
- Windsock - Top of the administrative building
- Wallboard for fixing up drawings and drawing pins. Flip charts, drawing sheets and sketch pens
- Switch for actuating the siren, drinking water arrangement, tables, chairs, etc.
- Details of address and telephone numbers of key personnel of emergency command structure, statutory authorities and mutual aiders
- Worksheet of key personnel of emergency command structure
- Applicable siren code
- Safety manual
- List of emergency telephone numbers (external and internal)
- Local P & T telephone directories
- List of people working in the installation, location wise
- List of residential addresses of employees / contract workers and casual workers
- Red / Green flag – 6 nos. each

B. ASSEMBLY POINTS:-

In an emergency, it will be necessary to evacuate people from the affected zones or the zones likely to be affected, to safe areas. The safe areas are identified and designated as Assembly Points (AP). The location of the assembly point is the vacant space shown in the Plot Plan. Arrangements for taking head count of persons, reconciling the head count with the attendance rolls, temporary shelter and further evacuation if necessary to safer place outside factory campus can be made.

C. WIND SOCKS:-

During emergencies, the knowledge of exact wind direction helps the factory personnel to decide on the escape route to be taken for safe evacuation of personnel and also the safe assembly point and Emergency Control Centre. Therefore, the windsock is provided at the top of the administrative building for easy identification of the wind direction.

D. COMMUNICATING THE EMERGENCY AND MEDICAL AID :

For communicating the declaration of emergency and evacuation decision to the plant personnel, it is envisaged that the siren would be utilized.

Declaration of emergency	: -	Intermittent three times with Half-minute interval
Normal factory siren	: -	Continuous for 30 secs.
All-clear signal	: -	Continuous for 3 mins.

E. EMERGENCY MEDICAL ARRANGEMENT:-

⇒ The first-aid box is available in each department ; viz. main store, sponge side, furnace side, control room, office room

⇒ First-aid boxes are maintained in each department

⇒ Adequate stock of essential medicines, bandages and other appliances are being maintained

F. FIRE HYDRANT SYSTEM:

Fire Hydrant points are provided inside the plant as shown in plot plan. Fire hydrant hoses are 63mm. dia in size. Two motors of 55 kw having capacity of dischaging water 180 m^3/hr are provided to main header to maintain a pressure of 7kg/cm^2. In case of temporary power failure, the fire pumps are run by DG. One water reservoir of capacity 3000 KL is supplying water to the fire main line and is receiving water from nearby Lilary nallah by pump of capacity 60 m^3/hr

G. First Aid Centre:

One first aid room with facilities of oxygen fittings, stretchers, thermometer, first aid kits, blankets, kidney tray and a team of first aiders are available

H. FIRE EXTINGUISHERS:

Required types of fire extinguishers have been provided at different locations of the plant as given below

Location of Equipment	Particulars	Quantity	Remarks
Store Room	ABC – 5.0 Kg	1	At the time of Emergency any nos. of equipments can be used collecting from any place point as per requirement
Compressor Panel	Co_2 –4.5 ltrs	1	
VSK Production Area	ABC – 2.0 Kg	2	
D.G Room	ABC- 5.0 Kg	1	
Paste Plant	AB-9.0 Kg	1	
Laboratory	ABC- 2.0 Kg	1	
Guest House	ABC- 2.0 Kg	1	
Office	ABC- 5.0 Kg	1	
Weigh Bridge Room	ABC- 2.0 Kg	1	
Weigh Bridge Godown	ABC- 5.0 Kg	1	
VSK Panel	Co_2-2.0 Kg	1	
VSK Pump House	ABC- 5.0 Kg	1	
RK Panel	Co_2-4.5 Kg	1	

AMRITESH INDUSTRIES PVT. LTD.

RK Production Godown	DCP- 9.0 Kg	1	
Screening M/C Area	ABC- 2.0 Kg	1	
Godown	DCP- 9.0 Kg	1	
RK Panel	Co_2-4.5 Kg	1	

J. **FACILITIES FOR EMERGENCY COMBAT & RESCUE:**

SL. NO.	Equipment	QTY/NO	LOCATION
1.	Portable fire extinguishers	16 Nos.	Details given at page-
2.	Breathing apparatus	02 Set	First aid room
3.	Manila rope	50 mtr.	Security
4.	Emergency light	05 Set	Adm. office, Time office, Control room, Store
5.	AC Generator operated siren	02 Set	Control room
6.	Rescue ladder	01 set	Store
7.	Fire beaters	02 Nos.	Store
8.	Fire hooks	05 Nos.	Store
9.	Safety gloves	10 Pair	Store
10.	Safety belt	04 Nos.	Store
11.	Siren (Plant)- Plant control room	02 Nos.	Plant
12.	First aid box	04 Nos.	Lab., Administrative building, Store, Security room, First aid room
13.	Sand buckets	16 Nos.	At location point of fire extinguishers

K. **SIREN:**

Company has Siren/ hotter arrangement, which can be activated manually during fire related emergency.

L. **COMMUNICATION:**

Public address system and EPABX telephone is available for effective communication inside the plant. Telephone directory is available in the entire department.

Hording

1. Wear only cotton/approved work clothes while on duty in the plant.
2. Don't resort to short cuts.
3. Don't attempt to operate any equipment to which you are not specifically assigned.
4. Don't use the defective equipments of any kind.
5. Use the PPE to work safely.
6. Insist your fellow workers to observe the safety rules.
7. Take instruction from your superior before starting any new works.
8. Report all injuries/dangerous occurrence to your superior.
9. Curing emergency be strictly guided by the emergency action plan.

ANNEXURE-II

MUTUAL AID:

LIST OF MUTUAL AIDDER DURING EMERGENCY			
Name & Address of the mutual address	Distance from the factory	Contact Person with Tel. No.	Facilities Provided
Sakuntala Aluminium Industries Pvt. Ltd.	0.7 Km	N.P Choudhury	Vehicle & Manpower

MUTUAL AGREEMENT

M/S. Amritesh Industries Pvt. Ltd. AT- Industrial Estate, Angul, Angul, ODISHA	M/S. Sakuntala Aluminium Industries Pvt. Ltd. AT- Industrial Estate, Angul, Angul, ODISHA
HAZARD Fire hazard due to storage/ handling of Coal, HSD & Transformer Oil	HAZARD furnace oil
FACILITIES AVAILABLE • Fire Extinguishers – 16 • Manpower – 100 • Vehicles One Vehicle	FACILITIES AVAILABLE • Fire Extinguishers – 02 • Manpower – 10 • Vehicles – one vehicle
FACILITIES TO BE PROVIDED DURING EMERGENCY • Fire Extinguishers – 10 • Manpower – 100 • Transport One Vehicle	FACILITIES TO BE PROVIDED DURING EMERGENCY • Fire Extinguishers 2 • Manpower 10 • Transport one vehicle
CONTACT PERSON Mr. Rajendra Prasad Behera Designation: General Manager Mobile No. 9556393252	CONTACT PERSON Mr. Narayan Prasad Choudhury Designation: managing Director Mobile No.: 9437039764

For AMRITESH INDUSTRIES PVT. LTD.
RAJENDRA BEHERA
General Manager

Signature of Occupier/ Manager with seal

FOR SAKUNTALA ALUMINIUM IND. PVT. LTD.

Signature of Occupier/ Manager with seal

ANNEXURE-III

(A) DETAILS OF TELEPHONE NUMBERS OF KEY PERSONNEL

TELEPHONE NUMBERS OF KEY PERSONS OF EMERGENCY COMMAND STRUCTURE

Sl. No.	Name & Designation	Designation	Designation as per emergency command structure	Telephone Numbers
1.	Sri G.K Das	Director (Occupier)	Works Main Controller	9339646008
2.	Sri R. Behera	General Manager	Alternate Works Main Controller	9556393252
3.	Sri Mukesh Gautam	Plant Manager	Site Incedent Controller	9778232325
4.	Sri A.K Parida	Production Incharge	Combat Team Leader	9778152065
5.	Sri Gurupada Pradhan	Officer Production	Rescue Team Leader	9438011955
6.	Sri Manamohan Mishra	Manager (Maint. & safety)	Alternate Rescue Team Leader	9090424200
7.	Sri L. Garnaik	Personal & Admin. Officer	Alternate Auxiliary Team Leader	9937709481
8.	Sri N. Sharma	Manager Commercial	Alternate Auxiliary Team Leader	8599000930
9.	Sri D. Pradhan	Fiter	Alternate Combat Team Leader	9937615202
10.	Sri N. Samanta	Electrical Incharge	Member of Combat Team	9937175154
11.	Sri S.Patnaik	Electrician	Member of Combat Team	9438069239
12.	Sri S.Mahapatra	Manager Marketing	Member Of Rescue Team	9937004180
13.	Sri D.Beura	Sr. Manager Marketing	Member Of Auxiliary Team	8599000939
14.	Sri K.C.Pal	Lab Analyst	Member Of Auxiliary Team	9778248324
11.	Sri S.Patnaik	Electrician	Member of Combat Team	9438069239

(B) DETAILS OF TELEPHONE NUMBERS OF STATUTORY AUTHORITY

Sl. No.	AUTHORITY	ADDRESS	TELEPHONE NUMBER
1	District Collector,	Angul	06764-230567 (O) 06764-230234 (R)
2	Addl. District Magistrate,	Angul	06764-230491
3	District Fire Officer,	Angul	06764-280222
4	Chief District Medical Officer,	Angul	06764-232507
6	Police Station,	Angul	06764-230474
7	Director of Factories & Boilers, Odisha	Bhubaneswar	0674-2396070
8	Dy. Director of Factories & Boilers,	Angul	06764-220164
9	Asst. Director of Factories & Boilers,	Angul	06764-220164

SOURCE OF METEOROLOGICAL DATA:

We obtained Meteorological Data through Google Net.

MATERIAL SAFETY DATA SHEET FOR FURNACE OIL :

1.	Physical State	Liquid
2.	Colour	Black - Brown
3.	Specific Gravity	0.95
4.	Chemical Formula	—
5.	Molecular Weight	—
6.	Flash Point °C	66
7.	Melting Point °C	—
8.	Boiling Point °C	315
9.	Auto Ignition Temperature °C	407
10.	Vapor Pressure	N / A
11.	Solubility	NO
12.	Explosive Limit (% Volume in air)	5

A. POTENTIAL HEALTH EFFECTS

- Inhalation:

  None expected under normal conditions of use.

- Ingestion:

  Based on animal testing, the oral toxicity is presumed to be slight to moderate.

- Skin Contact:

  Prolonged or repeated exposure may cause skin irritation. May cause harmful effects on prolonged, repeated skin contact.

- Eye Contact:

  May cause mild eye irritation.

B. FIRSTAIDMEASURES

- Inhalation:

  Remove from further exposure. If unconsciousness occurs, seek immediate medical assistance. If breathing stops, use mouth-to-mouth resuscitation.

- Ingestion:

  Do not induce vomiting. Seek medical assistance promptly.

- Skin Contact:

  Wash contact areas with soap and water. Launder contaminated clothing before reuse. Discard contaminated leather articles.

- Eye Contact:

  Flush immediately with water for at least fifteen minutes. Seek medical attention promptly.

C. **FIREFIGHTINGMEASURES:**

- **General Hazard:**

  Incomplete burning can produce carbon monoxide. Water or foam may cause frothing, which can be violent and endanger fire fighters, especially if sprayed into containers of hot liquid.

- **Fire Fighting Instructions:**

  Use water fog, CO_2, foam, dry chemical or Halon to extinguish. Keep personnel removed from and up-wind of fire. Cool adjacent structures and storage drums with water spray. Evacuate area. Prevent runoff from fire control dilution from entering streams or drinking supply.

D. **HANDLINGAND STORAGE:**

- **General:**

  Store away from ignition sources in a cool area. When material heated to application temperatures, precautions should be taken to prevent thermal burns.

E. **PERSONALPROTECTION:**

- **Engineering controls:**

  Provide ventilation sufficient to prevent exceeding recommended exposure limit or build-up of explosive concentrations of vapor in air.

- **Personal Protection:**
  Approved respiratory protection must be used when vapor or mist concentrations are unknown or exceed the TLV. Avoid prolonged or repeated breathing of vapor or mists.

- **Protective Clothing:**
  Full- face shield chemical goggles are required. Impervious gloves, boots and whole body protection needed.

F. **ACCDENTALRELEASEMEASURES:**

- **Land Spill:**
  Treat spill as an oil spill. Eliminate all sources of ignition. Remove leaking containers to a safe area. Contain and remove by mechanical means. Guards against contamination of water supplies. Solidified material can be scrapped up from ground with mechanical dredges or lifts. Report spills to appropriate authorities. Dispose of in accordance with State, and Local regulations.

- **Water Spills:**
  Treat spill as an oil Spill. Solidified material may be removed from water with a mechanical dredge or lift. Report to appropriate authorities. Dispose of in accordance with Federal, State regulations.

MATERIAL SAFETY DATA SHEET FOR HIGH SPEED DIESEL :

1.	Physical State	Liquid
2.	Colour	Straw red
3.	Specific Gravity	0.86
4.	Flash Point °C	66
5.	Boiling Point °C	149
6.	Auto ignition Temperature °C	256
7.	Vapor Pressure	< 1 mm
8.	Solubility	NO
9.	Explosive Limit (% Volume in air)	5 - 7

A. POTENTIAL HEATH EFFECTS

- **Inhalation:** - Irritation of the upper respiratory tract and eyes, with possible euphoria, dizziness, headache, disco ordination, ringing in the ears, convulsions, coma, and respiratory arrest.
- **Ingestion:** - Irritation of the mucous membranes of throat, esophagus and stomach which may result in nausea and vomiting; central nervous system depression may occur, if absorbed (see inhalation symptoms above). If aspirated, chemical pneumonitis may occur with potentially fatal results. Possible kidney and liver damage may be delayed.
- **Skin Contact:** - Defeating of the skin may occur with continued and prolonged contact. Irritation and burning sensation may occur on exposure to the liquid or mists.
- **Eye Contact:** - Severe burning sensation with temporary irritation and swelling of lids.

B. FIRSTAID MEASURES

- **Inhalation:** Get person out of contaminated area to fresh air. If breathing has stopped resuscitate and administer oxygen if readily available. **SEEK MEDICAL ATTENTION IMMEDIATELY.**
- **Ingestion:** Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. If vomiting occurs spontaneously, keep airway clear. SEEK MEDICAL ATTENTION IMMEDIATELY.
- **Skin Contact:** - Wash contaminated areas with plenty of soap and water. A soothing ointment may be applied to irritated skin after thoroughly cleansing. Remove contaminated clothing and footwear.
- **Eye Contact:** - Immediately flush eyes with large amount of water for at least 15 minutes holding lids apart to ensure flushing of the entire eye surface. **SEEK IMMEDIATE MEDICAL ATTENTION.**
- **Note to Physician:** Do not induce vomiting, use gastric lavage only. Aspiration of liquid into the lungs could result in Chemical pneumonitis. Use of adrenaline is not advised. Treat symptomatically.

C. FIRE FIGHTING MEASURES

- Fire Fighting Instructions:- Use water fog, C02, foam, dry chemical or Halon to extinguish. Keep personnel removed from and up-wind of fire. Cool adjacent structures and storage drums with water spray. Evacuate area. Prevent runoff from fire control dilution from entering streams or drinking supply.

D. HANDLING AND STORAGE

- Store only in approved containers. Protect containers against physical damage. Outside or detached storage is preferred. Separate from oxidizing materials. Store in cool, well ventilated area of non-combustible construction away from possible sources of ignition. Keep away, from incompatible materials.
- **Product Use:** This product is intended for use as a fuel in engines and heaters designed for kerosene or diesel fuels, and for use in engineered processes. Use in other applications may result in higher exposure; and require additional controls, such as local exhaust ventilation and personal protective equipment.

E. PERSONAL PROTECTION

- **Airborne Exposure Limits:** None established.
- **Ventilation System:** Not expected to require any special ventilation.
- **Personal Respirators:** Respiratory protection is not required unless product is sprayed or heated. Use approved respiratory protection following manufacture's recommendations where spray, mists, or vapors may be generated. Supplied air respiratory protection is required for IDLH areas.
- **Skin protection:** Wear protective glove and clean body-covering clothing.
- **Eye protection:** Face shield and goggles or chemical goggles should be worn where mist or spray may be generated, and where splashing occurs. Shower and eyewash facilities should be accessible.

ACCIDENTAL RELEASE MEASURES

- If material is spilled, steps should be taken to contain liquid and prevent discharges to streams or sewer systems and control or stop the loss of volatile materials to the atmosphere. Spills or releases should be reported, if required to the appropriate local, state and federal regulatory agencies.
- **Small Spills:** Remove ignition sources. Absorb spilled material with non-combustible materials such as cat litter, dirt, sand, or petroleum as sorbent pads/pillows. Do not use combustible materials like rags, wood chips, or saw dust. Remove contaminated materials to an appropriate disposal container.
- **Large Spills:** Remove ignition sources. Dike spill area with sand or dirt to contain material and cover sewers/drains. Remain upwind and keep unnecessary people away. Contact trained emergency response team for cleanup. Remove liquid using grounded suction pumps, isolate hazard area and deny entry.

G. TRANSPORTATION

- It is transported as combustible liquid following the transport rules of hazardous chemicals.

MATERIAL SAFETY DATA SHEET FOR LPG:

PHYSICAL DESCRIPTION / PROPERTIES

CHARACTERISTIC		UOM	
Appearance and Odour	Colourless gas, Liquid under pressure, unpleasant distinctive, mercaptan like odour.		
Chemal Reactivity	Dangerous reaction with oxidizing agent and concentrated nitric acid. Reacts violently with oxides of nitrogen.		
Specific Gravity,	15°C	0.532	
Boiling Point,	C°	-42 (propane component); 0 (butane component)	
Vapour Pressure	Kpa	580 kPa @ 15C; 810 kPa @ 25 C	
Vapour Density	Air = 1	1.4 @ 15C	
Solubility [Water]	1.01% Wt @ 20C		
Flash Point	°C,	n / ap	
Autoignition	°C,	430 for Butane; 486 for Propane	
Flammability Limits	% v / v in air	LEL 2%	UEL 10%

INGREDIENTS	Cas No	Proportion; % m / m
Mixture of simple hydrocarbons having 3 or 4 carbon atoms, mainly propane and butane. Propane Butane Ethyl mercaptan as stanching agent	68476-85-7 74-98-6 106-97-8 75-08-1	100 < 50 ppm

MATERIAL SAFETY DATA SHEET OF CALCINED PETROLEUM COKE:

PRODUCT AND COMPANY INFORMATION – SECTION 1	
Product name :	Calcined Petroleum Coke
Synonyms:	Coke, Calcined, Electrode Coke, Petroleum Coke, Calcined
Intend Use:	Composite Materials or Friction

COMPOSITION INFORMATION – SECTION 2	
Chemical Name :	Calcined Petroleum Coke
Percent :	100
CAS Number:	64743-05-1

HAZARDS IDENTIFICATION – SECTION 3	
EMERGENCY OVERVIEW AND HAZARDS PRESENT TO ENVIRONMENT	This product is nontoxic. The "nuisance dust" exposure value that are listed apply to any inert substance capable of producing airborne particulate deposits in the eye, ear, and nasal passages, or irritate the skin or mucous membranes by mechanical means. However, normal workplace exposure has not been determined to cause a significant health effect. Calcined Petroleum Coke, as with many petroleum products, may cause minor skin, eye, or lung irritation, but good hygienic practices can minimize these effects.
REGULATORY STATUS	This material is classified as hazardous under OSHA regulations.
PRIMARY ROUTES OF EXPOSURE :	In dust form, inhalation is the primary route of exposure.
POTENTIAL HEALTH EFFECTS:	
Eyes :	In dust form, may be abrasive and irritating to the eyes.
Skin:	In dust form, may cause irritation through mechanical abrasion.
Inhalation:	In dust form, inhalation of high concentrations of these inert nuisance particles can result in mild irritation of the respiratory tract.
Ingestion:	May cause gastrointestinal disturbances.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:	Persons with pre-existing respiratory impairments.
CHRONIC HEALTH EFFECT:	
Eyes:	In dust form, may be abrasive and irritating to the eyes through mechanical abrasion.
Skin:	In dust form, may be abrasive and irritating to the skin through mechanical abrasion.
Inhalation	In dust form, prolonged and repeated over exposure may result in benign pneumoconiosis.
Ingestion:	May cause nausea, vomiting, and diarrhea.
FIRST AID MEASURES – SECTION 4	
SEEK MEDICAL ATTENTION FOR ALL CASES OF OVEREXPOSURE.	

FIRST AID MEASURES:	
Eyes:	Flush thoroughly with water, taking special care to rinse under the eyelids. Do not rub the eye as mechanical abrasion due to the dust may be damaging to the cornea. If irritation persists, continue flushing for fifteen (15) minutes. If discomfort persists, seek consultation from a physician.
Skin:	Remove contaminated clothing. Wash irritated area thoroughly with water. Do not rub as mechanical abrasion due to the dust may prolong irritation to the skin.
Inhalation:	If overcome by dust concentration, remove to a more ventilated area (Fresh air)
Ingestion:	Do not induce vomiting. Seek consultation from a physician.
Instruction for Physician:	None recommended.

FIRE FIGHTING MEASURES – SECTION 5			
NFPA Classification			
Health	Fire	Reactivity	Other
1	1	0	N/ A

FLAMMABILITY PROPERTIES					
Flash Point:	N / A	Method:	N/A		
Flammability Limits : (in air % by volume)		LEL:	N/A	UEL:	N/A

Autoignition Temperature: Not determined.
Hazardous Combustion Products: Carbon dioxide, reactive hydrocarbons, Sox
Extinguishing Media: Use extinguishing agent suitable for type of surrounding fire.
Prohibited Extinguishing Media: None identified.
Firefighting Instructions: Exposed firefighters should wear MSHA/NIOSH approved self-contained breathing apparatus with full-face mask and full protective equipment.
Unusual Fire and Explosion Hazards: In dust form, this material is combustible at high temperatures. Dusts may form explosive mixtures in air. Material itself burns with difficulty.

ACCIDENTALRELEASEMEASURES- SECTION 6
Personnel Precautions: Take immediate steps to stop and contain the spill. Caution should be exercised regarding personnel safety and exposure to the spilled material. Keep unnecessary people away. Do not touch or walks through spilled material; stop leak if you can do it without risk.
Environmental Precautions: Spill and releases of this material to navigable water in sufficient amounts that cause sludge or emulsion under the water must be reported immediately to the National Response Center *(800/424-* 8802), as required by U.S. Federal Law. Contact the Coast Guard and appropriate state and local regulatory agencies. Failure to report these spills may result in substantial civil and criminal penalties.
Cleanup Methods: Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: Shovel into clean, dry containers and cover loosely; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal.

	HANDLING& STORAGE- SECTION 7
Handling:	In dust form, handlers should avoid excess dust generation during the handling and contact of this material.
Storage:	In dust form, this material should be stored outdoors with proper provisions for containment or in ventilated indoor areas equipped to confine dusts.
Specific Uses:	Users should avoid inhalation of dust.

EXPOSURECONTROLS/ PERSONALPROTECTION- SECTION 8		
EXPOSURE CONTROLS		
Exposure Limit Values:		
	OSHAPEL:	ACGIHTLV:
Nuisance Dust (when in dust form)	15 mg/m3	10 mg/m3
Engineering Controls:		
VENTILATION: Keep area well ventilated to minimize exposure to dust.		
PERSONAL PROTECTIVE EQUIPMENT:		
Respiratory Protection: If exposure limits are exceeded or if irritation is experienced, NIOSH approved respiratory protection should be worn. Respiratory protection may be needed for non-routine or emergency situations.		
Hand Protection: Appropriate chemical protective gloves should be used while handling this material		
Eye/Face Protection: Avoid eye contact with this material. Wear safety glasses or chemical goggles. Provide an eyewash station in the work area. Do not wear contact lenses when working with this substance.		
Skin Protection: Sufficient protective clothing should be worn to minimize skin exposure when handling this material. Wash contaminated clothing thoroughly before reuse.		
General Hygiene Considerations: Wash thoroughly after handling this material to prevent prolonged exposure.		
Other Protective Equipment: Depending upon conditions of use, additional protection may be necessary such as face shield, apron, arm-covers, etc.		

MATERIAL SAFETY DATA SHEET OF TRANSFORMER OIL:

Product Name:	Transformer Oil
Product Code:	1041410
Synonyms:	Conoco Transformer Oil Phillips Transformer Oil
Chemical Family:	Petroleum Hydrocarbon

EMERGENCY OVERVIEW:

Health Hazards/Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Keep away from all sources of ignition.

Appearance: Clear brown
Physical Form: Liquid
Odor: Mild petroleum

HAZARDS IDENTIFICATION:

Potential Health Effects:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness, and a burning sensation. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin leading to dermatitis (inflammation). No harmful effects from skin absorption are expected.

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): No harmful effects expected from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea and diarrhea.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders.

FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Wipe material from skin and remove contaminated shoes and clothing. Cleanse affected area(s) thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. Often these injuries require

extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury. Acute aspirations of large amounts of oil-laden material may produce serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term squeal. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

FIRE-FIGHTING MEASURES

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn.

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

ACCIDENTAL RELEASE MEASURES

This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk.

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material.

HANDLING AND STORAGE

Handling: Do not enter confined spaces such as tanks or pits without following proper entry procedures. Do not wear contaminated clothing or shoes. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioned. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Storage temperatures above 113°F may lead to thermal decomposition, resulting in the generation of hydrogen sulfide and other sulfur containing gases. Store only in approved containers. Protect container(s) against physical damage.

EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with a Type 95 (R or P) particulate filter may be used under conditions where airborne concentrations are expected to exceed exposure limits

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact and possible irritation

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Appearance:	Clear brown
Physical Form:	Liquid
Odor:	Mild petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure (mm Hg):	<0.1
Vapor Density (air=1):	> 5
Boiling Point:	No data

Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water):	No data
Specific Gravity:	0.88 - 0.89
Bulk Density:	7.33 - 7.41 lbs/gal
Viscosity eSt @ 100°C:	2.2 - 3.0
Viscosity cSt @ 40°C:	9.4 - 12.0
Percent Volatile:	Negligible
Evaporation Rate (nBuAc=1):	< 0.01
Flash Point:	> 293°F / > 145°C
Test Method:	(COC)
Flammable/Explosive Limits:	No data
Autoignition Temperature:	No data
Decomposition Temperature:	No data

STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong acids, strong bases, and oxidizing agents.

Hazardous Decomposition Products: Combustion can yield and carbon, nitrogen and sulfur oxides.

Hazardous Polymerization: Will not occur.

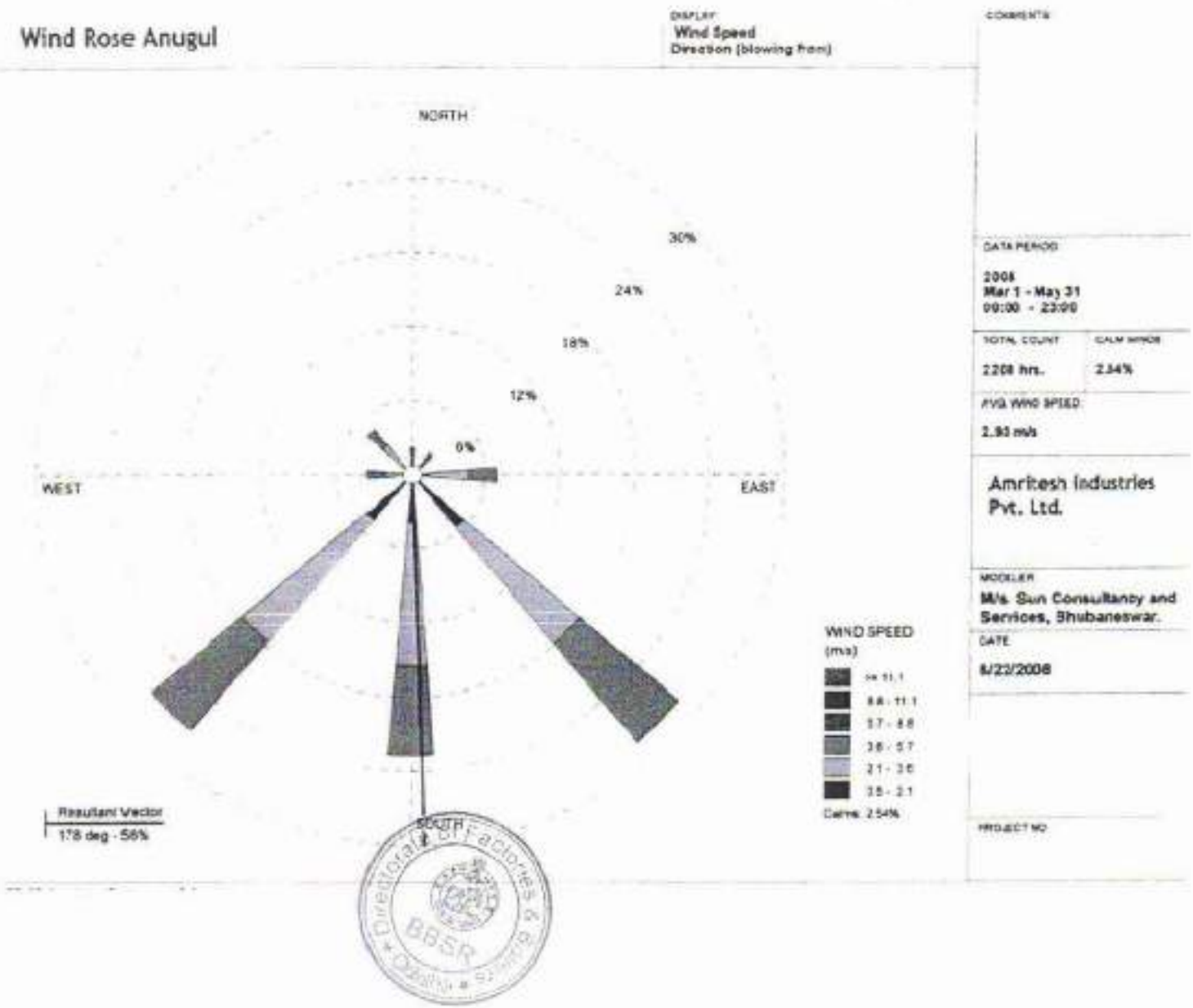
DISPOSAL CONSIDERATIONS

This material under most intended uses would become used oil due to contamination by physical or chemical impurities. RECYCLE ALL USED OIL. While being recycled, used oil is regulated by 40 CFR 279. Use resulting in chemical or physical change or contamination may also subject it to regulation as hazardous waste. Under federal regulations, used oil is a solid waste managed under 40 CFR 279. However, in California, used oil is managed as hazardous waste until tested to show it is not hazardous. Consult state and local regulations regarding the proper handling of used oil. In the case of used oil, the intent to discard it may cause the used oil to be regulated as hazardous waste.

Contents should be completely used and containers emptied prior to discard. Rinsate may be considered a RCRA hazardous waste and must be disposed of with care and in compliance with federal, state and local regulations. Large empty containers, such as drums, should be returned to the distributor or a drum reconditioned. To assure proper disposal of small empty containers, consult with state and local regulations and disposal authorities.

WINDROSE DIAGRAM, POOL-FIRE AND DISPERSION MODELLING

SITE SPECIFIC WIND ROSEIS SHOWN BELOW:



GAS DISPERSION MODEL FOR TOXIC RELEASE OF LPG:

Dispersion modeling is done for toxic release of LPG Gas during storage and handling in Bullets. The dispersion modeling is done on the basis of Gaussian Model. Gaussian Model is used to predict the way gas disperses in the atmosphere. According to this model, "Wind" and "Atmospheric Turbulence" are the main forces that move the molecules of a released gas through the air, as an escaped cloud is blown down the wind. The "turbulent mixing" causes it to spread over in the crosswind and upward directions. According to the Gaussian Model, any crosswind slice of a moving pollutant cloud looks like a bell - shaped curve, high in the centre and lower on the sides.

Methodology of Modeling:

While doing the dispersion modeling, the methodology adopted is as follows:

i) The Plant layout, GA drawing and other related documents with respect to LPG gas were critically studied.

ii) The site visit and physical inspection of the horizontal cylinders containing the LPG gas was conducted; and the site data were recorded.

iii) Discussion was made with the technical team of the plant on different aspects of LPG gas such as storage, handling and usages.

iv) Data relating to the plant and meteorological data were recorded and tabulated in a standard format for the purpose of modeling.

v) While doing the modeling, certain considerations and assumptions were made to fit the model.

vi) The input data were fed and the result (foot print) of the modeling was taken in a graphical form (Coloured). The colour code shows the different level of LPG gas at different distances.

vii) The contour of the gas was super-imposed on the plant layout to indicate the extent of influence of LPG gas in case of dispersion due to leakage.

Modeling:

While doing the modeling, care is taken in incorporating the predictions of the model under the following conditions;

- Very low wind speeds.
- Very stable atmospheric conditions.
- Wind shifts and terrain steering effects.
- Concentration patchiness particularly near the source.

The model does not incorporate the effect of following:

- Fires or chemical reactions.
- Particulates.
- Chemical mixtures.

Modeling Procedure:

The following information/date was taken into consideration while preparing the LPG Gas Dispersion Model.

(A) Site Information Data:

- Industry:
  M/s. Amritesh Industries Pvt Ltd,
  Industrial Estate.
  Dist.: Angul, (Orissa), India

- Latitude: 20°. 50' N
- Longitude: 85° .06' E
- Offset: From Local Standard Time from GMT=-5.5 hrs.
- Current Model - Standard Time.
- Infiltration building parameter:

The building type selected to be "Double Storied" building because during the inspection, it was observed that most of the buildings were Single Storied.

The building surroundings were chosen to be "Un-sheltered Surroundings", as there are no large obstacles and the wind blows directly onto the buildings.

(B) Chemical Information Data:

The chemical properties of LPG Gas are as follows:

Physical Pressure	Liquefied Petroleum Gas
Boiling Point	-45.70F
Vapor Pressure	188/psia@1000F
Specific Gravity	.504/600F
Solubility (H20)	<0.1%
Evaporation Rate	Gas at normal ambient conditions
TEEL-1	= 2100PPM
TEEL-2	= 2100PPM
TEEL-3	= 2100PPM

(C) Atmospheric Information:

i) Atmospheric Information of the place were noted for three different seasons i.e. Summer, Rainy and Winter and the modeling was done for the respective seasons for dispersion of LPG Gas from Tank containing 19.5 x 10 =195 Kilogram of Gas.

ii) The atmospheric data as collected is given in the tabular form in the following table:

Sl. No.	Description	Summer		Rainy		Winter	
		Day	Night	Day	Night	Day	Night
a.	Average Wind Speed m/ sec.	3.2	2.7	2.4	2.2	1.6	1.4
b.	Average Wind Direction (from)	SW	SW	NW	NW	N	NE
c.	Humidity	65	45	85	80	73	47
d.	Average Ambiant air temperature °C	40	26	31	25	27	13

So accordingly there are 6 dispersions models for prediction of Toxic release of LPG gas.

iii) So for each model, data and corresponding footprint and concentration curve are enclosed for reference.

iv) The wind speed, wind direction were noted at a height of 5 meter above the ground.

v) The Wind Speed, Wind Direction, Relative Humidity and Ambient Air Temperature were noted from the meteorological data sheet.

vi) The ground roughness was chosen as "Open Country" with an input roughness factor of 3 cm. The ground roughness has an important influence on the footprint size; a footprint will be smaller when the ground roughness value is more. The degree of atmospheric turbulence influences how quickly a polluting cloud, as it moves downward, will mix with the air around it and be diluted. This affects the size of the cloud's footprint in the model. The friction between the ground and the air passing over it may cause of atmospheric turbulence. Because the air nearest the ground is slowed the most. The rougher the ground surface, the greater the ground roughness, and the greater the turbulence that develops.

In the present case the roughness class were selected as 'Open country' as the area has many friction generating 'roughness elements', such as trees or small buildings, residential housing developments, Industrial Areas etc.

vii) The stability class of the area was selected depending upon the different parameters of atmospheric conditions.

The stability class has big effect on the model's prediction of footprint size, for example - under unstable conditions; a dispersing gas will mix rapidly with the air around it. The model will display a shorter footprint than it would for a stable condition, because pollutant will be diluted more quickly below the Level of Control (LaC).

The atmosphere may be more or less turbulence at another given time, depending on the amount of incoming solar radiation as well as other factors. There are six' Atmospheric Stability Classes', each representing a different degree of turbulence in the atmosphere. When moderate to strong incoming solar radiation heats air near the ground, causing it to rise and generating large eddies, the atmosphere is considered 'Unstable', or relatively turbulent. Unstable conditions are associated with atmospheric stability classes 'A & B'. When Solar Radiation is relatively weak, air near the surface has less tendency to rise and less turbulence develops. In this case, the atmosphere is considered 'Stable' or less turbulent, the wind is weak, and the stability class would be E or F. Stability Classes D & C represent conditions of more neutral stability, or moderate turbulence. Neutral conditions are associated with relatively strong wind speeds and moderate solar radiation.

viii) Models need a value for cloud cover, the proportion of the sky i.e. covered by clouds, in order to estimate the amount of incoming solar radiation at the time of an accidental release. Solar Radiation has an important influence of puddle evaporation rate because heat from the Sun can warm a puddle and speed up evaporation.

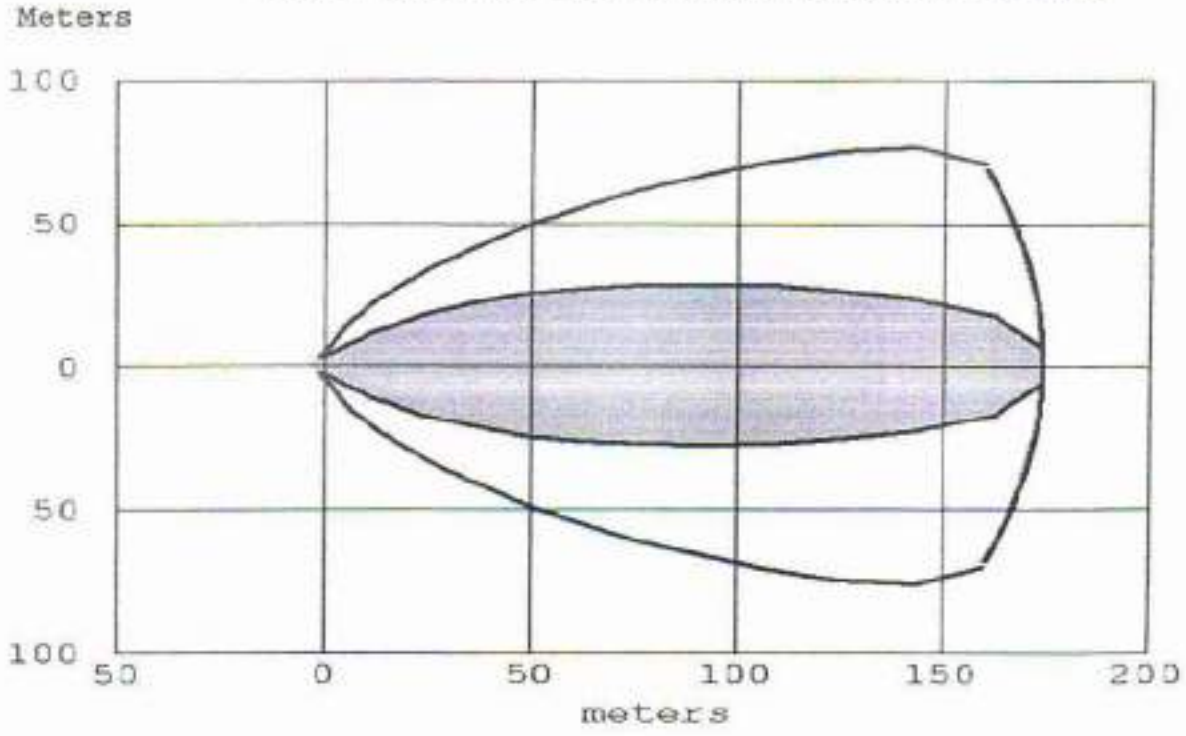
(D) **Source Strength Information:**

In the present scenario the source was selected as Tank Source containing 195 Kilogram of LPG gas, Kept in a Horizontal position and the leakage is from manifold. While doing the modeling, we considered a rupture of 10cmhole at the manifold.

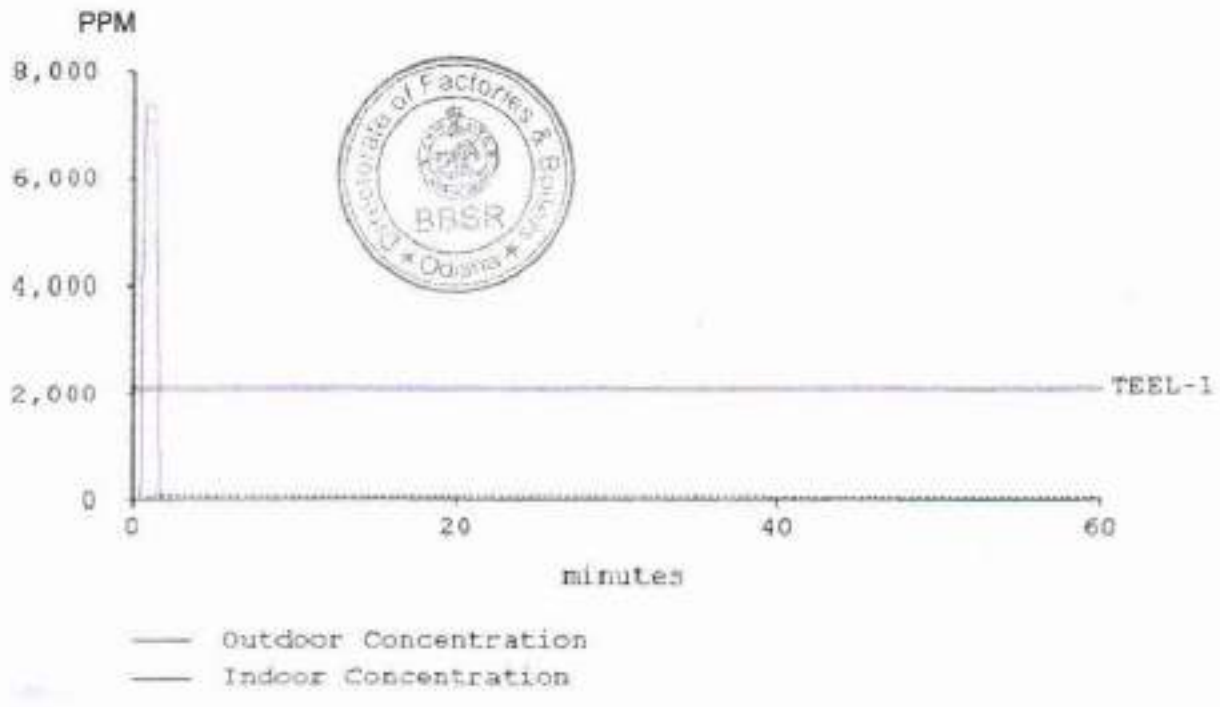
DISPERSION MODEL DATA SHEET FOR TOXIC RELEASE OF LPG GAS:-

Model No.	Season	Day/ Night	Wind Speed (m/sec.)	Wind Direction	Relative Humidity (%)	Ambient Temperature (°C)	Distance		
							TEEL-1 [2100PPM]	TEEL-2 [2100PPM]	TEEL-3 [2100PPM]
LDSD	Summer	Day	3.2	SW	65	40	170 Meters		
LDSN	Summer	Night	2.7	SW	45	26	175 Meters		
LDRD	Rainy	Day	2.4	NW	85	31	200 Meters		
LDRN	Rainy	Night	2.2	NW	80	25	204 Meters		
LDWD	Winter	Day	1.6	N	73	27	199 Meters		
LDWN	Winter	Night	1.4	NE	47	13	202 Meters		

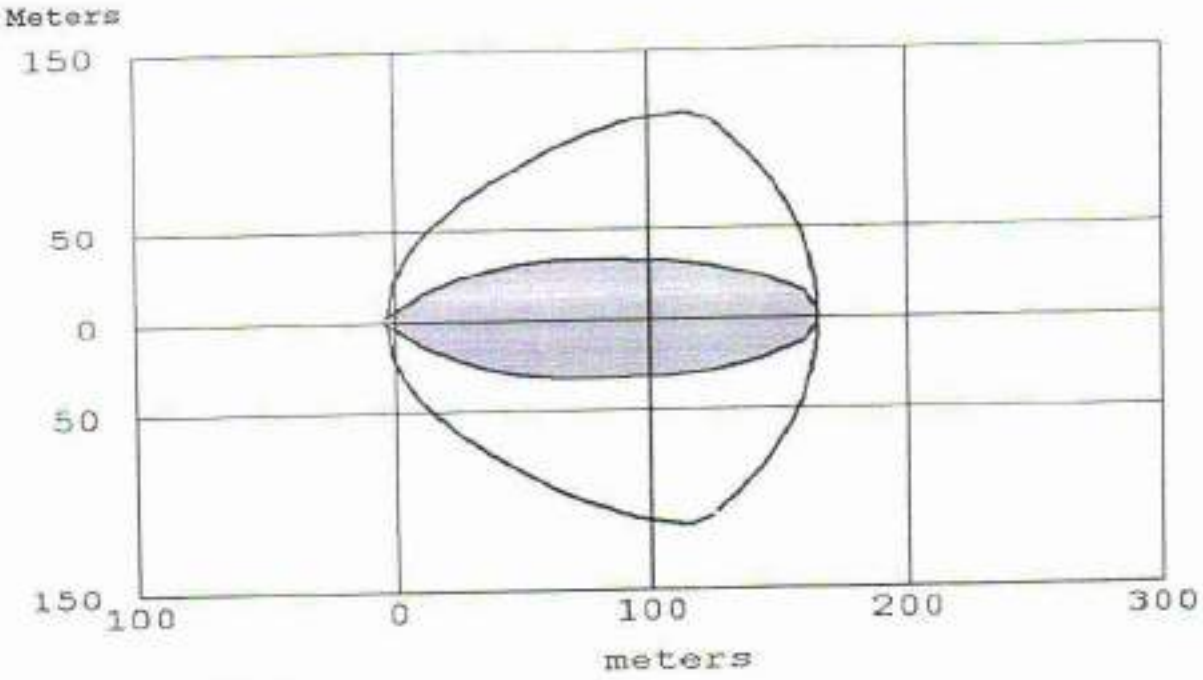
FOOT PRINT: LPG DISPERSION IN SUMMER DAY TIME



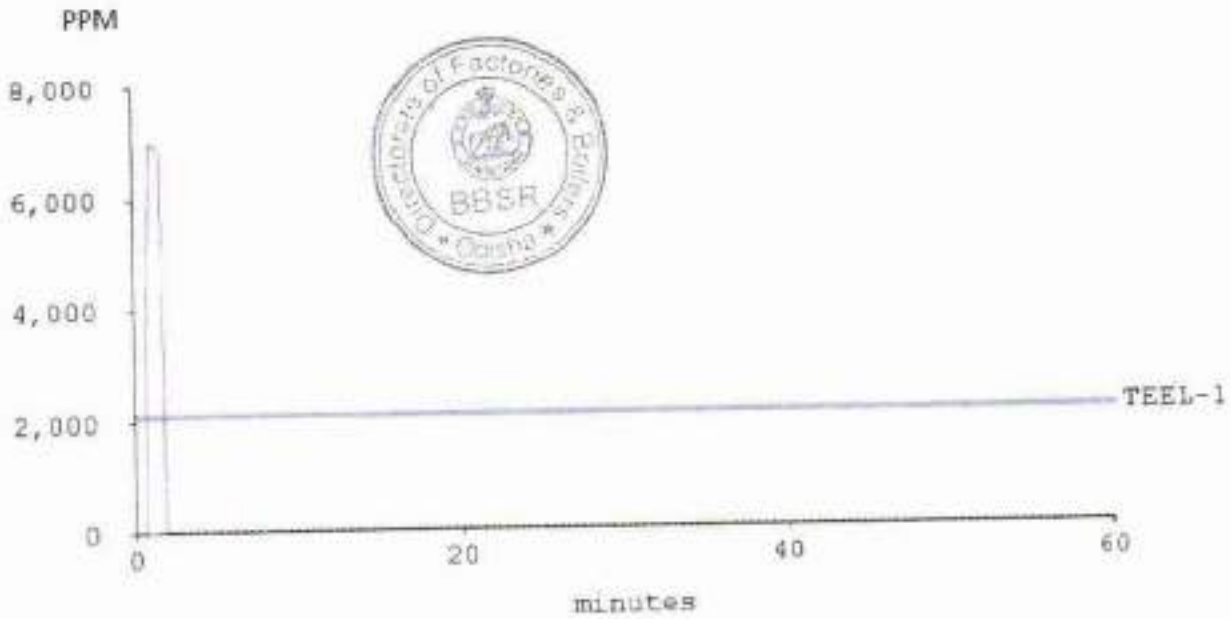
CONCENTRATION: LPG DISPERSION IN SUMMER DAY TIME

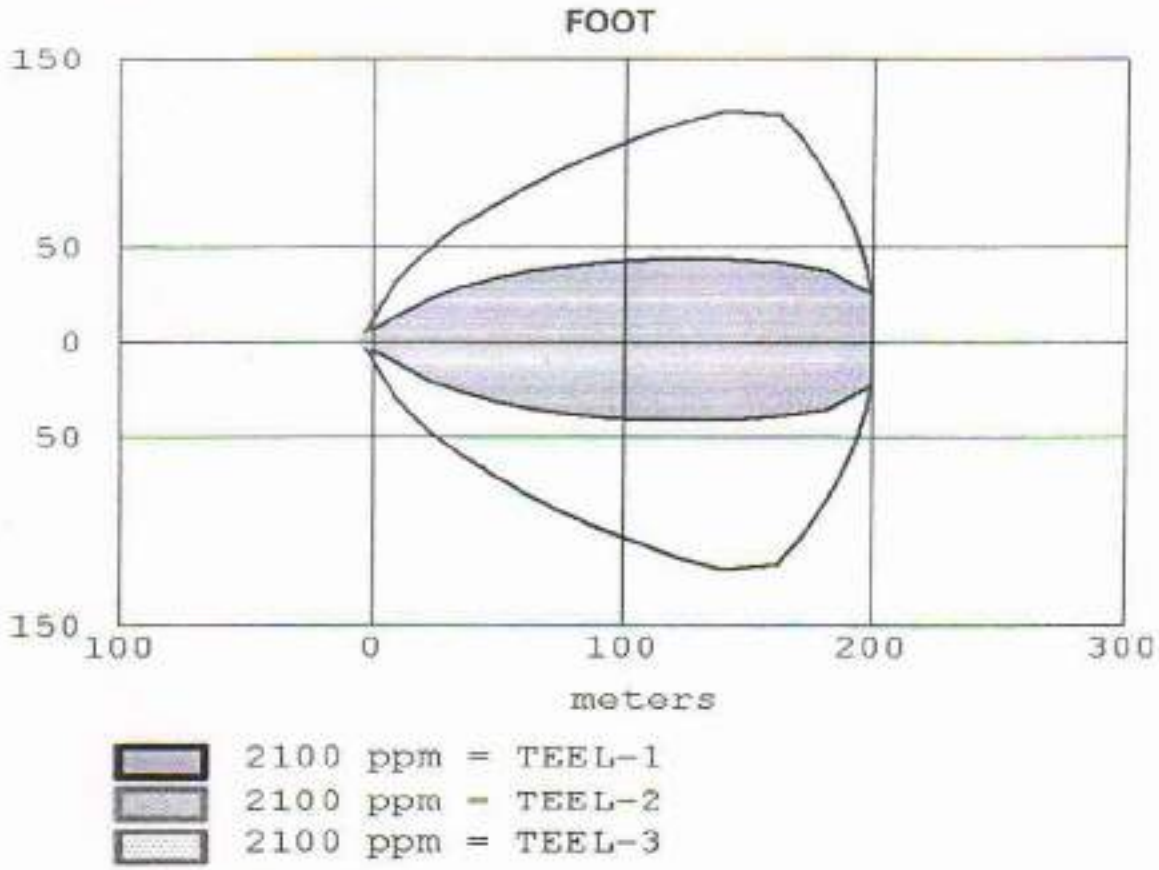


FOOT PRINT: LPG DISPERSION IN SUMMER NIGHT TIME



CONCENTRATION: LPG DISPERSION IN SUMMER NIGHT TIME

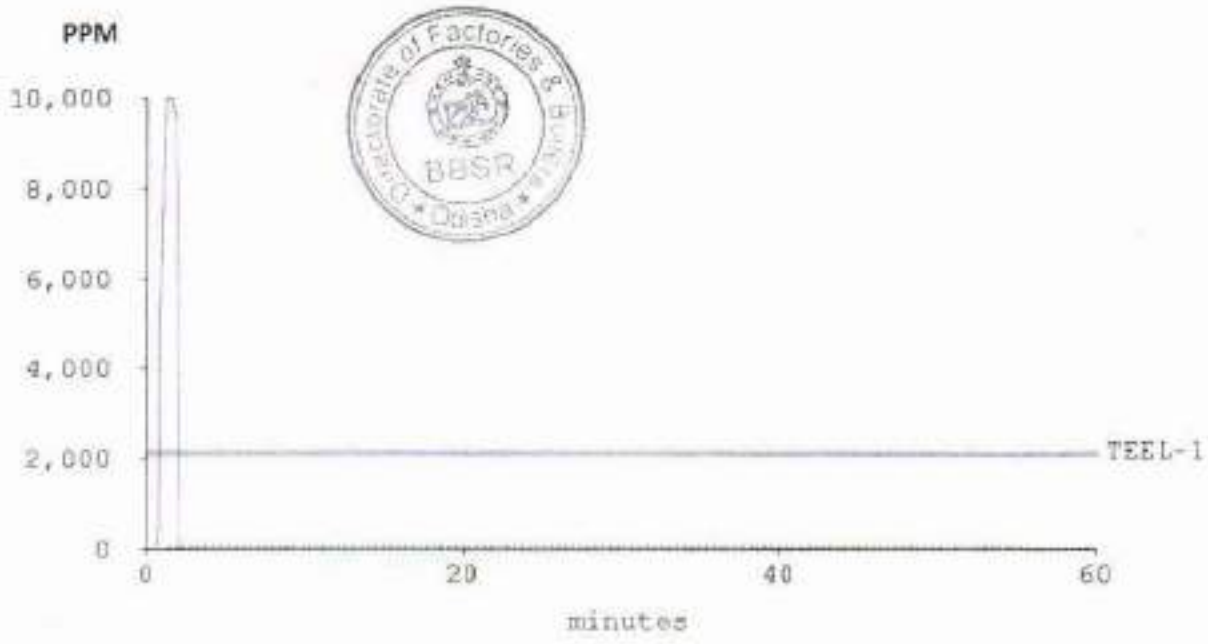




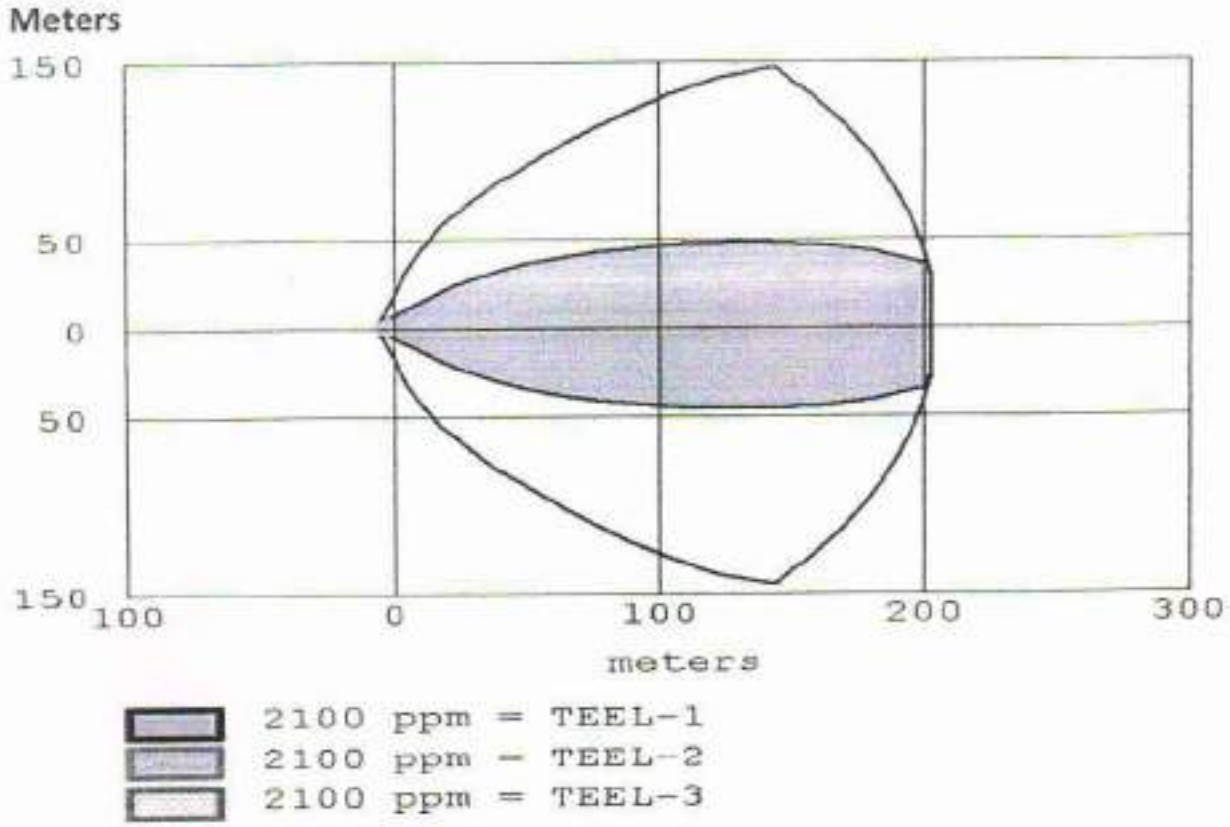
PRINT: LPG DISPERSION IN RAINY DAY TIME

Meters

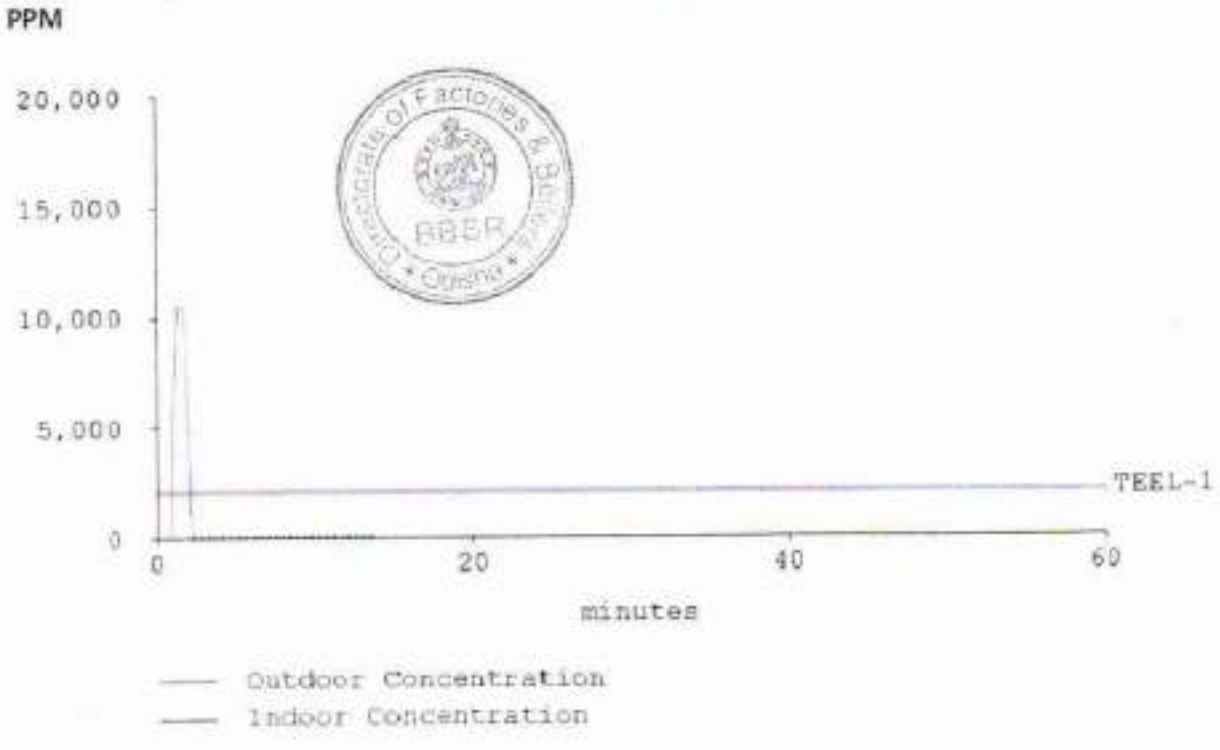
CONCENTRATION: LPG DISPERSION IN RAINY DAY TIME



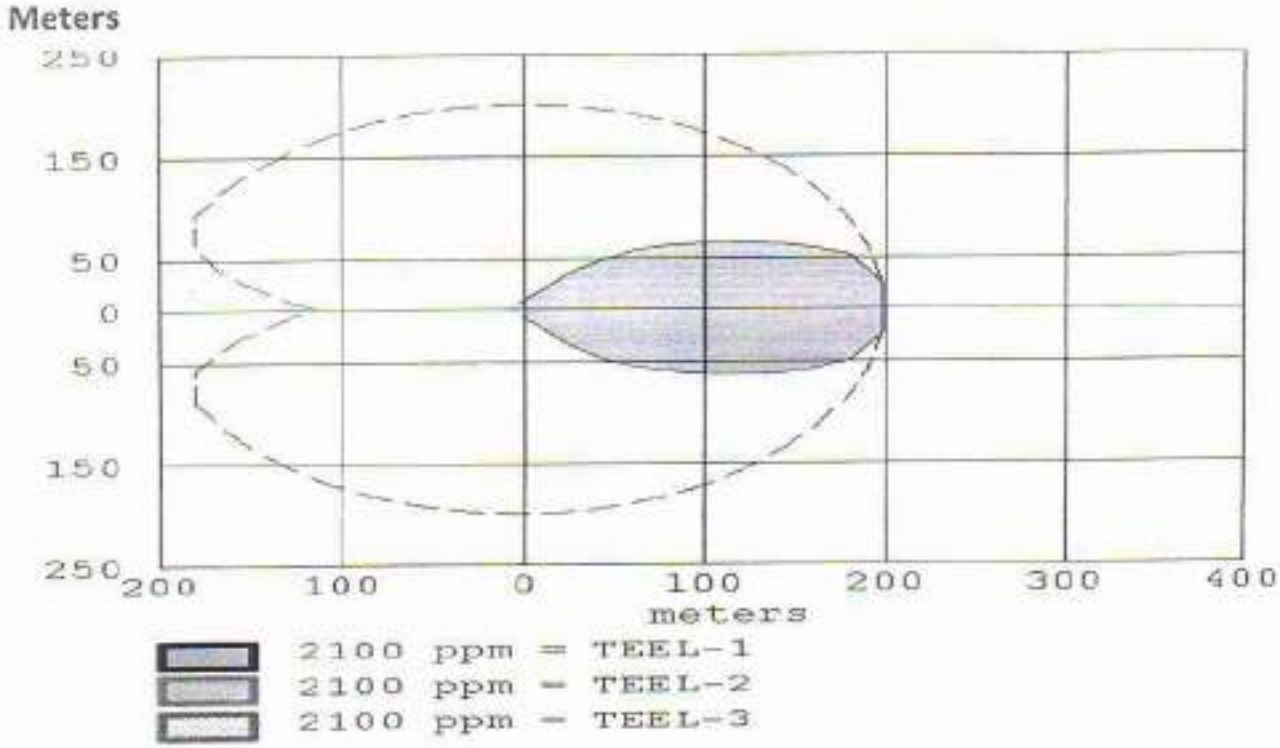
FOOT PRINT: LPG DISPERSION IN RAINY NIGHT TIME



CONCENTRATION: LPG DISPERSION IN RAINY NIGHT TIME

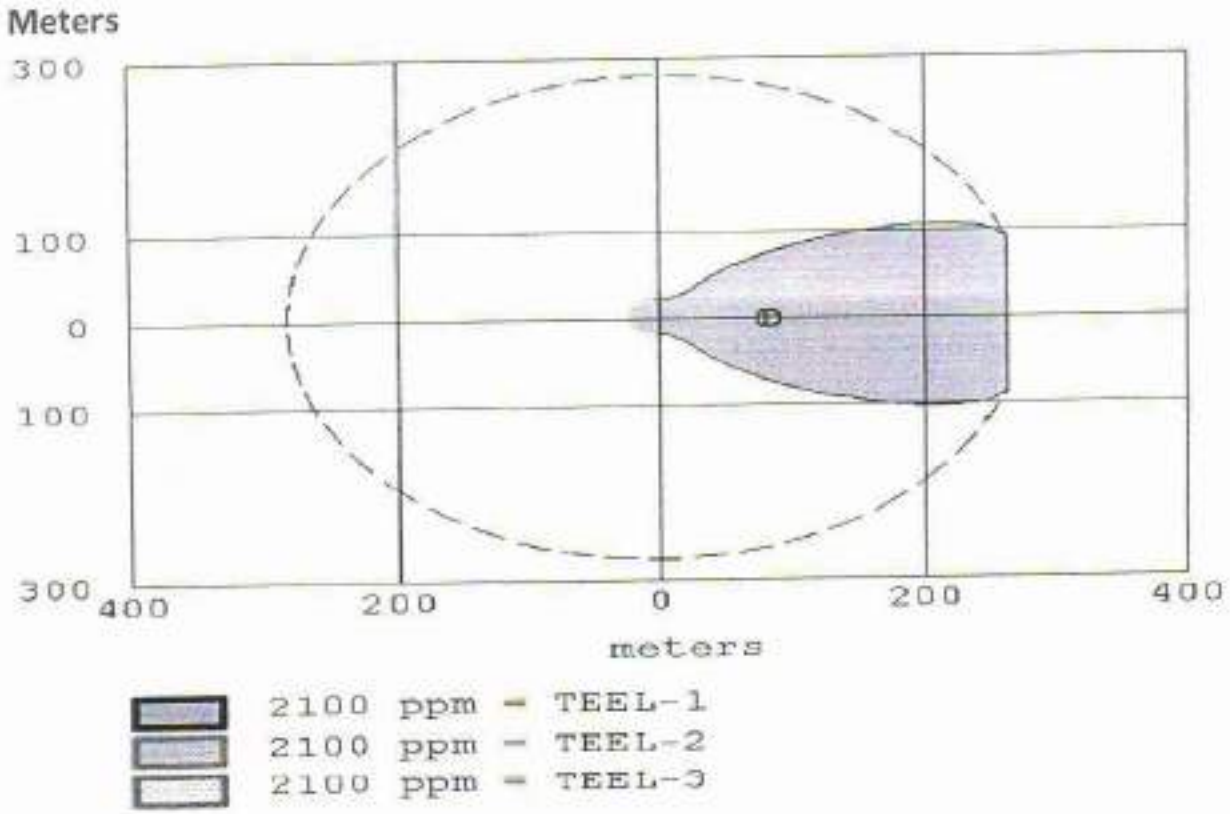


FOOT PRINT: LPG DISPERSION IN WINTER DAY TIME

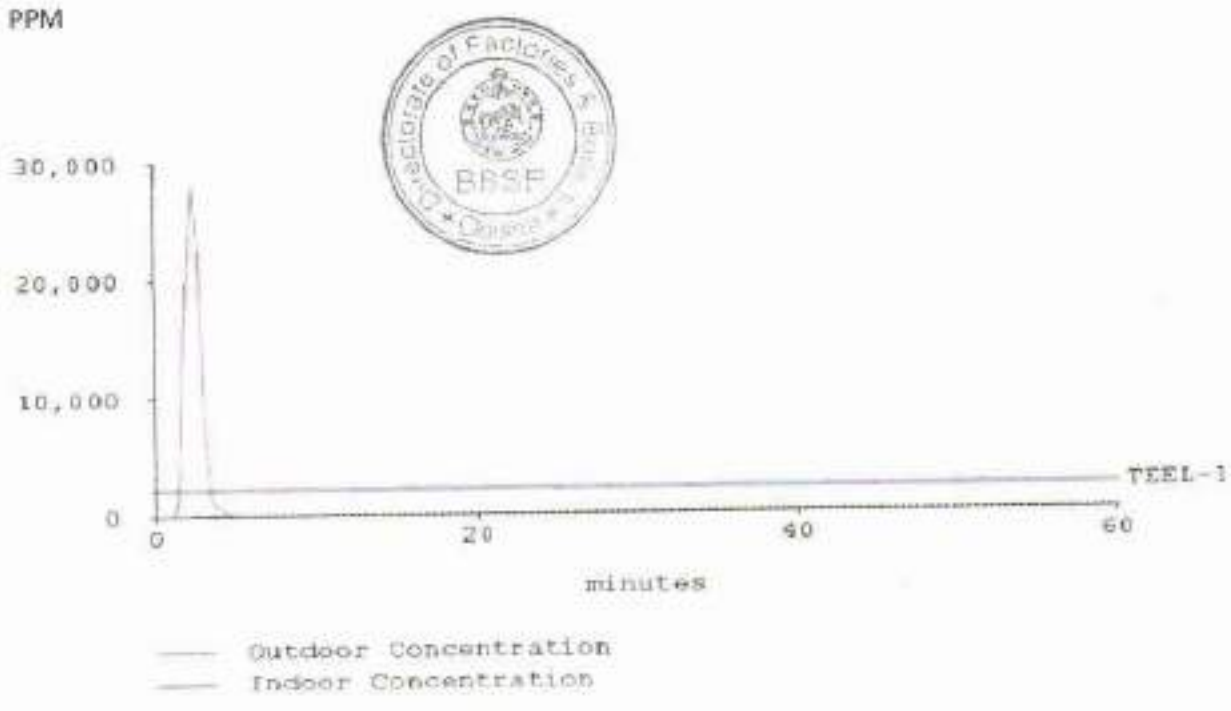


CONCENTRATION: LPG DISPERSION IN WINTER DAY TIME

FOOT PRINT: LPG DISPERSION IN WINTER NIGHT TIME



CONCENTRATION: LPG DISPERSION IN WINTER NIGHT TIME



18.0 POOL FIRE MODELLING FOR FURNACE OIL IN STORAGE TANK.

Input Data: For Summer Season in Day Time.

Storage Details:	
1. No. of Tanks	: 1
2. Capacity	: 20KL
3. Diameter	: 2.1m.

Meteorological Data :

	Summer		Rainy		Winter	
	Day	Night	Day	Night	Day	Night
a. Average wind speed m/sec.	3.2	2.7	2.4	2.2	1.6	1.4
b. Average wind direction (form)	SW		NW		N	
c. Humidity	65	45	85	80	73	47
d. Average Ambient Air temperature °C	40	26	31	25	27	13

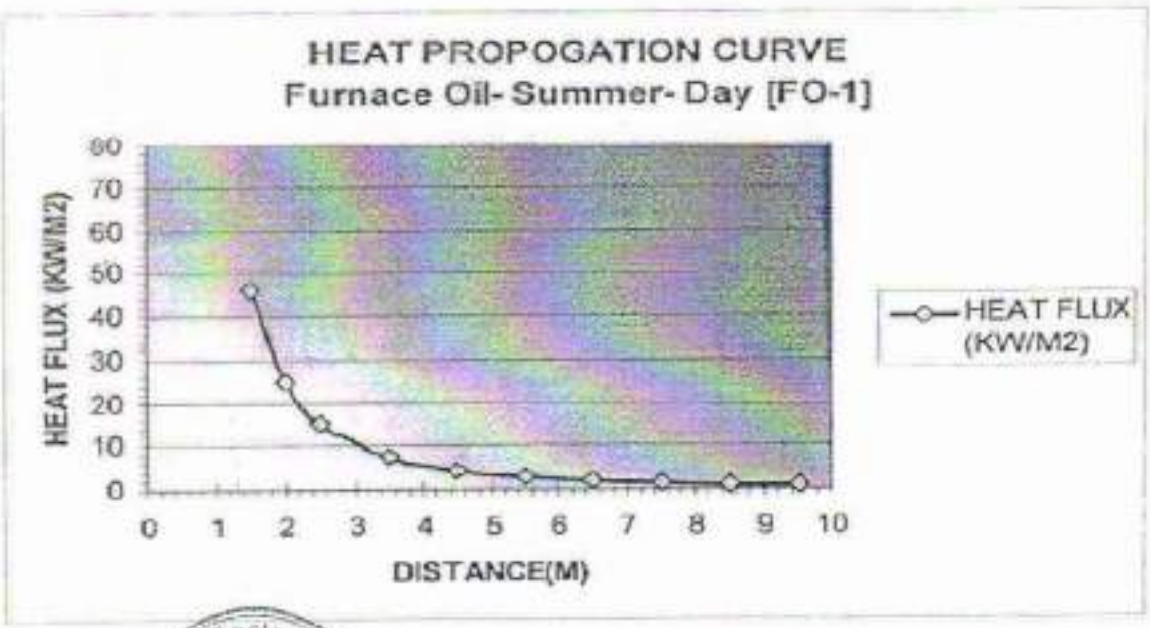
Fire Characteristics Data:

E_{max}	=	Maximum surface emissive power for the fuel (kW/m^2)
KB	=	Mean began length corrector extinction coefficient product (m^{-1}).
K_m	=	extinction coefficient for fuel (m^{-1})
m''	=	mass burning rate of fuel kg/m^2s)
u_{10}	=	wind speed at a height of 10m (m/s).
U_R	=	unobscured ratio of upper flame zone.

OUT PUT DATA for Summer in Day Time:

Heat Flux Data: Furnace Oil

AMRITESH - POOLFIRE MODEL - FURNACE OIL -Summer- Day [HSD-1]	
DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	45.94
2	24.81
2.5	15.36
3.5	7.42
4.5	4.30
5.5	2.77
6.5	1.92
7.5	1.40
8.5	1.06
9.6	0.83



There are three significant "Heat Levels" of interests which are as follows:

Significant Heat Level	Value	Experience at Distance Of	Indication
SHL-1	4.5 kW/m^2	4.3 m	Causes pain if unable to reach cover within 20sec.
SHL-2	12.5 Kw/m^2	2.8 m	Minimum energy required for melting of plastic.
SHL-3	37.5kW/m^2	1.8 m	Sufficient to cause damage to the equipment.

Therefore, the three levels of thermal radiations of interest i.e., 4.5 kW/m^2, 12.5kW/m^2, 37.5kW/m^2 are experienced at a distance of 4.3 m, 2.8 m and 1.8 m respectively.

AMRITESH INDUSTRIES PVT. LTD.

Directorate of Factories & Boilers BBSR Orissa

Input Data: For Summer Season in Night Time: FURNACE OIL IN STORAGE TANK

Storage Details:		
1. No. of Tanks	: 1	
2. Capacity	: 20KL	
3. Diameter	: 2.1m.	

Meteorological Data :

	Summer		Rainy		Winter	
	Day	Night	Day	Night	Day	Night
a. Average wind speed m/sec.	3.2	2.7	2.4	2.2	1.6	1.4
b. Average wind direction (form)	SW		NW		N	
c. Humidity	65	45	85	80	73	47
d. Average Ambient Air temperature °C	40	26	31	25	27	13

Fire Characteristics Data:

E_{max}	=	Maximum surface emissive power for the fuel (kW/m^2)
KB	=	Mean began length corrector extinction coefficient product (m^{-1}).
K_m	=	extinction coefficient for fuel (m^{-1})
m"	=	mass burning rate of fuel kg/m^2s)
U_{10}	=	wind speed at a height of 10m (m/s).
U_R	=	unobscured ratio of upper flame zone.

AMRITESH INDUSTRIES PVT. LTD.

Directorate of Factories & Boilers BBSR

Input Data: For Rainy Season in Day Time: FURNACE OIL IN STORAGE

TANK

Storage Details:		
1. No. of Tanks	: 1	
2. Capacity	: 20KL	
3. Diameter	: 2.1m.	

Meteorological Data :

	Summer		Rainy		Winter	
	Day	Night	Day	Night	Day	Night
a. Average wind speed m/sec.	3.2	2.7	2.4	2.2	1.6	1.4
b. Average wind direction (form)	SW		NW		N	
c. Humidity	65	45	85	80	73	47
d. Average Ambient Air temperature °C	40	26	31	25	27	13

Fire Characteristics Data:

E_{max}	=	Maximum surface emissive power for the fuel (kW/m^2)
KB	=	Mean began length corrector extinction coefficient product (m^{-1}).
K_m	=	extinction coefficient for fuel (m^{-1})
m"	=	mass burning rate of fuel kg/m^2s)
u_{10}	=	wind speed at a height of 10m (m/s).
U_R	=	unobscured ratio of upper flame zone.

Input Data: For Rainy Season in Night Time: FURNACE OIL IN STORAGE

TANK

Storage Details:

1. No. of Tanks	: 1
2. Capacity	: 20KL
3. Diameter	: 2.1m.

Meteorological Data :

	Summer		Rainy		Winter	
	Day	Night	Day	Night	Day	Night
a. Average wind speed m/sec.	3.2	2.7	2.4	2.2	1.6	1.4
b. Average wind direction (form)	SW		NW		N	
c. Humidity	65	45	85	80	73	47
d. Average Ambient Air temperature °C	40	26	31	25	27	13

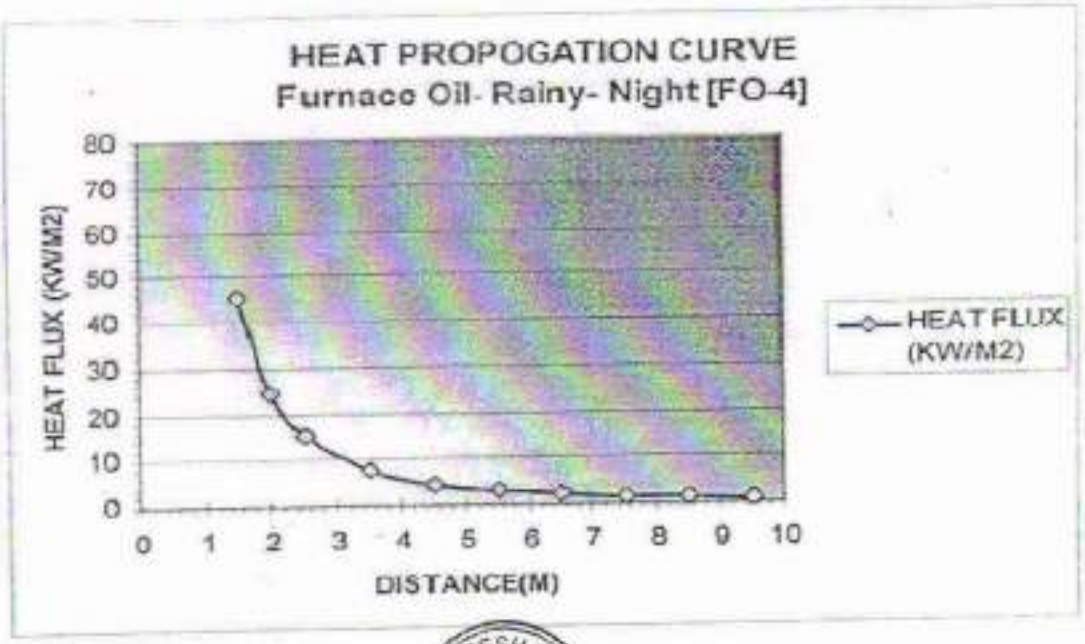
Fire Characteristics Data:

E_{max}	=	Maximum surface emissive power for the fuel (kW/m^2)
KB	=	Mean began length corrector extinction coefficient product (m^{-1}).
K_m	=	extinction coefficient for fuel (m^{-1})
m"	=	mass burning rate of fuel kg/m^2s)
u_{10}	=	wind speed at a height of 10m (m/s).
U_R	=	unobscured ratio of upper flame zone.

OUT PUT DATA for Rainy in Night Time:

Heat Flux Data: Furnace Oil

AMRITESH - POOLFIRE MODEL - FURNACE OIL - Rainy- Night [HSD-4]	
DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	45.21
2	24.5
2.5	15.20
3.5	7.38
4.5	4.29
5.5	2.78
6.5	1.93
7.5	1.41
8.5	1.07
9.5	0.84



AMRITESH INDUSTRIES PVT. LTD.

Directorate of Factories & Boilers BBSR Orissa

There are three significant "Heat Levels" of interests which are as follows:

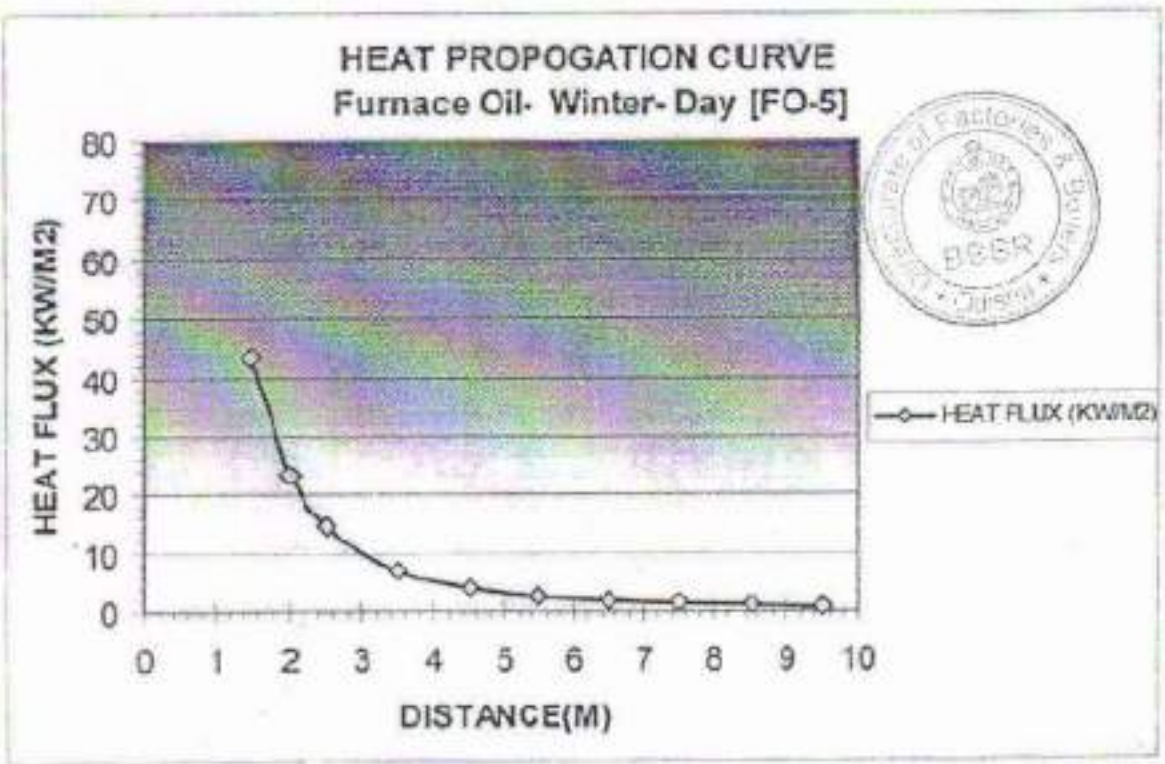
Significant Heat Level	Value	Experience at Distance Of	Indication
SHL-1	4.5 kW/m^2	4.2 m	Causes pain if unable to reach cover within 20sec.
SHL-2	12.5 Kw/m^2	2.3 m	Minimum energy required for melting of plastic.
SHL-3	37.5kW/m^2	2.0 m	Sufficient to cause damage to the equipment.

Therefore, the three levels of thermal radiations of interest i.e. 4.5 kW/m^2, 12.5 kW/m^2, 37.5kW/m^2 are experience at a distance of 4.2 m, 2.3 m, 2.0m respectively.

OUT PUT DATA for Winter in Day Time:

Heat Flux Data: Furnace Oil

AMRITESH - POOLFIRE MODEL - FURNACE OIL - Winter- Day [HSD-5]	
DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	43.38
2	23.52
2.5	14.6
3.5	7.09
4.5	4.13
5.5	2.67
6.5	1.86
7.5	1.36
8.5	1.03
9.5	0.81



There are three significant "Heat Levels" of interests which are as follows:

Significant Heat Level	Value	Experience at Distance Of	Indication
SHL-1	4.5 kW/m^2	4.0 m	Causes pain if unable to reach cover within 20sec.
SHL-2	12.5 Kw/m^2	2.3 m	Minimum energy required for melting of plastic.
SHL-3	37.5kW/m^2	1.4 m	Sufficient to cause damage to the equipment.

Therefore, the three levels of thermal radiations of interest i.e. 4.5 kW/m^2, 12.5 kW/m^2, 37.5kW/m^2 are experience at a distance of 4.0 m, 2.3m, 1.4 m respectively.

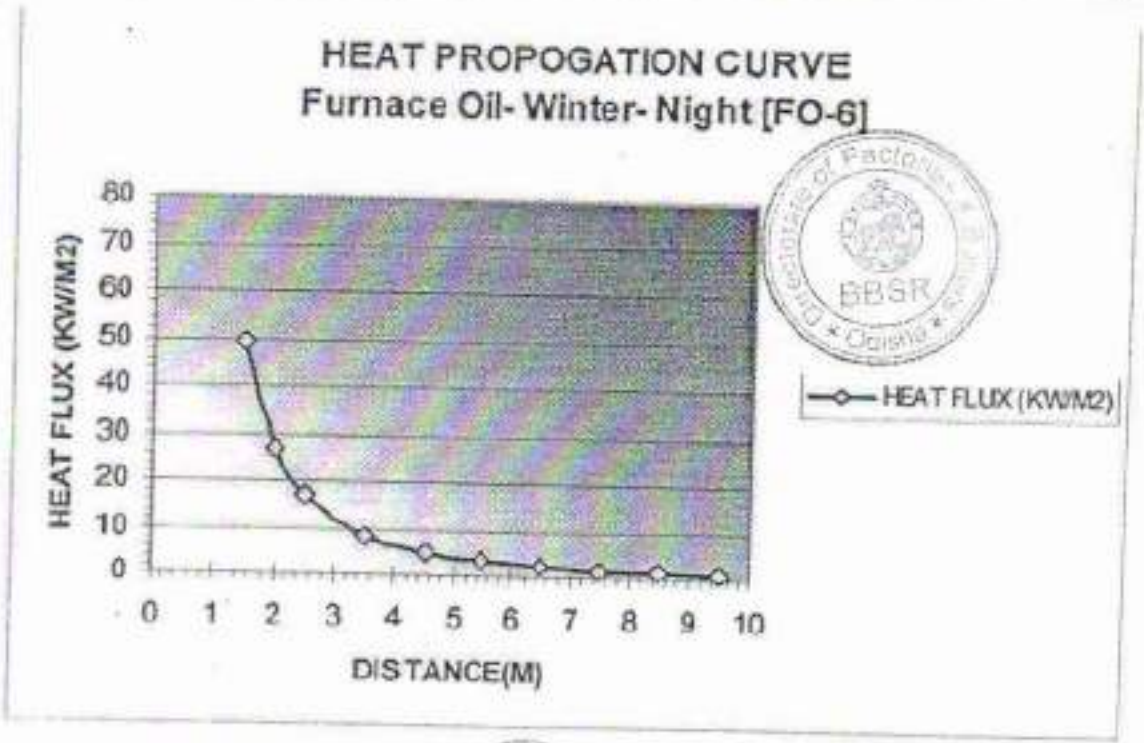
AMRITESH INDUSTRIES PVT LTD

Chief Inspectorate of Factories & Boilers BBSR Odisha

OUT PUT DATA for Winter in Night Time:

Heat Flux Data: Furnace Oil

AMRITESH - POOLFIRE MODEL - FURNACE OIL - Winter- Night [HSD-6]	
DISTANCE(M)	HEAT FLUX (KW/M2)
1.5	49.22
2	26.97
2.5	16.90
3.5	8.33
4.5	4.9
5.5	3.21
6.5	2.25
7.5	1.66
8.5	1.27
9.5	1.006



There are three significant "Heat Levels" of interests which are as follows:

Significant Heat Level	Value	Experience at Distance Of	Indication
SHL-1	4.5 kW/m^2	4.0 m	Causes pain if unable to reach cover within 20sec.
SHL-2	12.5 Kw/m^2	2.3 m	Minimum energy required for melting of plastic.
SHL-3	37.5kW/m^2	1.4 m	Sufficient to cause damage to the equipment.

Therefore, the three levels of thermal radiations of interest i.e. 4.5 kW/m^2, 12.5 kW/m^2, 37.5kW/m^2 are experience at a distance of 4.0 m, 2.3 m, 1.4 m respectively.

AMRUTESH INDUSTRIES PVT. LTD.

Directorate of Factories & Boilers BBSR