To,

Date: 23rd Oct 2024

The Deputy Director General of Forests (C)
Ministry of environment, forest, and climate change
Integrated. Regional office, Gandhinagar

Letter Ref: HIL/BC/ENV/I/15178/2024-25/56

Sub : Submission of Six-Monthly Compliance report for April-24 to Sept-24.

1. Environmental clearance letter no. J-11011/927/2008-IA-II (I) dated 23.02.2017
2. Environmental clearance letter no. J-11011/927/2008-IA-II (I) dated11.02.2009
3. Environmental clearance letter no. J-11011/220/2004-IA II (I) dated 18.03.2005
4. Environmental clearance letter no. J-11011/86/2002- IA II (I) dated 10.02.2004
5. Environmental clearance letter no. J-11011/81/2000- IA II (I) dated 08.01.2002
6. Environmental clearance letter no. J-11011/7/94- IA II dated 14.03.1995

Sir,
Please find enclosed herewith the status of six-monthly compliances of above-mentioned Environment Clearances obtained from MoEF & CC New Delhi, for the period of April-24 to September-24

Thanking You,
Yours faithfully,

For Hindalco Industries Ltd.
(Unit: Birla Copper)

Sanghamitra Mishra
HOD (Environment)

CC:

1. The Director- EAC-1, Ministry of Environment, Forests & Climate Change, Paryavaran Bhavan, Jorbagh Road, Aliganj, New Delhi – 110 003
2. Central Pollution Control Board, Parivesh Bhavan East Arjun Nagar, New-Delhi-110032
3. The Member Secretary, Gujarat Pollution Control Board, Paryavaran Bhavan, Sector -10 A, Gandhinagar - 382 010

Encl: As Above

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Annexure-A

Hindalco Industries Ltd.
Unit: Birla Copper, Dahej

Status of compliance to conditions of Environmental Clearance No. J-11011/7/94 – I A II dated 14-03-1995
Six monthly compliance report from April-24 to September-2024**)**
Subject: Establishment of copper smelting plant having capacity 1.0 lac MTPA, based on imported copper concentrate to be received at proposed captive jetty (270mts x 270mts) at the distance of 2 km from shoreline.
It is also considered that the Sulphuric acid (296000 TPA) Phosphoric acid (50000 TPA), Silver (26TPA), Gold (3.0 Kg/Annum)

Sr. No	Details of condition	Compliance status
i	The project authority must strictly adhere to the stipulations laid down by the State Pollution Control Board and the State Govt.	The stipulation laid down by the State Pollution Control Board is complied with. As such there is no condition stipulated by the State Government. The Consolidated consent & authorization obtained from GPCB for whole Smelter complex vide Consent Order No.: AWH-108216 issued dated 30-05-2020 which is valid up to 02-03-2026. The compliance of conditions stipulated by State Pollution Control board is attached as Annexure- (E)
ii	Any expansion of the plant either with the existing product mix or new products can be taken up only with the prior approval of this Ministry.	The company has obtained prior environment clearance from the Ministry before expansion of the plant with the existing product mix or new products. The condition is complied with
iii	Comprehensive EIA report for the proposed copper smelter and captive jetty facilities should be submitted within 15 months.	The company submitted a comprehensive EIA report on copper smelter and captive jetty facilities on 25.8.1996. The condition is complied with
iv	The gaseous emissions from various process units should confirm to the standards prescribed by the concerned authorities from time to time. At no time the emission level should go beyond the stipulated standards. In the event of failure of any pollution control system adopted by the units, the respective unit should be put off	The gaseous emission from various process units is within the standards prescribed by GPCB. The efficient and adequate capacity of pollution control equipment and sufficient stack height is provided to ensure the emission level well within the prescribed standards. The process operation is interlocked. It

	operation immediately and should not be restarted until the control measures are rectified to achieve the desired efficiency.	is ensured that in case of failure of pollution control system, the respective plant is stopped till the control system is rectified and restarted. The condition is complied with. (Stack analysis report is given in below table:

Stack analysis report April 2024 to September 2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	61.71	50 ppm	18.44	150 mg/Nm3	73.13
2	Sulphuric acid Preheater I	100 ppm	63.20	50 ppm	25.0	150 mg/Nm3	85.11
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	351.63	600 mg/Nm3	187.2	100 mg/Nm3	83.33
4	Shaft furnace of CC Rod plant I	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.57
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	42.34	50 ppm	19.62	150 mg/Nm3	55.08
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	342.87	300 mg/Nm3	179.72	50 mg/Nm3	32.65
9	Shaft furnace of CC Rod plant-III	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.56
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	84.93
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	29.54	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	30.36	NA	NA	150 mg/Nm3	86.05
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	1.04 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.32
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.86
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	19.41	NA	NA	150 mg/Nm3	51.16
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.34	Acid Mist 25 mg/Nm3	ND	NA	NA

			Kg/T				
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	ND	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	Nil	Acid Mist 25 mg/Nm3	NA	NA	NA
23	PMR Phase -III	40 mg/Nm3	30.77	25 mg/Nm3	18.41	150 mg/Nm3	79.39
DAP / PAP Fertilizer		F Norms	F	NH3 Norms	NH3	PM Norms	PM
DAP		6.0 mg/Nm3	Plant s/d	175 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)		6.0 mg/Nm3	Plant s/d	NA	NA	NA	NA

v	Adequate number of ambient air quality monitoring station should be set up in the down wind direction as well as where maximum ground level concentration is anticipated, especially covering the human settlements for the estimation of particulates, fluoride dust SO2, etc. in consultation with the SPCB. Monitoring network should be designed taking into consideration the existing land-use pattern, location of stacks, meteorological condition and topographic features including existing ambient air quality data.	Adequate number of ambient air quality monitoring station are set up in the down wind direction as well as where maximum ground level concentration is anticipated, especially covering the human settlements for the estimation of particulates, fluoride dust SO2, etc. in consultation with the State Pollution Control Board. The ambient quality data is submitted to the State pollution control board and Ministry of Environment and Forest on monthly and 6 months' basis respectively. The statistical analysis of ambient air quality is as under:

Hindalco Industries Limited Unit: Birla Copper, Dahej
AMBIENT AIR QUALITY AV. MEAN (µg/m3)

Sr. No.	Monitoring Stations	April-24 to Sept-24			
		PM 10	PM 2.5	SO2	NOx
1	Township	55.28	41.50	37.18	11.86
2	Jetty	56.16	43.44	33.86	12.02
3	Near 16 ha	59.46	43.46	34.75	12.67
4	Near YMA	57.25	42.28	32.20	12.63

vi	All the stacks of the plant must be provided with on-line stack emission monitoring equipment for the estimation of SO2, fluoride, SPM etc. Stack emission and ambient air quality data must be submitted to the State Pollution Control Board once in 3 months and once in 6 months to the Ministry of Environment and Forests along with statistical analysis and interpretation.	Stacks are provided with SO2, fluoride and SPM online emission monitoring analyzer. The stack emissions and ambient air quality monitoring data are being submitted to the State pollution control board on monthly basis and Ministry of Environment and Forest once in 6 months. The concentration of SPM, SO_2 and NOx is being monitored at four locations and Reported to GPCB, CPCB and Ministry. Stack emission data for the month of April-24 to Sept-24 are given below.

Stack analysis report CEMS April 2024 to September 2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	4.11	50 ppm	5.065	150 mg/Nm3	21.66
2	Sulphuric acid Preheater I	100 ppm	5.20	50 ppm	5.20	150 mg/Nm3	11.2
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	164.69	600 mg/Nm3	44.3	100 mg/Nm3	12.20
4	Shaft furnace of CC Rod plant I	100 ppm	1.64	50 ppm	2.92	150 mg/Nm3	37.16
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	11.21	50 ppm	0.00	150 mg/Nm3	10.10
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	122.07	300 mg/Nm3	0.00	50 mg/Nm3	4.52
9	Shaft furnace of CC Rod plant-III	100 ppm	19.92	50 ppm	3.64	150 mg/Nm3	20.57
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	32.98
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	17.18	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	10.25	NA	NA	150 mg/Nm3	44.70
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	0.023	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA

16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	2.69
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	6.07	NA	NA	150 mg/Nm3	4.41
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	2.53	NA	NA	150 mg/Nm3	31.93
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.057	Acid Mist 25 mg/Nm3	ND	NA	NA
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	ND	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	Nil	Acid Mist 25 mg/Nm3	NA	NA	NA
23	PMR Phase -III	40 mg/Nm3	1.64	25 mg/Nm3	1.27	150 mg/Nm3	31.60
DAP / PAP Fertilizer		F Norms	F	NH3 Norms	NH3	PM Norms	PM
DAP		6.0 mg/Nm3	Plant s/d	175 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)		6.0 mg/Nm3	Plant s/d	NA	NA	NA	NA

vii	Fugitive emission of dust/mist vapors, fumes, SO2 and HC should be controlled, and work environment monitored for prevailing contaminants regularly. Fugitive dust generated during pyrite crushing screening and handling at various transfer points should be reduced to the minimum by installing adequate dust collection and extraction system and regularly monitored.	All possible measures are adopted to mitigate fugitive emissions, SO2, fumes in the work environment. The prevailing contaminants are monitored regularly. Adequate capacity of bag filters is attached to all transfer points to mitigate fugitive emission. As such there is no emission of HC from our process & operation. However, SO2 emission is being monitored periodically, and data are maintained.
viii	Adequate scrubbing system must be provided to remove silica, fluoride, and rock phosphate dusts from flue gases.	An adequate scrubbing system is provided to remove silica, fluoride, and rock phosphate dust from flue gas. Phosphoric acid plants are under long term shut down.
ix	There should be no change in the stack design without prior approval from the State Pollution Control Board and this Ministry.	The company has not changed the stack design. The existing stacks are as per GPCB consents only. The condition is complied with

x	An adequate number of effluent monitoring station must be set up in consultation with the State Pollution Control Board. If the effluent quality at any time exceeds the standards prescribed, the corresponding unit of the plant which is contributing to the excessive pollution level shall be immediately stopped from operating till the quality of pollutant discharged from the respective units are brought down to the required standards	Effluent monitoring station is installed in consultation with the State Pollution Control Board. Whenever the effluent quality at any time exceeds the standards prescribed, the corresponding unit of the plant which is contributing to the excessive pollution level has been immediately stopped from operating till the quality of pollutant discharged from the respective units are brought down to the required standards.
xi	The treated effluents should conform to the prescribed standards and be discharged into the sea at a point approved by the State Pollution Control Board and NIO, Goa. Efforts should also be made to recycle the treated effluents for green belt development to the maximum possible extent	The treated effluent confirms to the prescribed standards and discharges into the sea at a point approved by the State Pollution Control Board and NIO, Goa. Efforts are made to recycle the treated effluents for green belt development to the maximum possible extent. Treated water quality for the period of April-24 to Sept-24 are as under: The observed parameters are well within prescribed limit; hence condition is complied with.

Sr. No	Parameters	Units	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	GPCB Norms	Treated Effluent analysis report Average
1	pH	--	7.58	7.66	7.50	7.55	7.65	7.74	5.5-9.0	7.61
2	Temp	o C	30	31.00	30.35	30.05	30.7	30.55	45	30.44
3	Colour	units	10.79	10.80	10.75	10.00	10.85	10.74	100	10.65
4	Suspended Solids	mg/L	19.16	18.99	19.07	18.12	19.89	19.53	100	19.13
5	COD	mg/L	34.19	34.36	32.90	33.01	33.81	37.30	250	34.26
6	BOD 3 day at 27o C	mg/L	8.33	7.99	8.20	8.42	7.67	8.07	100	8.11
7	Oil & Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20	<0.1
8	Phenolic compound	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	<0.1
9	Ammonical N2	mg/L	9.75	10.33	10.09	9.93	10.48	9.55	50	10.02
10	Sulphide	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0	<0.2
11	Cyanides	mg/L	Nil	Nil	Nil	Nil	Nil	Nil	0.2	Nil
12	Fluoride	mg/L	2.01	2.15	1.92	2.06	1.91	1.99	10	2.01
13	Hexa. Chromium	mg/L	0.39	0.42	0.40	0.38	0.42	0.44	1.0	0.41
14	Total Chromium	mg/L	0.43	0.40	0.47	0.44	0.43	0.44	2.0	0.43

15	Copper	mg/L	0.25	0.23	0.20	0.24	0.26	0.25	3.0	0.24
16	Nickel	mg/L	0.09	0.01	0.08	0.07	0.09	0.10	5.0	0.07
17	Zinc	mg/L	0.25	0.25	0.27	0.21	0.26	0.20	15.0	0.24
18	Mercury	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
19	Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1	<0.005
20	Arsenic	mg/L	0.04	0.05	0.032	0.025074	0.040	0.032	0.2	0.04
21	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.000	<0.01
22	Insecticides and Pesticides	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01
24	Bio-Assay Test	% Survival of fish after 96 hrs. in 100 % effluent.	96.89	96.47	96.12	96.65	96.16	96.47	95.00	96.46

xii	The industry should provide separate drain for storm water, sanitary wastewater and process effluents and the entire layout plan for the above must have the approval of the State Pollution Control Board.	A separate drain is provided for storm water, whereas sanitary wastewater is sent to the STP in a closed loop for treatment, the process effluent is sent to the effluent treatment plant in a closed pipeline for further treatment. The condition is complied with
xiii	A guard pond must be constructed near the terminal end of all the effluents before final disposal of effluents. This pond must have two compartments of which one will be kept empty while the other will be operated as a routing guard pond. When the concentration of effluents is high in the final effluents, corrective measures should be taken at source and the effluent shall be discharged at a regulated rate after treatment, to conform to the prescribed standards.	The guard pond is constructed at the terminal end of the effluent disposal. Two compartments are available for storage of treated liquid effluent and they are operating one by one; one is always kept in standby condition. Whenever a high pollution level is observed corrective action is taken immediately before reaching the effluent treatment plant so that the treated effluent adheres to the standards prescribed by GPCB limit. The condition is complied with
xiv	Disposal site of Phosphogypsum, spent cathodes etc. should be impervious to avoid ground water contamination. These sites should have the approval of State pollution control Board. Adequate monitoring of the impounded sites (soil, surface, and ground water) should be carried out regularly and record maintained.	The disposal site of Phosphogypsum yard is impervious lined to avoid ground water contamination. The MoEFF & CC, New Delhi has removed the condition for storage of spent cathode vide letter dated 17.08.1995. The disposal site of Phosphogypsum is approved by GPCB vide letter no. GPCB/HAZ/GEN-55(8)42131 dated 1st Dec 2000. The adequate monitoring of soil, surface and ground water is carried out on a regular basis and record is maintained. The soil quality is as under

Date of Sampling	pH of 10% solution Near Phosphogypsum yard	Bulk Density	Moisture	Alkalinity	Acidity	Organic Matter
Pre monsoon season						
20.06.2024	8.06	2.61	7.10	60.80	Nil	0.11
Monsoon Season						
14.08.2024	8.11	2.98	13.32	54.70	Nil	0.13
Post Monsoon Season						
12.10.2024	8.15	2.77	8.88	42.55	Nil	0.10

Ground water quality is attached as below. The observed values of parameters monitored are well within limits, hence condition is complied with.

Ground Water Analysis (Average) near Solid Waste Facility (April-24 to September-2024)

Ground Water Analysis (Avg) near Solid Waste Facility (April-24 to Sept-24)											
	Unit	HP-01	HP-02	HP-03	HP-04	HP-05	HP-06	HP-07	HP-08	HP-09	HP-10
pH	--	8.17	7.21	6.94	7.21	7.87	7.19	7.20	7.96	7.45	7.72
SS	mg/L	25.26	15.44	21.96	24.92	25.14	21.96	15.86	18.63	17.54	25.86
TDS	mg/L	10780	29528	38440	38160	6205	21452	33925	6697	45064	27035
COD	mg/L	19.03	21.03	18.79	21.38	20.06	18.88	20.49	20.26	18.37	19.20
BOD3	mg/L	6.34	7.01	6.26	7.13	6.69	6.29	6.83	6.75	6.12	6.40
Fluoride	mg/L	0.36	0.07	0.20	0.81	0.27	0.31	0.10	0.12	0.26	0.17
Copper	mg/L	0.03	0.27	0.09	0.08	0.05	0.05	0.10	0.04	0.05	0.11
Nickel	mg/L	0.25	0.25	0.22	0.22	0.22	0.27	0.23	0.219	0.223	0.258
Iron	mg/L	0.11	0.78	0.01	0.02	0.03	0.01	0.01	0.03	0.18	0.01
Zinc	mg/L	0.21	2.70	1.17	1.45	3.13	1.58	2.63	1.97	2.67	1.65
Chloride	mg/L	3889	3676	3919	3559	3783	3985	3754	3563	3697	3731
O&G	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	mg/L	0.005	0.005	0.002	0.002	0.000	0.002	0.000	0.002	0.001	0.001
Chromium	mg/L	ND	0.001	0.002	ND	0.002	0.001	0.00037	0.002	0.004	0.002
Colour	Hazen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear

	Taste	---	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline
	HP- Hand pump											

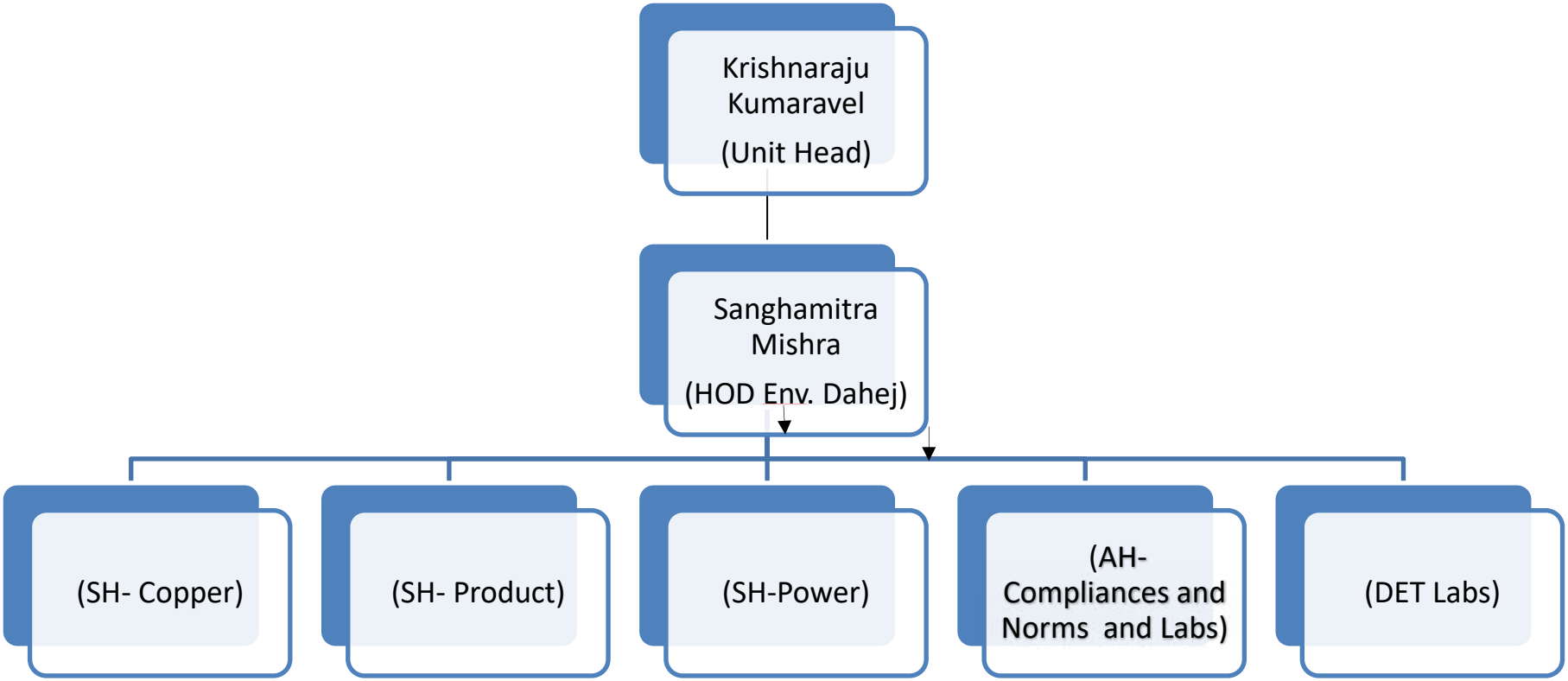
xv	The radium content in the Jordan rocks proposed to be imported should be intimated to Ministry of Environment & Forests.	The radium content in Jordan rocks analysis report was intimated to Secretary AERB, Director, IPSD and ITSD government of India, Mumbai. The report was submitted to Ministry of Environment Forest and Climate Change. However, Phosphoric acid plant is shut down for a longer period. The condition is complied with:
xvi	Spent Cathode should be enclosed in reinforced cement concrete vaults/ container before disposal. Recovery of carbon and fluoride from the spent cathode lining should be attempted.	The spent cathodes are totally recycled in smelter hence enclosure of spent cathode is kept in reinforced cement concrete vaults/stainless steel container and recycled in process, therefore further recovery of carbon and fluoride from spent cathode lining is not done. However, the condition related to spent cathodes was removed by MoEF & CC vide letter dated 17-08-1995. The condition is complied with.
xvii	Fluoride levels in the ground water around the project site should be monitored on a regular basis and report submitted to this Ministry every 6 months.	Fluoride levels in the ground water around the project site is monitored regularly and it is reported to MoEF & CC on six monthly bases. Concentration of fluoride in ground water is well within the limit. Please refer to condition no. xiv pg. no.11.The condition is complied with.
xviii	Detailed risk analysis should be carried out and inventories located in such a manner so as to contain the impact zone under the worst scenario within the plant boundary. The risk analysis should include Hazard identification using standard methods, fault tree analysis, reliability and failure analysis and worst scenario for MCA such as catastrophic failure of tanks and pipelines. The risk analysis report should be submitted in this Ministry for review within a period of one year.	The detailed risk analysis is carried out and it is ensured that the inventories are in such a manner to contain the impact zone under the worst scenario within the plant boundary. The hazard identification was carried out by using a standard method. The technique used for the Hazard Identification is Maximum Credible Accident (MCA) analysis, which allows identification of an accident with probable maximum damage distance. Based on inventories identified and their probable hazards, an onsite emergency plan is prepared for risk mitigation and the plan is approved by regulatory authority. The report is already submitted to the Ministry dated 12th November 2016.The condition is complied with.

<table>
<tr><td>xix</td><td>Efforts should be made to sell sulfuric Acid (H2SO4) to the maximum extent possible. The capacity of the proposed phosphoric acid plant should be reduced to half so that the quantity of Phosphogypsum generated is reduced.</td><td>The effort has been made to maximize the sell through exporting of Sulphuric acid as well as ensuring captive consumption in phosphoric plants. The stipulated condition regarding the phosphoric acid plant capacity has been removed by MoEFF & CC vide letter No. J-11011/7/IAII (I) dated 28-06-1996. The condition is complied with.</td></tr>
<tr><td>xx</td><td>Long term workable plan for utilization and disposal of Phosphogypsum should be worked out and report submitted to this Ministry for review within 10 months.</td><td>The company has signed agreements with several cement manufacturing companies to sell the Phosphogypsum. The generation and disposal report submitted to MOEF on regular basis.</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><td colspan="3">April-24 to Sept-24</td></tr>
<tr><td>Year and Month</td><td>Generation</td><td>Dispatch to Cement & POP manufacturer</td></tr>
<tr><td>Unit</td><td>MT</td><td>MT</td></tr>
<tr><td>Apr-24</td><td>0</td><td>62751</td></tr>
<tr><td>May-24</td><td>0</td><td>84760</td></tr>
<tr><td>Jun-24</td><td>0</td><td>28979</td></tr>
<tr><td>Jul-24</td><td>0</td><td>0</td></tr>
<tr><td>Aug-24</td><td>0</td><td>0</td></tr>
<tr><td>Sep-24</td><td>0</td><td>962</td></tr>
<tr><td>Total</td><td>0</td><td>177453</td></tr>
</table></td></tr>
<tr><td>xxi</td><td>A study to assess the impact due to disposal of solid waste/sludge on land should be carried out and report submitted to this Ministry for review within 6 months.</td><td>A study to assess the impact due to disposal of solid waste /sludge on land is carried out by Industrial Toxicology Research Centre Lucknow. The report is already submitted to the Ministry, dated April 2002.The condition is complied with.</td></tr>
<tr><td>xxii</td><td>A study to assess the impact of the proposed pipeline for disposal of treated effluent should be carried out and reports submitted to this Ministry for review within 6 months.</td><td>A study to assess the impact of the pipeline for disposal of treated effluent is carried out by National Institute of Oceanography, Goa. The report is already submitted to the Ministry. The condition is complied with.</td></tr>
<tr><td>xxiii</td><td>A community welfare scheme for improving the socio-economic environment should also be worked out and report submitted to this Ministry for review within 6 months.</td><td>A community welfare scheme for improving the socio-economic environment is worked out and the report is submitted to the Ministry. The CSR activities of the unit have been appreciated at all levels and the</td></tr>
</table>

<table>
<tr><td></td><td></td><td>unit has received many awards for the same. The condition is complied with.</td></tr>
<tr><td>xxiv</td><td>The project authorities must submit on-site/off-site emergency preparedness plan based on detailed risk analysis. Approval from the nodal agency should be obtained for the above plan.</td><td>The on-site/off-site emergency preparedness plan based on detailed risk analysis is carried out and obtained approval of required nodal agency. The condition is complied with.</td></tr>
<tr><td>xxv</td><td>All recommendations made in the EMP based on comprehensive EIA report and detailed risk analysis reports should be implemented.</td><td>The recommendations made in the EMP based on comprehensive EIA report by Tata Consultancy services are implemented. The condition is complied with.</td></tr>
<tr><td>xxvi</td><td>A detailed green belt development plan should be submitted to this Ministry for review within 3 months. The proposed green belt design should have scientific basis and plant species identified should be indigenous and not exotic varieties.</td><td>The detailed green belt development plan is prepared and submitted accordingly to the ministry dated August 1995.The proposed green belt designed and prepared by a competent expert on the scientific basis. The Species identified are indigenous and nontoxic. The condition is complied with.
The various species planted in and around the plant site are given in the table below:
<table>
<tr><th>Scientific name</th><th>Common name</th></tr>
<tr><td>Acasia arabica</td><td>Babul</td></tr>
<tr><td>Annona squamosa</td><td>Sitafal</td></tr>
<tr><td>Azadirachta indica</td><td>Neem</td></tr>
<tr><td>Borassus sp</td><td>Borldi</td></tr>
<tr><td>Callistemon lancedltus</td><td>Bottle brush</td></tr>
<tr><td>Cassia fistula</td><td>Cassia</td></tr>
<tr><td>Casurinia equisetifolia</td><td>Casurina</td></tr>
<tr><td>Cessalpennia pulcherima</td><td>Gultora</td></tr>
<tr><td>Dalbergia sissoo</td><td>Sissoo</td></tr>
<tr><td>Delonix regia</td><td>Gulmohar</td></tr>
<tr><td>Dendrocalamus strictus</td><td>Bamboo</td></tr>
<tr><td>Ficus bengalensis</td><td>Bargad</td></tr>
<tr><td>Ficus benzimean</td><td>Rubber plant</td></tr>
<tr><td>Ficus indica</td><td>Banyan</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Ficus religiosa</td><td>Peepal</td></tr>
<tr><td>Hibiscus sp</td><td>Hibiscus</td></tr>
<tr><td>Mangifera indica</td><td>Mango</td></tr>
<tr><td>Nerium sp</td><td>Kanar</td></tr>
<tr><td>Peltophorum ferrugineum</td><td>Peltophorum</td></tr>
<tr><td>Plumeria alba</td><td>Champa</td></tr>
<tr><td>Spathodia campanulata</td><td>Spathodia</td></tr>
<tr><td>Syzigium jambolana</td><td>Jamun</td></tr>
<tr><td>Tamarinduc indica</td><td>Imli</td></tr>
<tr><td>Tecoma gaudichadi</td><td>Tecoma</td></tr>
<tr><td>Terminallia cuttapa</td><td>Badam</td></tr>
<tr><td>Terminelia arjuna</td><td>Arjuna</td></tr>
<tr><td>Thespesia populnea</td><td>Paras papal</td></tr>
</table>
</td></tr>
<tr><td>xxvii</td><td>The project authorities must set up laboratory facilities for collection and analysis of samples under the supervision of competent technical personnel who will report directly to the Chief Executive.</td><td colspan="2">A full-fledged separate Environmental Laboratory is set up and equipped with all necessary instruments/ equipment’s. The following equipment and consumable are available in the laboratory:
<table>
<tr><td>CAAQMS (04)</td><td>OCEMS (35)</td></tr>
<tr><td>Atomic Absorption Spectrophotometer</td><td>Weather station</td></tr>
<tr><td>PM2.5, PM10 Combo</td><td>Stack Monitoring Kit (3)</td></tr>
<tr><td>Noise Level monitors (02)</td><td>Handheld SO2, NH3, HF analyzer</td></tr>
<tr><td>Multi gas Analyzer (SO2, NOx, CO2, HC, O2, and CO)</td><td>Ion selected Fluoride analyzers</td></tr>
<tr><td>Spectrophotometer (visible range)</td><td>BOD incubator</td></tr>
<tr><td>COD reflux set up</td><td>Single pan balance</td></tr>
<tr><td>Relevant chemicals as per IS 5182</td><td>Hot Air Oven</td></tr>
<tr><td>Stopwatch</td><td>Thermometer</td></tr>
<tr><td>PH Meter</td><td>Titration set</td></tr>
</table>
</td></tr>
</table>

ENVIRONMENTAL MANAGEMENT CELL



xxviii	A separate Environmental Management Cell with suitable qualified people to carry out various functions should be set up under the control of senior executive who will report directly to the Head of the Organization.	A separate Environmental Management Cell is established headed by suitable qualified person, who reports to President & Unit Head. Kindly refer the reply of condition no. xxvii. The condition is complied with
xxix	The funds earmarked for the environmental protection measures should not be diverted for any other purpose and year wise expenditure should be reported to the Ministry.	The Funds earmarked for Environment protection measures are used only for Environment Protection purpose. Details of expenditure for operation of pollution control measures are regularly submitted to Ministry. The cost incurred on environment control measures is as under:

Hindalco Industries Ltd.

Unit: Birla Copper, Dahej

Capital Cost for Environmental Control Measures

Sr no	Item	Total in lacs
1	Dryer bag filer & dedusting system	669
2	Alkali Scrubber Smelter-1	8500
3	Water Cool hood Smelter-1 Converter 1,2 &3	1770
4	Ventilation hood from S & C furnace & bag house	150
5	ESP's of smelter-III	518
6	ESP's of CPP	400
7	Alkali Scrubber of Smelter –III	694
8	Effluent Treatment –II	1000
9	Sewage Treatment Plant-II	100
10	Sulfuric Acid Plant –III	8595
11	Tail Gas Scrubber SAP-III	3466.69
12	SLF for ETP waste	700
13	PG, slag & Flyash yard- for Phase-III	2000
14	Bag filters for CHP CPP-III and ash management	800.38
15	Liberator scrubber	141
16	PMR plant Bag filter	50
17	Fluorine scrubbing system in PAP-III	203.08
18	Scrubbing system for DAP-III plant	300

19	Green belt development	600
20	Zero Liquid Discharge	6754
21	Wind fencing for coal yard	1395
22	SLF9 for ETP waste	3551
	Total in Lacs	42357.15
	Total in crore	423.5715

xxx	Proposed Jetty and the related infrastructure should be in conformity with the provisions of the Coastal Regulation Zone.	The Jetty and the related infrastructure are in conformity with the provisions of the Coastal Regulation Zone Act-2011 and amended 2013.The condition is complied with.
xxxi	Screening of pollutants in the harbor waters should be taken up by the project authorities and periodical monitoring reports on water quality parameters must be forwarded to this Ministry at six monthly intervals.	The screening of pollutants in the harbor waters is carried out on regular basis by competent agency, Gujarat Ecological Society (GES), Vadodara. The laid down quality parameters are periodically monitored, and the report is forwarded to the Ministry on six monthly bases. Last Six months water quality data observed in the harbor water are as under:

Analysis results of harbor water are as below: Sea water quality near treated effluent discharge (April-24 to September-2024)

Sr. No	Parameters	Units	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	GPCB Norms	Treated Effluent analysis report Average (April-24 to Sept-24)
1	pH	--	7.58	7.66	7.50	7.55	7.65	7.75	5.5-9.0	7.62
2	Temp	°C	30.01	31.00	30.35	30.05	30.69	30.55	45	30.42
3	Colour	units	10.79	10.80	10.75	10.00	10.85	10.74	100	10.35
4	Suspended Solids	mg/L	19.16	18.99	19.07	18.12	19.89	19.53	100	19.61
5	COD	mg/L	34.19	34.36	32.90	33.01	33.81	37.30	250	35.00
6	BOD 3 day at 27o C	mg/L	8.33	7.99	8.20	8.42	7.67	8.07	100	8.10
7	Oil & Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20	<0.1
8	Phenolic compound	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	<0.1
9	Ammonical N2	mg/L	9.75	10.33	10.09	9.93	10.48	9.55	50	9.57
10	Sulphides	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0	<0.2
11	Cyanides	mg/L	Nil	Nil	Nil	Nil	Nil	Nil	0.2	Nil
12	Fluoride	mg/L	2.01	2.15	1.92	2.06	1.91	1.99	10	2.02

13	Hexa. Chromium	mg/L	0.39	0.42	0.40	0.38	0.42	0.44	1.0	0.41
14	Total Chromium	mg/L	0.43	0.40	0.47	0.44	0.43	0.44	2.0	0.44
15	Copper	mg/L	0.25	0.23	0.20	0.24	0.26	0.25	3.0	0.23
16	Nickel	mg/L	0.09	0.01	0.08	0.07	0.09	0.10	5.0	0.09
17	Zinc	mg/L	0.25	0.25	0.27	0.21	0.26	0.20	15.0	0.26
18	Mercury	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
19	Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1	<0.005
20	Arsenic	mg/L	0.04	0.05	0.03	0.03	0.04	0.03	0.2	0.03
21	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.000	<0.01
22	Insecticides and Pesticides	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.050	<0.01
24	Bio-Assay Test	% Survival of fish after 96 hrs in 100 % effluent.	96.89	96.47	96.12	96.64	96.16	96.47	95.00	96.56

All values are well within limits; hence condition is complied with.

xxxii	A comprehensive disaster Management Plan considering worst-case disaster scenarios with respect to specific cases like oil/ chemical spills, fire/explosion, terrorist attack, flood, etc. Spelling out definite/adequate measures to be taken to prevent and contain such disasters. A report on this must be forwarded to this Ministry within six months from the date of issue of the environmental clearance.	A comprehensive disaster Management Plan prepared, considering worst case disaster scenarios with respect to specific cases like oil/ chemical spills, fire/explosion, terrorist attack, flood, etc. and adequate measures are taken to prevent and contain such disasters accordingly. The reports prepared and submitted to the Ministry dated August 1997. The condition is complied with
xxxiii	To prevent discharge of sewage, bilge wastes and other liquid wastes into the marine environment, adequate system for collection, treatment and disposal of liquid wastes including shoreline interceptor for receiving liquid wastes from all shoreline installations and special hose connection for ships to allow for discharge of sewage must be provided.	Adequate measures are taken for collection, treatment and disposal of liquid waste including shoreline interceptors to prevent discharge into the marine environment. The sewage from the ship is collected through hose connection in tanker and sent to STP for further treatment and disposal. The condition is complied with
xxxiv	Appropriate devices such as oil water separator, oil monitor, oil skimmer etc. must be provided to remove all floatable material including oil spills while re-fueling the vessels, because of operations of cargo handling equipment	An appropriate devices and action is taken such as, use of Oil spill dispersant, Oil skimming pads and Portable Oil spill dispersant pumps

	and allied machinery, cranes, tractors etc. to tackle the oil pollution in the port area and marine environment.	are provided to remove all floated material and oil spill to tackle the oil pollution in port area and in marine environment. The condition is complied with
xxxv	Proper firefighting arrangements must be ensured by providing adequate number of fire hydrants in free prone areas. The entire firefighting line must be maintained under pressure through jockey pumps for appropriate volume of dead storage water must be ensured for this purpose. The employees must be kept alert and trained to combat fire by conducting regular fire drills to keep these facilities in working conditions.	Adequate firefighting arrangement is provided in plant as depicted as under: • All plants/ facilities are connected with fire Hydrant system, kept under pressure to control any fire / emergency. • A water sprinkler system is provided in the Fuel storage area. • Three Fire tenders are placed. • 1529 Fire extinguishers are installed within the plants. • Fire Alarm system and smoke detection system are installed. • Availability of Safety shower, Breathing Apparatus sets, Air Line Respirator, Life Jackets, Aluminum fire entry suits, Fire Proximity suits, etc. • Personal Protective Equipment's like Helmet, safety shoes, safety goggles, etc., to all employees. • Regular training for safe working and firefighting is provided. • Regular fire drills/mock drills are conducted. The condition is complied with
xxxvi	The quality of treated effluents, solid wastes, emissions and noise levels etc. must conform to the standards laid down by the competent authorities including central/state Pollution control board and under the Environment (Protection) Act, 1986, whichever are more stringent.	The qualities of treated effluents - kindly refer compliance of condition no." x". The Solid waste management - kindly refer compliance of condition no." xx". The emissions conformity - kindly refer compliance of condition no." iv". The noise levels monitored at different locations are as under. The Noise level observed is all well within limit, Hence Condition is complied with.

Monitored ambient noise levels(dB) from April-24 to September-24 (Average)

		Day time	Nighttime
Sr No.	Location	Noise Level in dB(A)	Noise Level in dB(A)
1	Near Smelter-I	63.7	62.9
2	Near SAP-I	63.2	62.2
3	Near ETP Plant	60.6	59.6
4	Near Captive Power Plant-1	64.7	63.5

	5	Near DAP	61.6	60.5
	6	Near Smelter-III	64.2	63.3
	7	Near Guest house in T/ship	59.4	58.7
	8	Near Central Park in T/ship	59.6	58.5
	9	Near YMA Hostel	61.1	59.7
	10	Near Gypsum yard (boundary wall)	60.9	59.5
	11	Near Coal yard	60.5	59.1
	12	Near Jetty Platform	62.3	61.5

xxxvii	The project authority should take necessary measures to avoid adverse impact on marine life in consultation with the Zoological Survey of India.	The study has been carried out by a competent expert agency approved by the Government of Gujarat i.e., Gujarat Ecology Society, Vadodara, to avoid adverse impact on marine life. The report clearly indicates that the ecosystem is stable and no significant change is observed over last decades. It could be concluded from the study that the ecosystem around the coastal waters surrounding the Birla Copper installations and discharge point has maintained a healthy environment without any deviation in the physical and chemical properties of the waters or sediments. The condition is complied with
xxxviii	The project authority should take approval of State Pollution Control Board for the proposed dumping site within the plant area and provide proper lining of the area.	The Company has already taken approval from the State Pollution Control Board for the dumping sites within the plant area vide notification no. GPCB/HAZ/GEN-55 (8)/ 42131 dated 01.12.2000. The unit has provided proper lining at disposal site. The condition is complied with
xxxix	With respect to the facilities, if any to be provided within 500 mts. If HTL, the directions issued by the Supreme Court on 12.12.1994 in respect of Writ Petition No.664/93 and 561/94 should be complied with. In view of this no construction work pertaining to jetty etc. within 500 mt of HTL should be undertaken.	The unit is complying with the direction issued dated 12.12.1994 from Hon'ble Supreme court in respect of Writ petition no-664/93 and 561/94. The condition is complied with

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J-11011/7/94 ? I A II
Compliance ID	72439613
Compliance Number(For Tracking)	EC/M/COMPLIANCE/72439613/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

Annexure-B

Hindalco Industries Limited
Unit: Birla Copper, Dahej

Status of compliance to conditions of Environmental Clearance No. J-11011/81/2000-I (A) II (I) dated 8th January 2002
(Six monthly compliance report from April-24 to September-2024**)**
Sub.: Copper Smelter expansion and Copper foil plant by M/s Indo Gulf Corporation Limited at Dahej, District Bharuch.
The expansion proposal is for increasing the capacity of copper smelter plant from 1.0 lakh TPA to 1.50 lakh TPA.

[A] SPECIFIC CONDITIONS:

Sr. No.	Details of condition	Compliance status
01	The conditions stipulated by MoEF while according to environmental clearance J-11011/ 07/94-I(A)II (I) dated 14-03-1995 for copper smelter project shall be strictly complied.	There are thirteen conditions stipulated in environmental clearance issued by the Ministry Vide Letter No. J-11011/ 07/94-I(A)II (I) dated 14-03-1995. The total conditions are complied with. The compliance report is attached as Annexure- (A)
02	The ambient air quality data around the plant show a declining trend with respect to all the parameters. Procedure of sampling and analysis may be got checked through other referral environmental laboratory for confirmation and the data submitted to the Ministry / GPCB / RO Bhopal for records, within six months.	The ambient air quality data around the plant showing a declining trend with respect to all the parameters are monitored. The concentration of PM2.5, PM10, SOx, and NOx is being monitored and reported to GPCB, CPCB and Ministry. The copy of monitoring data is attached as under:

Hindalco Industries Limited Unit: Birla Copper, Dahej
AMBIENT AIR QUALITY AV. MEAN (µg/m3)

Sr. No.	Monitoring Stations	April-24 to Sept-24			
		PM 10	PM 2.5	SO2	NOx
1	Township	55.28	41.50	37.18	11.86
2	Jetty	56.16	43.44	33.86	12.02
3	Near 16 ha	59.46	43.46	34.75	12.67
4	Near YMA	57.25	42.28	32.20	12.63

03	The company should utilize the treated effluent to the maximum extent possible for green belt development. However, additional treated effluent or during the rainy season, effluent could be discharged into the deep sea through HDPE pipeline at a point through multiple diffuser system as recommended by the NIO. The treated effluent should confirm to the standards including Bio-Assay test as per the GPCB. The monitoring report should be submitted to the ministry regularly.	The treated effluent conforming to the standards is mainly reutilized for Lime slurry preparation and green belt development. Additional treated effluent is discharged into the deep sea through a HDPE pipeline having multiple diffuser system at a point lat 21° 42'0', long 72° 30'35", as recommended by National Institute of Oceanography, Goa. As per the study carried out by NIO, Goa is no impact on marine aquatic life. The treated effluent conforms to the standards including Bio-Assay test as per the GPCB guidelines. The monitoring report is submitted regularly to GPCB (Monthly) & Ministry (Six months). The quality of treated effluent is as under:

The observed values of parameters monitored are well within limits, hence condition is complied with.

Sr. No	Parameters	Units	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	GPCB Norms	Treated Effluent analysis report Average
1	pH	--	7.58	7.66	7.50	7.55	7.65	7.74	5.5-9.0	7.61
2	Temp	o C	30	31.00	30.35	30.05	30.7	30.55	45	30.44
3	Colour	units	10.79	10.80	10.75	10.00	10.85	10.74	100	10.65
4	Suspended Solids	mg/L	19.16	18.99	19.07	18.12	19.89	19.53	100	19.13
5	COD	mg/L	34.19	34.36	32.90	33.01	33.81	37.30	250	34.26
6	BOD 3 day at 27o C	mg/L	8.33	7.99	8.20	8.42	7.67	8.07	100	8.11
7	Oil & Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20	<0.1
8	Phenolic compound	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	<0.1
9	Ammonical N2	mg/L	9.75	10.33	10.09	9.93	10.48	9.55	50	10.02
10	Sulphide	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0	<0.2
11	Cyanides	mg/L	Nil	Nil	Nil	Nil	Nil	Nil	0.2	Nil
12	Fluoride	mg/L	2.01	2.15	1.92	2.06	1.91	1.99	10	2.01
13	Hexa. Chromium	mg/L	0.39	0.42	0.40	0.38	0.42	0.44	1.0	0.41
14	Total Chromium	mg/L	0.43	0.40	0.47	0.44	0.43	0.44	2.0	0.43
15	Copper	mg/L	0.25	0.23	0.20	0.24	0.26	0.25	3.0	0.24
16	Nickel	mg/L	0.09	0.01	0.08	0.07	0.09	0.10	5.0	0.07
17	Zinc	mg/L	0.25	0.25	0.27	0.21	0.26	0.20	15.0	0.24

18	Mercury	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
19	Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1	<0.005
20	Arsenic	mg/L	0.04	0.05	0.032	0.0250	0.040	0.032	0.2	0.04
21	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.00	<0.01
22	Insecticides and Pesticides	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01
24	Bio-Assay Test	% Survival of fish after 96 hrs. in 100 % effluent.	96.89	96.47	96.12	96.65	96.16	96.47	95.00	96.46

04	The company should also set up a separate online fish pond using treated effluent to ensure that the quality of treated effluent discharged into the sea does not have any adverse impact on marine life. The effluent quality at the marine discharge point must also be monitored periodically by an independent agency authorized by CPCB and report of the independent agency should be submitted to the ministry's regional office at Bhopal / CPCB / GPCB.	Kindly refer point No.3. A separate fishpond has been prepared to ensure the quality of treated effluent; the effluent quality Is also monitored at marine discharge point. The reports of same are sent to regional office at Bhopal. CPCB and GPCB on regular basis. The condition is complied with.
05	The industry should develop within three months a new secured landfill sit of disposal of ETP sludge and the hazardous wastes as per the CPCB guidelines. Authorization under the hazardous wastes (Managements & handling) Rules, 2000 from the GPCB should be obtained.	Hindalco Industries Limited (Unit Birla copper) has developed a secure land fill site for disposal of ETP sludge and the hazardous waste as per the CPCB guidelines. The company has also obtained authorization under the Hazardous other waste (Managements & handling) Rules, 2000 from the GPCB vide letter No GPCB/HAZ/GEN-55(8)/42131 dated. 01.12.2000. The condition is complied with.
06	Adequate facilities and safety measures, including protective clothing for personnel working in the critical areas, e.g., in the anode casting area, must be strictly explored. The company should get an occupational health and safety study done through NIOH, Ahmedabad and submit a report to the ministry within one year. The recommendations of the study must be implemented by the company.	Adequate facilities and safety measures including protective clothing for personnel working in critical areas are implemented. The PPEs given are Helmet, Goggles, Hand Gloves, Gas mask and Aprons. This is strictly implemented in the Anode Casting area. The company conducted occupational health and safety study by NIOH, Ahmedabad in the year of Feb-2005 and the report is submitted to the Ministry. The following recommendations have been implemented:

		1. The workplace standards have been improved by providing better ventilation and light. 2. A system of environment monitoring is in place. 3. Regular medical check-up is done. 4. Providing personal protective equipment's 5. Maintain good housekeeping and good hygiene. 6. Records of environmental and occupational health are maintained. 7. Medical services are provided as per the OHS principles. 8. Orientation of machine and manpower is done. The safety measures are taken adequately; hence condition is complied with.
07	Green belt of adequate width and density in 36 ha of project area in addition to the 40 ha of area already afforested should be provided to mitigate the effects of fugitive emission all around the plant. The development of green belt along the boundary walls, open space and avenue roads should be as per the CPCB guidelines.	The project is developed within the existing copper complex area where green belt development is done. The 36 Ha project area is already taken care of to mitigate the effect of fugitive emission all around the plant. The development of green belt along the boundary as well as the open space available in the plant area, the plantation is also done all along the road as per the CPCB guidelines. The green belt is developed in scientific manner; hence the condition is complied with.

[B] GENERAL CONDITIONS:

01	The project authorities must strictly adhere to the stipulations made by the Gujarat State Pollution Control Board.	The company is fully committed to adhering to the stipulated conditions made by the GPCB. Hence condition is complied with.
02	No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of environment & Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	The company has obtained prior environmental clearance before expansion or modification in the plant. In case of any deviations or alterations in the project proposal, the company has approached the Ministry and accordingly, Ministry has accessed the adequacy of conditions imposed for environment protection measures. Hence the condition is complied with.
03	The project authorities must strictly comply with the rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and January, 2000. Prior approval from Chief	The company has already obtained the permission from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire safety Inspectorate for Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and January 2000.

	Inspectorate of Factories, Chief Controller of Explosives, Fire safety Inspectorate etc. must be obtained.	The permission obtained from Factories Inspectorate is attached as Annexure-V The Rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 is complied with. The necessary permission is attached as Annexure-V The company has already obtained necessary licenses from Controller of Explosives, the necessary permission is attached as Annexure-VI Boiler inspectorate permission is attached as Annexure-VII The desired permission is obtained; hence condition is complied with.
04	The project authorities must strictly comply with the rules and regulations with regard to handling and disposal of Hazardous wastes in accordance with the Hazardous wastes (management and Handling) Rules, 1989 as amended in January 1994 and in January 2000. Authorization from the State Pollution Control Board must be obtained for collections/treatment/storage/disposal of hazardous wastes.	The company has strictly complied with the rules and regulations with regard to handling and disposal of Hazardous wastes in accordance with the Hazardous wastes (management and Handling) Rules, 1989 as amended in January, 1994 and in January, 2000.The company has already obtained authorization for collections/treatment/storage/disposal of hazardous waste, Under the Hazardous Wastes (Management and Handling) Rules, 2003 vide CCA No. AWH-108216 dated 30-05-2020 which is valid up to 02-03-2026 by GPCB. The rules and regulation regarding hazardous waste is followed, hence condition is complied with.
05	The overall noise levels in and around the plant area should be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA rules 1989 viz. 75 dBA (daytime) and 70 (dBA nighttime).	The overall noise levels in and around the plant area is 63.20 dB(A) in daytime and 61.40 dB(A) in nighttime which is well within the standards 75 dB(A) in daytime and 70 dB(A) in nighttime. The ambient noise level measured are as under:

Monitored ambient noise levels(dB) from April-24 to September-24 (Average)

		Day time	Nighttime
Sr No.	Location	Noise Level in dB(A)	Noise Level in dB(A)
1	Near Smelter-I	63.7	62.9
2	Near SAP-I	63.2	62.2
3	Near ETP Plant	60.6	59.6
4	Near Captive Power Plant-1	64.7	63.5
5	Near DAP	61.6	60.5

6	Near Smelter-III	64.2	63.3
7	Near Guest house in T/ship	59.4	58.7
8	Near Central Park in T/ship	59.6	58.5
9	Near YMA Hostel	61.1	59.7
10	Near Gypsum yard (boundary wall)	60.9	59.5
11	Near Coal yard	60.5	59.1
12	Near Jetty Platform	62.3	61.5

06 Occupational health surveillance programme should be undertaken as regular exercise for all the employees, specifically for those engaged in handling hazardous substances. The first aid facilities in occupational health center should be strengthened & medical record of each employee should be maintained.

Medical examinations are carried out of the workers on a regular basis and the records are maintained as per the factory act. The copy of records is attached as Annexure-I

The medical examination of employee is carried out regularly, hence condition is complied with

07 The project proponent should have scheme for social upliftment in the surrounding village with reference to contribution in road construction, education of Children, festivals, health centers, sanitation facilities, drinking water supply, community awareness and employment to local people whenever and whenever possible both for technical and non-technical jobs.

The company is committed to undertake the activities to uplift the socioeconomic status of surrounding villages like community development programme, educational programme, drinking water supply and health care etc. The activities conducted in surrounding villages and beneficiaries are as under: CSR data: April-24 to Sept-24

Activities Undertaken	No. of Activities	Beneficiaries	No. of Villages Benefited
Education	12	31703	72
Health	164	12087	18
Sustainable livelihood	116	2365	19
Social	1	100	1
Others	9	10114	5
Total	302	56369	115

08 The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA and Risk analysis report.

The company has undertaken several measures to protect the environment and safeguard the recommendations already made in EIA/EMP report. The protection measures taken are attached as Annexure-II. The risk assessed and accordingly EMP is prepared, hence condition is complied with.

<table>
<tr>
<td>09</td>
<td>A separate Environmental Management Cell equipped with full-fledged laboratory Facilities should be set up to carry out the environmental Management and monitoring functions.</td>
<td>A separate Environmental Management Cell equipped with full-fledged laboratory facilities is set up to carry out the environmental management and monitoring functions. List of equipment and consumable available in the laboratory are as under:
A full-fledged separate Environmental Laboratory is set up and equipped with all necessary instruments/ equipment's. The following equipment and consumable are available in the laboratory:
<table>
<tr><td>CAAQMS (04)</td><td>OCEMS (35)</td></tr>
<tr><td>Atomic Absorption Spectrophotometer</td><td>Weather station</td></tr>
<tr><td>PM2.5, PM10 Combo</td><td>Stack Monitoring Kit (2)</td></tr>
<tr><td>Noise Level monitors (02)</td><td>Handheld SO2, NH3, HF analyzer</td></tr>
<tr><td>Multi gas Analyzer (SO2, NOx, CO2, HC, O2, and CO)</td><td>Ion selected Fluoride analyzers</td></tr>
<tr><td>Spectrophotometer (visible range)</td><td>BOD incubator</td></tr>
<tr><td>COD reflux set up</td><td>Single pan balance</td></tr>
<tr><td>Relevant chemicals as per IS 5182</td><td>Hot Air Oven</td></tr>
<tr><td>Stopwatch</td><td>Thermometer</td></tr>
<tr><td>PH Meter</td><td>Titration set</td></tr>
</table>
The company has separate environment cell and sufficient infrastructure to monitor and analyzes the environmental parameters.
Hence condition is complied with</td>
</tr>
<tr>
<td>10</td>
<td>The project authorities will provide adequate funds both recurring and non-recurring to implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purpose.</td>
<td>The company has incurred an amount of Rs. 423.5715 crores to implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government. The details of amount incurred is as under
<table>
<tr><td colspan="3">Hindalco Industries Ltd.</td></tr>
<tr><td colspan="3">Unit: Birla Copper, Dahej</td></tr>
<tr><td colspan="3">Capital Cost for Environmental Control Measures</td></tr>
<tr><td>Sr no</td><td>Item</td><td>Total in lacs</td></tr>
<tr><td>1</td><td>Dryer bag filer & dedusting system</td><td>669</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><td>2</td><td>Alkali Scrubber Smelter-1</td><td>8500</td></tr>
<tr><td>3</td><td>Water Cool hood Smelter-1 Converter 1,2 &3</td><td>1770</td></tr>
<tr><td>4</td><td>Ventilation hood from S & C furnace & bag house</td><td>150</td></tr>
<tr><td>5</td><td>ESP's of smelter-III</td><td>518</td></tr>
<tr><td>6</td><td>ESP's of CPP</td><td>400</td></tr>
<tr><td>7</td><td>Alkali Scrubber of Smelter –III</td><td>694</td></tr>
<tr><td>8</td><td>Effluent Treatment –II</td><td>1000</td></tr>
<tr><td>9</td><td>Sewage Treatment Plant-II</td><td>100</td></tr>
<tr><td>10</td><td>Sulfuric Acid Plant –III</td><td>8595</td></tr>
<tr><td>11</td><td>Tail Gas Scrubber SAP-III</td><td>3466.69</td></tr>
<tr><td>12</td><td>SLF for ETP waste</td><td>700</td></tr>
<tr><td>13</td><td>PG, slag & Flyash yard- for Phase-III</td><td>2000</td></tr>
<tr><td>14</td><td>Bag filters for CHP CPP-III and ash management</td><td>800.38</td></tr>
<tr><td>15</td><td>Liberator scrubber</td><td>141</td></tr>
<tr><td>16</td><td>PMR plant Bag filter</td><td>50</td></tr>
<tr><td>17</td><td>Fluorine scrubbing system in PAP-III</td><td>203.08</td></tr>
<tr><td>18</td><td>Scrubbing system for DAP-III plant</td><td>300</td></tr>
<tr><td>19</td><td>Green belt development</td><td>600</td></tr>
<tr><td>20</td><td>Zero Liquid Discharge</td><td>6754</td></tr>
<tr><td>21</td><td>Wind fencing for coal yard</td><td>1395</td></tr>
<tr><td>22</td><td>SLF9 for ETP waste</td><td>3551</td></tr>
<tr><td></td><td>Total in Lacs</td><td>42357.15</td></tr>
<tr><td></td><td>Total in crore</td><td>423.5715</td></tr>
</table>
The funds earmarked were used for environmental protection measures and not diverted for any other purposes. The condition is complied with.
</td>
</tr>
<tr>
<td>11</td>
<td>The implementation of the project vis-à-vis environmental action plans will be monitored by Ministry’s regional office at Bhopal/State Pollution Control Board / Central Pollution Control Board. A six-monthly compliance status report should be submitted to monitoring agencies.</td>
<td>The implementation of the project is monitored by Ministry's regional office at Bhopal / State Pollution Control Board / Central Pollution Control Board. A six-monthly compliance status report is submitted regularly to monitoring agencies. (RO, MOEF, Bhopal and SPCB.)
Hence the condition is complied with.
The acknowledge copy of last six month is attached as under.</td>
</tr>
</table>

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J-11011/81/2000-I (A) II (I)
Compliance ID	72458067
Compliance Number(For Tracking)	EC/M/COMPLIANCE/72458067/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

12	The project proponent should inform the public that the project has been accorded environmental clearance by the ministry and copies of the clearance letter are available with the state Pollution Control Board / Committee and may also be seen at website of the Ministry of Environment and Forests at http.//envfor.nic.in. This should be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional Office.	The company has published the information regarding obtaining the environment clearance for the aforesaid project in two daily news papers i.e. sandesh dtd.13.1.2002 and The Times of India dtd.12.1.2002. A copy of the above letter and a copy of each advertisement was submitted to MoEF & CC, New Delhi vide letter No. IGCL/TIC/01 dated 16.01.2002. The condition is complied with.
13	The project authorities should inform the Regional Office as well as the ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work, if any.	The company has informed the Regional Office as well as the Ministry, the date of financial closure and final approval of the project and commencing the land development work. The condition is complied with.

Annexure-C

Hindalco Industries Limited
Unit: Birla Copper, Dahej
Status of compliance to conditions of Environmental Clearance No. J- 11011/85/2002-IA II (I) dated 10th Feb-2004
(Six monthly compliance report from April-24 to September-2024)
Sub.: Expansion of Copper Smelter and setting up of Zinc smelter plant by M/s Hindalco Industries Limited at Village Lakhigam and Dahej, Tehsil Vagra, District Bharuch in Gujarat- Environmental Clearance reg.
Expansion proposal is for increasing capacity of copper smelter plant from 1.50 lakh TPA to 2.50 lakh TPA.
and setting up of Zinc Smelter Plant of 1.0 lakh TPA.

(A) SPECIFIC CONDITIONS:

<table>
<tr><th>Sr.No.</th><th>Details of condition</th><th>Compliance status</th></tr>
<tr><td>01</td><td>All the conditions stipulated by the Ministry while according to environmental clearance to the existing project vide its letter no. J-11011/81/2000-IA. II(I) dated 8th January 2002 should be strictly implemented.</td><td>There are seven specific condition, and thirteen general conditions stipulated in environmental clearance issued by the Ministry Vide Letter No. J-11011/81/2000-IA. II (I) dated 8th January 2002 the total conditions have been complied with. The compliance report is attached as Annexure- (B)</td></tr>
<tr><td>02</td><td>As reflected in the EIA/EMP effluent generation should not exceed 153 m3/hr. Capacity of the existing ETP should be further augmented from 160m3/hr to 200m3/hr. company should make efforts to achieve zero discharge, till such time, company should utilize the treated effluent to the maximum extent possible for green belt development. However, additional treated effluent or during the rainy season, effluent could be discharged into the deep sea through HDPE pipeline at a point through multiple diffuser system as recommended by the NIO. The treated effluent should conform to the standards including Bioassay test as per the GPCB. The monitoring report should be submitted to the Ministry regularly.</td><td>The effluent generation is 110 m3 /hr. The Capacity of ETP is increased from 160 m3/hr. to 320 m3/hr. The Company has maintained zero liquid effluent discharge except RO reject and storm water in rainy season which is discharged into deep sea through HDPE pipeline at a point through multiple diffuser system as suggested by NIO. The total treated water is recycled in the process and effluent quality is maintained as per prescribed standard including bioassay test as per the GPCB. The Monitoring report is submitted regularly. The monitoring reports are submitted to the Ministry regularly.
The condition is complied with.
<table>
<tr><th>Month</th><th>Treated effluent discharged Monthly Avg.</th><th>KLD</th></tr>
<tr><td>Apr-24</td><td>2796</td><td>93.2</td></tr>
<tr><td>May-24</td><td>1185</td><td>38.2</td></tr>
<tr><td>Jun-24</td><td>1305</td><td>43.5</td></tr>
<tr><td>Jul-24</td><td>1592</td><td>51.4</td></tr>
<tr><td>Aug-24</td><td>4389</td><td>141.6</td></tr>
<tr><td>Sep-24</td><td>4080</td><td>136</td></tr>
<tr><td>Average</td><td>2558</td><td>84</td></tr>
</table></td></tr>
</table>

03	Fugitive emission of dust/acid mist vapors, fumes and SO2 should be controlled, and work environment monitored for prevailing contaminants regularly. Fugitive dust emission in the zinc concentrates handling area and at various transfer points should be minimized. The company should install bag filter in the calcine grinding, melting, and casting sections of zinc smelter plant for recovery of dust & should be recycled in the process.	All possible measures are adopted to mitigate the fugitive emission, SO2, fumes in the work environment. The prevailing contaminants are monitored regularly. Adequate capacity of bag filters is attached to all transfer points to mitigate the fugitive emission. As such there is no emission of HC from our process & operation. However, SO2 emission is being monitored periodically, and data are maintained.
04	SO2 containing off-gases from smelting, setting and converting furnaces in copper and zinc smelter plants should be cleaned and converted to Sulphuric acid by Double Conversion Double Absorption (DCDA) Process technology for maximum conversion of SO2 to H2SO4. Industry should meet SO2 emission limit of 2kg/ton of H2SO4 produced and emission limit of 50mg/Nm3 of acid mist. Company should install fluoride scrubbing system for phosphoric acid plant so that fluoride concentration should conform to the prescribed standards of 25mg/Nm3.	SO2 containing off-gas from smelting, converting furnace is cleaned and converted into sulfuric acid by double conversion and double absorption process technology at scrubber. The company has complied the SO2 emission as well as acid mist. The Observation is well within the prescribed standard. Phosphoric acid plant has been shut down for long term. Zinc Smelter plant was not commissioned. Au smelt plant & SAP-II plant has been dismantled in 2017 & 2019 respectively. CPP-II and CCR-II plants has been dismantled in 2021. Phosphoric acid plant and Di ammonium phosphate plant is being dismantled in Year 2024. The observed values of parameters monitored are well within limits, Hence condition is complied with

Stack analysis report April 2024 to September 2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	61.71	50 ppm	18.44	150 mg/Nm3	73.13
2	Sulphuric acid Preheater I	100 ppm	63.20	50 ppm	25.0	150 mg/Nm3	85.11
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	351.63	600 mg/Nm3	187.2	100 mg/Nm3	83.33
4	Shaft furnace of CC Rod plant I	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.57
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	42.34	50 ppm	19.62	150 mg/Nm3	55.08
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	342.87	300 mg/Nm3	179.72	50 mg/Nm3	32.65

9	Shaft furnace of CC Rod plant-III	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.56
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	84.93
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	29.54	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	30.36	NA	NA	150 mg/Nm3	86.05
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	1.04 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.32
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.86
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	19.41	NA	NA	150 mg/Nm3	51.16
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.34 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	ND	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	Nil	Acid Mist 25 mg/Nm3	NA	NA	NA
23	PMR Phase -III	40 mg/Nm3	30.77	25 mg/Nm3	18.41	150 mg/Nm3	79.39
DAP / PAP Fertilizer		F Norms	F	NH3 Norms	NH3	PM Norms	PM
DAP		6.0 mg/Nm3	Plant s/d	175 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)		6.0 mg/Nm3	Plant s/d	NA	NA	NA	NA

05	The industry should develop a dedicated new secured landfill facility for jarosite from the zinc smelter plant as per the CPCB guidelines besides the land fill facility already developed for disposal of solid waste from copper smelter plant. Authorization under the hazardous wastes (Management & Handling) rules 2000, from the GPCB should be obtained. Ground water quality in the vicinity of the landfill should be regularly monitored and report submitted to the CPCB/GPCB/Ministry once in six months.	Zinc Smelter plant was not commissioned hence not relevant for zinc smelter. However, secured land fill facility is already developed as per CPCB guidelines for disposal of waste from copper smelting plant. The required Authorization under the hazardous wastes (Management & Handling) rules 2000, from the GPCB is obtained. The Ground water quality is monitored and report of the same is submitted to GPCB and Ministry periodically. The condition is complied with
06	Green belt of adequate width and density in 25 ha. Of project area in addition to the 62 ha. Of area already afforested should be provided to mitigate the effects of fugitive emission all around	The project is developed within the existing copper complex area where green belt is developed in 117 Ha. The project area is already taken care of to mitigate the effect of fugitive emission all around the plant. The development

	the plant. The addition land required for green belt development should be procured and progress made in this regard should be reported to this Ministry within three months The development of green belt along the periphery of plant and township should be anomy based as per CPCB guidelines.	of green belt along the boundary as well as the in open space available in the plant area is done; the plantation is also done all along the road as per the CPCB guidelines. The condition is complied with
07	The solid hazardous waste/sludge generated from the process should be disposed off in a landfill. The landfill should be constructed at a safe height from Gr water. The design of the landfill should be approved by SPCB as per Hazardous Wastes (M&H) Rules 06-01-2003.	The solid hazardous waste/sludge generated from the process is disposed in a secured landfill. The secured landfill is constructed as per CPCB guideline which is approved by GPCB. The safe height from Gr water, designed of the land fill is approved by GPCB as per Hazardous Wastes (M&H) Rules 06-01-2003.The condition is complied with

(B) GENERAL CONDITIONS:

01	The project authorities must strictly adhere to the stipulations made by the Gujarat State Pollution Control Board.	The company is fully committed to adhere to the stipulated conditions made by the GPCB. The condition is complied with
02	No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment & Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference should be made to the ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	The company has obtained prior environment clearance before expansion or modification in the plant. In case of any deviations or alterations in the project proposal, the company has approached to the Ministry and accordingly, Ministry has accessed the adequacy of conditions imposed for environment protection measures. The condition is complied with
03	The project authorities must strictly comply with the rules under Manufacture, Storage and import of hazardous chemicals Rules, 1989 as amended in October 1994 and January 2000. Prior approvals from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire Safety Inspectorate etc. must be obtained.	The company has already obtained the permission from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire safety Inspectorate for Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and January 2000. The permission obtained from Factories Inspectorate is attached as Annexure-V. The Rules and regulations under Manufacture, storage and

<table>
<tr><td></td><td></td><td>import of hazardous chemicals rules, 1989 is complied with. The necessary permission is attached as Annexure-V. The company has already obtained necessary licenses from Controller of Explosives, the necessary permission is attached as Annexure-VI
Boiler inspectorate permission is attached as Annexure-VII
The condition is complied with</td></tr>
<tr><td>04</td><td>The project authorities must strictly comply with the rules with regard to hazardous wastes in accordance with the hazardous Wastes (M & H) Rules 1989 as amended in Oct-94 and in Jan, 00. Authorization from the SPCB must be obtained.</td><td>The company has strictly complied with the rules and regulations about handling and disposal of Hazardous wastes in accordance with the Hazardous wastes (management and Handling) Rules, 1989 as amended in January 1994 and in January; 2000.The company has already obtained authorization for collections/treatment/storage/disposal of hazardous waste. Under the Hazardous Wastes (Management and Handling) Rules, 2003 vide CCA No. AWH-108216 dated 30-05-2020 which is valid up to 02-03-2026.The company has followed the stipulated rule; hence condition is complied with</td></tr>
<tr><td>05</td><td>The overall noise levels in and around the plant area should be kept well within the standard (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standard prescribed under EPA rules 1989.</td><td>The overall noise levels in and around the plant area is 61.90 dB(A) in daytime and 60.60 dB(A) in nighttime which is well within the standards (75 dB(A) in daytime and 70 dB(A) in nighttime) The ambient noise level measured are as under:
<table>
<tr><td>Noise Measurement (April-24 to Sept-24)</td><td>Day time</td><td>Nighttime</td></tr>
<tr><td>Location</td><td>Noise Level in dB(A)</td><td>Noise Level in dB(A)</td></tr>
<tr><td>Near Township opp. to Arogya</td><td>61.1</td><td>59.6</td></tr>
<tr><td>Near 16 ha opp. to Smelter-III</td><td>63.2</td><td>61.8</td></tr>
<tr><td>Near YMA Hostel</td><td>61.1</td><td>59.5</td></tr>
<tr><td>Near Jetty Platform</td><td>62.3</td><td>61.5</td></tr>
</table>
Monitored ambient noise levels(dB) from April-24 to Sept-2024 (Average)
<table>
<tr><td></td><td></td><td>Day time</td><td>Nighttime</td></tr>
<tr><td>Sr No.</td><td>Location</td><td>Noise Level in dB(A)</td><td>Noise Level in dB(A)</td></tr>
<tr><td>1</td><td>Near Smelter-I</td><td>63.7</td><td>62.9</td></tr>
<tr><td>2</td><td>Near SAP-I</td><td>63.2</td><td>62.2</td></tr>
<tr><td>3</td><td>Near ETP Plant</td><td>60.6</td><td>59.6</td></tr>
<tr><td>4</td><td>Near Captive Power Plant-I</td><td>64.7</td><td>63.5</td></tr>
<tr><td>5</td><td>Near DAP</td><td>61.6</td><td>60.5</td></tr>
<tr><td>6</td><td>Near Smelter-III</td><td>64.2</td><td>63.3</td></tr>
</table>
</td></tr>
</table>

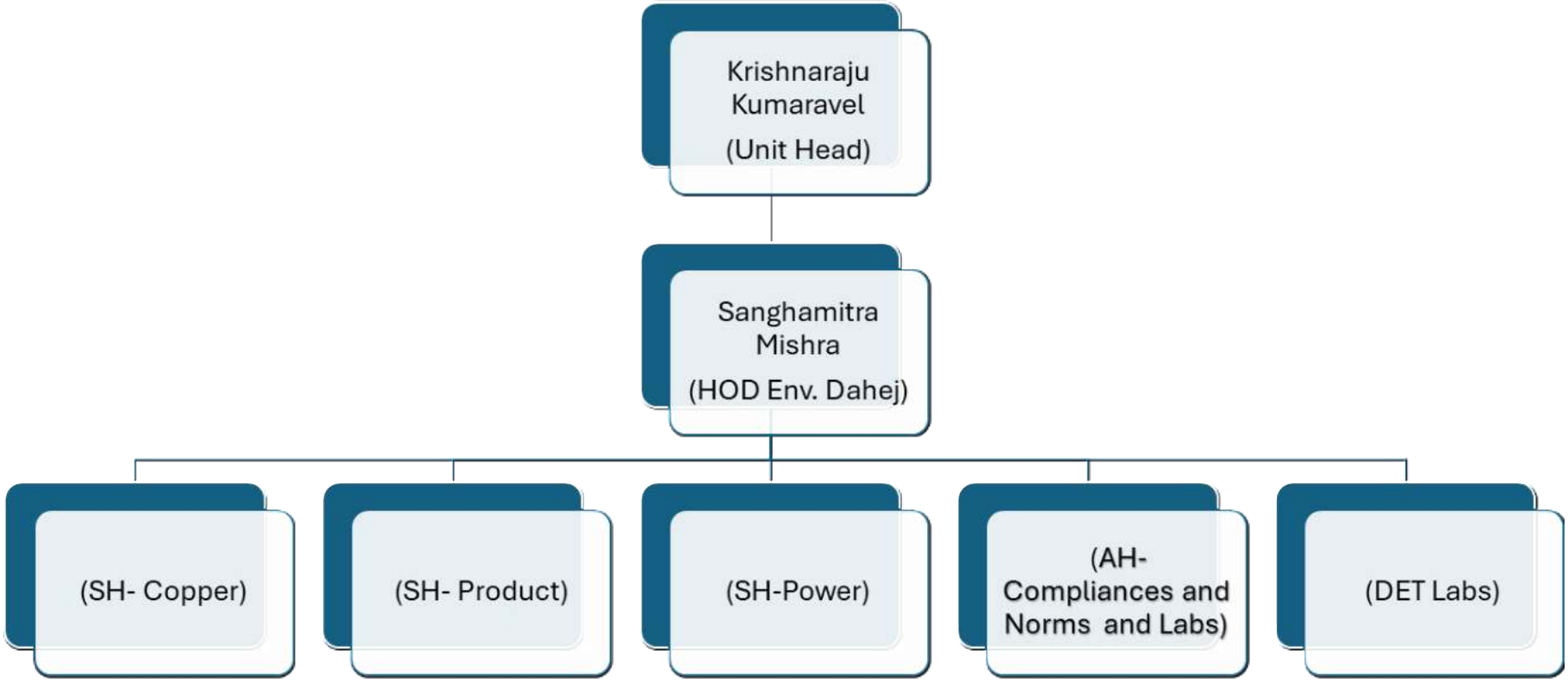
7	Near Guest house in T/ship	59.4	58.7
8	Near Central Park in T/ship	59.6	58.5
9	Near YMA Hostel	61.1	59.7
10	Near Gypsum yard (boundary wall)	60.9	59.5
11	Near Coal yard	60.5	59.1
12	Near Jetty Platform	62.3	61.5

06	Occupational health surveillance programmes should be undertaken as regular exercise for all the employees, specifically for those engaged in handling hazardous substances. The first aid facilities in the occupational health center should be strengthened and the medical records of each employee should be maintained separately.	The medical examination is carried out of the workers on regular basis and the records are maintained as per the factory act. The copy of records is attached Annexure-I. The medical examination is carried out regularly, hence condition is complied with.
07	The project proponent should have a scheme for social upliftment in the surrounding villages with reference to contribution.	The company is committed to undertake the activities to uplift the socioeconomic status of surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc. The public hearing of this project was exempted by MoEF, New Delhi the company has well defined CSR policy, the activities conducted in surrounding villages and beneficiaries are as under: Hence condition is complied with.
08	The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA and risk analysis report.	The company has undertaken several measures to protect the environment and safeguard the recommendations already made in EIA/EMP report. The protection measure taken is attached as Annexure-II. The condition is complied with.

Activities Undertaken	No. of Activities	Beneficiaries	No. of Villages Benefited
Education	12	31703	72
Health	164	12087	18
Sustainable livelihood	116	2365	19
Social	1	100	1
Others	9	10114	5
Total	302	56369	115

<table>
<tr>
<td>09</td>
<td>A separate Environmental Management Cell equipped with full-fledged laboratory facilities must be set up to carry out the Environmental Management and monitoring functions.</td>
<td>A separate Environmental Management Cell equipped with full-fledged laboratory facilities is set up to carry out the Environmental Management and monitoring functions:
List of equipment and consumable available in the laboratory facilities is as under:
<table>
<tr><td>CAAQMS (04)</td><td>OCEMS (35)</td></tr>
<tr><td>Atomic Absorption Spectrophotometer</td><td>Weather station</td></tr>
<tr><td>PM2.5, PM10 Combo</td><td>Stack Monitoring Kit (2)</td></tr>
<tr><td>Noise Level monitors (02)</td><td>Handheld SO2, NH3, HF analyzer</td></tr>
<tr><td>Multi gas Analyzer (SO2, NOx, CO2 , HC, O2, and CO)</td><td>Ion selected Fluoride analyzers</td></tr>
<tr><td>Spectrophotometer (visible range)</td><td>BOD incubator</td></tr>
<tr><td>COD reflux set up</td><td>Single pan balance</td></tr>
<tr><td>Relevant chemicals as per IS 5182</td><td>Hot Air Oven</td></tr>
<tr><td>Stopwatch</td><td>Thermometer</td></tr>
<tr><td>PH Meter</td><td>Titration set</td></tr>
</table>
The condition is complied with.
ENVIRONMENTAL MANAGEMENT CELL as under</td>
</tr>
</table>

ENVIRONMENTAL MANAGEMENT CELL



10	The project authorities will provide adequate funds both recurring and non-recurring to implement the conditions stipulated by the MoEF as well as the State Government The funds so provided should not be diverted for any other purpose.	The company has incurred an amount of Rs. 423.5715crores to implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government. The funds earmarked were used for environmental protection measures and not diverted for any other purposes. The Pollution control equipment's are installed and working efficiently, adequate measures are taken. The details of amount incurred are as under:

	Hindalco Industries Ltd. Unit: Birla Copper, Dahej Capital Cost for Environmental Control Measures	

Sr no	Item	Total in lacs
1	Dryer bag filer & dedusting system	669
2	Alkali Scrubber Smelter-1	8500
3	Water Cool hood Smelter-1 Converter 1,2 &3	1770
4	Ventilation hood from S & C furnace & bag house	150
5	ESP's of smelter-III	518
6	ESP's of CPP	400
7	Alkali Scrubber of Smelter –III	694
8	Effluent Treatment –II	1000
9	Sewage Treatment Plant-II	100
10	Sulfuric Acid Plant –III	8595
11	Tail Gas Scrubber SAP-III	3466.69
12	SLF for ETP waste	700
13	PG, slag & Flyash yard- for Phase-III	2000
14	Bag filters for CHP CPP-III and ash management	800.38
15	Liberator scrubber	141
16	PMR plant Bag filter	50
17	Fluorine scrubbing system in PAP-III	203.08
18	Scrubbing system for DAP-III plant	300
19	Green belt development	600
20	Zero Liquid Discharge	6754
21	Wind fencing for coal yard	1395
22	SLF9 for ETP waste	3551
	Total in Lacs	42357.15
	Total in crore	423.5715

11	A six-monthly compliance status report should be submitted to monitoring agencies.	The six-monthly compliance status reports are submitted regularly. The copy of acknowledgement is attached as under: The environmental monitoring report is sent regularly to government agencies. Hence condition is complied.

12	The project proponent should inform the public that the project has been accorded environmental clearance by the Ministry. This should be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region and a copy of the same should be forwarded to the regional office.	The company has published the information regarding obtaining the environment clearance for the aforesaid project in two daily newspapers i.e. Times of India dtd.21.02.2004 and Gujarat Samachar dtd.20.02.2004. A copy of the above letter and a copy of each advertisement was submitted to MoEF, New Delhi vide letter No. IGCL/TIC/01 dated 24.02.2004. The condition is complied with
13	The project Authorities should inform the Regional Office as well as the ministry, the date of financial closure, approval and the date of commencing land development work, if any.	The company has informed the Regional Office as well as the Ministry, the date of financial closure and final approval of the project and commencing the land development work. The condition is complied with.

Sr No	Description	Status
1	The project authorities must strictly adhere to the stipulations made by the Gujarat State Pollution Control Board.	The company is fully committed to adhere to the stipulated conditions made by the GPCB. The condition is complied with
2	No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment & Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	The company has obtained prior environment clearance before expansion or modification in the plant. No deviations or alterations in the project proposal is carried out.
3	The project authorities must strictly comply with the rules and regulations under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 as amended in October 1994 and January 2000. Prior approvals from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire Safety Inspectorate etc. must be obtained. Rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and 2000 are being complied by us. Necessary licenses from Controller of Explosives, Boiler inspectorate and Factories Inspectorate have been obtained as per requirement.	The company has already obtained the permission from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire safety Inspectorate for Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and January 2000. The permission obtained from Factories Inspectorate is attached as Annexure-V The Rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 is complied with. The necessary permission is attached as Annexure-V The company has already obtained necessary licenses from Controller of Explosives, the necessary permission is attached as Annexure-VI Boiler inspectorate permission is attached as Annexure-VII The condition is complied with
4	The project authorities must strictly comply with the rules and regulations with regard to handling and disposal of hazardous wastes in accordance with the Hazardous Wastes (Management and Handling) Rules, 2003. Authorization from the State Pollution Control Board must be obtained for collections/ treatment/ storage/disposal of hazardous wastes.	The company has already obtained authorization under the Hazardous Wastes (Management and Handling) Rules, 2003. CCA No. AWH-108216 dated 30-05-2020 which is valid up to 02-03-2026. The condition is complied with.
5	The overall noise levels in and around the plant area should be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA (daytime) and 70 dBA (nighttime)	The overall noise levels in and around the plant area is 63.20 dB(A) in daytime and 61.40 dB(A) in nighttime which is well within the standard. 75 dB(A) in daytime and 70 dB(A) in nighttime. The ambient noise level measured are as under: The condition is complied with

Monitored ambient noise levels(dB) from April-24 to Sept-24 (Average)			
		Day time	Nighttime
Sr No.	Location	Noise Level in dB(A)	Noise Level in dB(A)
1	Near Smelter-I	63.7	62.9
2	Near SAP-I	63.2	62.2
3	Near ETP Plant	60.6	59.6
4	Near Captive Power Plant-1	64.7	63.5
5	Near DAP	61.6	60.5
6	Near Smelter-III	64.2	63.3
7	Near Guest house in T/ship	59.4	58.7
8	Near Central Park in T/ship	59.6	58.5
9	Near YMA Hostel	61.1	59.7
10	Near Gypsum yard (boundary wall)	60.9	59.5
11	Near Coal yard	60.5	59.1
12	Near Jetty Platform	62.3	61.5

6	Occupational health surveillance programmes should be undertaken as regular exercise for all the employees, specifically for those engaged in handling hazardous substances. The first aid facilities in the occupational health center should be strengthened and the medical records of each employee should be maintained separately.	The occupational health surveillance of the workers is carried out by medical examination on regular basis and the records are maintained as per the factory act. The copy of records is attached Annexure-I The condition is complied with.
7.	The project proponent should have a scheme for social up liftment in the surrounding villages with reference to contribution in road construction, education of Children, festivals, health centers, sanitation facilities, drinking water supply, community awareness and employment to local people whenever and wherever possible both for technical and non-technical jobs	The company is committed to undertake the activities to uplift the socioeconomic status of surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc. The activities conducted in surrounding villages and beneficiaries are as under: The condition is complied with.

Activities Undertaken	No. of Activities	Beneficiaries	No. of Villages Benefited
Education	12	31703	72
Health	164	12087	18
Sustainable livelihood	116	2365	19
Social	1	100	1
Others	9	10114	5
Total	302	56369	115

8	The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA and Risk analysis report.	The company has taken several environmental protection measures and safeguards recommended in the EIA and risk analysis report. The majors taken and risk analysis is attached as Annexure-II
9	A separate Environmental Management Cell equipped with full-fledged laboratory facilities must be set up to carry out the Environmental Management and monitoring functions.	A separate Environmental Management Cell equipped with full-fledged laboratory facilities is set up to carry out the environmental Management and monitoring functions. A full-fledged separate Environmental Laboratory is set up and equipped with all necessary instruments/ equipment's. The following equipment and consumable are available in the laboratory:

CAAQMS (04)	OCEMS (35)
Atomic Absorption Spectrophotometer	Weather station
PM2.5, PM10 Combo	Stack Monitoring Kit (1)
Noise Level monitors (02)	Handheld SO2, NH3, HF analyzer
Multi gas Analyzer (SO2, NOx, CO2, HC, O2, and CO)	Ion selected Fluoride analyzers
Spectrophotometer (visible range)	BOD incubator
COD reflux set up	Single pan balance
Relevant chemicals as per IS 5182	Hot Air Oven
Stopwatch	Thermometer
PH Meter	Titration set

		The condition is complied with
10	The project authorities shall earmark an amount of Rs. 162.65 cores (as mentioned in question no. xix of questionnaire) to	The company has incurred an amount of Rs. 474.507 crores to implement the conditions stipulated by the Ministry of Environment & Forests as well as

	implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purpose. The funds already were used for environmental protection measures during the plant expansion and not diverted for any other purposes.	the State Government. The details of amount incurred is as under: The funds earmarked were used for environmental protection measures and not diverted for any other purposes. The condition is complied with

Hindalco Industries Ltd.

Unit: Birla Copper, Dahej

Capital Cost for Environmental Control Measures

Sr no	Item	Total in lacs
1	Dryer bag filer & dedusting system	669
2	Alkali Scrubber Smelter-1	8500
3	Water Cool hood Smelter-1 Converter 1,2 &3	1770
4	Ventilation hood from S & C furnace & bag house	150
5	ESPs of smelter-III	518
6	ESP's of CPP	400
7	Alkali Scrubber of Smelter –III	694
8	Effluent Treatment –II	1000
9	Sewage Treatment Plant-II	100
10	Sulfuric Acid Plant –III	8595
11	Tail Gas Scrubber SAP-III	3466.69
12	Tail Gas Scrubber SAP-I	5093.56
13	SLF for ETP waste	700
14	PG, slag & Fly ash yard- for Phase-III	2000
15	Bag filters for CHP CPP-III and ash management	800.38
16	Liberator scrubber	141
17	PMR plant Bag filter	50
18	Fluorine scrubbing system in PAP-III	203.08
19	Scrubbing system for DAP-III plant	300

	20	Green belt development	600
	21	Zero Liquid Discharge	6754
	22	Wind fencing for coal yard	1395
	23	SLF9 for ETP waste	3551
		Total in Lacs	47450.71
		Total in crore	474.5071

11	The implementation of the project vis-à-vis environmental action plans will be monitored by Ministry's regional office at Bhopal / State Pollution Control Board / Central Pollution Control Board. A six-monthly compliance status report should be submitted to monitoring agencies.	The implementation of the project is monitored by Ministry's regional office at Bhopal / State Pollution Control Board / Central Pollution Control Board. The six-monthly compliance status reports are submitted regularly. The copy of acknowledgement is attached as under: The condition is complied with
12	The Project Proponent should inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the State Pollution Control Board/ Committee and may also be seen at website of the Ministry of Environment and Forests at http://envfor.nic.in. This should be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional Officer.	The company has published the information regarding obtaining the environment clearance for the aforesaid project in two daily news papers i.e. Gujarat Samachar dtd.2.4.2005 and The Times of India dtd.2.4.2005. The condition is complied with

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J- 11011/85/2002-IA II (I)
Compliance ID	72470854
Compliance Number(For Tracking)	EC/M/COMPLIANCE/72470854/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

Annexure-D

Hindalco Industries Limited

Unit: Birla Copper, Dahej

Status of compliance to conditions of Environmental Clearance No. J-11011/220/2004-I A II (I) dated 18th March, 2005

(Six monthly compliance report **from** April-24 to September-2024)

Sub.: Phase-III Copper Smelter expansion project by M/s Hindalco Industries Limited from 2, 50,000 TPA to 5, 00,000 TPA and From 67.35 to 145.60 MW Captive Power Plants at Village Lakhigam and Dahej, Tehsil Vagra, District Bharuch in Gujarat.

[A] SPECIFIC CONDITIONS:

Sr. No.	Details of condition	Compliance status
1	All the conditions stipulated by the Ministry while according to environmental clearance to the existing project vide its letter No. J-11011/86/2002-IA. II (I) dated 10th February 2004 shall be strictly implemented.	There are seven specific condition, and eleven general conditions stipulated in environmental clearance issued by the Ministry Vide Letter No. 11011/86/2002-IA II (I) dated 10-02-2004. The total conditions are complied with. compliance report is attached in Annexure- (C)
2	The gaseous emissions from various process units should conform to the standards prescribed by the concerned authorities from time to time. The State Pollution Control Board may specify more stringent standards for the relevant parameters keeping in view the nature of the industry and its size and location. At no time the emissions level should go beyond the prescribed standards. In the event of failure of any pollution control system adopted by the unit, the respective unit should not be restarted until the control measures are rectified to achieve the desired efficiency.	The gaseous emission from various process units is within the standards prescribed by GPCB. The efficient and adequate capacity of pollution control equipment and sufficient stack height is provided to ensure the emission level well within the prescribed standards. The process operation is interlocked. It is ensured that in case of failure of pollution control system, the respective plant is stopped till the control system is rectified and restarted. The condition is complied with.

Stack analysis report April 2024 to September 2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	61.71	50 ppm	18.44	150 mg/Nm3	73.13
2	Sulphuric acid Preheater I	100 ppm	63.20	50 ppm	25.0	150 mg/Nm3	85.11
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	351.63	600 mg/Nm3	187.2	100 mg/Nm3	83.33
4	Shaft furnace of CC Rod plant I	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.57
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	42.34	50 ppm	19.62	150 mg/Nm3	55.08
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	342.87	300 mg/Nm3	179.72	50 mg/Nm3	32.65
9	Shaft furnace of CC Rod plant-III	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.56
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	84.93
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	29.54	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	30.36	NA	NA	150 mg/Nm3	86.05
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	1.04 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.32
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.86
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	19.41	NA	NA	150 mg/Nm3	51.16
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.34 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	ND	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	Nil	Acid Mist 25 mg/Nm3	NA	NA	NA
23	PMR Phase -III	40 mg/Nm3	30.77	25 mg/Nm3	18.41	150 mg/Nm3	79.39
DAP / PAP Fertilizer		F Norms	F	NH3 Norms	NH3	PM Norms	PM

DAP	6.0 mg/Nm3	Plant s/d	175 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)	6.0 mg/Nm3	Plant s/d	NA	NA	NA	NA

3 The effluent generation shall not exceed 2655 m3/d (2525 m3/d of industrial effluent and 130 m3/d of domestic effluent). The Company shall undertake measures to reduce the water consumption by recycling/ reuse measures. The company shall achieve zero discharge as per the action plan submitted to the Ministry by use of treated wastewater after conforming to the prescribed standards for green belt development (1330m3/d), lime slurry preparation (475m3/d), make up in slag granulation (480m3/d) and gas cleaning section (370m3/d). Domestic effluent shall be treated in the STP and used for green belt development.

The average industrial effluent generation is 1626 m3/d whereas domestic effluent is 107 m3/d of plant. Use of treated wastewater after conforming to the prescribed standards for green belt development (1330 m3/d), lime slurry preparation (475 m3/d), make up in slag granulation (480m3/d) and gas cleaning section (370 m3/d).

Month	Effluent generation Per day (KL)	For green belt development (KL)	Lime slurry preparation (KL)	Make up in slag granulation (KL)	Gas cleaning section (KL)
Apr-24	716	359	128	129	100
May-24	841	421	150	152	117
Jun-24	1806	905	323	327	252
Jul-24	1945	974	348	352	271
Aug-24	1943	973	348	351	271
Sep-24	1818	911	325	329	253
Average	1511	757	270	273	211

Domestic effluent is treated in STP and used for green belt development. The condition is complied with

4 The company shall install cyclone and bag-filter to control the particulate emission in concentrates handling area. The recovered dust shall be recycled

The adequate capacity bag filters (2 no's) are installed in concentrate handling area to control the particulate emission. The recovered dust is recycled in the system.
The condition is complied with

5 The company shall recover the energy from the smelter and use it for waste heat boiler. Secondary gases from the smelter shall be passed through centralized scrubbing system. Off gases from the re-boiler shall be cleaned by installation of high efficiency ESP.

The company has installed waste heat recovery boiler to generate steam of 35 m3/hr. which can produce 7 MW power from the smelter. The secondary gas from the smelter is passed through centralized scrubbing system where lime and alkali dosing is provided to neutralize the gas. Off-gases from the re-boiler is passed through high efficiency ESP to get cleaned the off-gas. The condition is complied with.

6 As per the action plan submitted to the Ministry, the Company shall achieve SO2 emission of 1kg/tonne of sulfuric acid produced. The company shall install scrubber to scrub

The SO2 emission and acid mist from stack is monitored regularly in house as well as by third party. The concentration observed is well within the prescribed standards. The average concentration observed

<table>
<tr><td></td><td>emissions during start and shut down of H2SO4 plant. The acid mist emission should conform to the prescribed standard of 50mg/Nm3</td><td>during the last six months is as under:
<table>
<tr><td>Sr. No</td><td>Stack Details</td><td colspan="2">Observed Average Value (April-24 to Sept-2024) Average value</td></tr>
<tr><td></td><td>Norm: SO2 – 1 Kg/T of 100% H2SO4 & Acid Mist- 50 mg/Nm3</td><td>SO_2 (kg/T)</td><td>Acid mist (mg/Nm3)</td></tr>
<tr><td>1</td><td>Sulphuric Acid plant – III (TGS)</td><td>0.342</td><td>Nil</td></tr>
</table>
The company has already installed scrubber to scrub the emission during start and shut and shutdown of sulfuric acid plant where lime and alkali dosing is given. The condition is complied with.</td></tr>
<tr><td>7</td><td>To control the total fluoride emission within the prescribed standards of 25mg/Nm3 in the phosphoric acid plant, the company shall provide multistage scrubbers in the phosphoric plant.</td><td>The multistage scrubber is provided to mitigate the fluoride emission from phosphoric plant. The average concentration observed during the last six months is as under:
<table>
<tr><td>Sr. No</td><td>Stack Details</td><td>Observed Average Value (Oct-23 to March-2024) HF mg/Nm3</td></tr>
<tr><td></td><td>GPCB Norm</td><td>-</td></tr>
<tr><td>1</td><td>Reactor (Phosphoric Acid Plant)</td><td>Plant Shut down. for long term maintenance</td></tr>
</table>
The condition is complied with.</td></tr>
<tr><td>8</td><td>The company shall provide HDPE lined facility with proper Leachate collection system for phospho-gypsum storage. ETP sludge shall be disposed of in the TSDF developed as per the Central Pollution Control Board guidelines. The ground water quality around the phospho-gypsum and ETP sludge disposal area shall be monitored and data submitted to the Ministry.</td><td>The HDPE lined facility with proper leachate collection system is provided for phospho gypsum storage yard. The ETP sludge is disposed of in secured landfill which is developed as per CPCB guidelines. The bore well (10 no’s) is established all around the secured landfill to monitor ground water quality. The ground water quality monitored around the ETP sludge disposal area and phospho gypsum area from April-24 to Sept-24 is attached as Annexure-III The condition is complied with.</td></tr>
<tr><td>9</td><td>Green belt in 106.11 ha. of project area shall be provided to mitigate the effects of fugitive emissions all around the plant. The development of green belt should be in consultation with the DFO as per the CPCB guidelines.</td><td>The green belt is developed to mitigate the effect of fugitive emission all around the plant. The green belt development based on expert scientific opinion and with the consultation of DFO and as per the CPCB guidelines. The green belt developed is attached as Annexure-IV. The green belt is developed in and around the plant,
Hence condition is complied with.</td></tr>
<tr><td>10</td><td>The company shall firm up the action plan for solid waste</td><td>The company has already submitted the action plan for solid waste</td></tr>
</table>

	management and submitted to the Ministry	management to the Ministry on 03.01.2005. The condition is complied with.
11	The company shall take measures for harvesting the rainwater to recharge the ground water.	The company has taken several measures for rainwater harvesting and the harvested water is utilized in green belt development. The recharge of rainwater in the ground water is not possible because the water table is high in this area. The condition is complied with.

[B] GENERAL CONDITIONS:

Sr No	Description	Status
1	The project authorities must strictly adhere to the stipulations made by the Gujarat State Pollution Control Board.	The company is fully committed to adhere to the stipulated conditions made by the GPCB. The condition is complied with
2	No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment & Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	The company has obtained prior environment clearance before expansion or modification in the plant. No deviations or alterations in the project proposal is carried out.
3	The project authorities must strictly comply with the rules and regulations under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 as amended in October 1994 and January 2000. Prior approvals from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire Safety Inspectorate etc. must be obtained. Rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and 2000 are being complied by us. Necessary licenses from Controller of Explosives, Boiler inspectorate and Factories Inspectorate have been obtained as per requirement.	The company has already obtained the permission from Chief Inspectorate of Factories, Chief Controller of Explosives, Fire safety Inspectorate for Manufacture, storage and import of hazardous chemicals rules, 1989 as amended in October 1994 and January 2000. The permission obtained from Factories Inspectorate is attached as Annexure-V The Rules and regulations under Manufacture, storage and import of hazardous chemicals rules, 1989 is complied with. The necessary permission is attached as Annexure-V The company has already obtained necessary licenses from Controller of Explosives, the necessary permission is attached as Annexure-VI Boiler inspectorate permission is attached as Annexure-VII The condition is complied with
4	The project authorities must strictly comply with the rules and regulations with regard to handling and disposal of hazardous wastes in accordance with the Hazardous Wastes (Management and Handling) Rules, 2003. Authorization from the State Pollution Control Board must be obtained for collections/ treatment/	The company has already obtained authorization under the Hazardous Wastes (Management and Handling) Rules, 2003. CCA No. AWH-108216 dated 30-05-2020 which is valid up to 02-03-2026. The condition is complied with.

	storage/disposal of hazardous wastes.	
5	The overall noise levels in and around the plant area should be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA (daytime) and 70 dBA (nighttime).	The overall noise levels in and around the plant area is 61.70 dB(A) in day time and 58.30 dB(A) in night time which is well within the standards 75 dB(A) in day time and 70 dB(A) in night time. The ambient noise level measured are as under: The condition is complied with

Monitored ambient noise levels(dB) from April-24 to September-24 (Average)

		Day time	Nighttime
Sr No.	Location	Noise Level in dB(A)	Noise Level in dB(A)
1	Near Smelter-I	63.7	62.9
2	Near SAP-I	63.2	62.2
3	Near ETP Plant	60.6	59.6
4	Near Captive Power Plant-1	64.7	63.5
5	Near DAP	61.6	60.5
6	Near Smelter-III	64.2	63.3
7	Near Guest house in T/ship	59.4	58.7
8	Near Central Park in T/ship	59.6	58.5
9	Near YMA Hostel	61.1	59.7
10	Near Gypsum yard (boundary wall)	60.9	59.5
11	Near Coal yard	60.5	59.1
12	Near Jetty Platform	62.3	61.5

6	Occupational health surveillance programme should be undertaken as regular exercise for all the employees, specifically for those engaged in handling hazardous substances. The first aid facilities in the occupational health center should be strengthened and the medical records of each employee should be maintained separately.	The occupational health surveillance of the workers is carried out by medical examination on regular basis and the records are maintained as per the factory act. The copy of records is attached Annexure-I The condition is complied with.

<table>
<tr><td>7.</td><td>The project proponent should have a scheme for social up liftment in the surrounding villages with reference to contribution in road construction, education of Children, festivals, health centers, sanitation facilities, drinking water supply, community awareness and employment to local people whenever and wherever possible both for technical and non-technical jobs</td><td>The company is committed to undertake the activities to uplift the socioeconomic status of surrounding villages like community development programme, educational programme, drinking water supply and health care etc. The activities conducted in surrounding villages and beneficiaries are as under:
The condition is complied with.</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th>Activities Undertaken</th><th>No. of Activities</th><th>Beneficiaries</th><th>No. of Villages Benefited</th></tr>
<tr><td>Education</td><td>12</td><td>31703</td><td>72</td></tr>
<tr><td>Health</td><td>164</td><td>12087</td><td>18</td></tr>
<tr><td>Sustainable livelihood</td><td>116</td><td>2365</td><td>19</td></tr>
<tr><td>Social</td><td>1</td><td>100</td><td>1</td></tr>
<tr><td>Others</td><td>9</td><td>10114</td><td>5</td></tr>
<tr><td>Total</td><td>302</td><td>56369</td><td>115</td></tr>
</table></td></tr>
<tr><td>8</td><td>The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA and Risk analysis report.</td><td>The company has taken several environmental protection measures and safeguards recommended in the EIA and risk analysis report. The majors taken and risk analysis is attached as Annexure-II</td></tr>
<tr><td>9</td><td>A separate Environmental Management Cell equipped with full-fledged laboratory facilities must be set up to carry out the Environmental Management and monitoring functions.</td><td>A separate Environmental Management Cell equipped with full-fledged laboratory facilities is set up to carry out the environmental Management and monitoring functions.
A full-fledged separate Environmental Laboratory is set up and equipped with all necessary instruments/ equipment’s. The following equipment and consumable are available in the laboratory:
<table>
<tr><td>CAAQMS (04)</td><td>OCEMS (35)</td></tr>
<tr><td>Atomic Absorption Spectrophotometer</td><td>Weather station</td></tr>
<tr><td>PM2.5, PM10 Combo</td><td>Stack Monitoring Kit (2)</td></tr>
<tr><td>Noise Level monitors (02)</td><td>Handheld SO2, NH3, HF analyzer</td></tr>
<tr><td>Multi gas Analyzer (SO2, NOx, CO2, HC, O2, and CO)</td><td>Ion selected Fluoride analyzers</td></tr>
<tr><td>Spectrophotometer (visible range)</td><td>BOD incubator</td></tr>
<tr><td>COD reflux set up</td><td>Single pan balance</td></tr>
</table></td></tr>
</table>

		<table><tr><td>Relevant chemicals as per IS 5182</td><td>Hot Air Oven</td></tr><tr><td>Stopwatch</td><td>Thermometer</td></tr><tr><td>PH Meter</td><td>Titration set</td></tr></table> The condition is complied with
10	The project authorities shall earmark an amount of Rs. 162.65 cores (as mentioned in question no. xix of questionnaire) to implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purpose. The funds already were used for environmental protection measures during the plant expansion and not diverted for any other purposes.	The company has incurred an amount of Rs 423.5715 crores to implement the conditions stipulated by the Ministry of Environment & Forests as well as the State Government. The details of amount incurred is as under: The funds earmarked were used for environmental protection measures and not diverted for any other purposes. The condition is complied with

Hindalco Industries Ltd.

Unit: Birla Copper, Dahej

Capital Cost for Environmental Control Measures

Sr no	Item	Total in lacs
1	Dryer bag filer & dedusting system	669
2	Alkali Scrubber Smelter-1	8500
3	Water Cool hood Smelter-1 Converter 1,2 &3	1770
4	Ventilation hood from S & C furnace & bag house	150
5	ESP's of smelter-III	518
6	ESP's of CPP	400
7	Alkali Scrubber of Smelter –III	694
8	Effluent Treatment –II	1000
9	Sewage Treatment Plant-II	100
10	Sulfuric Acid Plant –III	8595
11	Tail Gas Scrubber SAP-III	3466.69
12	SLF for ETP waste	700
13	PG, slag & Flyash yard- for Phase-III	2000
14	Bag filters for CHP CPP-III and ash management	800.38
15	Liberator scrubber	141

	16	PMR plant Bag filter	50
	17	Fluorine scrubbing system in PAP-III	203.08
	18	Scrubbing system for DAP-III plant	300
	19	Green belt development	600
	20	Zero Liquid Discharge	6754
	21	Wind fencing for coal yard	1395
	22	SLF9 for ETP waste	3551
		Total in Lacs	42357.15
		Total in crore	423.5715

11	The implementation of the project vis-à-vis environmental action plans will be monitored by Ministry's regional office at Bhopal / State Pollution Control Board / Central Pollution Control Board. A six-monthly compliance status report should be submitted to monitoring agencies.	The implementation of the project is monitored by Ministry's regional office at Bhopal / State Pollution Control Board / Central Pollution Control Board. The six-monthly compliance status reports are submitted regularly. The copy of acknowledgement is attached as under: The condition is complied with
12	The Project Proponent should inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the State Pollution Control Board/ Committee and may also be seen at website of the Ministry of Environment and Forests at http://envfor.nic.in. This should be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional Officer.	The company has published the information regarding obtaining the environment clearance for the aforesaid project in two daily news papers i.e. Gujarat Samachar dtd.2.4.2005 and The Times of India dtd.2.4.2005. The condition is complied with.

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J-11011/220/2004-I A II (I)
Compliance ID	72482613
Compliance Number(For Tracking)	EC/M/COMPLIANCE/72482613/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

Hindalco Industries Limited

Unit: Birla Copper, Dahej

Status of compliance to conditions of Environmental Clearance No. J-11011/927/2008 -I A II (I) dated 11th Feb 2009.
(Six monthly compliance report from April-24 to September-2024)
Sub.: Expansion of Continuous Cast Copper Rod (CCR) Plant (120000 to 240000 TPA) by de-bottlenecking at GIDC Industrial Area, Dahej, Lakhigam, District Bharuch by M/s Hindalco Industries Limited (Unit: Birla Copper, Dahej) – Environmental Clearance reg.

[A] SPECIFIC CONDITIONS:

Sl No	Condition stipulated	Compliance Status
1	The company shall comply with the stipulations made in the environmental clearance issued by the Ministry vide letter No. J-11011/220/2004-IA. II (I) dated 18.03.2005.	There are eleven specific condition, and eleven general conditions stipulated in environmental clearance issued by the Ministry Vide Letter No. J-11011/220/2004-IA. II (I) dated 18.03.2005. The total conditions have been complied with. The compliance report is attached as Annexure- (D)
2	The company shall install sufficient air pollution control equipment's to comply with the emission norms prescribed by the Gujarat Pollution Control Board.	The company has installed sufficient air pollution control equipment's to comply with the emission norms. The pollution control equipment installed in Birla copper complex is as under: 1. ESPs installed: 16 Nos. 2. Scrubbers: 4 Nos. 3. Bag Filters : 27 Nos. 4. Tail Gas Scrubber SAP-III installed in March 2019.
3	The company shall provide the monitoring arrangement with stacks/vents and regular monitoring carried out and reports submitted to the SPCB, CPCB and Ministry's Regional Office at Bhopal.	The gaseous emission from various process units is within the standards prescribed by GPCB. The efficient and adequate capacity of pollution control equipment and sufficient stack height is provided to ensure the emission level well within the prescribed standards. The process operation is interlocked. It is ensured that in case of failure of pollution control system, the respective plant is stopped till the control system is rectified and restarted. The condition is complied with.

Stack analysis report April 2024 to September 2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	61.71	50 ppm	18.44	150 mg/Nm3	73.13
2	Sulphuric acid Preheater I	100 ppm	63.20	50 ppm	25.0	150 mg/Nm3	85.11
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	351.63	600 mg/Nm3	187.2	100 mg/Nm3	83.33
4	Shaft furnace of CC Rod plant I	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.57
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	42.34	50 ppm	19.62	150 mg/Nm3	55.08
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	342.87	300 mg/Nm3	179.72	50 mg/Nm3	32.65
9	Shaft furnace of CC Rod plant-III	100 ppm	ND	50 ppm	ND	150 mg/Nm3	86.56
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	84.93
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	29.54	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	30.36	NA	NA	150 mg/Nm3	86.05
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	1.04 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.32
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	82.86
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	19.41	NA	NA	150 mg/Nm3	51.16
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.34 Kg/T	Acid Mist 25 mg/Nm3	ND	NA	NA
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	ND	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	Nil	Acid Mist 25 mg/Nm3	NA	NA	NA

23	PMR Phase -III	40 mg/Nm3	30.77	25 mg/Nm3	18.41	150 mg/Nm3	79.39
DAP / PAP Fertilizer		F Norms	F	NH3 Norms	NH3	PM Norms	PM
DAP		6.0 mg/Nm3	Plant s/d	175 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)		6.0 mg/Nm3	Plant s/d	NA	NA	NA	NA

4	Secondary fugitive emissions from all the sources shall be controlled within the latest permissible limits issued by the Ministry and regularly monitored. Guidelines / Code of practice issued by the CPCB shall be followed	Secondary fugitive emissions from all the sources are within the permissible limits issued by the Ministry and are regularly monitored. Fugitive emission monitored as per CPCB code of practices.
5	The water requirement and wastewater generation for expansion project shall not exceed 500.0 KLD and 0.5 KLD respectively.	The water consumption from April-24 to September-24 was 157.95 KLD and wastewater generation was 0.369 KLD.
6	The company shall obtain the permission for drawl of 500 KLD water from Narmada River and submit a copy to the Ministry's Regional Office at Bhopal.	Condition is already complied with; the Company has obtained permission of 11 MGD water from GIDC, as the approving authority for water drawl from Narmada River is GIDC.
7	Green belt shall be developed in 33% area in and around the plant as per the CPCB guidelines in consultation with DFO	The green belt is being developed as per the CPCB guidelines in consultation with local DFO.
8	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, Safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Already complied with.

[B] GENERAL CONDITIONS:

Sl No	Description	Status
1	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board (SPCB) and the State Government.	The company is fully committed to adhere to the stipulated conditions made by the GPCB.
2	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment & Forests.	The company has obtained prior environmental clearance before expansion or modification in the plant. No deviations or alteration in the project proposal is carried out.
3	The gaseous emissions from various process units shall conform to the load/mass-based standards notified by this Ministry on 19th May, 1993 and standards prescribed from time to time. The State Pollution Control Board (SPCB) may specify more stringent	The emission level is well below the prescribed standards. The process is interlocked with the operation of Pollution control devices. The copy of emission observed and reported to the GPCB and Ministry is as under attached (Ref Special Condition No.3)

	standards for the relevant parameters keeping in view the nature of the industry and its size and location. At no time, the emissions level shall go beyond the prescribed standards. Interlocking facilities shall be provided so that process can be automatically stopped in case emission level exceeds the limit.	
4	At least four ambient air quality monitoring stations shall be established in the downward direction as well as where maximum ground level concentration of SPM, SO2 and NOX are anticipated in consultation with the SPCB. Data on ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office and the SPCB/CPCB once in six months.	The concentration of SPM, SOx and NOx is being monitored and reported to GPCB, CPCB and Ministry. The copy of monitoring data is as below.

The concentration of SPM, SOx and NOx is being monitored at four locations and Reported to GPCB, CPCB and Ministry. The copy of monitoring data is as under: The statistical analysis of ambient air quality is as under: AAQMS Average ((µg/m3) (April-24 to Sept-24).

Hindalco Industries Limited Unit: Birla Copper, Dahej
AMBIENT AIR QUALITY AVERAGE MEAN (µg/m3)

Sr. No.	Monitoring Stations	April-24 to Sept-24			
		PM 10	PM 2.5	SO2	NOx
1	Township	54.54	40.52	35.20	11.38
2	Jetty	58.36	41.57	35.13	12.12
3	Near 16 ha	59.61	44.03	34.49	59.61
4	Near YMA	56.31	44.00	35.17	10.70

5	In-plant control measures for checking fugitive emissions from all the vulnerable sources shall be provided. Further, specific measures like water sprinkling around the coal stockpiles and asphalting or concreting of the roads shall be done to control fugitive emissions.	All possible measures have been adopted to mitigate the fugitive emission; dedicated water sprinkling system is deployed control the fugitive emission. The roads are made concrete or asphalt to reduce fugitive emission.
6	Industrial wastewater shall be properly collected and treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.	Adequate capacity effluent treatment plant is installed to treat effluent from different parts of plant. The treated effluent maintains the prescribed standards. The copy of quality of treated effluent is attached as under: Treated Effluent analysis report for month of April-24 to Sept-24 is as under:

The observed values of parameters monitored are well within limits, hence condition is complied with.

Sr. No	Parameters	Units	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	GPCB Norms	Treated Effluent analysis report Average
1	pH	--	7.58	7.66	7.50	7.55	7.65	7.74	5.5-9.0	7.61
2	Temp	o C	30	31.00	30.35	30.05	30.7	30.55	45	30.44
3	Colour	units	10.79	10.80	10.75	10.00	10.85	10.74	100	10.65
4	Suspended Solids	mg/L	19.16	18.99	19.07	18.12	19.89	19.53	100	19.13
5	COD	mg/L	34.19	34.36	32.90	33.01	33.81	37.30	250	34.26
6	BOD 3 day at 27o C	mg/L	8.33	7.99	8.20	8.42	7.67	8.07	100	8.11
7	Oil & Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20	<0.1
8	Phenolic compound	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	<0.1
9	Ammonical N2	mg/L	9.75	10.33	10.09	9.93	10.48	9.55	50	10.02
10	Sulphide	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0	<0.2
11	Cyanides	mg/L	Nil	Nil	Nil	Nil	Nil	Nil	0.2	Nil
12	Fluoride	mg/L	2.01	2.15	1.92	2.06	1.91	1.99	10	2.01
13	Hexa. Chromium	mg/L	0.39	0.42	0.40	0.38	0.42	0.44	1.0	0.41
14	Total Chromium	mg/L	0.43	0.40	0.47	0.44	0.43	0.44	2.0	0.43
15	Copper	mg/L	0.25	0.23	0.20	0.24	0.26	0.25	3.0	0.24
16	Nickel	mg/L	0.09	0.01	0.08	0.07	0.09	0.10	5.0	0.07
17	Zinc	mg/L	0.25	0.25	0.27	0.21	0.26	0.20	15.0	0.24
18	Mercury	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
19	Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1	<0.005
20	Arsenic	mg/L	0.04	0.05	0.032	0.025074	0.040	0.032	0.2	0.04
21	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.000	<0.01
22	Insecticides and Pesticides	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01
24	Bio-Assay Test	% Survival of fish after 96 hrs. in 100 % effluent.	96.89	96.47	96.12	96.65	96.16	96.47	95.00	96.46

<table>
<tr><td>7</td><td>The overall noise levels in and around the plant area should be kept well within the standards 85 dB(A) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dB(A) (day time) and 70 dB(A) (night time).</td><td>The overall noise levels in and around the plant area is 62.50 dB(A) in daytime and 61.00 dB(A) in nighttime which is well within the standards (75 dB(A) in daytime and 70 dB(A) in nighttime) The ambient noise level measured are as under:
<table>
<tr><td>Noise Measurement (April-24 to Sept-24)</td><td>Day time</td><td>Nighttime</td></tr>
<tr><td>Location</td><td>Noise Level in dB(A)</td><td>Noise Level in dB(A)</td></tr>
<tr><td>Near Township opp. to Arogya</td><td>61.2</td><td>59.2</td></tr>
<tr><td>Near 16 ha opp. to Smelter-III</td><td>63.2</td><td>62.4</td></tr>
<tr><td>Near YMA Hostel</td><td>60.7</td><td>59.3</td></tr>
<tr><td>Near Jetty Platform</td><td>65.0</td><td>63.2</td></tr>
</table></td></tr>
<tr><td>8</td><td>Occupational health surveillance of the workers shall be done on a regular basis and the records maintained as per the factory act.</td><td>The occupational health surveillance of the workers is carried out by medical examination on a regular basis and the records are maintained as per the factory act. The copy of records is attached Annexure-I</td></tr>
<tr><td>9</td><td>The company shall develop rainwater harvesting structures to harvest the rainwater for utilization in the lean season besides recharging the ground water table.</td><td>The company has developed rainwater harvesting structure and the harvested water is utilized in green belt development. The ground water table of this area is high hence the recharging of ground water is not possible.</td></tr>
<tr><td>10</td><td>The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA/EMP report further, the company must undertake socio-economic development activities in the surrounding villages like community development programme, educational programme, drinking water supply and health care etc. suggestion made during the public hearing shall be implemented</td><td>The company has undertaken adequate measures to protect the environment and safeguards as per the recommendations already made in EIA/EMP report. The protection measures taken are attached as Annexure-II. The company is committed to undertake the activities to uplift the socioeconomic status of surrounding villages like community development programme, educational programme, drinking water supply and health care etc. The activities conducted in surrounding villages and beneficiaries are as above: April-24 to Sept-24 CSR data The public hearing of this project was exempted by MoEFCC, New Delhi</td></tr>
</table>

Activities Undertaken	No. of Activities	Beneficiaries	No. of Villages Benefited
Education	12	31703	72
Health	164	12087	18
Sustainable livelihood	116	2365	19
Social	1	100	1
Others	9	10114	5
Total	302	56369	115

11	Adequate fund shall be earmarked towards capital cost and recurring cost/annum for environment pollution control measures and shall be judiciously utilized to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State	Adequate fund has been provided towards the capital cost of pollution control measures and implement the condition stipulated by Ministry of environment and forest. The capital cost earmarked was Rs.60 crores and recurring cost was Rs.3 crores/annum. The funds earmarked had been utilized judiciously for environmental protection purposes only.

	Government. The funds so provided shall not be diverted for any other purpose.	
12	The Regional Office of this Ministry / CPCB / SPCB shall monitor the stipulated conditions. A six-monthly compliance report and the monitored data along with statistical interpretation shall be submitted to them regularly.	The Regional Office MoEFF& CC, Bhopal / GPCB is monitoring the stipulated conditions on a regular basis. A six-monthly compliance report and the monitored data along with statistical interpretation is submitted to MoEFF& CC, Bhopal and MoEFF & CC, New Delhi whereas the monitoring data is being sent to GPCB on monthly basis. The acknowledgement copies of latest six-monthly report submitted to MoEFF Bhopal and MoEFF & CC, New Delhi is attached as under after general condition no.14. The details of monitoring results of various stacks, ambient air quality is given in compliance status of specific condition No. 3 and general condition No. 4 respectively.
13	The Project Proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the State Pollution Control Board/ Committee and may also be seen at Website of the Ministry of Environment and Forests at http://envfor.nic.in. This should be advertised within seven days of the date of issue of the clearance letter, at least in two local newspapers that are widely. circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the regional office.	Project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB and may also be seen at Website of the Ministry of Environment, Forests and Climate Change (MoEFF & CC) has been advertised in two local newspapers and a copy of the same has been submitted to the regional office at Bhopal. Complied with
14	The Project Authorities should inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work, if any.	The company has informed the Regional Office as well as the Ministry, the date of financial closure and final approval of the project and commencing the land development work.

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J-11011/927/2008 -I A II (I)
Compliance ID	72496389
Compliance Number(For Tracking)	EC/M/COMPLIANCE/72496389/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

Hindalco Industries Limited

Unit: Birla Copper, Dahej

Status of compliance to conditions of Environmental Clearance No. J-11011/927/2008-IA II (I) 23rd February,2017.

(Six monthly compliance report from April-24 to September-2024)

Sub.: Expansion of Continuous Cast Copper Rod Plant (CCR) capacity from 2, 40,000 TPA to 4, 84,000 TPA by setting up of a New CCR plant of 2, 44,000 TPA capacity by M/s Hindalco Industries Ltd., located at Village(s) Lakhigam and Dahej, Tehsil Vagra, District Bharuch Gujarat. - Environmental Clearance regarding.

[A] SPECIFIC CONDITIONS:

Sl No	Condition stipulated	Compliance Status
1	The project proponent shall install 24x7 automatic air monitoring devices (Continuous Emission Monitoring System) to monitor air emissions, as provided by the CPCB and submit report to Ministry and its Regional Office.	We have installed 34 no's of 24x7 automatic air monitoring devices (Continuous Emission Monitoring System) to monitor air emissions, and emission observed reports are submitted to Ministry and its regional office periodically.
2	Continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), bag house, bag filters etc. shall be provided to keep the emission levels below 50 mg/Nm3 and installing energy efficient technology.	Continuous stack monitoring facilities for all the stacks have been provided. The Electrostatic precipitator (ESP), Bag house, bag filters are provided to keep the emission levels below prescribed limit.
3	The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No.826 (E) dated 16th November 2009 shall be followed.	At four location CAAQMS has been installed and running satisfactorily. Two in up wind and two in down wind direction. All parameters have been monitored as per the consent granted by GPCB Gandhinagar.
4	The Project Proponent shall install scrubber or upgrade the existing scrubbers within one year to reduce Sox emission which will be verified by the Regional Office.	The scrubber is already installed, and SOx emission is being monitored regularly and observed values are well within limit. We have installed Tail Gas Scrubber in SAP-III in the year 2018-19 to reduce further SOx emissions.
5	Vehicular pollution due to transportation of raw material and finished product shall be controlled. Proper arrangements shall also be made to control dust emissions during loading and unloading of the raw material and finished product.	The internal roads are constructed with RCC. The high-volume mechanized road sweeping machines (02 no's) are provided to clean the road regularly. The water sprinkling system is provided to control fugitive dust emissions during loading and unloading of coal in coal yard.

6	A statement on carbon budgeting including the quantum of equivalent C02 being emitted by the existing plant operations, the amount of carbon sequestered annually by the existing green belt and the proposed green belt and the quantum of equivalent C02 that will be emitted due to the proposed expansion shall be prepared by the project proponent and submitted to the Ministry and the Regional Office of the Ministry. This shall be prepared every year by the project proponent. The first such budget shall be prepared within a period of 6 months and subsequently it should be prepared every year.	The carbon budgeting including the quantum of equivalent C02 being emitted by the existing plant operations, the amount of carbon sequestered annually by the existing green belt and the proposed green belt and the quantum of equivalent C02 is being monitored periodically by the competent agency third party, Confederation India Industries, New Delhi.
7	For the employees working in high temperature zones falling in the plant operation areas, the total shift duration would be 4 hrs. or less per day where the temperature is more than 50°C. Moreover, the jobs of these employees will be alternated in such a way that no employee is subjected to working in high temperature area for more than 1hr continuously. Such employees would invariably be provided with proper protective equipment, garments, and gears such as head gear, clothing, gloves, eye protection etc. There should also be an arrangement for sufficient drinking water at site to prevent dehydration etc.	The Employees working in high temperature zones falling in the plant operation areas, the job is rotated every 4 hrs. where the temperature is more than 50°C. The employee is shifted to another area, where temperature is normal/ambient condition. The protective equipment, garments, and gears such as head gear, aluminum tapping suite, hand gloves, safety goggles have been provided to employee who are working in high temperature. Sufficient arrangement i.e. water Cooler is provided for drinking water at site to avoid dehydration.
8	The internal roads should be designed such that the fire tenders should reach up to 10 meters of any unit.	All internal roads are well designed;fire tenders are easily accessible up to 10 meters
9	'Zero' effluent discharge shall be strictly followed, and no wastewater shall be discharged outside the premises.	We have adequate capacity with the latest technology effluent treatment plant to treat the entire effluent generated during the process. We have primary treatment as well as secondary treatment up to Reverse Osmosis. The treated water is reused in our process. We have permission from Gujarat Pollution Control Board, Gandhinagar to discharge the RO reject 300 m3/day into the deep sea with diffuser system. We are in progress to achieve Zero Liquid Discharge. We have installed the Tertiary Water Recycling unit, which is commissioned, from which we will recycle 700 m3/day and the remaining 300 m3/day water will be discharged in deep sea.

10	Regular monitoring of influent and effluent surface, sub-surface and ground water shall be ensured and treated wastewater shall meet the norms prescribed by State Pollution Control Board or described under the E (P) Act.	The regular monitoring of six samples on a daily basis analyzed in our own laboratory of influent and effluent samples. Surface, sub-surface and ground water have been carried out monthly once Treated water is conforming to the norms prescribed by Gujarat Pollution Control Board or described under the E(P)Act and report of treated water is being submitted monthly to Gujarat Pollution Control Board.
11	Proper handling, storage, utilization, and disposal of all the solid waste shall be ensured and regular report regarding toxic metal content in the waste material and its composition, end use of solid/hazardous waste shall be submitted to the Ministry's Regional Office, SPCB and CPCB.	The Proper handling, storage, utilization, and disposal of all the solid waste have been ensured i.e., Phosphogypsum, Copper Granulated Slag and Fly ash are stored properly. The FORM-4 under Hazardous and other waste Handling, Storage and Management & Tr-Rule-2016 is being submitted periodically.
12	A time bound action plan shall be submitted for reduction in solid waste, its proper utilization and disposal.	The solid waste generation and disposal is monitored monthly. The Phospho gypsum generation is stopped as Phosphoric Acid Plant which produces Phosphogypsum is under shutdown for long period. The Copper granulated Slag is used for cement manufacturing, road construction as abrasive material. The generated Fly ash have been utilized 100% in various applications such as Cement & Brick manufacturing and Road construction.
13	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1999 and subsequent amendment in 2003, 2009 and 2016. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Memorandum of Understanding shall be submitted to the Ministry's Regional Office at Chennai.	We have ensured the Fly Ash utilization as per Notification, 1999 and subsequent amendment in 2003, 2009 and 2016.The fly ash generated in our plant has been 100% utilized f for Cement and Bricks manufacturing.
14	A Risk and Disaster Management Plan shall be prepared, and a copy submitted to the Ministry's Regional Office, SPCB and CPCB within 3 months of issue of environment clearance letter.	The Risk and Disaster Management Plan is prepared and submitted to the Ministry's Regional Office, GPCB and CPCB.
15	Green belts shall be developed all along the periphery of the plant boundary in 33 % of plant area. Selection of plant species shall be as per the CPCB guidelines in consultation with the DFO.	The green belt is developed all along the periphery of the plant. The total greenbelt development is about 35 % of the plant area.
16	At least 2.5% of the total cost of the project shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues, locals need and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional	The company has incurred sufficient amount on Enterprises Social Commitment. The company has been doing several social activities with the consultant of Gram Panchyat, and District Administration. The amount incurred during 05 years on different social activities are as

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<td>Office. Implementation of such a program shall be ensured by constituting a Committee comprising of the proponent, representatives of village Panchayat and District Administration. Action taken report in this regard shall be submitted to the Ministry's Regional Office. An amount of at least Rs. 4.25 crores will be set aside by the Project Proponent with a detailed plan for the ESC activities to be carried out in next 4 years.</td>
<td>under:
<table>
<tr><th>Sr No.</th><th>Year</th><th>Amount Incurred (in Lakhs)</th></tr>
<tr><td>1</td><td>2019-2020</td><td>165.37</td></tr>
<tr><td>2</td><td>2020-2021</td><td>87.99</td></tr>
<tr><td>3</td><td>2021-2022</td><td>121.08</td></tr>
<tr><td>4</td><td>2022-2023</td><td>64.37</td></tr>
<tr><td>5</td><td>2023-2024</td><td>63.01</td></tr>
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</td>
</tr>
<tr>
<td>17</td>
<td>The proponent shall prepare a detailed CSR Plan for every year for the next 5 years for the existing-cum-expansion project, which includes village-wise, sector-wise (Health, Education, Sanitation, Health, Skill Development, and infrastructure requirements such as strengthening of village roads, avenue plantation, etc.) activities in consultation with the local communities and administration. The CSR Plan will include the amount of 2% retain annual profits as provided for in Clause 135 of the Companies Act, 2013 which provides for 2% of the average net profits of previous 3 years towards CSR activities for life of the project. A separate budget head shall be created and the of the Plan shall be submitted as part of the Compliance Report to RO. The details of the CSR Plan shall also be uploaded on the company website and shall also be provided in the Annual Report of the company. The plan so prepared shall be based on SMART (Specific, Measurable,
Achievable, Relevant and Time bound) concept. The expenditure should be aimed at sustainable development and direct free distribution and temporary relief should not be included.</td>
<td>The Company has separate CSR cell and dedicated manpower to take care of the CSR activities as per clause 135 of the companies Act – 2013. The CSR Plan has covered surrounding villages where several social up liftment activities initiated, such as monthly health camps, women empowerment, skill development for young youth, infrastructure development i.e., construction of school building, sewage drainage all along the village Lakhigam, water supply to Dahej and Lakhigam. A separate budget has been provided. The details of the CSR Plan were uploaded on the company website and provided in the Annual Report of the company.
The details of CSR plan carried out during April-24 to Sept-2024 is as under:
<table>
<tr><th>Activities Undertaken</th><th>No. of Activities</th><th>Beneficiaries</th><th>No. of Villages Benefited</th></tr>
<tr><td>Education</td><td>12</td><td>31703</td><td>72</td></tr>
<tr><td>Health</td><td>164</td><td>12087</td><td>18</td></tr>
<tr><td>Sustainable livelihood</td><td>116</td><td>2365</td><td>19</td></tr>
<tr><td>Social</td><td>1</td><td>100</td><td>1</td></tr>
<tr><td>Others</td><td>9</td><td>10114</td><td>5</td></tr>
<tr><td>Total</td><td>302</td><td>56369</td><td>115</td></tr>
</table>
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</tr>
<tr>
<td>18</td>
<td>The Company shall submit within three months their policy towards Corporate Environment Responsibility which shall inter-alia address (i) Standard operating process/procedure to being into focus any infringement deviation/ violation of environmental or forest norms/conditions, (ii) Hierarchical system or Administrative order of</td>
<td>We have a Corporate Environment policy. We have SOPs to address infringement deviation / violation of Environmental norms /conditions, Hierarchical system to deal with environmental issues and ensuring compliance and communication with stakeholders. The corporate Environment Responsibility duly signed by our Managing Director.</td>
</tr>
</table>

	the Company to deal with environmental issues and ensuring compliance to the environmental clearance conditions and (iii) System of reporting of non-compliance/violation environmental norms to the Board of Directors of the company and/or stakeholders or shareholders.	Annexure attached
19	The project proponent shall provide solar light system for all common areas, streetlights, villages, parking around project area and maintain the same regularly.	The common areas, streetlights, villages, parking around project area are provided with LED bulbs. We have installed 27 solar lights in plant area, and we are in process to increase the nos.
20	The project proponent shall provide for LED lights in their offices and residential areas.	We have provided LED light in offices and residential areas.
21	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, Safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project	The provisions have been made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, Safe drinking water, medical health care, etc. during the construction period. Temporary structures have been removed after the completion of the project.

[B] GENERAL CONDITIONS:

Sl No	Description	Status
1	The project authorities must strictly adhere to the stipulations made by the Gujarat Pollution Control Board and the State Government.	The company is fully committed to adhering to the stipulated conditions made by the GPCB.
2	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF & CC).	Noted and shall be complied with.
3	At least four ambient air quality monitoring stations should be established in the downward direction as well as where maximum ground level concentration of PM10, PM2.5, SO2 and NOx are anticipated in consultation with the SPCB. Data on ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office at Bhopal and the Bhopal and the GPCB/CPCB once in six months.	Four ambient air quality stations have been established, 02 in the downward direction and 02 in upwind direction, where maximum ground level concentration of PM10, PM2.5, SO2 and NOx are anticipated. The report of Ambient Air quality and Stack emission have been submitted to Ministry of Environment Forest and Climate Change including its Regional Office at Bhopal and GPCB periodically.

Hindalco Industries Limited Unit: Birla Copper, Dahej
CONTINUOUS AMBIENT AIR QUALITY AV. MEAN (µg/m3)

Sr. No.	Monitoring Stations	April-24 to September-24			
		PM 10	PM 2.5	SO2	NOx
1	Township	81.48	25.17	1.59	5.60
2	Jetty	11.99	19.31	12.13	14.87
3	Near 16 ha	31.42	1.16	8.06	12.82
4	Near YMA	40.98	2.34	7.16	11.26

Stack analysis report April-24 to Sept-2024		SO2		NOx		PM	
Sr No	Stack list at Birla Copper	GPCB Norms	Observed	GPCB Norms	Observed	GPCB Norms	Observed
			Value		Value		value
1	Dore furnace of PMR plant	100 ppm	4.11	50 ppm	5.065	150 mg/Nm3	21.66
2	Sulphuric acid Preheater I	100 ppm	5.20	50 ppm	5.20	150 mg/Nm3	11.2
3	CPP-I (CFBC Boiler) 35 MW	600 mg/Nm3	164.69	600 mg/Nm3	44.3	100 mg/Nm3	12.20
4	Shaft furnace of CC Rod plant I	100 ppm	1.64	50 ppm	2.92	150 mg/Nm3	37.16
5	Shaft furnace of CC Rod plant-II	-	Plant s/d	--	NA	-	Plant s/d
6	Sulphuric acid Pre-heater-III	100 ppm	11.21	50 ppm	0.00	150 mg/Nm3	10.10
7	CPP-II (CFBC Boiler) 15.35 MW	600 mg/Nm3	Plant s/d	600 mg/Nm3	Plant s/d	150 mg/Nm3	Plant s/d
8	CPP-III (CFBC Boiler) 60 MW	600 mg/Nm3	122.07	300 mg/Nm3	0.00	50 mg/Nm3	4.52
9	Shaft furnace of CC Rod plant-III	100 ppm	19.92	50 ppm	3.64	150 mg/Nm3	20.57
10	Anode Casting of Smelter-I	40 mg/Nm3	ND	25 mg/Nm3	ND	150 mg/Nm3	32.98
11	Main stack Sec. Gas Scrubber of Smelter-I	40 mg/Nm3	17.18	NA	NA	NA	NA
12	Main stack Slag Cleaning Furnace of Smelter-I	40 mg/Nm3	10.25	NA	NA	150 mg/Nm3	44.70
13	Main Stack Sulphuric Acid plant - I	2.0 kg/T of 100 % H2SO4	0.023	Acid Mist 25 mg/Nm3	ND	NA	NA
14	Cathode Stripping m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA
15	Anode scrap Washing m/c of Ref-I	40 mg/Nm3	ND	NA	NA	NA	NA

16	Liberator stack of Refinery-I	40 mg/Nm3	ND	Acid Mist 25 mg/Nm3	ND	NA	NA
17	Slag granulation of Smelter-I	40 mg/Nm3	ND	NA	NA	150 mg/Nm3	2.69
18	Steam Dryer of Copper Conc. of Smelter-I	40 mg/Nm3	6.07	NA	NA	150 mg/Nm3	4.41
19	Centralized Scrubbing System Smelter-III	40 mg/Nm3	2.53	NA	NA	150 mg/Nm3	31.93
20	Sulphuric Acid plant – III (TGS Scrubber)	1.0 kg/T of 100 % H2SO4	0.057 ND	Acid Mist 25 mg/Nm3	ND NA	NA	NA NA
21	Cathode Stripping m/c - Ref-III	40 mg/Nm3	Nil	NA	NA	NA	NA
22	Liberator stack of Refinery-III	40 mg/Nm3	1.64	Acid Mist 25 mg/Nm3	1.27	NA	31.60
23	PMR Phase -III	40 mg/Nm3	F	25 mg/Nm3	5.065	150 mg/Nm3	21.66
DAP / PAP Fertilizer		F Norms	F	Plant s/d	NH3	PM Norms	PM
DAP		6.0 mg/Nm3	Plant s/d	Plant s/d	Plant s/d	150 mg/Nm3	Plant s/d
Reactor (Phosphoric Acid plant)		6.0 mg/Nm3	Plant s/d	4.11	NA	NA	NA

4	Industrial wastewater shall be properly collected and treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.	Adequate capacity effluent treatment plant is installed to treat effluent from different parts of plant. The quality of treated water conforms to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993. The quality of treated effluent is attached as under:

Sr. No	Parameters	Units	Apr-24	May-24	June-24	July-24	Aug-24	Sept-24	GPCB Norms	Treated Effluent analysis report Average
1	pH	--	7.58	7.66	7.50	7.55	7.65	7.79	5.5-9.0	7.62
2	Temp	o C	30	31.00	30.35	30.05	30.7	30.55	45	30.44
3	Colour	units	10.79	10.80	10.75	10.00	10.85	10.74	100	10.65
4	Suspended Solids	mg/L	19.16	18.99	19.07	18.12	19.89	19.53	100	19.13

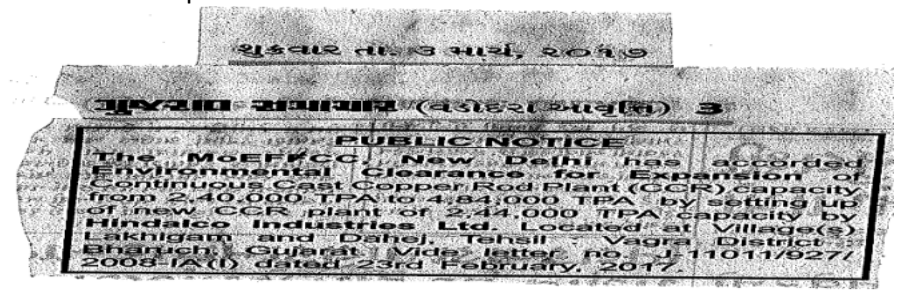
5	COD	mg/L	34.19	34.36	32.90	33.01	33.81	37.30	250	34.26
6	BOD 3 day at 27o C	mg/L	8.33	7.99	8.20	8.42	7.67	8.07	100	8.11
7	Oil & Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20	<0.1
8	Phenolic compound	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	<0.1
9	Ammonical N2	mg/L	9.75	10.33	10.09	9.93	10.48	9.55	50	10.02
10	Sulphide	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0	<0.2
11	Cyanides	mg/L	Nil	Nil	Nil	Nil	Nil	Nil	0.2	Nil
12	Fluoride	mg/L	2.01	2.15	1.92	2.06	1.91	1.99	10	2.01
13	Hexa. Chromium	mg/L	0.39	0.42	0.40	0.38	0.42	0.44	1.0	0.41
14	Total Chromium	mg/L	0.43	0.40	0.47	0.44	0.43	0.44	2.0	0.43
15	Copper	mg/L	0.25	0.23	0.20	0.24	0.26	0.25	3.0	0.24
16	Nickel	mg/L	0.09	0.01	0.08	0.07	0.09	0.10	5.0	0.07
17	Zinc	mg/L	0.25	0.25	0.27	0.21	0.26	0.20	15.0	0.24
18	Mercury	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
19	Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1	<0.005
20	Arsenic	mg/L	0.04	0.05	0.032	0.025	0.040	0.032	0.2	0.04
21	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.000	<0.01
22	Insecticides and Pesticides	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01
24	Bio-Assay Test	% Survival of fish after 96 hrs. in 100 % effluent.	96.89	96.47	96.12	96.65	96.16	96.47	95.00	96.46

5	The overall noise levels in and around the plant area shall be kept well within the standards (85dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA (daytime) and 70 dBA (nighttime).	The overall noise levels in and around the plant area is 62.5 dB(A) in daytime and 61.0 dB(A) in nighttime which is well within the standards (75 dB(A) in daytime and 70 dB(A) in nighttime) The ambient noise level measured are as under:

Noise Measurement (April-24 to Sept-24)	Day time	Nighttime
Location	Noise Level in dB(A)	Noise Level in dB(A)
Near Township opp. to Arogya	61.1	59.6
Near 16 ha opp. to Smelter-III	63.2	61.8
Near YMA Hostel	61.1	59.5
Near Jetty Platform	62.3	61.5

6	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.	The occupational health surveillance of the workers is being done on a regular basis and records maintained as per the Factories Act.
7	The company shall develop rainwater harvesting structures to harvest the rainwater for utilization in the lean season besides recharging the ground water table.	The company has developed rainwater harvesting structure and the harvested water is utilized in green belt development. The ground water table of this area is high hence the recharging of ground water is not possible.
8	The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA/EMP report. Further, the company must undertake socio- economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc.	Development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care women empowerment programmes, including all the environmental protection measures and safeguards recommended in EIA/EMP report.
9	Requisite funds shall be earmarked towards capital cost and recurring cost/annum for environment pollution control measures to implement the conditions stipulated by the Ministry of Environment, Forest, and Climate Change (MoEF & CC) as well as the State Government. An implementation schedule for implementing all the conditions stipulated herein shall be submitted to the Regional Office of the Ministry at Bhopal. The funds provided shall not be diverted for any other purpose.	The amount incurred on environment pollution control measures during the the funds earmarked towards capital cost and recurring cost/annum for environment pollution control measures to implement the conditions stipulated by the Ministry of Environment, Forest, and Climate Change (MoEF & CC) as well as the State Government has been already incurred and implemented. The amount incurred on environment pollution control measures under capital cost are as under: 1. Tertiary water recycling Unit : 57.40 crore 2. Wind Screen at Coal yard : 14.0 crore 3. Bag filers at transfer points : 7.0 crore 4. Hygiene Bag filter Smelter-III : 5.25 Lakhs 5. SLF-9 (Captive TSDF) : 35.51 crore
10	A copy of clearance letter shall be sent by the proponent to concern Panchayat, Zila, Parishad/Municipal Corporation, Urban Local Body, and the local NGO, if any, from whom suggestions /representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	The condition is complied with.

11	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the MOEFCC at Bhopal. The respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; PM10, S02, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	We have uploaded Environment clearances on website. The monitoring reports have been submitted to the Regional Office of the MOEFCC at Bhopal. The respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely, $PM_{2.5}$ PM_{10}, S02, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects are monitored and displayed at the main gate of the company in the public domain.
12	The project proponent shall also submit six monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data (both in hard copies as well as by e-mail) to the Regional Office of MOEFCC, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bhopal / CPCB / SPCB shall monitor the stipulated conditions.	We have submitted six monthly reports on the status the compliance of the stipulated environmental conditions including results of monitored data (both in hard copies as well as by e-mail) to the Regional Office of MOEFCC, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bhopal / CPCB/SPCB.
13	The environmental statement for each financial year ending 31 st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental conditions and shall also be sent to the respective Regional Office of the MOEFCC at Bhopal by e-mail.	We have prepared Form-V Environmental Statement for the financial year ending 31st March 2024 and submitted it to Gujarat Pollution Control Board dated 16th Sept 2024 as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently. The status of compliance of environmental conditions have been periodically sent to the respective Regional Office of the MOEFCC at Bhopal.
14	The Project Proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB and may also be seen at Website of the Ministry of Environment, Forests and Climate Change (MoEF & CC) at http:/envfor.nic.in. This shall be advertised	The Environment Clearance project is available on the Website of the Ministry of Environment, Forests and Climate Change (MoEF & CC) . The information to the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the GPCB. We had given for advertised in two local newspapers dated 03rd March-2017. A copy of the same has been submitted to the regional office at Bhopal.

	within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the regional office at Bhopal.	Advertisement published is attached as below.  PUBLIC NOTICE The MoEF/CC, New Delhi has accorded Environmental Clearance for Expansion of Continuous Cast Copper Rod Plant (CCR) capacity from 2,40,000 TPA to 4,84,000 TPA by setting up of new CCR plant of 2,44,000 TPA capacity by Hindalco Industries Ltd. Located at Village(s) Lakhigam and Dahej, Tehsil : Vagra District : Bharuch, Gujarat. Vide letter no. J-11011/927/ 2008-IA(I) dated 23rd February, 2017.  THE TIMES OF INDIA, AHMEDABAD FRIDAY, MARCH 3, 2017 TIMES CITY 5 PUBLIC NOTICE The MoEF/CC, New Delhi has accorded Environmental Clearance for Expansion of Continuous Cast Copper Rod Plant (CCR) capacity from 2,40,000 TPA to 4,84,000 TPA by setting up of new CCR plant of 2,44,000 TPA capacity by Hindalco Industries Ltd. Located at Village(s) Lakhigam and Dahej, Tehsil : Vagra District : Bharuch, Gujarat. Vide letter no. J-11011/927/ 2008-IA(I) dated 23rd February, 2017.
15	Project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work.	The company has informed the Regional Office as well as the Ministry, the date of financial closure and final approval of the project.

Your (Environment Clearance) application has been Submitted with following details	
Proposal No	J-11011/927/2008-IA II (I)
Compliance ID	52228261
Compliance Number(For Tracking)	EC/M/COMPLIANCE/52228261/2024
Reporting Year	2024
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	31-05-2024
IRO Name	Shrawan Kumar Verma
IRO Email	kr099.ifs@nic.in
State	GUJARAT
IRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Shrawan Kumar Verma, GUJARAT with Notification to Project Proponent.	

FORM No. 32 Health Register (Prescribed under Rule 68-T and 102)

1. Sr.No.Reg.of Adult workers :

2. Name Of Worker : Bhavesh S. Prajapat.

3. Sex : Male 4. Date Of Birth 1-6-80 5. Date Of Join 13 NOV 2009 6. Cont.No - 9712105934

Department/ Works	Name Of Hazardous Processes	Dangerous Process	Nature of Job of Occupation	Raw Materials Products or by products likely to be exposed to	Date of Posting	Date of leaving/ transfer to or transfer	Reasons for discharge/ leaving or transfer	Medical examination and the results thereof				If declared unfit for work				Signature with date of the Factory Medical Officer/the Certifying Surgeon
								Date	Signs and Symptoms observed during examination	Nature of tests & results there of	Result Fit/Unfit	Period of temporary withdrawal from that work	Reason for such withdrawal	Date of declaring him unfit for that work	Date of issuing fitness certificate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CCR					4/6/1980	—	—	18/6/18	NIL	NAD	Fit	—	—	—	18/6/18	
CCP					"	—	—	12/7/19	NIL	NAD	Fit	—	—	—	12/7/19	
CCR					"	—	—	5/11/2020	NIL	NAD	FIT	—	—	—	5/11/2020	
CCR					"	—	—	4/6/2021	NIL	NAD	FIT	—	—	—	4/6/21	
CCP					"	—	—	1/8/21	NIL	NAD	FIT	—	—	—	1/8/21	

Annexure-I

Annexure-II

Environment Protection Management

1.0 Air Quality Management - Existing at Birla Copper:

The following control measures have been adopted in the existing plant operations to maintain the air quality of the region.

- Bag filters are provided for recovery & recycle of
- Concentrate dust from steam drying area.
- Furnace dust from Slag Cleaning Furnace (SCF)
- Dust from Precious Metal Recovery plant.

The respective bag filters are connected to stacks of adequate height for proper dispersion.

- Waste heat recovery boilers have been installed as energy conservation measure to capture heat from off gasses of the furnaces. .
- Separate Electrostatic Precipitators (ESP's) are provided for recovery and recycle of dust from operation of smelting and converting in furnaces.
- Two separate alkali scrubbers are provided for cleaning of secondary gases. . The scrubbers are connected to respective stacks of adequate height for proper dispersion.
- Sulphuric Acid Plants have been provided with Five-pass converter system with Double Conversion and Double Absorption (DCDA) facility to ensure maximum conversion of SO_2 gases in to H_2SO_4.Tail Gas Scrubber is installed in Sulphuric Acid Plant-3 and commissioned successfully in March-2019.
- Electrostatic Precipitators (ESP's) have been installed for dust collection in the form of fly ash from flue gases of power plants. Lime injection in boilers of power plants is being carried out to capture SO_2.
- Adequate ventilation and air conditioning have been provided in the plant with a view to maintain better working conditions.

The quality of gaseous emissions from stacks as well as ambient air are regularly monitored and are found to be within the norms specified by GPCB.

2.0 Water and Wastewater Management

Details of Existing ETP

Industrial effluent streams from various plants like Smelter, Refinery, Sulphuric Acid plant, CCR Plant, PMR plant is sent to main ETP by pumping, which is collected in Raw Effluent Tank - I & II. ETP is having capacity to treat effluent up to 320 m^3 /hr of avg. load (max – 400 m^3/ hr).

2.1 Effluent Treatment process:

Effluent from raw effluent tank is pumped at regulated flow rate to Precipitation Reactor Tank, PRT - IV where lime solution is added. The lime dosing is linked with pH of effluent which is raised to 1.5 to 2.0 with agitation and air purging. The effluent from PRT– IV is sent to Thickener – II, where flocculent are added to and precipitated solids mainly Calcium Sulphate is settled in bottom in form of slurry. This slurry is dewatered in Rotary Vacuum

Drum Filter – II and thus obtained ETP waste is known as first stage ETP gypsum. The first stage ETP gypsum is non-metallic solid waste.

The overflow effluent from Thickener – II is pumped to PRT- I, where lime solution & $FeSO_4$ solution are added to increase the pH further from 1.5 to 2.0 up to 4.0 to 5.0. Agitation and air purging is continued, from there it flows by gravity to PRT-II, where pH of effluent is gradually raised up to 8 with addition of lime. In PRT-III pH is raised up to 9 to 10 by lime slurry addition. During this process all heavy metals get precipitated and from their hydroxides with Lime along with Calcium Sulphate. Neutralized effluent then overflows to thickener – I, flocculent solution is added in before entry in to Thickener - I. Precipitated solids get separated from bottom as slurry and sent to Rotary Vacuum Drum Filter through slurry tank. Thus formed ETP waste mainly contains calcium sulphate and traces of heavy metals, which is dry enough for easy handling, and sent through dumper to secured land fill facility for ETP waste disposal. Clear overflow from Thickener – I is sent to Treated Effluent tank. Blow down of cooling towers is collected in a sump and sent to lagoon.
In Treated effluent Sulphuric acid is dosed in effluent to attain pH range of 6.5 to 8.5. Thus, treated effluent is sent to Treated Effluent Lagoon through Alumina Filter. The lagoon is having two compartments and two vertical pumps are installed on Treated Effluent Lagoon for final disposal in deep sea at a point (Lat. 21^0 42' 00", Long. 72^0 30'35"). The effluent discharge point is recommended by NIO and approved by GPCB. A HDPE pipeline (3.2 km long) is installed for disposal of treated effluent from ETP.
As per the study conducted by National Institute of Oceanography in 1996, release of treated effluent quantity up to 5759 m^3/day at above mentioned point after meeting with the GPCB norms is unlikely to have any adverse impact on marine ecology. At present the effluent discharge quantity is lower than 1000 m^3/day. Treated effluent from lagoon is also partially used for green belt development within premises and in RO Plant.

2.2 Effluent Units: List of Units / equipment of existing Effluent Treatment plant

Sr.	Name of Unit / Tank	Capacity	Size
1.	Equalization Tank	600 m^3	Length - 16 M ; Height – 5.6 M; Width-10.8
2.	HRSCC	1000 m^3	Dia - 20 M ; Height – 4.5 M
3.	Clarified water storage tank	300 m^3	L – 10 M ; H – 4.8 M, W –9.6 M
4.	Filter Water tank	600 m^3	L – 12.8 M ; H – 6.2 M, W-10
5.	RO product Tank	400 m^3	L-9.8M; W-8.8M, H-6 M
6.	RO Reject	180 m3	L-9.3M; W-5.4M; H-4.6 M
7.	UF Permeate Tank	120	

2.3 Mechanical Equipment's

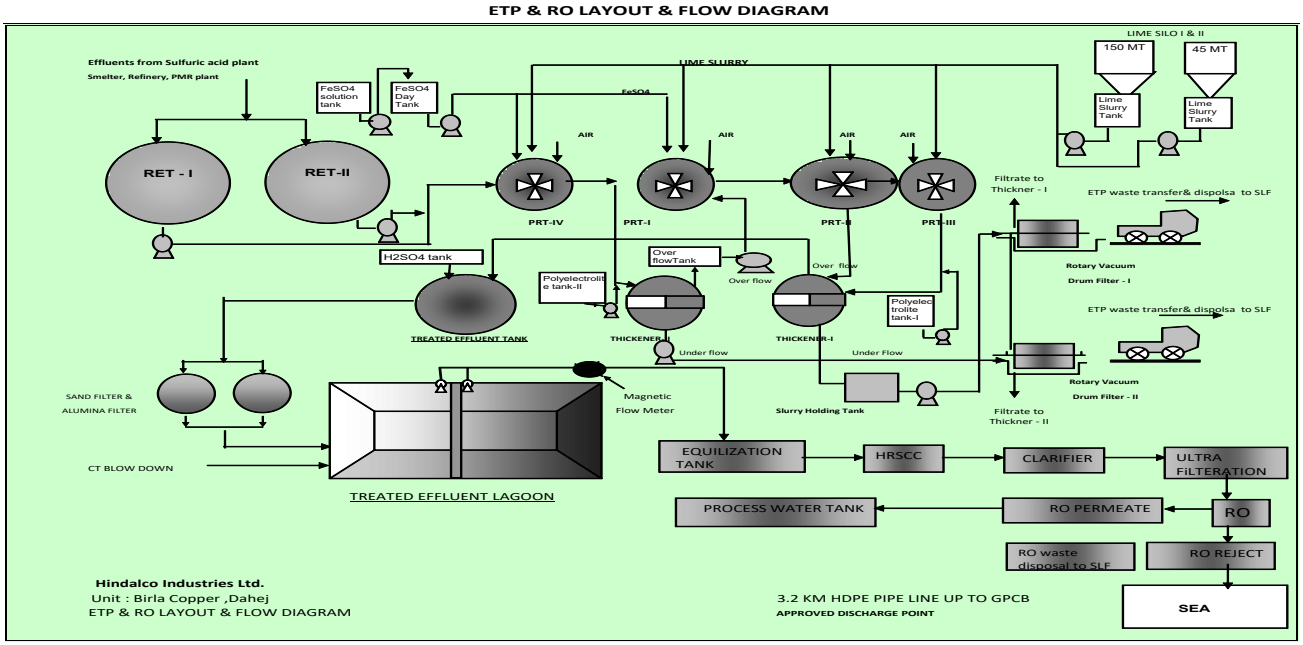
Sr.	Name of Unit	Capacity (M3/hr)	KW / RPM
1.	Equalization feed pump I	250	22/1500
2.	Effluent transfer pump (1W+1S)	280	5.5 / 1500

3.	PSF Feed Pump (1W+1S)	280	37 /1500
4.	DMF&UF Feed Pump (1W+1S)	285	37/2900
5.	Lime Dosing Pump (1W+1S)	20	5/2900
6.	Flocculent Dosing Pump (1W+1S)	0 – 260 LPH	0.18
7.	Fecl3 Dosing Pump (1W+1S)	0 – 260 LPH	0.18
8.	HCl Dosing Pump (1W+1S)	0 – 260 LPH	0.18
9	Hypo Dosing pump (1W+1S)	0 – 260 LPH	0.18
10	Soda Ash dosing pump (1W+1S)	3000 LPH	3.75
11	RO Feed pump (1W+1S)	250	37/2900
12	HP Pump (2W+1S)	105	132/2900
13	Booster Pump 1W	39	18.5/2900
14	Product transfer pump (1W+1S)	100	15/2900
15	Reject Water pump (1W+1S)	85	37/2900
16	Sludge transfer Pump (1W+1S)	25	7.5/2900
17	Filter Press feed pump (2W+1S)	20	11/1500
18	CIP Pump (1W+1S)	70	18.5/2900
19	Air Compressor	30 cfm	11.5/2900
20	Equalization Tank blower	750 M3/hr	15/1450
21	Filter Backwash blower	200 M3/hr	5.5/1450
22	HRSCC Agitator	-	5.5/1440/50
23	Flash mixer	-	2.25/900/120
24	HRSCC scraper	-	1.5/900/0.06
25	Thickener scraper	-	0.57/750/0.06
26	Lime Agitator	-	2.25/1440/75
27	Soda Agitator	-	3.75/1440/75
28	Dolomite Agitator	-	1.5/1440/75

2.4 Solution Preparation Tanks

Sr. No.	Description of Tanks	Capacity	Size
1.	Lime Solution Tank I & II	12 m^3 (each)	Dia – 2 m
2.	Soda Ash tank 1 & 2	20 m3 (each)	Dia -2.5 M
3.	FeCl3 Tank 1	3 M3	Dia 1.5 M
4.	Dolomite Tank 1	10 M3	Dia 1.5 M

2.5 ETP FLOW DIAGRAM:



2.6 Details on Process of Sewage Treatment Plant:

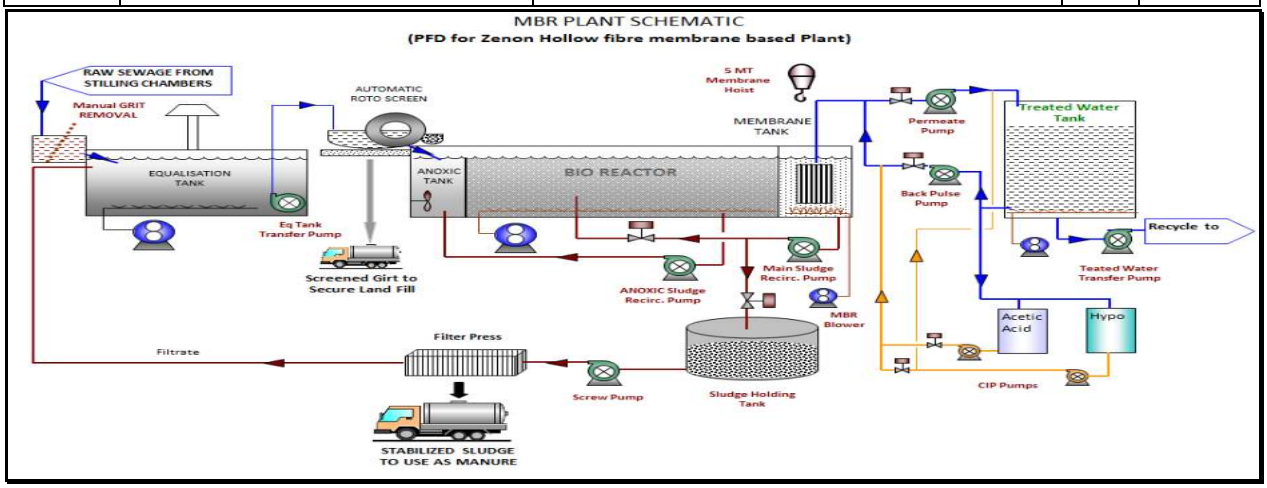
The sewage water from various plants comes through the separate piping network in to Sewage Treatment Plant. This plant is having avg. 500 KLD of treatment capacity. Additional sewage generated due to proposed expansion i. e. 6 KLD will also be treated in same STP. The raw sewage is collected in the equalization tank. Before entering to the equalization tank, the sewage is passed through a coarse screen (16 mm), a fine screen (6 mm) and finally to oil & grease trap. Air is supplied to the equalization tank with the help of a mixing blowers to prevent settling of the sewage. From the tank, sewage is passed to the anoxic tank for further treatment through the sewage transfer pumps. The oxygen deficient environment within the anoxic tank supports the micro-organisms required for the de-nitrification process. Then the sewage is passed to the aeration tank. Air required by the micro-organisms is provided by the blowers and is introduced into tank through an air diffuser array. The sewage along with biomass is passed to the Membrane Bioreactor Tank (MBR) where the biological sludge separated by ultra-filtration membranes to produce particle free permeate/treated water. The settled biological sludge is recycled to aeration tank through Return Activated Sludge (RAS) pump for maintaining bacterial level & excess sludge is passed to Sludge Sump tank to Filter Press. The filter press removes water from the sludge, filtrate is passed to equalization tank and dewatered sludge is sent for disposal. As a final process stage, permeate is transferred to a UV unit for disinfections then finally stored in treated water tank for further plant water usage. The water quality achieved is as good as it is directly recycled back to plant processes.

The advantages of this system are:

- Effective organics (COD and BOD) removal
- Low sludge production
- Good tolerance against effluent water quality fluctuation
- Optimized process circumstances in different treatment step minimize energy consumption and nutrient dosing.
- Highest solids tolerance of any hollow-fibre membrane

2.7 Second stage to obtain higher recoveries

Sl. No.	Units	Size	Qty	Make
1	Settling Chamber	3.55m x 1.70m x 1.25m SWD + 0.5m FB	1	RCC
2	Bar Screen Chamber	3.00m x 0.70m x 0.30m SWD + 0.5m FB	2	RCC
3	Oil & Grease Trap	8.00m x 1.70m x 0.75m SWD + 0.85m FB	1	RCC
4	Collection Sump	21.40m x 5.80m x 2.10m SWD + 0.75m FB	1	RCC
5	Anoxic Tank	5.00m x 2.00m x 4.50m SWD + 0.5m FB	1	RCC
6	Aeration Tank	7.00m x 3.50m x 4.50m SWD + 0.5m FB	1	RCC
7	Membrane Bio-Reaction Tank	3.20m x 3.05m x 3.615m SWD + 0.5m FB	1	RCC
8	Sludge Holding Tank	2.70m x 3.05m x 2.60m SWD + 0.5m FB	1	RCC
9	Treated Water Tank	11.90m x 3.70m x 5.75m SWD + 0.5m FB	1	RCC



3.0 Noise Levels:

Suitable noise enclosures are provided in the plant, and the green belt development shall work as noise attenuators. No worker is exposed to noise level above a mean Leq (8 hours) level of 90 dB (A). Personal protection devices like ear plugs/muffs are provided to workers exposed to noisy operations. The high-speed fans and pumps are installed in closed chambers and have vibration insulators.

Few of the noise abatement measures at Birla Copper are:

- Effective enclosure is constructed of heavy weight material and any air gaps in its construction are filled with master or other fillers
- Usage of acoustic proof material for walls, ceilings and doors to absorb sound waves to reduce reverberations will result in significant noise reduction

- All the openings like covers, partitions are acoustically sealed
- The use of damping materials such as thin rubber/sheet for insulating the noise generating sources
- Shock absorbing techniques are adopted to reduce impact.
- Inlet and outlet mufflers are provided to the outlet of the exhausts.
- Provision of separate acoustic proof (soundproof) cabins for workers/operators
- Hearing protectors such as ear plugs/muffs are provided to the operators working in the high noise areas.

The green belt, which is provided in an area of 117 acres, acts as a noise attenuator.

The noise levels in the workplace environment, particularly near the generating sources, are monitored regularly.

4.0 Solid Waste Management:

Three types of solid wastes are generated at Birla Copper. These wastes find various uses. Birla Copper has initiated an action plan to find new avenues for utilizing the solid wastes. The details of generation and utilization of solid wastes from April-24 to September-24 are summarized below:

Solid Waste Generation and Utilization (April-24 to September-24)						
Months	Granulated Slag		Fly Ash		Phosphogypsum	
	Generation	Dispatch	Generation	Dispatch	Generation	Dispatch
	MT	MT	MT	MT	MT	MT
Apr-24	29308	91256	4179	4179	0	62751
May-24	32474	39564	4169	4169	0	84760
Jun-24	61775	71748	6526	6526	0	28979
Jul-24	66544	69805	6573	6573	0	0
Aug-24	67909	64720	7018	7018	0	0
Sep-24	57793	65430	8052	8052	0	962
Total	315803	402523	36517	36517	0	177453

4.1 Granulated Slag:

Granulated slag is a Ferro-silicate type of material & inert in nature generated from the Copper Smelter and used as abrasive material for sand blasting and road and land filling purposes.

4.2 Phosphogypsum:

The following are the usages of Phosphogypsum

- Usage of Phosphogypsum as additive in Cement manufacturing. Major customers are Ultra Tech Cement
- Usage of Phosphogypsum as additive in Fertilizer industry.
- Usage of Phosphogypsum to manufacture Plaster of Paris.
- Usage of Phosphogypsum as Soil Conditioner.

4.3 Fly Ash

Fly ash is generated from the coal based captive power plant.

The fly ash generated from the existing operations is currently being supplied for brick, cement manufacturing and topsoil voids filling.

4.4 Solid waste disposal facilities developed onsite.

All solid wastes are individually stored within the plant premises in designated areas. The details about the present facilities for solid wastes are as per the following:

Name of facility	Overall Size	Area covered (Ha)	Capacity (MT)	Exhausted/ in use
Granulated slag yard	280m x 120m	3.36	900000	In use
Phosphogypsum yard – 1	300m x 250m	7.50	1000000	In use
Phosphogypsum yard – 2	325m x 310m	10.08	1700000	In use
Phosphogypsum yard – 3	275m x 275m	7.56	1100000	In use
Fly ash storage	120m x 70m	0.84	65000	In use

4.5 Management of Hazardous Wastes

4.5.1 ETP Waste

ETP waste generated from the Effluent Treatment Plant is disposed in a captive secured land fill designed as per CPCB guidelines.

ETP waste from Rotary Vacuum Drum Filters have 30 to 40% moisture which is easy to handle and directly unloaded in to dumpers placed below rotary vacuum drum filters, so that no manual contact is made during loading of ETP waste. The dumpers hydraulically operated to unload the ETP waste, into the SLF cell, thereby avoiding manual contact.

DETAILS ON WASTE STORAGE / DISPOSAL FACILITIES				
Name of facility	**Overall Size**	**Area covered (Ha)**	**Capacity (MT)**	**Exhausted/ in use / in construction**
ETP waste SLF – I	90 m x 65 m	0.59	32000	Exhausted & remediated
ETP waste SLF – II	90 m x 85 m	0.77	52000	Exhausted & remediated
ETP waste SLF – III	131m x 86.4m	1.12	83000	Exhausted & remediated
ETP waste SLF – IV	230 m x 120 m	2.76	262000	Exhausted & remediated
ETP waste SLF – V	230 m x 120 m	2.76	262000	Exhausted & remediated
ETP waste SLF – VI	257 m x 109 m	2.80	262000	Exhausted & remediated
ETP waste SLF – VII	257 m x 109 m	2.80	262000	Exhausted & remediated
ETP waste SLF – VIII A	435 m X 100 m	5.42	536400	In use w. e. f. 01-09-2018 Exhausted 31st May 2022
ETP waste SLF – VIII -B				In use w. e. f. 01-06-2022 Exhausted
ETP waste SLF – IX-A		6.674	667400	In use from 18-10-2024

Other hazardous wastes like SAP dust residue, dust from SCF bag filter and PMR bag filter, Cu-As precipitate and HFA is being reused and recycled within the plant. Used oil and discarded containers are being sent to registered recyclers for reuse. Spent electrolyte generated from Refinery is being treated in ETP. Spent resin from WTP and spent catalyst from SAP disposed off in captive SLF.

5.0 Green Belt Development

The main objective of the green belt is to provide a barrier between the plant and the surrounding areas. The green belt helps to capture the fugitive emissions and to attenuate the noise & odor generated in the plant apart from improving the aesthetics of the plant site.

Birla Copper has developed green belt along the plant boundary, internal roads and vacant places in the plant including the township area. The total area of green belt is about 133 ha. The green belt area is more than the total built up area of the plant. different types of species suitable to this region have been planted.

The various species planted in and around the plant site are given in the table below:

Scientific name	**Common name**
Acasia arabica	Babul
Annona squamosa	Sitafal
Azadirachta indica	Neem
Borassus sp	Borldi
Callistemon lancedltus	Bottle brush
Cassia fistula	Cassia
Casurinia equisetifolia	Casurina
Cessalpennia pulcherima	Gultora
Dalbergia sissoo	Sissoo
Delonix regia	Gulmohar
Dendrocalamus strictus	Bamboo
Eucalyptus sp	Nilgiri
Ficus bengalensis	Bargad
Ficus benzimean	Rubber plant
Ficus indica	Banyan
Ficus religiosa	Peepal
Hibiscus sp	Hibiscus
Mangifera indica	Mango
Nerium sp	Kanar
Peltophorum ferrugineum	Peltophorum
Plumeria alba	Champa
Spathodia campanulata	Spathodia
Syzigium jambolana	Jamun
Tamarinduc indica	Imli
Tecoma gaudichadi	Tecoma
Terminallia cuttapa	Badam
Terminelia arjuna	Arjuna
Thespesia populnea	Paras papal

6.1 Environment Policy

Birla Copper has a written environment policy declaring its responsibility and commitment to protect the environment.

ENVIRONMENT POLICY

We, at Hindalco Industries Limited, operating across the process chain from mining to semi-fabricated products in non-ferrous metals, will strive to continually improve our environmental performance for sustainable operations and responsible growth globally, by integrating sound environmental systems & practices and Pollution Prevention approach.

To achieve this, we shall:

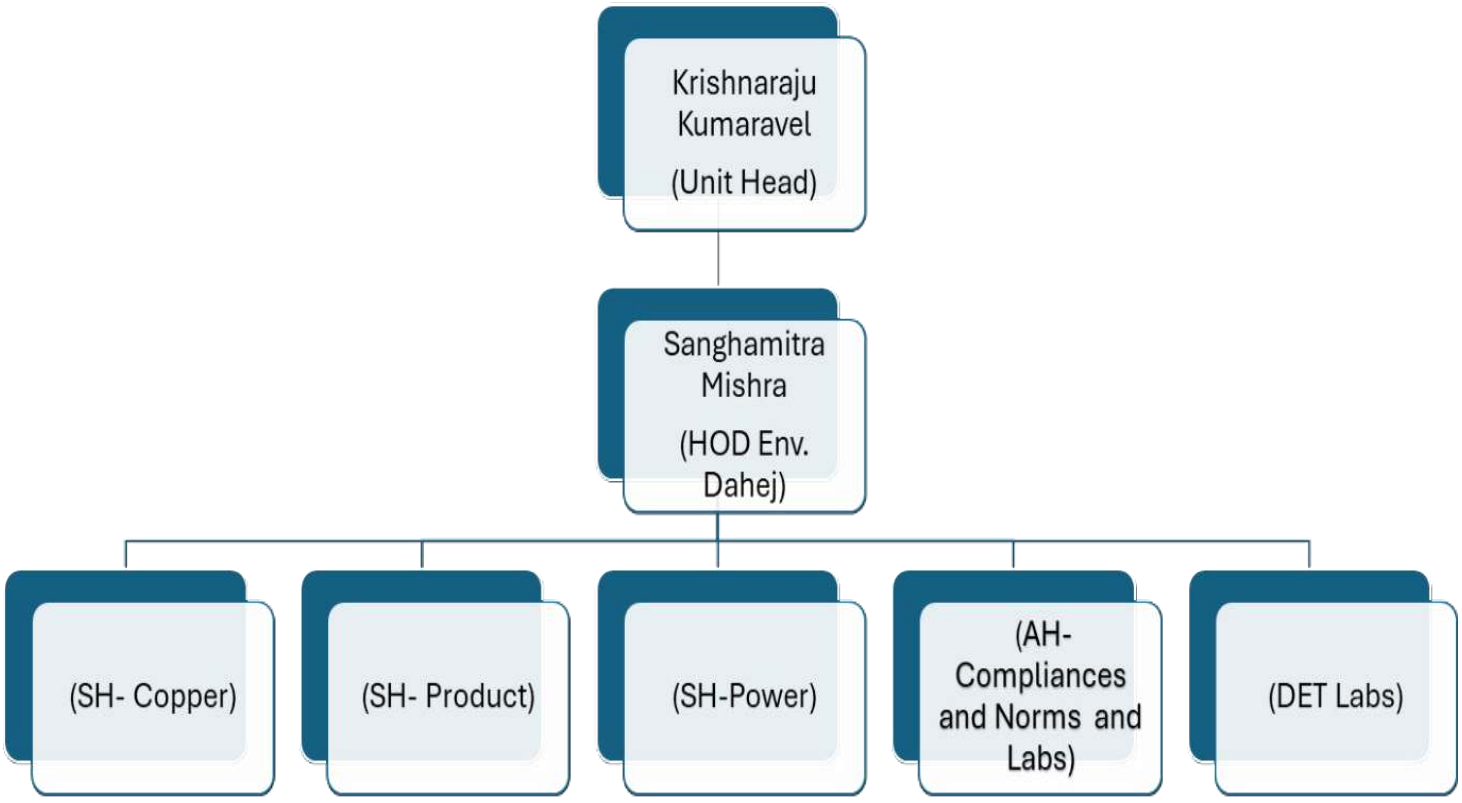
- Continue to comply with all applicable legal and other requirements on environment.
- Continually improve environmental performance by strengthening the Environmental Management System conforming to national /international standards, including setting up and reviewing targets and measuring, monitoring and reporting their progress.
- Allocate sufficient resources such as organisational structure, technology and funds for implementation of the policy and for regular monitoring of performance.
- Adopt pollution prevention approach for all our processes; enhance material efficiency and achieve high productivity.
- Conserve key resources like electricity, coal, water, oil, and raw materials, by promoting efficient technologies and manufacturing process improvements, water conservation programmes, and efficient use of raw materials.
- Adopt energy efficient and cleaner technologies based on techno-economic viability, appropriate to the region in which we operate, and in line with our growth and diversification plans.
- Promote the principles of waste prevention, reduction, reuse, recycling and recovery to minimize waste generation and strengthen the practices for management of wastes.
- Work in partnership with regulatory authorities, relevant suppliers, contractors, distributors and logistics partners and all other stakeholders, as applicable, to understand and initiate improvement actions.
- Engage with internal and external stakeholders including key business partners such as joint venture partners, licensees and outsourcing partners and wider communities, to broaden our understanding of environmental priorities and initiate actions on key environmental challenges.
- Adapt environmental performance over life cycle as an important input to the decision-making processes in the organization.
- Raise environmental awareness at all levels of our operations, through training and effective communication, participation and consultation.
- Communicate this Policy within the Organization. Develop and follow appropriate communication system to inform other stakeholders, as applicable, about our environmental commitment and performance.
- Conduct environmental, health and safety due diligence before undergoing any mergers and acquisitions.

This policy shall be made available to all employees, suppliers, customers, community and other stakeholders, as appropriate. The implementation of this policy is the responsibility of respective heads of units with the monitoring and tracking done by the Apex Sustainability Committee under the guidance of the Managing Director.

Satish Pai
MD, Hindalco Industries Limited
Date : 9th August, 2022

6.2 Environment Management Cell

A full-fledged separate Environmental Laboratory is functioning. It is equipped with all necessary instruments**.** It is headed by AVP (Environment), who reports to President & Unit Head.
Structure of Environment Cell is under:



Following equipment and consumable are available in the laboratory:

CAAQMS (04)	OCEMS (35)
Atomic Absorption Spectrophotometer	Weather station
PM2.5,PM10 Combo	Stack Monitoring Kit (3)
Noise Level monitors (02)	Hand held SO2 , NH3, HF analyser
Multi gas Analyser (SO2, NOx, CO2 , HC, O2, and CO)	Ion selected Fluoride analysers
Spectrophotometer (visible range)	BOD incubator
COD reflux set up	Single pan balance
Relevant chemicals as per IS 5182	Hot Air Oven
Stopwatch	Thermometer
PH Meter	Titration set

7.0 SAFE-GUARDS AS RECOMMENDED IN THE EIA AND RISK ANALYSIS REPORT AND COMPLIED BY THE BIRLA COPPER:

The following disaster management plans are being followed in the plant while handling the fuels/solvents.

HSD: A separate dyke wall is constructed to contain the liquid in case of spillage from tank. Tank is fitted with all safety gauges like Level indicator, Temperature gauge. Storage is surrounded by fire hydrant system. All electrical fittings used in area are flameproof type.

Propane & LNG: The construction and maintenance of Propane bullet is as per approval from competent authority (Chief Inspectorate of Explosives, Nagpur). The flooring around Propane bullet area is of concrete and free from depressions. Only two fittings, one for water drain – off line and other for liquid drain off line is provided at the bottom of Propane bullet. Five nos. of Safety valves have been provided on bullet. Arrangement for water spraying system for cooling of Propane bullet is provided, which can be actuated from outside of propane area. Flameproof electrical fittings are used for Propane bullet area.

Presently, liquid natural gas is being used in the process in place of propane. Hence, a request for cancellation of license for the propane storage has been made to the regulatory authority. LNG is being directly taken from the suppliers through the pipe line. No storage of LNG within the premises.

Sulphuric Acid: The Sulphuric acid tanks are provided with level gauge and necessary safety gauges. The tanks are located inside Dyke wall, with a view to contain the acid spillage if any takes place in case of emergency.

Disaster Management Plan to be followed in case of spills/Leakages of fuels/Solvents:

HSD: Spillages will be treated as fire hazard. Spillages causes slippery surface. The spillage will be absorbed onto sand, earth or any suitable absorbent material like diatomaceous earth. The spillage will be transferred to a container and disposed off safely. It will not be allowed to enter drains, sewers, or watercourses. Spillages or

Uncontrolled discharges into watercourses or large spillages on land must be alerted to the Environmental Agency or the appropriate regulatory body.

Isopropyl Alcohol: In case of spill/leakage, all ignition sources will be removed. The runoff will be prevented from entering storm sewers and natural waterways and will be absorbed with clay, diatomaceous earth, dry sand other inert material.

Sulphuric Acid: Slippery when wet. Proper protective equipment shall be worn to prevent skin and eye contact and inhalation of mist. The spill will be contained using sand, earth, inert material or vermiculite. It will be diluted with water (fine spray or fog) then neutralized with lime. The spilled material shall be transferred to SLF for disposal.

Furnace Oil: Full protective clothing, rubber gloves (PVC, Neoprene, Nitrile, or Viton), gumboots and respirator will be worn. Leaks will be shut off and all sources of heat or flame will be removed from the vicinity. Spill will be controlled by use of booms, sand, sawdust or any other suitable available medium.

On-site Emergency and Off-site Emergency plan:

The company has prepared a On-site Emergency and Off-site Emergency plan approved by regulatory authority and revised time to time to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations. At the same time also addresses all the requirements of environment protection act schd-11.

Annexure-III

Hindalco Industries Ltd.

Unit : Birla Copper, Dahej

Ground Water Analysis (Avg) near Solid Waste Facility (April-24 to Sept-24)											
	Unit	HP-01	HP-02	HP-03	HP-04	HP-05	HP-06	HP-07	HP-08	HP-09	HP-10
pH	--	8.17	7.21	6.94	7.21	7.87	7.19	7.20	7.96	7.45	7.72
SS	mg/L	25.26	15.44	21.96	24.92	25.14	21.96	15.86	18.63	17.54	25.86
TDS	mg/L	10780	29528	38440	38160	6205	21452	33925	6697	45064	27035
COD	mg/L	19.03	21.03	18.79	21.38	20.06	18.88	20.49	20.26	18.37	19.20
BOD3	mg/L	6.34	7.01	6.26	7.13	6.69	6.29	6.83	6.75	6.12	6.40
Fluoride	mg/L	0.36	0.07	0.20	0.81	0.27	0.31	0.10	0.12	0.26	0.17
Copper	mg/L	0.03	0.27	0.09	0.08	0.05	0.05	0.10	0.04	0.05	0.11
Nickel	mg/L	0.25	0.25	0.22	0.22	0.22	0.27	0.23	0.220	0.223	0.259
Iron	mg/L	0.11	0.78	0.01	0.02	0.03	0.01	0.01	0.03	0.18	0.01
Zinc	mg/L	0.21	2.70	1.17	1.45	3.13	1.58	2.63	1.97	2.67	1.65
Chloride	mg/L	3889	3676	3919	3559	3783	3985	3754	3563	3697	3731
O&G	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	mg/L	0.005	0.005	0.002	0.002	0.000	0.002	0.000	0.002	0.001	0.001
Chromium	mg/L	0.000667	0.001	0.002	0	0.002	0.001	0.00037	0.002	0.004	0.002
Colour	Hazen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Taste	---	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline	Saline

Hindalco Industries Ltd.
Unit: Birla Copper, Dahej

Annexure-IV

Green Belt Development:

The main objective of the green belt is to provide a barrier between the plant and the surrounding areas. The green belt helps to capture the fugitive emissions and to attenuate the noise & odor generated in the plant apart from improving the aesthetics of the plant site. Birla Copper has developed green belt along the plant boundary, internal roads and vacant places in the plant including the township area. The total area of green belt is about 123.5 ha. Thirty different types of species suitable to this region have been planted.

The various species planted in and around the plant site are given in the table below:

Scientific name	**Common name**
Acasia arabica	Babul
Annona squamosa	Sitafal
Azadirachta indica	Neem
Borassus sp	Borldi
Callistemon lancedltus	Bottle brush
Cassia fistula	Cassia
Casurinia equisetifolia	Casurina
Cessalpennia pulcherima	Gultora
Dalbergia sissoo	Sissoo
Delonix regia	Gulmohar
Dendrocalamus strictus	Bamboo
Eucalyptus sp	Nilgiri
Ficus bengalensis	Bargad
Ficus benzimean	Rubber plant
Ficus indica	Banyan
Ficus religiosa	Peepal
Hibiscus sp	Hibiscus
Mangifera indica	Mango
Nerium sp	Kanar
Peltophorum ferrugineum	Peltophorum
Plumeria alba	Champa
Spathodia campanulata	Spathodia
Syzigium jambolana	Jamun
Tamarinduc indica	Imli
Tecoma gaudichadi	Tecoma
Terminallia cuttapa	Badam
Terminelia arjuna	Arjuna
Thespesia populnea	Paras papal

Green belt developed at 16 ha in plant area ,11000 native species were planted.

Annexure-V

Directorate Industrial Safety & Health

Gujarat State

FORM NO. 4

(Prescribed under Rules 5)

License to work a factory

Registration No. **233/27201/1997**
FIN. **S06011335A**

License No. **11335**
D.A. **25-Mar-1997**

License is hereby granted to

Mr. K N BHANDARI

For the premises known as

HINDALCO INDUSTRIES LIMITED [UNIT: BIRLA COPPER]

situated at

AT: LAKHIGAM PO: DAHEJ TAL-VAGRA DIST: BHARUCH

Ta.: **Vagra** Dist.: **Bharuch**

for use as a factory within the limits specified in the plan approved by the

Joint Director Industrial Safety and Health, Surat Region

vide No. **1107** Date **19-Nov-2009** subject to provisions of the

Factories Act, 1948 and the Rules made thereunder.

The license is issued for:

- Maximum Number of workers to be employed on any day during the Year :** **Above 5000****
- Maximum installed power in B.H.P. on any day during the year :** **Above 5000****

The license is valid up to 31st December **2026**,

Fees paid Rs. **401,450.00**
Fees due Rs. **401,450.00**
Excess Rs. **0.00**
Place : Bharuch
Date : 17-Dec-2021

Signature Not Verified
Digitally signed by VASAVA DIPAKKUMAR KANTILAL
Date: 2021.12.31 12:06:39 +05:30
Reason: Approval
Location: Bharuch

Deputy Director
Industrial Safety and Health
Bharuch

Annexure-VI

LICENCE FORM LE-3

(See article 3(a) to (d) of Part 1 of Schedule IV of Explosives Rules, 2008)

Licence to possess : (c) for use,explosives of class 1, 2,3,4,5,6 or 7 in a magazine

Licence No. : E/WC/GJ/22/956(E24051)
Annual Fee Rs:2000/-
2480/-

1. Licence is hereby granted to : **HINDALCO INDUSTRIES. LTD. (Occupier : SHRI KAILASH NATH BHANDARI)**
P.O.DAHEJ, DISTRICT- BHARUCH (GUJARAT), Town/Village - DAHEJ
District-BHARUCH, State-Gujarat, Pincode - 392130
2. Status of licensee : **Company**
3. Licence is valid only for the following purpose : possess for use of **Nitrate Mixture, Safety Fuse, Ordinary Detonator, Electric Detonators,**
4. (a) Licence is valid for the following kinds and quantity of explosives:

Sr. No.	Name and Description	Class & Division	Sub-division (If any)	Quantity at any one time
1.	Nitrate Mixture	2 ,0	0	100 Kg.
2.	Safety Fuse	6 ,1	0	550 Mtrs
3.	Ordinary Detonator	6 ,3	0	1500 Nos.
4.	Electric Detonators	6 ,3	0	1000 Nos.

(b) Quantity of explosives to be purchased in a calendar month[applicable for licence under article 3(b) and (c)] : **3 times as above.**

5. The licensed premises shall conform to the following drawing(s):
Drawing No : E/WC/GJ/22/956(E24051) dated : 18/10/2004
6. The licensed premises are situated at following address:
Survey No(s). PLOT NO. 2, DAHEJ , Town/Village : **DAHEJ TAL- VAGRA**
Police Station : **DAHEJ** District : **BHARUCH**
PinCode : Phone : E-Mail : State : **Gujarat**
Fax :
7. The licensed premises consist of following facilities : **A & S TYPE PORTABLE MAGAZINE**
8. The licence is granted subject to the provision of Explosives Act 1884 as amended from time to time and the Explosives Rules, 2008 framed there under and the conditions, additional conditions and the following Annexures.
(1) Drawings (showing site, constructional and other details) as stated in serial No. 5 above.
(2) Conditions and additional conditions
(3) Distance Form DE-2
9. This licence shall remain valid till **31st day of March 2006**

This licence is liable to be suspended or revoked for any violation of the Act or Rules framed there under or the conditions of this licence as set forth under Set VIII, wherever applicable, referred to in Part 4 of Schedule V or if the licensed premises are not found conforming to the description shown in the plans and Annexure attached hereto.

R/up to 31/03/2025

The Date: 18/10/2004

Sd/-
Joint Chief Controller of Explosives
West Circle, Mumbai

उप मुख्य विस्फोटक नियंत्रक
Dy. Chief Controller of Explosives
वडोदरा/Vadodara

Transfers :
- Change in Authorized Signatory/Occupier/Partners/Directors dated : 22/04/2013

Endorsement for renewal of licence:

Date of Renewal	Date of Expiry	Signature of licensing authority
22/04/2013	31/03/2016	Jt. Chief Controller of Explosives, West Circle, Mumbai

Statutory Warning : Mishandling and misuse of explosives shall constitute serious criminal offence under the law.

नवीनीकृत 31/03/2021 तक

31/03/2018 तक वडोदरा

उप मुख्य विस्फोटक नियंत्रक, वडोदरा.

(This certificate must be hung up in the boiler house)

सत्यमेव जयते

FORM VI

No.: CA032022-20230036540

GUJARAT BOILER INSPECTION DEPARTMENT

CERTIFICATE FOR USE OF A BOILER

(regulation 389)

Registry No. of Boiler : GT-3880 **Type of Boiler :Waste Heat Recovery Steam Generator**

Boiler Rating :1,433.00 m² **Place & Year of Manufacture :Germany** -1996

Maximum Continuous Evaporation : 26,000.00 **kg/hr**

Name of Owner : HINDALCO INDUSTRIES LTD (BIRLA COPPER)

Situation of Boiler : A & Po Dahej Unit Birla Copper Tal. Vagra , Dist. Bharuch , Pin 392130- Bharuch

Repairs : 2001:Radiation screen wall 2 no. & evaporator bundle 1 no. added. 2007: 6 no. +6 no. convection & radiation zone screen panel replaced.2012: 4 no. radiation chamber wall panels & 20 no. convection zone water wall panels replaced. 2014: Boiler water wall panel 6L replaced. 2016: LH/RH radiation chamber wall panels, screen panels replaced. 2019:- Re RLA carried out. 1 no. baffle coil replaced.2020:- Radiation panels 2L to 7L & 2R to 7R and LG replaced. 2023: Waterwall furnace radiation screen tubes, baffle walls, convection waterwall panels are replaced.

Remarks : Nil

Hydraulically tested on 26-05-2023 to 84.25 kg/cm²(g)

I hereby certify that the above described boiler is permitted by **Shri P A Vyas /Deputy Director of Boilers** under the provisions of Section 7/8 of the Boilers Act, No. V (Amended 2007) of 1923, to be worked at a Maximum Pressure of **67.30** kg/cm²(g) for the period from **27/05/2023** to **26/05/2025**.

The loading of the **each of dia. 40 mm FLSPSL** safety valve is not to exceed **67.30** kg/cm²(g) Cws **Drum:- F- 15.70 mm & R- 14.10 mm thk**.

I hereby further certify that the main steam pipe was tested hydraulically to a pressure of **122.40** kg/cm² last on **05/03/1998**

Fees Rs.**11,100.00** paid on - **27/03/2023** V.No. - **2136310**

Dated at **Vadodara** this 31 day of May 2023

Signature Not Verified
Digitally signed by VYAS PARESHKUMAR ANANTPRASAD
Date: 2023.06.02 17:45:59 +05:30
Reason: Approved
Location: Gandhinagar

(Shri P A Vyas)
Deputy Director of Boilers
Vadodara

Counter Signed
Director of Boilers
Gujarat State,
Ahmedabad

see reverse for "conditions"

Conditions

(Reverse of Form VI)

1.No structural alteration, addition or renewal shall be made to the boiler otherwise than in accordance with section 12 of the Act.

2.Under the provisions of Section 8 of the Act, this certificate shall cease to be in force:

(a) on the expiry of the period for which it was granted; or

(b) when any accident occurs to the boiler; or

(c) when the boiler is moved the boiler not being vertical boiler the heating surface of which is less than 18.58 sq. meters or a portable vehicular boiler; or

(d) save as provided in section 12 of the Act, when any structural alteration, addition or renewal is made in or to the boiler; or

(e) if the competent authority in any particular case so directs when any structural alteration, addition or renewal is made in or to any steam- pipe attached to the boiler; or

(f) on the communication to the owner of the boiler of an order of the competent authority or competent person prohibiting its use on the ground that it or any boiler component attached thereto is in a dangerous condition.

Under section 10 of the Act, when the period of a certificate relating to a bolier has expired, the owner shall, provided that he has applied before the expiry of that period for a renewal of the certificate be entitled to use the boiler at the maximum pressure entered in the former certificate, pending the issue of orders on the application but this shall not be deemed to authorize the use of a boiler in any of the cases referred to in clauses (b),(c),(d),(e) and (f) of sub-section (1) of section 8 occuring after the expiry of the period of the certificate.

3.The bolier shall not be used at a pressure greater than the pressure entered in the certificate as the maximum pressure nor with the safety valve set to a pressure exceeding such maximum pressure.

4.The boiler shall not be used otherwise than in a condition which the owner reasonably believes to be compatible with safe working.

NB :- Detail regarding this boiler are record in Registration Book No. of which is copy may be obtained of payment on application to the Director

(This certificate must be hung up in the boiler house)

सत्यमेव जयते

FORM VI

No.: CA032022-20230036539

GUJARAT BOILER INSPECTION DEPARTMENT

CERTIFICATE FOR USE OF A BOILER

(regulation 389)

Registry No. of Boiler : GT-3879 **Type of Boiler :Waste Heat Recovery Steam Generator**

Boiler Rating :2,327.00 m² **Place & Year of Manufacture :Pune** -1997

Maximum Continuous Evaporation : 21,700.00 **kg/hr**

Name of Owner : HINDALCO INDUSTRIES LTD (BIRLA COPPER)

Situation of Boiler : A & Po Dahej Unit Birla Copper Tal. Vagra , Dist. Bharuch , Pin 392130- Bharuch

Repairs : 2008: 10 no. each radiation panel LR/RH, 6 no. radiation screen coils one convection panel & one buffer panel replaced. 2019:- Re-RLA carried out. 2020:- 2 nos. LG & Drum safety valves replaced.

Remarks : 2020:- Boiler is to be steam tested.

Hydraulically tested on 26-05-2023 to 84.25 kg/cm²(g)

I hereby certify that the above described boiler is permitted by **Shri P A Vyas /Deputy Director of Boilers** under the provisions of Section 7/8 of the Boilers Act, No. V (Amended 2007) of 1923, to be worked at a Maximum Pressure of **67.30** kg/cm²(g) for the period from **27/05/2023** to **26/05/2025**.

The loading of the **each of dia. 25.4 mm FLSPSL** safety valve is not to exceed **67.30** kg/cm²(g) Cws **to be ascertain.**.

I hereby further certify that the main steam pipe was tested hydraulically to a pressure of **122.00** kg/cm² last on **05/03/1998**

Fees Rs.**15,800.00** paid on - **27/03/2023** V.No. - **2136315**

Dated at **Vadodara** this 31 day of May 2023

Signature Not Verified
Digitally signed by VYAS PARESHKUMAR ANANTPRASAD
Date: 2023.06.02 12:44:14 +05:30
Reason: Approved
Location: Gandhinagar

(Shri P A Vyas)
Deputy Director of Boilers
Vadodara

Counter Signed
Director of Boilers
Gujarat State,
Ahmedabad

see reverse for "conditions"

Conditions

(Reverse of Form VI)

1.No structural alteration, addition or renewal shall be made to the boiler otherwise than in accordance with section 12 of the Act.

2.Under the provisions of Section 8 of the Act, this certificate shall cease to be in force:

(a) on the expiry of the period for which it was granted; or

(b) when any accident occurs to the boiler; or

(c) when the boiler is moved the boiler not being vertical boiler the heating surface of which is less than 18.58 sq. meters or a portable vehicular boiler; or

(d) save as provided in section 12 of the Act, when any structural alteration, addition or renewal is made in or to the boiler; or

(e) if the competent authority in any particular case so directs when any structural alteration, addition or renewal is made in or to any steam- pipe attached to the boiler; or

(f) on the communication to the owner of the boiler of an order of the competent authority or competent person prohibiting its use on the ground that it or any boiler component attached thereto is in a dangerous condition.

Under section 10 of the Act, when the period of a certificate relating to a bolier has expired, the owner shall, provided that he has applied before the expiry of that period for a renewal of the certificate be entitled to use the boiler at the maximum pressure entered in the former certificate, pending the issue of orders on the application but this shall not be deemed to authorize the use of a boiler in any of the cases referred to in clauses (b),(c),(d),(e) and (f) of sub-section (1) of section 8 occuring after the expiry of the period of the certificate.

3.The bolier shall not be used at a pressure greater than the pressure entered in the certificate as the maximum pressure nor with the safety valve set to a pressure exceeding such maximum pressure.

4.The boiler shall not be used otherwise than in a condition which the owner reasonably believes to be compatible with safe working.

NB :- Detail regarding this boiler are record in Registration Book No. of which is copy may be obtained of payment on application to the Director

(This certificate must be hung up in the boiler house)

सत्यमेव जयते

FORM VI

No.: CA032022-20230036538

GUJARAT BOILER INSPECTION DEPARTMENT

CERTIFICATE FOR USE OF A BOILER

(regulation 389)

Registry No. of Boiler : GT-4429 **Type of Boiler :Waste Heat Recovery Steam Generator**

Boiler Rating :2,220.00 m² **Place & Year of Manufacture :Hyderabad** -2001

Maximum Continuous Evaporation : 18,541.00 **kg/hr**

Name of Owner : HINDALCO INDUSTRIES LTD (BIRLA COPPER)

Situation of Boiler : A & Po Dahej Unit Birla Copper Tal. Vagra , Dist. Bharuch , Pin 392130- Bharuch

Repairs : 2023: Both bottom Heat exchanger are replaced.

Remarks : ---- NIL ----

Hydraulically tested on 26-05-2023 to 13.50 kg/cm²(g)

I hereby certify that the above described boiler is permitted by **Shri P A Vyas /Deputy Director of Boilers** under the provisions of Section 7/8 of the Boilers Act, No. V (Amended 2007) of 1923, to be worked at a Maximum Pressure of **9.00** kg/cm²(g) for the period from **27/05/2023** to **26/05/2025**.

The loading of the **each of dia. 51.44 mm FLSPSL** safety valve is not to exceed **9.00** kg/cm²(g) Cws **N:- 17.0 mm and S:- 18.0 mm thk**.

I hereby further certify that the main steam pipe was tested hydraulically to a pressure of **15.00** kg/cm² last on **18/05/2001**

Fees Rs.**15,800.00** paid on - **27/03/2023** V.No. - **2136307**

Dated at **Vadodara** this 31 day of May 2023

Signature Not Verified
Digitally signed by VYAS PARESHKUMAR ANANTPRASAD
Date: 2023.06.02 12:45:16 +05:30
Reason: Approved
Location: Gandhinagar

(Shri P A Vyas)
Deputy Director of Boilers
Vadodara

Counter Signed
Director of Boilers
Gujarat State,
Ahmedabad

see reverse for "conditions"

Conditions

(Reverse of Form VI)

1.No structural alteration, addition or renewal shall be made to the boiler otherwise than in accordance with section 12 of the Act.

2.Under the provisions of Section 8 of the Act, this certificate shall cease to be in force:

(a) on the expiry of the period for which it was granted; or

(b) when any accident occurs to the boiler; or

(c) when the boiler is moved the boiler not being vertical boiler the heating surface of which is less than 18.58 sq. meters or a portable vehicular boiler; or

(d) save as provided in section 12 of the Act, when any structural alteration, addition or renewal is made in or to the boiler; or

(e) if the competent authority in any particular case so directs when any structural alteration, addition or renewal is made in or to any steam- pipe attached to the boiler; or

(f) on the communication to the owner of the boiler of an order of the competent authority or competent person prohibiting its use on the ground that it or any boiler component attached thereto is in a dangerous condition.

Under section 10 of the Act, when the period of a certificate relating to a bolier has expired, the owner shall, provided that he has applied before the expiry of that period for a renewal of the certificate be entitled to use the boiler at the maximum pressure entered in the former certificate, pending the issue of orders on the application but this shall not be deemed to authorize the use of a boiler in any of the cases referred to in clauses (b),(c),(d),(e) and (f) of sub-section (1) of section 8 occuring after the expiry of the period of the certificate.

3.The bolier shall not be used at a pressure greater than the pressure entered in the certificate as the maximum pressure nor with the safety valve set to a pressure exceeding such maximum pressure.

4.The boiler shall not be used otherwise than in a condition which the owner reasonably believes to be compatible with safe working.

NB :- Detail regarding this boiler are record in Registration Book No. of which is copy may be obtained of payment on application to the Director

Annexure IX

Hindalco Industries Ltd.				
Unit : Birla Copper, Dahej				
Monitored ambient noise levels(dB) for the month of(April-24 to Sept-24)(Avg)				
			Leq_{Day}	Leq_{Night}
	Sr. No.	Location	(06:00 hr - 22: 00 hr)	(22:00 hr -06:00 hr)
	1	Near Township opp to Arogya	61.1	59.6
	2	Near 16 ha opp to Smelter-III	63.2	61.8
	3	Near YMA Hostel	61.1	59.5
	4	Near Jetty Platform	62.3	61.5

GHG INVENTORISATION 2020-21 & CARBON SEQUESTRATION 2022

Contents

List of Abbreviations:

GHG: Greenhouse Gas

GHG Protocol: GHG Protocol Corporate Accounting and Reporting Standard

HFCs: Hydrofluorocarbons

PFCs: Perfluorocarbons

Kg: Kilogram

MT/ T: Metric tonnes (1 MT= 1000 Kg)

KT: Kilo-tonne (1KT = 1000 MT)

TJ: Terajoule (1TJ = 10^{12} Joule)

CO_2e: Carbon dioxide equivalent

GWP: Global Warming Potential

LNG: Liquified Natural Gas

C: Carbon

Km: Kilometre

PART-1: GHG INVENTORY REPORT

1 GHG INVENTORY FOR 2020 - 2021

1.1 Introduction

The report pertains to the operations of Birla Copper, Hindalco's copper unit, located at Dahej in the Bharuch district of Gujarat. This is one of the largest single-location copper smelters in the world with integrated port facilities.

The unit is comprises of copper smelters, backed by a captive power plant, oxygen plants, by-products plants, utilities and a captive jetty. There is also a precious metals recovery plant which produces gold, silver and selenium.

1.2 Scope of Work

Preparation of a greenhouse gas (GHG) inventory and report for Birla Copper, covering a period of financial year 2020 – 2021. The work carried out is in accordance with the GHG Protocol Corporate Accounting and Reporting Standard, hereafter referred to as the GHG Protocol, which is considered equivalent to the ISO 14064-3:2018 standard.

The work carried out involved the following activities:

i. Site-visit to facility for understanding organizational and operational boundaries, collection of activity data and a review of onsite plantation for carbon sequestration potential
ii. Literature review for selection of appropriate GHG emission factors or emission quantification methodologies
iii. Quantification of GHG emissions
iv. Design and development of facility's GHG inventory, as well as preparation of excel-based inventory worksheet
v. Preparation of GHG inventory report for the facility

1.3 GHG Inventory Information

The GHG inventory has been prepared in accordance with the GHG Protocol. The various aspects of the GHG inventory are detailed below in this section.

1.3.1 Gases Covered

The GHG protocol requires organizations to include the emissions of the following gases in its GHG emissions inventory: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF_6), and Nitrogen trifluoride (NF_3).

The gases relevant for the operations of Birla Copper that included in the GHG inventory are CO_2, CH_4, and N_2O.

1.3.2 Reporting Period

The GHG inventory report comprise annual GHG inventories for the year 2020 to 2021, with reporting periods from 1st March 2020 to 31st March 2020.

1.3.3 Inventory Boundary

The GHG emissions for an organization are the aggregate of the emissions from various facilities either partially, jointly, or wholly owned by the organization. The organization may also have varying levels of influences over the operations within these facilities in addition to varying levels of ownership of these facilities.

The inventory boundary defines the scope of GHG emissions attributable to an organization. The guidance provided in the GHG protocol has been used in determining the inventory boundary for Birla Copper.

1.3.4 Defining Organizational Boundary

As described in the GHG Protocol, the organization must consolidate its facility-level GHG emissions by one of the following approaches:

A. **Control:** The organization accounts for all GHG emissions from facilities over which it has financial or operational control; or
B. **Equity Share:** The organization accounts for a portion of GHG emissions from facilities in proportion to its respective share of equity in the facilities.

As the management of Hindalco Industries Ltd. *has full operational and financial control of the Birla Copper facility* in Dahej, *the control approach has been selected for defining the organizational boundary* in this case, and 100% of the GHG inventory emissions would be attributable to Hindalco Industries Ltd.

1.3.5 Defining Operational Boundary

As described in the GHG Protocol, the establishment of operational boundary includes identifying sources of GHG emissions associated with the organization's operations and categorizing each source into one of the following three categories:

- ✓ **Scope-1** or direct GHG emissions, which result directly from activities within the organisation's control;
- ✓ **Scope-2** or energy indirect GHG emissions, which result from any electricity, heat or steam purchased by the organization;
- ✓ **Scope-3** or other Indirect GHG emissions, which result from activities that are a consequence of the activities of the organization but occur from sources not owned or controlled by the organization. Reporting emissions from this category is optional.

Sources of GHG emissions associated with Birla Copper operations were identified and categorized as per the above classification, as shown in Table-1 below.

Table-1: Operational Boundary of Birla Copper		
Scope	**Emission Source**	**Gases**
Scope-1	**Stationary Combustion**	
	i) Furnace oil combustion in onsite burners	CO_2, CH_4, N_2O
	ii) Coal combustion in captive power plant	CO_2, CH_4, N_2O
	Mobile Combustion	
	iii) Diesel consumption in company-owned tugboats and various vehicles (cars, trucks, cranes, manlifts) operated on site.	CO_2, CH_4, N_2O
	Process Emissions	
	iv) Metallurgical reduction processes	CO_2
	v) Phosphoric acid production	CO_2
Scope-2	i) Purchased electricity from grid	CO_2
Scope-3	**Travel & Commuting**	
	i) Business Travel by Air	CO_2
	ii) Employee Commute by Bus	CO_2
	Material Transportation	
	iii) Incoming/Outgoing material transport by Road	CO_2
	iv) Incoming/Outgoing material transport by Sea	CO_2

1.4 Exclusions

Fugitive emissions of HFCs from air conditioners as well as emissions from fuel combustion in the canteen and backup diesel-generator (DG) set have not been considered in scope-1 of the GHG inventory due lack of available data and expected negligible contribution of these sources to the scope-1 total.

1.5 Base Year

Base year is defined as a historic datum (a specific year or an average over multiple years) against which an organization's emissions are tracked over time. In establishing the base year, the following points need to be considered, as per the GHG Protocol:

a. Base year GHG emissions are quantified using data representative of the organization's activity,
b. Verifiable GHG emissions data are available for the base year,
c. The organization can explain the selection of the base year, and
d. The organization develops a GHG inventory for the base year consistent with the provisions of the GHG Protocol.

If enough or reliable information on historical GHG emissions is not available, the organization may use its first GHG inventory period as the base year.

1.5.1 Determining Base Year for Birla Copper

The first GHG inventory year, i.e. *year 2017-18*, comprising the period 1st March 2017 to 31st March 2018 *is selected as the base year for Birla Copper*. The reason for selection of this base year is that it is the first year for which a GHG inventory has been compiled in accordance with the GHG Protocol, using representative, verifiable data.

1.5.2 Recalculation of Base Year Emissions

As per the GHG Protocol, the organization is required to recalculate emissions in the base year to reflect any subsequent changes in accounting methodology or the structure of the company affecting its inventory boundary. This ensures data consistency over time, i.e., comparisons of like with like over time.

As no such change has taken place at Birla Copper over the reporting period covered in this report, re-calculation of base year emissions is not applicable.

1.6 Quantification Methodology

The methodology adopted for the quantification of GHG emissions is calculation-based, i.e. GHG activity data over the inventory period multiplied by appropriate GHG emission factors, in accordance with the GHG Protocol.

Detailed calculation of emissions, including values of month-wise activity data, emission factors, and parameters used for developing appropriate emission factors, along with corresponding literature sources wherever applicable, can be found in the MS-Excel inventory spreadsheet accompanying this report.

The quantification methodology for each emission source is described below.

1.6.1 Scope-1 Emissions

A. Emissions from Fuel Combustion Activities: This includes emissions from stationary and mobile combustion of fuels. The gases emitted from these activities are CO_2, CH_4 and N_2O. Emissions of CH_4 and N_2O are also reported as equivalent CO_2 emissions in metric tonnes (MT) of CO_2e, calculated by multiplying emissions of the gas (in MT) with the corresponding Global Warming Potential (GWP) of the gas.

The fuels used in stationary combustion are coal for captive power generation, and furnace oil for generation of process heat. The fuel used in mobile combustion for all activities, i.e. in tug-boats and vehicles operated on-site, is diesel. In the case of liquid fuels, the mass of fuel consumed was calculated as:

Mass (MT) = Volume of fuel consumed (m^3) x Average fuel density (kg/m^3) / 1000.

The following equations were used in quantifying emissions:

i. CO_2 emissions (MT) = Mass of fuel consumed (MT) x Net calorific value of fuel (TJ/MT) x Emission factor of fuel (MT CO_2/TJ)
ii. CH_4 emissions (MT CO_2e) = Mass of fuel consumed (MT) x Net calorific value of fuel (TJ/MT) x Emission factor of fuel (MT CH_4/TJ) x GWP of CH_4

iii. N_2O emissions (MT CO_2e) = Mass of fuel consumed (MT) x Net calorific value of fuel (TJ/MT) x Emission factor of fuel (MT N_2O /TJ) x GWP of N_2O

B. Process Emissions: This includes CO2 emissions from the metallurgical reduction and phosphoric acid production processes. In the metallurgical reduction reaction, the reducing agents coke, liquified natural gas (LNG) and coal are used to reduce metal oxides to base metals, with the carbon content in the reducing agents being oxidized to CO_2.

In phosphoric acid production, CO_2 emissions occur due to the oxidation of inorganic carbon, present as an impurity in rock phosphate, when it is reacted with sulphuric acid. The following equations were used in quantifying emissions:

i. Metallurgical reduction

CO_2 emissions (MT) = *Mass of reducing agent consumed* (MT) x *Carbon content of reducing agent* (MT C/MT) x 44/12

ii. Phosphoric Acid Production

CO_2 emissions (MT) = *Mass of rock phosphate consumed* (MT) x *Inorganic carbon content reported as CO_2* (MT CO_2/MT)

1.6.2 Scope-2 Emissions

Scope-2 GHG emissions for the Birla Copper facility comprise emissions due to electricity purchased from the grid. They are calculated by multiplying the quantity of grid electricity purchased by the facility with the grid emission factor. CO_2 emissions have been accounted in this category using the following equation:

Scope 2 CO_2 emissions (MT) = Quantity of Electricity consumed (MWh) x Grid emission factor (MT CO_2/MWh)

1.6.3 Scope-3 Emissions

Emissions calculated in this category include CO_2 emissions due to travel and commute of employees as well as due to transportation of incoming and outgoing materials. The following equations were used in quantifying emissions:

i. **Employee Commute/Travel:** Employee commute by company-contracted bus and business travel by air have been considered in this category.

CO_2 emissions (MT) = *Distance travelled* (passenger-Km) x *Emission factor Bus or Air travel* (Kg CO_2/ passenger-Km) / 1000

ii. **Material Transport:** Transport of incoming and outgoing materials by road (truck) and sea (ship) have been considered in this category.

CO_2 emissions, Road (MT) = *Distance transported* (Km) x *Emission factor of truck, capacity > 12MT* (Kg CO_2/Km) / 1000

CO_2 emissions, Sea (MT) = *Distance transported* (Km) x *Quantity transported* (MT) x *Emission factor Container or Tanker Shipping* (Kg CO_2/tonne-Km) / 1000

1.7 GHG Emission

1.7.1 Total GHG Emissions

Total Scope-1, Scope-2 and Scope-3 GHG emissions for the year 2020-2021 is summarized in Table-2. The unit used for reporting these figures is Kilotons (KT) of CO_2e (1KT = 1000 MT).

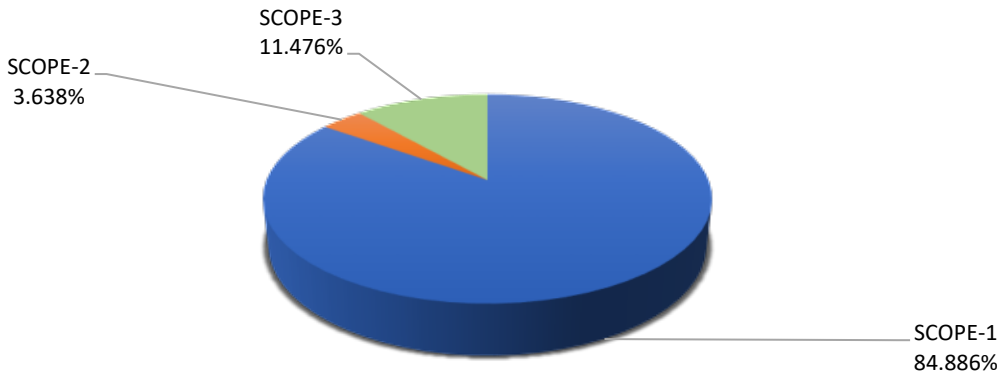
In the year 2020-2021 the total GHG emission is 1,025.60 Kt CO2e which is about 30% lower than the base year emission. During the reporting period the GHG emission form Scope 2 has increased to 66% from base year, this may be a result of high dependency for power requirements form Grid electricity (table 1).

Table 2: Absolute Emissions

Scope	GHG Emissions (Kt Co2e)		Percentage Change (From Base Year)
	2020-21	2017-18 (Base Year)	
Scope-1	870.59	1,124.18	-22.56%
Scope-2	37.312095	22.48	66.00%
Scope-3	117.70	319.09	-63.11%
Total	**1,025.60**	**1,465.74**	**-30.03%**

In terms of relative contribution of three category to the total GHG emissions, Scope 1 emissions comprise the 85% of total GHG emissions, followed by 11.4% Scope 3 and only 3.6% Scope 2 emissions (Chart 1).

Chart 1: Relative Category Contribution of GHG Emission in 2020-2021

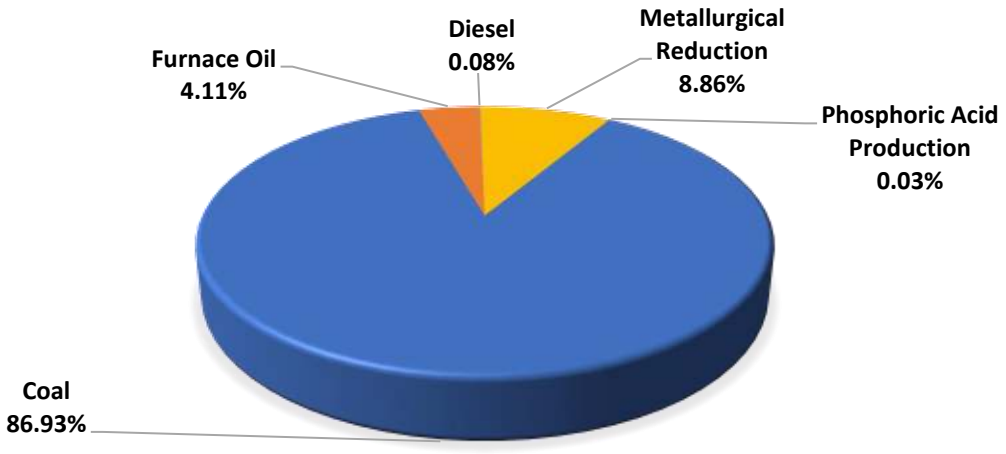


1.7.2 Scope-1 Emissions

i. **By Source:** The GHG emission figures for each source category in Scope 1 for the 2020-2021 and base year are depicted in Table 3 in KT of CO_2e. The relative contribution (in percentage) of each of these sources to the Scope 1 total for 2020-2021 is also shown in Chart-2.

Table 3: Breakup Scope 1 Emissions			
Source	**GHG Emissions (KT CO2e)**		**Percentage Change (From Base Year)**
	2020-21	**2017-18 (Base Year)**	
1A: Stationary Combustion	**792.58**	**1,069.51**	**-25.89%**
Coal	756.77	1,036.10	-26.96%
Furnace Oil	35.82	33.41	7.22%
1B: Mobile Combustion	**0.66**	**1.19**	**-44.39%**
Diesel	0.66	1.19	-44.39%
1C: Process Emissions	**77.35**	**53.48**	**44.62%**
Metallurgical Reduction	77.12	42.49	81.51%
Phosphoric Acid Production	0.23	11.00	-97.90%

Chart 2: Scope 1 Relative Category Contribution



ii. By Gas: The gases accounted within scope-1 emissions include CO_2, CH_4 and N_2O. The emission figures of each gas are depicted in Table 4. In terms of relative contribution to the total in 2020-2021, CO_2 accounts for more than 98.5%. N_2O and CH_4 contribute approximately 1.12% and 0.37% respectively.

Table 4: Gas-Wise Totals			
Gas	**Scope-1 Emissions**		**Percentage Change (From Base Year)**
	2020-21	**2017-18 (Base Year)**	
Carbon Dioxide (Co_2)	8,64,512.98 Mt	11,16,386.43 Mt	-22.56%
Methane (CH_4)	108.60 MT	114.01 MT	-4.74%
	3,236.29 CO2e	3,192.19 CO2e	
Nitrous Oxide (N_20)	35.94 MT	19.61 MT	83.29%
	9,812.43 CO2e	5,196.71 CO2e	

TOTAL (KT CO2e)	**877.56**	**1,124.78**	**-21.98%**

1.7.3 Scope 2 Emission

Gird electricity sourced for the Birla Copper, Dahej operations is considered as a Scope 2 emission. During the 2020-2021 reporting period the project has higher dependency on Grid power resulting into higher emission as compared to base year.

Table 5: Scope 2 Emissions

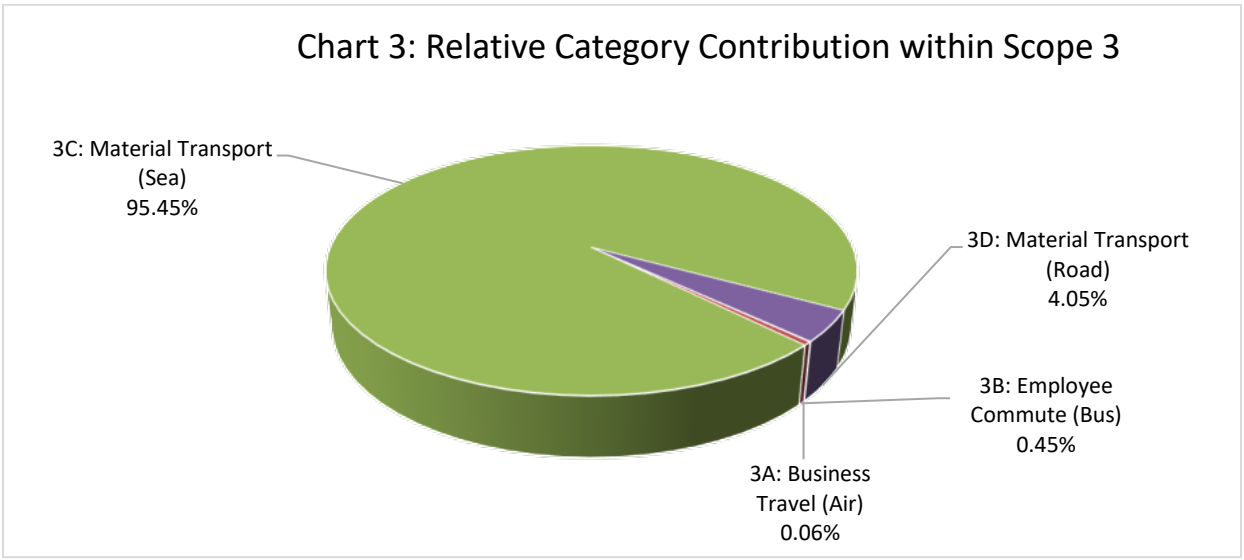
Scope	GHG Emissions (KT CO2e)		Percentage Change (From Base Year)
	2020-21	2017-18 (Base Year)	
Scope-2	37.31	22.48	66.00%

1.7.4 Scope 3 Emissions

GHG emission figures for each source category accounted within Scope 3 emission for the 2020-2021 year and base year is illustrated in Table 6 in KT of CO_2. The relative contribution (in percentage) of each of these sources to the scope-3 total for 2020-2021 is also shown in Chart-3.

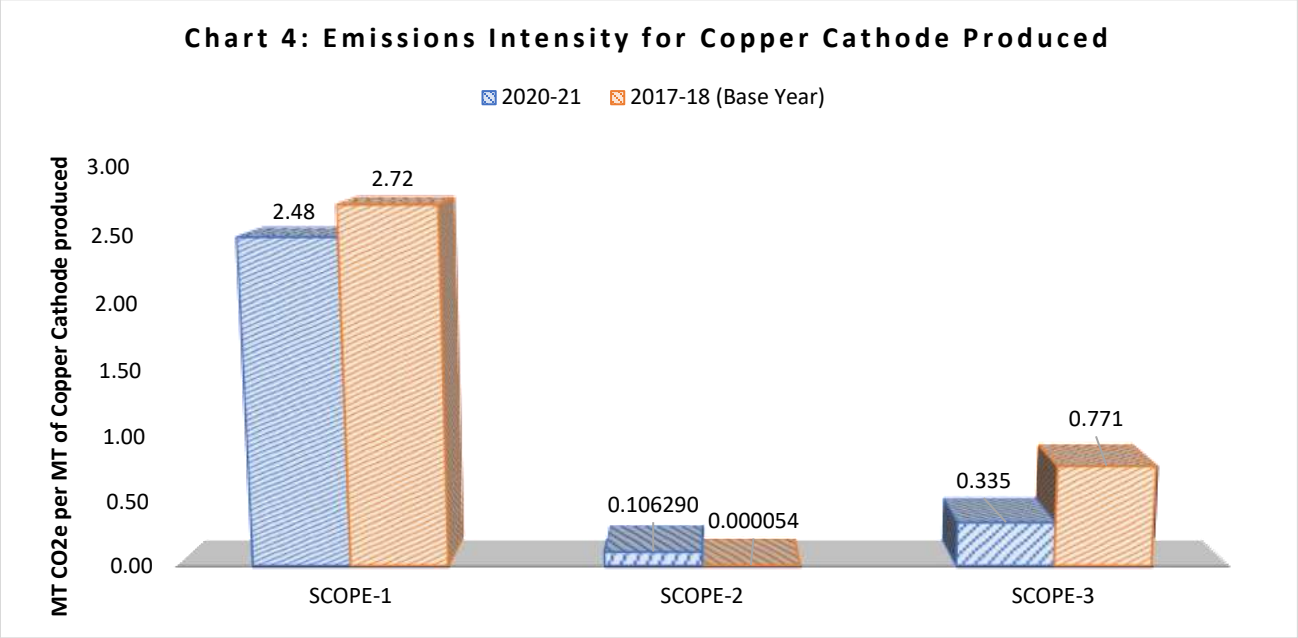
Table 6: Breakup Scope-3 Emissions

Source	GHG Emissions (Kt Co2)		Percentage Change (From Base Year)
	2020-21	2017-18 (Base Year)	
Business Travel (Air)	0.07	N/A	N/A
Employee Commute (Bus)	0.53	0.53	0.00%
Material Transport (Sea)	112.41	317.35	-64.58%
Material Transport (Road)	4.76	1.21	294.28%



1.8 GHG Emissions Intensity

GHG emissions intensity can be defined as the quantity of GHG emissions per unit of output. Since the primary product of Birla Copper is copper cathode, the GHG emissions intensity has been calculated as MT of GHG emissions per MT of copper cathode produced. The overall (scope 1+2+3) GHG emissions intensity for the year 2020-2021 is 2.92 *MT CO_2e / MT copper cathode. In base year it is around 3.49 MT CO_2e / MT copper cathode.* This represents 16.23% reduction in the GHG emissions intensity from the base year. The GHG emissions intensity values for scope 1, 2 and 3 can be seen separately in Chart 4.



1.9 GHG Inventory Quality

The guidelines on managing inventory quality in the GHG Protocol have been followed in compiling this GHG inventory. A complete quantitative uncertainty assessment of the inventory is precluded by the unavailability of parameter uncertainty values, i.e. the uncertainty associated with the used activity data and emission factors. However, the emission figures reported in this document, are indicatively ranked in terms of the uncertainty rankings used in Appendix X of the GHG Protocol.

Emission figures for scope-1 sources, obtained by combining fuel and material activity data collected directly at the facility with emission factors based on mass balance of carbon content, are expected to have a "high" level of data accuracy, defined as an uncertainty interval of +/- 5% of the mean value with a 95% confidence level.

Scope-2 emission figures, obtained by combining metered electricity consumption data with the average emission factor of the grid, are expected to have "fair" data accuracy, defined as an uncertainty interval of +/- 30% of the mean value with a 95% confidence level. Emission figures for scope-3 sources, obtained by combining exact distance-based activity data with average emission factors based on transportation mode, are also expected to have a "fair" level of data accuracy.

PART-2: Carbon Sequestration by Trees in 2022

2 CARBON SEQUESTRATION BY TREES IN 2022

Developmental activities and increased transportation activities are increasing the concentration of air pollutants like greenhouse gases, especially CO_2 (Chavan and Rasal, 2010). These are leading to increased atmospheric temperature through the trapping of certain wavelengths of heat radiation in the atmosphere. The increasing carbon emission is of major concern and addressed in Kyoto Protocol (Ravindranath et al., 1997). Natural forests, forest plantations, agroforestry practices and some other agricultural activities act as a sink for carbon dioxide (CO_2) through photosynthesis and store carbon as biomass (Benites et al., 1999; David and Crane, 2002; Thangata and Hildebran, 2012). They reduce the amount of CO_2 in the atmosphere and provide benefits to the global climate (Kort and Turnock, 1999).

India has taken the initiative to reduce greenhouse gas emissions and increase carbon sequestration. To reduce greenhouse gas emissions, India committed to three quantitative goals in its Nationally Determined Contributions:

I. Reducing industrial carbon intensity by 35% from 2005 levels,

II. Ensuring that 40% of its electricity comes from non-fossil fuels,

III. Achieving 2.5 billion tonnes of CO_2 sequestration through tree plantation.

Since the mid-1990s, it has been mandatory in India (CPCB, 1995) for a large-scale industry to plant appropriate green belts in and around its units to protect the surrounding ecosystem from pollution. This green belt might be used to reduce air pollutants produced at ground level from fugitive sources, absorb carbon dioxide, reduce industrial noise, reuse treated wastewater, utilise compost made from solid waste and sludge, and improve the general aesthetics of the area.

As trees grow and their biomass increases, they absorb carbon from the atmosphere and store it in the plant tissues (Mathews et. al., 2000) resulting in the growth of different parts. Active absorption of CO_2 from the atmosphere in the photosynthetic process and its subsequent storage in the biomass of growing trees or plants is the carbon storage (Baes et al., 1977). In terms of atmospheric carbon reduction, green belts in industrial areas act as carbon sinks by collecting and storing carbon dioxide emitted by industry also offers the stability of the natural ecosystem with increased recycling of nutrients along with maintenance of climatic conditions by the biogeochemical processes.

Biomass is an essential aspect of studies of the carbon cycle (Cairns et al., 2003; Ketterings et al., 2001). There are two methods to calculate forest biomass, one is the direct method and the other is the indirect method (Salazar et al., 2010). Direct methods, also known as destructive methods, involve the felling of trees to determine biomass (Parresol, 1999; Salazar et al., 2010). Indirect means of estimation of stand biomass are based on allometric equations using measurable parameters. The use of circumference or girth at breast height alone (expressing the basal area) for above-ground biomass estimation is common in many studies that showed that diameter at breast height (DBH) is one of the universally used predictors because it shows a high correlation with all tree biomass components and easy to obtain accurately (Razakamanarivo et al., 2012; Antonio et al., 2007; Heinsoo et al., 2002; Zianis, 2008).

Plantations have an important role in climate change mitigation and adaptation. In the current context, plantation restoration, community forestry plantations, agroforestry plantations and wood plantations are the best strategies for CO_2 sequestration. Plantation plays a critical role in CO_2 reduction, and there is an urgent need to monitor, conserve, and increase the terrestrial carbon supply. As a result, the following goals were used to measure tree carbon sequestration in current green belt vegetation in Birla Copper, Dahej.

2.1 Objectives

The purpose of this study is to estimate and compare the amount of carbon sequestration potential of woody biomass of tree species to the amount of carbon dioxide emitted from it in the green belt and plantation zones of Birla Copper in Dahej, Gujarat.

2.2 Study Area

Birla copper, a unit of Hindalco Industries Limited, is a mega copper smelting and refining complex at Dahej, District – Bharuch in Gujarat (

Figure 1). The nearest town from project site is Dahej, which is located about 4.8 km away. Dahej is the largest industrial estate with many small scale & medium-scaleindustries.

Total area of 1170654 m^2 (117.065 ha) of the industry is covered by green belt, planted with native plant and tree species. Green belt area of entire company premises is given in Table 7.

Figure 1: Google Earth Image of Hindalco, Dahej Gujrat

Table 7: Total Greenbelt Area

Sr. No	Location	Plantation Area (Hectare)
1.	Infront of Store & Commercial Building	0.444
2.	Near Refinery- 3	0.4393
3.	Infront of Canteen and Parallel to SM-1	0.2456
4.	Infront of HR	0.1242
5.	Infront of Workshop	0.0685
6.	In-between SM-1 and road 6	0.5974
7.	Infront of Technology Block	0.2612
8.	Infront of CPP-3	1.219
9.	Near Steel yard	0.6459
10.	Between SLF-1,2,3 and township road	0.3088
11.	Between SLF-1,2,3 and township road	0.5255
12.	SLF-3 to township gate	11.9916
13.	Value circle to town ship south side	21.6893
14.	Outer gate to main security gate (Between road and boundary wall) right side	4.1718
15.	Outer gate to main security gate (Between road and boundary wall) right side	2.02
16.	Fire & safety office to Oxygen plant -5 (Road no 2)	0.1005
17.	Old Punching plant to Refinery-1&2 (road no.5) towards refinery 1&2	0.4197
18.	New Punching gate to HR building (road no.5A)	0.065698
19.	New Punching gate to CPP-1 cooling tower (road no.)	0.0211
20.	Area between road no 16 and 20 from CPP-3 to Gupta circle	0.117
21.	Area between commercial road and SLF 4 &7 up to commercial weighbridge	1.443
22.	Area between TGS, upto SP3-3 acid loading station and road 20 east side	0.0627
23.	Behind Labor colony	3.6241
24.	Area between SLF-5 &6 and Road coming from labour colony (Labour gate to Commercial weighbridge turning)	1.19728
25.	Area from Labour colony to BSF (- Truck plaza and water reservoir)	18.823
26.	Gate no.6-BASF boundary-labour colony	46.196
27.	Area between Ammonia plant and plant boundary	0.079288
28.	Area between CCR-3 road and plant boundary, Water reservoir side (Road no.3)	0.1639
	Total	**117.065366**

2.3 Methodology

In this study, the total carbon stock sequestration of tree species was determined by non-destructive methods. The study was conducted in the second week of April 2022. Sampling was conducted by non-destructive quadrate method (10m × 10m) laying a total of 40 quadrates randomly distributed in all plantation area in industrial region. The number of trees species and their individuals in each sample plot was recorded. The girth at breast height (GBH) 1.37m and height of all trees in the quadrates were measured by using the measuring tape and Bosch Laser range finder respectively (**Figure 2**). Data of individual trees were used to estimate the tree density, frequency, basal area, green weight, dry weight and finally the CO_2 sequestered by trees in the plantation area. Location of each sampling point is marked on Google earth imagery presented

Figure 2: Field data collection

Figure 3 Sampling Points of the Hindalco industrial area, Dahej Gujra

To calculate CO_2 sequestration in planted species of existing greenbelt, following methodology (Clark & Joseph 1990; CPCB Report 2016) was used:

1) Determine the total (green) weight of the tree
2) Determine the dry weight of the tree
3) Determine the weight of carbon in the tree
4) Determine the weight of carbon dioxide sequestered in the tree

An allometric equations (Clark & Joseph 1990; CPCB Report 2016) was used to determine the total (green) weight of the planted tree species:

Formula used		DBH
Hardwood species	$W= 0.38315 (D^2H)^{0.92045}$	< 11inches
	$W= 0.11710 (D^2)^{1.16763} (H)^{0.92045}$	≥ 11 inches
Softwood species	$W= 0.26153(D^2)^{1.12422}(H)^{0.93871}$	< 11 inches
	$W= 0.10743 (D^2)^{1.12422}(H)^{0.93871}$	≥ 11 inches

Where,

W = Above-ground weight of the tree in pounds
D = Diameter of the trunk in inches
H = Height of the tree in feet

In this study, 20% as much as the above-ground weight of the tree for root weight was considered (Hangarge et al., 2012). To determine the total green weight of the tree, the above-ground weight of the tree is multiplied by 20%. For dry weight of the tree (total biomass) calculation, all species were considered, and 72.5% dry matter and 27.5% moisture was considered for an average tree. Therefore, to determine the dry weight of the tree, the weight of the tree was multiplied by 72.5%. To determine of the total weight of carbon in the tree the average carbon content is generally 50% of the tree's total dry biomass (Nowak & Crane 2002). Therefore, to determine the weight of carbon in the tree, the dry weight of the tree was multiplied by 50%.And finally, the weight of carbon dioxide sequestered in the tree CO_2 is composed of one molecule of Carbon and 2 molecules of Oxygen (McPherson & Simpson 1999). Therefore, to determine the weight of carbon dioxide sequestered in the tree, the weight of carbon in the tree was multiplied by 3.6663.

2.4 Results

During the carbon sequestration study, 411 individual trees of 19 different species were identified while laying quadrats in the plantation area of the Industrial site (**Table** 8).

Table 8: No. of species identified at study site

Sr. No.	Species	Common Name	No. of Individuals
1.	*Acacia arabica*	Babul	4
2.	*Ailanthus excelsa*	Bakram neem	8

3.	*Azadirachta indica*	Neem	77
4.	*Cassia fistula*	Garmalo	11
5.	*Casuarina equisetifolia*	Sharu	18
6.	*Ceiba pentandra*	Kapok	8
7.	*Dalbergia sissoo*	Shisham	1
8.	*Ficus bengalensis*	Banyan	62
9.	*Ficus elastica*	Rubber plant	29
10.	*Ficus religiosa*	Peepal	4
11.	*Pandanus species*	Kewada	6
12.	*Peltophorum ferruginium*	Peltophorum	70
13.	*Pithecellobium dulce*	Jungle jalebi	3
14.	*Plumeria alba*	Champa	2
15.	*Polyalthea longifolia*	False ashoka	6
16.	*Samania saman*	Raintree	2
17.	*Tamarindus indica*	Imli	9
18.	*Terminalia cuttapa*	Badam	56
19.	*Thespesia populnea*	Paras peepal	35
Total			**411**

A total of 19 tree species were identified in industrial premises in which *Acacia Arabica, Ailanthus excelsa, Azadirachta indica, Cassia fistula, Casurina equisetifolia, Ceiba pentandra* are dominated planted species (**Figure 4**). The majority of the tree species planted in the industry were urban tree species, with only a few forestry species.

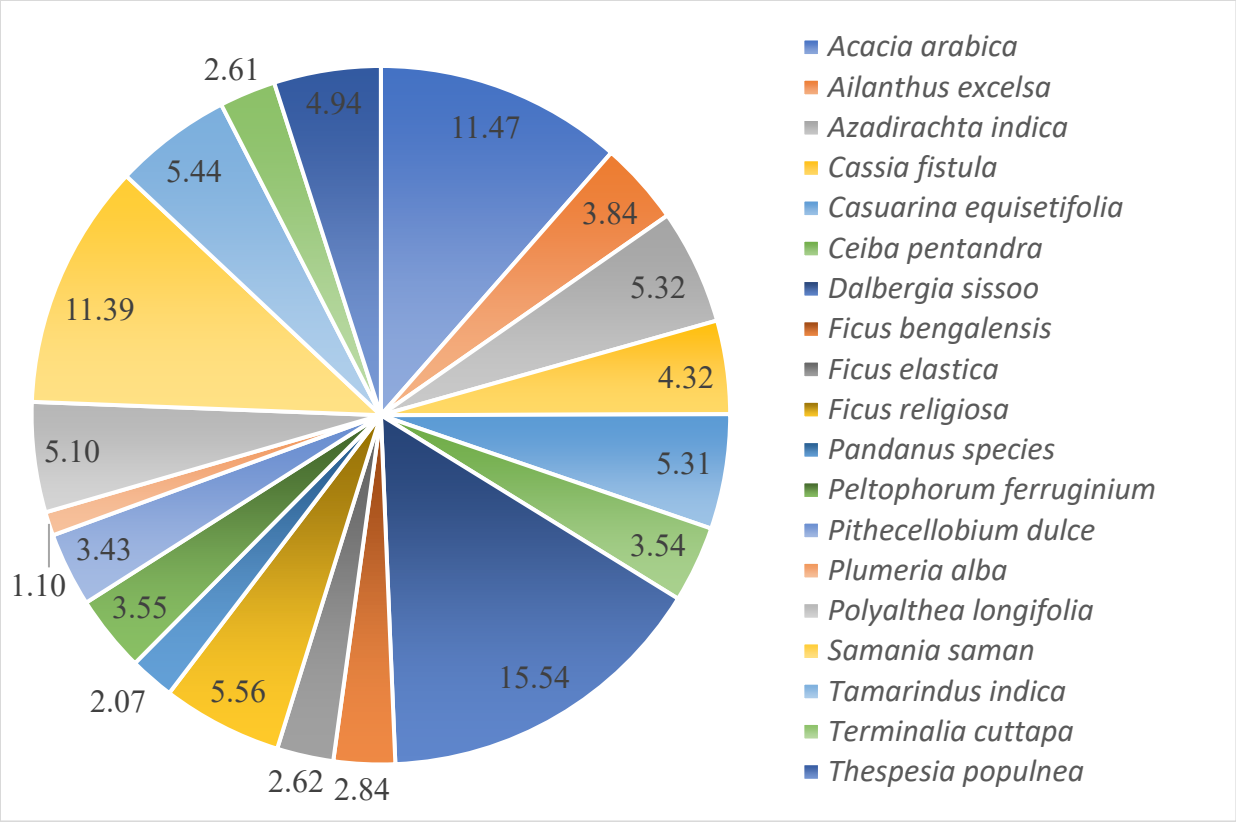


Figure 4 Figure showing relative dominance of identified species

2.5 Carbon stock and CO_2 Sequestration

The carbon sequestration potential of the tree species in green belt area of Hindalco industrial site was calculated. Hindalco, Dahej industrial plant consists of total 1170654 m^2 (117.065 ha) green belt area in which 19 tree species were identified.

The value of identified total green weight was 2644.24 kg, total biomass (dry weight) was 1917.07 kg, 958.54 kg of carbon content and 3511.12 kg CO_2 is sequestered by sampled tree species in existing green belt area.

The CO_2 sequestration of plant species in the greenbelt of studied area varies from 0.15 MT/hectare to 30.47 MT/hectare with an average of 7.06 MT/hectare among the total 19 plant species.

Species wise total green weight, total biomass (dry weight), carbon stock and total CO_2 sequestration value estimations have been given in Table 9.

Thus, total greenbelt may sequester 147.7 ton/hectare (134.22 MT/hectare) CO_2 in present study (Table 9). *Thespesia populnea, Ficus bengalensis, Terminalia catappa, Casuarina equisetifolia, Peltophorum ferruginium, Azadirachta indica* were highly CO_2 sequestered species with more than 10t/hectare whereas, *Plumeria alba, Pithecellobium dulce, Pandanus species, Dalbergia sissoo, Ficus religiosa, Samania saman* were lower CO_2 sequestered species in industrial green belt (Table 9).

Total CO_2 sequestered in whole greenbelt area (i.e.,117 ha) is 17,280 tons

Since the plantations were of different age ranging from 3 year to 10 year, taking average age of the plantations in the green belt to be 7.5 years, total CO_2 sequestered in whole greenbelt area is 2307 tons/year.

Table 9: Species wise carbon stock and CO2 sequestration

Sr. No.	Species	Avg. DBH (inches)	Avg. Height (feet)	Density	UGW (lbs)	RW (lbs)	TGW (lbs)	TGW (kg)	DW (kg)	C (kg)	CO_2 (kg)	CO_2 (MT)	Total CO_2 MT/hectare
1	*Acacia arabica*	10.1	24.0	10	506.51	101.30	607.81	275.95	200.06	100.03	366.41	0.37	3.66
2	*Ailanthus excelsa*	5.9	23.6	20	182.53	36.51	219.04	99.44	72.10	36.05	132.04	0.13	2.64
3	*Azadirachta indica*	6.9	20.8	192.5	218.79	43.76	262.54	119.20	86.42	43.21	158.27	0.16	30.47
4	*Cassia fistula*	6.2	23.8	27.5	205.00	41.00	246.00	111.68	80.97	40.49	148.30	0.15	4.08
5	*Casuarina equisetifolia*	6.9	29.9	45	487.42	97.48	584.91	265.55	192.52	96.26	352.61	0.35	15.87
6	*Ceiba pentandra*	5.6	23.5	20	168.46	33.69	202.15	91.77	66.54	33.27	121.86	0.12	2.44
7	*Dalbergia sissoo*	11.8	30.0	2.5	851.31	170.26	1021.57	463.79	336.25	168.13	615.84	0.62	1.54
8	*Ficus bengalensis*	5.0	16.5	155	99.40	19.88	119.28	54.15	39.26	19.63	71.90	0.07	11.15
9	*Ficus elastica*	4.8	16.9	72.5	94.34	18.87	113.21	51.40	37.26	18.63	68.25	0.07	4.95
10	*Ficus religiosa*	7.1	20.5	10	225.17	45.03	270.21	122.67	88.94	44.47	162.89	0.16	1.63
11	*Pandanus species*	4.3	17.2	15	77.07	15.41	92.48	41.99	30.44	15.22	55.75	0.06	0.84
12	*Peltophorum ferruginium*	5.6	24.0	175	172.04	34.41	206.45	93.73	67.95	33.98	124.46	0.12	21.78
13	*Pithecellobium dulce*	5.5	18.0	7.5	127.99	25.60	153.59	69.73	50.55	25.28	92.59	0.09	0.69
14	*Plumeria alba*	3.1	17.0	5	42.59	8.52	51.11	23.21	16.82	8.41	30.81	0.03	0.15
15	*Polyalthea longifolia*	6.7	29.5	15	290.34	58.07	348.40	158.18	114.68	57.34	210.03	0.21	3.15
16	*Samania saman*	10.1	23.5	5	493.96	98.79	592.75	269.11	195.10	97.55	357.33	0.36	1.79
17	*Tamarindus indica*	7.0	31.7	22.5	329.01	65.80	394.81	179.25	129.95	64.98	238.01	0.24	5.36
18	*Terminalia cuttapa*	4.8	20.3	140	111.16	22.23	133.39	60.56	43.91	21.95	80.41	0.08	11.26
19	*Thespesia populnea*	6.6	17.1	87.5	170.50	34.10	204.60	92.89	67.34	33.67	123.34	0.12	10.79
	Total												**134.22**

3 Quadrat Wise CO2 Sequestration Estimation

Quadrat wise CO_2 estimation

Quadrat No.	No. of species identified in each quadrat	Species name	Total CO_2 (MT/0.01 hectare)
1	1	*Ficus bengalensis*	3.63
	2	*Thespesia populnea*	
2	1	*Ceiba pentandra*	1.19
	2	*Terminalia catappa*	
3	1	*Ficus bengalensis*	9.34
	2	*Ficus elastica*	
	3	*Ficus religiosa*	
	4	*Terminalia catappa*	
4	1	*Ficus bengalensis*	5.51
	2	*Plumeria alba*	
	3	*Thespesia populnea*	
5	1	*Casuarina equisetifolia*	0.97
	2	*Ficus bengalensis*	
	3	*Terminalia catappa*	
6	1	*Terminalia catappa*	0.61
7	1	*Ficus elastica*	0.27
8	1	*Peltophorum ferruginium*	0.81
9	1	*Azadirachta indica*	0.27
	2	*Peltophorum ferruginium*	
10	1	*Acasia arabica*	0.88
	2	*Azadirachta indica*	
	3	*Peltophorum ferruginium*	
11	1	*Ficus bengalensis*	1.00
	2	*Peltophorum ferruginium*	
12	1	*Azadirachta indica*	2.04
	2	*Terminalia catappa*	
13	1	*Azadirachta indica*	2.21
	2	*Terminalia catappa*	
14	1	*Azadirachta indica*	4.02
	2	*Dalbergia sissoo*	
	3	*Pithecellobium dulce*	
	4	*Thespesia populnea*	
15	1	*Azadirachta indica*	2.28
	2	*Peltophorum ferruginium*	
16	1	*Azadirachta indica*	6.94
	2	*Casuarina equisetifolia*	
	3	*Ficus bengalensis*	
	4	*Thespesia populnea*	

17	1	*Azadirachta indica*	1.42
	2	*Thespesia populnea*	
18	1	*Azadirachta indica*	1.50
19	1	*Azadirachta indica*	0.20
20	1	*Tamarindus indica*	0.26
21	1	*Cassia fistula*	0.77
22	1	*Ailanthus excelsa*	1.06
	2	*Cassia fistula*	
23	1	*Acacia arabica*	0.96
	2	*Azadirachta indica*	
	3	*Samania saman*	
24	1	*Ficus bengalensis*	0.31
25	1	*Peltophorum ferruginium*	0.33
	2	*Polyalthea longifolia*	
26	1	*Casuarina equisetifolia*	0.44
27	1	*Peltophorum ferruginium*	0.01
28	1	*Peltophorum ferruginium*	0.85
29	1	*Ficus bengalensis*	0.51
	2	*Ficus elastica*	
	3	*Ficus religiosa*	
30	1	*Ficus bengalensis*	1.89
31	1	*Ficus bengalensis*	0.06
32	1	*Ficus bengalensis*	1.14
33	1	*Ficus bengalensis*	0.11
34	1	*Terminalia catappa*	0.37
35	1	*Pandanus species*	0.04
36	1	*Ficus bengalensis*	0.93
	2	*Terminalia catappa*	
37	1	*Ficus elastica*	1.66
38	1	*Ficus elastica*	3.17
39	1	*Ficus bengalensis*	2.23
40	1	*Peltophorum ferruginium*	0.65

4 Photos of Tree Plantation

Greenbelt plantation inside industry area






Plantation at residential region






Residential area

5 GHG Emission Factors

Sr. No.	Parameter	Emission Factor	Source
Global Warming Potential (GWP) Values			
1	GWP of Methane	29.8	IPCC Fifth Assessment Report, AR6, 2021
2	GWP of N_2O	273	IPCC Fifth Assessment Report, AR6, 2021
3	GWP of R-22	1810	http://www.linde-gas.com/internet.global.lindegas.global/en/images/Refrigerants%20environmental%20GWPs17_111483.pdf
4	GWP of R-410	1182	http://www.linde-gas.com/internet.global.lindegas.global/en/images/Refrigerants%20environmental%20GWPs17_111483.pdf
Fuel Data			
5	Density of Diesel, kg/l	0.8325	https://bharatpetroleum.com/Our-Businesses/I&C/Industrial-Fuel-Products/Fuels.aspx
6	Net Calorific Value (NCV) of Diesel, TJ/MT	0.043	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 1
7	CO_2 Emission Factor for Diesel (Off-Road mobile combustion, Industry), MT per TJ on NCV basis	74.1	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 3
8	CH_4 Emission Factor for Diesel (Off-Road mobile combustion, Industry), MT per TJ on NCV basis	0.00415	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 3
9	N_2O Emission Factor for Diesel (Off-Road mobile combustion, Industry), MT per TJ on NCV basis	0.0286	2006 IPCC Guidelines for National GHG Inventories, Vol.2 Chapter 3
10	Density of Furnace Oil (FO), kg/l	0.95	BEE

11	Net Calorific Value of FO (TJ/MT)	0.0404	Intergovernmental Panel on Climate Change (IPCC) - 2006 Database
12	CO_2 Emission Factor for FO Combustion, MT per TJ on NCV basis	77.4	Intergovernmental Panel on Climate Change (IPCC) - 2006 Database
13	CH_4 Emission Factor for FO Combustion, MT per TJ on NCV basis	0.007	Intergovernmental Panel on Climate Change (IPCC) - 2006 Database
14	N_2O Emission Factor for FO Combustion, MT per TJ on NCV basis	0.002	Intergovernmental Panel on Climate Change (IPCC) - 2006 Database
15	Density of Liquified Natural Gas (LNG), kg/m^3	426	http://www.irimee.indianrailways.gov.in/instt/uploads/files/1466235607549-IROF%20Concept%20Paper%20LNG%205-9-13.pdf
16	LNG SCM to SCF	35.3147	https://sciencing.com/convert-scm-scf-8365122.html
17	LNG CO2 emission (kg CO2 per scf)	0.05444	https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf
18	LNG CH4 emission (g CH4 per scf)	0.00103	https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf
19	LNG N2O emission (g N2O per scf)	0.0001	https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf
21	Net Calorific Value of Coal (Captive Power Plant, Hindalco) TJ/MT	0.0251	Provided by Hindalco (GCV= 6500KCal/Kg; NCV ~6000KCal/Kg)
22	Coal CO2 Emission Factor, MT per TJ on NCV basis	94.6	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 1
23	Coal CH4 Emission Factor, MT per TJ on NCV basis	0.01	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 2
24	Coal N2O Emission Factor, MT per TJ on NCV basis	0.0015	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 2
25	Net Calorific Value of MetCoke, TJ/MT	0.0282	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 1
26	Carbon Content of MetCoke, MT/TJ	29.2	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 1
27	Net Calorific Value of Coal (Smelter, Hindalco) TJ/MT	0.0172	Provided by Hindalco (GCV= 4500KCal/Kg; NCV ~4100KCal/Kg)

28	Carbon Content of Coal (Smelter, Hindalco; Category: Sub-bituminous) MT/TJ	26.2	2006 IPCC Guidelines for National GHG Inventories, Vol. 2, Chapter 1
Other Emission Factors			
29	Grid Emission Factor (MT CO_2/MWh)	0.79	CEA database ver 16 (Average margin)
30	Emission factor for Goods transport by air, KgCO2/tonne-km	1.58	India GHG Program, (http://indiaghgp.org/transport-emission-factors)
31	Emission Factor for Goods Transport by Rail, kg CO_2/tonne-km	0.00996	India GHG Program, India Specific Rail Transport Emission Factor for Passenger Travel and Material Transport, 2015
32	Emission Factor for Goods Transport by Road (Truck, Capacity >12T), kg CO2/km	0.7375	India GHG Program, (http://indiaghgp.org/transport-emission-factors)
33	Emission Factor Container Shipping (Long dist. avg.), KgCO2/tonne-km	0.0084	https://www.ecta.com/resources/Documents/Best%20Practices%20Guidelines/guideline_for_measuring_and_managing_co2.pdf
34	Emission Factor Tanker Shipping (Long dist. avg.), KgCO2/tonne-km	0.005	https://www.ecta.com/resources/Documents/Best%20Practices%20Guidelines/guideline_for_measuring_and_managing_co2.pdf
35	Emission Factor Short-distance Sea Shipping, KgCO2/tonne-km	0.016	https://www.ecta.com/resources/Documents/Best%20Practices%20Guidelines/guideline_for_measuring_and_managing_co2.pdf
36	Emission Factor Passenger Transport by Air in India, kg CO2/pax-km	0.121	India GHG Program, (http://indiaghgp.org/transport-emission-factors)
37	Emission Factor Passenger Transport by Rail (Suburban) in India, kg CO2/pax-km	0.007976	India GHG Program, (http://indiaghgp.org/transport-emission-factors)
38	Emission Factor Passenger Transport by Bus in India, kg CO2/pax-km	0.015161	India GHG Program, (http://indiaghgp.org/transport-emission-factors)

ANNEXURE-(E) CMP

Compliance of the conditions stipulated by GPCB while granting CC&A
NO: GPCB/BRCH/CCA-310(19)/ID-15178/568901/Dt 30/09/2020

Condition No.	Detail of Condition	Compliance status
1.0	Consent Order No. : AWH-108216 date of Issue 30/05/2020.	Noted

<table>
<tr>
<td>2.0</td>
<td>The consent under Water Act-1974 for conveying the industrial treated effluent discharge to deep sea, the consent under Air Act-1981 & Authorization under Environment (Protection) Act, 1986 shall be valid up to 02/03/2026 to operate industrial plant to manufacture following products:
<table>
<tr><th>Sr No.</th><th>Products</th><th>Quantity(TPA)</th></tr>
<tr><td>1.</td><td>Cathode Copper</td><td>500000</td></tr>
<tr><td>2.</td><td>Sulfuric Acid (98.4%)</td><td>1470000</td></tr>
<tr><td>3.</td><td>Oxygen (Tech)</td><td>780000</td></tr>
<tr><td>4.</td><td>Gold</td><td>26</td></tr>
<tr><td>5.</td><td>Silver</td><td>200</td></tr>
<tr><td>6.</td><td>CC Rod</td><td>484000</td></tr>
<tr><td>7.</td><td>Phosphoric Acid (as P_2O_5)</td><td>360000</td></tr>
<tr><td>8.</td><td>DAP/NPK Fertilizer</td><td>872000</td></tr>
<tr><td>9.</td><td>Electric Power (MW)</td><td>145.60</td></tr>
<tr><td>10.</td><td>Copper Wire ($\leq$ 4 mm dia)</td><td>60000</td></tr>
</table>
<table>
<tr><th>No.</th><th>Name of By Products</th><th>Quantity (TPM)</th></tr>
<tr><td>1.</td><td>Selenium</td><td>60 TPM</td></tr>
<tr><td>2.</td><td>PGM Concentrate</td><td>0.0508 TPM</td></tr>
<tr><td>3.</td><td>Granulated slag</td><td>65500 TPM</td></tr>
<tr><td>4.</td><td>Phosphogypsum</td><td>150000 TPM</td></tr>
<tr><td>5.</td><td>Hydro fluosilicic acid</td><td>5580 TPM</td></tr>
<tr><td>6.</td><td>Aluminum Fluoride</td><td>500 TPM</td></tr>
</table>
</td>
<td>The products and by products have been produced as per consent order, which are well within the limit mentioned in CCA , hence Consent order is complied with.</td>
</tr>
<tr><td colspan="3">Specific conditions:</td></tr>
</table>

a)	Unit shall comply with all the conditions stipulated by SEIAA / MoEF in the order of Environment Clearance issued vide letter No. J-11011/07/94-IAII(I) dated14th March, 1995, J-11011/81/2000-IAII (I) dated 08th January 2002, No. J-11011/86/2002-IAII (I) dated 10th February.2004, J-11011/220/2002-IAII (I) dated. 18th March.2005, J-11011-927/2008-IA-II (I) dated 11th February 2009, and J-11011-927/2008- IA-II (I) dated.23rd February 2017.	All the conditions stipulated by the Ministry while according environmental clearances to the existing project vide its letter no. J-11011/07/94-IAII dated 14th March, 1995, J-11011/81/2000-IAII (I) dated 08th January 2002, J-11011/86/2002-IAII (I) dated 10th February.2004, J-11011/220/2002-IAII (I) dated. 18th March.2005, J-11011-927/2008-IA-II (I)dtd.11th February 2009, J-11011-927/2008-IA-II (I) dtd.23rd February 2017 is implemented and compliance reports are submitted to MoEF from time to time.
b)	Unit shall sell out their hazardous waste to authorized end users who is having authorization with valid CCA and rule 9 permission to receive this waste. Unit shall make MoU with such authorized end users and submit MoU.	Hazardous waste is sale to authorized end users who is having authorization with valid CCA and rule 9 permission to receive this waste. Unit shall make MoU with authorized end users and submit to board.
c)	All the efforts shall be made to send hazardous waste to cement industry for Co- processing first & there after it shall be disposed through other option.	Is being complied with.
d)	Unit shall follow coal handling guideline framed by Board and provide close ash handling facility.	Is being complied with.
e)	Unit shall strictly follow the Fly Ash Notification for disposal of generated ash.	Is being complied with
f)	Unit shall install online Continuous Emission Monitoring Systems (CEMS) and link it with the server of GPCB for real time data transfer for boiler more than 8 TPH capacity or equivalent capacity of TFH.	Continuous Emission Monitoring Systems CEM is installed and is linked with CPCB server for real time data
3.0	**CONDITIONS UNDER THE WATER ACT**	

3.1	The quantity of total water consumption shall not exceed 39742 KL/Day as per below break up as mentioned in form D submitted for consent application under the Water Act- 1974. a) Industrial: 38524 KL/Day b) Domestic: 1218 KL/Day	The quantity of total water consumption is remaining in range of 22000 to 25000 KL/Day which is below the limit as prescribed by the board.
3.2	The quantity of total waste water generation shall not exceed 5161 KL/DAY as per below break up as mentioned in form D submitted for consent application under the Water Act- 1974. a) Industrial: 4755 KL/Day (Including R.O reject 1000 KL/day) b) Domestic: 406 KL/Day	The quantity of industrial effluent is remaining in range of 3300 – 3500 KL/day which is below the limit as prescribed by the board.
3.3	**Mode of disposal of wastewater:**	
a)	The treated effluent conforming to the above standards as per condition no.3.4 shall be reutilized as per specific condition no. (III) of Environment Clearance Certificate dated: 18/03/2005 i.e. unit shall use 1330 M3/Day of treated effluent for greenbelt development. 475 M3/Day of treated effluent for lime slurry preparation. 480 M3/Day of treated effluent for make up in slag granulation and remaining 370 M3/Day of treated effluent in gas cleaning section. However, additional treated effluent or during the rainy season. Effluent shall be discharged into the deep sea through HDPE pipeline at a point through multiple diffuser system as recommended by the NIO specifically for the effluent generated from copper smelter Plant I & II. There shall not be any discharge outside the premises for the effluent generated from copper smelter Plant-III. The treated effluent should conform to the marine environmental standards as specified as per condition no.3.4	The treated effluent is being reutilized as per specific condition. Treated effluent confirms the marine environmental standards as specified by board.
b)	The Sewage from the entire complex shall be treated separately to conform to the following and utilized on land for gardening and plantation only.	We have two Sewage Treatment Plant, one in Plant and another in Township having capacity 500 KLD and 800 KLD

<table>
<tr><td></td><td><table>
<tr><th>Sr. No.</th><th>PARAMETERS</th><th>PERMISSIBLE LIMIT</th></tr>
<tr><td>1</td><td>Biochemical Oxygen Demand, BOD_3, 27^0 C</td><td>20 mg/L</td></tr>
<tr><td>2</td><td>Total Suspended Solids (TSS)</td><td>30 mg/L</td></tr>
<tr><td>3</td><td>Total Residual Chlorine</td><td>Minimum 0.5 ppm</td></tr>
</table></td><td>respectively. The sewage from the entire complex & Township is treated and conforms to the standards specified by GPCB it is used for gardening and plantation only.</td></tr>
<tr><td>c)</td><td>The company should operate a separate online Fish pond using treated effluent to ensure that the quality of treated effluent discharged into the sea does not have any adverse impact on the marine life. The effluent quality at the marine discharge point must also be monitored periodically by an independent agency authorized by CPCB and report of the independent agency should be submitted to the Ministry’s Regional office at Bhopal/CPCB/GPCB.</td><td>A separate online fish pond using treated effluent is operated to ensure that the quality of treated effluent discharged into the sea does not have any adverse impact on the marine life. The effluent quality at the marine discharge point is monitored periodically by an independent agency authorized by CPCB and reports of the independence agency and reports are submitted to the GPCB & MoEF.</td></tr>
<tr><td>d)</td><td>Adequate facilities and safety measures including protective clothing for personnel working in the critical area. e.g. in the anode casting area must be strictly explored.</td><td>Adequate facilities and safety measures including protective clothing’s, hand gloves, gumboot, eye goggles, full body mask apron for personnel working in the critical areas are provide. Specially in anode casting area fire protective suite and nose mask and eye goggles have been provided.</td></tr>
<tr><td>3.4</td><td>The quality of industrial effluent shall conform to the following standards (as per GPCB norms, whichever is applicable) (additional treated effluent shall be discharged into the deep sea through HDPE pipeline at a point through multiple diffuser system as recommended by the NIO)<table>
<tr><th>Sr. No.</th><th>PARAMETERS</th><th>PERMISSIBLE LIMIT</th></tr>
<tr><td>1</td><td>pH</td><td>5.5-9.0</td></tr>
<tr><td>2</td><td>Temperature</td><td>45°C</td></tr>
<tr><td>3</td><td>Colour(Pt,Co.scale)</td><td>100 units</td></tr>
<tr><td>4</td><td>Total suspended solids</td><td>100 mg/l</td></tr>
</table></td><td>The industrial effluent confirms to the standards specified by board and analysis reports are submitted to board on monthly basis.</td></tr>
</table>

<table>
<tr><td></td><td></td><td><table>
<tr><td>5</td><td>BOD(3 days at 27o C)</td><td>100 mg/l</td></tr>
<tr><td>6</td><td>COD</td><td>250 mg/l</td></tr>
<tr><td>7</td><td>Oil and Grease</td><td>20 mg/l</td></tr>
<tr><td>8</td><td>Phenolic Compounds</td><td>5 mg/l</td></tr>
<tr><td>9</td><td>Ammonical Nitrogen</td><td>50 mg/l</td></tr>
<tr><td>10</td><td>Sulphides</td><td>5 mg/l</td></tr>
<tr><td>11</td><td>Cyanides</td><td>0.2 mg/l</td></tr>
<tr><td>12</td><td>Fluoride</td><td>10 mg/l</td></tr>
<tr><td>13</td><td>Hexavalent Chromium</td><td>1.0 mg/l</td></tr>
<tr><td>14</td><td>Total Chromium</td><td>2.0 mg/l</td></tr>
<tr><td>15</td><td>Copper</td><td>3.0 mg/l</td></tr>
<tr><td>16</td><td>Nickel</td><td>5.0 mg/l</td></tr>
<tr><td>17</td><td>Zinc</td><td>15.0 mg/l</td></tr>
<tr><td>18</td><td>Mercury</td><td>0.01 mg/l</td></tr>
<tr><td>19</td><td>Lead</td><td>1.0 mg/l</td></tr>
<tr><td>20</td><td>Arsenic</td><td>0.2 mg/l</td></tr>
<tr><td>21</td><td>Cadmium</td><td>2.0 mg/l</td></tr>
<tr><td>22</td><td>Insecticide/Pesticide</td><td>Absent</td></tr>
<tr><td>23</td><td>Selenium</td><td>0.05 mg/l</td></tr>
<tr><td>24</td><td>Bio-Assay Test</td><td>90 % survival of fish after 96 hours in 100 % effluent</td></tr>
</table></td><td></td></tr>
<tr><td>3.5</td><td colspan="2">The treated effluent conforming to the above standards shall be reutilized in the process.</td><td>The treated effluent conforms to the above standards and is being recycled into process</td></tr>
<tr><td>3.6</td><td colspan="2">Unit shall implement & follow communication plan so that respected work can be done in minimum response time in case of emergencies</td><td>Complied .</td></tr>
</table>

3.7	Unit shall install continuous / online monitoring system and shall transmit online data so generated simultaneously to GPCB and CPCB as well for the parameters such as pH, BOD, COD, TSS, other sector specific parameters etc. with recorder & magnetic flow meters for flow measurement of treated wastewater as per CPCB guideline.	Unit has installed continuous / online monitoring system and its data are transmit online to CPCB/GPCB for the parameters such as BOD,COD,TSS .Data are recorded & waste water flow is measured with magnetic flow meter as per CPCB guideline.
3.8	Unit shall make fixed arrangement for discharge of the effluent from their Final collection tanks. Unit shall not keep any by-pass line or system or loose or flexible pipe line for discharge of the effluent into underground drainage network of Pipeline.	Unit has made fixed arrangement for discharge of the effluent from final collection tank i. e RO Reject tank.
3.9	Magnetic flow meters shall be installed at the inlet & outlet of effluent collection tanks/ETP to measure the quantity of effluent.	Magnetic Flow Meters is installed at inlet and outlet of Effluent Treatment Plant .
3.10	Unit shall affix of water meters as per Section 4 (1) of the water (Prevention and Control of Pollution) Cess Act – 1977 for the purpose of measuring and recording the quantity of water consumed at such places as may be required	Complied
3.11	Unit shall provide adequate / safe effluent sampling facility for the effluent being stored in final collection / discharge tank of ETP	Safe effluent sampling facility is being provided at final storage /discharge tank of ETP.
3.12	Unit shall put up at the entrance a board displaying the name of unit, particulars of the products/ process, the name of proprietor/partners /directors of the unit.	Complied.
3.13	Unit shall have to display on-line data outside the main factory gate with regard to and nature of hazardous chemicals being handled in the plant, including waste water and air emission and solid hazardous waste generated within the factory premises, if applicable as per CPCB norms.	Complied.
3.14	Unit shall either stop or curtail its production activities if the effluent is not conforming to the standards of GPCB.	Noted.

3.15	Unit shall keep accurate records of quantity of production of each product, quantity of water consumption, quantity of effluent generated and consumption of electricity on day to day basis and required to submit the complied record of each month to GPCB on or before fifth day of the succeeding month.	Complied.
3.16	Disposal system for storm water shall be provided separately. In no circumstances storm water shall be mixed with the industrial effluent.	Disposal system for storm water is provided separately hence storm water will not get mixed with the industrial effluent is being taken care.
3.17	Leachate from the Secured Land Fill, if any shall also be connected into a collection tank through leachate collection facilities and shall be treated along with industrial effluent.	Leachate from the Secured Land Fill is transferred with help of pump mounted tanker and is being treated along with industrial effluent.
3.18	The Environmental Management Unit/Cell shall be setup to ensure implementation on and monitoring of environment safeguards and other conditions stipulated by statutory authorities. The Environmental Management Cell / Unit shall directly report to the Chief Executive of the organization and shall work as a focal point for internalizing environmental issued. These Cells also coordinate the exercise of environmental audit and preparation of environmental statements.	Complied.
3.19	The Environmental audit shall be carryout yearly, if applicable. The environmental statements pertaining to the previous year shall be submitting to this State Board latest by 30th September every year.	The Environmental audit is being carried out yearly and the environmental statements pertaining to previous year is being submitted to Board before 30th September every year last environmental statements submitted to Board dated 21.07.2020.
3.20	In case of change of ownership/ management the name and address of the new ownership/ partners/ directors/ proprietor should immediately be intimate to the Board. Also any change in equipment or working conditions	Noted.

<table>
<tr><td></td><td>as mentioned in the consents form/ order should immediately be intimated to this Board.</td><td></td></tr>
<tr><td>3.21</td><td>The Board reserves the right to review and/or revoke the consent and / or make modifications in the conditions which it seems fit in accordance with provisions of Water Act-1974.</td><td>Noted.</td></tr>
<tr><td>4.0</td><td>CONDITIONS UNDER THE AIR ACT:</td><td></td></tr>
<tr><td>4.1</td><td>The following shall be used as fuel:
<table>
<tr><td colspan="3">DETAILS PF FUEL CONSUMPTION</td></tr>
<tr><td>Sr No.</td><td>Details of Fuel</td><td>TPM</td></tr>
<tr><td>1.</td><td>HSD</td><td>900</td></tr>
<tr><td>2.</td><td>HFO</td><td>1530</td></tr>
<tr><td>3.</td><td>Imported Coal</td><td>36980</td></tr>
<tr><td>4.</td><td>LNG (SCM)</td><td>1486197</td></tr>
</table></td><td>The fuels are used as specified in the CC& A order.
We have stopped to use Naphta and Propane as fuel as green initiatives.</td></tr>
<tr><td>4.1.1</td><td>The flue gas emission through stack shall conform to the following standards
<table>
<tr><th>STACK NO.</th><th>STACK ATTACHED TO</th><th>STACK HEIGHT IN METER</th><th>AIR POLLUTION CONTROL SYSTEM</th><th>PARAMETER</th><th>PERMISSIBLE LIMITS</th></tr>
<tr><td>1).</td><td>Dore Furnace of PMR Plant</td><td>45</td><td>Bag Filter</td><td>SPM
SO_2
NO_x</td><td>150 mg/NM^3
100 ppm
50 ppm</td></tr>
<tr><td>2.</td><td>Package Boiler</td><td>43</td><td>Scrubber</td><td>SPM
SO_2
NO_x</td><td>150 mg/NM^3
100 ppm
50 ppm</td></tr>
<tr><td>3.</td><td>Sulphuric Acid
Pre Heater-I</td><td>30</td><td>-</td><td>SPM
SO_2
NO_x</td><td>150 mg/NM^3
100 ppm
50 ppm</td></tr>
<tr><td>4.</td><td>Sulphuric Acid
Pre Heater-II</td><td>30</td><td>-</td><td>SPM
SO_2
NO_x</td><td>150 mg/NM^3
100 ppm
50 ppm</td></tr>
</table></td><td>The flue gas emission through stack conforms to the specified standards. Monitoring reports are submitted to the Board on monthly basis</td></tr>
</table>

		5.	D.G. Set-I	30	Cyclone Separator	SPM SO_2 NO_x	150 mg/NM^3 100 ppm 50 ppm	
		6.	D.G. Set-II	30	Cyclone Separator	SPM SO_2 NO_x	150 mg/NM^3 100 ppm 50 ppm	
		7.	Captive Power Plant (CPP-1) CFBC Boiler 35 MW	75	ESP+ Lime dosing system	SPM SO_2 NO_x	150 mg/NM^3 600 mg/Nm3 600 ppm	
		8.	Shaft Furnace of CCR plant-I	26	-	SPM SO_2 NO_x	150 mg/NM^3 100 ppm 50 ppm	
		9.	Shaft Furnace of CCR plant-II	26	-	SPM SO_2 NO_x	150 mg/NM^3 100 ppm 50 ppm	
		10.	Power plant AFBC Boiler 15.35 MW (CPP -II)	60	ESP+ Lime dosing system	SPM SO_2 NO_x	150 mg/NM^3 600 mg/Nm3 600 mg/Nm3	
		11.	Sulphuric Acid Pre Heater-III	38	-	SPM SO_2 NO_x	150 mg/NM^3 100 ppm 50 ppm	
		12.	Captive Power Plant (CPP-III) CFBC Boiler 60 MW	85	ESP+ Lime dosing system	SPM SO_2 NO_x Mercury	50 mg/NM^3 600 mg/Nm3 300 mg/Nm3 0.03 mg/Nm3	

		13.	Shaft Furnace of CCR Plant-III	35	--	PM SO2 NOx	150 mg/Nm3 100 ppm 50 ppm	

4.2 The process emission through various stacks/ vent of reactors, process, vessel shall conform following standards.

STACK NO.	STACK ATTACHED TO	STACK HEIGHT IN METER	AIR POLLUTION CONTROL SYSTEM	PARAMETER	PERMISSIBLE LIMITS
1	Anode Casting	20	-	SPM SO2 NOx	150 mg/NM3 40 mg/Nm3 25 mg/Nm3
2	Main Stack Secondary Gas Scrubber	75	Two stage alkali Scrubber	SO2	40 mg/NM3
3	Copper scrap melting furnace (Cap 50 TPD)				
4	Main Stack Slag cleaning Furnace	75	Bag Filter	SO2 SPM	40 mg/NM3 150 mg/Nm3
5	Main Stack Sulphuric Acid plant I	75	5 Stage DCDA system & Mist Eliminator	Acid Mist SO2	25 mg/Nm3 2 Kg per ton of 100 % conc. Sulphuric acid
6	Cathode Stripping M/C plant-I of Refinery-I	20	-	SO2	40 mg/NM3
7	Anode scrap washing M/C of Refinery-I	20	-	SO2	40 mg/NM3
8	Liberator Stack of Refinery-I	26	Scrubber	SO2 Acid Mist	40 mg/NM3 25 mg/Nm3
9	Slag Granulation of Smelter-I	45	-	SPM	150 mg/NM3
10	Steam Dryer for copper concentrate of Smelter-I	58	Bag Filter	SPM SO2	150 mg/NM3 40 mg/Nm3
11	Slag Cleaning furnace (By pass Vent) of Smelter-I	46	Bag Filter	SPM SO2	150 mg/NM3 40 mg/Nm3

The process emission through various stacks/ vent of reactors, process, and vessel conforms to the specified standards. Monitoring reports are submitted to the Board on monthly basis.

	12	Cathode Stripping M/C plant-II of Refinery-II	20	-	SO2	40 mg/NM3	
	13	Centralized Scrubbing System Smelter-III	75	Bag Filter +Alkali Scrubber	SPM SO2	150 mg/NM3 40 mg/NM3	
	14	Sulphuric Acid Plant-III	75	5 stage DCDA system & Mist Eliminator Tail Gas Scrubber based on Dyna wave scrubber	Acid Mist SO2	25 mg/Nm3 1.0 Kg per Ton of 100 % conc Sulphuric Acid	
	15	Cathode Stripping M/C Refinery-III	20	-	SO2	40 mg/NM3	
	16	Liberator Stack of Refinery-III	26	Scrubber	SO2 Acid Mist	40 mg/Nm3 25 mg/Nm3	
	17	DAP Plant	60	Dual media scrubber	SPM SO2 NOx NH3 HF	150 mg/NM3 40 mg/Nm3 25 mg/Nm3 175 mg/NM3 6 mg/Nm3	
	18	PS Convertor area (Gases are to be transferred to H2SO4 plant) only emergency vent	47	--	PM SO2 Copper	150 mg/Nm3 40 mg/Nm3 20 mg / Nm3	
	19	Reactor (Phosphoric Acid Plant)	60	Scrubber	HF	6 mg/Nm3	
	20	PMR Plant Phase -III	30	Bag Filter	SPM SO2 NOx	150 mg/NM3 40 mg/Nm3 25 mg/Nm3	

4.3

The concentration of the following parameters in the ambient air within the premises of the unit shall not exceed the limits specified hereunder.

Sr. No.	Parameters	Permissible Limit (microgram /m^3)	
		Annual	24 Hours Average
1.	Particulate Matter (PM_{10})	60	100
2.	Particulate Matter ($PM_{2.5}$)	40	60
3.	Oxides of Sulphur (SO_x)	50	80
4.	Oxides of Nitrogen (NO_x)	40	80

Ambient air quality is monitored within the premises of the unit on regular basis. The concentration of the specified parameters in the ambient air remains within the standards prescribed; monitoring reports are submitted to the board on monthly basis.

4.4	Unit shall operate industrial plant / air pollution control equipment very efficiently and continuously so that the gaseous emission always conforms to the standards specified as above.	Industrial plant / air pollution control equipment is efficiently and continuously operated so that the gaseous emission always conforms to the standards specified by the Board.
4.5	The consent to operate the industrial plant shall lapse if at any time the parameters of the gaseous emission are not within the tolerance limits specified as above.	Parameters of the gaseous emission are monitored on regular basis and report are being submitted to board. No parameter specified in consent to operate lapse.
4.6	Unit shall provide portholes, ladder, platform etc at chimney(s) for monitoring the air emissions and the same shall be open for inspection to/and for use of Board's staff. The chimney(s) vents attached to various sources of emission shall be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.	Permanent stair case with sufficient capacity monitoring platform to all monitoring stacks have been provided along with Sampling portholes, etc for monitoring air emissions, this facilities is well open to Govt. agencies for inspection
4.7	Unit shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standards in respect of noise to less than 75 dB(a) during day time and 70 dB (A) during night time. Daytime is reckoned in between 6 a.m. and10 p.m. and nighttime is reckoned between 10 p.m. and 6 a.m.	All adequate measures for control of noise levels from its own sources within the premises. The noise level is observed < 75 dB in day time 6.0 Am to 10.PM and < 70 dB in night time 10.PM to 06.AM within plant premises.
4.8	All efforts shall be made to control VOC emissions and odor problem, if any.	Noted and shall be complied with.
4.9	Total control of odor nuisance from the plant premises, shall be achieved & maintained by the unit continuously	Noted and shall be complied with
4.10	Unit shall install continuous / online monitoring system in the stacks and shall transmit online data so generated simultaneously to GPCB and CPCB as well for the parameters such as PM, SO2, NOx, other sector specific parameters etc., if applicable as per CPCB guideline.	Unit has installed continuous / online monitoring system in the stacks and data are being transmitted online to GPCB and CPCB for the parameters such as PM, SO2, NOx, as per CPCB guideline.
5.	**GENERAL CONDITIONS:**	
5.1	In case of change of ownership/ management the name and address of the new ownership/ partners/ directors/ proprietor should immediately be intimate to the Board. Also any change in equipment or working conditions as mentioned in the consents form/ order should immediately be intimated to this Board.	Any change ownership/ management the name and address of the new ownership/ partners/ directors/ proprietor as mentioned in the consents form/order is immediately be intimated to Board. Any change in equipment or working

<table>
<tr><td></td><td></td><td colspan="2">conditions as mentioned in the consents form/order shall be immediately intimated to Board.</td></tr>
<tr><td>5.2</td><td>Unit shall put up at the entrance a board displaying the name of unit, particulars of the products/ process and the name of proprietor/partners /directors of the unit and the electricity consumer number as on the record of DGVCL.</td><td colspan="2">Complied .</td></tr>
<tr><td>6.</td><td colspan="3">AUTHORISATION FOR THE MANAGEMENT & HANDLING OF HAZARDOUS WASTES Form-2 (See rule 3 (c) & 5 (5)).</td></tr>
<tr><td>6.1</td><td colspan="2">Number of authorization: AWH-108216 date of Issue 30/05/2020</td><td>Noted.</td></tr>
<tr><td>6.2</td><td colspan="3">M/s. HINDALCO INDUSTRIES LTD. is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at PLOT No.2,10,11,43, AT &PO DAHEJ, LAKHIGAM, TAL.VAGRA, GIDC ESTATE DAHEJ, DIST: BHARUCH.</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><th>No.</th><th>Name of Hazardous Waste</th><th>Category Number</th><th>Quantity</th><th>Facility</th></tr>
<tr><td>1</td><td>ETP waste sludge & Scrubber waste (Sludge & Filter cakes)</td><td>8.2/I</td><td>175095 TPA</td><td>Collection ,Storage, transportation and disposal at own SLF site/ common TSDF of BEIL.</td></tr>
<tr><td>2</td><td>Arsenic bearing sludge, As-Cu precipitate</td><td>7.3/I</td><td>270.80 TPA</td><td>Collection in closed stainless steel vessel, recycle & treatment /encapsulation & disposed at own SLF site/ common TSDF of BEIL.</td></tr>
<tr><td>3</td><td>Used oil</td><td>5.1/I</td><td>50 KL/Yr</td><td>Collection, storage, transportation and disposal by sale to registered re -refiners</td></tr>
<tr><td>4</td><td>Spent Electrolyte solution</td><td>8.1/I</td><td>52560 KL/Yr</td><td>Collection, Storage, Transportation and recycle in smelter or sell to recyclers</td></tr>
<tr><td>5</td><td>Residue dust from SAP</td><td>17.1/I</td><td>12 TPA</td><td>Collection, Storage, Transportation & Disposal in</td></tr>
</table></td><td>Various hazardous wastes are generated and facility as per the authorization is provided as required. The quantity of hazardous waste generated is within the specified figures.</td></tr>
</table>

					furnace or into own SLF site / third party TSDF
6	Spent catalyst	17.2/I	160 KL/Yr	Collection, Storage, Transportation and Disposal in furnace or into own SLF site / common TSDF of BEIL	
7	Used Empty Drums(Empty barrels/ Containers/ liners contaminated with hazardous chemicals /wastes)	33.1/I	200 TPA	Collection, Storage, Transportation & Disposal in furnace or into own SLF site	
8	Flue gas cleaning residue (Exhaust air /gas cleaning residue)	35.1/I	864 TPA	Collection, Storage, Transportation and Disposal in furnace or into own SLF site / third party TSDF	
9	Spent resin from DM plant (Spent ion exchange resin containing toxic metals)	35.2/I	7.5 KL/Yr	Collection ,Storage, transportation and disposal at own SLF site / common TSDF of BEIL.	
10	Selenium & selenium compounds.	A-8/II	6 TPA	Collection, storage, transportation and disposal by sale to actual users.	
11	Silver compounds.	A9/III	6 TPA	Collection, storage, transportation and disposal by sale to actual users.	
12	Inorganic Acid (Spent Acids)	B15/II	66960 TPA	Collection, storage, transportation and reuse to Mfg of ALF3 /disposal by sale to actual users.	
13	Dust & Lumpy	4/IV	35000 TPA	Collection, Storage, Transportation and recycle in smelter or sell to recyclers	
14	Copper Converting or C-Slag	6/IV	6000 TPA	Collection, Storage, Transportation and recycle in smelter or sell to recyclers	
15	Liberator cake	4/IV	3000 TPA	Collection, Storage, Transportation & recycle in smelter or sell to recyclers	

	16	Copper Revert	4/IV	72000 TPA	Collection, Storage, Transportation & recycle in smelter or sell to recyclers	
	17	Dore Slag (Slags from copper processing for further processing or refining)	6/IV	2500 TPA	Collection, Storage, Transportation and recycle in smelter or sell to recyclers	
	18	Lead Anode/ Cathode	7./I	80 TPA	Collection, Storage, Transportation and recycle in smelter or sell to recyclers.	
	19	Cotton waste used (Contaminated cotton rags or other cleaning materials)	33.2/I	15 TPA	Collection, Storage, Transportation and Disposal in furnace or into own SLF site / common TSDF of BEIL.	
	20	Used Insulation	X-X02	100 TPA	Collection, Storage, Transportation & Disposal in furnace or into own SLF site / common TSDF of BEIL.	
	21	Discarded PPE (Rubber)	X-X08	5 TPA	Collection, Storage, Transportation & Disposal in furnace or into own SLF site / common TSDF of BEIL.	
	22	Used membrane/ Filter cloth and bags	Z-Z37	20 TPA	Collection, Storage, Transportation & Disposal in furnace or into own SLF site / common TSDF of BEIL.	

6.3	The authorization is granted to operate a facility as above	Noted.
6.4	The authorization shall be in force for a period **up to 02/03/2026**.	Noted.
6.5	The authorization is subject to the conditions stated below and such other conditions as may be specified in the rules from time to time under the Environment (Protection) Act-1986.	Noted.
7.0	**TERMS AND CONDITIONS OF AUTHORISATION:**	

7.1	The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.	Is being complied with.
7.2	The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board.	Is being complied with.
7.3	The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.	Is being complied with.
7.4	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization	Is being complied with.
7.5	The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;	Noted. Shall be complied with.
7.6	The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty"	Noted.
7.7	It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility.	Noted. Shall be complied with.
7.8	The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.	Noted.
7.9	The record of consumption and fate of the imported hazardous and other wastes shall be maintained.	Shall be complied with.
7.10	The hazardous and other waste which gets generated during recycling or reuse or recovery or pre-processing or utilization of imported hazardous or other wastes shall be treated and disposed of as per specific conditions of authorization.	Unit is complying as per specific condition of authorization for recycling or reuse or recovery or pre-processing or utilization of imported hazardous or other wastes which gets generated from process.
7.11	The importer or exporter shall bear the cost of import or export and mitigation of damages if, any.	Shall be complied with.

7.12	An application for the renewal of an authorization shall be made as laid down under Hazardous & Other Wastes (Management and Transboundary Movement) Rules-2016.	Noted.
7.13	Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.	Noted.
7.14	Annual return shall be filed by June 30th for the period ensuring 31st March of the year.	Is being Complied with.
7.15	Unit shall have to display the relevant information with regard to hazardous waste as indicated in the Court's order in W.P. No. 657 of 1995 dated 14th October 2003.	Is being complied.
7.16	Unit shall have to display on-line data outside the main factory gate with regard to and nature of hazardous chemicals being handled in the plant, including waste water and air emission and solid hazardous waste generated within the factory premises.	Online display board is provided to Products and name of Proprietor/Partners/Directors has been displayed at main of gate of factory,
7.17	Unit shall have to manage used or spent oil; empty or discarded barrels / containers / liners contaminated with hazardous chemicals / wastes, process waste as per Hazardous & Other Wastes (Management and Transboundary Movement) Rules-2016, framed under the E(P)Act-1986 and shall apply Authorization for all applicable waste	Shall be complied with

ON SITE EMERGENCY PLAN

[As per required by Schedule 8-A, Rules 68-J (12)(1) of the GFR 1963]
[The rule 13(1) of MSIHC Rules 1989 (Manufacture, Storage and Import of Hazardous chemicals Rule – 1989)]

M/s. HINDALCO INDUSTRIES LTD
(Unit: Birla Copper).

AT & PO DAHEJ, NEAR LAKHIGAM,
GIDC INDUSTRIAL ESTATE, TA: VAGRA - 392130
BHARUCH, GUJARAT, INDIA.

JUNE- 2023

CONTENT

PREFACE

Our First Emergency Plan was prepared and then after it is updated annually based on the learning outcome from various Mock drills or on account of expansion of the facility. Mock drills are to be conducted to test the plan and improve our emergency preparedness. The goals and objectives will be to improve quality of work and working life through dedicated and concentrated efforts consistent with the requirements of safety, health and environment at work place. The results of these exercises, identification and assessments of all credible scenarios, survey of various Rules, Regulations and standards will be taken as basis for modifying the ON-SITE Emergency Plan. Classification of Emergencies as well as keeping in view the requirements of implementation of ISO 14001:2015 and ISO 45001:2018.

As emergencies arise suddenly the necessity to stay alert at all times & ready with supporting facilities to face them is of paramount importance. This document cannot be said to be complete is always under continuous evaluation based on current emergency response. Well planned and well-rehearsed Emergency Plan will help organization to mitigate / control emergency situation in minimum time and also to restart operation with minimum losses.

The Onsite Emergency Plan (OSEP) is prepared and revised after reviewing & refereeing Last few Mock drills was conducted by sites.

All the key personnel are requested to study the document and become familiar with the contents and disseminate information to those working with them.

Mr. K. N. Bhandari

Occupier

PURPOSE

Major accidents may cause emergency and it may lead to disaster, which may cause heavy loss of life, property, environment and which may also reflect in production.

Emergency situation arises all of a sudden and creates havoc and damage to property, life and surrounding biodiversity.

Therefore, such situations and risks should be thought, visualized and assessed in advance and it should be planned beforehand to tackle them efficiently and control them within the shortest time possible.

We handle various hazardous chemicals & employ processes involving pressure and temperature. In spite of precautions and safety measures we take, an incident of potential damage may arise. Such incidents if effectively handled by the Department Heads/ Shift-in-Charges / Shift Engineers would cease to be a potential hazard thereafter. However, in case the situation demands for greater assistance, and the mitigation measures are not enough to control or when the Shift-in-Charge / Shift Engineer is in doubt of combating and controlling the situations with resources at his command, he will initiate the emergency procedure. “The purpose of this plan is to lay down guidelines to handle such emergencies.”

Under the provision of Sec 41B (4) of the Factories Act 1948, every occupier shall draw up an On-site Emergency Plan and detailed disaster control measures for his factory and make known to the workers employed therein and to the general public living in the vicinity of the factory the safety measures required to be taken in the event of an accident taking place.

Similarly, Schedule 8-A of Sub rule 68-J-(12) (1) of Gujarat Factory Rule 1963, requires that every occupier of a hazardous factory shall prepare an ON-SITE emergency plan & The rule 13(1) of MSIHC Rules 1989 (Manufacture, storage and Import of Hazardous chemicals Rule, 1989) requires the Occupier of any Major Accident Hazards (MAH) installation to prepare and an On-site Emergency Plan and detailed disaster control measures including linkage with off Site Emergency Management for the factory. Accordingly, the ON-SITE and OFF-SITE emergency plan with details of disaster control measures have been prepared for the employees and general public living in the vicinity of the factory. This plan gives the safety measures to be taken in the event of any accident or disaster happening at the plant.

The provisions of the following guidelines are kept in mind while preparing this plan.

- Status relating to risk assessment and environment impact in case of major accidents and the measures taken for prevention.

- Probabilities of possible hazard due to the failure of provided control measures and equipment such as safety valve, pressure gauge, temperature indicator etc. at different stages of process.
- Provisions for all facilities and procedures for immediate control to minimize the effect of such probabilities.
- Arrangement with mutual aid agencies.
- Arrangement for informing workers through emergency alarm and public in vicinity and surrounding factories through telephone
- Arrangement for evacuation of persons likely to be affected due to emergency.
- Arrangement for transporting affected persons to the hospital and medical Centre through Car/Ambulance.
- Arrangement for necessary treatment and availability of antidotes at hospitals and at medical Centre.
- Organization Chart for fixation of responsibilities of managers, officers, workers at different stages for handling emergency due to fire, explosion etc.
- Details regarding alert system like emergency detection and alarm.
- Notification of place of gathering of workers and staff at the time of emergency.
- Information in detail, regarding any disaster, which might have occurred in factory.
- Provisions of main control for 24 hours to be of use at the time of emergency.
- Arrangement regarding maintenance of different equipment, control measures and safe procedure of work so that they shall work effectively.
- A statement of all possible source of accidents involving fire, explosion, toxic gas release etc. and plan of showing the place of above accidents within the facilities.
- OFF-SITE emergency services that is a link between ON-SITE and OFF-SITE Emergency Plan. While preparing this plan, the following documents have been referred.
- As per Gujarat Disaster Management Act, as requested shall assist the State Government, the Commissioner and the Collector in all disaster management activities and should prepare a disaster management plan in conformity with the other disaster management plans of local authorities, departments of Government having regard to the guidelines laid down in this behalf by the Authority.
- Each factory shall be responsible for effective implementation of the plan drawn up by it in this behalf. Each private and public sector entity shall provide assistance to the Authority, the Commissioner, the Collector and take such other steps as may be necessary for disaster management.

STATUTORY PROVISIONS

- On site emergency plan of the unit has to be developed by the occupier of the factory as per statutes given below;
- **The Factories Act, 1948(1987) & the Gujarat Factories Rules 1963 Section 7A (2) & 41(B) of the Factories Act 1948 (1987) and Rules 68-J (12) of the Gujarat Factories Rules 1963** providing that the every occupier; who has control of an industrial activity pertaining to hazardous chemicals or industries involving hazardous process shall furnish the on-site emergency plan detailing how major accidents shall be deal with along with explaining specific responsibilities and actions by various persons. On site emergency plan shall contain the details as specified in Schedule 8-A of the GFR. The guideline for preparation of onsite emergency plan is issued by Director Industrial Safety and Health, Gujarat State. The present on site emergency plan is prepared as per above guideline.
- **The Manufacture, Storage and Import of Hazardous Chemicals Rule 1989 (Amended 2000) Rule 13(1) under the Manufacture, Storage and Import of Hazardous Chemicals Rule 1989 (Amended 2000)**, Rules framed under the Environment (Protection) Act-1986(2001), indicates that the occupier shall prepare and keep up-to-date an on-site emergency plan containing details specified in Schedule 11 and detailing responsibilities and actions by different persons and agencies.
- **Chemical Accidents (Emergency Planning, Preparedness and Response) Rule 1996 (2000)** Under these Rules, framed under the Environment (protection) Act-1986, the State Government has constituted Local Crisis Group & District Crisis Group to deal with major chemical accidents and to provide expert guidance for handling chemical accidents. Further provision is made that the Major Accident Hazardous units have to prepare the on-site emergency plan & submit the plan to the crisis groups. The local emergency plan will dovetail with the District off-site emergency plan.

OBJECTIVES

To define and assess emergencies, including risk and environment impact assessment.

- To control and contain incidents.
- To safeguard employees and people in vicinity.
- To minimize damage to property or/and the environment.
- To inform employees, the general public and the authority about the hazards/risks assessed, safeguards provided, residual risk if any and the role to be played by them in the event of emergency.
- To be ready for 'mutual aid' if need arises to help neighbouring unit. Normal jurisdiction of an OEP is limited to the own premises only, but looking to the time factor in arriving the external help or off-site plan agency, the jurisdiction must be extended outside to the extent possible in case of emergency occurring outside.
- To inform authorities and mutual aid centres to come for help.
- To effect rescue and treatment of casualties. To count injured.
- To identify and list any dead.
- To inform and help relatives.
- To secure the safe rehabilitation of affected areas and to restore normalcy.
- To provide authoritative information to the news media.
- To preserve records, equipment etc, and to organise investigation into the cause of the emergency and suggest preventive measures to stop its recurrence.
- To ensure safety of the works before personnel re-enter and resume duty.
- To work out a plan with all provisions to handle emergencies and to provide necessary inputs for emergency preparedness and the periodical rehearsal.

DEFINITIONS

Some definitions of the terms used in on-site emergency plan are given below:

ACCIDENT

An accident is an unplanned event, which has a probability of causing personal injury or property damage or both. It may result in physical harm (injury or disease) to person, damage to property, loss to the company, a nearby area or any combination of these effects.

MAJOR ACCIDENT

A major accident is an, unexpected, unplanned event, resulting from uncontrolled developments during an industrial activity, which causes, or has the potential to cause-

i) Serious adverse effects immediate or delayed (death, injuries, poisoning or hospitalization) to a number of people inside the installation and/or to persons outside the establishment, or

ii) Significant damage to crops, plants or animals or significant contamination of land, water or air, or,

iii) An emergency intervention outside the establishment (eg. evacuation of local population, stopping of local traffic) or,

iv) Significant changes in the process operating conditions, such as stoppage or suspension of normal work in the concerned plant for a significant period, or

v) Any combination of above effects

The definition is changed under the Manufacture, Storage and Import of Hazardous chemicals (Amendment) Rules 2000 as loss of life inside or outside the plant or ten injuries outside or on-site or off-site emergency or damages to equipment or adverse effects to environment due to toxic release, fire, explosion or spillage of hazardous chemical.

INCIDENT:

Incident can be defined as an undesired event giving rise to death, ill health, injury, damage or other loss.

EMERGENCY:

An emergency is an abnormal event, which could result in danger to person, property and environment. It could be due to fire, explosion, heavy spillage of hazardous liquid, toxic gas release etc.

A MAJOR EMERGENCY:

Is one that may affect several departments within it and/or may cause serious injuries, loss of life, and extensive damage to property or serious disruption outside the works? It will require the use of outside resources to handle it effectively.

NOTE: Emergency due to operating conditions, uncontrolled reaction, small fire, small gas leak, spill, failure of power, water, air, steam, cooling media, scrubbing media etc. and which can be locally handled by plant personnel alone (without outside help) is not considered as major emergency.

TYPES OF EMERGENCIES

Man made	Natural Calamities	Extraneous
• Heavy Toxic Leakage/ Spillage	• Flood	• Riots/Civil Disorder/Mob Attack
• Fire	• Earthquake	• Terrorism
• Explosion	• Cyclone	• Sabotage
• Failure of Critical Control system	• Outbreak of Disease	• Bomb Threat
• Design deficiency	• Tsunami • Lightning	• War/Hit by missiles
• Unsafe acts		• Abduction
• In-adequate maintenance		• Food Poisoning/Water Poisoning

DISASTER

Is a catastrophic situation in which the day-to-day life patterns are, in many instances, suddenly disrupted and people are plunged into helplessness and suffering and as a result need protection, clothing, shelter, medical and social care & other necessities of life, such as: Disasters resulting from natural phenomena are earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, landslides, fierce fires and massive insect infestation. severe draught leading to famine and death.

Second group includes disasters to man's impact on the environment, such as armed conflict, industrial accidents, factory fires, explosions and escape of toxic releases of chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents, such as, collisions of vehicles carrying inflammable liquids, oil spills at sea and dam failures.

ENVIRONMENT

Environment as defined u/s 2(a) of the Environment Protection Act includes water, air and land and the inter relationship which exists among and between water, air and land and human beings, other living creatures, plants, micro-organism and property.

ENVIRONMENT POLLUTANT

Environment pollutant defined u/s 2(a) of the Environment Protection Act any solid, liquid or gaseous substance present in such concentration as may be or tend to be injurious to environment.

HAZARD:

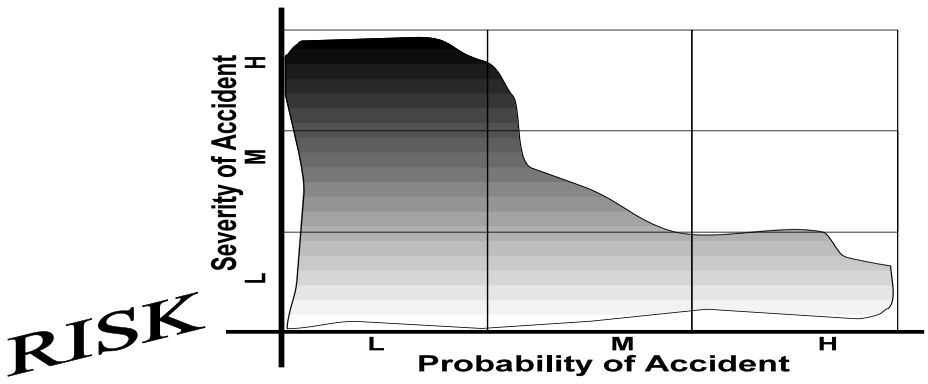
Source or situation with a potential for causing harm in terms of injury or ill health, damage to property, damage to the workplace environment or a combination of these.

CHEMICAL HAZARD

Chemical Hazard is a hazard caused due to chemical (including its storage, process, handling etc.) and the output is fire, explosion, toxicity, corrosion, radiation etc.

RISK:

Risk is the likelihood of an undesired event (i.e. accident, injury or death) occurring within a specified period or under specified circumstances. It may be either a frequency or a probability depending on the circumstances.



INDIVIDUAL RISK

Individual risk is the frequency at which an individual may be expected to sustain a given level of harm from the realization of specific hazards.

SOCIETAL RISK

Societal risk is a measure of the chances of a number of people being affected by a single event or set of events and is often presented as f/n curves (i.e. frequency v/s number of people affected).

ON-SITE EMERGENCY

The on-site emergency plan deals with measures to prevent and control emergencies within the factory and not affecting outside public or environment.

OFF-SITE EMERGENCY

If an accident takes place in a chemical installation and its effects are felt outside its premises, the situation thus created is called an off-site emergency.
Off-site Emergency Plan is prepared under rule 14 of the Manufacture, Storage and Import of Hazardous Chemicals Rules.

CLASSIFICATION OF EMERGENCY:

Levels	Description
Level 1 Emergency	This is an emergency situation or an incident that: i. Can be effectively and safely managed, and contained within the site, location or installation by the available resources; ii. Has no impact outside the site, location or installation; and iii. Is unlikely to be danger to life, the environment or to company assets or reputation.
Level 2 Emergency	This is an emergency situation or an incident that i. Cannot be effectively and safely managed or contained at the site, location or installation by available resource and additional support is required ii. Is having, or has the potential to have an effect beyond the site, location or installation and where external support of mutual aid partner may be involved. iii. Is likely to be danger to life, to the environment, to company assets or reputation.
Level 3 Emergency	This is an emergency situation or an incident that i. Is catastrophic and is likely to affect the population, property and environment inside and outside the installation, and management & control is done by Local Administration Authority. Although the level-III emergency falls under the purview of Local Administration Authority but till they step in, it shall be the responsibility of the site to manage the emergency situation.

Note: Level-I and Level- II shall normally be grouped as on-site emergency and Level- III as off-site emergency.

At all the Hindalco site for all level 2 and 3 emergency situations, the emergency response shall be actuated by chief Incident Controller as appropriate. Other key persons shall also start performing their defined role as per the Incident Command Structure.

CHAPTER- 1: NAME AND ADDRESS OF THE PERSONS FURNISHING THE INFORMATION

Full Name & Address of the company:	**M/s HINDALCO INDUSTRIES LTD (Unit: Birla Copper).** At & Po Dahej, Near Lakhigam, GIDC Industrial Estate, Ta: Vagra - 392130 Bharuch, Gujarat, India.		
Contact No.: 2641-256004/5/6/9			
Full Name & Address of the occupier:	**Mr. K N Bhandari - Director** 5-New power house road, Sector -7, Jodhpur – 342003	**Contact No:**	
		Office	**Residence**
		2641-256004/5/6/9	
Full Name & Address of the Manager:	**Mr. Krishnaraju Kumaravel - President & Unit Head** President's Bungalow, Birla Copper Township, P.O. Dahej, Taluka: Vagra, District- Bharuch.	**Contact No:**	
		Office	**Residence**
		02646 – 251036	+91 73537 23000

Name of the shift	**Maximum workers at a time**			(a). Workers" include all employee, contract workers, trainees, apprentices, etc
	Male	**Female**	**Total**	
General (G)	708	34	742	
First (A)	279	0	279	
Second (B)	261	0	261	
Third (C)	225	0	225	
Total Workers (a)	**1473**	**34**	**1507**	

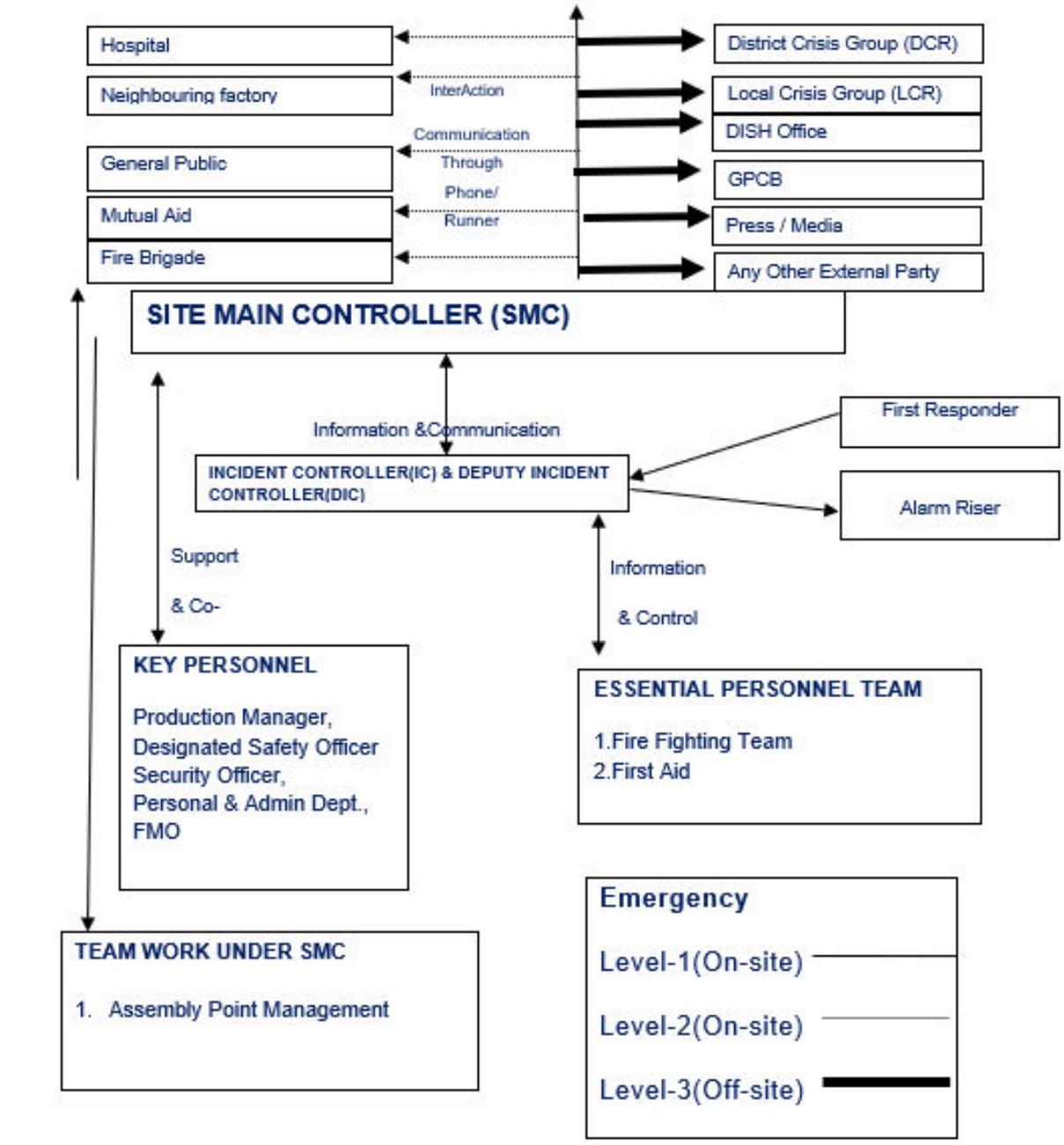
Maximum workers at a time				
Name of the shift	**Male**	**Female**	**Total**	(b). Contractual Employees Man Power
Day	3422	117	3539	
Night	449	00	449	
Total Workers (b).	3871	117	3988	
Grand Total (a + b)	**5344**	**151**	**5495**	

First person to be contacted in the case of emergency: Mr. Ajeet Kumar

Sr. No.	Name	Designation	Office Phone No.
01	Mr. Jatinder Khaira	Head - Security & Fire	+91 8727022255
02	Mr. Ajeet Kumar	Head - Safety	+91 9727706570
03	Mr. Krishnaraju Kumaravel	President & Unit Head	+91 96691 67000

CHAPTER-2: KEY PERSONNEL OF THE ORGANISATION AND RESPONSIBILITIES ASSIGNED TO THEM IN CASE OF AN EMERGENCY

Emergency Organization Chart & Communication Chart



INTRODUCTION

This chapter is devised to suggest the organization for emergency preparedness. Key personnel to combat emergency should be nominated with specific responsibilities according to the set procedures (rehearsed) and making the best use of the resources available. Such key personnel include Incident Controller, Site Main Controller, other trained workers. Assembly points for workers, emergency control centre, ambulance room/ OHC and ambulance van, fire and toxicity control arrangements, medical arrangements, transport and evacuation arrangements, pollution control arrangements, other arrangements and persons to manage them are also important part of the emergency plan.

All such key personnel must be available in all shifts and on call as well as on off-duty hour or holiday. Their specific duties shall be listed (person wise) in annexure as attached in the Emergency Instruction Booklet. The details are explained below.

ROLES AND RESPONSIBILITY OF EMERGENCY RESPONSE PERSONNEL

- **FIRST RESPONDER & ALARM RAISER**

  (He should follow fire Order in case of fire as mentioned below)

  - **In case of Fire / Explosion**

  - Alert Control Room by Breaking MCP and try to extinguish the fire by using the nearest fire extinguisher, if safe to do so.

    OR

  - Loudly Sought fire, fire, fire to alert nearby people and try to extinguish the fire by using the nearest fire extinguisher, if safe to do so
  - Help evacuate occupant (a person who resides or is present in a house) by Using Emergency Exit or Shortest safe root. Send them to Assembly Point.
  - Do not use the elevators, use stairs for exit purpose.
  - Report to the assembly point.
  - Be calm - do not panic; Walk, do not run.

  - **For Other Emergency Situation**

    Any person who notices any abnormal major incident of hazardous nature, has responsibilities as first responder

  - As soon as he notices any incident of hazardous nature i.e. ire, Toxic gas Release, Heavy Spillage of hazardous & Toxic Chemicals or building collapse. He will first inform to his superior and co-worker about the situation.

- After getting instruction from Respective Incident Controller, Alarm riser will raise the siren.
- In case of failure of power supply ring, the manual bell loudly

- **SITE MAIN CONTROLLER**

He is the head authority of the Emergency Organization. Unit Head holds the responsibility of the Site Main Controller. He owns overall responsibility for directing operation and calling for outside help from Emergency Control Centre.

In absence of Unit Head, Factory Manager Head Will Act as a Deputy Site Main Controller and During Silent hours

On being informed about the emergency he will-

1. Rush to the ECC
2. Relieve the incident controller from responsibilities for overall main control.
3. On consultation with I.C. and Key Personnel decide about the type of emergency and activate on site / off site Emergency Plan as the situation demands.
4. Ensure that key personnel are called in.
5. Ensure that, after declaring the major emergency,
   a) To activate the off-site plan (if required).
   b) To ensure about the outside emergency services and mutual aid helps are called.
   c) To inform neighbours factories by telephone or by sending informer and surrounding population through loud speakers, and any medium of communication available.
6. Continuously review and assess possible developments to determine the most probable course of events.
7. Direct the safe shut down and evacuate the plant in consultation with the incident controller and key person. If necessary, arrange to evacuate the neighbouring population.
8. To ensure that the casualties are receiving adequate attention -
   - To arrange for hospitalization of victims.
   - To inform/ensure that the relatives are informed.
9. To inform and liaison with Local Crisis Group (SDM-LCC), District Crisis Group (collector-DCR), Joint Director (Industrial safety & Health) and experts of health and safety, District Magistrate, Police Station, Fire Brigade & Hospital.
10. In the case of if the emergency is prolonged & emergency involving risk to outside area by wind blow materials contact meteorological office to receive early notification of impending changes in weather condition.

11. Ensure that assembly point managing team reached on the company assembly point to take charge.
12. Ensure that Transportation In-charge reached on the company transport office to take charge.
13. Ensure that Public address system In-charge has reached & take charge.
14. Ensure the headcount of the employees at present in the company and rescue of missing ones.
15. Control traffic movement inside factory.
16. Ensure canteen facilities, if the emergency is prolonged.
17. Issue authorized statement to the news media.
18. To ensure preservation of evidence make arrangement for taking photographs etc.
19. Control rehabilitation of affected areas and victims on cessation of emergency.
20. To instruct the Security office to raise "All Clear Siren" after ensuring that the emergency is controlled and over.
21. To ensure that the plant is not started unless complete inspected / investigated is done.

- **DEPUTY SITE MAIN CONTROLLER**

In absence of Factory Manager, Plant Manager will act as a Deputy Site Main Controller and during Silent hours.

Note: It is recommended to have a special identification for this role & responsibility at a time of actual Emergency or Mock drill.

Note: See **Annexure: - 16** for Individual Name as a SMC.

- **INCIDENT CONTROLLER**

Respective Plant In charge holds the responsibility of the Incident Controller, if the incident is in their plant/area. On being informed of the emergency and its location he should immediately go to the site and process the following:

1. Immediately take change of incident place.
2. Assess the scale of emergency, if the emergency is minor, try to prevent by using on site resources like fire extinguishers in case of fire, and cover the spillage by sand in case of liquid spillage.
3. Assess the scale of emergency, if the emergency is major / unable to prevent by using on site resources, he will start to activate on-site plan by raising the siren through telephone office/security office. The security officer on duty will inform security staff to raise the siren.

4. If fire emergency is there and fire is major /unable to prevent by using on site resources, the incident controller (IC) will inform to local fire brigade by telephone through (ECC) office.
5. If incident controller is absent, then deputy incident controller will have to take responsibilities of Site main controller (SMC), till site main controller take the charge of emergency control centre (ECC).
   a) They should remain at the plant assembly point with their personnel if safe to do so unless instructed by SMC/IC.
   b) Partial shutdown of plant should be followed by trained essential person of the plant/area.
   c) As per the emergency, the fully equipped essential person team member will be sent at the incident place.
   d) Incident controllers will direct ECC to inform Police, Medical Services, Mutual Aiders, etc. giving details of incident for required helps.
6. To ensure that emergency information is passed to the all emergency services i.e. Safety Department, Engineering department, Security Main Gate, OHC Room, for responding at incident site.
7. To ensure that all steps are taken for mechanical and electrical isolation to control the situation.
8. Incident controller of the affected area should notify other area's Incident controllers their help in communication to SMC.
9. To send telephonic message to Site Main Controller and key personnel or send messenger to inform them about incident.
10. Assessing the incident, direct the respective team of essential personnel to prevent it by using adequate measuring like, extinguishers in case of fire, by covering the liquid spillage by sand or soil.
11. To make sure that the key personnel are present on the site of the incident and perform their allotted duties.
12. To ensure to post the person at strategic location to guide the route from the incident area to the outside agencies/authority.
13. To ensure that all workers/staff of the affected area are instructed to go to assembly point / shelter and afterwards the areas is searched for casualties if any.
14. To ensure that ERT member reported at the site.
15. Establish a control point at a safe distance.
16. To set up a communication point and establish contact with the emergency control centre.
17. To ensure availability of the outside services like mutual aid, fire brigade through emergency control centre.

18. To ensure the availability of equipments, machineries and devices in the unit is mobilized for lifting and shifting of material from the scene of emergency site
19. To Ensure that affected area is barricaded and evidences of incident are retained at site.
20. Direct the safe shut down of the plant or part of the plant and evacuate the plant or area to the safe company assembly point.
21. Direct all operations within the affected areas with the following priorities.
    a) Secure the safety of personnel.
    b) Minimum damage to plant, property and environment.
    c) Minimize loss of material.
22. To give advice and as asked by the head of fire brigade and emergency services.
23. To brief site main controller and keep informed of development of situation.
24. To Inform the Site Main Controller/Telephone operator after controlling the emergency to raise all clear siren.
25. To preserve evidences that will be necessary for subsequent inquiry into the cause of the emergency and concluding preventive measures.

Note: See **Annexure: - 14** for Individual Name as an IC.

- **DEPUTY INCIDENT CONTROLLER**

  Respective Shift In charge of the Plant (Site) holds the responsibility of the Dy. IC, if the incident is in their plant/area, until the arrival of the IC on the Site. Than DY IC will support to IC. Duties of Deputy IC is as follows:

  1. Raise the alarm/warning signal.
  2. Activate fixed protection equipment (e.g. sprinkler systems, water curtains, fire hydrants & fire monitors);
  3. Carry out initial rescue and firefighting, employing appropriate combat and protective equipment.
  4. Stop or minimize fuel flow
  5. Make the process equipment involved in the event safe by isolation of source of leakage, depressurizing and/or shutting down, as necessary in consultation with IC.
  6. Request assistance from others (e.g. engineering, medical).

  Note: See **Annexure: - 15** for Individual Name as a DIC.

- **KEY PERSONNEL**

  On being informed about the emergency by Phone or by Emergency Siren, report to incident controller or Site Main Controller at E.C.C.

IC of the Other plant / area will be the key personnel and holds their respective the responsibilities.

The responsibilities and duties of key personnel are as follows.

A: Operation Manager

1. To keep in touch with IC & SMC in assessing/ controlling the emergency.
2. To guide essential personnel team.
3. To guide personnel for safe shut down of the plant.
4. To guide transport service for safe shifting of materials from one place to other.
5. To guide mutual aids services and the teams.
6. To keep informed the site main controller about developments.
7. To make arrangement like emergency light, water etc.
8. To assess the emergency & evacuate the neighbouring factory workers and neighbouring population through SMC.
9. To inform the effect of emergency and steps to be taken to avoid the effects of a radiation, or leaks, or emissions etc.

B: Safety Officer

1. To get information on emergency, he must immediately go to the site.
2. To assist incident controller in controlling emergency
3. To help site main controller in communication.
4. To ensure that adequacy of firefighting and rescue operation during action
5. To provide necessary equipment like FFE, PPE & RPE.
6. To guide transport for safe shifting of materials from one place to other.
7. To guide mutual aids services and the teams.
8. To keep informed the site main controller about developments.
9. To make arrangement like emergency light, water etc.
10. To assess the emergency & evacuate the neighbouring factory workers and neighbouring population through SMC.
11. To inform the effect of emergency and steps to be taken to avoid the effects.
12. To ensure that all trapped persons are safely rescued and if necessary give proper medical treatment.
13. Monitor the situation and give guidance for response action to the team members.
14. To Ensure adequacy of resources to tackle the emergency. If more resources are required, then after consulting with IC & SMC, he can call for other help from outside resources such as mutual aiders and Vapi Industrial Association.

15. Monitor the effect of the incident on the nearby plants & facilities.
16. Appraise the IC/SMC on Fire / Gas Leak, evacuation of persons, hazards of chemicals and on emergency situation.
17. To Ensure that environment will be properly monitored before environment clearance for re-starting of plant.
18. Monitor the runoff water route and Effluent Treatment Plant operations
19. Monitor the Fire Water Tank Level and operation of the Fire pumps.

C: Security officer

1. Blowing siren.
2. To help incident controller & site main controller at the time of emergency.
3. Maintain list of contract employees and visitors present on site.
4. To keep road clear and control the traffic movement.
5. To clear all Assembly points.
6. To reach at site and barricade the area & inform to incident controller or site main controller about the emergency.
7. To depute one dedicated person at Gate for proper communication till emergency ends.
8. To stop unnecessary vehicle movements.
9. To stope out vehicle entry containing materials.
10. During emergency to keep main gate close.
11. If any outside help like fire tender arrived at site, ask / take approval from SMC for its entry through walkie or Telephone. If approved one security person should assist to reach at emergency scenario.
12. To make arrangement for evacuating workers from the place of accident and guide non- essential workers towards company assembly point.
13. To ensure that the roadway to plant is clear for emergency vehicles. Obtain assistance to keep roadway clear and to stop non-emergency traffic from entering.
14. To direct their personnel (Response force & Task force) for evacuation of non-essential workers & Crowd control.
15. To direct mutual aid services for their help and guide to them.
16. If any government officials / media personnel arrived at gate – ask them to stay at visitors' room at gate. In form the same to SMC. Once emergency is over SMC & personnel head will brief the details.
17. Follow the instructions of IC & SMC.
18. Blowing of all clear siren.

D: Personal & Admin Department & HR

1. To assist site main controller & incident controller in controlling emergency.
2. Keep constant touch with the SMC and he will keep liaison with official of labour dept., Office of Director Industrial Safety & Health, Police Authority, Notified Area Authority, local authorities and relatives of affected person, trapped, injured or admitted to the hospital inside and outside, further he will keep ready the local and permanent address of such persons and their relatives.
3. To guide mutual aids services and the teams
4. Keep liaison with Explosive Department, GPCB and Boiler Inspector
5. To Ensure to post an experienced and senior person for recording presence and missing, injured, trapped, dead person's name, if so, and HR will prepare the list and report to the SMC.
6. To get the details of head count from all Assembly points.
7. To ensure the counting of total number of persons at site, list of missing / trapped person, injured person and fatality. Further, he will ensure to convey the message to the relatives of injured or death.
8. Arrange liaison work with hospital Authorities, admitted injured person and their relatives
9. If emergency extends for prolong period, then HR will arrange for water and food as per prevailing situation under consultation with SMC.
10. To keep informed the site main controller about developments.
11. To assess the emergency & evacuate the neighbouring factory workers and neighbouring population through SMC.
12. Arrange manpower and guide evacuation of the surrounding people to safe shelter by use of vehicles in consultation with SMC.
13. To Recall the personnel off the duty during emergency period and post them to carry out specific duties in consultation with SMC and Safety Head
14. To Ensure that the emergency work will not suffer due to administrative control
15. To inform the effect of emergency and steps to be taken to avoid the effects of a Fire etc.
16. To ensure that the suitable information is given to the media as approved by SMC.
17. To deal with external communication like media & external agencies.

E: Factory Medical Officer

1. To take charge of Occupational Health Centre.
2. To provide treatment/ first aid to the affected persons and if necessary, send them to hospitals for further treatment.

3. To keep liaison with hospitals and inform them about the type of emergency help required as per discussion with Site main control.
4. Arrangement for adequate stock of antidotes, lifesaving drugs and special medicines.
5. To keep the record of persons given first aid/ treatment and send them to hospitals with their name.
6. To keep ready the list of blood groupings.
7. To inform site main controller about the developing situation.
8. To Decide for further treatment & coordinate with transport incharge & keep record.
9. To Assess need of extra medical Ambulance, help & coordinate with IC / SMC.
10. To guide/instruct first aider, first aid & Rescue team in case of any emergency.
11. To keep ready the list of first aider.
12. To identify of all the hospitals for facilities to render medical aid to victims of exposure to dangerous chemical substances, burns and other specific injuries. (State authorities, local authorities, ESICS, Private, Railways/Voluntary institutions, trusts etc.) & report to SMC
13. To keep provisions of buffer stock of essential medicines like intravenous fluids, dressing materials, splints, oxygen cylinders, suction apparatus etc. Keeping in view the large number of third degree burns, heat radiation.

Note: See **Annexure: - 17** for Individual Name as a Key Personnel.

F: TRANSPORT IN-CHRAGE

1. Arrange transport for evacuated person to shift to outside shelter.
2. On being informed about the incident proceed to the emergency control center (ECC).
3. Take charge of all transport vehicles available on site and keep driver ready.
4. Arrange to transfer causalities to nearest hospital.
5. Coordinate with the SMC and follow his instructions.
6. To maintain arrangement of transport.

G: MECHANICAL IN-CHRAGE

1. To assist site main controller & incident controller.
2. To ensure that emergency engineering services are in working condition.
3. To render all engineering help to the IC in controlling the incident.
4. To arrange provide help for heavy vehicle as per requirement.

H: PUBLIC ADDRESS SYSTEM IN-CHRAGE

1. On being informed / aware of the emergency control room.
2. Take charge of public address system.
3. On declaration of major emergency start P.A system to inform neighbouring industries about evacuation first aid and precautionary measures to be followed for Gas leakage or fire (Downwind area).
4. Utilize mutual aid arrangement for quick action.

I: PUBLIC ADDRESS SYSTEM IN-CHRAGE

1. On being informed / aware of the emergency control room.
2. On declaration of major emergency arrange and supervise transport to evacuate person to downwind area using safe escape route.
3. Utilize mutual aid arrangement for quick action.
4. Keep contact with SMC / IC for quick action related to weather condition.

J: ASSEMBLY POINT IN-CHRAGE

1. He will prepare and maintain the records of persons present at assembly point, evacuated persons, person not tracked out.
2. He will collect the attendance sheets from the contractors and ensure that all personnel reported duties are evaluated safety at the assembly point.
3. In affected and vulnerable plants, all affected workers shall be evacuated to a specified assembly point by him.
4. In case of person who are missing or not tracing at incident site and not reported to the assembly point, He will immediately inform to SMC, IC, Head HR, Fire & Safety department and Head (Contract).
5. He will ensure that the list of relatives or care taker of such person, with contact details will be collected and communicated to the concern.
6. He will prepare and maintain the records of injured/ affected / hospitalized/ under treatment / person on leave, in addition to attendance sheet.
7. During extended emergency he will shift all assembly at another safe area and allow visitor, contract employee to go out of premises as per instruction of IC / SMC.

Note: See **Annexure: - 17** for Individual Name as a Key Personnel.

K: ESSENTIAL PERSONNEL TEAM

As soon as the essential personnel hear the emergency siren or any emergency brought to the knowledge, they first report to incident controller (After hand over their charge to other

plant supervisor) with fully equipped themselves. (For proper information all team member has to contact immediately on telephone Number)

The team of the essential personnel trained in Fire Fighting, First aid and Rescue. And they are available in factory in all shifts.

Their responsibilities are as under:

A: Fire Fighting Team:

1. On hearing siren or any emergency brought to the knowledge, they will first report to incident controller. (After hand over their charge to other plant supervisor)
2. To rush at the site for help with fully equipped. i.e. Firefighting equipment, SCBA sets, etc.
3. Communicate firefighting progress and details on additional resource needed to IC from time to time.
4. To decide line of action in consultation with incident controller & Key personnel and take appropriate measures to extinguish the fire.
5. To fight fire till a fire brigade and mutual aid team will take the charge.
6. To Ensure route of fire tender will be free from obstacles.
7. To help to the fire brigade and mutual aid teams.
8. To confirm the control of the incident and accordingly inform SMC/ IC.
9. To arrange to collect all firefighting equipments, instruments, articles, used or unused from the site after the incident is over.
10. To Coordinate for removal of water logging due to firefighting at site.
11. On getting clearance from IC/ SMC, he and his staff can leave the incident place

B: First aid Team

1. On hearing siren or any emergency brought to the knowledge, they first report to incident controller. (After hand over their charge to other plant supervisor)
2. To rush at the site for help with fully equipped. i.e. SCBA sets, Positive air mask, etc.
3. To Rescue the injured trapped person and call vehicles to shift them hospitalization.
4. To ensure during the search, no person is left inside.
5. To decide line of action in consultation with incident controller & Key personnel.
6. To provide first aid to the affected persons and if necessary, send them to hospitals for treatment.
7. To take charge of Ambulance room and first aid room.
8. To help & assist Factory Medical officer.

9. To assist at casualty's reception areas to record details of casualties.
10. On getting clearance from IC/ SMC, he and his staff can leave the incident place

Note: It is recommended to have a special identification for this role & responsibility at a time of actual Emergency or Mock drill.

- **FOLLOWING WORKS UNDER SITE MAIN CONTROLLER**

ASSEMBLY POINT MANAGING AND CONTROL PERSONNEL

1. He will prepare and maintain the records of persons present at assembly point, evacuated persons, person not tracked out.
2. He will collect the attendance sheets from the contractors and ensure that all personnel reported duties are evaluated safety at the assembly point.
3. In affected and vulnerable plants, all affected workers shall be evacuated to a specified assembly point by him.
4. In case of person who are missing or not tracing at incident site and not reported to the assembly point, He will immediately inform to SMC, IC, Head HR, Fire & Safety department and Head (Contract).
5. He will ensure that the list of relatives or care taker of such person, with contact details will be collected and communicated to the concern.

   He will prepare and maintain the records of injured/ affected / hospitalized/ under treatment / person on leave, in addition to attendance sheet.

- **INCIDENT CONTROLLERS**

  Note: See **Annexure: - 14** for Incident Controller

- **DEPUTY INCIDENT CONTROLLERS**

  Note: See **Annexure: - 15** for Deputy Incident Controller

- **SITE MAIN CONTROLLERS**

  Note: See **Annexure: - 16** for Site Main Controller

- **KEY PERSONNEL:**

  Note: See **Annexure: - 17** for Site Main Controller

- **ESSENTIAL PERSONS FOR FIRE FIGHTING & ERT TEAM**

  Note: See **Annexure: - 18** for Essential worker

CHAPTER- 3: OUTSIDE ORGANISATION IN INVOLVED IN ANNOTATING DURING ON-SITE EMERGENCY

(a) TYPE OF ACCIDENTS

a) Fire & Explosion
b) Toxic Gas release
c) Environmental Pollution
d) Spillage of strong acids & alkalis
e) Toxic Chemical release & Spillage

(b) RESPONSIBILITY ASSIGNED.

Site Main Controller is responsible for informed to all following authorized organization in case of on-site emergency.

At M/s. Hindalco Industries Ltd. (Unit of Birla Copper), Dahej regular mock drills conducted to ensure preparedness for handling of emergency. For detailed information on the key responsibilities please refer chapter 2. Site Main Controller is responsible for informed to all following authorized organization in case of on-site emergency.

During major emergencies it may be necessary to seek the support of neighbouring industries, govt. agencies in order to complement the supply of safety, firefighting materials, equipment and skilled firefighting crew etc. in the shortest possible time. This helps in a great way to control a major emergency that may escalate beyond the capability of the site.

In line with above and to share the reserves during major emergencies, a Mutual Aid Scheme has been developed and agreed amidst various industries, agencies in Vadodara District. A protocol has been developed under the Chairmanship of Bharuch District Collector in this regard. The procedure for seeking mutual aid, its area of operation and the conditions of the scheme are detailed in this protocol. From M/s. Hindalco Industries Ltd. (Unit of Birla Copper), Dahej all such requisitions will be made by the safety Coordinator in consultation with the SMC / Dy. SMC.

Adequate number of competent manpower resources, PPE, and SCBA sets are available from Mutual Aid Companies (Nearest Company, Mutual Aid Companies)

CHAPTER- 4: DETAILS OF LAISON ARRANGEMENT BETWEEN ORGANIZATION

As mentioned in chapter-2, Liaison arrangement with other organization and internally will be done by SMC and Dy. SMC with help of Telephone operator.

They will be responsible to make communication with all Government authority, nearby Organization, Journalist, population, Employees and nest to kin of the Employees. Following arrangement will also be useful

- **MUTUAL AID**

Since combating major emergencies might be beyond the capability of individual unit, it is essential to have mutual aid arrangements with neighbouring industries. Consideration shall be given to the following while preparing mutual aid arrangements:

(a) Written mutual aid arrangements are to be worked out to facilitate additional help in the event of Level-II emergencies by way of rendering manpower, medical aid or firefighting equipment, etc.

(b) The mutual aid arrangement shall be such that the incident controller of the affected installation shall be supported by neighbouring industries on call basis for the support services materials and equipment already agreed. Further, all such services deputed by member industry shall work under the command of the INCIDENT CONTROLLER of the affected installation.

(c) Mutual aid associations shall conduct regular meetings, develop written plans and test the effectiveness of their plans by holding drills. Drills are essential to establish a pattern for operation, detect weaknesses in communications, transportation and training. Periodic drills also develop experience in handling problems and build confidence in the organization.

(d) To make the emergency plan a success, the following exchange of information amongst the member organizations of mutual aid association is considered essential:

i. The types of hazards in each installation and firefighting measures.
ii. List of all the installations or entities falling along the routes of transport vehicles carrying petroleum or petroleum products.
iii. The type of equipment, that would be deployed and procedure for making the replenishment.
iv. Written procedures which spell out the communications system for help and response. This is also required to get acquainted with operation of different.

v. Firefighting equipment available at mutual aid members and compatibility for connecting at user's place

vi. Familiarization of topography and drills for access and exit details carried out by mutual aid members.

Note: Incidents involving road transport vehicles carrying petroleum products shall be attended by the nearest installation on request of civil authorities even in absence of mutual aid agreement with the consignor.

✓ **MUTUAL AID ARRANGEMENTS OF FIRST- AID AND HOSPITAL SERVICES AVAILABLE:**

Note: See **Annexure: - 22** Mutual aid arrangements of first- aid and hospital services available.

CHAPTER- 5: INFORMATION ON THE PRELIMINARY BETWEEN THE ORGANIZATION

➢ INTRODUCTION

Hazard is a physical situation or phenomena, which cause human injury, damages to property or the environment or combination of these criteria. Hazard Identification provides vital information to risk management and based on this information; management can keep ready the essential facilities & train the persons against the probable emergency.

Identification, analysis, assessment of hazards and risk provide vital information to risk management. Objective of this plan is to assess the risk and to provide guidelines for facing and controlling the emergency.

This Chapter contains the information of possible accidents, hazards and Safety relevant components.

This Emergency plan would also deal with following emergency situation provided; it can be rehearsed and updated on regular basis.

Man made	Natural Calamities	Extraneous
• Toxic gas release	• Flood	• Riots/Civil Disorder • Mob Attack
• Fire	• Earthquake	• Terrorism
• Explosion	• Cyclone	• Sabotage
• Failure of Critical Control system	• Outbreak of Disease	• Bomb Threat
• Spillage of strong Acid and Alkalis	• Tsunami • Lightning	• War/Hit by missiles
		• Abduction
		• Food Poisoning/Water Poisoning

➢ PROCESS DESCRIPTION

1. Smelter Plant I & III

Smelter plant is based on imported copper concentrate containing about 30-35 % Copper. Here, Copper concentrate is converted into anode copper, which is suitable for further treatment in electrolytic refinery to produce copper cathodes. The major steps in copper smelting include,

1. Drying of concentrate.
2. Smelting of concentrate in flash smelting furnace to produce an intermediate copper rich product, matte containing 60-65 % copper and slag
3. Converting of liquid matte to blister copper (98-99% Cu) in a converter.

Fire Refining of blister copper to produce anode copper (99.4 % Cu)

Concentrate Storage and Bedding Section

The concentrate storage is a covered building (330 m X 50 m) with a capacity of 90,000 tons (enough for 95 days concentrate feed to FSF).Concentrate is transported to concentrate storage from the harbor with a pipe belt conveyor system at a rate of 800 T/hr. Discrete piles for different kinds of concentrates are formed by the conveyor system. The concentrate piles are in two rows which are formed by a shuttle belt conveyor.

From the storage bays concentrate are transported to the bedding plant via feed funnels (4 nos.), each provided with a belt feeder and a belt conveyor system (200 T/hr.)

There is a covered storage (1500 T) for fine silica flux used in flash smelting process. Silica flux is transported to silica storage floor with trucks or pay-loader. Silica flux is reclaimed by a pay-loader to a belt conveyor system (200 T/hr) which conveys Silica flux today bin.

In Bedding Plant, concentrate feed is homogenised in a continuously operating circular bedding system. The bed capacity is 5000 Tones. Blending is accomplished by distributing the different concentrates in layers. Here, the concentrate coming from concentrate storage is weighed with belt scale and spread over a circular bed by horizontally rotating and vertically tilting stacker. The blended concentrate is fed by a movable reclaimer to a belt conveyor system by which it is transferred to the day bins. Same conveyor system is also partly used for conveying Silica flux to the day bin. Concentrate and Silica Flux are stored in concrete day bins lined with stainless steel. There are two concentrate day bins (each 400 m3) and one silica Flux day bin (170 m3).

Concentrate Drying Section

In this section, wet concentrate mixed with Silica Flux is dried in a steam dryer. Capacity of dryer is 60 TPH. The function of the steam dryer is to dry the mixture of wet concentrates mixed with Silica Flux (Average moisture content 7.1 %) to moisture of less than 0.2 %, so that the dried feed mixture can be conveyed pneumatically to the dry charge bin and it will readily ignite in the flash smelting furnace.

The steam dryer consists of a rotor which forms the heat transfer surface and a stationary outer drum. The rotor consists of a number of parallel coil sets arranged along a central tube. Here, the energy transfer medium is steam. Steam consumption is 12 TPH. Air is used as a vapor carrier in the dryer exhaust gases.

Steam Dryer

The wet mixture of concentrate and silica flux is fed into the steam dryer through a feed funnel. Dried concentrate is discharged continuously at the other end. The dried feed mixture falls from the dryer to a roller crusher where the oversize particles in the dried charge are crushed. After the crusher, the dried feed charge goes to an intermediate storage bin (capacity 200 m3) from here, it is discharged into a pneumatic conveyor through a drag feeder through which it is airlifted and stored in dry charge bin.

Dryer exhaust gases containing evaporated water, air and dust pass through a bag house for separation of dust after which gases are let into the atmosphere through dryer stack. Recovered dust is recycled. At the discharge end of the dryer and at the intermediate storage bin, there are nitrogen inlets for fire extinguishing of the drum, the bag house or the bin in case of emergency.

Flash Smelting Section

In this section, dried concentrate is smelted in a flash smelting furnace (FSF) with the help of pre-heated oxygen enriched air to produce matte (65 % Cu), slag and SO_2 rich flux gases. The flash smelting furnace is a U-shaped furnace. It consists of three main sections viz. Reaction Shaft, Settler, Uptake Shaft.

Flash Furnace

Reaction shaft is a cylindrical shaped structure at one end of the FSF and it is mounted over the settler section. Smelting reactions take place primarily in the reaction shaft and the molten products fall into the settler. The settler is a rectangular refractory lined box sitting on a concrete base. The smelting products settle on its bottom forming matte and slag layers. The uptake shaft is a vertical structure at the opposite end of the settler, through which the generated process gases are conducted to cooling and cleaning.

The dry concentrate from bin is fed by drag chain conveyors to a specially designed concentrate burner placed on the top of the reaction shaft, where concentrate is mixed with oxygen enriched air before feeding to the furnace. The oxygen enrichment may vary from 50-90 %. Average feed rate is 45 TPH.

The heat for smelting is partly available from exothermic reactions and balance requirement is met by fuel oil firing. The settler portion of flash furnace is provided with low pressure air atomised oil burners distributed on all four sides. Provision of oil burner in reaction shaft is also made for initial heating up and during stoppage of furnace feeding.

Two distinct liquid phases are separated in the settler, a copper rich matte phase containing 60-70 % copper and a slag containing upto 1.5-2.0 % copper. Matte and slag are tapped intermittently from respective tap holes from the furnace. The temperature of matte is around 1220 °C and of slag around 1320 °C.

Flash furnace is provided with copper cooling elements embedded in refractory lining at vulnerable areas to protect the refractories. The flash furnace off-gases exit at around 1300 °C through the uptake shaft and is cooled in a waste heat boiler consisting of a radiation section followed by a convection section. The boiler is a forced circulation type producing steam at a pressure of 60 bar. Part of the dust travelling with off-gases settles in the waste heat boiler, the rest being recovered in the electrostatic precipitator. The boiler tubes are kept clean by rapping devices. The dust collected in waste heat boiler and hot electrostatic precipitator is removed by drag chain conveyors and conveyed by a pneumatic conveyor in to the flue dust bin of the flash smelting furnace. The off-gas at approx. 330 °C outlet temperature is delivered to acid plant.

Converting Section

In this section, matte containing around 65 % Cu is converted into blister copper (98.5 % Cu) in Pierce-smith converter. There are two converters (4.25 m Ø X 10.7 m length) out of which one in operation at a time. No. of charges produced per day is three with blister copper per charge 135 T. Pierce-Smith converting is a two stage batch process treating copper mattes produced in the flash smelting and electric furnaces. The feed charged into the converting vessel is mainly Copper-Iron Sulphides. Matte treated per charge is 168 T.

The converting operation is divided into two main stages: Slag Blow & Copper Blow. In the slag low Iron Sulphide is oxidised with air or oxygen enriched air to Iron Oxide. This Iron Oxide is then bound with quartz to form Iron Silicate (slag) and removed in ladle. The slag is then transferred into the electric furnace by a aisle crane. Slag produced per charge is 55 T and Cu percentage in slag is around 10 %. Gaseous SO_2 formed in reaction is led into the off-gas duct work. In Copper blow, the Sulphur in remaining copper sulphide is oxidised to SO_2 which is led into the off-gas system and forming Blister Copper (99% Cu). Blister Copper thus formed is then transferred in ladles by aisle crane into the anode furnace for further refining.

The off-gases rich in SO_2 are cooled down in waste heat boiler and then passed into the electrolytic precipitator for dust removal. From there gases pass into acid plant.

Anode Furnace Section

The purpose of anode furnace operation and anode casting is to produce copper anodes with chemical and physical properties required for electrolysis.

The blister copper contains different impurities viz. Sulphur, Oxygen, Nickel, Iron, Zinc, lead, cobalt. Certain impurities, primarily iron and sulphur are oxidised into slag and gases in the anode furnace. Finally, excess oxygen left in copper is reduced.

There are two anode furnaces with holding capacity of 250 T. Each is provided with two tuyers for oxidation and reduction by propane. For furnace heating burner, Naptha is used.

Blister Copper is received in anode furnaces through ladles with the help of EOT crane. Blister Copper is first slowly oxidised to remove dissolved sulphur below 50 ppm by blowing air in it through tuyers. The formed slag is skimmed and transferred to the converter during slag blow stage. The metal is subsequently reduced by propane to control oxygen below 1500 ppm.

Anode Furnace

Fire refined copper is cast into 350 kg anodes on rotating anode cast wheel by means of automatic anode weighing and casting device. There are 28 nos. of moulds on cash wheel and casting rate is 50 TPH. Anodes (99.5 % Cu) from cast wheel are lifted by means of an automatic anode take-off device, cooled and stacked for dispatch to electrolytic refinery. A 12 T EOT crane is provided in anode casting area for handling of stacked anodes.

Off-gases from anode furnaces after cooling in refractory lined after-coolers are scrubbed in a scrubber before discharging to atmosphere.

2. CPP I, II & III

CPP 1 & 2 has power generation capacity of 75 MW and steam generation capacity of 225 TPH. CPP 3 has power generation capacity of 60 MW and steam generation capacity of 300 TPH. And balance 40-60 TPH steam diverted to CPP 1&2 via PRDS valve of 96/65 Kg/cm2.

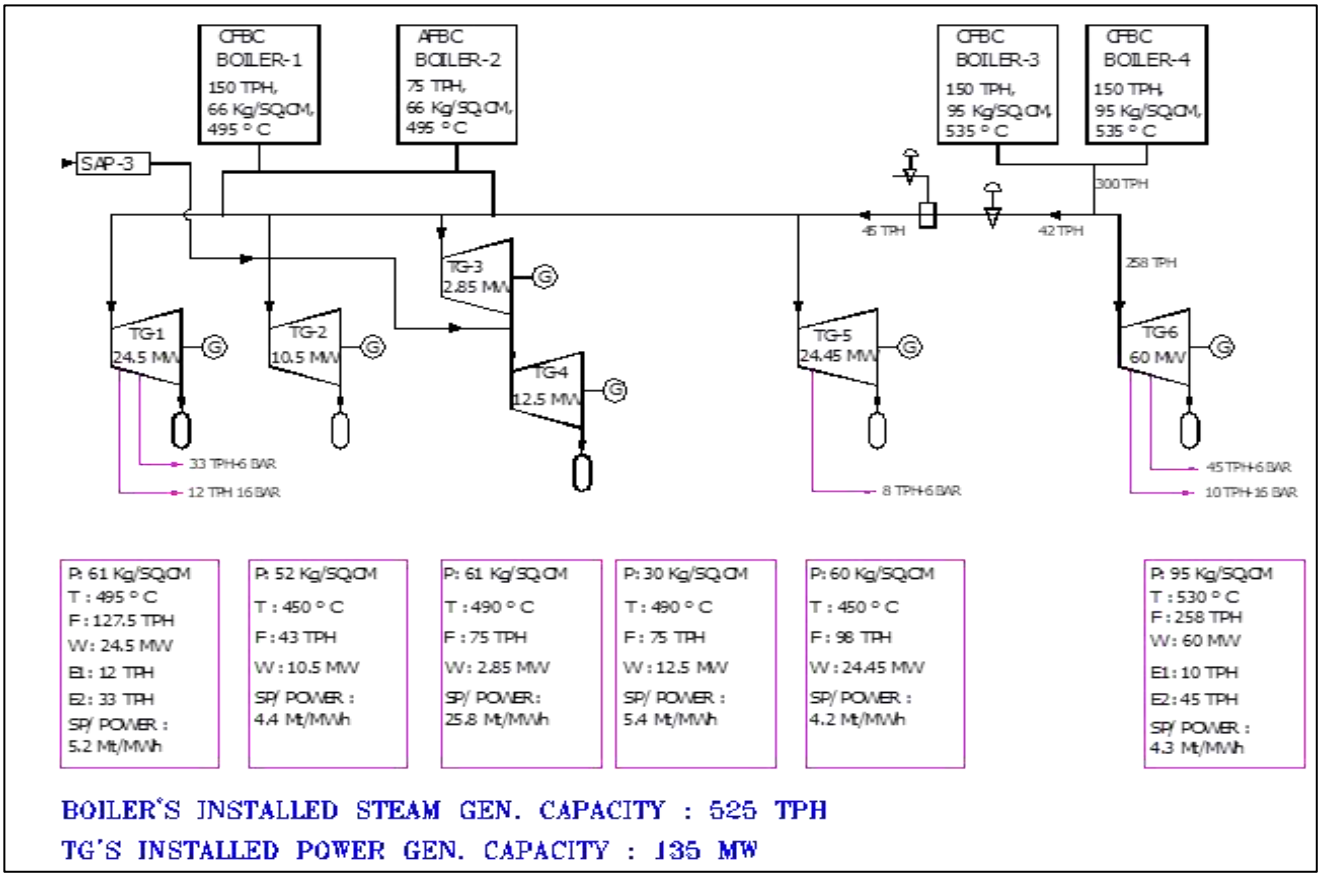
CPP 3 supplying LP steam of 45 TPH to Process of PAP plant and balance 20-25 TPH requirement of process fulfil by CPP 1&2.CPP plant has coal handling capacity of 150 TPH for supplying coal to CPP 1, 2, 3.

Coal (Imported) based Captive Power Plant is installed to supplement power supply by Gujarat Electricity Board. CPP is based on Circulating fluidized bed reactor boiler with imported coal firing. CPP boiler is having capacity of 150 MT/Hr. steam generation with MCR rating at 66 Kg/cm² of steam generation with MCR rating at 66 outlet. This is accomplished by passing the flue gases over convection heating surface and thus dissipating their energy to the water / steam. The fluid leaving the evaporator where the saturated steam is

separated from boiler water. The super heating system is arranged downstream of the evaporating system.

The steam turbine is of consisting type with provision of extract steam for re-generating feed heating and process requirements. The turbine is complete with steam ejectors, deaerator, HP & LP heater, and boiler feed pumps. Condensate is pumped from condenser to the condensate storage tank. From the storage tank, the condensate is sent to de-aerator through low pressure heater, and further pumped to the boiler through higher pressure heater.

In CFBC boiler fuel particles in suspension escaping the combustion chamber of the furnace is captured by the cyclone and circulated back to the particulate matter level in the exhaust gases. Flue gas is taken to 75 meters stack through hot electrostatic precipitator which has 99.9% efficiency. Auxiliary turbine of 10.5 MW is also installed in CPP where surplus steam from waste heater boiler of smelter and converter is used to generate power.



Equipment's	Capacity	Make	Type	Year of Commissioning
TG-1	24.5 MW	Skoda	Extraction – Cum Condensing	1998
TG-2	10.5 MW	Skoda	Condensing	1998
TG-3	2.85 MW	BHEL	Topping Condensing	Re Located from Grasim, Nagda in 2001
TG- 4	12.5 MW	Triveni	Condensing	Revamping in 2017
TG-5	24.45 MW	Shin- Nippon (TDPS)	Condensing	2003
TG-6	60 MW	LMZ	Condensing	2005
Boiler-1	150 TPH	Thyssen Krupp, Pune	CFBC (Imported Coal Fired)	1998
Boiler-2	70 TPH	BHEL	AFBC (Blended Coal Fired)	Re Located from Grasim, Nagda in 2001
Boiler -3	150 TPH	Thyssen Krupp, Pune	CFBC (Imported Coal Fired)	2004
Boiler -4	150 TPH	Thyssen Krupp, Pune	CFBC (Imported Coal Fired)	2004
DG-1 & 2	2.5 MW Each	Kirloskar	Diesel Engine	1996

- **ELECTRIC POWER SYSTEM**

Basic Definition

An **electric power system** is a network of electrical components deployed to supply, transfer, and use electric power.

An example of an electric power system is the network that supplies a region's homes and industry with power—for sizeable regions, this power system is known as the grid and can be broadly divided into the Generators that generate the power, the Transmission system that carries the power from the generating centers to the load centres and the Distribution system that feeds the power to nearby industrial system and consumers.

Power systems deliver energy to loads that perform a function. These loads range from household appliances to industrial machinery. Most loads expect a certain voltage and, for alternating current devices, a certain frequency and number of phases. Making sure that the voltage, frequency and amount of power supplied to the loads is in line with expectations is one of the great challenges of power system engineering.

1. Power Supply System at Birla Copper

Power Supply system at Birla Copper mainly comprises of:-

1. Six Synchronous Generators
2. Two Nos. 220KV Line from DGVCL (Line-1 & Line-2)
3. 220KV Tie-Line between MRS-1 and MRS-2
4. Two nos. DG set for Emergency Backup

The total installed Generating Capacity is approx. 139.8 MW, details of Installed Capacity of individual Generators at Birla Copper is:-

1. TG-1 – 24.5 MW
2. TG-2 – 1.5 MW
3. TG-3 - 2.85 MW
4. TG-4 – 12.5 MW
5. TG-5 – 24.45 MW
6. TG-6 – 60 MW
7. DG-1 – 2.5 MW
8. DG-2 – 2.5 MW

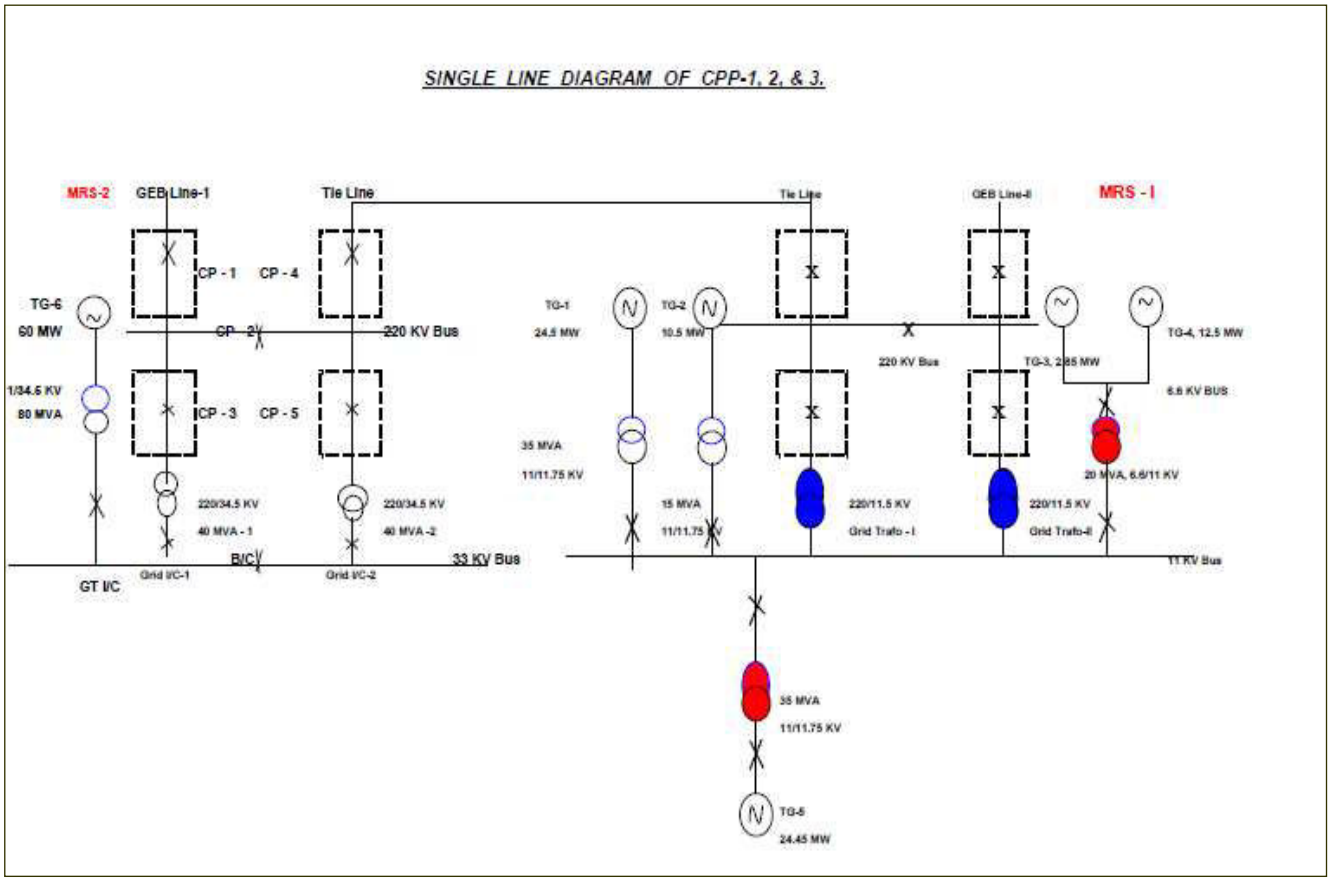
The Power supply system at our complex is mainly divided into two sections – MRS-1 and MRS-2. MRS -1 mainly caters to the load of Smelter-1, CCR- 1&2, Ref-1&2, PAP, DAP. MRS-2 caters to the load of Smelter-3, Ref-3, STP, and WTP.

MRS – 1 comprises of five Generators – TG-1, 2, 3, 4 & 5 and 220KV Line-2. MRS-2 comprises of TG-6 and Line-1.

Single Line Diagram of Steam Turbo Power Generation System

The 2 x 2.5 MW Diesel generators are also connected to the 11 kV bus of MRS1.

2. 220KV Switchyard



The major equipments of 220KV Switchyard are:-

1. SF6 Circuit Breaker
2. Isolators
3. Lightning Arrestor
4. Instrument Transformers (PT, CT)
5. Power Transformers (Grid Transformers)

- CPP 1 & 2 has power generation capacity of 75 MW and steam generation capacity of 225 TPH.CPP 3 has power generation capacity of 60 MW and steam generation capacity of 300 TPH. And balance 40-60 TPH steam diverted to CPP 1 & 2 via PRDS valve of 96/65 Kg/cm^2. CPP 3 supplying LP steam of 45 TPH to Process of PAP plant and balance 20-25 TPH requirement of process fulfil by CPP 1 & 2. CPP plant has coal handling capacity of 150 TPH for supplying coal to CPP 1,2,3.
- We have two incoming GEB lines of 220 KV.

3. Refinery Plant

Refinery Process can be divided into three main stages, such as Tank house (commercial cells), Slime- Treatment Area & Purification Area.

Electro Refinery is the last and final stage of recovery of Copper in purest form. In Refinery, Copper is purified from 99.5 % purity to 99.9 % purity through Electrolysis Process and is based ISA Refinery Technology. The Capacity of the plant is 1,00,000 TPA of LME Grade-A Copper. Besides Copper, it will produce 527 Ton of anode slime from which 3 tons of Gold and 29 tons of Silver will be recovered. Selenium is another by- product recovered during processing of Silver and Gold.

In this process Copper is deposited directly on Stainless Steel Cathode Plate and stripped off in Cathode Stripping Machine to get main product of 1 sq. meter Copper plates called Copper cathodes. Input anodes are processed through Anode Preparation Machine & scrap anodes are washed through Anode Scrap Wash Machine for recovery of slime. The production capacity of the plant is designed to be achieved at commercial cell current density of 280 A/m2 with an operational period of 345 days per year on a continuous basis, time efficiency being 95 %.

Tank House

In the Refinery Plant, total no. of commercial cells in the Tank house are 384 cells. There are 54 anodes and 53 cathodes into the each commercial cell. Here, $CuSO_4$ is used as electrolyte, S.S. plates are as Cathodes. The electrodes will be transported between cells and machines by using an Overhead Crane with a special lifting bale fixed to the crane. Once the section is filled with anodes, cathodes and electrolyte, then The power supply is switched on. The anode begins to dissolved and pure copper begins to plate on cathode. At the end of the 7th day fully grown cathodes are removed from the cells and new S.S. blanks will be inserted into the cells and the copper cathodes will be washed and sold or sent to CC rod plant. Here, three crops of Cathodes are produced from each anode, each weighing 100Kg. At the end of the 21st day electrolyte and slimes are drained from the bottom of the cells, From there slime is collected as waste product into the slime tank and the electrolyte is sent for filtration and storage.

Slime Treatment Area

In this section slime is decopperized to remove Copper and enrich slimes with Precious metals by leaching in an autoclave. The Decopperized slime is the by-product.

Purification Area

The main aim of the Purification is to keep the impurities at the desired level in the main Electrolysis circuit. Part of the electrolyte is taken out of circuit and decopperized in three stages to control Copper level in the electrolyte and remove impurities like Arsenic. The Copper Arsenic precipitate produced in this section is recycled to smelter.

A well equipped quality control lab with following equipment is provided to maintain round the clock check on CCR quality.

4. CCR I, II & III Plant

C.C.R Plant is capable of producing CC Rod of diameter 8, 11, 12.5 16 and 19 mm. CC Rod Plant consists of the areas like Liquid metal handling system, Casting Wheel, Rolling Mill, & Coiler.
Liquid metal handling system consists of Melting Furnace (55 MT) Slag vessel, Holding Furnace, Launders and Tundish. Fuel used for melting is propane fired through15 burners having pre-mix type nozzle. Charge consists of cathodes, cut rods, crop bar & clean scrap which is charged in a particular charge sequence.

The molten metal from hearth flows out from the tap hole into the Holding furnace via Upper launder and Slag Vessel where Slag is skimmed out from time to time. Thereafter the liquid metal is poured into the tundish via lower launder and then flows out through the fused silica spout into on a Copper alloy casting wheel. The metal flow is controlled by motorised actuation of metering pin automatically .The melt solidification is controlled by casting cooling water and soot. The solidified cast bar is passed to the Morgan 10-stand Rolling mill.
The 10 stands of the mill are arranged in alternative vertical and horizontal configuration which reduces the bar to rods of various diameters. After the mill, the rod enters into the NAPS (Non-Acid Pickling System), where copper oxide on the rod surface is reduced by circulation of ISO- propyl alcohol within the system. This is followed by a wax solution sprayer on the rod for prevention of surface oxidation in storage. Thereafter the rod is coiled to the required weight. From coiler, the coil passes through an in-line automatic weighing, compacting, strapping, end sealing and finally sent for packing.

5. Sulphuric Acid Plant

Gas Cleaning Section:

The gases from the FSF and the Converters contain impurities like water vapor, SO3, metallic fumes, dust, halogen particles etc. In the Gas Cleaning Section all these impurities are removed. First of all the combined SO2 gases from the Smelter plant enters a Primary Reverse Jet Scrubber (PRJS). Here, the gases are quenched and scrubbed by the weak acid spray. Here dust, metallic fumes and mist particles are removed efficiently. After PRJS gases pass through the Gas Cooling Tower (GCT). Weak acids flow from the top of tower and gases from the bottom to top. In the GCT solids and halogens are removed.
The gases go to the Final Reverse Jet Scrubber (FRJS), which contain two sets of reverse jet nozzles for spraying the weak acid. In FRJS, the dust and other impurities are scrubbed to the lowest possible value.

The gases coming out from the outlet of the FRJS enter the Electrostatic Static Precipitators (ESP). There is two stage mist separation by Wet Electrostatic Precipitators. In both primary and secondary ESPs, the mist is collected and removed.

Conversion & Absorption Section

In this section, the conversion of SO2 gases to SO3 gases occur in two converters made of S.S. and C.S. according to following reaction.

$$SO2 + 1/2\ O2 \rightarrow SO3$$

The cleaned SO2 gases from the mist precipitators are mixed with the atmospheric dilution air and then pass through Drying Tower (DT). In the Drying Tower 96% acid is sprayed and remaining water vapor is removed here which is not desirable for the Main Blower and the Converters. In the conversion section to initiate the catalytic conversion reaction reaction gases must be heated to auto-ignition temperature before contacted with catalyst. As the conversion reaction is exothermic, the heat of reaction is also removed before passing to the conversion bed. There are two converters of SS (Ist bed) and CS (IInd to Vth Bed). Gases after passing through First to third bed, enter to IPAT and SO3 absorbed in 98.5 %. Then, remaining gases are again converted in fourth and fifth bed and are absorbed in FAT. Absorbed acid from the bottom of the towers are diluted to 98 % and stored in storage tanks. The remaining gas passes through main stack to atmosphere.

6. Oxygen Plant

In the Oxygen plant the O2 and N2 are separated from the atmospheric Air. First of all air from the atmosphere is filtered in the Air Suction Filter House (ASFH). It is then fed to a Base Load Air Compressor (BLAC). In BLAC air is compressed to 5.62 Kg/cm2 and then fed to the bottom of Direct Contact After-cooler (DCA). The air is cooled by cooling water and chilled water.

Process air at about 19 0C enters the prepurifier bed (PP), packed with activated alumina and molecular sieve where CO2, Hydrocarbons and water vapors are removed.

The clean dry air from the PP split into two streams. The low pressure (LP) air stream is directly sent to the lower column and the other stream is fed to Booster Air Compressor (BAC). This HP air stream is condensed in liquid and fed to both upper & lower column.

Air entering the lower column is separated into Nitrogen and oxygen enriched liquid at the bottom. The Nitrogen gas is condensed against boiling liquid oxygen in main condenser. Part of Nitrogen liquid is used as a reflux in lower column and the remainder is subcooled in Nitrogen super heater and transferred to upper column as reflux.

The enriched air from lower column kettle along with turbine air and HP air is fed to upper column. The Upper column produces liquid oxygen (95% pure) from its sump. Remaining liquid oxygen is fed to the oxygen pool boiler where oxygen boils against condensing high pressure air. This gaseous oxygen is used in Smelter. The liquid O2 is vaporized in product vaporizer which is fed to converter and for tapping.The produced N2 (99.98% purity) is used for fire extinguishing in Smelter and will be used in Refinery autoclave.

7. PMR:

There is no significant hazard in the Precious Metal Recovery Plant. Moreover, in view of the confidentiality process descriptions are not made public.

(a) TYPE OF ACCIDENTS (MAJOR)

a) Fire & Explosion
b) Toxic Gas release
c) Environmental Pollution
d) Spillage of strong acids & alkalis
e) Toxic Chemical release & Spillage

- **COMMON CAUSES OF FAILURE**

Failure of containment or Pipeline may be caused by various reasons resulting in spillage / leakage of Flammable Liquids, Leakage of toxic gas, fire and explosion. It may be due to manmade, unsafe act, unsafe condition or due to natural calamity.

(b) SYSTEM ELEMENTS OR EVENT THAT CAN LEAD TO A MAJOR ACCIDENT

A. Inadequate design against internal pressure, external forces, corrosion and temperature.
B. Mechanical failure of Pipes, Vessels, elbows due to corrosion, erosion, impact, liquid expansion, weld failure etc.
C. Failure of manual / automatic control system.
D. Unsafe operation / maintenance including wrong operation of valve, mixing or overflowing of liquid chemicals.
E. Leakages and spillage of flammable material.
F. Uncontrolled vehicle movement.
G. Any source of Ignition to flammable liquid may be the reason of emergency.

(c) HAZARDS

Company is involved with various Hazards. However, the major hazards areas are identified as follows;

Integrated Copper Complex is having various Hazards. However, the major hazardous areas are identified as follows;

a) Storage & Handling area of Hazardous Chemicals like, LNG, H_2SO_4, Liquid Nitrogen, Liquid Oxygen, SO_2, SO_3 etc.
b) Hazardous Process: Process of Copper making is a hazardous because of handling of large quantity of hot molten metal.
c) Utilities Area like Boiler, D.G. Set, Oxygen plant, Air compressor, etc.
d) Sulphuric Acid is produced from the by-product gas SO_2. Which is handled through ducting which is hazardous.
e) Movement of ammonia tankers through the company premises.
f) Handling of large quantity of coal.

g) Lifting tools, tackles failure

h) Domino effect from the neighbouring industry. i.e., GCPTCL.

Being continuous process of manufacturing Copper, the various related hazards are posed due to different incidental activities at the site.

The probable emergency can be classified according to the physical & chemical properties as per following.

Table- (a): Probable Emergency

Sr. No.	Type of Probable Emergency	Hazardous Chemicals	Types of Storage
1.	Fire	LNG	Pipe line
2.	Explosion	LNG	Pipe line
		Liquid Nitrogen	Cryogenic Storage
		Liquid Oxygen	Cryogenic Storage
3.	Toxic gas release	LNG	Pipe line
		H_2SO_4	Storage Tank
		H_2SO_4	Pipe Line
		Liquid Nitrogen	Cryogenic Storage

Table (b): The conditions of events which could be significant in bringing one about:

Sr. No.	Type of Accident/Occurrence	Probable Reasons
1.	Fire & Explosion	Inadequate design against internal pressure, external forces, corrosion and temperature.
		Mechanical failure of Pipes, Vessels, & elbows due to • Corrosion & Erosion, • Impact, liquid expansion, weld failure
		Failure of manual / automatic control system.
		Unsafe operation / maintenance including wrong operation of valve, mixing or overflowing of liquid chemicals.
		Uncontrolled vehicle movement.
		Any source of Ignition like Matchbox, Mobile, Welding, Cutting, etc.
2.	Toxic chemical release & spillage, Toxic Gas release	Inadequate design against internal pressure, external forces, corrosion and temperature.
		Mechanical failure of Pipes, Vessels, & elbows due to • Corrosion & Erosion, • Impact, liquid expansion, weld failure
		Failure of manual / automatic control system.
		Unsafe operation / maintenance including wrong operation of valve, mixing or overflowing of liquid chemicals.
3.	Environmental Pollution	ETP Plant failure due to collection tank / Aeration tank overflow. Mixing or overflowing of liquid chemicals.
		Mechanical failure of Pipes, & elbows due to • Corrosion & Erosion, • Weld failure
		Unsafe operation / maintenance including wrong operation of valve.

(d) SAFETY RELEVANT COMPONENTS

Following Equipment's /components will be provided.

- Personal protective equipment
- Fire Fighting Extinguishers
- Dyke provided
- Interlock system
- Mock drill of emergency preparedness plan
- Ambulance Van
- Safety Valve
- Safety shower
- Fire hydrant system

➢ OTHER HAZARDS AND CONTROLS:

Hazards, which are not classified as storage hazards, i.e. hazards due to boilers, non-chemical pressure vessels, spills from pipelines or vessels, structural collapse, bad housekeeping and hazards from outside or likely to come from neighbouring plants, tank farms, etc. are given below:

Note: Other Hazards & controls also mentioned in **Chapter 8**

Note: See **Annexure: - 7** for other hazards & control

CHAPTER- 6: DETAILS ABOUT THE SITE

➢ BRIEF HISTORY OF THE COMAPNY:

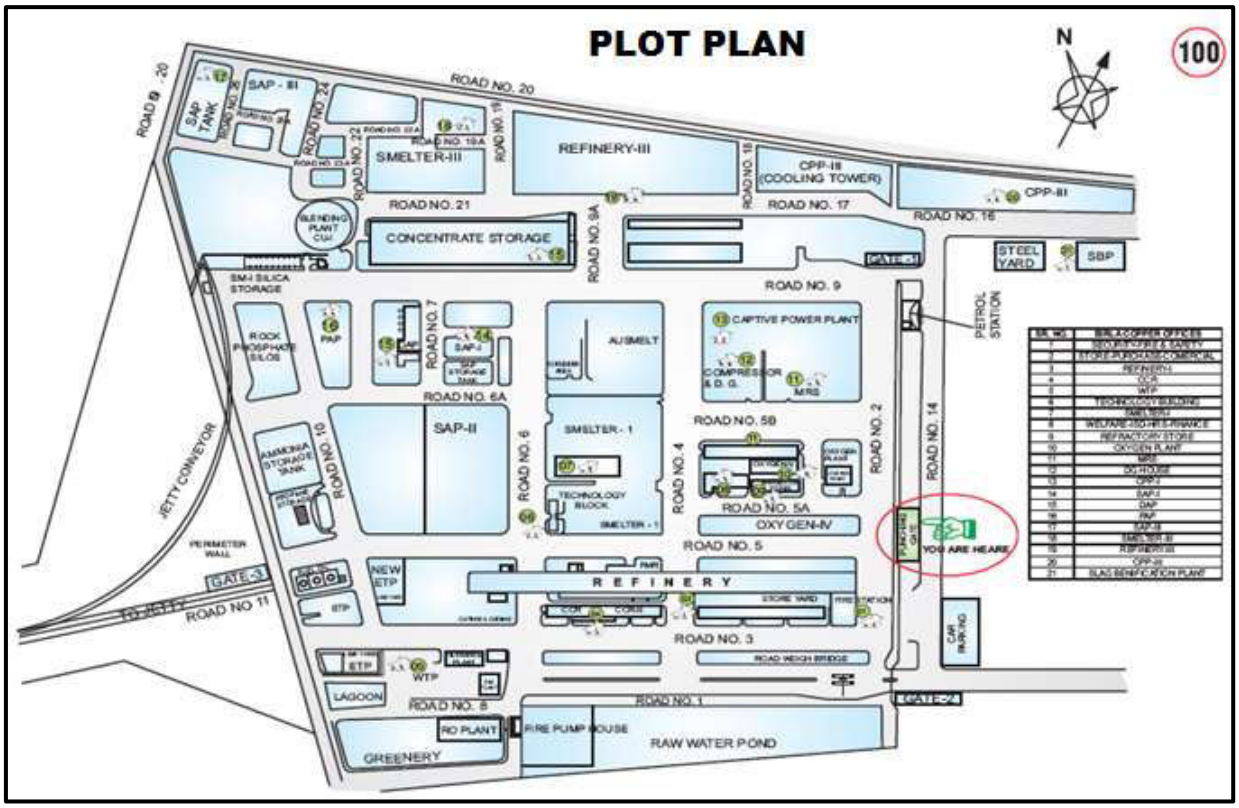
Hindalco Industries Limited is located at Dahej about 49 km away from Bharuch City in Gujarat State. The Site is situated at 21°42'7"N and 72°32'38"E.

The Mumbai-Ahmedabad National Highway No. 8 passes through Bharuch city and is well connected by Western Railway from all over India and from Bharuch to Dahej to the major markets of Country. Dahej is the nearest sea port at about 5 km road distance South-West. Dahej is also connected from National highway No. 8 by four lane state Highway.

Following are a number of major industries located near M/s. Hindalco Industries Limited.

1. Gujarat Chemical Port & Terminal Company Limited
2. BASF India Limited
3. Reliance Industries Limited
4. LNG Petronet Limited
5. GACL
6. Gujarat Fluorochemicals Ltd
7. SRF Limited
8. Adani Petronet Port Pvt. Ltd.
9. Torrent Pharmaceuticals Limited
10. Indofil Industries Limited
11. ONGC Petro Additions Limited (OPAL)


Laxmi Narayan Temple
Center Park
Arogya
આરોગ્ય
Birla Copper Division,
Hindalco Industries
Birla Copper Dahej
Rukhneshwar
Mahadev Temple
Lakhigam
લખીગામ
206


PLOT PLAN
N
100
ROAD NO. 20
REFINERY-III
SMELTER-III
CPP-III (COOLING TOWER)
CPP-III
ROAD NO. 21
ROAD NO. 17
ROAD NO. 16
CONCENTRATE STORAGE
ROAD NO. 9
STEEL YARD
SBP
PETROL STATION
CAPTIVE POWER PLANT
AUSMELT
SAP-II
SMELTER - 1
TECHNOLOGY BLOCK
ROAD NO. 5B
ROAD NO. 5A
OXY GEN-IV
ROAD NO. 5
REFINERY
ROAD NO. 3
ROAD NO. 1
ROAD NO. 11
JETTY CONVEYOR
PERIMETER WALL
GATE-1
GATE-2
ETP
NEW ETP
WTP
LAGOON
ROAD NO. 8
RO PLANT
FIRE PUMP HOUSE
RAW WATER POND
GREENERY
YOU ARE HEARE

Adjoining Properties	
East Side	Birla Copper Township
West Side	Open space
North Side	Laxmi Narayan Temple
South Side	GCPTCL

a) LOCATION OF DANGEROUS SUBSTANCES:

Location of above-mentioned hazardous substances kept in Designated storage area & respective plant area. Approach for these locations is easy in case of emergency situation.

b) SEATING IF KEY PERSONNEL

All key personal of the organisation are available at ECC centre or safety office at the time of emergency.

Key personnel list also mentioned in chapter 2.

Note: See **Annexure: - 17** for Individual Name as a Key Personnel.

c) EMERGENCY CONTROL ROOM

Details of Emergency Control Centres (ECC) is given in Annexure-20. The emergency control centre (or room) is the place from which the operations to handle the emergency are directed and coordinated. The site main controller, key personnel and senior officers of the fire, police, factory inspectorate, district authorities and emergency services will attend it. The centre should be equipped to receive and transmit information and directions from and to the incident controller and areas of the works as well as outside. It should also have equipment for logging the development of the incident to assist the controllers to determine any necessary action.

In addition to the means of communication, the centre should be equipped with relevant data and equipment which will assist those manning the centre to be conversant with the developing situation and enable them to plan accordingly.

It should be sited in an area of minimum risk and close to a road to allow for ready access by a radio-equipped vehicle for use if other systems fail or extra communication facilities are needed.

For large sites or where Fire may occur/ might be anticipated, consideration should be given to setting up two control centres to ensure, so far as is possible, that one will be available for use, should the other be disabled. If necessary, the police will assist to set up an emergency control centre remote from the works.

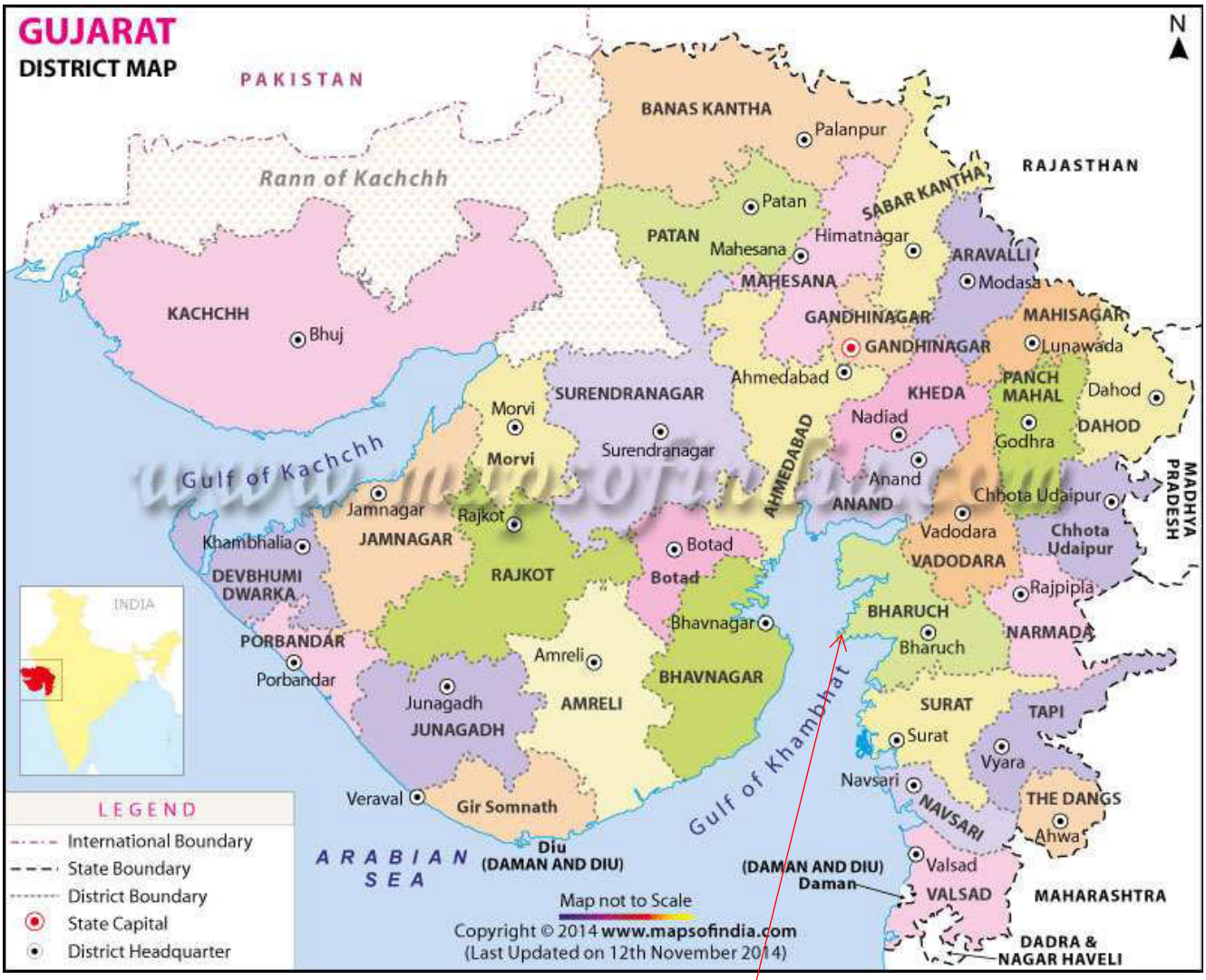
The centre should therefore contain:

1. An adequate number of internal telephones.
2. An adequate number of external telephones. It is strongly recommended that at least one should be ex-directory or capable of use for outgoing calls only. This will avoid the telephone switchboard being overloaded with calls from anxious relatives, the press etc. the least telephone directories with a separate list of important numbers.
3. Plans of the factory Should be show:
   a) Areas of large inventories of hazardous materials including tanks, reactors, and drums, compressed gas cylinders.
   b) Sources of sirens and safety equipment including fire, explosion, and Toxic gas Release, Heavy Spillage of Hazardous & Toxic Chemicals.
   c) Stocks of other fire extinguishing materials.
   d) The fire - water system and additional sources of water.
   e) Site entrances and road system updated at the time of the emergency to indicate any road that is impossible.
   f) Company assembly point, shelters, lunchroom and canteen.
   g) Casualty treatment centres, first aid centres and ambulance room.
   h) Parking points, rail sidings and visitors' room.
   i) Location of the factory in relation to the surrounding community
4. Additional plans which may be marked up during the emergency Should be show:
   a) Areas affected or endangered within the factory.
   b) Surrounding areas, population and other environment likely to be affected due to fire wind speed recorders and ready computer models (risk counters) based on prevailing wind direction, velocity, weather conditions and other parameters, will be much useful for quick judgement and evacuation of those areas.
   c) Areas where problems arise.
   d) Area evacuated and safe routes for escape.
   e) Deployment of emergency vehicles and personnel.
   f) Other relevant information.
5. Nominal roll of employees, work permits, MSDS, gate entries and documents for head count or access to this information. Employee's blood group information and addresses will also be useful.
6. Note pads, pens, pencils, rubber and stationery to record all messages received and sent by whatever means.

7. Note copies of this on-site emergency plan i.e. updated full text including all information from this, some vehicles and messengers (runners) should be kept ready at the centre.
8. Torches, umbrella, raincoats and some extra sets of gas detectors, explosive meters and personal protective equipment.

Note: See **Annexure: - 20** for Location of emergency control centre & items kept in the centre.

➢ Location in Gujarat



M/s. HINDALCO INDUSTRIES LTD (Unit: Birla Copper).

➢ Map of Bharuch District

M/s. HINDALCO INDUSTRIES LTD (Unit: Birla Copper)

- **SITE PLAN:**

  Note: See **Annexure: - 2** for map of area (site plan),

- **FACTORY LAY OUT PLAN**

  Note: See **Annexure: - 3** for factory layout plan and

  Note: See **Annexure: - 19** for assembly point with accommodation capacity, nearest ph.no

- **KEY PERSONNEL:**

  Note: See **Annexure: - 17** for Individual Name as a Key Personnel.

- **Details of the emergency control centre:**

  Note: See **Annexure: - 20** for Location of emergency control center & items kept in the center.

- **ASSEMBLY POINTS*:***

Affected and vulnerable plants, non-essential workers (who are not assigned any emergency duty) shall evacuate the area and report to a specified assembly point. The need to evacuate non-essential workers from non-affected area will be determined by the size of works and the foreseeable rate at which the incident may escalate.

Each assembly point should be clearly marked by a conspicuous notice and provide with an identification number e.g., ASSEMBLY POINT No.1. Mark such points permanently for the notice of people.

Each assembly points must be sited in a safe place, well away from areas of risk and least affected by the down wind direction. It may be in the open or in a building depending on the hazard involved.

More than one assembly point is needed (1) to ensure that employees do not have to approach the affected area to reach the point (2) In case any assembly point lies in the path of wind-blown harmful materials, e.g., toxic gas, burning brands, thrown (exploded) materials etc. (3) In case the factory is big having more plants and wide area.

Each assembly point should be manned by a nominated person(s) to record the names and departments of those reporting there. He should have a means of communication with the Site Main Controller in case it is necessary to establish the whereabouts of people and to receive further instructions concerning the deployment of the evacuated personnel.

Before reaching an assembly point, or subsequently, if it is required to pass through an affected area or the release of toxic substance, suitable personnel protective equipment (PPE) including respirator, helmets etc., should be available to the people.

Note: See **Annexure: - 19** for Safe Assembly point

CHAPTER- 7: DESCRIPTION OF HAZARDOUS CHEMICALS AT PLANT SITE

(a) CHEMICALS (QUALIFICATION AND TOXICOLOGICAL DATA):

In processing of Pesticide products unit, we handle various hazardous chemicals, we stored various hazardous chemicals.

Note: See **Annexure: - 4** for storage hazardous and control

(b) TRANSFORMATION IF ANY WHICH COULD OCCUR

(Material Safety Data Sheet)

Information on transformation of hazardous material if any which could occur is given in section-10 of MSDS which is Chemical Stability and Reactivity information.

Note: - MSDS have been available at safety, Plant & warehouse.

Note: See **Annexure: - 05** for Material Safety Data sheet

- **PROCESS HAZARDS & CONTROLS:**

In Processing of Chemical products unit, we handle various hazardous chemicals & employ processes involving pressure and temperature.

Note: See **Annexure: - 06** for Process vessels hazards and control

(c) PURITY OF HAZARDOUS CHEMICALS:

Purity of the all hazardous Substances mentioned are having technical grade.

Information on toxicological, physical, and chemical properties of the substances being handled in the format of Material Safety Data Sheet. MSDS of all raw materials intermediates, products and additives are available

CHAPTER- 8: LIKELY DANGERS TO THE PLANT

➢ MAXIMUM CREDIBLE ACCIDENT (MCA)

A Maximum Credible Accident (MCA) is an accident with maximum damage potential, which is believed to be credible in a hazardous installation.

In other word, Emergency situations posing various possible incidents – rather than just the worst-case scenario, MCA illuminates those scenarios that are really important and those that are most likely to occur.

➢ CONSEQUENCE ANALYSIS:

- **INTRODUCTION**

The selected release sources and the short-listed sources for RA have been considered for release consequence calculation. The results of the calculations are summarized in this chapter.

Major industrial hazards are generally associated with the potential for toxic chemical release.

Events involving release of materials

a) Slow release of toxic substance from a leaking valve,
b) Rapid release for limited duration due to fracture of pipe leading to a toxic cloud which may travel or dissipate (leading to MCA scenario),
c) Massive release of toxic substance due to failure of large storage or process vessel or uncontrolled chemical reaction (leading to Worst case scenario which is generally having very low probability and not considered for practical purpose).
d) Tabular data showing data for toxic chemicals.

- **METEROLOGICAL DATA**

Meteorological and climatologically data collected by India Meteorological Department (IMD) is available for Bharuch. Based on this data the annual mean air temperature and mean % humidity has been calculated. The data on cloud cover and wind speed has been used to select appropriate atmospheric stability class and wind speed combinations. Wind direction frequencies form a crucial parameter which is subject to significant variations from year to year and only averages over very long periods are relevant.

The consequences for various outcome cases such as thermal loads and vapour cloud explosion depends also on whether people are indoor or outdoor. The following assumptions have been made:

Day - 30% indoor, 70% outdoor

Night - 70% indoor, 30% outdoor

In case of toxic exposure "ventilation factor" of the buildings becomes relevant if people are indoors. However, many people live in hutments, some even out in the open to others living in pukka houses. Due to climatic reasons, whatever the kind of buildings/dwellings, they are generally well ventilated. As such they hardly provide much protection against toxic clouds. Therefore, no distinction is made in case toxic exposure.

Meteorological Information

SR.	PARAMETER	MAXIMUM	MINIMUM
1	2	3	4
1.	Temperature	44.0°C	10.0°C
2.	Humidity	70%	30%
3.	Wind -Velocity	3 m/s	1 m/s

- **STABILITY CLASS**

Dispersion of gases or vapors largely depends upon the Stability Class. Various stability classes that are defined by Pasqual are:

- A Very Unstable
- B Unstable
- C Slightly Unstable
- D Neutral
- E Stable
- F Very Stable

The stability class for a particular location is generally dependent upon:

- Time of the Day (Day or Night)
- Cloud Cover
- Season
- Wind Speed

Six stability classes from A to F are defined while wind speed can take any one of numerous values. It may thus appear that a large number of outcome cases can be formulated by considering each one of very many resulting stability class-wind speed combinations. However, in fact the number of stability class- wind speed combinations that need is to be considered for

formulating outcome cases in any analysis limited. This is because, in nature, only certain combinations of stability class and wind speed occur. Thus, for instance combinations such as A-3 m/s or B- 5 m/s or F-4 m/s do not occur in nature. As a result, only one or two stability class - wind speed combinations need to be considered to ensure reasonable completeness of a QRA. Furthermore, though wind speeds less than 1 m/s may occur in practice, not one of the available dispersion models, including state-of-art ones, can handle wind speeds below 1 m/s. Fortunately, wind speed does not influence consequences as much as stability class and for a given stability class, the influence of wind speed is relatively less. On the other hand, consequences vary considerably with stability class for the same speed.

The use of specific information regarding wind velocity, temperature etc. at the site during the actual occurrence of emergency can be made wherever the computer software model is in use. For this study, as per the standard meteorological data available for the site, wind velocity varies between 1 m/s and 3 m/s and weather stability classes D and F are considered.

- 1 F (Where F denotes Stable Condition – night with moderate clouds and light moderate winds; 1 denotes wind velocity in m /sec)
- 2 F (where F denotes neutral condition – little sun and high wind or over cast / windy night; 2 denotes wind velocity in m /sec)
- 3 D (where D denotes neutral condition – little sun and high wind or over cast / windy night; 3 denotes wind velocity in m /sec)

In general, the largest effect distance for release of substances is found with stable weather.
The following wind speed/stability class combinations and frequencies would appear to be relevant for Quantified Risk Analysis:

F	1 m/s	50%
F	2 m/s	50%
D	3 m/s	50%

In its absence, the standard calculations of Class D with wind speed of 3 m/s and Class F with wind speed 1 m/s, of Class D with wind speed of 2 m/s as prescribed by MoEF shall be used accordingly for delineation of vulnerable zones.

The cloud cover data is as follows:

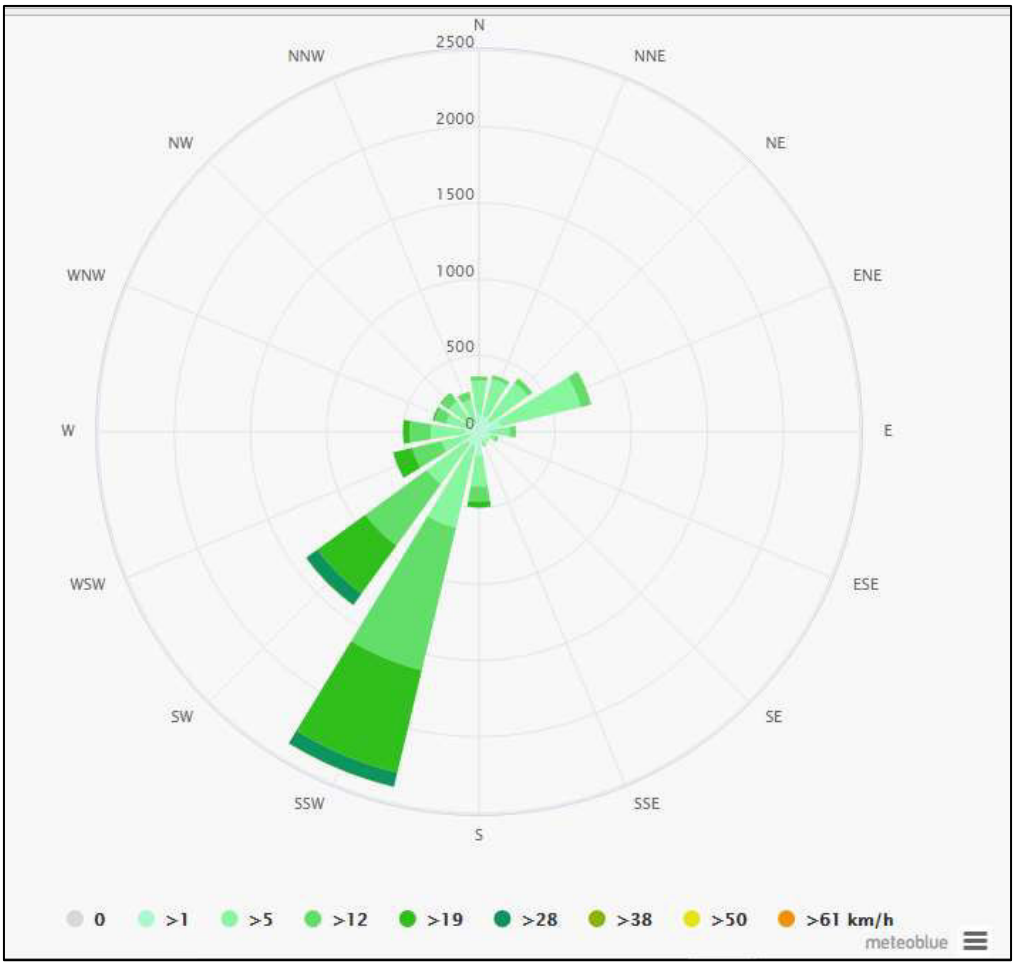
ALOHA needs a value for cloud cover (the proportion of the sky that is covered by clouds) in order to estimate the amount of incoming solar radiation at the time of a chemical release. Solar

radiation has an important influence on puddle evaporation rate, because heat from the sun can warm a puddle and speed up evaporation.

The cloud cover is usually measured in tenths: when the sky is completely covered by clouds, cloud cover is 10 tenths; when half the sky is covered by clouds, it is 5 tenths; when the sky is completely clear, it is 0 tenths. These values are represented by the complete cover, partly cloudy, and clear icons, respectively.

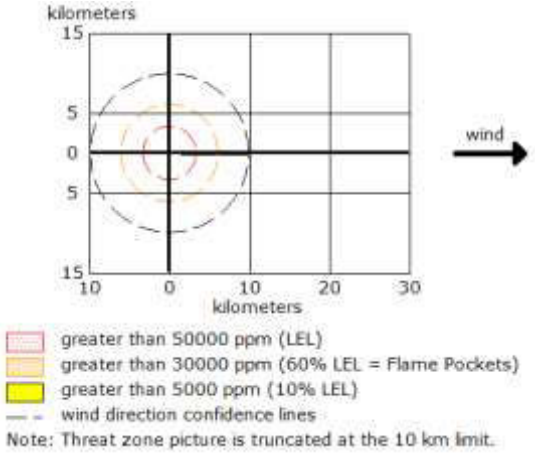
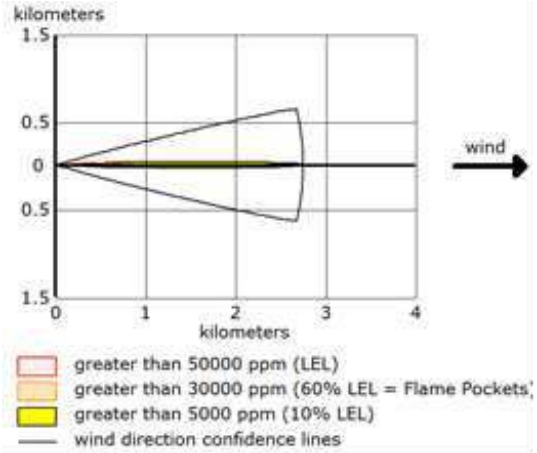
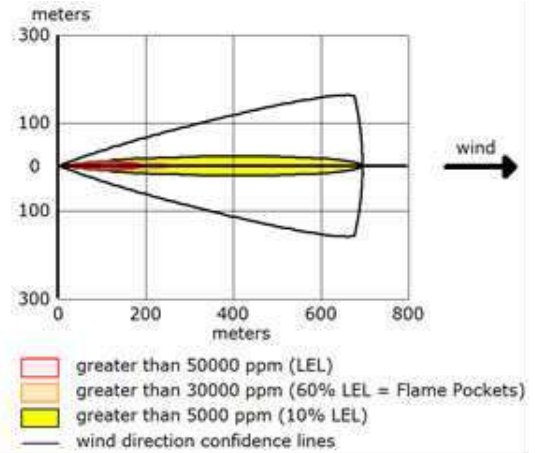
The following wind speed/stability class combinations and frequencies would appear to be relevant for Quantified Risk Analysis:

F	1 m/s	50%
F	2 m/s	50%
D	3 m/s	50%

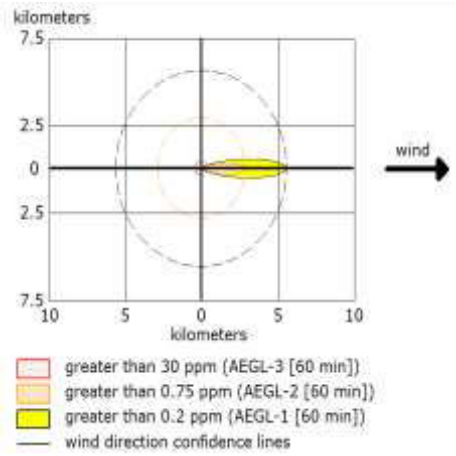
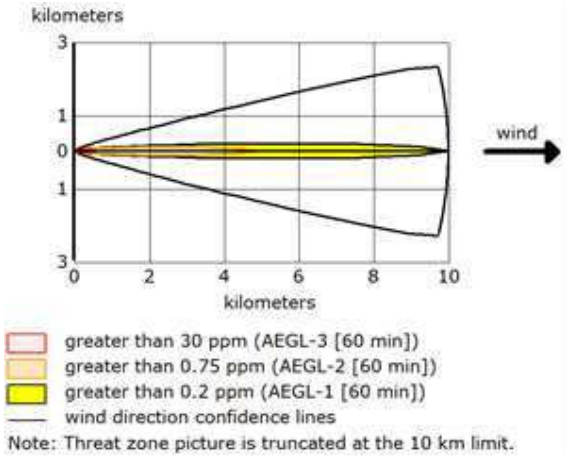
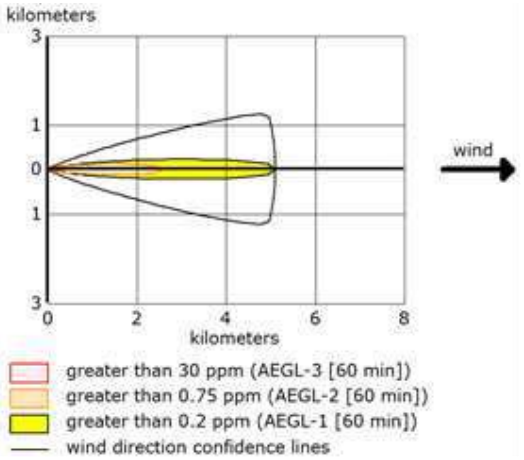


MCA identified for **M/s HINDALCO INDUSTRIES LTD (Unit: Birla Copper)** based on historical accident experiences of Chemical industry are as follows:

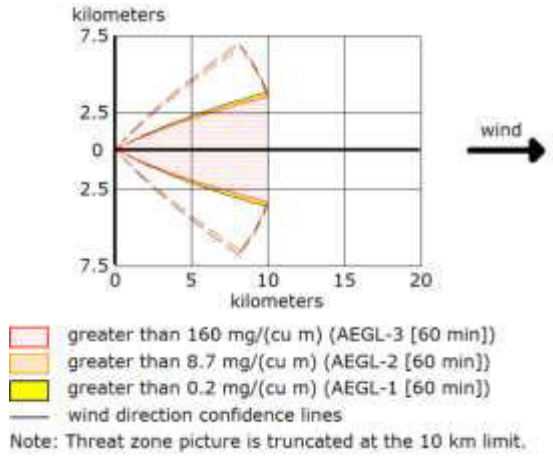
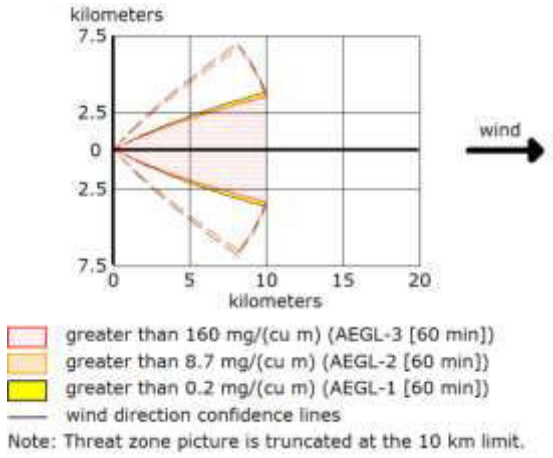
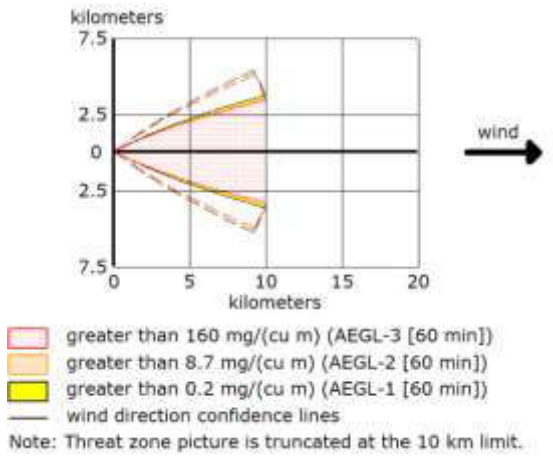
1. LNG: Flammable area of vapor cloud due to line leakage
2. Sulphur Dioxide: Toxic area of vapor cloud due to line leakage
3. Sulphuric acid: Toxic area of vapor cloud due to line leakage
4. Liquid Oxygen: Oxidization area of vapor cloud due to line leakage

1. Inlet LNG line leak – 3 m/s D size- 4 inch – Flammable Area Vapour Cloud		
Wind Speed: 1 m/s **Weather Class: F**	**Wind Speed: 2 m/s** **Weather Class: F**	**Wind Speed: 3 m/s** **Weather Class: D**
THREAT ZONE: Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian Red : 3.4 kilometers --- (50000 ppm = LEL) Orange: 6.1 kilometers --- (30000 ppm = 60% LEL = Flame Pockets) Yellow: greater than 10 km --- (5000 ppm = 10% LEL)	**THREAT ZONE:** Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian Red : 676 meters --- (50000 ppm = LEL) Orange: 901 meters --- (30000 ppm = 60% LEL = Flame Pockets) Yellow: 2.8 kilometers --- (5000 ppm = 10% LEL)	**THREAT ZONE:** Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian Red : 195 meters --- (50000 ppm = LEL) Orange: 256 meters --- (30000 ppm = 60% LEL = Flame Pockets) Yellow: 695 meters --- (5000 ppm = 10% LEL)
		

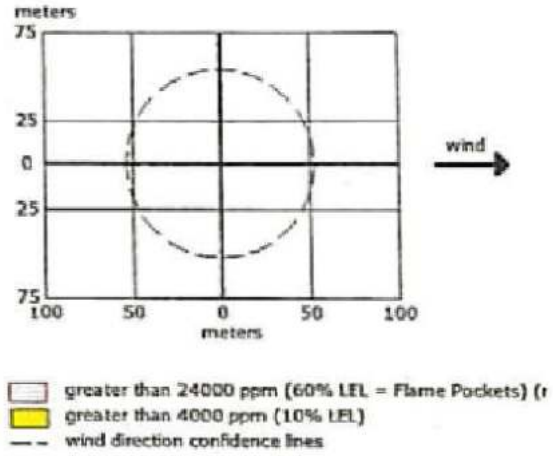
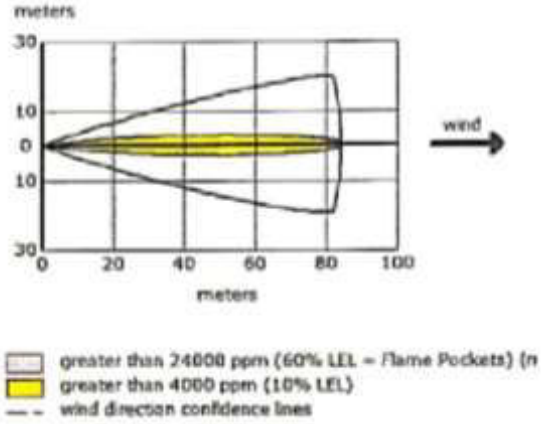
2. Sulphur Dioxide – Toxic Area Vapour Cloud

Wind Speed: 1 m/s Weather Class: F	Wind Speed: 2 m/s Weather Class: F	Wind Speed: 3 m/s Weather Class: D
THREAT ZONE: Model Run: Heavy Gas Red : 434 meters --- (30 ppm = AEGL-3 [60 min]) Orange: 2.9 kilometers --- (0.75 ppm = AEGL-2 [60 min]) Yellow: 5.6 kilometers --- (0.2 ppm = AEGL-1 [60 min])	**THREAT ZONE:** Model Run: Heavy Gas Red : 583 meters --- (30 ppm = AEGL-3 [60 min]) Orange: 4.9 kilometers --- (0.75 ppm = AEGL-2 [60 min]) Yellow: greater than 10 kilometers --- (0.2 ppm = AEGL-1 [60 min])	**THREAT ZONE:** Model Run: Heavy Gas Red : 371 meters --- (30 ppm = AEGL-3 [60 min]) Orange: 2.6 kilometers --- (0.75 ppm = AEGL-2 [60 min]) Yellow: 5.1 kilometers --- (0.2 ppm = AEGL-1 [60 min])
		

3. Sulphuric Acid – Toxic Area Vapour Cloud

Wind Speed: 1 m/s Weather Class: F	Wind Speed: 2 m/s Weather Class: F	Wind Speed: 3 m/s Weather Class: D
THREAT ZONE: Model Run: Gaussian Red : greater than 10 km --- (160 mg/(cu m) = AEGL-3 [60 min]) Orange: greater than 10 km --- (8.7 mg/(cu m) = AEGL-2 [60 min]) Yellow: greater than 10 km --- (0.2 mg/(cu m) = AEGL-1 [60 min])	**THREAT ZONE:** Model Run: Gaussian Red : greater than 10 km --- (160 mg/(cu m) = AEGL-3 [60 min]) Orange: greater than 10 km --- (8.7 mg/(cu m) = AEGL-2 [60 min]) Yellow: greater than 10 km --- (0.2 mg/(cu m) = AEGL-1 [60 min])	**THREAT ZONE:** Model Run: Gaussian Red : greater than 10 km --- (160 mg/(cu m) = AEGL-3 [60 min]) Orange: greater than 10 km --- (8.7 mg/(cu m) = AEGL-2 [60 min]) Yellow: greater than 10 km --- (0.2 mg/(cu m) = AEGL-1 [60 min])
		

4. LIQUID OXYGEN – Oxidization Area Vapour Cloud

Wind Speed: 1 m/s Weather Class: F	Wind Speed: 2 m/s Weather Class: F	Wind Speed: 3 m/s Weather Class: D
THREAT ZONE: Threat Modeled: Oxidization Area of Vapor Cloud Red : 22 Meters --- (24000 ppm = 60% LEL = Flame Pockets) Orange: 53 Meters --- (4000 ppm = 10% LEL = Flame Pockets)	**THREAT ZONE:** Threat Modeled: Oxidization Area of Vapor Cloud Red : 15 Meters --- (24000 ppm = 60% LEL = Flame Pockets) Orange: 38 Meters --- (4000 ppm = 10% LEL = Flame Pockets)	**THREAT ZONE:** Threat Modeled: Oxidization Area of Vapor Cloud Red : 34 Meters --- (24000 ppm = 60% LEL = Flame Pockets) Orange: 85 Meters --- (4000 ppm = 10% LEL = Flame Pockets)
	Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian Red : 15 meters — (24000 ppm = 60% LEL = Flame Pockets) Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances. Yellow: 38 meters — (4000 ppm = 10% LEL) Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.	

SUMMARY OF CONSEQUENCE DISTANCE:

Chemical Name	Emergency Event	Weather class	Wind Speed m/s	Release	Rate of Release	Probable extent of damage (50000 ppm = LEL)
LNG Line	Flammable vapour release	F	1	Leak	1440 kg/min	3.4 meters
		F	2		1440 kg/min	676 meters
		D	3		1440 kg/min	195 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (30 ppm = AEGL-3 [60 min])**
Sulphur Dioxide	Toxic vapour release	F	1	Leak	10.3 kg/min	434 meters
		F	2		10.3 kg/min	583 meters
		D	3		10.3 kg/min	371 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (160 mg/(cu m) = AEGL-3 [60 min])**
Sulphuric Acid	Toxic vapour release	F	1	Leak	1.88 kg/min	10,000 meters
		F	2		1.88 kg/min	10,000 meters
		D	3		1.88 kg/min	10,000 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (24000 ppm = 60% LEL = Flame Pockets)**
Liquid Oxygen	Oxidization Area Vapour Cloud	F	1	Leak	0.8 kg/min	22 Meters
		F	2		0.8 kg/min	15 Meters
		D	3		0.8 kg/min	34 Meters

Note: See **Annexure: - 9** for Gas dispersion & fire modelling

Other Hazards & Control

- **BOMB THREAT**

With increase in terrorist activities and as oil installations having, significant role in national economy sabotage & bomb threats should also be considered in the On-Site emergency Plan. In any such situation, city police/ administration should be informed immediately, and their help should be sought.

Bomb Threats made by telephone are usually to the organizations listed telephone number and hence are received by the telephone operator who manages the switch board. While only about 2% of reported bomb threats turn out to be real, there is no way of predicting whether thaw threat call is a thoughtless prank, a method of harassment designed to cause disruption or panic or a real warning of an impending explosion, Therefore All threats have to be treated as genuine.
Whenever observed Bomb threat, it is important that Management does not over react. An excessive response can cause panic & confusion and in necessary shutting down of certain vital sections of the plant, the problem compounded it – as will probably be the case – the threat turns out to be a hoax.

In place where important petroleum products are held, it should be remembered that a bomb threat may also be a decoy or diversion for a robbery attempt. If this is possible, then physical security should be reinforced at key locations.

Bomb threat evacuation methods & instruction

1. All response should leave through main or fire exit in a quiet and orderly manner and walking place should be used. Running will only cause panic and injuries.
2. Personnel should assemble in prearranged safe areas after evacuation. The supervisor will then hold a roll call to ensure that all personnel and visitors are accounted for. Anyone not present should be immediately reported to security.
3. As they leave, staff should be told to disconnect any electrical apparatus such as calculators, fans or electric/electronic typewriters.
4. The personnel should be told to open all doors and windows, as they leave. They should also be told to take their personnel belongings with them. As this will make the search easier.
5. Elevator should not be used during evacuation.
6. Building Custodians should switch off major equipments such as Air Conditioners, Generators, etc.

   It is recommended that the basic list of evacuation instructions as given below be issued to all personnel or displayed, for handling bomb threat situations.

Bomb threat Evacuation procedures

1. Walk out of the building in a quiet and composed manner. Do not causes panic by running.
2. Go to designated location and wait for instructions.
3. Do not use elevators when you leave.
4. Leave table drawers, doors and windows open.
5. Tank your Personnel belongings with you when you leave.

Search techniques

Since the terrorist does not label the device with the word “Bomb”, searching operations are very difficult, for no one knows what the bomb looks like. It can be packaged in many different ways as the techniques/imagination will allow.

There are, however three types of bomb search techniques; these are given below:

1. **Employee Search (immediate work area):** An Employee Search of the immediate work area is probably the first and most efficient response to the bomb threat. Only employees will be able to determine at a glance whether the objects around them are harmless or does anything give rise to suspicion. They can quickly detect ant strange or displaced items in their normal working environment. Immediately after receiving intimation about the bomb threat each employee will search his desk and the area around him and then leave accordingly to the evacuation procedure.

2. **Security personnel (Mainly Potential bomb plant Area):** Security officers should search such areas as reception, lounge, corridors, rest rooms, lockers Rooms, lavatories, space under staircases. Elevator shafts, trash bins and fire hose racks. While this list is not complete, it can give one and idea where a time – delayed explosive or an incendiary device may be concealed.

3. **Police Search (utilizing mobile detective apparatus, sniffer dogs, etc.):** In the event the above two searches prove negative, the installations/plat requires further investigation and the Police Bomb Disposal Squad should then take control of the operation. Such Squads may be equipped with remote control detection and examination equipment, explosive sniffing dogs or devices for sniffing explosives etc.

   The purpose of searching is to detect and report hazardous devices to the Police Bomb Squad Specialist. If there is something which could be all explosive device no one should touch it or even approach it to closely.

Some precautions to be taken after receipt of a Bomb Threat:

1. If time is sufficient or no fixed time has been given by the caller. It is advisable to maintain evacuation for 70 minutes and then organize search after that period, this is normally set to go off within an hour i.e. when the two hands of clock overlap one another.
2. The vehicle gate should be closed down, however, ie should easily accessible to incoming police and fire services.
3. In the event of a bomb warning being given, small parcels and plastic type shopping bags, transistors, toys and other foreign objects left in odd corners or near entrances should at once be suspected and dealt with accordingly.
4. Remove all vehicles from the premises as soon as a bomb threat received.

General Precautions at all Bomb threat Locations

1. Register all incoming – outgoing persons, vehicles and stores.
2. Control Entrance of visitors, suppliers and contractors to the administrative block. Ensure a record of the movement of persons and/or vehicles.
3. Do not allow visitors to enter non ant pretext without prior confirmation that they are expected/welcome. Arrange confirmation from reception point/main gate in cases of doubt.
4. Ensure that the standard of housekeeping around buildings is such that unfamiliar objects will at once become noticeable.
5. Establish a central control point which will not be evacuated, unless there is a substantiated positive danger to it. This should have means of communication with outside authorities.
6. It is a safe practice to display near the switch board and in the security room/control
7. At locations where frequent bomb threats are received, it is advisable not to park any visitor's vehicle within the installations/plant. Carefully enforced measures in parking of company vehicle should also be resorted to. No vehicle should be parked close to the plant area where an explosive device can cause immense damage.
8. Repeated dry runs on action to be taken on receipt of bomb threat are the only way to handle a real threat call with calmness and without causing any panic.
9. Discuss the bomb threat procedures/plans with the local police / bomb disposal squad and take their advice on evacuation procedures that they may like to suggest.

Emergency Action for Bomb Threat

- The persons inside the Depot should be evacuated as soon as possible.
- Depot personnel should contact district authorities like collector, police immediately.
- Any new or doubtful thing should not be touched.
- All pipeline and tank valves should be closed and all the operations inside the depot should be stopped.
- In case of fire, city fire brigade should be called.

➢ **FIRE IN SUBSTATION / DG SET:**

The possible impact of a substation fire can be catastrophic. Fires in substations can severely impact the supply of the power to rest of the plant.

The Following are some types of substation equipment that have caused fires:

- High-Voltage DC valves
- Outdoor or Indoor oil-insulated equipment
- Oil-Insulated Cable
- Polychlorinated biphenyls (PCB)-insulated equipment

Energized electrical cables with combustible insulation and jacketing can be major Hazard because they are a combination of fuel supply and ignition source. A cable failure can result in sufficient heat to ignite the cable insulation that could continue to burn, produce high heat and large quantities of toxic smoke. Oil insulation cables are an even greater hazard since the oil increase the fuel load and spill potential**.**

The hazard may be created by mineral oil-insulated equipment, such as transformer, reactors and circuit is that the oil is a significant fuel supply that can be ignited by an electrical failure within the equipment.

- **ELECTRICAL FIRE:**
  - Fire in cable tunnel due to short circuit
  - Fire in cable tuned due to external source.

Action to be taken

- Isolation of electrical supply must be done before allowing any action in the affected area.
- Till the time, isolation is done, affected area must be barricaded and hazard is to be communicated to the persons working in the area.
- Incident controller must inform firefighting team about the electrical hazards and must not allow of conducive material.
- Use only DCP or CO_2 type fire extinguisher.
- Electrical resistant high voltage PPEs must be used.
- In case of any causality, first aider-CPR and medical professional are to be informed.
- Electrical shift In-charge to ensure effective isolation & discharging of the affected area including isolation f Bunker Feeding.
- Electrical shift In-charge must confirm that there is no possibility of any electrical charge on the same circuit.

DO'S

- Use only 3 pin plug and sockets.
- Treat any unknown wire as "Live wire".
- Replace the fuse wire with correct gauge or use proper circuit breaker to protect from over building.
- Use ELCB for temperature electrical connections – 230v.
- Put off the line and ensure that the line is OFF, and it remains OFF during the job before undertaking any electrical work / repair.
- Cover the joints properly with insulating taps while connecting wires.
- Ensure proper insulation of cable leads.
- Use only, the electrical appliances manufactured by authorised and competent persons and having ISI marks.
- Ensure body earthing of the electrical appliance.
- Ensure the effectiveness of earthing and insulation of the wiring installations.
- Electrical jobs and wiring installation to be carried off only by competent and authorized persons.
- Report the defect to the shift In-charge or contact Electrician.
- Keep the tester handy but check in before use.
- Use only Test Lamp or Multimeter.
- Use suitable electrically resistant PPEs.

- To save a victim from an electric shock, switch off the power supply by using a dry wooden stick, rubber gloves or dry rope.
- To extinguish an electric fire, switch off the power supply, use Dry chemical or Carbon dioxide type extinguisher.
- De-energize the circuit before repairs.
- Use hand lamps of 24 V only.
- Ensure the fixture of 230v temporary lights fitted on fixed structure and should not be allowed to be shifted while in operation.
- No joints in the cables should be allowed. Temporary cables should not be allowed on the ground / Floor.
- Electrical apparatus and cable should not be allowed to come in contact with water.
- Wear Breathing Apparatus whenever going inside cable tunnel in emergency tunnel.
- Isolate the electrical supply before any firefighting operation.
- If you are unfamiliar with the equipment, do not get involved in emergency situation.

DON'TS

- Do not use metallic ladders in electrical / repairs unless with insulated supports only.
- Avoid using 2 pin plug and socket.
- Do not disturb / interfere the electrical safety devices.
- Do not adopt make shift arrangements in electrical connections.
- Do not use local / handmade electrical appliances.
- Do not carry out any unauthorized electrical wiring, Temporary extensions etc.
- Do not carry out temporary extensions and wiring to neighbours, social functions etc. Without obtaining clearance for the same from the factory electrical department.
- Do not use broken or loose plug.
- Do not store flammable liquids near electrical system.
- Do not over load a socket.
- Do not use electrical socket outlet without switch.
- Do not use water on electrical flash over / fire.
- Do not handle any electrical equipment / work on electrical system with wet hand / wet leg.
- Do not go inside the cable tunnel if you are not conversant with the route.
- If fires are more than do not go inside the cable tunnel.

➢ Poisoning, First Aid & Antidotes

- **Poisoning**

  Some substances when taken into the body in fairy large quantities can be dangerous to health or can cause death. Such substances are poisons.

  Poisons get into body by swallowing or by breathing poisonous gases, or by injection.

- **Poisoning by Swallowing**

  Sometimes acids, alkalis, disinfectants etc., are swallowed by mistake. They burn the lips, tongue, throat, and food passage and stomach and cause great pain. Other swallowed poisons cause vomiting, pain and letter on diarrhea. Poisonous fungi, berries, metallic poisons and stale food belong to the latter group some swallowed poisons affect the nervous system. To this group belong (a) alcoholic (methylated spirit, wine, whisky etc.) when taken in large quantities, and (b) tables for sleeping, tranquilizers, and pain killing drugs (aspirin or largectil). All these victims must be considered as seriously ill. The symptoms are either delirium or fits or come (unconsciousness). Some poisons act on nervous system- (belladonna, strychnine).

- **Poisoning by Gases**

  Fumes or gases from charcoal stoves, household gas, motor exhausts, some chemicals and smoke explosions etc., cause choking (asphyxia) which may result in unconsciousness in addition to difficult in breathing.

- **Poisoning by Injection**

  Poisoning get into the body through injection bites of poisonous snakes and rabid dogs, or stings by scorpions and insects. Danger to life is again by choking and coma.

✓ General first Aid in Poisoning

- Poisoning is a serious matter. Patient must be transfer to a hospital/or a doctor be sent for, at once with a note of the findings and, if possible, the name of the poison.
- Preserve packets or bottles which you suspect contained the position and also any vomits, sputum etc., for the doctor to deal with.
- If unconscious - (a) do not induce vomiting (b) Make the casualty lie on his back on a hard, flat bed without any pillow and turn the head to one side. As there is no pressure on the stomach and the gullet is horizontal, the vomited matter will not get into the voice box and the tongue will not close the air passage. This is also the best posture for giving artificial respiration, if needed (c) Sometimes when there is excess of vomiting the three-quarter-prone posture (i.e. the casualty is made to lie on his side with one leg stretched, the other bent at knee and thigh) will make things easier for the casualty. (d) If breathing is very slow or stopped, start artificial respiration and keep it up till the doctor comes.

- If conscious- (a) Aid vomiting by tickling the back of throat or make him dark tepid water mixed with 2 tablespoons of common salt for a tumbler of water. (b) Even if conscious, when the poison is a corrosive do not induce vomiting. Signs of corrosive: Lips, mouth and skin show gray white or yellow, patches that are to be looked for: acids, alkalis etc., cause such burns. First aid: Factories, which use certain poisons, shall have the respective antidotes ready and displayed in an easily available place. The personnel should be taught about the use of antidotes- so that anyone can render assistance in case of emergency.
- The poison must be diluted by giving large quantities of cold water (chilled, if possible). This will dilute the irritant and delay absorption and will replace fluid lost by vomiting. Tender coconut water will be even better as this will be a food and also a diuretic.
- Soothing drinks should be given. Milk, egg beaten and mixed with water or sojee congee are good for the purpose.

✓ **First Aid in Toxic Chemical Poisoning**

- The latent course of the disease is 15-60 minutes, after which the symptoms of the affection of the nervous appears (e.g., enhanced salvation, discharge of sputum, and perspiration). Breathing accelerates and becomes noisy, with rales beard at a distance. The patient becomes restless and excited. Cramp appears in the legs and the intestine undergoes increased peristalsis which is followed by muscular paralysis and paralysis of the respiratory muscular. The respiratory arrest that follows, causes asphyxia and death.
- In accidents connected with the inhalation of the toxic chemicals the victim must be immediately hospitalized. If possible, he should be given 6-8 drops of a 0.1 per cent atropine solution or 1-2 tables of belladonna. When respiration is arrested, artificial respiration should be carried out. When the poisoning is caused by toxins getting into the gastro - intestinal tract, the stomach should be washed with water mixed with suspension of activated carbon. Saline purgatives should also be prescribed. The toxic substances should be removed form the skin and mucous membranes with running water.

✓ **Carbon Monoxide Poisoning**

- Carbon monoxide poisoning may occur in the chemical industry where it is used for synthesizing certain organic compounds (acetone, methyl alcohol, phenol etc.) in poorly ventilated garages, or in stuffy, freshly painted premises. It may are happen in households when the stove shutters are closed too early in premises with stove heating.
- The early symptoms are headache, heaviness in the head, nausea, and dizziness, noise in the ears, and palpitation. Later muscular weakness and vomiting occur. If the victim remains in the poisonous atmosphere, the weakness intensifies, somnolence, clouding of

consciousness, and despond develop. The skin turns pale and sometimes bright and red spots appear on the body. In further exposure to carbon monoxide the patient's respiration becomes shallow, convulsions develop, and paralysis of the respiratory center terminates in death.

- **First aid :** The victim must be immediately removed from the poisonous surroundings, better into the open air in warm weather. If his breathing is weak and shallow or arrested, artificial respiration should be continued until adequate natural breathing or the true signs of biological death appear. Rubbing should be carried out and hot-water bottles applied to the legs. A brief whiff of ammonium hydroxide is beneficial. A patient with severe carbon monoxide poisoning must be immediately hospitalized in order to prevent possible grave complications in the lungs and nervous system which may develop later.

✓ **Poisoning with Toxic Chemicals**

- The latent course of the disease is 15-60 minutes, after which the symptoms of the affection of the nervous appears (e.g., enhanced salvation, discharge of sputum, and perspiration). Breathing accelerates and becomes noisy, with rales beard at a distance. The patient becomes restless and excited. Cramp appears in the legs and the intestine undergoes increased peristalsis which is followed by muscular paralysis and paralysis of the respiratory muscular. The respiratory arrest that follows, causes asphyxia and death.
- In accidents connected with the inhalation of the toxic chemicals the victim must be immediately hospitalized. If possible, he should be given 6-8 drops of a 0.1 per cent atropine solution or 1-2 tables of belladonna. When respiration is arrested, artificial respiration should be carried out. When the poisoning is caused by toxins getting into the gastro - intestinal tract, the stomach should be washed with water mixed with suspension of activated carbon. Saline purgatives should also be prescribed. The toxic substances should be removed form the skin and mucous membranes with running water.

✓ **Poisoning with Acids and Alkalis**

- In poisoning with concentrated acids and alkalis, a grave condition rapidly develops due, in the first place, to extensive burns in the mouth, throat, oesophagus, stomach, and often the larynx. Later, the absorbed toxins affect the vital oranges (e.g. liver, kidneys, lungs, or heart). Concentrated acids and alkalis are able to destroy tissues. The mucous membranes, being less resistant than the skin, are destroyed and necrosis occurs more rapidly involving deeper layers.
- Burns and scabs from on the mucous membrane of the mouth and lips. When a burn due to sulfuric acid the scabs are black, in a burn due to nitric acid they are grayish-white

- Alkalis more easily penetrate the skin and affect deeper layers. The burnt surface is loose, decomposed, and whitish in colour.
- As soon as an acid or alkali is swallowed the patient feels strong pain in the mouth, behind the breastbone and in the epigastrium.
- When laid be tosses in bed from unbearable pain. There is almost always tormenting vomiting often with admixtures of blood. Pain shock rapidly develops. The larynx may swell, and asphyxia develops. When an acid or alkali is taken in great amount cardiac weakness and collapse rapidly develops. The larynx may swell, and asphyxia develops. When an acid or alkali is taken in great amount cardiac weakness and collapse rapidly develop.
- Poisoning with ammonium hydroxide takes a grave course. The pain syndrome is attended is attended by asphyxia because the airways are also affected.
- The person who is rendering first aid must fond lout at once which chemical caused the poisoning because the treatment varies according to the type of poison.
- If the poisoning was caused by concentrated acids and the symptoms of esophageal or gastric perforation are absent the stomach should be lavaged through a thick stomach tube using for it 6-10 litters of warm water mixed with magnesium oxide (20 g per lifter of liquid), or lime water. Sodium carbonate is contraindicated for a gastric lavage. "Minor lavage", i.e. drinking 4-5 glasses of water and then inducing vomiting, will not alleviate the patient's condition and sometimes may even promote absorption of the poison.

✓ **Alcohol Poisoning**

- Alcohol taken in considerable (toxic) quantities may cause fatal poisoning. A fatal dose of ethyl alcohol is 8 g per 1 kg body weight. Alcohol affects the heart, blood vessels, gastro- intestinal tract, liver, kidneys, and mainly the brain. In a case of severe intoxication, sleep is followed by unconscious state. Vomiting and involuntary urination are frequent symptoms. The respiratory center is drastically inhibited, which is manifested by irregular breathing. Death ensures when the respiratory center becomes paralyzed.
- **First aid.** Fresh air should be provided (a window open or the victim taken outside), vomiting induced by "minor lavageas" If the patient is still conscious, he should be given hot strong coffee. A respiratory arrest is managed by artificial respiration.

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

✓ **Common Poisons and Their First Aid**

Poison	First Aid
Acacia, yellow, willow thicket	Gastric lavage with water, adding activated carbon. Saline purgative. Rest, Warming of the body.
Ammonium hydroxide	Gastric lavage with copious amount of water, adding citric or acetic acid. Orally: 1 percent solution of either of these acids.
Aniline (Aniline dyes, Nitrobenzene, Toluidine)	In natural breathing fresh air and inhalation of oxygen. In respiratory arrest: artificial respiration. In internal poisoning: gastric lavage adding activated carbon, administration of saline purgative (30 g) and Vaseline oil (150 ml); emetics (apomorphine). Milk, oils and spirit are forbidden.
Arsenic and is compounds	Copious gastric lavage with water adding either activated carbon or magnesia solution (20 g per one litter of water), or arsenic antidote solution (100 ml per 2-4 litters of water). Internally repeated every 5 minutes 1 tablespoonful of arsenic antidote or metal antidote, magnesia. Saline purgative, milk, oil, Warming of the body, hot water bottle on the belly.
Atropine (Beladonna, Henbane, thorn apple)	Gastric lavage with water, adding either activated carbon or potassium permanganate solution (1 : 1000); introduction of saline purgative through a stomach tube4. Bed-rest; cold to the head. In weakness: caffeine tables; in respiratory disorders; artificial respiration and oxygen inhalation.
Benzene, Kerosene, Acetylene	In poisoning with vapours: inhalation of oxygen, fresh air, artificial respiration, warming of the body: internally: caffeine, ascorbic acid (vitamin C). In internal poisoning: the same treatment and gastric lavage with water and activated carbon; purgative: castor oil, and black coffee and hot milk to drink.

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

✓ **Specific (Antidote) Treatment of Acute Poisoning**

Poison	First Aid
Acids	Diphoterine
Aniline, Potassium permanganate	Methylene blue (1 per cent solution), ascorbic acid (5 per cent solution)
Anticoagulants: heparin and other agents	Protamine sulphate (1 per cent solution), vitamin K (1 per cent solution)
Atropine	Pilocarpine (1 per cent solution), proserine (neostigmine methysulphate) (0.05 per cent solution)
Barbiturates	BemeGround Flooride (0.5 per cent solution)
Barium and its salts	Magnesium sulphate (100 ml of 30 per cent solution)
Cardiac glucosides	Tetacin calcium (sodium calcium edetate) (10 per cent solution), potassium chloride (0.5 per cent solution), atropine sulphate (0.1 per cent solution)
Carbon monoxide, Hydrogen sulphate, Carbon disulphide	Inhalation of oxygen
Formalin	Ammonium chloride (3 per cent solution) or ammonium carbonate (3 per cent solution)
Hydrocyanic(prussic) acid	Sodium nitrite (1 per cent solution), sodium thiosulphate (30 per cent solution), chromosmon (1 per cent methylene blue in 25 per cent glucose solution)

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

✓ **Antidots And Emergency Treatment-Table**

Sr. No.	Name of Chemical	Treatment/ Antidots
1	Acids	Ingestion: Give the person half to one glass of milk/water within 30 minutes of ingestion. Antacids like Aluminium hydroxide or milk of Magnesia. Do not induce vomiting. Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Inhalation: Move to fresh air. 100% oxygen. Complete rest for 24-48 hours. Note: Do not use alkali to neutralize acid
2	Acetonitrile	Cyanide antidotes: Due to delayed toxicity, repeated doses of Cyanide antidotes may be needed for acetonitrile poisoning irrespective of route of exposure. (For cyanide antidotes see below)
3	Acrylonitrile	1. Cyanide antidotes and 2. N-acetyl cysteine should be administered in by I/V route as follows150 mg/kg in 200 ml of 5% Dextrose over 60 min, then 50 mg/kg in 500 ml of 5% Dextrose over 4 hr then 100 mg/kg in 1 L of 5% Dextrose over16 hr
4	Alkali	Ingestion: Give the person half to one glass of milk/water. Do not induce vomiting Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Inhalation: Supportive treatment Note: Do not use acid to neutralize alkali
5	Ammonia	Inhalation: Move the person to fresh air Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Ingestion: Give the person half to one glass of milk/water. Do not induce vomiting
6	Aniline, Nitrobenzene, Toluidine and other dye intermediates	Cyanosis occurs when methemoglobin levels exceed 15%. Give 1-2 mg/kg of 1% Methylene blue I/V slowly over a period of five minutes. Repeat doses of methylene blue may be needed. Do not exceed total dose of 7 mg/kg.
7	Antimony	A. Treatment is primarily symptomatic. There are no specific antidotes, but DMSA, D-penicillamine, BAL, and DMPS (Unithiol) have been used as chelating agents. Metallic antimony is not highly toxic and usually only causes gastrointestinal effects. Various salt forms may cause significantly more irritation, and stibine is a highly toxic, haemolytic gas.

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

✓ **Scrubbing / Neutralising/ Inactivating Media**

Sr.no	Chemical Gases	Scrubbing, Neutralizing or Inactivating Media	Material of Construction
1.	Phosgene $COCl_2$	Caustic Soda Solution	Water scrubber of PPFRP followed by Caustic scrubber of MSRL (or Caustic scrubber alone)
2.	Chlorine Cl_2	Caustic/lime	MSRL/PP backed by FRP.
3.	Sulfur dioxide SO_2	Caustic soda solution	Polypropylene backed by FRP up to their thermal unit or SS scrubber.
4.	Ammonio gas NH_3	Water	MS
5.	Hydrochloric acid HCl	Caustic/lime	Msrl /PP backed by FRP
6.	Nitrous acid fumes	Caustic/Thiosulfate Solution/Urea.	FRP
7.	Hydrogen fluoride HF	Water/Caustic	Teflon.
8.	Hydrocyanic acid HCN	Hypochlorite	MSEL/PP backed by FRP.
9.	Ethyl chloride C-2H5Cl	Water (poor Solubility)	--
10.	Ethylene oxide CH2-O-CH2	Water spray	MS Tower.
11.	Hydrogen sulfide H2S	17% Monoethanol amine and 83% water or Caustic.	MSRL
12.	Hydrogen H2	Ignite, use back flame arrestor	MS
13.	Propylene CH2-CH=CH2	-do-	-
14.	Ethylene CH2=CH2	-do-	-
15.	Organic gases	-do-	-
16.	Fluoride, SiF4 from acidification	Water spray	-

Sr.no	Chemical Gases	Scrubbing, Neutralizing or Inactivating Media	Material of Construction
	of phosphate rock Liquids (Acids)		
17.	a. Sulfuric acid H2SO4 b. Hydrochloric acid HCL c. Nitrate acid HNO3 (Alkalies)	Lime/Caustic/Water Lime/Caustic/Water Lime/Caustic/Water	MLSR MLSR MLSR
18.	a. Sodium hydr-oxide NaOH b. Potassium Hydroxide KOH	Water Water	MS MS

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

➢ **Spillage Control**

✓ **General Guidelines for Responding to spill or Leak**

- Shut off ignition sources; no flares, smoking, or flames in hazardous area
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch spilled material. Do not touch damaged containers or move anything, except to rescue people.
- Detour pedestrian and vehicular traffic.
- Detain anyone who has been in the area of the spill or area of suspected contamination (except for victims requiring emergency medical care).
  Delay clean-up until the authorities arrive.
- Minimize dispersal of material (by wind, rain, etc.) by covering with a tarp, plastic sheet, etc. Tie down or use weights as necessary.
- If a right-of-way must be cleared before radiological emergency assistance arrives, move vehicles and debris the shortest distance required to open a pathway. Then, before permitting traffic to pass on the cleared path, spillage should be washed or wetted and swept to the edge with a minimum dispersal of wash water and spilled material.
- If radiation protection experts are not able to get to the scene within a reasonable period of time because of weather or other constraints and prompt action is required, do the following:
  Small Spills: Cover with sand or other non-combustible absorbent material and place into containers for later disposal.
  Large Spills: Build a dyke far ahead of the spill to contain spilled material for later disposal & follow SOP written in plant emergency manual.

  Source Site: https://dish.gujarat.gov.in (Director Industrial Safety and Health, Labour & Employment Department, Government of Gujarat)

✓ **Initial Isolation and Protective Action Distance (Useful at events of chemical spillage)**

Sr. No.	Name of chemical	Small Spill (from a large package or from many small packages)		Large Spill (From s small package or small leak from a large package)			
		First Isolate in all directions (Mts.)	Then Protect persons in downwind during	First Isolate in all directions (Mts.)		Then Protect persons in downwind during	
		Day Mtrs.	Night Kms.	Day Mtrs.	Night Kms.	Day Kms.	Night Kms.
1.	Liquid Ammonia Anhydrous Ammonia	30	0.2	95	0.3		0.8
2.	Ammonia Solution, with more than 50% Ammonia	30	0.2	60	0.2	0.2	0.3
3.	Chlorine	60	0.3	185	0.8	0.8	3.1
4.	Ethylene Oxide	60	0.2	125	0.3	0.3	1.0
5.	Hydrocyanic acid	60	0.2	185	0.8	0.6	2.7
6.	Hydrogen Fluoride	60	0.2	155	0.6	0.5	2.3
7.	Hydrogen Chloride	60	0.2	155	0.5	0.5	1.8
8.	Fluorine	60	0.2	185	0.8	0.6	2.7
9.	LPG	60	0.2	185	0.8	0.6	2.7
10.	Naptha/NGL	30	0.1	60	0.2	0.2	0.3
11.	Free So3/H2SO4	60	0.2	185	0.8	0.6	2.9
12.	Bromine	60	0.3	215	1.0	0.8	3.5
13.	Ethyl Mercaptan	60	0.2	125	0.5	0.3	1.3
14.	Benzene	50	0.1	100	0.3	0.2	0.6
15.	CNG	95	0.3	245	1.3	1.1	4.8
16.	HNO3	60	0.2	155	0.5	0.5	1.8

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety and Health, Labour & Employment Department, Government of Gujarat)

✓ **How to use the table of initial isolation and Protective Action Distance**

- The responder should already have
    1. Identified the material by its Name
    2. Read the Guide for that material and taken the emergency actions recommended
    3. Noted the wind direction
- Look in this Table, use the entry with the largest protective action distances
- Determine if the incident involves a SMALL or LARGE spill and if DAY or NIGHT. Generally, a SMALL SPILL, is one which involves a single, small package (i.e. up to a 200 litter drum), a small cylinder, or a small leak from a large package. A LARGE SPILL is one, which involves a spill from a large package, or multiple spills from many small packages. DAY is any time after sunrise and before sunset. NIGHT is any time between sunset and sunrise.
- Look up the initial ISOLATION distance.
  Direct all persons to move, in a crosswind direction, away from the spill to the distance specified.
- Next, look up the initial PROTECTIVE ACTION DISTANCE shown in the Table. For a given dangerous goods, spill size, and whether day or night, the Table gives the downwind distance - in kilometres for which protective actions should be considered. For practical purposes, the Protective Action Zone (i.e. the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance shown in the Table
- Initiate Protective Actions to the extent possible, beginning with those closest to the spill site and working away from the site in the downwind direction. When a water-reactive PIH producing material is spilled into a river or stream, the source of the toxic gas may move with the current or stretch from the spill point downstream for a substantial distance. The shape of the area in which protective actions should be taken (the Protective Action Zone) is shown in this figure. The spill is located at the center of the small circle. The larger circle represents the INITIAL ISOLATION zone around the spill.
- Call the emergency response telephone number listed on the TREMCARD as soon as possible for additional information on the material, safety precautions, and mitigation procedures

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety and Health, Labour & Employment Department, Government of Gujarat)

- **Quick Reference for Spill Clean-ups**

Chemical Spilled	Clean-Up Procedures
Acids, organic	Apply sodium bicarbonate. Adsorb with spill pillow or vermiculite.
Acids, inorganic	Apply sodium bicarbonate/Calcium Oxide or sodium carbonate/calcium oxide. Adsorb with spill pillow or vermiculite. NOTE: Hydrofluoric acid is an exception to the general practice, see below.
Acid Chlorides	Do not use water. Absorb with sand or sodium bicarbonate.
Aldehydes	Absorb with spill pillow or vermiculite.
Aliphatic Amines	Apply sodium bisulfite. Adsorb with spill pillow or vermiculite.
Aromatic Amines	Absorb with spill pillow or vermiculite. Avoid skin contact or inhalation.
Aromatic Halogenated Amines	Absorb with spill pillow or vermiculite. Avoid skin contact or inhalation.
Azides	Absorb with spill pillow or vermiculite. Neutralize with 10% ceric ammonium nitrate solution.
Bases (caustic alkalis)	Neutralize with acid, citric acid, or commercial chemical neutralizers. Absorb with spill pillow or vermiculite.
Carbon Disulfide	Adsorb with spill pillow or vermiculite.
Chlorohydrins	Absorb with spill pillow or vermiculite. Avoid skin contact or inhalation.
Cyanides	Cover solids with damp paper towel and push onto dust pan or use a HEPA filter vacuum to collect the solids. Absorb liquids with spill pillow or vermiculite.
Halides, organic or inorganic	Apply sodium bicarbonate.
Halogenated Hydrocarbons	Absorb with spill pillows or vermiculite.
Hydrazine	Avoid organic matter. Apply "slaked lime". Adsorb with spill pillow or vermiculite.
Hydrofluoric Acid	Adsorb with calcium carbonate (limestone) or lime (calcium oxide) rather than sodium bicarbonate. The use of sodium bicarbonate will lead to the formation of sodium fluoride, which is considerably more toxic than calcium fluoride. Be careful in the use of spill pillows used to adsorb the acid. Some pillows contain silicates which are incompatible with hydrofluoric acid.
Sulphuric acid	Apply with cloth or sponge, and avoid splashing or spreading the acid.
Inorganic Salt Solutions	Apply soda ash
Mercaptans/Organic Sulfides	Neutralize with calcium hypochlorite solution. Absorb with spill pillow or vermiculite.
Nitriles	Sweep up solids. Absorb liquids with spill pillows or vermiculite.
Nanoparticles	Pick up particles with a HEPA or ULPA filtered vacuum.
Nitro compounds/Organic Nitriles	Absorb with spill pillow or vermiculite. Avoid skin contact or inhalation.
Oxidizing Agents	Apply sodium bisulfite.
Peroxides	Absorb with spill pillow or vermiculite.
Phosphates, organic and related	Absorb with spill pillow or vermiculite.
Reducing Substances	Apply soda ash or sodium bicarbonate.

➢ **Oil Spill on Land**

- When oil is spilled on land, attempt to contain the spilled material and prevent further spread. Dikes or barriers of earth, sand or clay materials can be quickly constructed with bulldozers or similar equipment. Motorized equipment should not be used near flammable or explosive vapours or gases. Adequate shovels may be arranged for manual cleaning.
- Once the spilled material has been contained, the next step is to remove it from the environment.
- Following methods shall be adopted for Ground Floors clean-up of contaminated Ground Floor surfaces:
  - Use of compatible pumps, hoses, and tanks, drums, or vacuum trucks to collect pools of accumulated liquids.
  - Use of soil, sand, clay, straw, saw dust, fly ash, cement powder, vermiculite, or commercially available mineral or plastic sorbing materials to absorb and mop up liquid residues. Dispose-off the same as per procedure.
  - Removal of contaminated surface layers (where cleaning in place is not practical) by shovels or mechanical means.
  - Application of special mutant bacterial cultures to contaminated soils and liquids to "digest" contaminants over a period.

- **Special emergency situations**

  - ✓ **Emergency due to Visit/Inspection of outside plant by employee**

    Company employees visiting outside plant for inspection/maintenance related activity are at risk for any road accident.

    Step in case of road accident -

    - Provide first aid to injured
    - Contact nearby site / company. It will provide help & make arrangement for medical assistance & treatment.
    - Company vehicles are drive by experienced drivers & over speeding are avoided.

  - ✓ **Emergency due to raw material/finished goods transport at outside**

    Raw material & finished goods are transported through vehicles. Emergency situation will arise due to road accidents.

    Step in case of emergency:

    - Inform to commercial department & Transporter
    - Follow emergency steps given in TREM card in case of any leakage/Spillage
    - Contact nearby site. It will provide help & make arrangement for handling emergency situation.

  - ✓ **Food poison**

    - Inform personal department.
    - Contact Occupational health center for medical treatment.
    - If required transfer victim to the nearby hospital through vehicle & avail treatment.

  - ✓ **Riots:**

    Surviving a riot comes down to these basic actions:

    - Avoid them in the first place
    - Don’t let curiosity get the best of you
    - Practice your situational awareness skills
    - If with companions stick together – safety in numbers
    - If caught in the middle, move away from the violence with the least amount of attention as possible
    - Get to know your neighbourhoods and potential escape routes.

✓ **ETP overflow:**

When ETP will be overflow, following actions to be taken in emergency:

- Stop the inlet immediately.
- If secondary containment is available, then proceed ahead.
- Stop the pumps of inlet.
- Outlet of tank which is overflowing should be fully open till effluent pass out.

✓ **Biological emergencies:**

Before-

- Watch television, listen to radio, or surf the internet for official news of any outbreak.
- Practice good hygiene and keep your premises clean
- Use mosquito nets/repellents at night
- Boil water before drinking. Chlorinate it, if possible.
- Thoroughly wash all vegetables/fruits before cooking/eating
- Use insecticides to contain the vectors
- Don't consume stale or contaminated food products
- Immediately report any sickness with unusual and/or suspicious symptoms in the family neighborhood to health authorities
- Seek medical attention if you are sick; keep a stock of your regular prescribed - medicines.

During-

- Keep distance from and avoid direct contact with the affected person
- Avoid going to crowded areas
- Use a respiration mask for protection

After-

- Follow official instructions and help authorities dispose of contaminated items such as food, poultry, crops, vectors and other materials, if advised.
- Ensure that all the required immunizations are done and necessary precautions taken.

✓ **Chemical emergencies:**

For individuals

Before-

- Don't mix chemicals, even common household products. Some combinations, such as ammonia and bleach, can create toxic gases.
- Store chemical products properly.

- Store non-food products tightly closed in their original containers for easy identification.
- Dispose of unused chemicals properly.
- Improper disposal is harmful as it may contaminate the local water supply.
- Do not smoke or light fire in the identified hazardous areas.
- Avoid staying near industries which process hazardous chemicals, if possible.
- Keep emergency contact numbers handy,
- including that of nearby hazardous industries.
- Participate in capacity building programmes organized by the government/ voluntary organizations I industrial units.
- Identify safe shelters along with safe and easy access routes.
- Prepare a family disaster management plan.
- Prepare an emergency kit with essential items for safety and survival.

During-

- Do not panic. Evacuate quickly through the designated escape route.
- Keep a wet piece of cloth on your face while evacuating.
- If you are unable to evacuate, close all the
- doors and windows tightly.
- Once you are at a safe location, inform Emergency Services (Police, Hospital, etc.).
- Do not spread and/ or believe in rumors.

After-

- Do not consume uncovered food/ water, etc.
- Change into fresh clothes after reaching a safe place/ shelter, and wash hands properly.

Community

- Make the entire neighborhood aware of chemical hazards and the first aid required to treat them.
- Listen to radio, watch TV and surf
- The Internet for official news and announcements.
- Provide accurate information to government officials.
- Sensitize authorities about the exact
- requirement of protective equipment for dealing with the hazard present.

✓ **Nuclear- Radiological Emergencies:**

Before-

- Learn about nuclear radiation hazards.
- Discuss nuclear radiation safety with children, family, friends and neighbors
- Keep emergency contact numbers handy.

During-

- Go indoors. Close doors/windows. Stay inside.
- Switch on the radio/television and look out for public announcements from your local authority.
- Cover all food, water and other consumables. Eat only such covered items.
- If you are out in the open, cover your face and body with a wet cloth. Return home quickly, remove footwear before entering. Take a bath and wear fresh clothes. Keep the removed footwear and clothes packed in a polythene bag to be checked for contamination by authorities.
- Follow official instructions
- During prolonged contamination issues, try to feed milking cattle contamination• free fodder and water.

Don'ts-

- Do not panic.
- Do not spread and/ or believe in rumors
- Do not stay outside/or go outside unless it is really necessary.
- Do not use water from open wells/ponds; exposed crops, vegetables, food or milk

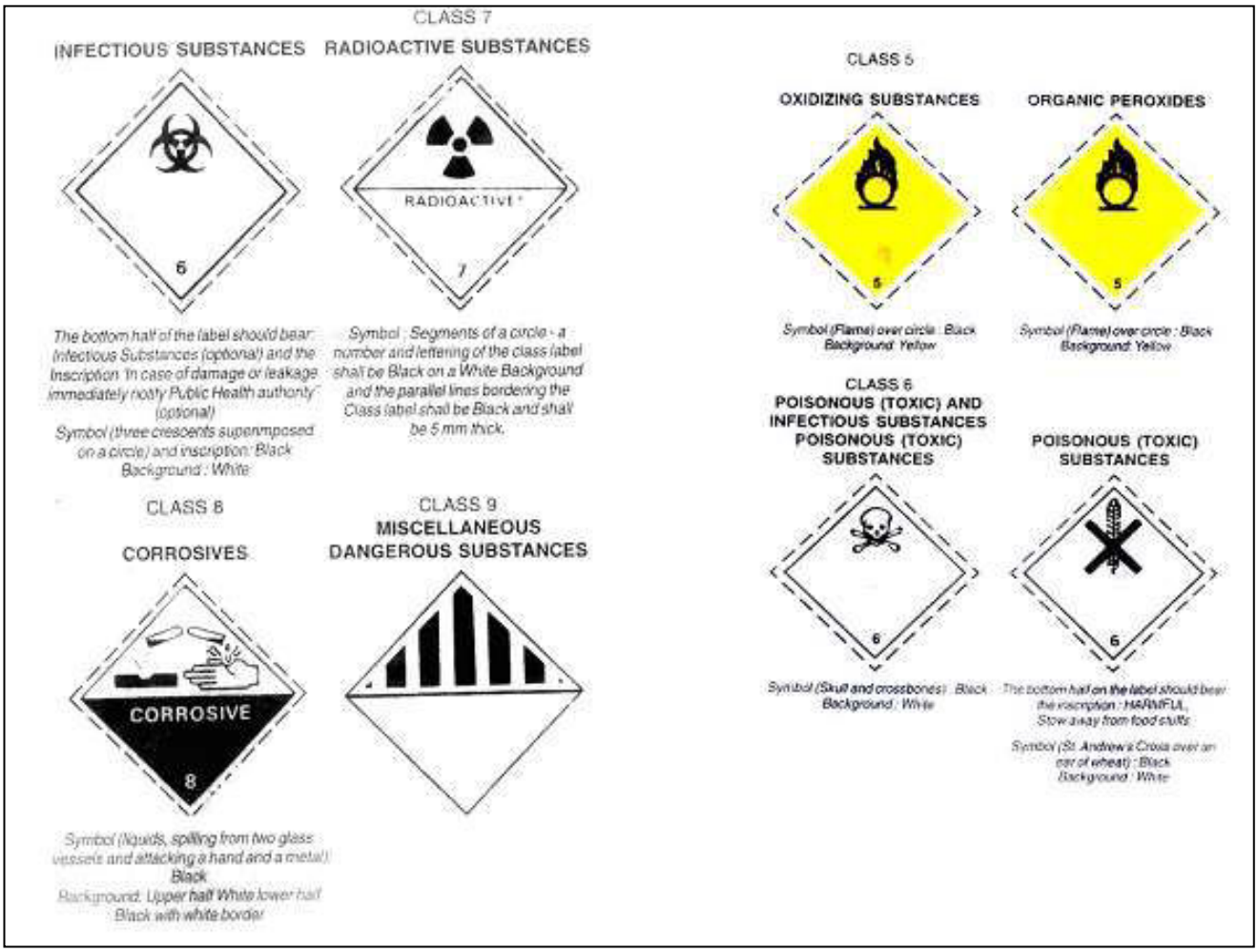
✓ **Transport Emergency:**

The Vulnerability of hazardous chemical in transit is a moving circle or is known as corridor.

The moving / transporting vehicle is the centre of this circle.

In case of emergency in transit, it should be communicated to:

UN CLASSIFICATION OF HAZARDOUS CHEMICALS



Emergency action code/HAZCHEM code:

United Nation has also made one code for chemical emergency during road transit of hazardous chemicals. This is name as HAZCHEM number. The word arrived from hazardous chemicals. This code is also known as Emergency Action Code (EAC). Chemical accident involve leak, spill, release, fire, explosion, exposure of combination of any of them. The Code is explained below.

2-to-3-digit code

First digit numeric, rest are alphabets (including “space” or “blank”)

Meaning of the first digit

1 - Jet, 2 - Fog, 3 - Foam, 4 - Dry agent

HAZCHEM CODE

1. JETS
2. FOG
3. FOAM
4. DRY AGENT

PR	V	FULL	DILUTE
S	V	BA	DILUTE
SS		BA for FIRE only	DILUTE
T		BA	DILUTE
TT		BA for FIRE only	DILUTE
WX	V	FULL	CONTAIN
Y	V	BA	CONTAIN
YY		BA for FIRE only	CONTAIN
Z		BA	CONTAIN
ZZ		BA for FIRE only	CONTAIN

E CONSIDER EVACUATION

Notes for Guidance

FOG : In the absence of fog equipment a fire spray may be used.

DRY AGENT : Water must not be allowed to come into contact with the substances at risk.

V : Can be violently or even explosively reactive

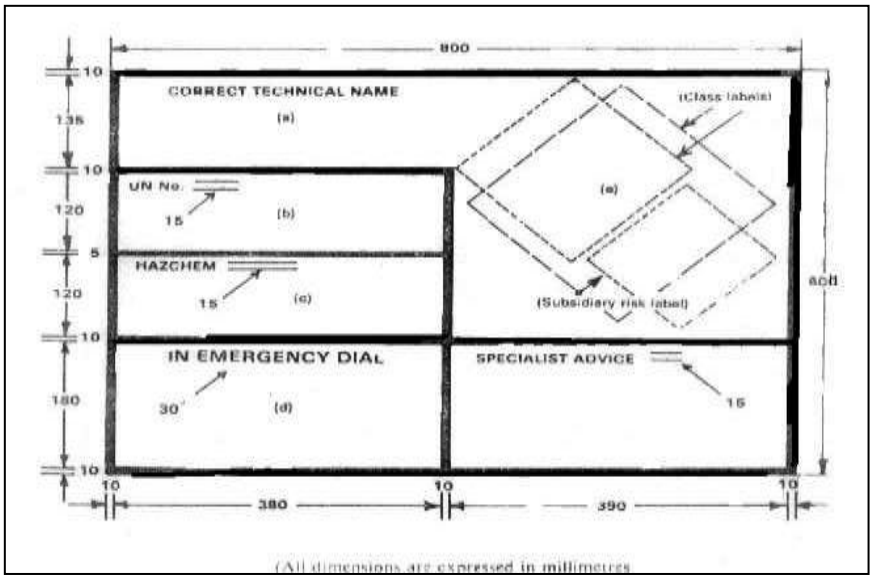
FULL : Full body protective clothing with BA.

BA : Breathing apparatus plus protective gloves.

DILUTE : May be washed to drain with large quantities of water

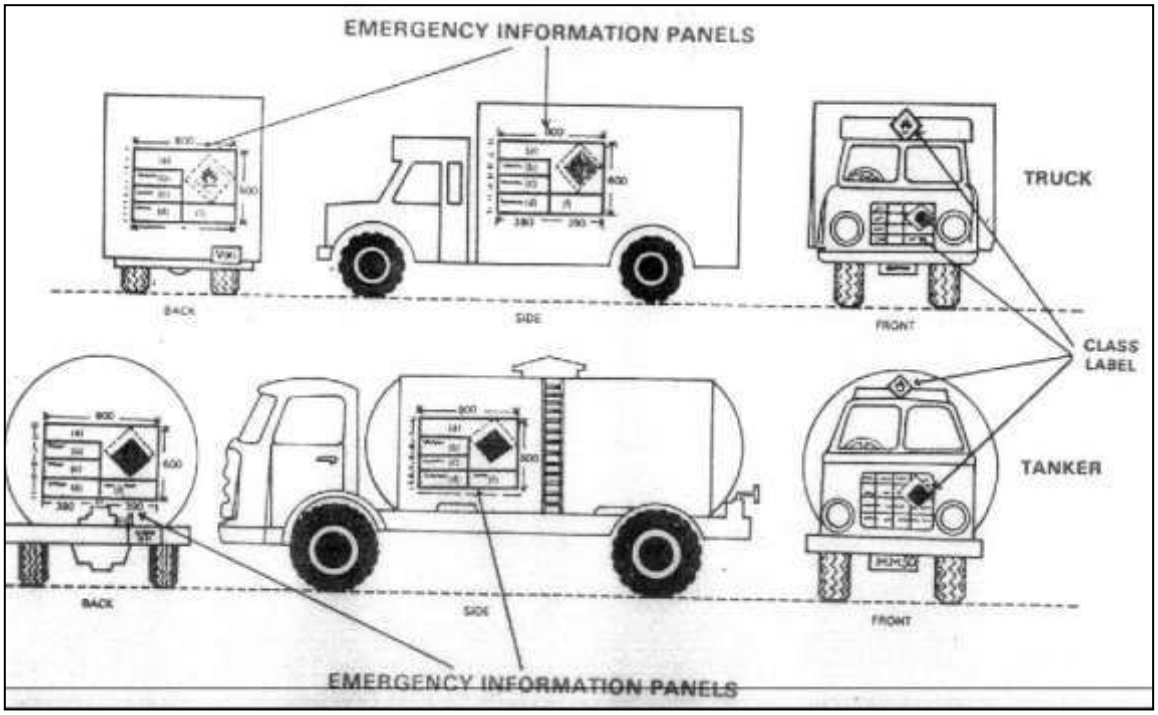
CONTAIN : Prevent by any means available, the spillage from entering drains or water course.

EMERGENCY INFORMATION PANEL



(All dimensions are expressed in millimetres

DISPLAY OF EMERGENCY INFORMATION PANEL



1.0 Introduction of transport emergency

Every industry encounters some form of transport which is from our factory premises to the domestic/ international customers/suppliers. It includes a wide range of vehicles such as delivery vans and large vehicles such as tankers, cranes and trucks etc. Every year people are killed or seriously injured in accidents involving such transport. Accidents that do not involve personal injury can result in damage to the equipment and the vehicle itself.

1.1 Emergency Command System

The below command system is applicable for transport emergencies.

The Crisis Management Team (CMT) will have the following structure. The below CMT will be activated by Corporate Safety and Compliance Head for transport emergencies.

2.0 Purpose

- To provide a clear chain of command to be followed in case of a transport emergency.
- To have clear and defined roles and responsibilities to be followed by ERT during such emergencies.
- To establish essential internal and external communication required during a transport emergency.

3.0 Policy and Scope

3.1 Policy

- Company shall comply with all compliance Obligations including the Applicable Regulatory requirements, Statutory requirements and Recommendations of the Regulatory Authority and implements the best industrial Practice.
- Company periodically Assesses the Risks involved in its operation(S) and during change/ Modification(S) of the Processes to evaluate impact on Health, Safety and Environment.
- Company Strengthen Protection of Environment by Prevention of Pollution and Waste abatement Practices and strive to provide a safe and Healthy Environment.
- Company implements an Effective and Standard SHE practices at the workplace, among employees and concerned Stakeholders to Prevent Injuries and ill Health of employees.

3.2 Scope

3.2.1 Applicability

This guideline applies to all the manufacturing sites, external warehouses, corporate offices, Head office, pilot plants & project sites of Hindalco Industries Ltd. (Unit of Birla copper)

4.0 Procedures for Transport Emergency Response

4.1 Security Officer

- On receiving the emergency call, the security officer shall collect following information from the caller.
  - Location of the incident
  - Time of the incident
  - Name of the Materials / Vehicle no/ Name of transporter
  - Type of the emergency- Leakage /fire /casualty etc
  - Contact no of the caller
- Pass on the communication to defined key members.

4.2 Site Main Controller

- Shall receive inputs from the functional departments and form a team for Emergency Response, team shall comprise personnel from Safety, Security, Corporate Affairs, Maintenance, Supply chain & Operation Deptt.
- Direct Emergency team members to the accident site under close coordination with Zone Safety Head & Zone Head.
- Maintain a speculative continuous review of possible development
- Report all significant development to the Zone Head

4.3 Corporate Affairs Head

- On getting the information from SMC work out course of actions
- Move to the Emergency scene along with the emergency response team
- Maintain a speculative continuous review of possible development
- Inform & co-ordinate with Civil authorities, Pollution Control Board, Nearby Hospitals, Media etc as required
- Ensure that injured are receiving adequate attention. Arrange for additional help, if required
- Report all significant development to the SMC & Zone Head
- The Corporate Affairs Head, depending on the communication from & in consultation with the SMC shall communicate regarding the emergency to the following organizations in case of Off-Site emergency

  1. District Collector
  2. State Pollution control board
  3. Police Commissioner
  4. DISH
  5. Community
  6. Media

4.4 Fire Controller

- Move to the Emergency scene along with the Emergency Response Team (ERT)
- Organize the fire & safety equipment for the Emergency site.
- Assess the situation and plan control measures
- Ensure safety of Fire Fighting / Rescue personnel.

4.5 Functional Support Team

- Collect Emergency tool kit
- Move to the Emergency scene along with the team
- Help in controlling the situation when required.
- Do the risk assessment and supervise for lifting/shifting heavy loads, if any.

4.6 Material Manager

- Define the route to be followed by the transporter along with Supply chain team
- Define the list of documents to be carried along with the consignment
- Inform to the Transporter and instruct to provide all necessary support at site.
- Move to the Emergency scene along with the team
- Arrangement of finance, if Required
- Ensure Supply/ issue of any item / equipment / materials required for handling emergency

4.7 Security Services

- Arrange vehicle for movement towards incident site.
- Arrange Security Staff for the emergency scene.
- Ensure that security measures are effective.

4.8 Emergency Response Team

Emergency actions will be decided based on the situation and conditions. Following actions to be taken in different types of emergencies.

4.8.1 Fire due to leakage / accident

With the help of Local authorities and other available agencies, the ERT will ensure.

- Use of PPE, protective clothing and BA set as required.
- Search and rescue of casualty.
- Blockage of traffic.
- Cordoning off area.
- Evacuation of public.
- Additional firefighting help from nearby industry /city fire stations.
- Safety instruction to nearby public.

- Use of the correct type of fire extinguishing media with the correct method.
- Arrangement of continuous water supply for firefighting.
- Try to contain the spillage of flammable materials to prevent spreading of fire.

4.8.2 Spillage to Hazardous/ Toxic/ Chemical due to leakage/accident

- Use of PPE, protective clothing and BA set as required.
- Search and rescue of affected person.
- Use of correct type of smothering/ blanketing agent with correct method.
- Containment with sand / mud.
- Blockage of traffic.
- Cordoning off area.
- Evacuation of public, if required.
- Safety instruction to nearby public.
- Repair / blockage of leakage.
- Arrangement of continuous water supply for containment of emergency.
- Removal of contaminated soil after controlling of emergency and arrangement for its safe disposal.

4.8.3 Leakage of toxic gas

- Use of PPE, protective clothing & BA set as required.
- Search and rescue of affected person.
- Blockage of traffic.
- Cordoning off area.
- Evacuation of public, if required.
- Start ventilation and dispersion as required.
- Repair / blockage of leakage.
- Arrangement of continuous water supply for containment of emergency.
- Removal of contaminated soil after controlling of Emergency and arrangement for its safe disposal.

➢ **Snake Bite:**

❖ **Always treat a snake bite as if it's venomous.**

❖ **To identify a snake bite, consider the following general symptoms:**

- Two puncture wounds
- Swelling and redness around the wounds
- Pain at the bite site
- Difficulty breathing
- Vomiting and nausea
- Blurred vision
- Sweating and salivating
- Numbness in the face and limbs

❖ **First aid for snake bites**

- Call Emergency Contact Number immediately.
- Note the time of the bite. (Most Important)
- Keep calm and still as movement can cause the venom to travel more quickly through the body.
- Remove constricting clothing or jewellery because the area surrounding the bite will likely swell.
- Apply a pressure bandage to the bitten limb. If the bite is to the trunk, head or neck, apply firm pressure to the bitten area. Do not restrict chest movement as breathing will be affected by this.
- Splint or use a sling on the bitten limb to restrict movement.
- If possible, lie down and keep the bitten extremity at body level. Raising it can cause venom to travel through the body quicker. Holding it down, can increase swelling.
- When possible arrange for transport to the OHC, DOH first, nearest hospital emergency room, where anti-venom for snakes common to the area will often be available.
- Don't allow the victim to walk. Carry or transport them by vehicle to Hospital.

- Do not kill or handle the snake. Take a picture if you can but don't waste time hunting it down.

➢ **Dog Bite:**

❖ **What Are the Signs That a Dog is going to Bite?**

One of the best ways to prevent a dog attack is to know the difference between a dog that is relaxed and calm, and a dog that is showing signs of aggression. A dog's body language is the key to understanding when it may be preparing to bite. Here are some common signs that a dog is relaxed and not planning to bite:

- A relaxed dog will hold its head up.
- The dog's tail with either be resting, pointing down, or gently wagging back and forth.
- The ears should be neither back nor forward.
- The dog's hair will lay smooth along its back.
- Its mouth and lips are relaxed, almost appearing as if the dog is smiling.
- You can see the dog's tongue.

Here are some signs that a dog may be getting ready to bite:

- The dog's nose may be pulled back and wrinkled.
- The dog's lips may be drawn back to reveal its teeth.
- The hair along the back of its neck may be sticking up along its spine.
- You can see that the dog's ears may lay back, pinned against its head, or be pushed up forward.
- Its body may appear tense and cocked.
- The dog is making noises such as growls or snarls.

Ways to Avoid Dog Bites and Dog Attacks

- Don't horse play with Dog during duty hours
- After getting any signs from above, immediately change your pathway and avoid the dog.
- Don't do any act which can encourage aggressive behaviour of dog.

First Aid Measures:

- Immediately call to OHC for ambulance
- The dog bite victim needs to be taken to a safe place away from the assailant

- Dog to prevent further attack and injury. Since dog bites can cause significant
- Damage beneath the skin, a type of injury that cannot always easily be
- Appreciated, medical care should be accessed by a health care practitioner.
- Wounds should be kept elevated and, if possible, washing the wound with tap water may be attempted.
- Necessary medical treatment will be given at nearst hospital

EMERGENCY DUE TO NATURAL CALAMITIES

TYPES OF NATURAL CALAMITIES& ITS ACTION PLAN:

❖ **Earth quake:**

DURING EARTHQUAKE, if indoors:

- ✓ Take cover under a piece of heavy furniture or against an inside wall and hold on.
- ✓ Stay inside.
- ✓ The most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you.

DURING EARTHQUAKE, if outdoors:

- ✓ Move into the open, away from buildings, street lights, and utility wires.
- ✓ Once in the open, stay there until the shaking stops.

DURING EARTHQUAKE, if in a moving vehicle:

- ✓ Stop quickly and stay in the vehicle.
- ✓ Move to a clear area away from buildings, trees, overpasses, or utility wires.
- ✓ Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.

AFTER EARTHQUAKE

- ✓ Be prepared for aftershocks. Although smaller than the main shock, aftershocks cause additional damage and may bring weaken structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the quake.
- ✓ Help injured or trapped persons.
- ✓ Give first aid where appropriate.
- ✓ Do not move seriously injured persons unless they are in immediate danger of further injury.
- ✓ Call for help.
- ✓ Listen to a battery-operated radio or television for the latest emergency information.
- ✓ Remember to help your neighbors who may require special assistance--infants, the elderly, and people with disabilities.
- ✓ Stay out of damaged buildings.
- ✓ Return home only when authorities say it is safe.
- ✓ Use the telephone only for emergency calls.
- ✓ Clean up spilled chemicals or other flammable liquids immediately. Leave the area if you smell gas or fumes.

❖ **Lighting & Thunderstorm:**

BEFORE

- ✓ Thunderstorm is invariably accompanied by lightning A single stroke of lightning has 125, 000, 00 volts of electricity. That's enough power to light a 100-watt light bulb for more than 3 months, or enough to seriously hurt or to skill someone. Know what steps to take in the event of an oncoming thunder storm& lightning. Lightning is something you should not be careless about, so seek a safe shelter immediately! Be warned, lightning can and does strike just about any object in its path. When you see lightning, follow these safety rules.

INDOORS

- ✓ Stay or go indoors! If you hear thunder, don't go outside unless absolutely necessary. Stand clear from windows, doors, and electrical appliances.
- ✓ Stay away from anything that could conduct electricity. This includes electric, lines, Electric Instruments, wires etc. and phones Unplug appliances well before a storm strike – never during.
- ✓ Don't use any plug-in electrical instruments. If lightning strikes your building, they can conduct the charge to you.
- ✓ Don't use the telephone during the storm. Lightning may strike telephone lines outside. Use the telephone only for emergencies quickly. Avoid contact with piping including sinks, baths and faucets.

OUTDOORS

- ✓ When outdoors, seek shelter from lightning! Buildings are best for shelter, but if no buildings are available, you can find protection in a cave, ditch, or a campus. Trees are not good cover. Tall trees attract lightning. Never use a tree as a shelter.
- ✓ Stay in your vehicle if you are travelling, vehicles give you excellent lightning protection. Get in a hard topped car.
- ✓ If you can't find shelter avoid the tallest object in the area. If only isolated trees are nearly, your best protection is to crouch in the open, keeping twice as far away from isolated trees are high. Avoid areas that are higher than the surrounding landscape.
- ✓ Don't use metal object outside. Keep away from metal objects including bikes, electric or telephone poles, fencing, machinery etc.
- ✓ Get out of the water. Immediately get out and away from pools, lakes, and other bodies of water.
- ✓ When you feel the electrical charge – if your hair stands on end or your skin tingles- lightning may be about to strike near you. Immediately crouch down and cover your ears. Do not lie down or place your hands on the ground.

- ✓ Victims of lightning shock are administered CPM (Cardio pulmonary resuscitation) i.e. artificial respiration, if necessary. Seek medical aid.

❖ **Flood:**

- ✓ Stay out of the basement.
- ✓ Stop all jobs outside.
- ✓ Heavy rain many times accompanies high-speed wind. Stop all work at height.
- ✓ Disconnection power supply to all electrical Machines in open yards.
- ✓ Cover all JBs\DBs where chances of water coming to it are there.
- ✓ Keep Gumboot, Raincoat and umbrellas ready.
- ✓ Keep all dewatering pumps ready in working order.
- ✓ Move valuable objects upstairs only if safe to do so, without straining yourself
- ✓ Keep yourself indoors and away from rivers and creeks
- ✓ Stay away from low/lying areas
- ✓ Avoid walking through a waterlogged area on foot; you can get swept away easily.
- ✓ Assemble everyone inside shelters or buildings.
- ✓ Close windows and blinds.
- ✓ Evacuate rooms that might bear the full force of the wind
- ✓ Avoid enclosures that have long roof spans.
- ✓ Keep the office radio tuned to a local station for current advisory information
- ✓ Trained Flood rescue team available.

❖ **Cyclone:**

- ✓ Listen to the Transistor for advance information and advice. Allow considerable margin for safety. A cyclone may change direction speed or intensity within a few hours, so stay tuned to the Transistor for updated information.
- ✓ If storm-force winds or severe gales are forecast for your area, then;
  - o Store or secure loose boards, corrugated iron, rubbish tins or anything else that could become dangerous.
  - o Tape up large windows to prevent them from shattering.
  - o Move to the nearest shelter or vacate the area if ordered / warned by the appropriate government agency.
- ✓ When the storm hits;
  - o Stay indoors and take shelter in the strongest part of your plant/office.
  - o Listen to the Transistor and follow instructions.
  - o Open windows on the sheltered side of the plant/office, if the roof begins to lift.
  - o Find shelter if you are caught out in the open.

- Do not go outside or into a beach during a lull in the storm.

✓ Cyclone are often accompanied by large storm surges from the ocean and the precautions listed for floods should be taken if you live near the coast.

CHAPTER- 9: ENUMERATE EFFECTS OF:

(i) STRESS AND STRAIN AND SAFETY AND SECURITY SYSTEMS

➢ **SAFETY & SECURITY SYSTEM:**

- A premise is covered by fully fencing and Main gate is secured by guard for 24 hours.
- All transport vehicles are checked at the gate for driver licenses, MSDS, Emergency Information Panel and for any unwanted / undesired threat material etc.
- Security staff takes round throughout the factory for security of plant & others.
- CCTV camera installed in critical locations.

(ii) FIRE AND EXPLOSION INSIDE THE PLANT AND EFFECT IF ANY, OF FIRE AND EXPLOSION OUT SIDE

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure
1.	Boiler & Explosion	Boiler House due to Failure of Controls or poor Maintenance	Hit of Fragments of boilers or Building	Boiler House	Water level indicator &controllerinter lock
			Hot water splash and burns		Air to full ratio control
			Damage to boiler		Flame failure control device
	Fire in Boiler Area in F.O day Tank	Furnace oil leak Spill in Boiler House	Fire and burns, smoke Inhalation Boiler damage, loss of Equipment.	Boiler House	Temperature indicator &controller
					Regular inspection /cleaning Testing of Boiler
					Hot work permit followed in this area
					Fire Extinguisher Hydrant provided.
					Isolated area with full ventilation, RCC Construction.
2.	Diesel Generator House	Spark/Fire in Generator area And HSD tank Fire	Fire and burns to personnel Generator damage, loss of equipment.	Generator Room	Housekeeping maintained
					Spillage/leak attended
					Loose drums, buckets avoided
					Level indicator on HSD tank in DG Room
					Hot work permit followed in this area.
					No smoking in area
3.	Transformer Fire	Transformer oil leakage/Spill Short circuit	Production hindrance	Transformer Provided at various Locations	Fire Extinguishers
			Power Failure		Hot work permit followed.

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure
		in Transformer Overheating of Transformer & fire.	Loss of transformer		Fire Hydrant protection
			Smoke inhalation		Smoke detector in area of selected transformer
					Oil spill containment and soaking Arrangement

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure
4.	Effluent generated in fire fighting	Fire Fighting operation, in case of fire	Water pollution	Fire/explosion location	All Engineering, Administrative and System Controls have been put in place to avert any fire or accidental situation in the factory like no smoking zone, PTW, SOP, Flameproof Electrical Installation, HAC, Lightening Arrester, etc. Sufficient dyke walls are provided to storage tank farms in case of any leakage/spillage takes place. In case of firefighting first contaminated water accumulates in the dyke wall of storage tank farm. In case of large fire water gets accumulated in the collection sump of the department from where it is being diverted to ETP by direct pumping facility (after QA analysis). In case of major fire where huge quantity of contaminated water gets generated due to firefighting that is collected in the storm drain which is closed from the end of pipeline. That contained water quality is checked and transferred to ETP for further treatment and disposal.

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure
5.	Electricity 1. Burning 2. Shock 3. Fire	Loose contact of wires, weak earthing Short Circuit, Improper Insulation	Person & Property	Factory Premises only	Regular inspection of electrical fitting, flame proof fitting provided in flammable area, proper earthing. Lightening arrestor provided, regular measurement of earth pit resistance
6.	Bad House Keeping Injury Burning Fire	Bad House Keeping	Person & Property	Factory Premises	Regular inspection of plant/area by housekeeping team, Proper placement of materials.
7.	Structural Collapse Injury	Due to over loading of machinery, Construction failure, E.Q	Person & Property	Factory Premises	Structural stability to be ensured, load-bearing capacity to be checked, regular inspection of plant.
8.	Air Raid	War	Death, fire, explosion & property damage.	Factory Premises & Nearby	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.
9.	Earthquake	Natural	Death, injury & property damage.	- do -	- do -
10.	Cyclone	Natural	- do -	- do -	- do -
11.	Sabotage	Human	- do -	- do -	- do -

CHAPTER- 10: DETAILS REGARDING

(i) WARNING ALARM AND SAFETY / SECURITY SYSTEM*:*

Company installed electrical siren in different location of plant and Uniform siren code has been established and implemented for emergency situations which is mentioned in **Annexure: - 26.**

Note: See Annexure**: - 26** for Alarms & Sirens

➢ **Security System:**

- A premise is covered by fully fencing and Main gate is secured by guard for 24 hours.
- All transport vehicles are checked at the gate for driver licenses, MSDS, Emergency Information Panel and for any unwanted / undesired threat material etc.
- Security staff takes round throughout the factory for security of plant & others.

(ii) Alarm and hazard control plans in line with disaster control and hazard control planning, ensuring the necessary technical and organizational precautions;

Uniform siren code has been established and implemented for emergency situations which is mentioned in **Annexure: - 26.**

(iii) Reliable measuring instruments, control units and servicing of such equipment.

All Measuring Instruments and Control units used at Critical processes and storages are maintained well by Instrumentation department and records are maintained.

(iv) PRECAUTIONS IN DESIGNING OF THE FOUNDATION AND LOADBEARING PARTS OF THE BUILDING*:*

- Factory premises have been approved by DISH-Government of Gujarat.
- Stability in form no.1 (A) was taken from Government approved Competent Agency.

➢ **CONTINUOUS SURVEILLANCE OF OPERATIONS:**

It has been done by qualified and technical person on regular basis.

➢ **MAINTENANCE AND REPAIR WORKS ACCORDING TO THE GENERALLY RECOGNIZED RULES OF GOOD ENGINEERING PRACTICES:**

- It has been done by qualified and technical person.

- **RELIABLE MEASURING INSTRUMENTS, CONTROL UNITS AND SERVICING OF SUCH EQUIPMENT.**
  - All Measuring Instruments and Control units used at Critical processes and storages are maintained well by Instrumentation department and records are maintained.

- **POLLUTION CONTROL ARRANGEMENTS**

Pollution control arrangements (including organization) for water, air and land are the permanent requirement for a hazardous or polluting factory. If such arrangements are not provided or not working or fail accidentally a major emergency may arise. Therefore, it should be ensured by regular preventive and corrective maintenance that such arrangements and their staff work efficiently. In case of emergency, information of such arrangements will also be necessary.

Hindalco Industries Ltd. (Unit of Birla Copper), Dahej has scrubber for neutralizing gaseous pollutants, ETP for liquid pollutants and solid waste disposal and sale arrangements.

Note: See **Annexure: -** 24 for Pollution Control Arrangement.

- **OTHER ARRANGEMENTS**

Arrangements not classified in chapter 2 & above, shall be included here. Particularly emergency heavy vehicles, lifts, cranes, lifting machines, transporters, alternate power and utilities supply, special equipment, instruments, materials, test facilities, specialists, special books and information, rescue team etc. shall be included here.

Note: See **Annexure: -** 25 for Other Arrangement

- **EVACUATION & TRANSPORTATION:**

Non-essential personnel (who are not assigned any emergency duty) will usually be evacuated from the incident area and also from adjacent areas. Evacuation should be to predetermined assembly points in a safe part of the works. In some cases, particularly where toxic releases are being considered, alternative assembly points need to be arranged to allow for the effects of wind direction. Assembly points need to be clearly marked. The plan should designate someone to record all personnel arriving at the assembly point so that the information can be passed to the Emergency Control Centre.

Personnel required to be transported outside for the purpose of medical care or for better shelter; should be transported with care and facilities.

Note: See **Annexure: -** 23 for Transportation & Evacuation Arrangement.

- **SAFE CLOSE DOWN**

If necessary, full or partial close down of the plant should be followed under the judgement and guidance of the Incident Controller or the Site Main Controller and with the help of trained essential workers.

For single plant sites, shut-down procedures may be comparatively simple, with no knock-on effects elsewhere on site. With complex sites, such as large petrochemical works or refineries, plant operations are often interlinked and the shut -down of any key plant on site (e.g. a power station) may have significant implications for other plant. Emergency plans will need to take account of this so that ordered and phased shut-downs can take place when necessary, depending on the type of incident occurring.

The safe close down procedure for each plant should be included in a Safety Manual and given to the workers.

- **USE OF MUTUAL AID**

Call and utilize mutual aid as per need. Consider their distance and means available for your judgement before calling.

- **USE OF EXTERNAL AUTHORITIES**

Outside authorities like police, district emergency authority, collector, factory inspector, health and medical officers, civil engineers, institutions, corporations, experts on safety, health, pollution control, special technology etc. should be contacted and utilized as per need.

- **MEDICAL TREATMENT**

Urgent search of injured workers is most important. All such persons must be given prompt first-aid and medical treatment at the earliest possible. If the company facilities are inadequate, call for mutual aid or evacuate to outside medical centres for further treatment.

- **ACCOUNTING FOR PERSONNEL**

It is necessary to know that everyone on site has been accounted for and that the relatives of casualties have been informed. The problem of accounting can be particularly difficult specially on these works and hinges on being able to know, with any certainty, who is on site at any one time. It can be exacerbated an incident occurs, as it frequently does, at a shift change or at a time when large numbers of contractors personnel are on the works.

It may be impracticable, in many situations to have an up-dated list of the names of people on site at any one time. Holidays and sickness absence will mean that relief personnel are present and some others may be off site at the time engaged on other work. In such cases, reliance is probably best placed on the knowledge of supervisors and other worker as to who was present in their particular areas of control. If a nominal roll is maintained of the employees normally present on a particular day or shift, known differences of manning can be entered onto it at the time of the emergency.

Contractors should maintain a similar list of personnel on site. If a record is maintained of the arrival and departure of visitors. Together with the names of those they called to see, it will prove useful in establishing their whereabouts on site by a responsible member of the works staff.

The procedures so far recommended have included certain actions which will assist in establishing the whereabouts of personnel. Those are

- In the immediately affected area, the Incident Controller should arrange for a search to be made to locate any casualties. On arrival, the officer in charge of the Local authority Fire brigade will want to know if this has been done and will, if necessary, arrange for a further search to be made.
- Nominated works personnel should record the names, where known, of casualties taken to the respective reception areas and the location, e.g. hospital, to which they are subsequently sent. The police will like to know the names of fatal casualties and will arrange for formal identification.
- Nominated works personnel should record the names and departments of people reporting at assembly points.

At the Emergency Control Centre, a responsible person should be appointed to collate the lists, check them against the nominal roll of those believed to be on site and inform the police of any believed to be missing. Where missing people could have had cause to be at the affected area, the Incident Controller should be informed and arrangements made for further search.

- **ACCESS TO RECORDS**

The relatives of casualties will need to be informed. This duty may be undertaken either by the employer or the police. The police will need to know the names of fatal casualties. It is suggested that a list of the names and addresses of all employees, their department of work and, where appropriate, the shift on which they are employed, should be maintained in the Emergency Control Centre. This is in addition to the lists normally maintained in the personnel department. It is advisable to arrange for another list to be located at a point outside the works, e.g. at a head office, company insurer's office or local bank.

It may also be advisable to record the religious conviction of each employee in case it may be necessary to summon a minister of their particular faith.

The list will require continual up-dating to take account of changes of address, next- of-kin, new starter, levers, etc.

- **PUBLIC RELATIONS**

Inevitable, a major incident will attract the attention of the press television and radio services. It is essential to make arrangements for authoritative releases of information to them, preferably at a place remote from the works to avoid any possible harm to the people concerned and unnecessarily adding to the traffic problems which are normally a feature at major emergencies the police have experience in arranging press conferences and will be willing to assist

A Senior Manager should be appointed as the sole authoritative source of information to the news media. All other employees should be instructed not to divulge information themselves which may, in the event, be misleading or inaccurate. They should instead, refer all inquiries to the senior manager.

➢ REHABILITATION

The Senior Fire Brigade Officer will not signal the end of the emergency until he is satisfied that all fires are extinguished and there is no risk of re-ignition. In the case of gas escapes, the emergency will be declared ended only when the source of emission has been effectively isolated and gas clouds dispersed. Even when the all clear has been given, great care is needed when re-emerging affected areas, and no work in connection with salvage, collection of evidence on start-up should be put in until a thorough examination of the areas has been carried out. The situation powers of Factory Inspectors must be borne in mind before evidence is disturbed. It is particularly important to avoid the introduction of possible sources of ignition, such as diesel engines hand or power-operated tools, flame-cutting equipment and so on until it has been established that flammable materials remain whereby they could be isolated.

Re-entry procedure in the factory and affected or contaminated area in vicinity should be prescribed and followed. The Security officer should know it and guide people accordingly.

➢ TRAINING, REHEARSAL & RECORDSEVACUATION:

- **Need of Training & Rehearsal**

Extensive experience in the chemical industry with on-site emergency planning has proved the need and value of rehearsal of emergency procedures.

When finalized, the major emergency procedure should be set down in clear, concise terms and everyone on-site made aware of them, particularly the key personnel and essential workers. They should then be put to the test. This may best be done by arranging a series of preliminary exercises to test certain parts of the procedures eg. effectiveness of the communications system, including the alternative arrangements in cases of failure; the speed of mobilization of the factory emergency teams, search, rescue and treatment of casualties, emergency isolation and shut down (on operating plants, tags can be used to indicate where valves are assumed to have been closed or opened).

These exercises will help to refine the procedures by identifying deficiencies and difficulties. At this stage, more elaborate exercises can be planned to involve the outside services who should be closely involved at the planning stage. Each exercise should be monitored by a

number of independent observers located at various positions, eg. at the scene, the Emergency Control Centre, works entrance, assembly points, casualty reception area. A follow-up round-the-table discussion between works mangers, senior officers of the Emergency Services, Factory Inspectorate and observers will further assist to develop practical and effective procedures. It is recommended that a major emergency exercise should be conducted at regular intervals by arrangements with the outside services.

There is much practical advantage to be gained in situations where people required to work together in handling emergencies, are already known to each other. Close local liaison and combined exercises are invaluable in this respect. At the same time, familiarization visits to works, especially of the Fire Service personnel, will help enormously to acquaint them with the works layout and the nature of the potential hazards.

Emergency plans need to be tested when first devised and thereafter to be rehearsed at suitable intervals. Individual personnel with duties under the plans will generally be qualified by their normal training and experience of day to day operations. Some duties, however, such as firefighting for the works fire team, are not routine and special training will be needed. In addition, key personnel will need training in their emergency roles both individually and as a team. For the professional emergency services the general training may be taken for granted.

Rehearsals or exercises are important for all personnel likely to be involved in an incident on or off the site because, for example:

a) They familiarize on-site personnel with their roles, their equipment and the details of the plans:
b) They allow the professional emergency services to test their parts of the plan and the coordination of all the different organizations. They also familiarize them with the special hazards:
c) They prove the current accuracy of the details of the plan (telephone number etc) and the availability of special equipment (fire and rescue, breathing sets etc);
d) They give experience and build confidence in the team members. In the initial shock and confusion of a real incident the ability to fail back on established initial actions is invaluable.

Employers should ensure that the on-site emergency procedures for each process plant, storage facility etc. are tested regularly and that all employees receive initial and refresher training. Exercises should be arranged to test each part of the emergency plan on each plant, stage by stage, starting with ‘first immediate action’ Emergency isolation and shout down should be rehearsed (where appropriate by simulation). Representatives from the

emergency services and the Emergency Planning Officer (EPO) should be invited to attend on-site exercise and familiarization visits should be encouraged.

The complete plan for each site including both on-site and off-site components should also be tested. Many organizations use table top exercises to test emergency plans; these are very cost effective because they do not interrupt the day-to-day running of the plants and also because many events can be catered for in one session. However, they are theoretical in nature and should be complemented by 'control post exercises designed to test communications and key personnel working from the locations they would use in an emergency. It is, of course, essential that the exercises are carefully prepared, the results analysed and the lessons learned, circulated and discussed. Full scale practices involving all concerned at suitable intervals are necessary to give the maximum possible confidence that all reasonably practicable measures have been taken.

After each rehearsal or practice the plan should be reviewed to take account of any shortcomings highlighted by the exercise. In addition, its effectiveness should be reviewed every time it is used to deal with a real emergency.

Fix your periodicity to carry out 'table-top-exercises' and real rehearsal of this on- site and off-site emergency plan, including mutual aid agencies.

- **Some Check Points**

a) Does the plan cover the range of incidents that can realistically be anticipated? The incidents considered should range from small events that can be dealt with by works personnel without outside help, to major accidents. Manufactures should be able to justify the proposals in their emergency plans, including the following points:

(i) the events considered, and why they were included or excluded:
(ii) the typical routes to these events;
(iii) the timescales involved;
(iv) the size of lesser events if the development is interrupted
(v) the likelihood of events, so far as can be assessed.

b) Have the consequences of the various incidents considered been adequately assessed?

For example, each incident should be assessed in terms of the quantities of release, the effects of explosions, the effects of thermal radiation from fires, the effects of toxic gases, etc.

c) Are there sufficient resources in terms of personnel and equipment on the site to carry out the emergency plan for the various incidents in conjunction with the public emergency services?

For example, is there sufficient water for cooling, and if this water is applied via hoses, are there sufficient people to operate them?

d) Have the timescales been assessed correctly?

The time element is of great significance but is often overlooked. For example, time will elapse between the start of the incident and the arrival of the fire brigade who will then need further time to deploy their men and equipment. In such circumstances the works' resources should seek to contain the incident until the fire brigade takes over.

Some toxic releases may take place quickly. For example, a one tonne of chlorine drum releasing liquid at full flow through and open valve will be empty in about ten minutes, and a cylinder in even less time. If the possibility of such a release is identified, the remedial action must be appropriately quick.

e) Is there a logical sequence of actions? For each person given a role in the plan?

f) Were key personnel, especially the nominated incident controllers, consulted in the preparation of the plan?

g) Is there 24-hour cover to take account of absences due to sickness and holidays, minimum shift manning, silent hours shut-down periods, only security personnel being present, or for unmanned sites etc?

h) Is there satisfactory co-operation with the local emergency services and district or regional emergency planning officers?

i) At sites whether an off-site plan to protect people and the environment outside the site in the event of an incident is appropriate? What is the procedure for initiating the off-site plan and is this satisfactory?

- **Records and Updating the Plan**

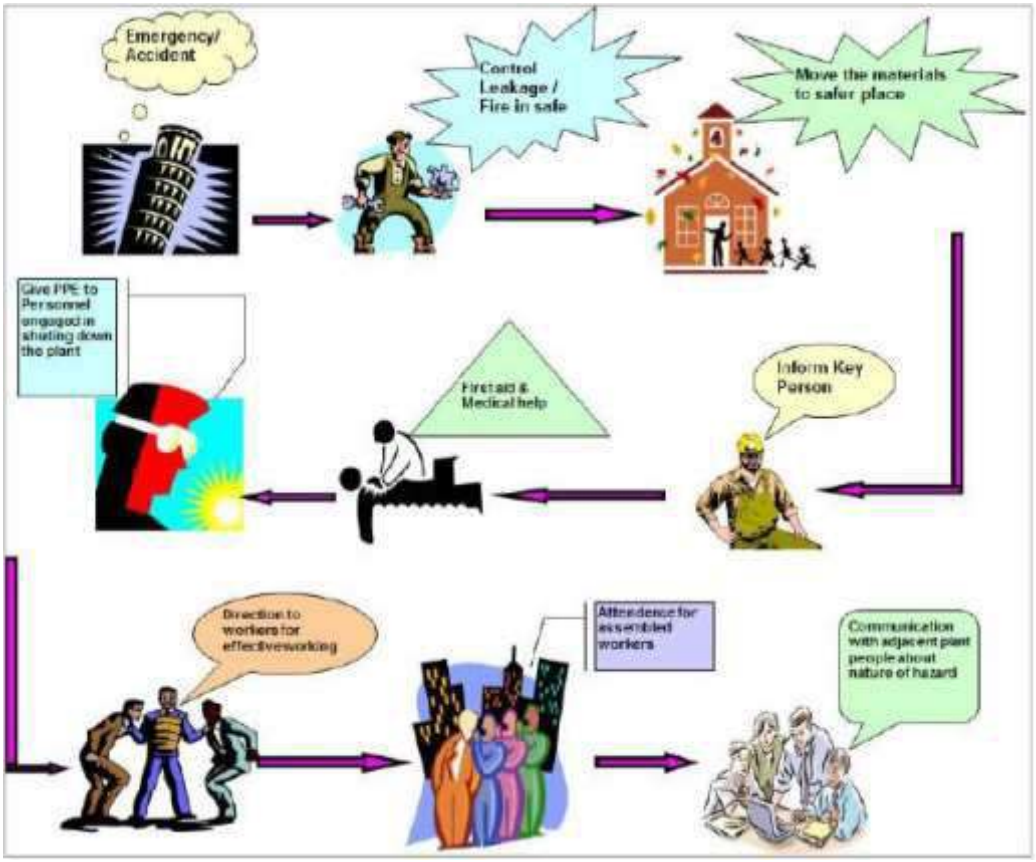
  All records of various on-site & off-site emergency plan of the factories in the jurisdiction, the District Emergency Control (contingent) plan and modifications by experience and suggestion, the rehearsals and conclusions of such plans and the inquiries shall be well maintained and preserved by the District Emergency Authority or the Emergency Planning Officer and the Factory Inspectorate for the purpose of review and further guidance. The necessary Data Bank shall also be maintained for the utility of industries and others.

  New information and the deficiencies (omission or short-comings) identified during the rehearsal should be reviewed and incorporated in the document for continual up- dating of the plan. Such information should be communicated to the concerned authorities.

- **Emergency Instruction Booklet**

  At many places in this plan, it is mentioned that the duties/functions of particular role shall be mentioned in the last annexure given as Emergency instruction booklet. For workers, the instruction should be given in their own language.

Work instruction for on-site emergency plan



➢ RISK & ENVIRONMENTAL IMPACT ASSESSMENT

✓ Preliminary

Proper planning during the conceptual stage of a chemical unit helps in enhancing the safety of the plant and workers, boosting of production and increasing the efficiency of the plant.

Risk associated with the process technology, safety measures, sighting of industry, layout of the plant, emergency preparedness and compliance with the regulatory requirements are the factors considered while planning for emergencies.

The steps of planning for emergencies are

1. To assess the hazards potential of an installation
2. To draw up plans to prevent and control emergencies as well as mitigate consequences of an accident.

✓ Risk Assessment

Hazard Analysis is a critical component in planning for emergencies. Hazard Analysis has these basic components.

i) Hazard Identification
ii) Vulnerability Analysis
iii) Risk Analysis

✓ Hazard Identification

This component includes following

a. Chemical Identity
b. Location / Site
c. Quantity of the substances
d. Nature of Hazard

✓ Environmental Impact Assessment

Environmental Impact Assessment (EIA) may be defined as a document containing environment analysis which includes identification, interpretation, prediction and mitigation of impacts likely to be caused by proposed action or project.

Generally, such EIA is required at project planning and for clearance of the site for a new project. See also Section 5 of the Environment (Protection) Act, 1986 and section 41-A of the Factories Act, 1948. Once the site is selected it is necessary to go in for detailed EIA for construction and operational phases.

The environmental elements(attributes) that are likely to be affected are to be identified and categorized as air, water land, sound, ecology, human aspects, economics and resources. Some of these attributes and their impacts are very closely connected to animal, plant and

human life. The environmental impact is measured in terms of changes in attribute values with and without project activity.

Identification and evaluation is necessary for solid, liquid wastes, quantity and quality, gaseous emissions, displacement, human settlement, landscape, vegetation, water courses, aquatic flora, fauna, hazards etc.

Environment includes human beings, other living creatures, plants and property. Amongst these, the human beings are the most important and need protection from any adverse impact.

To consider societal risk, whereabouts of the people at risk should be known. They are in two groups (1) those at work on site and (2) those living and/or working in the vicinity.

Of these, the first group is easily known while preparing on-site emergency plan. The second group i.e. off-site population needs following aspects:

1. Location and number of people normally resident at night.
2. Day time variation to this data.
3. The number and location of more vulnerable people.
4. Proportion of people outdoors.

Above details are enclosed as under:

Note: See **Annexure: -** 10 Gas Dispersion Concentration

Note: See **Annexure: -** 11 Evacuation Table

Note: See **Annexure: -** 12 Environment Impact Assessment

Note: See **Annexure: -** 13 Weather Conditions

CHAPTER- 11: DETAILS OF COMMUNICATION FACILITESAVAILABLE DURING EMERGENCY AND REQUIRED FOR AN OFF-SITE EMERGENCY

11.1 CO-RELATED ACTIVITIES OF ON-SITE EMERGENCY PLAN

Though the scope of the On-site Emergency Plan is to prepare for and activate the emergency time activities so that the emergency arose after failure of our pre - emergency control measures, can be controlled and contained within the shortest time, following three stage activities are suggested as they are co-related, and provide better points for emergency preparedness, emergency actions and subsequent follow up.

11.1.1 Pre-Emergency Activities

The following are the details of pre-emergency activities:

1. Internal Safety Survey

- It is to be conducted by a task force specially formed to identify various hazards in plant areas.
- To check protective equipment for workability.
- To check various safety installations / facilities available at site for workability.
- To check fire system, fire water pumps, sprinkler foam ejectors, spray systems etc.
- To suggest extra requirement/modifications to make system more reliable.

2. Third Party Survey

The survey to be conducted by a “third Party” me. Experts/ consultants from outside.

- To study and identify various hazards inside the factory.
- To conduct survey on available safety equipment/appliances.
- To check in-built safety system for its adequacy.
- To suggest modifications/additions in the system, if necessary.

3. Pressure Vessel Testing

- To prepare a list of pressure vessels for their testing along with testing procedures.
- To plan for testing various equipment under statutory obligations.
- To prepare and maintain record for reference.

4. Non-Destructive Testing

- To prepare a list of equipment/pipelines for NDT testing
- To draw an action plan for replacements/repairs as per the NDT reports.
- To maintain plant/section-wise record to compare with the past period.

5. Safety/Relief Valves Testing

- To prepare the list of safety/relief valves in plants.

- To prepare a periodic schedule for their testing and to maintain a record.
- To draw action plan on replacement/repairs and to implement.

6. Fire system Testing

- To prepare list of fire brigade, fire appliances, water pumps, water monitors from monitors, automatic fire alarms, smoke detectors and other available appliances and maintain the record.
- To draw testing schedule.
- To replace/modify defective equipment.
- To check fire pumps capacities, delivery pressures and auto start stop systems periodically.
- To draw schedule on running, stand-by equipment for workability.
- To check all the firefighting equipment, appliances and fire services fo r operability.

7. Mutual Aid Scheme

- To prepare “Mutual Aid Scheme” and enter into agreement with the neighbouring organizations for getting excluding help to each other in emergency.
- To name the coordinator under “Mutual Aid Scheme”.
- To have complete co-ordination understanding to rehearsal.

8. Mock Drills

Minor mock drills to be conducted for training the persons internally. Major mock drills to be conducted after informing State Authority, Press, Police for handling the situation effectively.

- To conduct periodic drills as to check the performance of the man and equipment.
- To know the draw-backs in the system for its corrective action.

9. Training

- To organize regular training to the employees on handling various safety equipment in emergency.
- To train fire staff for handling situation arising out of disaster.
- To conduct a survey of neighbouring areas and train the people on making protective steps in case of particular situation.

10. Protective Equipment

- To store adequate number of personal protective equipment in each plant control room.
- To train workers to use such PPEs.

11. Communications

- To maintain internal/external communication system in good working order.
- To Maintain magneto telephone system between fire station and off-sites in working condition.
- To install 5 km range hooter system which can be operated in case of disaster as modified.
- To modify the siren sound for emergency.
- To install wind-socks / wind recorders inside the plant areas at prominent locations to Indicate wind direction and velocity.

12. Emergency Lights

- To check and maintain the emergency lights provided in control rooms and selected plant areas.
- To keep sufficient number of torches/batteries available in control rooms.
- To keep mobile diesel operated power generating set standby in case of failure of normal power supply during emergency.

13. Emergency Control Room

- To identify the place for emergency central control room.
- To identify the place for alternative emergency control room to be operated in case of unfavourable wind direction.
- To keep adequate number of personal protective equipment in both the emergency control rooms.
- To provide proper telecommunication system in emergency control rooms.

14. Plant Assemblies and Assembly Points

- To identify the locations for assembling plant emergency staff and coordinators in each plant, in case of emergency.
- To utilize the services of staff by coordinators.
- To fix assembly points for non-essential workers to assemble in case of emergency.

15. Liaison with State Authorities

- To keep liaison with Civil Authorities, Local Hospitals, Police, Fire, Collector, Factories Inspectorate and keep them informed.
- To inform them about the requirements in advance.
- To keep them informed about “Mock Drills”.

16. Hospital Facilities

- Equip the hospital /health centre with necessary equipment/ medicines.

- To keep the blood group record of all the employees.
- To train the Doctors for handling emergent situation/ casualties.
- To keep liaison with city hospitals and other hospitals in the area.
- To keep the list of blood donors ready.

17. Outside Shelters

- To earmark the areas in the schools/hospitals/buildings/ for the temporary shelter to the affected persons.
- To keep necessary clothing, food, medicines arrangement in temporary shelter.

18. Statutory Information

- To workers.
- To public.
- To the Government Authorities.

11.1.2 EMERGENCY TIME ACTIVITIES

Under these activities, the staff in the plant at various levels with pre-assigned duties are expected to work in a coordinated manner to meet the emergency situation, remove the emergency co-ordinations and bring the plant to normalcy with the help of the resources available within and outside the plant.

Availability and correct use of different means of communications and control is an important emergency time activity.

11.2 Controlling Emergency

The successful handling of the emergency depends on correct decision and action on site. Some hazardous events and their control procedure are explained below in brief.

11.2.1 Flammable Releases

The following examples show how events involving flammable material may need different planned responses.

(a) A major fire, but with no danger of an explosion e.g. fire in an oil storage tank: The hazards would be prolonged high levels of thermal radiation and smoke. It is unlikely anyone outside the site would be affected immediately. Only houses close to and directly exposed to severe thermal radiation would need to be evacuated. In some cases, it might be desirable to evacuate those areas severely affected by smoke.

(b) A fire threatening a major item of plant or a storage tank containing hazardous materials; As a part of the on-site assessment the consequences of such an event should have been estimated and the area that it might be necessary to evacuate determined. Hence the

appropriate response might be to evacuate those potentially at risk.

(c) A fire similar to (b) above, but developing too quickly to allow evacuation. The best possible response might be to advise people to remain indoors away from windows and shielded from line of sight of the fire. Evacuation should NOT be attempted if there is a significant risk that a fireball or BLEVE could occur while the people were in the open.

(d) For some major catastrophic events that occur without warning. It may not be possible to take prior emergency action. However, mostly such events are of very short duration. The role of the emergency services would be rescue, treatment of the injured, extinguishing secondary fires, if such an event were to occur it might well be the majority of people off-site would be indoors would receive only relatively minor injuries.

11.2.2 Toxic Releases

The following examples show how events involving toxic materials may need different planned responses.

(a) A slow or intermittent release e.g. through a leaking relief valve; It would be unlikely that anyone outside the site would be severely affected immediately, although many of the notifiable substances have irritant properties or an unusual smell. If there were reason to foresee that the release would not be controlled quickly, or would grow with time, it might be desirable to evacuate those people nearest to the site of release and most closely downwind of it, provided that this evacuation would increase their safety.

(b) A fire or mechanical damage that threatened an installation containing toxic material; if fire could not be controlled and if there was likely to be a reasonable period before over pressurization or plant failure occurred, evacuation might be appropriate. Once again priority should be given to those nearest the plant (In all directions) and those in an appropriate arc, e.g. 30 o, downwind.

(c) Rapid event with a limited duration e.g. the fracture of a component that could be isolated within a reasonable time; Incidents that grow and are rapidly controlled should not be met by evacuation. Any toxic cloud formed would be limited in size and would be likely to drift past a particular spot relatively quickly. The best place for people in the area would be indoors, upstairs, with windows and doors closed.

(d) A major event leading to a sudden release of a large quantity of a toxic substance, which would form a large toxic cloud e.g., release to atmosphere of most of the contents of a storage vessel through the failure of a tank shell, manhole cover etc. Although the probability of such an event occurring is extremely low, the consequences would be severe for people living close to the incident and in the path of the cloud. The role of the emergency services would be rescue, treatment of the injured, making safe the affected areas etc. The major difference between releases of toxic and flammable materials is that toxic clouds and therefore may remain

hazardous over greater distances, while travelling with the wind. The consequences arising from a release of toxic material, drifting at perhaps 300 metres a minute and dispersing slowly, are difficult to predict. In every case, however, the hazard is greatest close to the source and near the downwind plume. Unless there is a delay, as in (a) or (b) above, the best course might be not to attempt evacuation. For those who were not evacuated, but were then exposed to a prolonged release, the chances of survival would, diminish with the passing of time. The Emergency Coordinating Officer (In charge of off-site plan) perhaps in consultation with the Site Main Controller would have to make the difficult decision when and how to attempt rescue.

On hearing the major emergency alarm key personnel should report to the Emergency Control Centre or other designated places. Everyone else should report to predetermined places, viz, their normal place of work, an assembly point or toxic refuge as appropriate to await further instructions.

On hearing the major emergency alarm the Incident Controller (or Deputy Incident Controller in his absence) will contact the Emergency Control Centre to send necessary help at the place of incident. If necessary, he will telephone at places to call essential workers. With the help of essential workers, he will try to contain and control the incident. He may direct to safely close down the plant if necessary. He will inform the action on site to the Site Main Controller and will work under his direction and his own best judgement depending on the situation. He will guide the own firefighting team and the outside Fire Brigade regarding type of action, extinguishing or controlling material and equipment necessary. He will organize the helps from all expert teams as may be necessary. He will prevent the spread and control the situation within the shortest possible time.

Non-essential workers will remain in their plants or go to the assembly points as per direction to them from the Emergency Control Centre or the Incident Controller.

Detailed instruction(role) for alarm raiser, telephone operator, key personnel, workers (task force), non-essential workers, security staff etc. should be list out as per your own organizational set-up system requirement and should be given in Emergency. Instruction Booklet as the last annexure. A fixed set of action for all classes (big or small) of factories may not be suitable to all and therefore they are not described here. It is suggested to prepare them to prepare them to fit your own framework and to include in the last annexure.

NOTES:

1. Small leaks, especially those, which are encountered and dealt with on a regular basis must still be handled with extreme care and utmost urgency.

   SMALL LEAKS CAN BECOME LARGE LEAKS VERY EASILY. DO NOT HESITATE TO UPGRADE THE LEVEL OF THE EMERGENCY EVEN TO FULL EVACUATION IF THE SITUATION GETS OUT OF CONTROL OR PERSON(S) ARE INJURED.

2. If in doubt as to what response to mount, play safe and activate the full Emergency Plan.

3. If a leak is being treated as a small local emergency without a full plant evacuation, employees should be sent to evacuate the affected area and to prevent unauthorized person to enter the area until the local emergency is pronounced “OVER”. This information should be communicated to concerned personnel. Supervisor should remain in the area to maintain control and to assist in a full evacuation, in the event the local emergency is upgraded to a higher level.

4. A major event leading to sudden release of a large quantity of a toxic substance, which would form a large toxic cloud e.g. release to atmosphere of most of the contents of a storage vessels through the failure of a tank shell, manhole cover etc.: The probability of such occurrences is extremely low. In case of such incident the role of emergency services would be rescue, treatment of the injured, evacuation of personnel, and making the affected area safe.
   Approach of the emergency services will be as under:

- **Alarm Raiser**:

  He will immediately raise the alarm / siren on receiving the message of an emergency in predefined tone.

- **Telephone Operator:**

  Will help to communicate necessary information

  to relevant person and will also receive and convey the information from incident place to the concerned person in control room.

  - A team of key personnel including Sr.Officer of production, Safety, Security, Fire, Gas control, Pollution control, Medical services, Transport, Engineering, Technical services, Stores, Power Plant, Personnel will contact to the incident controller and work to control emergency as per the directive received from him.
  - On hearing the major emergency siren key personnel will report to the emergency control room.
  - Everyone else shall report to predetermined place viz. Their normal work place, an emergency assembly point to wait for further instruction
  - To call essential worker with help of essential worker & he will try to contain
  - and control the incident. Direct the plant people for safe shut down of the plant
  - if necessary.
  - Incident Controller shall inform the action on site to the Site Main Controller
  - and will work under his direction and his best judgment.

- Guide Fire Fighting Team.
- Organize the help from all expert team as may be required.
- Prevent the spread and control the situation within the shortest time.
- Some standing instruction for persons assigned for specific duty is as under :

11.2.3 Evacuation And Transportation

Non-essential personnel will be evacuated from the incident area and also from the adjacent areas. For the above purpose all will gather at one or more than one of the safe assembly point considering the wind direction. In charge person of safe assembly point will inform the control room about the people from the effected and adjacent area. Due care shall be taken to confirm all the person from effected area has reached to assembly point. Due care shall be taken for evacuation especially of pregnant ladies and persons with disabilities.

11.2.4 Safe Shut Down

Operation personnel have been trained for this purpose and will act immediately in case of emergency.

11.2.5 Use of Mutual Aid

Hindalco Industries Ltd. (Unit of Birla copper), Dahej active member of district crisis group named mutual Aid

Scheme (MAS). All MAH industries of Bharuch District and non-industrial organization are member of this scheme. Regular meeting and mock drills are conducted under the guidance of Dist. Collector.

11.2.6 Use of External Authority

Help of the outside authority will be utilised as per the requirement of the emergency. List of telephone numbers of pre-consented outside authorities will be readily available in control room prepared as per Annexure-31.

11.2.7 Medical Treatment

Prompt medical treatment will be given to injured persons. As prescribed in Annexure-17 & 22. As mentioned earlier our in-plant clinic and hospital is well equipped with sufficient numbers of doctors and other medical staff with the adequate beds. In addition, medical help may be procured from surrounding private and government doctors from Valsad, Surat & Vadodara.

11.2.8 Head Count

List of the persons present at site will prepared by Personnel dept. on the base of ' in timings ' print on punch cards and signature of officers in musters. Shift supervisor will help to recall exact persons present under him.

- Similarly, contractors will also check their persons present at site.
- Further procedures to accounting the persons may split as under:
- Incident controller will instruct to find out if any casualty is there.
- Record of the name, area etc. will be prepared about casualties at site.
- Persons assisting to In charge of safe assembly point will record the names and departments of people reporting at assembly point
- Information collected from assembly point, plant supervisor, hospital etc. will be compared.

11.2.9 Access of Records:

In case any casualties occur their relatives will be informed through HR department managers. List of the names and address of all employees & their dept. type of work, shift schedule will be kept ready all the time for this purpose.

11.2.10 Public Relations

Site Main Controller will inform about emergency and its consequences to news media & government authorities. Other will not divulge information on their own since it may be inaccurate and misleading.

11.2.11 Rehabilitation

Emergency will be declared ended by incident controller only after the concrete confirmation of the controlling of even a little danger. Due care shall be taken to enter the affected areas. No work to remove salvage material, collection of evidence shall start before thoroughly examination of the area has been carried out. Other person than emergency squad will not enter in the area without pre-permission of security officer.

11.3 Post Emergency Activities

Post-emergency activities comprise of steps taken after the emergency is over so as to establish the reasons of the emergency and preventive measures

Post emergency activities will include following steps:

The steps involved are:

- Collection of record:
  - Exact information shall be collected regarding the cause of emergency so that remedial measures can be suggested to prevent such recurrence.
  - Detailed inquiry shall be conducted to find out cause which will be in form of fact finding committee comprising Sr. Executives. Recommendations of the committee will be complied with on priority.
  - Medical check-up of the affected persons, necessary medical aid will be provided.
- Conducting enquiries and concluding preventive measures.
- Making insurance claims: Insurance claim section of the factory will work to avail the claims for damage due to consequences of an emergency
- Preparation of Enquiry Reports and suggestion scheme.
- Implementation of enquiry Reports' recommendations.
- Rehabilitate the affected persons within the plant and outside the plant.
- To restart the plant.

➢ COMMUNICATION ARRANGEMENTS DURING EMERGENCY AND FOR OFF-SITE EMERGENCY

After the Risk and their possible environmental impact and after making an organization for the preparedness to control the emergency, the next step is to make ready the communication system. It is crucial factor in handling an emergency.

Under section 41-b of our factories act, now the disclosure of information to the workers, general public, local authority and the chief inspector is made compulsory. Such advance communication is for the purpose of their emergency preparedness.

For the purpose of on-site and off-site emergency plan, we should have quick and effective communication system to make the emergency known

(a) Inside the factory

(b) To key personnel outside normal working hours

(c) To the outside emergency services and authorities and

(d) To neighbouring factories and public in vicinity.

The communication system beginning with raising the alarm, declaring the major emergency and procedure to make it known to others is explained below in brief. Siren Code has been given above.

❖ COMMUNICATION EQUIPMENTS:

➢ Fixed Wireless Sets & Walkie Talkie

The Fixed Wireless Sets & Walkie Talkie are installed in the plant. It shall be used for all communication as well as emergency communication.

➢ Telephones

Each and every section, area & department of the plant are connected by internal telephones. In hazardous area, the telephones are flameproof. External phone at office and residence of the Key Personnel and top executives of the plant is also provided. Mobile phone is available with each employee for communicating during emergency.

Flameproof Telephones in the plant area will be used by the plant personnel to communicate internally and to avoid congestion of Radio Communication. Emergency contact numbers are displayed near the field telephones.

Lists of Internal / External Telephone Nos. are given in Para- 11.5 & 11.6.

- **Emergency Sirens**

The electrical operated and hand operated emergency sirens are provided for communicating emergencies. They are located at top of MCC building t which can be operated from one switch from Control room i.e., from one switch; all or only one siren can be blown. That means, the siren of affected area only can be blown or all siren can be actuated at a time.

- **Messengers/Runner**

In case any of the communication equipment is not working, Messengers will be engaged for communicating with Emergency Response Team during emergency.

The Communication System begins when any person sees the incident, raising the alarm, telephone messages, declaring the emergency and procedure to communicate the emergency to other persons & general public.

- **DECLARING THE MAJOR EMERGENCY**

The declaration of major emergency puts many agencies on action and the running system may be disturbed which may be very costly at times or the consequences may be serious, therefore such declaration should not be decided on whims or immature judgment or without proper thought.

Ref. Chapter- 2 for Incident Controller &Site Main Controller.

- **TELEPHONE MESSAGES**

After hearing the emergency alarm and emergency declaration or even while just receiving the emergency message on phone, a telephone operator has to play an important role. He/she should be precise, sharp, attentive and quick in receiving and noting the message and then for immediate subsequent action of further communication. Describe his duties in the emergency instruction booklet given.

A form is suggested for a telephone operator to receive and record the first emergency call. You should prescribe such form for your purpose with necessary modification, All Internal and External phones are provided in Chapter - 12.

- **COMMUNICATION OF EMERGENCY**

For the purpose of on-site and off-site emergency plan, Company is having quick and effective communication system to make the emergency known.

a. To the employee and workers inside the factory
b. To key personnel & Essential Workers outside the plant

c. To the outside emergency services and Statutory authorities and
d. To neighboring factories and the general public in vicinity.

a. To the employees and workers inside the factory

The communication to all personnel inside the factory is done by Sirens. This will be done by Control room Panel Operator. In the specific cases, the trapped employees must be communicated by respective dept. Head. For the same, telephone calls & messengers may be used. On hearing the siren, ERT coordinators & Key personnel will assemble at the respective ECC and locations inside the plant.

b. To key personnel & Essential workers outside the plant

Generally, because of the planning, Key personnel & essential workers will be available in all shifts. But due to some reason, if someone is outside the factory premises or not on duty and if his help is required, an updated list and telephone, address of the Key personnel and Essential workers is available in the ECC. They shall be communicated by Control room Panel Operator till the arrival of communication team. On arrival, communication team will take over the charge.

c. To the outside Emergency Services and statutory Authorities

Once the emergency is declared, it is essential that the outside emergency services should be informed in the shortest possible time.

Responsibilities have been fixed as per the Emergency Organization Chart to contact outside agencies for help and to communicate to all the Government and other Authorities such as Fire Brigade, Police, District Emergency Authorities, DISH and Hospital etc.

d. To neighbouring factories and the General Public in vicinity

A major emergency will affect areas outside the plant and it is essential that neighbouring factories and general public, should be informed to enable them to take prompt action to protect their own employees and to take whatever measures may be possible to prevent further escalation of the emergency due to effects on their own installations, at the same time, they may be required to provide assistance as part of a prearranged mutual aid plan.

Further, responsibilities have been fixed to inform the neighbouring factories and the general public living in the vicinity as per Emergency Organization Chart.

Nearby public will be evacuated by evacuation team and portable PA system will be used for announcement. Village awareness pamphlets also will be distributed to public in advance and during emergency for communication.

TO KEY PERSONNEL OUTSIDE NORMAL WORKING HOURS

Generally, because of the planning suggested in chapter - 2 the key personnel and essential workers will be available in all shifts or on short call. But due to some reason, if some are outside or not on duty and if their help is required, their up-dated lists (Chapter 2) shall be kept and (if located elsewhere) the communications centre from which the call in will be made.

Names should be listed in order of priority. Communicators should be told to call in the personnel in the order given, but not to waste time hanging on unduly for the call to be answered. Instead, they should proceed through the list and return to those where the initial call was unanswered. If the second call remains unanswered, they should try to contact the nominated deputy.

On making contact, the communicator should give a short prearrange message to the effect that a major emergency has been declared at the works. Those contacted should not try to elicit further information at this stage, thereby delaying other calls. Liaison with the police will help to establish means whereby personnel called in can be allowed to proceed through any road blocks set up as part of their traffic control arrangements.

TO THE OUTSIDE EMERGENCY SERVICES AND THE AUTHORITIES

Once the declaration is made, it is essential that the outside emergency services, if they have not already been called in, are informed in the shortest possible time. Liaison at local level will help to determine the best means of achieving this, for example, by direct line or automatic alarm to the fire brigade or by any emergency system. Predetermined code words to indicate the scale and type of the emergency may be useful.

In high risk works and where there is no fulltime works emergency team, it may be advisable to provide for the outside emergency services to be informed on all occasion when the emergency alarm is raised. Local discussion with the outside services will help to decide, but it should be borne in mind that it is better for the emergency services to arrive to find a situation already under control than to find one out of hand due to delay in call-in.

The inside and outside emergency services including mutual aid are listed in Chapter 4 & 13. These should be utilized as per need.

The emergency must be immediately communicated to the government control room and other authorities such as fire brigade, police, district emergency authority, factory inspectorate, hospital, etc.

The statutory information to above authorities must be supplied beforehand so that they can be well prepared to operate their offsite emergency control (contingent) plan. As per their advice or consultation your on-site plan should be modified and updated also.

TO NEIGHBOUR FIRMS AND THE GENERAL PUBLIC

A major emergency may affect areas outside the works. The surrounding public will be alerted with PA system. The police will undertake any necessary action to safeguard members of the public. In the case of other nearby industrial concerns, consideration should be given to the need for a direct notification to them of the major emergency. This can serve a dual purpose in that it will enable them to take prompt action to protect their own employees and to take whatever measure may be possible to prevent further escalation of the emergency due to effects on their own installations. At the same time, they may be able to provide assistance as part of a prearranged mutual aid plan.

The statutory information to the general public must be supplied beforehand to them for their emergency preparedness. Such information u/s 41-B of the factories act is as under.

1) Name of the factory and address where situated.
2) Identification by name and position of the person giving the information.
3) Confirmation that the factory has approval from the factory's inspectorate and pollution control board.
4) An explanation in the simple terms of the hazardous process (s) carried on in the premises.
5) The common names of the hazardous substance used which could give a rise to an accident likely to affect them, with an indication of their principal harmful characteristics.
6) Brief description of the measures to be taken to minimize the risk of such an accident in compliance with its legal obligations under relevant safety statues
7) Salient features of the approved disaster control measure adopted in the factory.
8) Details of the factor's emergency warning system for the general public.
9) General advice on the action members of the public should take on hearing the warning.
10) Brief description of arrangements in the factory, including liaison with the emergency services to deal with foreseeable accidents of such nature and to minimize their effects.
11) Details of where further information can be obtained.

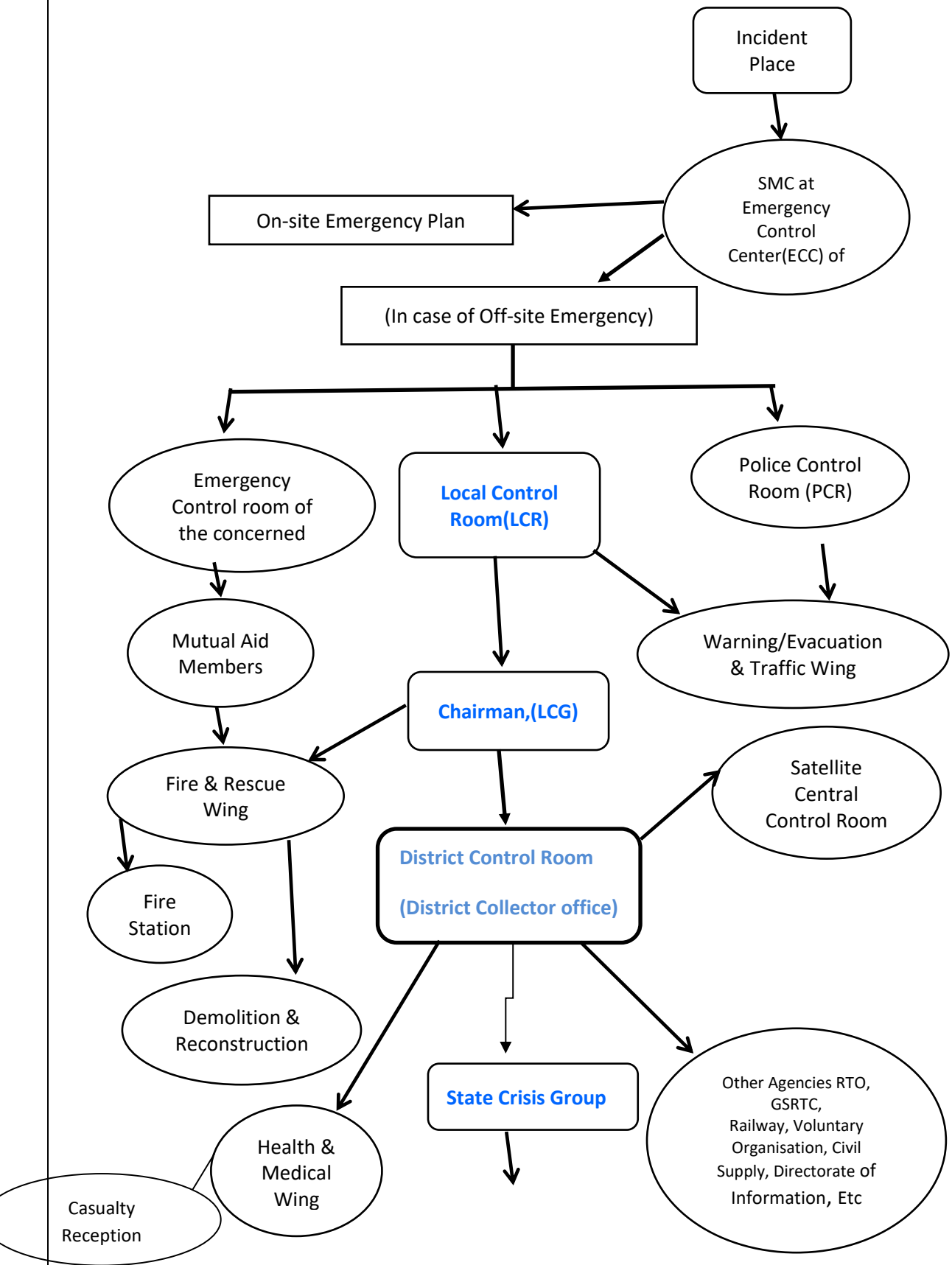
IMPORTANT INTERNAL TELEPHONE NUMBERS:

Note: See **Annexure: - 27** for **Internal Phones**

IMPORTANT EXTERNAL TELEPHONES NUMBERS:

Note: See **Annexure: - 28** for **External Phones**

- **Arrangement for Off Site Emergency plan and communication:**



- **NEED OF THE OFF-SITE EMERGENCY PLAN**

Major accident may affect areas outside the works. Explosions can scatter debris over wide areas, the effects of blast can cover considerable distances, wind can spread burning brands or toxic gases. In some cases, e.g. as the result of an explosion, outside damage will be immediate and part of the available resources of the Emergency Services may need to be deployed in the affected areas. In any event, the possibility of further damage may remain, e.g. as the result of further explosion or by the effect of wind spreading burning brands or hazardous materials.

The fact of a major emergency and the spread or potential spread of its effects outside the works may require that road and rail traffic past the works has to be halted or diverted. The responsibility for controlling road traffic flow rests with the police, taking account of the advice of the Site Main Controller. They will also, where necessary, inform the Rail. The problem is almost always exacerbated by members of the public driving to the scene to view the situation. The net effect can be to cause problems to those who have a real need to get to the works, including the key personnel who will have been called out. Liaison at local level will help to devise a means whereby key personnel can readily identify themselves to the Police controllers. The use of a windscreen sticker or other identity label may be advantageous.

The off-site plan is largely a matter of ensuring co-ordination of existing services and their readiness, as far as possible, for the specific hazards and problems which may arise in an incident. This means that key personnel have been identified, their duties defined and proper training achieved. Emergency Control Centres will also exist. The Chief Executive of the local authority will generally have staff in close liaison with the emergency services (fire, police, ambulance, etc.) and will be able to designate an emergency planning officer to mastermind the off-site plans.

Thus, in brief the two main purposes of the off-site emergency plan are:

1. To provide the local/district authorities, police, fire brigade, doctors, surrounding industries and the public, the basic information of risk and environmental impact assessment and to appraise them of the consequences and the protection/prevention measures and control plans and to seek their help to communicate with the public in case of a major emergency. This information from every industry enables the District Authorities to educate the public that what can go wrong, the measures to be taken and train them of the individual role in case of an emergency, and
2. To assist the District Authorities for preparing the off-site emergency (contingent) plan for the district or particular area and to organize rehearsals from time to time and initiate corrective actions based on the lessons learnt. An in charge of the on-site Emergency

Plan or the Site Main Controller will keep liaison, for this purpose, with the district as follows:

An industry should be familiar with such off-site plan and its functions as follows:

➢ STRUCTURE OF THE OFF-SITE EMERGENCY PLAN

Organization	Details of Command structure, Co-ordination arrangements, warning system, implementation procedures, emergency control centers. Names and appointments of: Incident Controller, Site Main Controller, their deputies and other key personnel.
Communications	Identification of personnel involved, communication center, call signs, network, lists of key telephone numbers.
Specialized emergency equipment	Details of availability, and location of: heavy lifting gear, bulldozers, specified firefighting equipment, fire boats.
Specialized knowledge	Details of specialist bodies, firms and people upon whom it may be necessary to call, e.g. People or firms with specialized chemical knowledge, laboratories.
Voluntary organizations	Details of organizers, telephone number, resources etc.
Chemical information	Details of the hazardous substances stored or processed on each site and a summary of the risks associated with them (HAZCHEM details),
Meteorological information	Arrangements for obtaining details of weather conditions prevailing at the time and for weather forecasts,
Humanitarian arrangements	Transport, evacuation centers, emergency feeding, treatment of injured-first aid, ambulances, temporary mortuaries.
Public information	Arrangements for (a) dealing with the media press office, (b) informing relatives etc.
Assessment	Arrangements for collecting information on the causes of the emergency, appointment of a historian. Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

➢ ROLES AND RESPONSIBILITIES OF STAKEHOLDERS INCLUDING EXTERNAL AGENCIES

The general responsibilities of the various authorities and agencies involved in mitigation of off-site emergency are listed below. In addition, the authorities and agencies will perform all such tasks as per the demands of emergency situation at hand.

➢ Duties of Main Incident Controller

(NOW Co-ordinator& Liaison Man) During Off Site Emergency, Unit's Main Incident Controller becomes Co-ordinator& Liaison Man and his duties are as follows:

- He has to extend liaison, co-ordination and facility to the Chairman of local crisis group or Chairman of district crisis group.
- He has to explain about disaster, his efforts and what type of help is needed in brief to Chairman of Local Crisis group (Govt. Authority) and Central Control Room.
- He has to communicate about available resources, fatality/injury to his own employees and probable affected surrounding area with maximum credible scenario.
- He has to keep ready with maps, layout of unit, records, documents, On Site Emergency Plan, M.S.D.S., Details of Process Hazards, Safe Handling procedure on specific hazardous chemicals etc.
- He has to advise for special medical treatment and availability of antidotes.
- He has to divert Communication system for Offsite emergency.
- He has to divert all available resource for Offsite emergency.
- He has to provide aid and assistance for Off Site Emergency.
- Shutdown plant safely, if hazards is not involved.
- He has to reorganize the work of Key personal & essential worker.
- Arrangement of food, water, rest etc. for the person engaged in the duty.
- Arrangement of disposal of contaminated water, effluent, solid waste, etc.

➢ Duties of Incident Controller

- He has to show the actual incident place to offsite action group.
- He has to provide proper information to all incoming off site action group.
- He has to also explain safe route for offsite team members, fire crew members, etc.
- He has to describe available resources, other hazardous material near disaster, available PPE, Neutralizing Media, etc.
- He has to show safe & proper parking arrangement for offsite action group members.

➢ District emergency Authority (DEA – District Collector)

- Take overall responsibility for combating the Off-site emergency
- Ensure the Police and Fire, personnel combat the emergency
- Arrange, if necessary, for warning and evacuating the public, through the Department of Police
- Communicate with Media to disseminate vital information to public
- Arrange for dispensing vital information to public using arrangements like mass-sms, public announcement using pre-recorded tapes
- Direct the team of Doctors headed by the Medical Officer
- Direct the local chief of State Transport Corporation to arrange for transport of victims and evacuation of people trapped within the hazard zone, if necessary
- Direct the Electricity Board officials to give uninterrupted power supply
- Direct the official in-charge to provide uninterrupted water supply as required
- If evacuation of population is necessary direct the Revenue officer and the Supply officer to provide safe shelters, food and other life sustaining requirements for the evacuees, if required
- Co-ordinate with the media
- Arrange for, release and provide necessary funds at various stages of disaster mitigation
- Direct railways to stop train, if required

Police

Communicate and co-ordinate with --

- MAH unit
- DEA
- Fire Services
- Transport authorities
- Medical Department
- Media
- Civil Defense and Home Guards
- Local Army establishment as required
- Warn and advice the people in the affected area
- Regulate and divert traffic
- Arrange for evacuation
- Maintain law and order in the area
- Ensure protection of life and property of evacuees
- Deal sternly with people exploiting opportunism in wake of a disaster

Fire Service Department

- Perform fire-fighting operations by deploying men and appliances
- Perform rescue operation in the affected area.
- Communicate and co-ordinate with Police, Medical Department of necessary information
- Keep knowledge on appropriate response to different chemical emergency scenarios
- Keep adequate stock and resource information on necessary means, material, appliances required to deal with particular emergency situations with updated details of suppliers and stockiest

Medical Department

- Arrange for preparing casualties to be sent to government/private hospitals
- Set up temporary medical camp and ensure medical facilities at affected location and neighborhood
- Keep knowledge on appropriate response to different cases of toxic consumption and injuries
- Set up temporary mortuary, identification of dead bodies and post-mortem

Factory Inspectorate Department

- Provide necessary direction to MAH unit and assistance to DEA, Fire Department, Medical Department among others
- Seek help from and involve assistance of Technical Experts of relevant and appropriate expertise and specialization
- Initiate, facilitate and provide for investigation into the accident

Occupier of MAH Unit

- Possess up-to-date copy of Off-site Emergency Plan
- Communicate promptly, any foreseeable disaster, to the DEA, Police, Fire Service and Inspector of Factories in-charge of the District
- Communicate changes within the factory that may require inclusion or suitable modification in the off-site plan to the DEA (Maintenance Officer) of the Plan

Technical Experts

- Promptly respond to provide the necessary technical advice to MAH unit, DEA, Factory Inspectors, Fire Department, Medical Department among others
- Provide on-phone help after properly understanding and assessing the situation
- Make visit to the site in co-ordination with DEA, Factory Inspector(s) to provide for appropriate technical assistance

Mutual AID Groups

To quickly mobilize the resources required to emergency mitigation at the site or wherever required

Pollution Control Board

- Project likely areas to be polluted.
- Carry out pollution assessment at suspected locations including soil, river and air assessment
- Ensure controlling of long-term pollution damage
- Identify unidentified substances, chemical releases, if any
- Transport Fleet Owners Including State Transport
- Act on the direction of DEA or Police
- Ascertain the extent of transport required with pick-points, routes and destinations to transport people
- Promptly arrange for dispatch of vehicles with sufficient fuel for evacuation purposes
- Arrange vehicles to transport water and other provision to camps set up

Media

- Disseminate vital information to public on direction of DEA, Police and other Authorities
- Act responsibly in disseminating vital information and dispel rumors, if any

Railways

- Act as per the direction of DEA to stop incoming trains, if required
- Arrange for evacuation, if required

Transporters of Hazardous Chemical

- Possess up-to-date copy of Off-site Emergency Plan
- Communicate promptly, any foreseeable disaster during transportation to the DEA, Police, Fire Service and Inspector of Factories in-charge of the District
- Communicate new assignments, newly added routes or other changes that may require inclusion or suitable modification in the off-site plan to the DEA (Maintenance Officer) of the Plan

Electricity Board

- Arrange for uninterrupted power supply to the plant, as required
- Arrange for lighting; at temporary medical camps etc.
- Arrange for switching off power supply on request from District Authorities
- Take care of electrical equipment within the damaged zone

Telecommunication Department

- Ensure working of communication lines to enable effective communication between various responder agencies

Civil Defence

- Co-ordinate with Police authorities
- Extend help in evacuation
- Arrange for round the clock security arrangements in the affected and evacuation areas
- Safeguard the properties and belongings of evacuees

Local Government Bodies

- Mobilize necessary resources in emergency mitigation
- Provide for community halls, town halls for evacuees

Public Works Department

- Ensure adequate water supply for fire- fighting
- Arrange for drinking water for evacuated persons at rallying posts, parking yards and evacuation centers. Arrange water for cattle.

Water Supply Board

- Arrange for supply of water to evacuees and all others involved in emergency control operations

Civil Supplies Department

- Arrangement to provide food and clothing as necessary, to the evacuees and all others involved in emergency controlling operations

Regional Transport Authority

- To investigate into the cause of road accident involving hazardous goods carrier and take necessary action.

Note: If any incident happens in plant premises responsible person has to rush to the site immediately.

CHAPTER-12: DETAILS OF FIRE FIGHTING AND OTHER FACILITES AVAILABLE AND THOSE REQUIRED FOR OFF-SITE EMERGENCY

FIRE AND TOXICITY CONTROL ARRANGEMENTS

A good organization should have its own fire station and emergency equipment room in the factory. It should be fully equipped with all necessary firefighting and personal protective equipment in readiness. Trained persons (essential workers) shall always (round the clock) be available at this room who will rush to the emergency point in the shortest time. Warning system (audio-visual) for emergency call shall always be in working order. The same staff be regularly trained to meet any emergency due to fire, explosion, spill or toxic release.

In a small factory if such separate fire station is not required, at least a room shall be kept ready round the clock with sufficient firefighting and personal protective equipment and in the case of emergency, the trained essential workers and the outside fire bridge and mutual aid shall be called in immediately.

Note: See **Annexure: - 21** Fire and toxicity control arrangements.

As per Gujarat Disaster Management Act, as requested

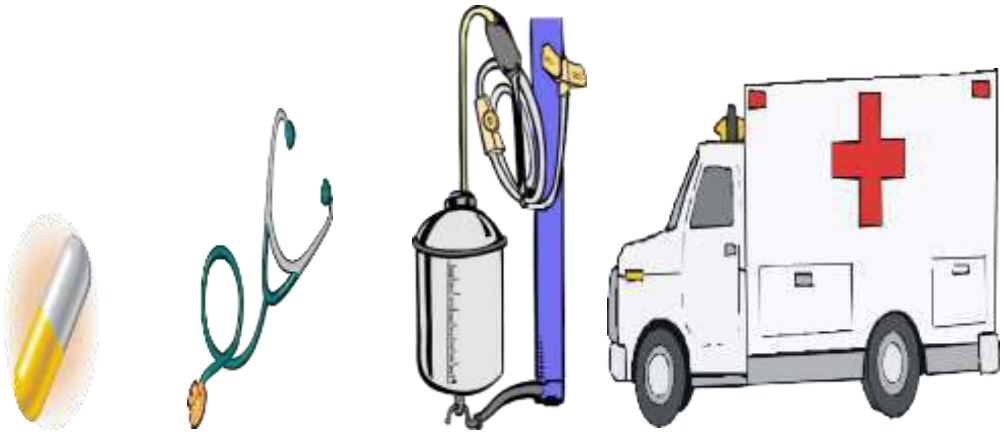
1. Each Factory as defined under the Factories Act 1948, shall-
   (a) assist the State Government, the Commissioner and the Collector in all disaster management activities;
   (b) Ensure that their staff are adequately trained;
   (c) Ensure that all necessary resources are in a ready-to-use state;
   (d) Ensure that its buildings and other structures are in compliance with all specifications stipulated by the departments of the Government and the Authority;
   (e) Carry out relief operations under the supervision of the Commissioner and the Collector;
   (f) Assist in conducting damage assessment and in carrying out reconstruction and rehabilitation activities in accordance with the guidelines framed by the Authority;
   (g) Prepare a disaster management plan in conformity with the other disaster management plans of local authorities, departments of Government having regard to the guidelines laid down in this behalf by the Authority;
   (h) (h) take all other steps and provide such assistance to the Authority, the Commissioner and the Collector and take such other steps as maybe necessary for disaster management.
2. Each factory shall be responsible for effective implementation of the plan drawn up by it in this behalf.
3. Each private and public sector entity shall provide assistance to the Authority, the Commissioner, the Collector and take such other steps as may be necessary for disaster management.

CHAPTER- 13: DETAILS FIRST-AID AND HOSPITAL SERVICES AVILABLE AND ITS ADEQUACY

MEDICAL ARRANGEMENTS

A good organization should have, depending on size of the factory, its own ambulance room or occupational health centre or dispensary or hospital for medical treatment of the workers in normal working and also at the time of emergency. It should be fully equipped with necessary instruments, arrangements, medicines including antidotes, and staff. It should have sufficient space, capacity and sited in a safe place (avoiding normal downwind direction). The statutory provisions shall be met with. There shall be sufficient first-aid centres and first-aiders properly trained. The staff shall be available round the clock.

In a small factory if such separate medical centre is not required (It may be statutorily required for a hazardous factory u/s 41-C of the Factories Act) at least a room shall be kept ready round the clock with sufficient first-aid arrangements and in case of emergency, the trained first-aiders and the outside medical help (including doctors, nurses, equipment, medicines, antidotes etc.) shall be called in immediately.



Where it is statutorily required, a suitable constructed ambulance van shall be maintained in good condition for the purpose of transportation of serious cases of accidents or sickness. The van shall be fully equipped with statutory facilities and available round the clock. In other cases, arrangement shall be made to procure such facility at short notice from nearby hospital or other places.

OHC is available for the factory. There is also liaison with the nearby hospitals.

Note: See **Annexure: - 22** for Medical arrangement & Mutual aid arrangements of first aid and hospital services available.

List of Annexure: (Attached to On- Site Emergency Plan)

ANNEXURE	SUBJECT
1.	Identification of the factory
2.	Map of the area
3.	Factory layout
4.	Storage hazards and control
5.	Material Safety Data Sheet
6.	Process and vessels hazard and controls
7.	Other hazards and controls
8.	Trade Waste Disposal
9.	Records of Past Incidents
10.	Gas dispersion & Fire modeling
11.	Evacuation Table
12.	Environment Impact Assessment
13.	Weather condition
14.	Incident controller
15.	Deputy Incident controller
16.	Main Incident Controller
17.	Key Personnel
18.	Essential Personal Team
19.	Safe assembly point
20.	Emergency Control Center (ECC)
21.	Fire and toxicity control arrangements
22.	Medical arrangement
23.	Transport & Evacuation Arrangement
24.	Pollution control arrangements
25.	Other Arrangement
26.	Alarms and sirens
27.	Internal phones
28.	External phones
29.	Nominated persons to declare major emergency
30.	Form to Record Emergency Telephone Calls
31.	Statutory Communication
32.	Separation Distances
33.	Emergency Instruction Booklet

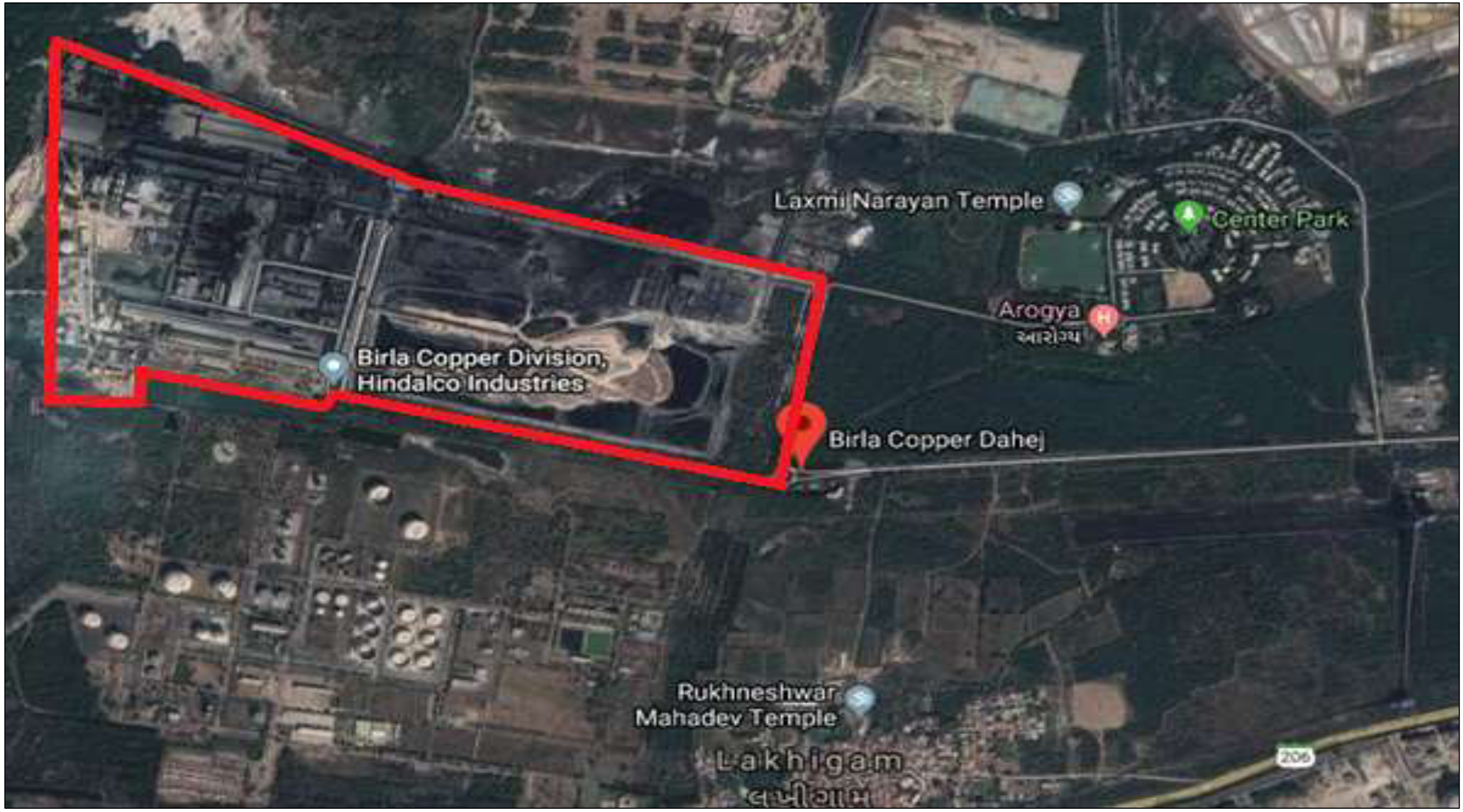
Annexure - 1: Identification of the factory

Full Name & Address of the company:	**M/s HINDALCO INDUSTRIES LTD (Unit: Birla Copper).** At & Po Dahej, Near Lakhigam, GIDC Industrial Estate, Ta: Vagra - 392130 Bharuch, Gujarat, India.			
Contact No.: 2641-256004/5/6/9				
Full Name & Address of the occupier:	**Mr. K N Bhandari - Director** 5-New power house road, Sector -7, Jodhpur – 342003		**Contact No:** Office: 2641-256004/5/6/9	Residence
Full Name & Address of the Manager:	**Mr. Krishnaraju Kumaravel - President & Unit Head** President's Bungalow, Birla Copper Township, P.O. Dahej, Taluka: Vagra, District- Bharuch.		**Contact No:** Office: 02646 – 252003	Residence: +91 73537 23000
Name of the shift	**Maximum workers at a time**			(a). Workers" include all employee, contract workers, trainees, apprentices, etc
	Male	**Female**	**Total**	
General (G)	708	34	742	
First (A)	279	0	279	
Second (B)	261	0	261	
Third (C)	225	0	225	
Total Workers (a)	**1473**	**34**	**1507**	
Maximum workers at a time				
Name of the shift	**Male**	**Female**	**Total**	(b). Contractual Employees Man Power
Day	3422	117	3539	
Night	449	00	449	
Total Workers (b).	3871	117	3988	
Grand Total (a + b)	**5344**	**151**	**5495**	

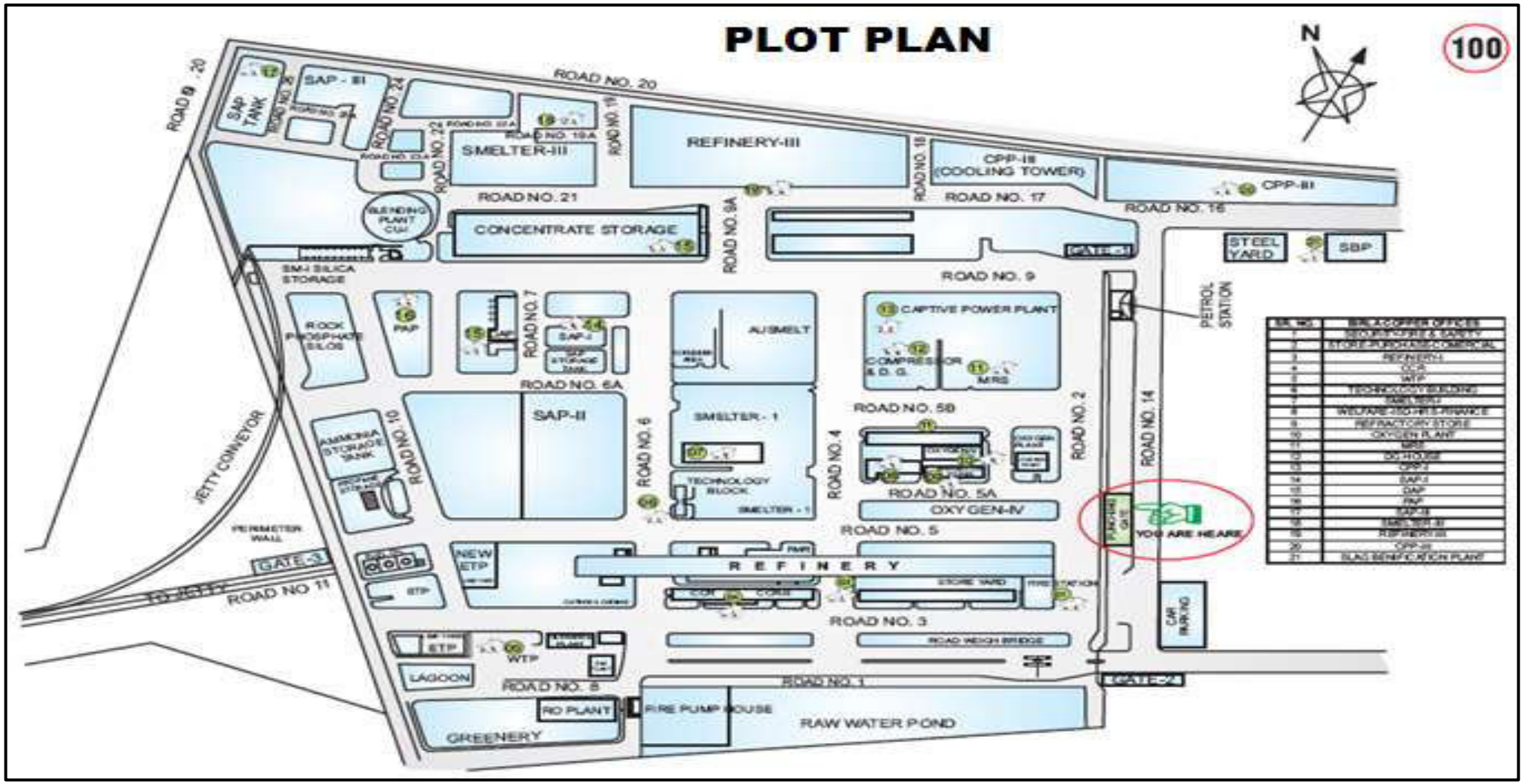
First person to be contacted in the case of emergency: Mr. Ajeet Kumar

Sr. No.	Name	Designation	Office Phone No.
01	Mr. Jatinder Khaira	Head - Security & Fire	+91 8727022255
02	Mr. Ajeet Kumar	Head - Safety	+91 9727706570
03	Mr. Krishnaraju Kumaravel	President & Unit Head	+91 96691 67000

Annexure - 2: Map of the area



Annexure - 3: Factory layout



Annexure - 4: Storage hazards and control

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
1.	Sulphuric Acid, 98.5%	10 KT X 3 Nos	15 -25 KT	8.5 KT	SAP III	Ambient Pressure & Temperature	Toxic & Spill	1. Dyke wall is there to accommodate 100% volume of Sul. Acid biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick. 3. Periodical thickness mapping. 4. Periodical empty out of the storage tank for condition monitoring and repair.	Pumping facility available for pumping Sul. Acid from affected Tank. PVC Suit with spill kit and hydrated lime kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
2.	Caustic lye, 48%	110 MT X 1 Nos.	100 MT	100 MT	SAP III	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of storage Tank. 2. Dyke area is fully covered with Chemical resistance Brick. 3. Periodical thickness mapping	Chemical Suit with spill kit kept ready at Storage location.
3.	Sulphuric Acid, 98.5%	10 KT X 2 Nos	5-15 KT	8.5 KT	SAP I	Ambient Pressure & Temperature	Toxic & Spill	1. Dyke wall is there to accommodate 100% volume of Sul. Acid biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick.	Pumping facility available for pumping Sul. Acid from affected Tank. PVC Suit with spill kit kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
								3. Periodical thickness mapping. 4. Periodical empty out of the storage tank for condition monitoring and repair.	
4.	Caustic lye, 48%	25 MT X 1 Nos.	5 -24 MT	24 MT	SM I – Scrubber Area	Ambient Pressure & Temperature	Toxic & Spill	Periodical thickness mapping	Chemical Suit with spill kit kept ready at Storage location.
5.	Caustic lye, 48%	37 MT X 1 Nos.	10 – 30 MT	30 MT	SM III – Central Scrubber Area	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of storage Tank. 2. Dyke area is fully covered	Chemical Suit with spill kit kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
								with Chemical resistance Brick. 3. Periodical thickness mapping	
6.	Caustic lye, 48%	10 MT X 2 Nos.	5 – 15 MT	9 MT	SM III – C & CL Granulation Pit	Ambient Pressure & Temperature	Toxic & Spill	Periodical thickness mapping	Chemical Suit with spill kit kept ready at Storage location.
7.	Effluent (15% Sul Acid)	150 M3 X 1 Nos.	10 - 150 M3	150 M3	SAP III - Gas Cleaning Area	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of storage Tank.	Pump with Transfer facility to Effluent Treatment Plant
8.	Effluent (10% Sul Acid)	25 M3 X 1 Nos.	5 - 25 M3	25 M3	SAP I - Gas Cleaning Area	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of storage Tank.	Pump with Transfer facility to Effluent Treatment Plant

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
9.	Electrolyte (20% Sul Acid)	1500 M3 X 4 Nos.	5000 – 6000 M3	80 M3	Ref I&II - Cells & Tanks	Ambient Pressure & 65 Deg C Temperature	Toxic & Spill	Basement Facility lined with Acid proof brick lining to accommodate spillage	Pump with Transfer facility to storage Tank
10.	Electrolyte (20% Sul Acid)	1500 M3 X 4 Nos.	5000 – 6000 M3	80 M3	Ref III - Cells & Tanks	Ambient Pressure & 65 Deg C Temperature	Toxic & Spill	Basement Facility lined with Acid proof brick lining to accommodate spillage	Pump with Transfer facility to storage Tank
11.	Sulphuric Acid, 98.5%	15 MT X 1 Nos	5 -12 MT	12 MT	Ref I	Ambient Pressure & Temperature	Toxic & Spill	1. Dyke wall is there to accommodate 100% volume of Sul. Acid biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick.	PVC Suit with spill kit kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
								3. Periodical thickness mapping.	
12.	Sulphuric Acid, 98.5%	25 MT X 1 Nos	5 -22 MT	22 MT	Ref III	Ambient Pressure & Temperature	Toxic & Spill	1. Dyke wall is there to accommodate 100% volume of Sul. Acid biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick. 3. Periodical thickness mapping.	PVC Suit with spill kit kept ready at Storage location.
13.	Hydrochloric Acid, 30 -35%	15 MT X 1 Nos	2 – 14 MT	14 MT	Ref I	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of Sul. Acid	PVC Suit with spill kit kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
								biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick	
14.	Hydrochloric Acid, 30 -35%	15 MT X 1 Nos	2 – 14 MT	14 MT	Ref III	Ambient Pressure & Temperature	Toxic & Spill	Dyke wall is there to accommodate 100% volume of Sul. Acid biggest storage Tank. 2. Dyke area is fully covered with Acid resistance Brick	PVC Suit with spill kit kept ready at Storage location.

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container Kg/Ltr.	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
1.	Diesel	25 KL	20-25 KL	20 KL	CPP	Ambient Pressure & Temperature	Fire	1. Dyke wall is there to accommodate volume of diesel in case of spillage. 2. Medium Velocity water spray system is being installed at Diesel Tank. 3. Surrounding Fencing. 4. Frequently Painting of Diesel tank is carried out. 5. Diesel unloading pump is converted from Gland pack to Mechanical seal type to eliminate leakage.	Personal Protective equipment's, isolated storages, regular inspection, and maintenance of premises No smoking zone
2.	Sulphuric acid 98.5%	20 MT x 2 Nos.	40 MT	20MT	WTP - 1 & 2 Bulk storage tank at	MS tanks NTP	Explosion	Stop valve, level control,	Personal Protective equipment, isolated storages,

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container Kg/Ltr.	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
					WTP-1&2 DM area				dyke wall, neutralization pit
3.	Caustic lye(48%)	10 MT X 2 Nos.	20 MT	20 MT	WTP - 1 & 2 Bulk storage tank at WTP-1&2 DM area	MSEP Tank NTP	Spillage	Stop valve, level control,	Personal Protective equipment, isolated storages, dyke wall, neutralization pit
4.	Sodium hypo chloride (10%)	20 MT	20 MT	20 MT	RO Plant Bulk storage tank Near PSF	FRP tank NTP	Spillage	Stop valve, level control	Personal Protective equipment, isolated storages, neutralization pit
5.	Ferrous Sulphate (90%)	30 MT+70 MT	100 MT	70 MT	ETP-1 & 2 Ferrous Sulphate godown	RCC go-down NTP	Spillage	Stored in leak proof bag,	Personal Protective equipment, isolated storages,

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container Kg/Ltr.	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
					near ETP-1 & 2				
6.	Hydrochloric acid (33%)	12 MT X2	20 MT	12 MT	RO Plant Bulk storage tank near reject tank	MSRL tank NTP	spill	dyke wall, neutralization pit	Personal Protective equipment, isolated storages, dyke wall, neutralization pit
7.	HFO	452 KL	452 KL	452 KL	FO AREA	NTP	Flammable	Skilled operator, Personal Protective equipment, isolated storages, dyke wall, fire hydrate system	fire hydrate system
8.	IPA (Iso propile alcohol)	25 KL	25 KL	25 KL	FO AREA	NTP	Flammable	Skilled operator, Personal Protective equipment, isolated storages, dyke wall, fire hydrate system	fire hydrate system

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container Kg/Ltr.	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
	Liquid oxygen 430 MT (95% Purity)	430MT	410MT	110MT	Near OP-1 cold box	1.9 Bar g (330 MT) & 8.0 Bar g (100MT), -183 Deg. C	Explosion, if Vacuum is failed in annular space	Safety Valves, Rupture disc, pressure control valves & vent Valves	Storage as per CCOE approvals & PPE is used
9.	Liquid Nitrogen 40 MT (99% Purity)	40 MT	36 MT	18MT	Near OP-1 cold box	4.0 Bar g, -193 Deg. C	Explosion, if Vacuum is failed in annular space	Safety Valves, Rupture disc, pressure control valves & vent Valves	Storage as per CCOE approvals & PPE is used
10.	Diesel	25 KL	20	20KL	Near Labour Gate	Ambient Pressure & Temperature	Fire	1. Dyke wall is there to accommodate volume of diesel in case of spillage. 2. Medium Velocity water spray system is being installed at Diesel Tank. 3. Surrounding Fencing. 4. Frequently Painting of Diesel tank is carried out.	Personal Protective equipment's, isolated storages, regular inspection, and maintenance of premises No smoking zone

Sr. No.	Name of the Material (Mention Concentration if any)	Max. Quantity can be stored	Actually stored (incl. In process & handling)	Actually, Stored in the biggest container Kg/Ltr.	Place of its Storage	Storage Condition (Pressure &Temp.)	Type of Hazards (Fire, Explosion, Toxic Release, Spill etc.)	Control Measures provided	Emergency Action
								5. Diesel unloading pump is converted from Gland pack to Mechanical seal type to eliminate leakage.	
11.	Petrol	20 KL	15-20KL	20 KL	Near Labour Gate	Normal atmospheric pressure	Fire	Underground Tank, Restricted Entry, No Smoking Zone, Fire extinguishers, Fire hydrant System Provided.	Storage as per the PESO guideline. Firefighting system installed.
12.	RLNG	NA	NA	NA	Pipeline	8 bar to 8.5 bar	Fire	Controlled system, no storage Facility, Fire hydrant system, and Fire extinguishers installed.	Firefighting system installed. Controlled system.

Chemical Compatibility Chart

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Inorganic Acids																								
2	Organic acids	X																							
3	Caustics	X	X																						
4	Amines & Alkanolamines	X	X																						
5	Halogenated Compounds	X		X	X																				
6	Alcohols, Glycols & Glycol Ethers	X																							
7	Aldehydes	X	X	X	X		X																		
8	Ketone	X		X	X			X																	
9	Saturated Hydrocarbons																								
10	Aromatic Hydrocarbons	X																							
11	Olefins	X				X																			
12	Petrolum Oils																								
13	Esters	X		X	X																				
14	Monomers & Polymerizable Esters	X	X	X	X	X	X																		
15	Phenols			X	X			X							X										
16	Alkylene Oxides	X	X	X	X		X	X							X	X									
17	Cyanohydrins	X	X	X	X	X		X									X								
18	Nitriles	X	X	X	X												X								
19	Ammonia	X	X					X	X					X	X	X	X	X							
20	Halogens			X			X	X	X	X	X	X	X	X	X	X				X					
21	Ethers	X													X						X				
22	Phosphorus, Elemental	X	X	X																	X				
23	Sulfur, Molten									X	X	X	X				X						X		
24	Acid Anhydrides	X		X	X		X	X							X		X	X	X	X					

X Represents Unsafe Combinations

Represents Safe Combinations

Annexure - 5: Material Safety Data Sheet

Sr. No.	Chemical Name	MSDS No.
1.	Sulphuric Acid, 98.5%	M 1
2.	Caustic lye, 48%	M 2
3.	Sulphuric Acid, 98.5%	M 3
4.	Caustic lye, 48%	M 4
5.	Caustic lye, 48%	M 5
6.	Caustic lye, 48%	M 6
7.	Effluent (15% Sul Acid)	M 7
8.	Effluent (10% Sul Acid)	M 8
9.	Electrolyte (20% Sul Acid)	M 9
10.	Electrolyte (20% Sul Acid)	M 10
11.	Sulphuric Acid, 98.5%	M 11
12.	Sulphuric Acid, 98.5%	M 12
13.	Hydrochloric Acid, 30 -35%	M 13
14.	Hydrochloric Acid, 30 -35%	M 14
15.	Diesel	M 15
16.	Sulphuric acid 98.5%	M 16
17.	Caustic lye(48%)	M 17
18.	Sodium hypo chloride (10%)	M 18
19.	Ferrous Sulphate (90%)	M 19
20.	Hydrochloric acid (33%)	M 20
21.	HFO	M 21

Sr. No.	Chemical Name	MSDS No.
22.	IPA (Iso propile alcohol)	M 22
23.	Liquid oxygen 430 MT (95% Purity)	M 23
24.	Liquid Nitrogen 40 MT (99% Purity)	M 24
25.	Petrol	M 25
26.	RLNG	M 26

Note: - MSDS of chemicals are available at Safety department, Production department (Production Manager & Production Office) of each plant & Laboratory & Warehouse

Annexure - 6: Process and vessels hazards and controls

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
Smelter (Copper Smelting Process 1,2,3)							
1.	Smelter	Blending of copper concentrate	Copper concentrate	RCC construction Mechanical Blending equipment	Atm. Ambient	Dust hazards	PPE, Dust collecting system, enclosed area
2.	Smelter	Copper concentrate storage	95000 MT	Covered storage in bays	Atm. Ambient	Dust hazards	PPEs, Dust collecting system, enclosed area
3.	Smelter	Conveying of copper concentrate / silica flux today bins	Copper concentrate + Silica flux	RCC construction inner S.S. lining	Atm. Ambient	Dust hazards	PPEs, Dust collecting system, enclosed area
4.	Smelter	Sizing / conveying to dryer	Copper concentrate + Silica flux	Mechanical handling equipment	Atm. Ambient	Dust hazards	PPEs, Dust collecting system, enclosed area
5.	Smelter	Drying of concentrate (Copper + SilicaFlux)	Copper concentrate + Silica flux	Dryer (Steam r-12 bar & 200°C	Atm. Ambient	Fire	Fire extinguishers provided, PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
6.	Smelter	Dry concentrate recovery from dryer off gases inbag house – 1 tostack	Copper concentrate + Silica flux	Bag house-1	Atm. Ambient	Dust hazards	PPEs, Dust collecting system, enclosed area
7.	Smelter	Pneumatic lift of concentrate (mixed) to 40 m elevation feedingsystem)	Copper concentrate – Silica Flux	Conveyer	Atm. Ambient	Fire, Explosion	Fire extinguishers, enclosed system
8.	Flash smelting furnace	Oxidation process inorganic compound formation	Copper concentrate + Silica Flux Fo matte + Slag 200 MT	Flash smelting furnace	-5 mm wc 1300°C	Exothermic, toxic, Fire, Burn, Radiation	Fire extinguishers, Auto control devices , PPE's
9.	Peirce-Smith Converter	Oxidation process	FSF Matte, SCF Matte, AF Slag FO, Blister copper, off gases, PSC slag,PSC secondary gases	Peirce-Smith converter 130MT	-5 mm wc 1300°C	Autogenous, toxic, in case ofwater contact chances of explosion, possibility of hotmetal splash.	Fire extinguishers / PPE's, effective dust collection system, pre-monsoon activity not to enter water.
10.	Slag cleaning furnace (SCF)	Reduction settling	FSF Slag, PSC	Slag cleaning furnace	Radiant Temperature 300° C	Exothermic, toxic, Fume exposure	Covering of launder, fume

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
			Slag, Matte, SCF, Coke Reverts off gases slag SCF 24/50 MT				PPEs, SO2 gas mask, heat resistant aprons.
11.	Anode furnace	Oxidation / reduction	Blister copper air, propane, naphtha, AF copper off gases,AF slag – 240 MT	Anode furnace	1280°C	Chances of fire hazards, heat exposure, metal splashing, molten metal, mould water leakage, hydraulic	In case of Pressure drop, Auto cut of switch, Routine checkup, and periodic maintenance to
12.	Anode casting	Mechanical operation	Anode furnace copper, copper anodes, (24 Nos. 3 MT)	Anode casting machine	-	Chances of fire hazards, heat exposure, metal splashing, molten metal, mould water leakage, hydraulic oil leakage	In case of Pressure drop, Auto cut of switch, Routine checkup, and periodic maintenance to stop water leakage.
13.	Waste heat boiler – 1 (FSF)	Unit operationHeat recovery	SO2 bearing off gases / water	Waste heatboiler – 1	-10, -15 mmwc / 60 bar 220°C	No Hazards	In case of maintenance,Work permit system.

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
14.	Electro static precipitator – 1 (FSF)	Unit operation dust recovery	SO2 bearing off gases / water	Electro static preciptitator – 1	-05 mm wc, 60 bar	No Hazards	During shut down, all the precaution to be taken.
15.	Waste Heat	Unit operation dust	SO2 bearing off	Waste heat	-0.5 mm wc, 60 bar	No Hazards	During shut down, all the precaution
16.	Electro static precipitator – 2 (PSC)	Unit operation dust recovery	SO2 bearing off gases / dust	Electro static precipitator – 2	-10/-15 mm wc	No Hazards	During shut down, all the precaution to be taken.
17.	Bag house-2	Unit operation	Anode furnace gases (Contain inflammable gases)	Bag house – 2	-	Dust Hazards	Temperature to be maintained not to catch fire.
18.	Incinerator-1	Combustion	SCF off gasesair	Incinerator-1	-10 mm wc / 1300°C	Fire, Dust Hazards	Fire extinguishers / PPEs
REFINERY- I							
19.	Copperrefining	Electro refining (electrolysis section)	Copper Sulphate, copperanodes cathodesof S.S.	Electrolysis cells – 384 53 anodes, 54 cathodes 30 KA,	Atm, 65°C	Acid splashing onto hands / face / body	PPEs Eye Washers, Shower, Hand Gloves, etc. provided.

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
				0.3 V, 8.5 Cu M capacity (10 KL)			
20.	Liberator – 1	Electro winning (02 generation with H2SO4 fumes occurs)	10 KL x 4 Nos. Liberators 15% CuSO4, 15% H2SO4 = Sol. (45 to 33 gm/lt of cu. Concentration, reduction)	Liberator 1 + 5 M elevation.	Atm. 50°C	Fumes generation, Acid splashing in to personnel	Additives added, TC/FC/DCS concentration control, hood provided.
21.	Liberator – 1	Electro winning (02 generation with H2SO4 fumes occurs)	12 KL x 4 Nos. (33 to 12 gm/lt of cu. Concentration, reduction)	Liberator 2 + 3 M elevation.	Atm. Ambient	Fumes generation, Acid splashing in to personnel, Arsine generation (AsH3)	FD/DCS common scrubber provided.
22.	Liberator-3	Electro winning (02 generation with H2SO4 fumes occurs)	12 KL x 10 Nos. (12 to 1 gm/lt of cu. Concentration, reduction)	Liberator 3 M elevation.	Atm. Ambient	Fumes generation, Acid splashing in to personnel, Arsine generation (AsH3)	FD/DCS common scrubber provided.

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
23.	Liberator	Slime treatment solid 30% cu, Ni, Se, Te, Ag, Au, Si	10 KL	Slime Tank Ground Tank	Atm, 50°C	Toxic	PPEs
24.	Liberator	Slime thickening (70% H2SO4 & CuSO4)	30 KL	Thickener (settling) Ground Floor	Atm. 40°C	Toxic	PPEs
25.	Liberator	Storage reactorfeed	10 KL	Reactor feed tank ground floor	Atm. Ambient	Toxic	PPEs
26.	Liberator	Autoclaving	14 KL	Auto clave + 5 M elevation (Cu / Ni removing by H2SO4 leaching, oxidation, steam heating by coil)	14 kg/cm^2, 140°C	Toxic	PVC hand gloves, rubber gum boots.
27.	Liberator	Ag reduction (SO2 blow into from SO2 cylinders SO2 reduces Ag)	10 KL	Flash Tank ground floor, (Cooling coil is provided)	Atm, 70°C	Toxic	PPEs
28.	Liberator	Filtering press		+7.8 M elevation			
29.	Liberator	Tellurium precipitation tank	10 KL	Ground floor	Atm. Ambient	Toxic	PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
30.	Liberator	Electrolytecirculation	Electrolyte 140M3 x 2 Nos.	Electrolyte circulation tank, ground floor	Atm. 65°C	Toxic	PPEs
31.	Liberator	Electrolytedecanting	Electrolyte 140M3 x 1 No.	Electrolyte storage tankground floor	Atm. 65°C	Toxic	PPEs
32.	Liberator	Electrolyte storage	Electrolyte 80.6 M3 x No.	Electrolyte storage tank first floor	Atm. 65°C	Toxic	PPEs
33.	Liberator	De-mineralizedwater tank	De-mineralized water 100 m3 x 1 No.	D.M. Water Tank, groundfloor	Atm. Ambient	Non-hazardous	
34.	Liberator	Floor sump	Floor washing 3.9 m3 x 10 Nos.	Floor sump below groundfloor	Amt. ambient	Toxic	PPEs
35.	Liberator	Filter cakecontainer	1.5 m3 x 4 Nos.	Filter cake container, firstfloor	Amt. ambient	Toxic	PPEs
36.	Liberator	Slime holding	Slime 7.8 m3 x 3 Nos.	Slime tank, ground floor	Amt. ambient	Toxic	PPEs
37.	Liberator	Pre-coat	10.1 m3 x 1 No.	Pre-coat Tank	Atm. Ambient	Non hazardous	
38.	Liberator	H2SO4 dilution	7.8 m3 x 1 No.	H2SO4 dilution tank	Amt. ambient	Toxic	PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
39.	Liberator	G.S. Sulphuric,acid tank	13.6 m3 x 1 No.	H2SO4 dilution tank	Amt. ambient	Toxic	PPEs
40.	Liberator	Thickener Tank	63 m3 x 1 No.		Amt. ambient	Toxic	PPEs
41.	Liberator	Pre-coat measuring	0.26 m3 x 1 No.	Pre-coat measuring tank	Amt. ambient	Non hazardous	PPEs
42.	Liberator	Sealing water storage	5.73 m3 x 1 No.	Sealing watertank	Amt. ambient	Non hazardous	PPEs
REFINERY III : ISA PROCESS : 250000 TPA							
43.	Copper refining 280000 TPA Cathode	Electro refining (Electrolysis section)	Copper sulphate, copper anodes cathodes of S.S.	Electrolysis cells 384 53 anodes, 54 cathodes 30 KA, 0.3 V, 8.5 cu M capacity (10KL)	Atm, 65°C	Acid splashing onto hands / face / body	PPEs Eye Washers, Shower, Hand Gloves, etc. provided
CCR (1,2,3)							
44.	Melting furnace /launder	Combustion /melting	Copper 18 MT	Furnace FG / FF / SF	1300°C	Heat Exposure, radiant heat, chances of copper wire breakage.	Mesh guard, enclosed system, face shield mask, gold plated suit,

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
							heat reflection suit, Aluminum suit.
45.	Holding Furnace Launder	Combustion /melting	Copper 15 MT	First Floor	1300°C	Heat Exposure, radiant heat.	Mesh guard, enclosed system, face shield mask, gold plated suit, heat reflection suit, Aluminium suit.
46.	Tundish	Combustion /melting	Copper 15 MT	First Floor	1300°C	Hot metals splashing to working personnelwhen metal fall onwater pockets.	Mesh guard, enclosed system, face shield mask, gold plated suit, heat reflection suit, Aluminium suit.
47.	Casting wheel	Mechanicaloperation	Copper 15 MT	First Floor	< 1300°C	Heat Exposure, radiant heat.	DCS, PPEs
48.	Rolling mill	Mechanical operation / reduction of CuO	Copper 15 MT	First Floor	1300°C	-	DCS
49.	Rod cleaning and cooling pipe (with IPA)	Mechanical operation / reduction of CuO	Copper 15 MT	First Floor	1300°C	Fire	DCS

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
50.	WAX spray system	Finishing	-	- do -	1300°C		DCS
51.	Coilers	Mechanicaloperation	-	Ground Floor	1300°C	Heat Exposure, radiant heat.	DCS
52.	Weighing / compacting / exit roll system	Mechanicaloperation	-	Ground Floor	1300°C	Heat Exposure, radiant heat.	DCS
53.	Copper Revert Crushing Plant	Crushing	Copper	Crusher	Atm	Cutting, fire, dust hazards	PPEs, hand gloves
SAP – I & II							
54.	SAP – I & II	Scrubbing of SO2off gases	SO2 off gases weak H2SO4-60 m3/hr approx	Primary reversejet scrubber, ground floor	1/60/60°C g/340/60°C – 254 mmwc	Acid burn,corrosive	PVC suits, PVC Hand gloves, safety shower, Cautionary Notice
55.	SAP – I & II	Scrubbed gas cooling	Scrubbed SO2 off gases, weak,acid 35 m3/approx	Gas coolingtower	1/38/58°C g/38/38°C 432/-1143 mmwc	Acid burn,corrosive	PVC suits, PVC Hand gloves, safety shower, Cautionary Notice
56.	SAP – I & II	Scrubbing of SO2off gases	SO2 containing gases, weak acid 15 m3/stripped	Final reverse jet scrubber	1/38/38°C g/38/38°C 432/-1143 mmwc	Acid burn,corrosive	PVC suits, PVC Hand gloves, safety shower, Cautionary Notice

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
			gases of stripper (SO2)				
57.	SAP – I & II	SO2 stripping of weak acid	Weak acid (air)no holdup	Stripper	1/60/am. g/atm/380 mmwc / 30°C	Acid burn,corrosive	PVC suits, PVC Hand gloves, safety shower, Cautionary Notice
58.	SAP – I & II	Mist precipitation	SO2 containing gases, no hold up	Mist precipitator (Electrostatic Precipitator – 5 Nos.)	g-1143 / -1270 mmwc /38 / 38°C	Toxic	DCS / PPEs (Microcomputer based control)
59.	SAP – I & II	Hold up of weakacid	Weak H2SO4 –15 m3 (3-5% H2SO4)	Wash acid tank	Atm. Ambient	Acid burn,corrosive	PVC suits, PVC Hand gloves, safety shower, Cautionary Notice
60.	SAP – I & II	Drying of SO2 containing gases	SO2 containing gases Air 96% H2SO4 No holdup	Drying tower	g-1295/-1499 mmwc, 38/71°C 1-71/84°C	Toxic	DCS / PPEs
61.	SAP – I & II	SO2 oxidation to SO3 / Heat Exchanger	SO2, O2, N2, (Catalyst vanadium Pentoxide 40 m3	Heat exchanger contact converter-1	3711/2878 mmwc / 420/625°C,	Toxic, exothermic	DCS / PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
			– 1 bed				
62.	SAP – I & II	SO2 oxidation to SO3 / Heat Exchanger	SO2, O2, N2, (Catalyst vanadium Pentoxide 40 m3 – 1 bed	Heat exchanger contact converter-1	2616/757 mmwc / 420/625°C	Toxic, exothermic	DCS / PPEs
63.	SAP – I & II	SO3 absorption in 98.5% H2SO4	98.5% H2SO4 SO3 containing gases (+M3) No liquid holdup	Inter pass absorption tower	Gas, 1753/1306 mmwc / 275/82°C 1,113/82°C	Toxic, exothermic	DCS / PPEs
64.	SAP – I & II	SO3 absorption in 98.5% H2SO4	No liquid hold up 98.5% H2SO4 SO3 containing gases (+N2)	Final absorption tower	Gas 447 / 20 mmwc 317/82°C 1-113/82°C	Toxic, exothermic	DCS / PPEs
65.	SAP – I & II	Retaining 96% H2SO4	96% H2SO4 26 M3	96% H2SO4 – Tank	Atm. 84°C	Toxic,	DCS / PPEs
66.	SAP – I & II	Hold up tank for process 98.5% H2SO4	98.5% H2SO4 59 M3	Common pump tank H2SO4 98.5% Ground level	Atm. Pressure 113°C	Toxic,	DCS / PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
67.	SAP – I & II	Hold up tank for process 98.5% H2SO4	98.5% H2SO4	Product tank H2SO4 98.5% ground level	111°C atm.	Toxic,	DCS / PPEs
68.	SAP – I & II	Combustion of FO / Heating process gases (SO2)	No hold up	Preheater	Combustion draft (30 M Chimney)	Fire explosion,toxic	DCS / PPEs
69.	SAP – I & II	Product storage	98.5% H2SO4 10,000 MTT X 2 Nos.	H2SO4 Storage tank, ground floor	Atm. Ambient	Toxic,	DCS / PPEs
70.	SAP – I & II	Loading of tankers	98.5% H2SO4 10 MT x 2 Nos. (Transits time between fill up & loaded)	Loading 98.5% H2SO4 tank (7-10 M Elevation)	Atm. Ambient	Toxic,	DCS / PPEs
71.	SAP – I & II	Hold up to liquid effluent coming from stripper / other equipment	Effluent +0-2% H2SO4 10 M3	Effluent stripper tank ground floor	Atm. Ambient	Toxic,	DCS / PPEs
SAP III							
72.	2837 TPD, DCDA	Oxidation, DCDA	SO2, SO3, H2S2O7, H2SO4	---	113°C Atmospheric pressure	Toxic release Corrosion Chemical burns	PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
	Process, Monsanto design						
CPP I, II & III / DG							
73.	Captive Power plant 24.5 mw	Combustion of coal / LDO		Boiler	-10 mmwc, balanceddraft 900°C	Explosion	DCS / BMS provided
74.	10.5 MW	Combustion of fuel		Super heater	+ve draft	Explosion	DCS
75.	DG Set 2 x 2.5 MW	Internal combustion	HSD		1200°C 40 kg/cm sq.g	Non hazardous	Control panel
76.	60 MW Cogeneration Power Plant	Cogeneration	Steam	---	7 kg/cm2 495°C	Explosion Burn	DCS, safety valves, PPE
Oxygen Plant							
77.	Oxygen Plant	Air compression, cooling	Air water	--	--	--	--
78.	Oxygen Plant	Purification		Director contact after cooler ground level	5.3 kg/cm sq.g	Non hazardous	Pressure / temp. / indicators, DCS
79.	Oxygen Plant	Flash cooling absorption	Aluminia, molecular sieve beds	Prepurifiers (2 Nos.)	5.3 kg/cm sq.g	Non hazardous	Pressure / temp. / indicators, DCS

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
80.	Oxygen Plant	Unit operation (Dust removal)		Filter	5.2 kg/cm sq.g 17°C	Non hazardous	Pressure / temp. / indicators, DCS
81.	Oxygen Plant	Flash cooling	Waste N2, water	Evaporatorcooler	Atm. 10°C	Non hazardous	Pressure / temp. / indicators, DCS
82.	Oxygen Plant	Cooling / distillation (Encased in a single cold box)	Air, Liquid N2, 40% O2 Liquid	Lower column	5 kg/cm s.q. 160°C	Non hazardous	Pressure / temp. / indicators, DCS
83.	Oxygen Plant	Distillation	Liq. O2 / Water N2	Upper column	0.6 kg/cm sq. g -170°C	Non hazardous	Pressure / temp. /
84.	Oxygen Plant		Waste N2 / air, kettle liquid / shell liquid	N2 super heater	0.6 kg/cm sq. g -160°C	Non hazardous	Pressure / temp. / indicators, DCS
85.	Oxygen Plant		High pressure Air, Low pressure Air, Waste N2, GasO2	Primary Heat Exchanger	0.6 kg/cm sq. g -160°C ASmbient N2 7 kg/cm2 gauge -183/40°C (Air)	Non hazardous	Pressure / temp. / indicators, DCS
86.	Oxygen Plant		O2, Air	Pool Boiler	4 kg/cm sq. g -183°C	Non hazardous	Pressure / temp. / indicators, DCS
87.	Oxygen Plant	Liquid O2 Storage	100 T x 2 Nos.	Liquid O2 storage tank (ground level)	2 kg/cm sq. g -183°C	Non hazardous	Pressure / temp. / indicators, DCS
88.	Oxygen Plant	Liquid – 2 Storage	11 KL	Liquid O2 storage tank	15 kg/cm sq. g -175°C	Explosion	Double walled insulated SV/RD, P T-t/C, DCS, P, T

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
							alarms
89.	Oxygen Plant	Liquid N2 Storage	13 KL	Liquid N2 Storage tank	16 kg/cm sq. g -180°C	Explosion	Double walled insulated SR/RD
90.	Oxygen Plant	Gas O2 storage	40 cum	Gas O2	15 kg/cm sq. g Ambient	Explosion	Single walled, Ni insulation SV/PI
91.	Oxygen Plant	Gaseous O2 generation		Steam / hot water vaporizer 100°C / atm. H2O, 2.5 kg/cmg. Steam	13 kg/cm.g. ambient		DCS
92.	Oxygen Plant OP-IV	Oxygen generation and storage	Air, Oxygen, Nitrogen	Oxygen tanks 11 KL + 2 x 100 T	Liquid, 15 kg/cm2, -183°C	Frostbite	DCS, PPEs
93.	Oxygen Plant	Oxygen generation and storage	Air, Oxygen, Nitrogen	Oxygen tanks, 11 KL + 2 x 100T	Liquid, 15 kg/cm2, -183°C	Frostbite	DCS, Ear plugs, Cryogenic gloves, medical exam
ETP 1 & 2 and WTP 1 & 2							
94.	ETP	-	Effluent 400 KL	Storage tank, (RCC, splined level, open)	Atm. Ambient	Acidic	Periodic monitoring PPEs
95.	ETP	-	Effluent 100 KL x3 Nos.	Reactor RCC / AP lined x 3 Nosin	Atm. Ambient	Acidic	Periodic monitoring PPEs

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
				series, ground level			
96.	ETP	-	Effluent 300 KL x1 No.	Thicker RCC/AP lined x 1 No. ground level	Atm. Ambient	Non hazardous	Periodic monitoring PPEs
97.	ETP	-	Effluent 4.8 KL x1 No.	Filter presses / PV sand filter (MS / RL) groundlevel	2.5 kg/cm ambient	Non hazardous	Periodic monitoring PPEs
98.	ETP	-	10,000 m3 x 1 No.	Lagoon	Atm. Ambient	Non hazardous	Periodic monitoring PPEs
PMR							
99.	PMR	Selenium	Anode slime 44 MT / Month	SeleniumRoasting Furnace	Temp. 450°C	Toxic	PPEs & exhaust hood with scrubber
100.	PMR	Dore Smelting	Desalinized Slime 35T/M	TROF Furnace	Temp. 125°C	Toxic	Multi gas mask, health protection, environment contamination with gases
101.	PMR	Silver refinery	Dore anodes5T/M	MOEBIUSCELLS	Temp. 65°C	Toxic	- do -
102.	PMR	Gold refining	0.5 T / M Gold Sand	Crucible Furnace	Temp. 1250°C	Toxic	PPEs Eyewash shower hand gloves, goggles

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
103.	PMR	43% P205 and setting	28% P205 acid, 54% P205 acid, 43% P205 acid, sludge (Rock phosphate)	43% P205 settler – vertical 12/2 elevation	Atm. Ambient	Toxic	PPEs / DCS
104.	PMR	Single effect forced circulation evaporation	43% P205 acid 800 MT	Phosphoric acid concentrator	Atm. Ambient	Toxic	PPEs / DCS
105.	PMR	Fluorine based vapors release(HF, S1F4)	(LP steam utility P205 acid (52-54%) – 100 MT		88°C 700 mm Hg, vacuum	Toxic (HF, S1F4)	PPEs / DCS
106.	PMR	HF, S1F4 absorption in H2O to process H2 SIF6	Water HF, SIF4, vapors H2SIF6-3T (as F) (overall 20% H2SIF6)	Fluorine absorptionsystem	70-82°C 700 mm hg vacuum	Toxic, corrosive	PPEs / DCS
COMMON FACILITIES AND UTILITIES							
107.	Co-generation power plant	Co-generation	Steam	--	7 kg/cm2 250°C	Burn, noise hazard	DCS, Safety valve, PPE, PRV, first aid
108.	Emergency power	--	--	--	--	Electrocution, fire hazards, noise	D G Set, ears plugs, cautionary

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
						hazards, high voltage	board, earthing & bonding,
109.	Power Distribution	--	--	--	--	Electrocution	Pressure cut off switches
110.	Compressedair facilities	Storage of air	Air	Receivers	6 kg/cm2	Explosion	Safety valve
111.	Fuel storage	Storage of Naphtha Storage of Coal Storage ofIPA Storage of Propane Storage of FO Storage of HSD	Naphtha, Coal IPA Propane FO HSD	659 KL empty tank Open yard Tank 1 x 25 KL Tank 1 x 160 T Tank 1 x 452 KL Tanks 25 KL	5 psig, Amb. Temp. Ambient Ambient 16 kg/cm2, Amb. Temp. Ambient Ambient	Fire, ExplosionFire Fire Fire, ExplosionFire Fire	Restricted entry, Dyke, SV, Monitor, Hydrant, PPE Hydrant, PPE Monitor, PPE, restricted entry, Hydrant, PPE Hydrant, PPE
112.	Laboratory	Analysis &Research	Lab chemicals	Consumables	Ambient	Fire, Explosion,Toxic	PPE, Labels, MSDS, fume chamber, periodic testing
113.	Fire protection facilities	Fire protection	Fire water Extinguishers	Reservoir Near ETP	Ambient	Release	Periodic inspection, PPE

Sr. No.	Name of the Plant, Department or Place	Name of the hazardous process and operation	Materials in the process / operation with their quantity	Name of the vessel and its location	Operation parameters: pressure, temperature etc.	Type of hazards possible (exothermic, run away, pressure release, toxic release, fire explosion etc.)	Control measure provided
1	2	3	4	5	6	7	8
114.	Water treatment Plant	Water Treatment	Raw water, DM water treatment chemicals	Water reservoir	Ambient	No hazards	-
115.	Effluent treatment plant	Effluent treatment	Effluent treatment chemicals	Effluent pit	Ambient	Release, toxic	PPEs
116.	Sewage treatment plant	Sewage treatment	Sewage, Treatment chemicals	Sewage pit	Ambient	Release, toxic	PPEs

Annexure - 7: Other hazards and controls

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure	In charge person at source	
						Name & Designation	Tele. No.
1.	Spillage from pipe lines 1.leakage 2. Fire	Pipe line & vessels By not adhering safety norms and by negligence	Person	Factory Premises only	Regular inspection of pipelines and tanks. The damaged pipes & flanges to be replaced, regular painting of pipelines, regular preventive maintenance, Selection of MOC	Engineering Head Electrical Supervisor Production Head Electrical Engineer Manager Engineer Unit Head	---
2.	Fire (Small)	Transformer Short Circuit	Person & Property	Factory Premises only	Isolated Area. Fire Extinguisher Co2 Type. Alternate Power From D.G. Set		
3.	Boiler Fire & Explosion	Boiler House due to Failure of Controls or poor Maintenance	Person & Property	Factory Premises only	Regular inspection /cleaning Testing of Boiler Fire Extinguisher Hydrant provided, trained and qualified operators		
4.	Electricity 1. Burning 2. Shock 3. Fire	Loose contact of wires, weak earthing Short Circuit, Improper Insulation	Person & Property	Factory Premises only	Regular inspection of electrical fitting, flame proof fitting provided in flammable area, proper earthing. Lightening arrestor provided, regular measurement of earth pit resistance		
5.	Leakage from Flammable Liquid Tanker While Unloading	Leak Substance May Catch Fire Due To Spark, Ignition	Person & Property	Factory Premises only	Effective Earthing, Bonding Safe Unloading Procedure To Be Prepared Unloading By Gravity Flame Arrestor Provided On Vent		

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure	In charge person at source	
						Name & Designation	Tele. No.
6.	Bad House Keeping 1. Injury 2. Burning 3. Fire	Bad House Keeping	Person & Property	Factory Premises	Regular inspection of plant/area by housekeeping team, Proper placement of materials.	Engineering Head Electrical Supervisor Production Head Electrical Engineer Manager Engineer Unit Head	---
7.	Structural Collapse Injury Property damage	Due to over loading of machinery, Construction failure, Earthquake,	Person & Property	Factory Premises	Structural stability to be ensured, load-bearing capacity to be checked, regular inspection of plant.		
8.	Air Raid	War	Death, fire, explosion & property damage.	Factory Premises & Nearby	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.		
9.	Earthquake	Natural	Death, injury & property damage.	- do -	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.		
10.	Floods	Natural- very less chance as no big river nearby	- do -	- do -	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.		
11.	Cyclone	Natural	- do -	- do -	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.		

Sr. No.	Name of the possible hazard or emergency	Its source & reasons	Its effect on persons, property & environment	Place of effects	Control Measure	In charge person at source	
						Name & Designation	Tele. No.
12.	Sabotage	Human	- do -	- do -	On-site & Off site emergency plan provided. Mock drills are conducted. Help of mutual aid and off-site emergency plan is available on demand.	Engineering Head Electrical Supervisor Production Head Electrical Engineer Manager Engineer Unit Head	---

Annexure - 8: Trade Waste Disposal

Sr. No.	Type and name of trade waste	Its generation Kg per day	Place of its generation	Place of safe disposal	Treatment methods of safe disposal (treatment plant, vent gas scrubber, flare incinerator water, blanketing etc.	Alarm indicating accidental release or release in excessive proportion	Monitoring measures provided	In charge person	
								Name & Designation	Phone No.
1	2	3	4	5	6	7	8	9	10
1.	As Per Gujarat Pollution Control Board CC&A.								

Note: - Company maintained records of trade waste & its disposal at Environment department.

Annexure - 9: Records of Past Incidents

Sr. No.	Type of incident (Major Accident Emergency or Disaster)	Date & time of occurrence	Its place	Duration	Time required in controlling it	No. of workers working at that time	Persons Affected		Persons Died		Effects on the survivors		Subsequent Safety measures Provided
							Inside the factory	Outside the factory	Inside the factory	Outside the factory	Immediate	Delayed	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Annexure - 10: Gas dispersion

Note: Gas Dispersion information is given in chapter 8.

Annexure - 11: Evacuation Table

Chemical Name	Emergency Event	Weather class	Wind Speed m/s	Release	Rate of Release	Probable extent of damage (50000 ppm = LEL)
LNG Line	Flammable vapour release	F	1	Leak	1440 kg/min	3.4 meters
		F	2		1440 kg/min	676 meters
		D	3		1440 kg/min	195 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (30 ppm = AEGL-3 [60 min])**
Sulphur Dioxide	Toxic vapour release	F	1	Leak	10.3 kg/min	434 meters
		F	2		10.3 kg/min	583 meters
		D	3		10.3 kg/min	371 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (160 mg/(cu m) = AEGL-3 [60 min])**
Sulphuric Acid	Toxic vapour release	F	1	Leak	1.88 kg/min	10,000 meters
		F	2		1.88 kg/min	10,000 meters
		D	3		1.88 kg/min	10,000 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (24000 ppm = 60% LEL = Flame Pockets)**
Liquid Oxygen	Oxidization Area Vapour Cloud	F	1	Leak	0.8 kg/min	22 Meters
		F	2		0.8 kg/min	15 Meters
		D	3		0.8 kg/min	34 Meters

Note:

1. Evacuation Table is as per ALOHA & Gas Dispersion modelling.
2. More details please, given in chapter – 8

Annexure - 12: Environment Impact Assessment

Department	Evaluation done by	Review No.	Date	Location	Page No.

Sr. No.	Activity	Environmental Aspect	Aspect (N/A/ E)	Environmental Impact	Significance Analysis Criteria						Total Score	Significant (Y/N)
					Qty A	Occur B	Impact C	Legisl D	Control E	Detect F		

Quantity A Score	Quantity parameter Criteria				
5	Excessive				
4	Very High				
3	High				
2	Moderate				
1	Low				

Score	Occurrence B	Impact C	Legislation D	Controls E	Detection / Preventive Mechanism F
10					
5					
4					
3					
2					
1					

Note: - Updated information for EIA is maintained at Environment Department.

Annexure - 13: Weather condition

Sr. No	Month	Wind Velocity M/sec	Wind direction	Weather condition (Dry, moisture, rainy, cold, hot, stable unstable, stormy, etc)	Pasqual classification A to F
1	2	4	5	6	7
1	January	2.00	NW	Cold & Stable	D
2	February	2.00	NW	Dry & Stable	D
3	March	2.00	SW	Dry & Stable	D
4	April	2.00	SW	Dry & Stable	D
5	May	2.00	SW	Hot	D
6	June	2.00	SW	Moist & Hot	D
7	July	2.00	SW	Hot & Rainy	D-F
8	August	2.00	SW	Hot & Rainy	D-F
9	September	2.00	SW	Hot & Rainy	D-F
10	October	2.00	SW	Moist	D
11	November	2.00	NW	Dry	D
12	December	2.00	NW	Cold & Stable	D

Annexure - 14: Incident controllers

Sr. No.	Incident controllers				
	Plant Name	Name	Designation	Contact No.	
				In the Factory	Mob No.
1	2	3	4	5	6
1.	CPP I & II	Mr. Pinakin Patel	DGM	2005	+91 99044 02548
2.	CPP III	Mr. Parag Agarwal	AGM		+91 80180 43876
3.	Smelter I/II	Mr. Jayesh Patel	VP	2025	+91 97235 55857
4.	Smelter III	Mr. Vivek Gupta	AVP	3218	+91 99044 02563
5.	Fertilizers	Mr. Nishit Dave	GM	2265	+91 97235 55829
6.	CCR I, II & III	Mr. Linu Panchaman	Jt President	2573	+91 81081 30209
7.	SAP I & III	Mr. Pradip Datar	GM	3250	+91 81550 01387
8.	Refinery I, II & III	Mr. Biswadip Basu	AVP	2265	+91 99044 02650
9.	PMR	Mr. Divyang Shah	GM	2241	+91 99044 02599
10.	Oxygen Plant	Mr. Niranjan Behra	AVP	2197	+91 81550 01371

Annexure - 15: Deputy Incident controllers

DY. INCIDENT CONTROLLERS'			
Department		**Name and Designation**	**Contact Number**
1.	CPP I & II	Shift in Charge of the shift or General shift Dy. Manager/Manager	2196
2.	Smelter I	-Do-	211/2122
3.	Fertilizers	-Do-	2207
4.	CCR I & II	-Do-	3140
	CCR III	-Do-	2140
5.	SAP I & III	-Do-	2150/2151
6.	Refinery I, II & III	-Do-	2103/2141
7.	PMR	-Do-	2125
8.	Oxygen Plant	-Do-	2198/2153

Annexure - 16: Site Main Controllers

Sr. No.	Name	Designation	Contact Number
1.	Mr. Krishnaraju Kumaravel	President & UH	+91 73537 23000
2.	Mr. P a n k a j J a i n	Vice President - Operations	+91 98261 52532
3.	Mr. Manohar Gupta	Asst. Vice President	+91 81550 01383
4.	Mr. Bishnu Agrawal	Jr. President-F&C	+91 95940 20904
5.	Mr. Jayesh Pawar	Jr. President- Operations	+91 73537 23000
6.	Mr. Linu Panchaman	Vice President - Operations	+91 7894403006
7.	Mr. Anand Pawar	Vice President	+91 95949 59581

Annexure - 17: Key Personnel

Sr No	Department	Name	Contact No.
1.	Operations	Mr. Jayesh Pawar	+91 99044 02557
2.	Eng. /Maintenance	Mr. Manohar Gupta	+91 90900 92570
3.	HR	Mr. Anand Pawar	+91 87228 04677
4.	Power	Mr. Sriram	+91 97237 09892
5.	Environment	Dr. Sanjay Kumar	+91 81550 66673
6.	Safety	Mr. Ajeet Kumar	+91 9727706570
7.	Security, Transport & Fire	Jainder Pal Khaira	+91 7069010457
8.	Jetty	Mr. Deepak Razdan	+91 97237 09899
9.	Electrical	Mr. Pramod B	+91 8155001322
10.	Medical	Dr. Deepak Dara	+91 9816014880
11.	Assembly Point, time office, Head count	Respective Shift In-charge	

Annexure - 18: Essential Personal Team

Shift	Sr. No.	any one shall Available in shift & on Holiday on call						
		Name	Designation	Trained for work	Place of Availability	Phone No		PPEs Required
						In the Factory	Resi No	
General First Second Third	1.							1. SCBA set 2. NH3 Gasmask 3. PVC Suit 4. Hand Gloves 5. Helmet 6. Safety Shoes 7. Cotton Dust Mask 8. Safety Belt 9. Safety Goggles 10. 3M make Respirator
	2.							
	3.							
	4.							
	5.							
	6.							
	7.							
	8.							
	9.							
	10.							
	11.							
	12.							
	13.							
	14.							

Annexure - 19: Safe assembly points

Sr. No	Location	Accommodation capacity	At the time of emergency						
			Person In-charge					Nearest Ph. No.	PPE that may be required
			Name & Designation	Place of availability					
				In the factory	Residence address	Phone No.			
						Office	Residence		
1	2	3	4	5	6	7	8	9	10
1.	Safety Office (Near Main Gate)	500	In charge person	--	--	--		--	1. Hand Gloves & Googles. 2. Face Shield. 3. Helmets. 4. Gum Boot. 5. Gas Mask with SCBA Set. 6. Required antidots.
2.	Contractor Employees Gate	500	In charge person	--	--	--		--	
3.	Cu-3 Porta Cabin	500	In charge person	--	--	--		--	
4.	Copper House Garden	500	In charge person	--	--	--		--	
5.	Jetty	100	In charge person	--	--	--		--	
6.	Near Laxmi Narayan Temple	833	In charge person	--	--	--		--	
7.	Beside Block No. D-14	833	In charge person	--	--	--		--	
8.	Near Guest House	833	In charge person	--	--	--		--	

**** Minimum space of 0.3 m^2per person with a minimum height of 200 cm (6.56168 ft) [Ref. NFPA, 101 of 2000 (Pratama,2016)**

Annexure - 20: Emergency control center (ECC)

Location of the center:	(1) Main Gate
Telephone Nos. of the centre:	(1) External- 02641 256004/05/06
	(2) Internal- 101

				Its period of Inspection		**Monthly**
Sr. No.	**Items kept in the ECC**	**Nos. or Quantity**	**Persons who will handle/operate**	**Last**	**Present**	**Notes**
1	External Telephone	Available	Security officer, Site Main Controller,Incident Controller & Dy.Site Incident Controller	Company has a checklist to check once in every month	---	---
2	Internal Telephone	Available				
3	Area Map	Available				
4	Siren Control	Available				
5	Fire Extinguishes	Available				
6	Torches	Available				
7	Umbrella	Available				
8	Raincoat	Available				
9	Fire Suit	Available				
10	S.C.B.A.	Available				
11	Helmet	Available				
12	First Aid Box	Available				
13	Visitors Room	Available				
14	On Site Emergency Plan	2 Sets				
15	Note Pad, Pens, Pencils, Rubbers, etc.	Sufficient				

Annexure - 21: Fire and toxicity control arrangement

1. Fire Fighting System:

- **Reservoir Capacity –** Main Pump House – 3 Lacs m3
  Copper III Pump House – 600 m3
  Jetty Pump House – 600m3

- **Fire Pump House**

Sr. No.	Area	Pump	Capacity
1.	Main Pump House	Jockey Electrical Diesel	01 No. of 41m3/hr 01 No. of 410m3/hr 01 No. of 410m3/hr
2.	Copper III Pump House	Jockey Electrical Diesel	01 No. of 27m3/hr 01 No. of 273m3/hr 01 No. of 273m3/hr
3.	Jetty Pump House	Jockey Electrical Diesel	01 No. of 27m3/hr 01 No. of 273m3/hr 01 No. of 273m3/hr

2. Status of Fire Fighting System:

Sr. No.	Description	Quantity
1.	Hydrant Points	283 Nos.
2.	Riser	90 Nos.
3.	Monitor	18 Nos.
4.	4 Ways	10 Nos.
5.	Hose Box	137 Nos.
6.	Delivery Hose	500 No.
7.	Hose Reel	25 Nos.
8.	Triple Purpose Nozzle	445 Nos.
10.	Fire Extinguishers	1654 Nos.

3. Fire Protection Arrangements

- **Fire Tender –** Water Tender
  Foam Tender
  Multi Tender
- **Sprinkler System** – Gas Cylinder Storage Area
  Scrap Yard area
  HSD Tank
  IPA tank
- **Foam Based system-**
  FO tank
- **Extinguishers**

Sr. No.	Descriptions	Quantity
1	Clean Agent 04 Kg	07 Nos.
2	DCP 02 Kg	11 Nos.
3	DCP 06 Kg	780 Nos.
4	DCP 09 Kg	205 Nos.
5	DCP 25 Kg	04 Nos.
6	CO2 4.5 Kg	585 Nos.
7	CO2 6.8 Kg	07 Nos.
8	CO2 22.5 Kg	03 Nos.
9	Foam 09 Litres	36 Nos.
10	Foam 50 Litres	02 Nos.
11	Foam 60 Litres	14 Nos.
	Total	**1654 Nos.**

4. Rescue Equipments

- SCBA set – MSA & Dragger – 30 + 12 Nos.
- Descending Kit – 03 Nos.
- Cutter & Spreader – 01 No.
- Oxygen Pack – 05 Nos.
- Jel Blanket – 05 Nos.
- Fire Blanket – 05 Nos.
- Skid Stretcher – 02 Nos.
- Devit arm Rescue Kit – 01 No.
- Air Cushion Bag – 01 No.
- Portable Inflatable Light – 02 Nos.
- Tripod – 02 Nos.
- Anchorage Karamental Line 200m – 02 Nos.
- Nomex Poximity Suit – 06 Nos.
- Fire entry suit :- 03 Nos.
- Foam Compound Reserve – 2610 Litres

5. Fire Detection system

Sr. No.	Description	Quantity
1.	Gas Detector	02 Nos.
2.	Smoke Detector	70 Nos.
3.	MCP	05 Nos.

6. Emergency Siren Code

Sr. No.	Modes	Types of Sound	Duration
1.	Emergency	On 10 sec, Off 5 sec	2 Minutes – Wailing Sound
2.	All Clear	Continuous	2.5 Minutes
3.	Testing	Continuous	1 Minutes

7. Other Means of Communication in Emergency

- Telephones
- Mobile
- Walkie talkies

List of Fire Bucket Stand:

Sr. No.	Plant/ Location	No. of Bucket
1.	Raw material Warehouse	12
2.	Utility area	8
3.	Plant -1	8
4.	Plant – 2	8
5.	Plant – 3	8
6.	HT yard	3
7.	EO Tank Farm	16
8.	PO Tank Farm	8
9.	Underground storage area	12
10.	Near AG Tank area	4
11.	New Finished good Warehouse	34

Details of mutual Aid with Nearby Organizations:

Name of Address of the Factories	Approx. Dist. Kms.	Contact Person		FEE Available		PPE Available	
		Name	Phone No.	Type	Qty in No.	Type	Qty in No.
Fire Station	5 KM	Fire Officer	02641-256004/05/06	Fire tender	No.	sufficient	

Details of mutual Aid of Fire & Toxic Control Arrangements:

Sr. No.	Fire Station with Address and Phone Number	Designated Contact Persons With Address (O, R) And Phone: Numbers (O, R, M)	Type and Numbers of Fire Tenders, (Water, Foam, Mist Tenders)	Other Equipments And Materials (SCBA, PPE, Dry Chemical Powder Etc)
1.				
2.				

Note: Company maintain records of mutual aid arrangement at EHS department & Plant admin team as per above format.

Annexure - 22: Medical arrangement

Name & Location	Tel. Nos.	In-charge Person			Facilities & Equipment	Antidotes	First Aiders	Accommodation	Ambulance van or alternate arrangement			
		Name & Designation	Ph.	Address					Place of availability	Capacity	Facilities in the van	Driver's name & address
1	2	3	4	5	6	7	8	9	10	11	12	13

Yes, available in company premises

Sr. No	Company Name	Contact Number
1.	RIL, DMD Fire Station	026411-016000 & 679390
2.	HIL Fire Station	9723555846 (02641)-, 662222, 662835, 662980, 662813
3.	GCPTCL Fire Station	(02641)- 261101, 261035, 9998950550
4.	PLL Fire station	(02641)- 300444,300445,300447, MCR- 300101, 300102
5.	GACL Fire station	(02641)-256315/16/17,Extn no 203/333,9979891873
6.	ONGC Dahej Plant, Fire Station	(02641) -264111/222/135
7.	OPAL Fire Station	(02641)-666101, 666555, 9099901600
8.	TPL Fire Station	02641-202500/202502 (CCR), 9099006655 (Shift Manager)

Mutual Aid of First aid & Hospital Services Available

Annexure - 23: Transport & Evacuation Arrangement

Own Transport Centre						Own Vehicle			
Name & location	Ph. Nos.	In-charge Person Name & Designation	Residence		Sr. No	Type & No.	Capacity	No & type of public warning instrument	Drivers' name & address
			Phone	Address					
1	2	3	4	5	6	7	8	9	10
Main Gate	02641-256004/05/06	Security	02641-256004/05/06	REFER TIME OFFICE	1	Four-Wheeler – 2 No during day time	5 Seat	NIL	DRIVEN BY EMPLOYEE
Loading and unloading place	02641-256004/05/06/108	Security EMRI Services	02641-256004/05/06/108	REFER TIME OFFICE		NA	NA	NIL	NA

Note: Company has to be provided sufficient Nos Buses & Cars for Evacuation arrangement.

Annexure - 24: Pollution control arrangement

Water Pollution Controls					Air Monitoring					
Type & capacity of effluent Treatment Plant	No. of sample monitoring frequency	Other control measures	Log book& record	In-charge person's name, address & Phones	No. & place of sample monitoring centers	Type, Parameters & Frequency of tests	Wind direction & velocity	Instruments available	Log book & Record	In-charge person's name, address & phone
1	2	3	4	5	6	7	8	9	10	11

Flue Gas Stack Monitoring					Process Scrubbers & Stacks			
No. of Location of sample places	Type, Parameter s & frequency of tests	Control Measures provided	Instrument available	Log Book & Records	Location	Type & Capacity	For What	In-Charge Person's Name, Address & Phone No.
11	12	13	14	15	16	17	18	19

Land Pollution Controls			Pollution Control Board	
No. of sample monitoring centres & its frequency	Other control measures	Log Book & Records	Permission Obtained?	Conditions fulfilled?
20	21	22	23	24

Note: Company maintain records of Pollution control at Environment department as per above format.

Annexure - 25: Other Arrangement

Sr. No.	Type and name of arrangements available	Qty	Place of availability	Phone No.	In charge person's		
					Name & Designation	Residence	
						Phone	Address
1	JCB / Crane	2 – 3	R & B Department, Bharuch	Executive EngineerR & B Department			
2	Power Alternatives DG set	1 500 KVA	R & B Department, Bharuch	Executive EngineerR & B Department			
3	Crane Services, Dahej	2	Bharuch	Third Party in-charge person			
4	Hydra Available	2	Bharuch	Third Party in-charge person			

Note: Company have adequate nos, of emergency heavy vehicles, lifts, cranes, lifting machines, transporters, alternate power and utilities supply, special equipment, instruments, materials, test facilities, specialists, special books and information available.

Annexure - 26: Alarms and signs

- **Emergency Siren / Alarms**

Sr. No.	Plant	Location of siren installation	Range of siren
1.	Fire Station building (ECC)	Fire station building	2.5 KM
2.	CPP1&2	Control room Top	2.5 KM
3.	Oxygen plant	Oxygen plant 5 Building	2.5 KM
4.	MRS2	Building top	2.5 KM
5.	HR	Building top	2.5 KM
6.	Refinery	Refinery 1 Building	2.5 KM
7.	ETP	. ETP	2.5 KM
8.	Technology block (Copper house)	Technology block (Copper house)	2.5 KM
9.	SM1 building	SM1 building	2.5 KM
10.	SM3 building Top	SM3 building Top	2.5 KM
11.	SAP3	near control room	2.5 KM
12.	Refinery 3	Rectifier area.	2.5 KM
13.	PAP3	PAP3 building.	2.5 KM

Annexure - 27: Internal Telephone Numbers

Office: M/s. Hindalco Industries Ltd. Located at Near Lakhigam, Dahej, Gujarat 392130.

Name	Number
FACTORY	02641-256004/05/06
OFFICE	02641-256004/05/06
Fire bridge	101
Police station	100
Ambulance	108/100

List of Rescue Member & Important Telephone No.

Informationofficer	Liaison officer	Safety andAdmin	Planning & Operations Engineering
		Safety	**Planning & Engineering**
Sunil Kumar +91 99244 22443 Gaurav Bansal +91 99044 02608	Bheru Ujjwal +91 99989 89502	Ajeet Singh +91 97277 06570 Vijayrajsinh Sarvaiya +91 96870 04077	Manohar Gupta +91 81550 01383
Logistic section	**Human Resource**	**Admin**	**Operations**
Anurag Chaudhary +91 97953 37065 Nikhil Supekar +91 81550 00682	Anand Pawar +91 95949 59581 Uddeptabh Mishra +91 77730 13210	Rajesh Jha +91 81550 01392	Jayesh Pawar +91 81081 30209 Pankaj Jain +91 98261 52532 Linu Panchaman +91 78944 03006
Fire and Security	**Environment**	**Legal Section**	**Finance section**
Jatinder Khaira +91 70690 10457 Rupesh Ranjan +91 75099 83844	Krishnu Mahapatra +91 99044 02603 Sanghamitra Mishra +91 70690 05471	Rohit Sarangi +91 80505 66690	Bishnu Agarwal +91 95940 20904 Narendra Sahu +91 90900 88772

Annexure - 28: External Telephone Numbers

IMPORTANT TELEPHONE NOS. DIFFERENT ORGANISATIONS (MAS) FOR EXTERNALHELP

Sr. No.	Organization / Department	Contact No.
GOVERNMENT		
1.	Directorate Industrial Safety & Health – Ahmedabad	079 - 25502346
2.	Dy. Directorate Industrial Safety & Health - Bharuch	02642-240421
3.	Collector and District Magistrate – Bharuch	02642-242300
4.	G.P.C.B. Control room	02642-246333
FIRE		
5.	BHARUCH FIRE STATION	02642-220151 / 95740 07006/7/48
6.	DPMC ANKLESHWAR	02642-220229 / 226101 / 653101 / 9426889616
7.	ONGC FIRE STATION	02641-290376 / 254090
HOSPITAL		
8.	RELIANCE HOSPITAL, DAHEJ	02641-282033
9.	M/S SAI CLINIC, JOLWA	02641-254040, 097237708257.
POLICE STATION		
10.	Police Station - Dahej	02641-256233
NEIGHBOURING INDUSTRIES		
11.	GACL LTD.	02641-256315 / 16 / 17, 99798 91873
12.	GFL LTD.	02641-308084/80
OTHERS INDUSTRIAL		
13.	DAHEJ ECO FRIENDLY SOCIETY (DISASTER MANAGEMENT CENTER, DAHEJ)	02641-256670 / 9824475576
14.	RELIANCE INDUSTRIES LTD.	(2641-282031 / 282400/31/21/22/04
15.	HINDALCO LTD. (BIRLA COPPER UNIT)	02641-256004/05/06
EMERGENCY NUMBERS FOR VISITORS		
16.	JUST DIAL	02641-69999999
17.	AMBULANCE	108

Sr. No.	Company name	Name	Code No.	Landline No.	Landline No./ MobileNo.
1.	Hindalco Ltd.	Control Room No.	02641	256004/05/06	Ext No. 101
2.	DMC (DEFS)	Control Room No.	02641	256670	9924937101
3.	DMC (DEFS)	Mr. Hitesh Shah	02641	256670	9824475576
4.	DMC (DEFS)	Mr. Tejas Thodiya	02641	256670	7600933658
5.	SEZ Fire Station	Control Room No.	02641	291101	83474201017
					7874787973
6.	RIL Ltd.	Control Room No.	02641	616021/ 022,279391	9998001085
7.	GCPTL Ltd.	Control Room No.	02641	261101	261035/261036
8.	GACL Ltd.	Fire Ext. No.	202/333		9979891873
		CCR Ext. No.	232/293		9879604102
9.	OPAL	Control Room No.	02641	666101/666555	9909028345
10.	Torrent Power (DGEN)	Control Room No.	02641	202500/502	9099006666
11.	ONGC C2 C3	Control Room No.	02641	264111/22	9428520375
12.	GNFC	Control Room No.	02641	676300/67301	67302
13.	GFL	Control Room No.	02641	618084	618096
14.	LNG Ltd.	Control Room No.	02641	300101/102	300447/445

Annexure - 29: Nominated persons to declare major emergency

Sr. no.	Name of the plant department or location	Name & designation of the nominated person to declare majoremergency	Duty or designation given, under the on-site/ off-site emergency plan.	Residence	
				Phone No.	Address
1	2	3	4	6	7
2	Office	Mr. Ajeet Singh	Safety Head	+91 97277 06570	REFER TIME OFFICE
3	Office	Mr. Jitendra Kharia	Fire & Security	+91 70690 10457	REFER TIME OFFICE

Annexure - 30: A form to record emergency telephone calls

Part A: ESSENTIAL INFORMATION	
Details of call as reported	
Caller's Name & Designation: Date: Time: Ph. No.	
Purpose of call Is any particular advice required Immediately?	
Name of Chemicals To be spelt out clearly	
Brief description of Incident	
Fire/Explosion/Liquid spill/ Gas release	
Quantity involved	
Packaging/Storing/Handling/Using Details	
Location of incident	
Cause if known, in brief	
Part B: INFORMATION TO BE OBTAINED IF READILY AVAILABLE	
Has anyone been injured? Yes/No If Yes how many? Affected by Chemicals? Yes/No If Yes how many?	
What First-aid has been given?	
Has anyone been taken to hospital If Yes, Address of the Hospital Yes/No	
Is the roadblocked? Yes/No Closed to Traffic? Yes/No	
Who Owns the Chemicals? Has the owner been informed? Yes/No	
If caused by Vehicle, Vehicle Number_____ and Name & Address of the Owner _____ Has the Owner been informed? Yes/No To whom was the Load consigned?	

Annexure - 31: Statutory Communication

Statutory information to be given to:	Periodicity of such information to be given (statutory or self-decided)	Date of last information given	To how many persons	Suggestion received if any	Last date of information of useful suggestions
1	2	3	4	5	6
1.The Workers	Notice Board, LoudSpeakers, Cassette Player, Alarm	--	Employee presenton shift	Applicability and need of suggestions discussed in safety committee meeting ---	Implemented when received. It is an on-going process
2. The general public & neighbouring firms	Notice Board (outside) Announcement	--	To the neighbouring firms and public		---
3. District emergency Authority	By post By TelephoneTelegram	--	Copy of emergency plan	None	None
4. Factory Inspectorate	By post By Telephone	--	Do	Yes, as per remark book	It is an on-going process

Annexure - 32: Separation Distances

Sr. No.	Substance	Tank Capacity (KL)	Nos.	Separation distance (M)
1	2	3	4	5
1.	Ammonia	10000 T	Above ground tank	3 mt.
2.	CaCO3	One day stock	Above ground tank	3 mt.
3.	Ca (OH)2	One day stock	Above ground tank	3 mt.
4.	Copper	100000 T	Above ground tank	3 mt.
5.	FeSO4	50 T	Above ground tank	3 mt.
6.	Floculant	100 kg	Above ground tank	3 mt.
7.	Hydrochloric acid	1800 kg	Above ground tank	3 mt.
8.	Hydrogen peroxide	50 Ltr	Above ground tank	3 mt.
9.	Nitric Acid	500 Ltr	Above ground tank	3 mt.
10.	Phosphoric acid	12000 T	Above ground tank	3 mt.
11.	Lime	200 T	Above ground tank	3 mt.
12.	Sulphuric acid 98%	1000 T	Above ground tank	3 mt.

Note: Separation Distance of tanks has maintained in above format at safety department as per PESO Guidelines & Plot Plan Drawing approved by Chief Inspector of Factories (DISH)

Annexure - 33: Emergency Instruction Booklet

Sr. No	Role to be played as (Name emergency designation viz., incident controller, particular key person or essential worker doing the job of…)	His Emergency duties/functions (Narrate in short and clear sentences and in 1 2, 3.....)	Also refer (Other relevant document of the Factory viz. safety manual	He should report at (the incident place or control room etc)
1	2	3		4
1.	Site main Controller	Describe under Ch – 3	- - - -	ECC – Emergency Control Center
2.	Incident Controller			
3.	Dy. Incident Controller			
4.	Key personnel			
5.	ERT			
6.	Fire Fighting Team			
7.	FMO			
8.	Transport & Evacuation Organizer			
9.	Pollution Control			
10.	Siren Riser			

Note: Please see Chapter 2 for Role to be played as (name emergency designer Viz. Incident Controller, particular key person or essential worker doing the job of & His emergency duties / functions.

APPENDIXES

Annexure – 1

અ.નં.	વિગત	
૧	ઇન્ડસ્ટ્રીઝ નું નામ	M/S HINDALCO INDUSTRIES LTD (Unit: Birla Copper).
૨	ઇન્ડસ્ટ્રીઝ નું સરનામું	AT & PO DAHEJ, NEAR LAKHIGAM, GIDC INDUSTRIAL ESTATE, TA: VAGRA - 392130 BHARUCH, GUJARAT, INDIA.
૩	ઇન્ડસ્ટ્રીઝ ના જવાબદાર અધિકારી/કર્મચારીશ્રીનું મોબાઈલ નંબર તથા આધાર નંબર	Mr. Krishnaraju Kumaravel Designation: - President & Unit-Head Mo. No. 7353723000 Adhar Card No. xxxx xxxx xxxx
૪	કયા મટીરીયલ નું ઉત્પાદન કરે છે ?	As enclosed in Enc.-01
૫	કયા કાચા મટીરીયલ નો સંગ્રહ કરે છે ?	As enclosed in Enc.-02
૬	ફેકટરી માં કામ કરતા કર્મચારીઓની સંખ્યા	**5495 (Male: 5344, Female: 151)**
૭	કયા કયા મટીરીયલ ના કેટલા જથ્થાના સંગ્રહનું લાયસન્સ મેળવેલ છે.	PESO Licence No. xxxxxx, Valid Till :xxxxxxx for storage of xxxxxxx (Chem.Name)
૮	લાયસન રીન્યુ થયેલ છે કે કેમ ?	Yes, Valid Till xxxxxxxx
૯	કઈ આઇટમ નો કેટલો જથ્થો ઉપ્લબ્ધ છે ?	As enclosed in Enc.-03
૧૦	જો એક કરતા વધુ યુનિટ હોય તો યુનિટ વાર વિગતો	Not Applicable
૧૧	આ જથ્થો કઈ જગ્યાએ થી ખરીદવામાં આવે છે ?	As enclosed in Enc.-04
૧૨	ફેકટરીમાં દુર્ઘટના સમયે કેટલા પ્રમાણ માં અને કેટલા વિસ્તારમાં અસર થઈ શકે ?	As enclosed in Enc.-05
૧૩	જથ્થાને ઓલવવા માટે પાણી સિવાય કયા પદાર્થની કેટલી જરૂર પડશે ?	As enclosed in Enc.-06
૧૪	આ પદાર્થ નો જરૂરી જથ્થો કયા થી મળશે તેની વિગત	Details available at Emergency control center (ECC), Near Material Gate External- 02641 256004/05/06,Internal - 101
૧૫	દુર્ઘટના સમયે માનવ વસવાટને અસર થાય છે કે કેમ ?	Yes, at our Residential Colony
૧૬	દુર્ઘટના ના સમયે માનવ વસવાટને અસર થાય તો કેટલા વિસ્તારને, કેટલા કુટુંબોને, કેટલા લોકો ને અસર થશે ?	at Residential colony of Hindalco,approx 700 Family and morethan 3000 Peoples those who is available in Colony .

૧૭	માનવ શરીર ઉપર કયા કયા પ્રકારની શારીરીક તકલીફો જોવા મળશે ?	A small chemical exposure can cause tearing eyes and burning of the eyes, nose, throat, chest and skin. It may cause headache, sweating, blurred vision, stomach aches and diarrhea. It is common for even mild symptoms from a harmful chemical to make people feel anxious.
૧૮	દુર્ઘટના સમયે માનવ શરીર ઉપર થતી તકલીફોના નિવારણ માટે ના એન્ટી ડોટ ની વિગત	As enclosed in Enc.-07
૧૯	એન્ટી ડોટ કયા થી અને કેટલા સમય માં મળશે તેની વિગત	From Occupational Health Center (OHC) within 5 min.
૨૦	એન્ટી ડોટ ના જવાબદાર કર્મચારીશ્રી ના મોબાઈલ નંબર ની વિગત	OHC Male Nurse , Mo. No.-xxxxxxxxxx
૨૧	દુર્ઘટના સમયે કેટલા જથ્થામાં એન્ટી ડોટ ની જરૂરીયાત રહેશે	05 to 10 nos. during worst case scenario
૨૨	ઇન્ડસ્ટ્રીઝ ની નજીક આવેલ ફાયર ફાઈટર ની વિગત	As enclosed in Enc.-08
૨૩	ઇન્ડસ્ટ્રીઝ ના વોલીયેંટર્સની વિગત (નામ, સરનામા,મોબાઈલ નંબર)	As enclosed in Enc.-09
૨૪	ઇન્ડસ્ટ્રીઝ ની નજીક માં આવેલ સીફટીંગ ના સ્થળ ની વિગત (નામ, સરનામા,મોબાઈલ નંબર)	Not applicable
૨૫	નજીક માં નજીક આવેલ હોસ્પિટલ/ડોક્ટર્સ ની વિગત	RELIANCE HOSPITAL, DAHEJ- 02641-282033 M/S SAI CLINIC, JOLWA- 02641-254040, 097237708257.
૨૬	નજીક માં આવેલ મેડીકલ સ્ટોર ની વિગત	AT Dahej village & Jolva Village

સ્થળ: દહેજ

જિલ્લો: ભરૂચ

તારીખ 09.07.2023 ઇન્ડસ્ટ્રીઝના જવાબદાર અધિકારી સહી તથા સિક્કો

Enc.01

Details of Finished Product

Sr. No.	Product Name
1.	Cathode Copper
2.	Sulfuric Acid (98.4%)
3.	Oxygen (Tech)
4.	Gold
5.	Silver
6.	CC Rod
7.	Phosphoric Acid (as P2O5)
8.	DAP/NPK Fertilizer
9.	Electric Power (MW)
10.	Copper Wire (< 4 mm dia)

Enc. 02

Details of Raw Material

Sr. No.	Product Name
1.	Diesel
2.	Sulfuric Acid (98.4%)
3.	Caustic Lye (48%)
4.	Sodium Hypo chloride (10%)
5.	Ferrous Sulphate (90%)
6.	Hydrochloric acid (33%)
7.	HFO
8.	IPA (Iso propyl alcohol)
9.	Liquid oxygen 430 MT (95% Purity)
10.	Liquid Nitrogen 40MT (99% Purity)
11.	RLNG

Enc. 03

Details of RM wrt Qty.

Sr. No.	Raw Material Name	Quantity
1.	Diesel	
2.	Sulfuric Acid (98.4%)	
3.	Caustic Lye (48%)	
4.	Sodium Hypo chloride (10%)	
5.	Ferrous Sulphate (90%)	
6.	Hydrochloric acid (33%)	
7.	HFO	
8.	IPA (Iso propyl alcohol)	
9.	Liquid oxygen 430 MT (95% Purity)	
10.	Liquid Nitrogen 40MT (99% Purity)	
11.	RLNG	

Enc. 04

Details of RM wrt Qty.

Sr. No.	Raw Material Name	Material to be purchased from
	Diesel	
2.	Sulfuric Acid (98.4%)	
3.	Caustic Lye (48%)	
4.	Sodium Hypo chloride (10%)	
5.	Ferrous Sulphate (90%)	
6.	Hydrochloric acid (33%)	
7.	HFO	
8.	IPA (Iso propyl alcohol)	
9.	Liquid oxygen 430 MT (95% Purity)	
10.	Liquid Nitrogen 40MT (99% Purity)	
11.	RLNG	

Enc. 05

AFFECTED AREA

Chemical Name	Emergency Event	Weather class	Wind Speed m/s	Release	Rate of Release	Probable extent of damage (50000 ppm = LEL)
LNG Line	Flammable vapour release	F	1	Leak	1440 kg/min	3.4 meters
		F	2		1440 kg/min	676 meters
		D	3		1440 kg/min	195 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (30 ppm = AEGL-3 [60 min])**
Sulphur Dioxide	Toxic vapour release	F	1	Leak	10.3 kg/min	434 meters
		F	2		10.3 kg/min	583 meters
		D	3		10.3 kg/min	371 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (160 mg/(cu m) = AEGL-3 [60 min])**
Sulphuric Acid	Toxic vapour release	F	1	Leak	1.88 kg/min	10,000 meters
		F	2		1.88 kg/min	10,000 meters
		D	3		1.88 kg/min	10,000 meters
Chemical Name	**Emergency Event**	**Weather class**	**Wind Speed m/s**	**Release**	**Rate of Release**	**Probable extent of damage (24000 ppm = 60% LEL = Flame Pockets)**
Liquid Oxygen	Oxidization Area Vapour Cloud	F	1	Leak	0.8 kg/min	22 Meters
		F	2		0.8 kg/min	15 Meters
		D	3		0.8 kg/min	34 Meters

Enc. 06

FIRE CONTROL ARRANGEMENT

Fire Fighting System:

- **Reservoir Capacity –** Main Pump House – 3 Lacs m3
  Copper III Pump House – 600 m3
  Jetty Pump House – 600m3

- **Fire Pump House**

Sr. No.	Area	Pump	Capacity
1.	Main Pump House	Jockey Electrical Diesel	01 No. of 41m3/hr 01 No. of 410m3/hr 01 No. of 410m3/hr
2.	Copper III Pump House	Jockey Electrical Diesel	01 No. of 27m3/hr 01 No. of 273m3/hr 01 No. of 273m3/hr
3.	Jetty Pump House	Jockey Electrical Diesel	01 No. of 27m3/hr 01 No. of 273m3/hr 01 No. of 273m3/hr

2. Status of Fire Fighting System:

Sr. No.	Description	Quantity
1.	Hydrant Points	283 Nos.
2.	Riser	90 Nos.
3.	Monitor	18 Nos.
4.	4 Ways	10 Nos.
5.	Hose Box	137 Nos.
6.	Delivery Hose	500 No.
7.	Hose Reel	25 Nos.
8.	Triple Purpose Nozzle	445 Nos.
10.	Fire Extinguishers	1654 Nos.

3. Fire Protection Arrangements

- **Fire Tender –** Water Tender
  Foam Tender
  Multi Tender
- **Sprinkler System** – Gas Cylinder Storage Area
  Scrap Yard area
  HSD Tank
  IPA tank
- **Foam Based system-**
  FO tank
- **Extinguishers**

Sr. No.	Descriptions	Quantity
1	Clean Agent 04 Kg	07 Nos.
2	DCP 02 Kg	11 Nos.
3	DCP 06 Kg	780 Nos.
4	DCP 09 Kg	205 Nos.
5	DCP 25 Kg	04 Nos.
6	CO2 4.5 Kg	585 Nos.
7	CO2 6.8 Kg	07 Nos.
8	CO2 22.5 Kg	03 Nos.
9	Foam 09 Litres	36 Nos.
10	Foam 50 Litres	02 Nos.
11	Foam 60 Litres	14 Nos.
	Total	**1654 Nos.**

4. Rescue Equipments

- SCBA set – MSA & Dragger – 30 + 12 Nos.
- Descending Kit – 03 Nos.
- Cutter & Spreader – 01 No.
- Oxygen Pack – 05 Nos.
- Jel Blanket – 05 Nos.
- Fire Blanket – 05 Nos.
- Skid Stretcher – 02 Nos.
- Devit arm Rescue Kit – 01 No.
- Air Cushion Bag – 01 No.
- Portable Inflatable Light – 02 Nos.
- Tripod – 02 Nos.
- Anchorage Karamental Line 200m – 02 Nos.
- Nomex Poximity Suit – 06 Nos.
- Fire entry suit :- 03 Nos.
- Foam Compound Reserve – 2610 Litres

5. Fire Detection system

Sr. No.	Description	Quantity
1.	Gas Detector	02 Nos.
2.	Smoke Detector	70 Nos.
3.	MCP	05 Nos.

6. Emergency Siren Code

Sr. No.	Modes	Types of Sound	Duration
1.	Emergency	On 10 sec, Off 5 sec	2 Minutes – Wailing Sound
2.	All Clear	Continuous	2.5 Minutes
3.	Testing	Continuous	1 Minutes

7. Other Means of Communication in Emergency

- Telephones
- Mobile
- Walkie talkies

List of Fire Bucket Stand:

Sr. No.	Plant/ Location	No. of Bucket
12.	Raw material Warehouse	12
13.	Utility area	8
14.	Plant -1	8
15.	Plant – 2	8
16.	Plant – 3	8
17.	HT yard	3
18.	EO Tank Farm	16
19.	PO Tank Farm	8
20.	Underground storage area	12
21.	Near AG Tank area	4
22.	New Finished good Warehouse	34

Details of mutual Aid with Nearby Organizations:

Name of Address of the Factories	Approx. Dist. Kms.	Contact Person		FEE Available		PPE Available	
		Name	Phone No.	Type	Qty in No.	Type	Qty in No.
Fire Station	5 KM	Fire Officer	02641-256004/05/06	Fire tender	No.	sufficient	

Enc. 07

✓ **Antidots And Emergency Treatment-Table**

Sr. No.	Name of Chemical	Treatment/ Antidots
1	Acids	Ingestion: Give the person half to one glass of milk/water within 30 minutes of ingestion. Antacids like Aluminium hydroxide or milk of Magnesia. Do not induce vomiting. Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Inhalation: Move to fresh air. 100% oxygen. Complete rest for 24-48 hours. Note: Do not use alkali to neutralize acid
2	Acetonitrile	Cyanide antidotes: Due to delayed toxicity, repeated doses of Cyanide antidotes may be needed for acetonitrile poisoning irrespective of route of exposure. (For cyanide antidotes see below)
3	Acrylonitrile	3. Cyanide antidotes and 4. N-acetyl cysteine should be administered in by I/V route as follows150 mg/kg in 200 ml of 5% Dextrose over 60 min, then 50 mg/kg in 500 ml of 5% Dextrose over 4 hr then 100 mg/kg in 1 L of 5% Dextrose over16 hr
4	Alkali	Ingestion: Give the person half to one glass of milk/water. Do not induce vomiting Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Inhalation: Supportive treatment Note: Do not use acid to neutralize alkali
5	Ammonia	Inhalation: Move the person to fresh air Dermal/Eye exposure: Wash with plenty of water or saline for 15-20 minutes Ingestion: Give the person half to one glass of milk/water. Do not induce vomiting
6	Aniline, Nitrobenzene, Toluidine and other dye intermediates	Cyanosis occurs when methemoglobin levels exceed 15%. Give 1-2 mg/kg of 1% Methylene blue I/V slowly over a period of five minutes. Repeat doses of methylene blue may be needed. Do not exceed total dose of 7 mg/kg.
7	Antimony	A. Treatment is primarily symptomatic. There are no specific antidotes, but DMSA, D-penicillamine, BAL, and DMPS (Unithiol) have been used as chelating agents. Metallic antimony is not highly toxic and usually only causes gastrointestinal effects. Various salt forms may cause significantly more irritation, and stibine is a highly toxic, haemolytic gas.

Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

✓ **Scrubbing / Neutralising/ Inactivating Media**

Sr.no	Chemical Gases	Scrubbing, Neutralizing or Inactivating Media	Material of Construction
19.	Phosgene $COCl_2$	Caustic Soda Solution	Water scrubber of PPFRP followed by Caustic scrubber of MSRL (or Caustic scrubber alone)
20.	Chlorine Cl_2	Caustic/lime	MSRL/PP backed by FRP.
21.	Sulfur dioxide SO_2	Caustic soda solution	Polypropylene backed by FRP up to their thermal unit or SS scrubber.
22.	Ammonio gas NH_3	Water	MS
23.	Hydrochloric acid HCl	Caustic/lime	Msrl /PP backed by FRP
24.	Nitrous acid fumes	Caustic/Thiosulfate Solution/Urea.	FRP
25.	Hydrogen flu-oride HF	Water/Caustic	Teflon.
26.	Hydrocyanic acid HCN	Hypochlorite	MSEL/PP backed by FRP.
27.	Ethyl chloride C-2H5Cl	Water (poor Solubility)	--
28.	Ethylene oxide CH2-O-CH2	Water spray	MS Tower.
29.	Hydrogen sulfide H2S	17% Monoethanol amine and 83% water or Caustic.	MSRL
30.	Hydrogen H2	Ignite, use back flame arrestor	MS
31.	Propylene CH2-CH=CH2	-do-	-
32.	Ethylene CH2=CH2	-do-	-
33.	Organic gases	-do-	-
34.	Fluoride, SiF4 from acidification	Water spray	-

Sr.no	Chemical Gases	Scrubbing, Neutralizing or Inactivating Media	Material of Construction
	of phosphate rock Liquids (Acids)		
35.	a. Sulfuric acid H2SO4 b. Hydrochloric acid HCL c. Nitrate acid HNO3 (Alkalies)	Lime/Caustic/Water Lime/Caustic/Water Lime/Caustic/Water	MLSR MLSR MLSR
36.	a. Sodium hydr-oxide NaOH b. Potassium Hydroxide KOH	Water Water	MS MS

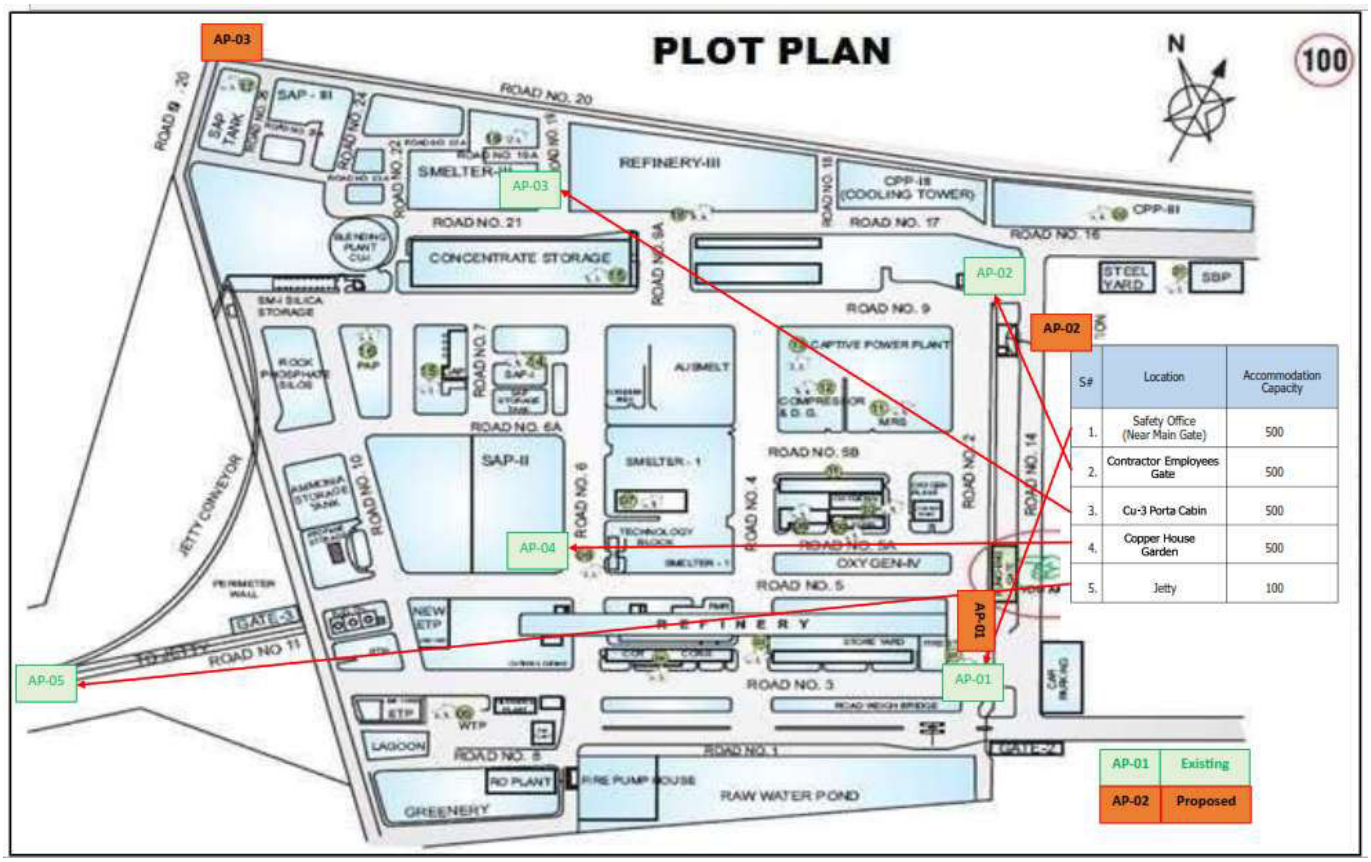
Source Site: https://dish.gujarat.gov.in (Director Industrial Safety & Health, Labour & Employment Department, Government of Gujarat)

Enc. 08

FIRE BRIGADE CONTACT INFORMATION

Sr. No.	Company Name	Contact Number
1.	RIL, DMD Fire Station	026411-016000 & 679390
2.	HIL Fire Station	9723555846 (02641)-, 662222, 662835, 662980, 662813
3.	GCPTCL Fire Station	(02641)- 261101, 261035, 9998950550
4.	PLL Fire station	(02641)- 300444,300445,300447, MCR- 300101, 300102
5.	GACL Fire station	(02641)-256315/16/17,Extn no 203/333,9979891873
6.	ONGC Dahej Plant, Fire Station	(02641) -264111/222/135
7.	OPAL Fire Station	(02641)-666101, 666555, 9099901600
8.	TPL Fire Station	02641-202500/202502 (CCR), 9099006655 (Shift Manager)

APPENDIX – 2


PLOT PLAN
N
100
AP-03
AP-02
AP-04
AP-05
AP-01
ROAD NO. 20
ROAD NO. 21
ROAD NO. 17
ROAD NO. 16
ROAD NO. 9
ROAD NO. 5
ROAD NO. 3
ROAD NO. 1
REFINERY-III
CPP-II (COOLING TOWER)
CPP-III
SMELTER-III
CONCENTRATE STORAGE
STEEL YARD
SBP
CAPTIVE POWER PLANT
AUSMELT
SMELTER - I
SAP-II
OXYGEN-IV
REFINERY
NEW ETP
ETP
WTP
LAGOON
RO PLANT
FIRE PUMP HOUSE
RAW WATER POND
GREENERY
JETTY CONVEYOR
PERIMETER WALL
GATE-3
GATE-2
S# | Location | Accommodation Capacity
1. | Safety Office (Near Main Gate) | 500
2. | Contractor Employees Gate | 500
3. | Cu-3 Porta Cabin | 500
4. | Copper House Garden | 500
5. | Jetty | 100
AP-01 | Existing
AP-02 | Proposed

ASSESSMENT ON ASSEMBLEY POINT OF PLANT PREMISES

As per above plot plan and assembly point location we just diversify all department with respect to nearby Assembly point No. in following table.

SR. NO.	Department	# of Person Ordinarily Worked	Near by Assembly Point Number
1	CPP I , II & III	35	AP-2
2	Smelter I	45	AP-4
3	Fertilizers (Dismantling activities)	500	AP-4
4	CCR I & II	30	AP-4
5	CCR III	15	AP-3
6	SAP I & III	50	AP-3
7	Refinery I	60	AP-1
8	Refinery III	60	AP-3
9	Oxygen Plant	20	AP-1

Various factors need to be considered including; size of your premises, access to the assembly point, distance from the building, other potential dangers, and the role of fire wardens in relation to fire assembly points.

This study considers six key variables in designing/revamping evacuation routes and assembly points based on relevant literature enclosed in following Table.

Five variables are related to the assembly points: minimum areas, safety from falling trees, safety from other hazards, access to assembly points, and surface conditions. Furthermore, route length is the main variable used for evaluating evacuation routes.

The variables are operationalized through a set of criteria

Sr. No.	Variable	Data	Criteria	Source or reference
Stage 1: Assembly Points				
1	Minimum area	Potential assembly point locations	Minimum space of 0.3 m2 per person with a minimum height of 200 cm.	National Fire Protection Association (NFPA) 101 of 2000 (Pratama, 2016)
2	Safety from falling trees	Location of trees	Minimum distance from trees is 6.1 m	

Sr. No.	Variable	Data	Criteria	Source or reference
3	Safety from hazards	Inundation/ flood-prone locations	Not in hazardous area.	Wiwaha, Mei, & Rachmawati, (2016); National Fire Protection Association (NFPA) 101 of 2000 (Pratama, 2016)
4	Access to assembly points	Traffic routes in the Premises	Does not share vehicle routes in case of an emergency	Safrina et al. (2015); National Fire Protection Association (NFPA) 101 of 2000 (Pratama, 2016)
5	Surface condition	Land profiles	Flat (not uneven) and non-slippery surface.	Safrina et al. (2015)
Stage 2: Evacuation Routes				
6	Route length	Roads/paths in the Premises	Shortest route	Safrina et al. (2015)

An overlay analysis was performed with possible constraining factors, namely trees and poles, inundation areas, vehicle routes, and surface conditions.

AP - 01 Safety Office (Near Main Gate)

Moreover, AP#01 indicates the unsuitable areas for shelter due to vehicle routes for FG & Other Vehicle Movements.

The disadvantage of the first assembly point (AP1) is its small area of approximately 100 m2, and fallen under the route of vehicle movements regular Road (Road No. 02 and 03 intersect) due to this surface area will decrease to accommodate employees.

Therefore, some modifications are needed (Need to relocate or Expand Horizontally towards Road # 02.)

AP - 02 Contractor Employees Gate

The second assembly point (AP2) is prone to collapsing trees and poles also having restricted Vehicle movement in case of Emergency and tree plantation (Dense and tallest Green Belt).

Therefore, some modifications are needed. (Need to Shift towards Opposite Side)

AP - 03 Cu-3 Porta Cabin

The third point (AP3) is prone to get affected if there is any gas leakage from inside the plant (i.e Refinery and Smelter – III, Moreover, in the event of an earthquake, the Surrounding structure may collapse, causing AP-3 to be inaccessible.

Therefore, some modifications are needed. (Need to Shift towards Boundary Side with Opposite wind direction I.e., North West near Road No.20)

AP - 04 Copper House Garden

The Fourth point (AP4) are meeting all requirements, considering as it is.

AP - 05 Near Jetty

The Fifth point (AP5) are also meeting all requirements, considering as it is.

Most of the Premise's roads are paved (flat surface) and marked properly, thus, are ideal for evacuation routes.

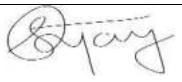
In conclusion, the modification of AP1, AP2 & AP3 is the most appropriate option for modification, and revamping assembly points for this Premises.

Client	Hindalco Industries Limited
Report Issued	30th January, 2021
Job Number	J1269
Report Number	J1269 HIL DA Rev0

DISPERSION ANALYSIS STUDY REPORT

For

HINDALCO INDUSTRIES LTD.

Report compiled by:	 Vijay S– Consulting Engineer
Checked and Approved by:	 Sunil Deshmukh – Technical Manager

Sigma-HSE (India) Pvt Ltd

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"Health, Safety and Environmental Experts"

Tel: +91 (0)11 4356 5446
Web: www.sigma-hse.com
Email: safety-india@sigma-hse.com

Date: 30th January 2021

Hindalco Industries Limited
Dahej, India

Kind Attn: Mr. Subhankar Saha,

Dear Sir,

PROJECT: DISPERSION ANALYSIS STUDY FOR BIRLA COPPER UNIT (HINDALCO INDUSTRIES LIMITED)

We are pleased to submit softcopy of the Dispersion Study Report (Rev 0) for the above captioned project. If you have any questions or comments, please contact the undersigned. If the report is to your complete satisfaction, please sign and return a copy of this letter.

Sigma-HSE thanks you for giving us the opportunity to perform this study and if we can be of any further assistance to you, do contact us.

Thanking you.

On behalf of Sigma-HSE (India)

Sunil Deshmukh
Technical Manager

Report Approval Signature
Hindalco Industries Limited

CONTENTS

EXECUTIVE SUMMARY

Sigma-HSE India Pvt. Ltd. (SHIPL) has been engaged by Hindalco Industries Limited for carrying out Dispersion Modelling for Birla copper Units (Hindalco Industries Limited), Dahej India. The present report is the document based on the design information and suitable conservative assumptions. Based on the dispersion analysis study, the conclusions of the study are reported in Section 4.3 of this report and following recommendations have been suggested:

It is observed from the Phast dispersion analysis of different industries handling flammable/toxic materials with the operating conditions and inventories provided by Hindalco that in case of occurrence of any leakage/rupture in any of the plant has no significant effect on Hindalco Industries Limited. However large leak of Ethylene oxide from Indofill industries limited (Unit-1) at 5D weather condition shall have a possible impact of toxic gas dispersion which is close to Hindalco industries limited.

It is recommended to follow emergency response plan and guidelines for safety reactions on any occurrence of toxic gas release from any of the plant. The following points are general emergency response plan:

1. Based on the hazardous substances release from any of the nearby industries or conditions present, ensure that personal protective equipment is used and is appropriate for the hazards to be encountered.
2. It is recommended to alert the operating personnel working in the plant environment in case of any information regarding the incident that occurred at nearby industries.
3. Ensure plan of action is readily available to handle such accidental scenarios from the nearby industries.
4. It is recommended to educate all the working personnel about emergency response plan and risk involved in it.

Note: This report of Dispersion analysis has been supplied in a digital format, and therefore the copy archived at Sigma-HSE server shall be considered as the primary document. This report and related files submitted should be considered as secondary documents.

1 INTRODUCTION

Birla Copper unit (Hindalco Industries Limited) operates one of the largest single location custom copper smelters in the world. The custom copper smelter at Dahej in the state of Gujarat (west coast of India) houses three copper smelters, three refineries, two rod plants, a captive power plant, a captive oxygen plant, phosphoric acid plant, di-ammonium phosphate plant, precious metal recovery plant, captive jetty and other utilities.

Hindalco produces LME grade copper cathodes, continuous cast copper rods in various sizes, and precious metals like gold and silver. Hindalco is one of the major manufacturers of 19.6mm diameter copper rods, which is used for railway electrification. The co-product, sulphuric acid, is partly utilised to produce phosphoric acid and fertilizers like di-ammonium phosphate (DAP).

Birla Copper's brands, Birla Copper and Birla Copper II, are recognized for their high purity and consistent quality in the domestic as well as global markets. Birla Copper is an ISO 9001, 14001, 27001, 50001 and OHSAS 18001 certified company, registered on the London Metal Exchange as Grade-A copper brand, and certified as a Star Trading House having labs for chemical, mechanical and electrical testing accredited by the National Accreditation Board for Laboratories (NABL).

Sigma-HSE India Pvt. Ltd. (SHIPL) has been engaged by Hindalco Industries Limited for carrying out Dispersion Modelling for Birla copper Units (Hindalco Industries Limited), Dahej India. The present report is the document based on the design information and suitable conservative assumptions.

2 SCOPE OF STUDY

The scope of work is to conduct Dispersion Modelling for Birla Copper unit (Hindalco Industries).

Birla Copper wants to understand the dispersion extent (Both toxic and flammable) and downwind ambient concentration arising due to any leakages from the storage tanks of different chemicals present at various site in the nearby vicinity and its impact on their facility.

3 METHODOLOGY

Following steps shall be followed for performing the Dispersion study:

- Review documents and identify leak sources.;

- Identification of all sensitive receptors such as common work areas, air intake points, etc.;
- Modelling of dispersion from the identified sources. The dispersion simulations for the identified cases will be undertaken.
- Based on our previous experience in undertaking these studies, Sigma-HSE propose to model two different wind speeds i.e. F-1.5m/s and D-5 m/s to cater for low and high wind conditions, which will be based on the wind rose data of the region.
- Assessment of the predicted impacts for different leak sizes.
- Provide recommendations to eliminate or mitigate unacceptable working conditions and minimise operational constraints.

3.1 FACILITY DESCRIPTION

The details of the facility and process components to be modelled were provided by the company. Based on the details a summary of identified representative leak cases was prepared and are detailed in Chapter-02.

3.2 WEATHER CONDITIONS

The consequences arising out of the release of chemicals are dependent among other things on the prevailing meteorological conditions. Following is the meteorological data of the location:

Month	Average ambient temperature °C	Average wind Velocity Km	Average relative humidity (%)
March-June	34-36	18-21.6	10
July-September	28-30	32.4-36	60
October-February	22-24	25.2-28.8	20

3.2.1 Stability Class

Dispersion of gases or vapours largely depends upon the Stability Class. Various stability classes defined as Pasquill classes are:

- A Very Unstable
- B Unstable
- D Neutral
- E Stable
- F Very Stable

The stability class for a particular location is generally dependent on:

- Time of the Day (Day or Night)
- Cloud Cover
- Season
- Wind Speed

Six stability classes (A to F) are defined; wind speed can take any one of numerous values. It may thus appear that a large number of outcome cases can be formulated by considering each of very many resulting stability class-wind speed combinations. However, number of stability - wind speed combinations that needs to be considered for formulating outcome cases in any analysis is very limited. This is because, in nature, only certain combinations of stability class and wind speed occur. Thus, for instance combinations such as A-3 m/s or B-5 m/s or F-4 m/s do not occur in nature. As a result, only 1 or 2 stabilities - wind speed combinations need to be considered to ensure reasonable completeness of QRA study. Furthermore, though wind speeds less than 1 m/s may occur in practice, none of the available dispersion models, including state-of-art ones, can handle wind speeds below 1 m/s. Fortunately, wind speed does not influence consequences as much as stability class and for a given stability class, the influence of wind speed is relatively less. On the other hand, consequences vary considerably with stability class for the same speed.

Except during the monsoon months little or no cloud cover along with the prevailing low wind velocities results in unstable conditions during the day (C or D) and highly stable conditions (E or F) at night. During 3 months of monsoons, wind velocities are higher and cloud cover present. This results in stability class of D during day and E or F during night. Stability class distribution over the year roughly works out as below:

A - B - C	17%
D	50%
E or F	33%

The following wind velocity/ stability class combinations & frequencies are used for Dispersion analysis.

D – 5 m/s

F – 1.5 m/s

4 HAZARD IDENTIFICATION

The hazardous scenarios considered in the dispersion analysis for the project facility will be identified based on the properties of the materials handled and the identification of the potential hazards in the systems which could lead to loss of containment events. A set of credible leak cases was prepared to carry out Dispersion Analysis which are listed in Table 4-1.

In any installation, main hazard arises due to loss of containment during handling of flammable liquids / gases. To formulate a structured approach to identification of hazards, an understanding of contributory factors is essential.

Operating Parameters

Potential gas release for the same material depends significantly on the operating conditions. The operating range is enough to release a large amount of gas in case of a leak / rupture; therefore the leaks and ruptures need to be considered in the risk analysis calculations.

Inventory

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard. Larger the inventory of a vessel or a system, larger is the quantity of potential release. A practice commonly used to generate an incident list is to consider potential leaks and major releases from fractures of pipelines and vessels/tanks containing sizable inventories.

Range of Incidents

Both the complexity of study and the number of incident outcome cases are affected by the range of initiating events and incidents covered. This not only reflects the inclusion of accidents and / or non-accident-initiated events, but also the size of those events. For instance, studies may evaluate one or more of the following:

- Full bore rupture of the tank
- Large Size holes

In general, quantitative studies do not include very small continuous releases or short duration small releases if past experience or preliminary consequence modelling shows that such releases do not contribute to the overall risk levels. The inventory considered for the study is as follows:

Table 4-1: List of Hazardous Scenarios (VI)

S.No	Scenario Description	Hazardous Chemical	Tank Capacity (MT)	Pressure	Temp. (^{0}C)
1.	Ineos Styrolution India Ltd	Styrene monomer	2000 4700	Ambient	<21 deg C
2.	Indofill Ind Ltd (Unit: -1)	Ethylene oxide	70	240-410 kPa	2-8 dec C
		propylene oxide	20	Ambient	<30 deg C
3.	Bharat Rasayan Ltd	Chlorine	18	5 Atm	Ambient
4.	Gujarat Alkalies And Chemicals Limited	Chlorine	1290	5 Atm	Ambient
5.	Reliance Industries Limited (Ipcl)	Chlorine	379.25	5 Atm	Ambient
		Ethylene oxide	162	240-410 kPa	2-8 dec C
		Ethylene	215.6	ambient	32 deg F
		Lpg	540	850 kpa	70 deg F
6.	Gujarat Fluorochemicals Limited	Chlorine	315	5 Atm	Ambient

S.No	Scenario Description	Hazardous Chemical	Tank Capacity (MT)	Pressure	Temp. (^{0}C)
7.	Meghamani Industries Limited	Chlorine	15	5 Atm	Ambient
8.	Payal Polyplast Pvt Ltd (Payal Group)	Chlorine	600	5 Atm	Ambient
		Sulphur dioxide	2	-	-
		Oxo-alcohol	600	-	-
9.	Petronet Lng Ltd.	Lng	592000 (M3)	0.1 to 0.24 bar	-160 Deg C
	SRF Limited	Chlorine	441.2	5 Atm	Ambient
		Hydrochloric acid	1050	Ambient	<25 deg C
10.	Sterling Auxiliaries Pvt. Ltd.	Ethylene oxide	70	240-410 kPa	2-8 dec C
		propylene oxide	20	-	<30 deg C

For the following tanks we have not received complete details, report for the following chemicals will be updated on receipt of the data in Rev 1 Report.

Note: "-" in the table is where data is missing

S.No	Scenario Description	Hazardous Chemical	Tank Capacity (MT)	Pressure	Temp. (^{0}C)
1.	Reliance Industries Limited (IPCL)	Naphtha	46617	ambient	Ambient
		Propylene	4430		Ambient
		Hexane	1650	-	-
		Ethylene dichloride	7314	-	-
		Vinyl chloride monomer	5600	-	-
		Butane	400	-	-
		Ethane/propane	2720	-	-
2.	GCPTCL	Naphtha	66262	ambient	Ambient
		Benzene	7740	-	-
		Styrene	10504	-	-
		Butadiene	2961	-	-

S.No	Scenario Description	Hazardous Chemical	Tank Capacity (MT)	Pressure	Temp. (^{0}C)
		Propane	26285	-	-
		Sulphur dioxide	2	-	-
		Oxo-alcohol	600	-	-
	SRF Limited	Methanol	37	-	-
		Ethanol	45	-	15-25 deg C
		Bromine	40	-	-
		Acetonitrile	50	-	-
		Ethylene dichloride	558	-	-

5 CONSEQUENCE CALCULATIONS

In Dispersion analysis, several calculation models is made use to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects.

Consequential Effects

- Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
- Intensity of heat radiation [in kW/ m2] due to a fire, as a function of the distance to the source.
- Energy of vapour cloud explosions [in N/m2], as a function of the distance to the distance of the exploding cloud.
- Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

5.1 DAMAGE CRITERIA

In Dispersion analysis, use is made of a number of calculation models to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

a) Determination of the source strength parameters;
b) Determination of the consequential effects;
c) Determination of the damage or damage distances.

In Dispersion Analysis studies, in principle two types of exposure to hazardous effects are distinguished:

1. Toxic Dispersion
2. Flammable Dispersion/ Flash Fire

Toxic Dispersion & Effects

Toxic chemicals enter the body in three ways

1) Inhalation

2) Ingestion
3) External Contact

Generally; gases, vapours and fumes are inhaled and liquids and solids are ingested.

Effects of Exposure

The effects of exposure to toxic chemicals may be acute or toxic. Acute effects result from single exposure to a high concentration of the chemical; chronic effects result from exposure to low concentrations, perhaps over a large part of a working lifetime. The effects of acute exposure of toxic chemicals include:

1) Irritation
2) Narcosis
3) Asphyxiation
4) Systematic damage

Note: Chronic Exposures are not considered in RA.

A statistical method of assessing a consequence of exposure to toxic chemicals is the dose-response method. This is coupled with a probit equation to linearize the response.

Probit Equation:

$$Pr = A + B \ln (C^N T)$$

where A, B and N are probit constants, C is the conc. in ppm is calculated with Toxic Averaging Time, and T is the duration of exposure in minutes, which have been used by the software for calculating the probability of fatality at different locations.

Considering the guidelines being followed at the plant, following levels of toxic exposure were considered in analysis and are reported within this document.

Table 5-1: Damage Criteria for Toxic Dispersion

Toxic Exposure Characterization	Concentration Value (ppm)
ERPG-1 (emergency response planning guidelines, as per statutory requirements) for an exposure for 01 hours	25
IDLH (immediately dangerous to life or health) for an exposure of 30 minutes	500
ERPG-3 (emergency response planning guidelines, as per statutory requirements) for an exposure of 15 minutes	1000

Flammable Dispersion

The flammable dispersion hazard is characterized by the flammability limits and the associated distances. The distances associated with flammable dispersion (0.5LFL, LFL and UFL) will be provided in this report.

5.2 HOLE SIZE DISTRIBUTION

A review of P&IDs provided were carried out to identify the possible cases of leak from the different process equipment of different leak/ release sizes. Based on this review and internationally accepted practices of physical effects modelling following hole size distribution is considered for the study.

- Large: 100mm
- Catastrophic Rupture of tanks

5.3 DISPERSION ANALYSIS CALCULATIONS

This section documents the consequence-distance calculations. In general, a very stable atmosphere (Pasquill class F) and a low wind speed (1.5 m/s) is considered. These conditions result in the lowest dispersion velocity & consequently in the highest vapour concentrations and the largest damage distances. Less pessimistic assumptions (e.g. neutral weather, wind speed 3 m/s), which are generally the more average conditions, results in smaller damage distances.

DISPERSION ANALYSIS CALCULATIONS

Sc# 1. INEOS Styrolution India Ltd

Flash Fire Distances

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Styrene monomer storage tank-1	Large	1.5F	12.8016	13.7766
		5D	9.42618	9.85178
	FBR	1.5F	14.3136	14.3242
		5D	16.6091	16.6203
Styrene monomer storage tank-2	Large	1.5F	12.8016	13.8741
		5D	7.55726	7.56159
	FBR	1.5F	19.7857	19.7996
		5D	22.4595	22.4636

Sc# 2. Indofill Ind Ltd (unit: -1)

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Ethylene oxide storage tank	Large	1.5F	NA	5268.43	1078.31	NA	NA
		5D	NA	3057.07	682.068	NA	NA
	FBR	1.5F	NA	3742.09	1307.88	NA	NA
		5D	NA	2816.84	549.342	NA	NA
Propylene oxide storage tank	Large	1.5F	2405.6	676.426	464.707	NA	NA
		5D	1453.31	534.988	277.926	NA	NA
	FBR	1.5F	2074.73	740.612	494.604	NA	NA
		5D	1103.54	345.491	264.644	NA	NA

Figure 1: Cloud Foot Print of Leakage from Ethylene Oxide storage tank

Figure 2: Cloud Foot Print of Leakage from Proylene Oxide storage tank

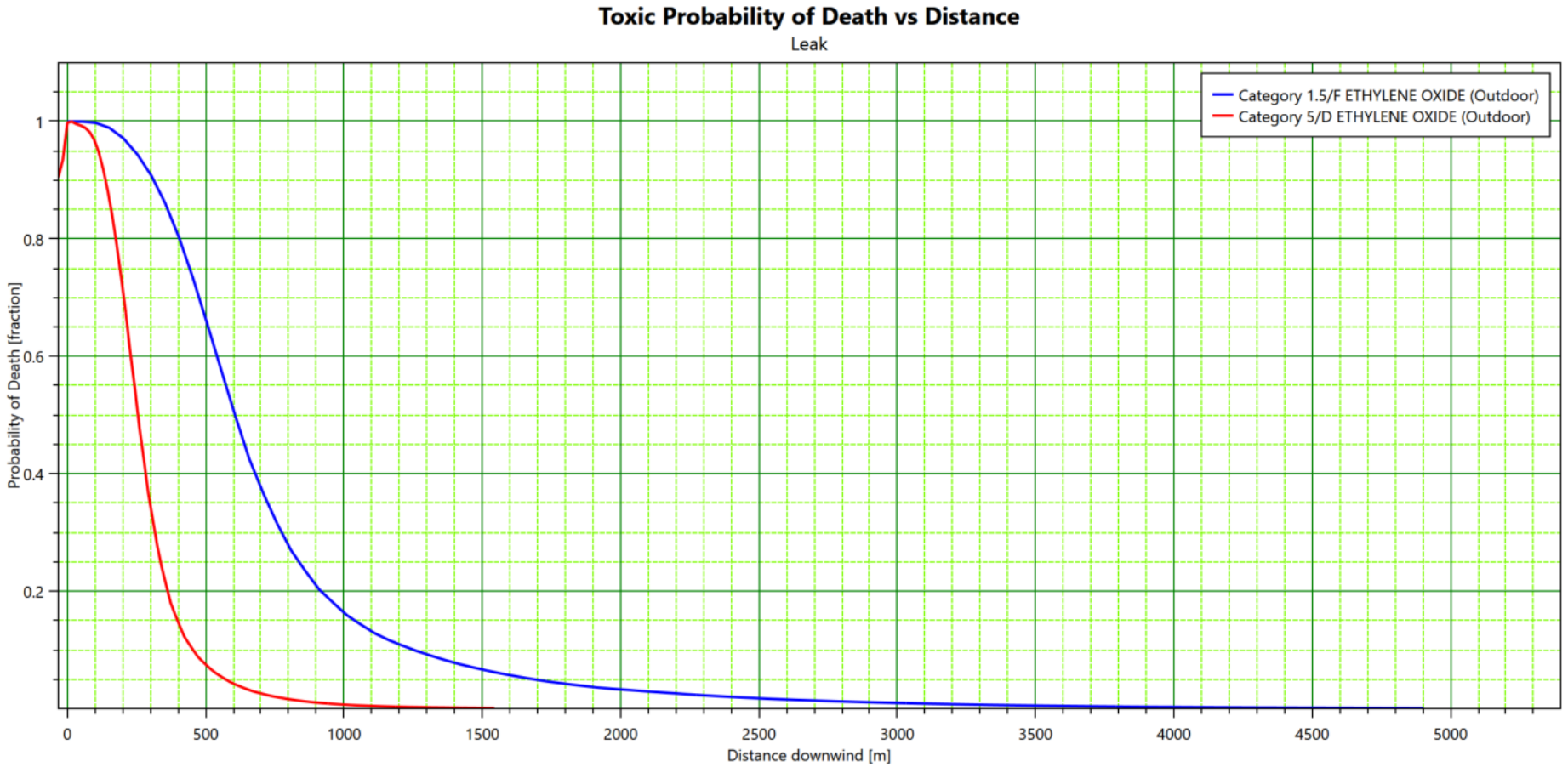

Figure 3: Toxic Probability of Death Vs Distance (Ethylene Oxide)

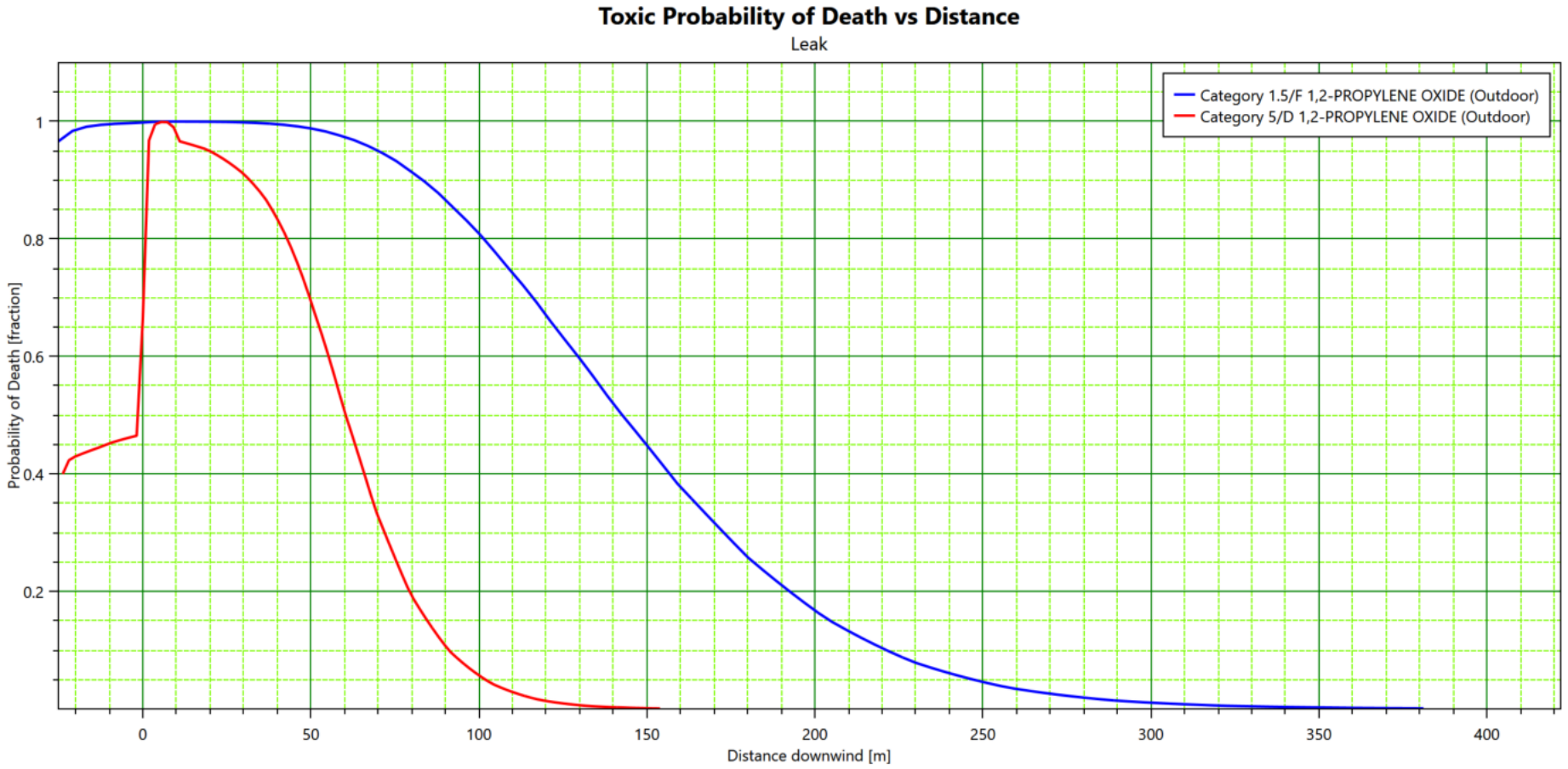

Figure 4: Toxic Probability of Death Vs Distance (Propylene Oxide)

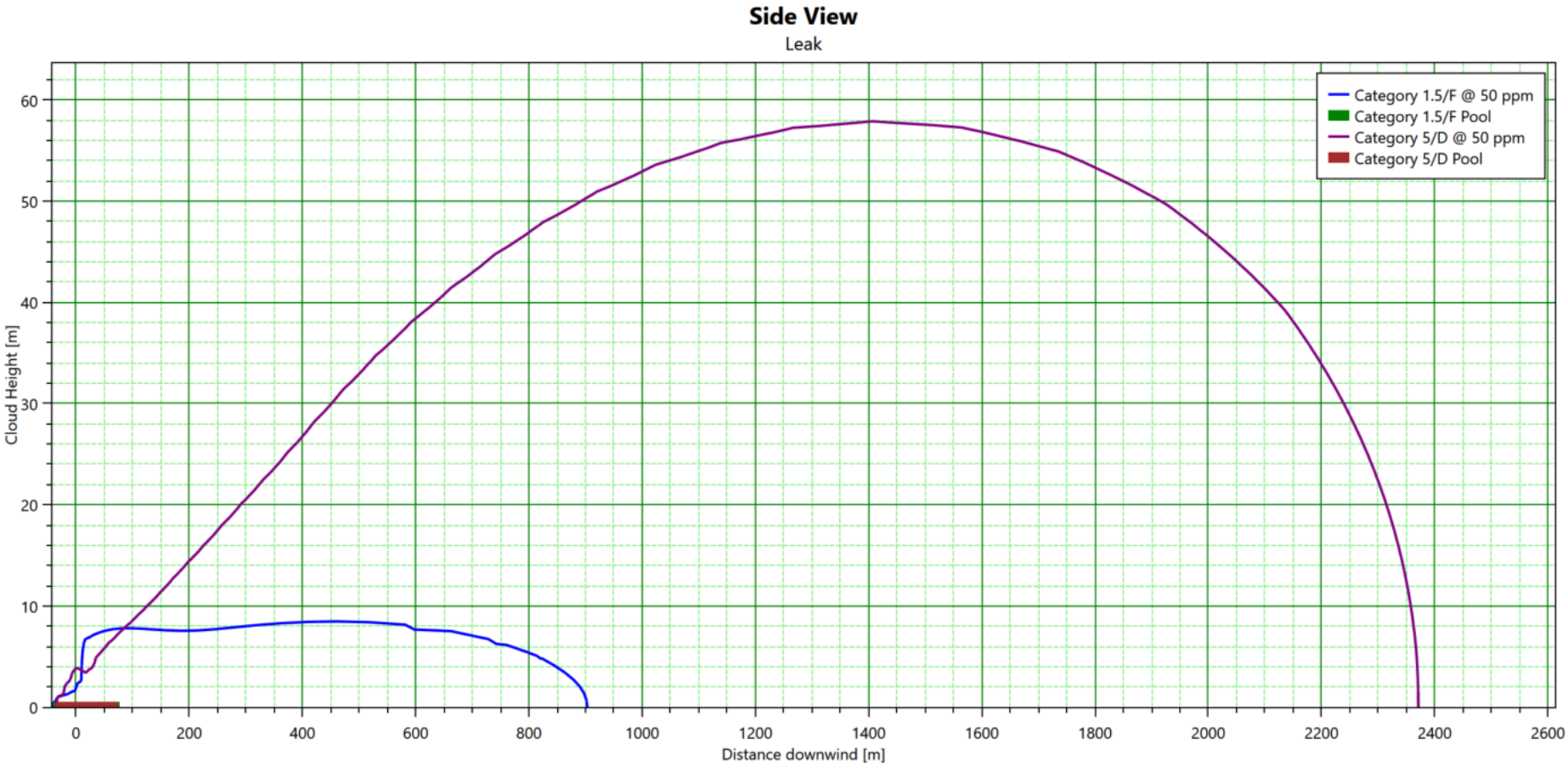

Figure 5: Toxic Dispersion Side View (Ethylene Oxide)

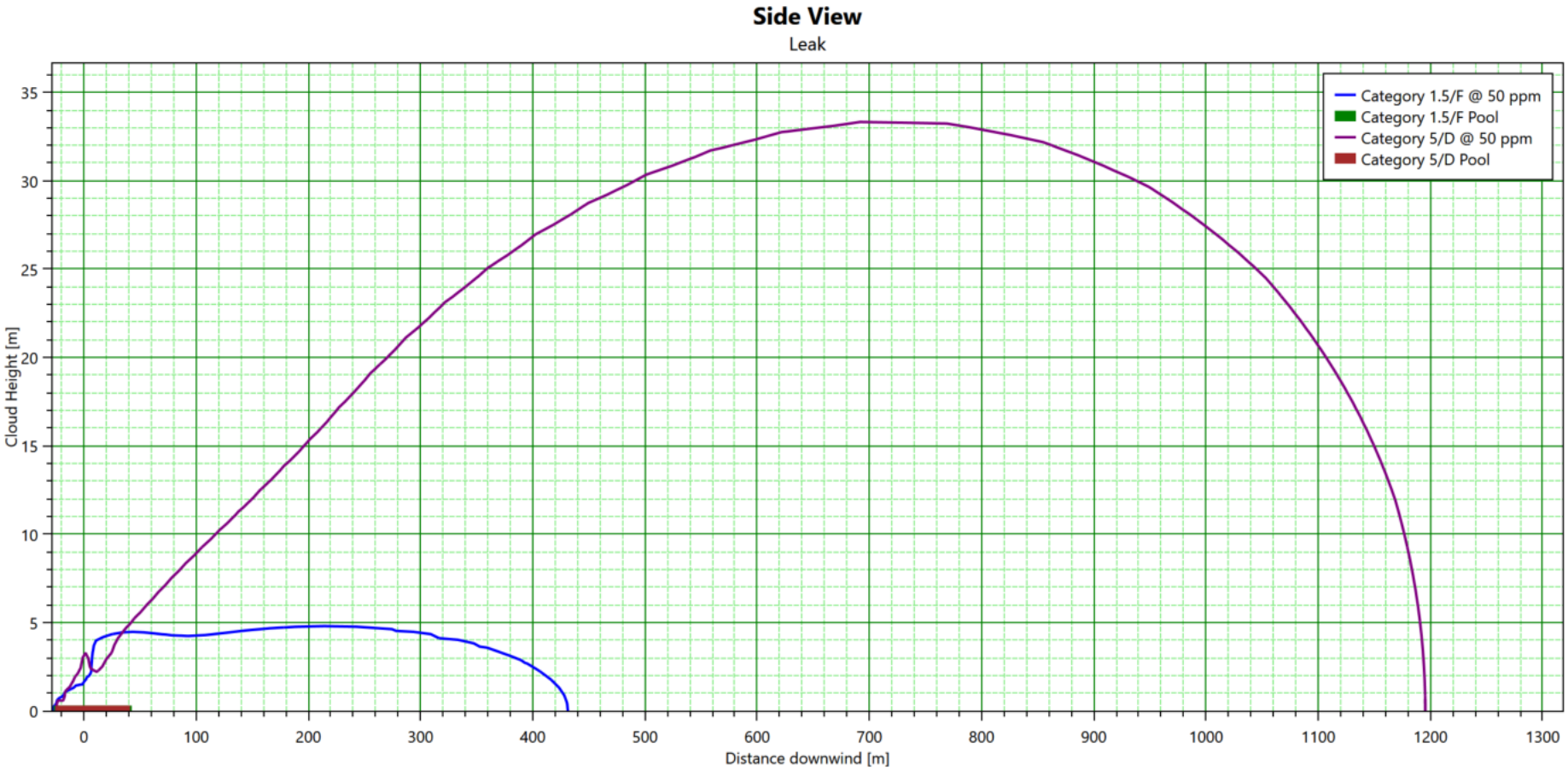

Figure 6: Toxic Dispersion Side View (Propylene Oxide)

Flash Fire Distances

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Ethylene Oxide storage tank-1	Large	1.5F	232.387	381.162
		5D	125.944	189.723
	FBR	1.5F	188.818	278.81
		5D	133.526	184.389
Propylene oxide storage tank-2	Large	1.5F	175.175	241.251
		5D	80.8433	121.656
	FBR	1.5F	110.042	149.692
		5D	97.0229	133.115

Sc# 3. Bharat Rasayan Ltd

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5773.87	3195.93	NA	NA	NA
		5D	5497.38	3495.08	1576.91	NA	NA
	FBR	1.5F	12985.3	6054.29	1145.43	NA	NA
		5D	5315.89	3225.99	1243.71	NA	NA

Figure 7: Cloud Foot Print of Leakage from Chlorine storage tank at 1.5F weather condition

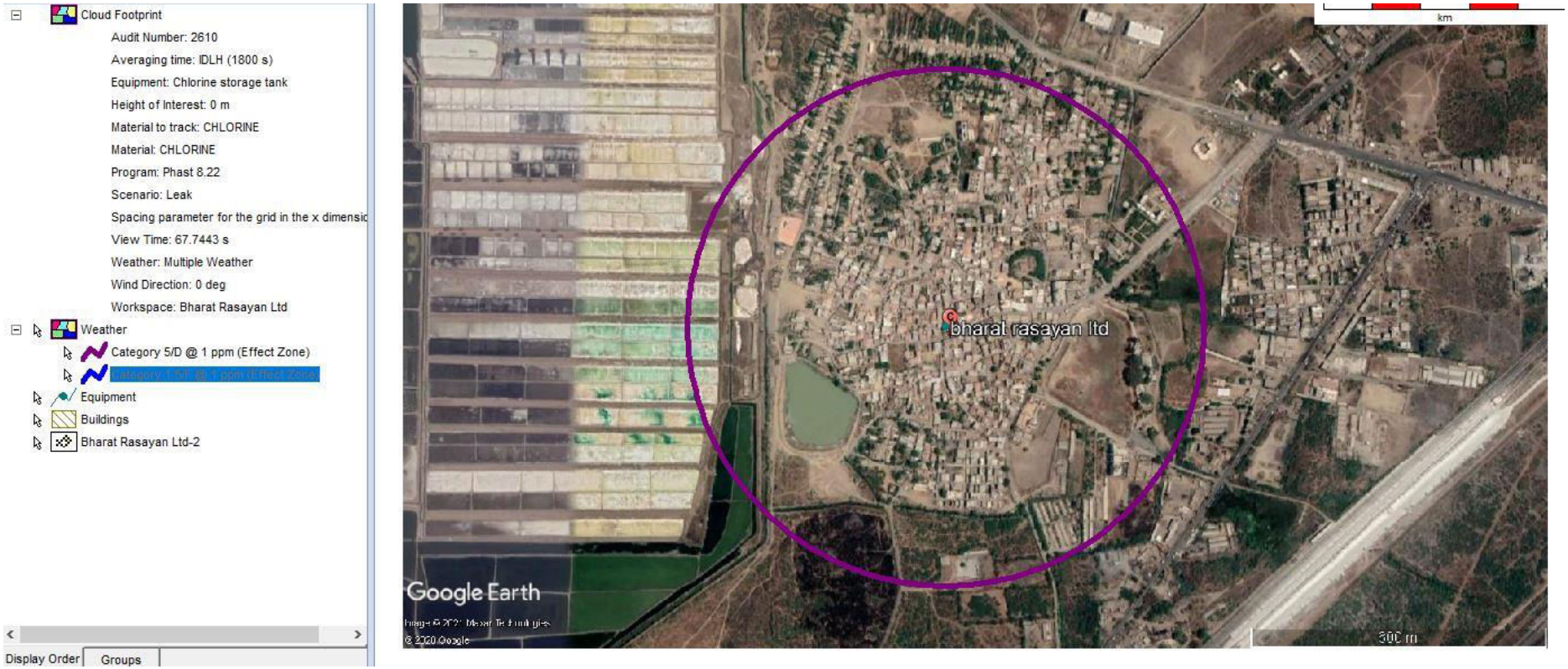

Figure 8: Cloud Foot Print of Leakage from Chlorine storage tank at 5D weather condition

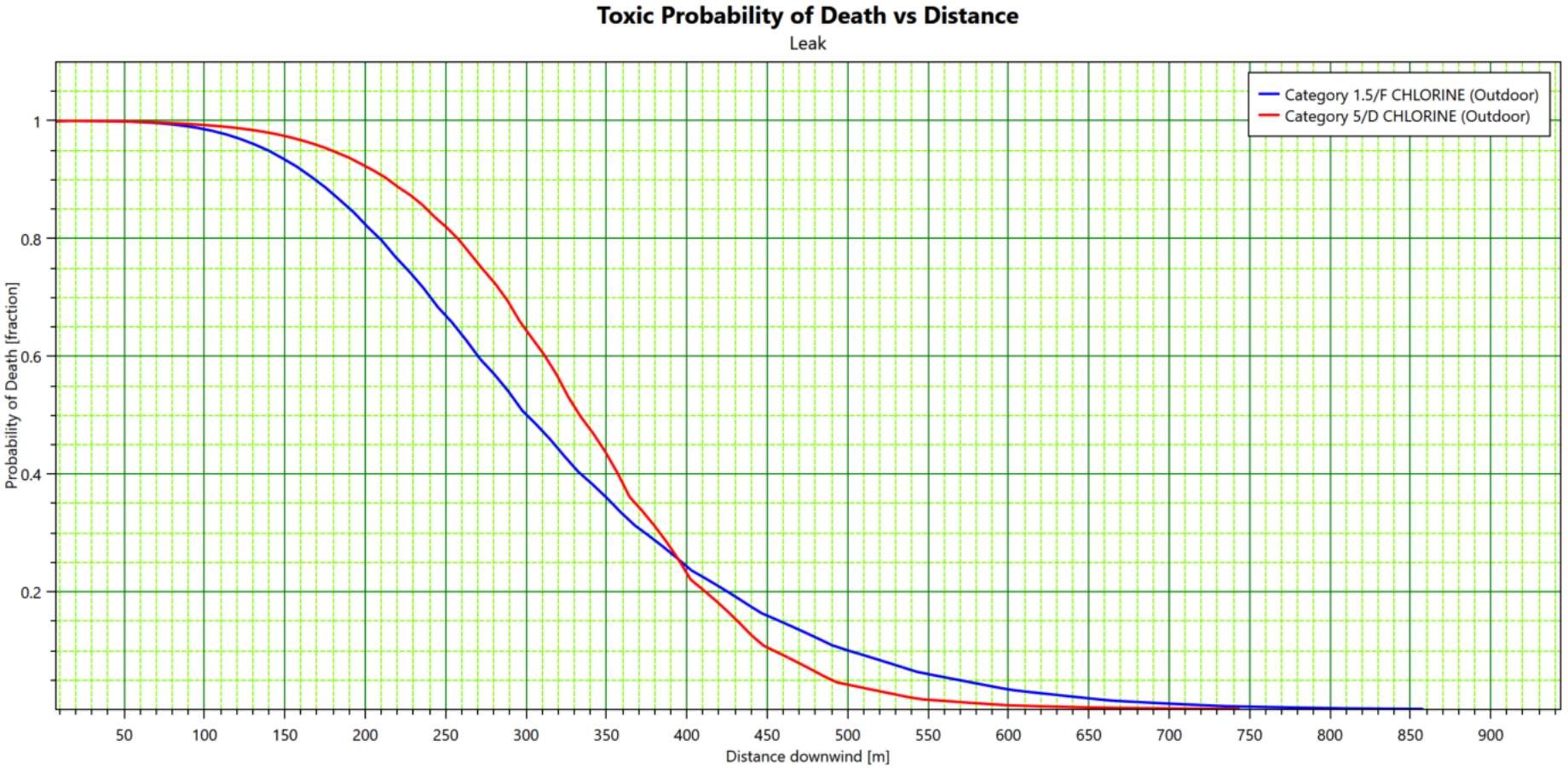

Figure 9: Toxic Probability of Death Vs Distance (Chlorine)

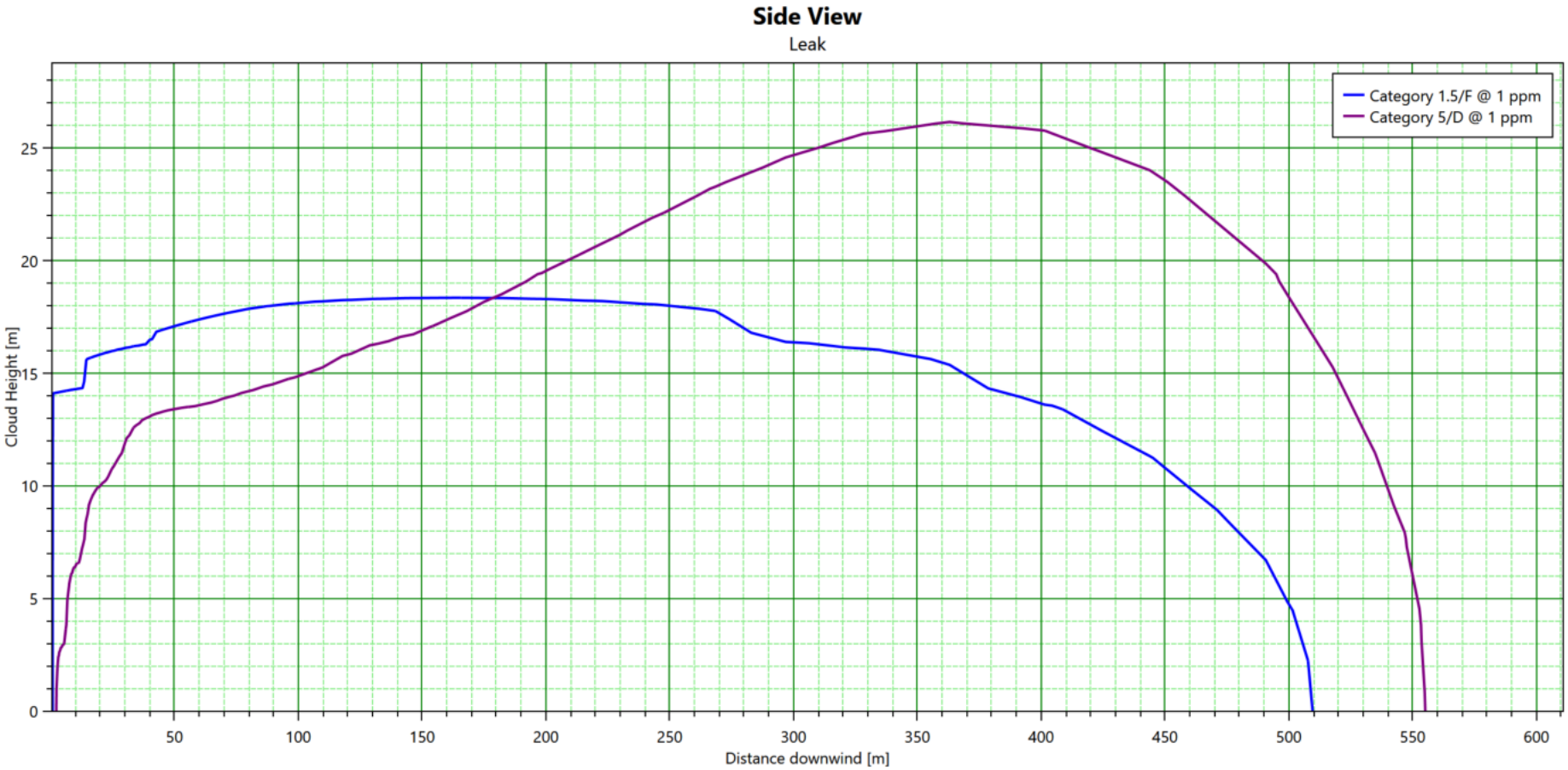

Figure 10: Toxic Dispersion side view (Chlorine)

Sc# 4. Gujarat Alkalies and Chemicals Limited

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5773.87	3195.93	NA	NA	NA
		5D	5497.38	3495.08	1576.91	NA	NA
	FBR	1.5F	12985.3	6054.29	1145.43	NA	NA
		5D	5315.89	3225.99	1243.71	NA	NA

Figure 11: Cloud Foot Print of Leakage from Chlorine storage tank at 1.5F weather condition

Figure 12: Cloud Foot Print of Leakage from Chlorine storage tank at 5D weather condition

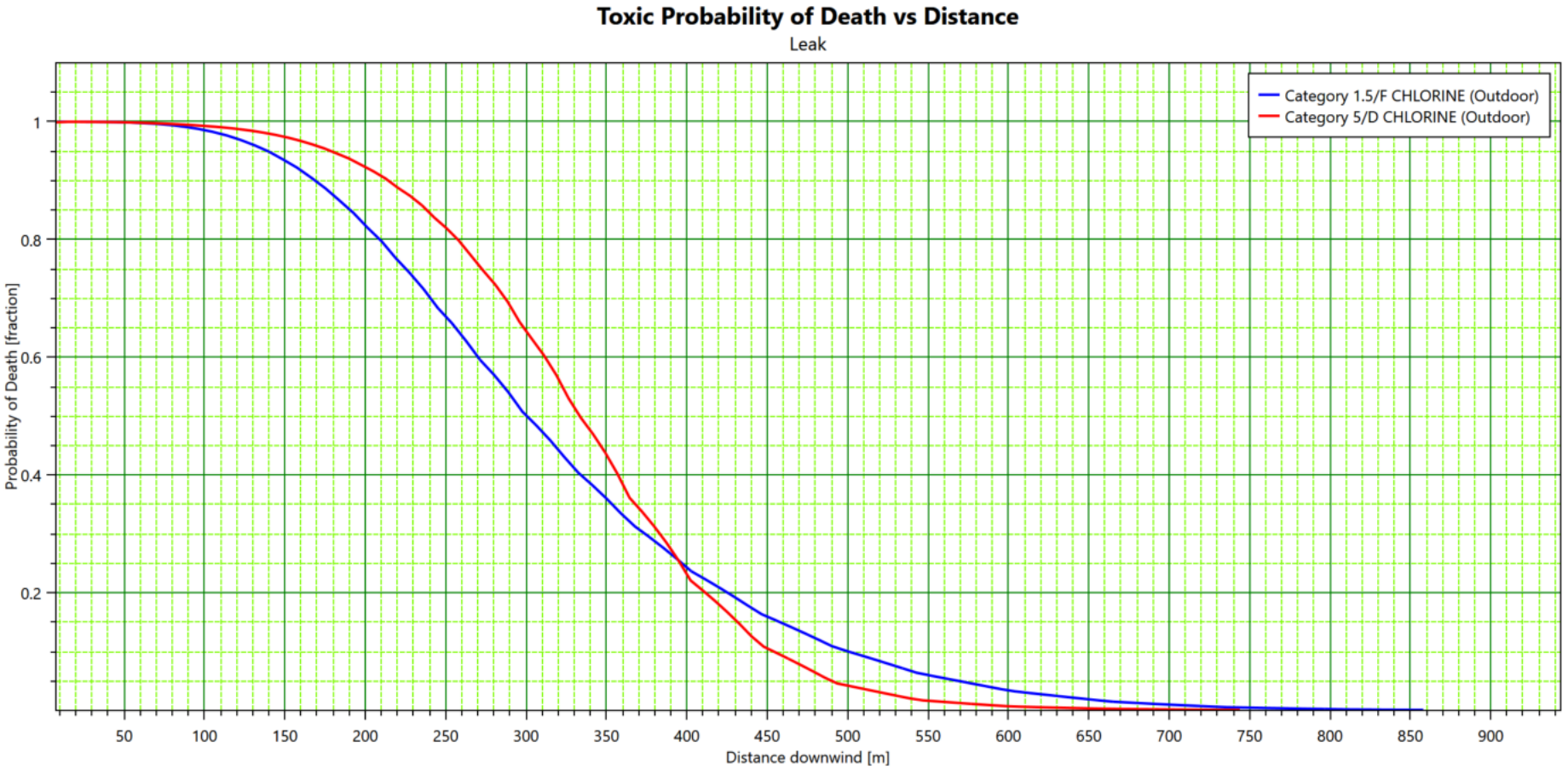

Figure 13: Toxic Probability of Death Vs Distance (Chlorine)

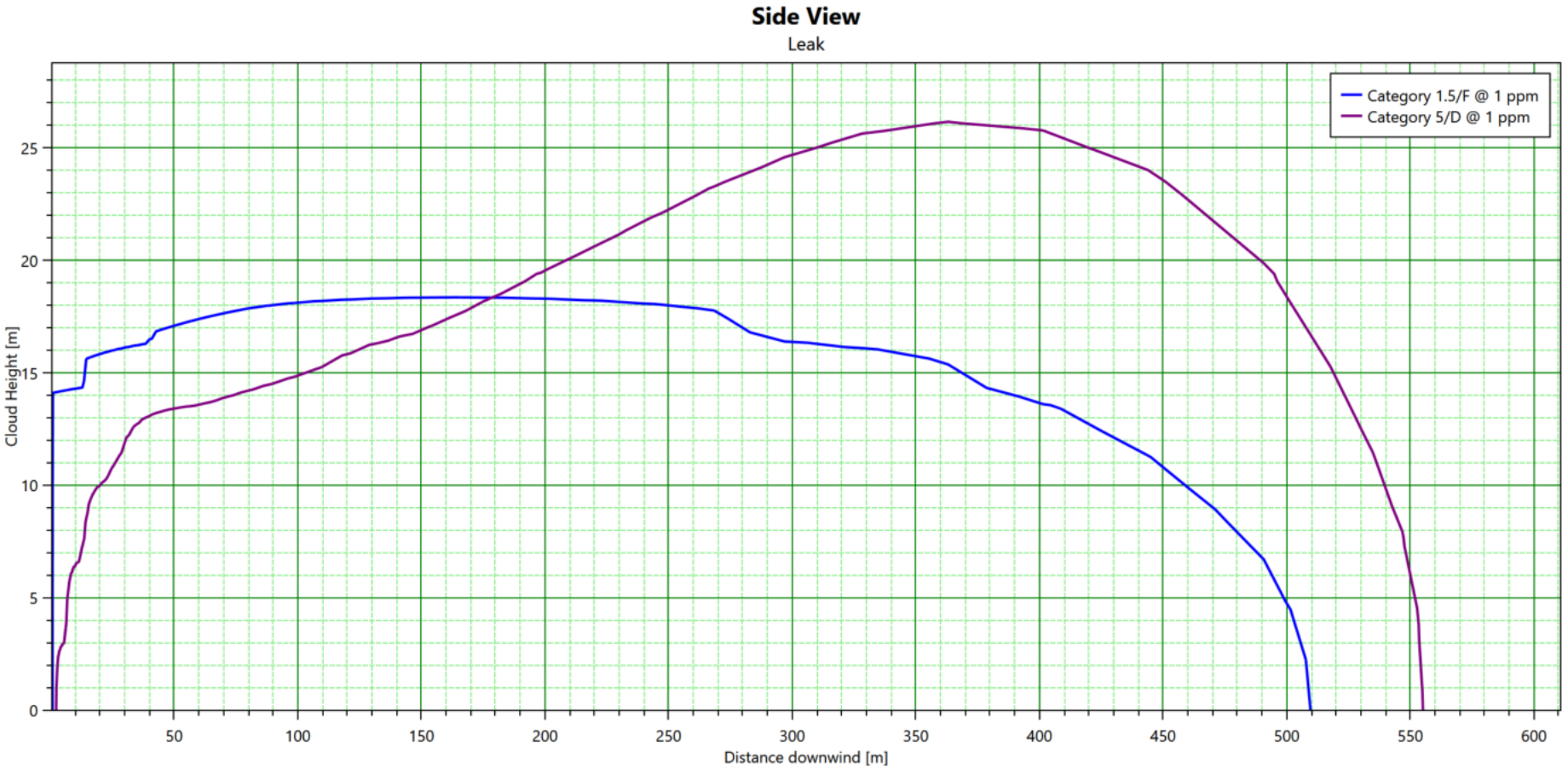

Figure 14: Toxic Dispersion side view (Chlorine)

Sc# 5. Reliance Industries Limited (IPCL)

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5810.39	3236.62	NA	NA	NA
		5D	5532.76	3516.78	1584.1	NA	NA
	FBR	1.5F	13069.2	6088.72	1149.89	NA	NA
		5D	5339.21	3245.94	1250.26	NA	NA
Ethylene oxide storage tank	Large	1.5F	1	7559.04	1508.99	NA	NA
		5D	NA	3672.2	766.468	NA	NA
	FBR	1.5F	NA	4720.72	1954.85	NA	NA
		5D	NA	4172.23	780.244	NA	NA

Flash Fire Distances

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Ethylene Oxide storage tank	Large	1.5F	334.493	497.082
		5D	135.584	207.122
	FBR	1.5F	286.341	423.143
		5D	160.244	218.817
Ethylene storage tank	Large	1.5F	19.8808	55.569
		5D	NA	51.3183
	FBR	1.5F	597.551	1035.42
		5D	658.387	1308.92
LPG storage tank	Large	1.5F	258.122	547.099
		5D	292.581	444.273

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
	FBR	1.5F	1127.87	1419.48
		5D	770.236	1020.36
Propylene storage tank	Large	1.5F	14.4569	46.9708
		5D	NA	41.3158
	FBR	1.5F	2465.88	3438.11
		5D	2153.79	2932.66

Sc# 6. Gujarat Fluro chemicals Limited

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5773.87	3195.93	NA	NA	NA
		5D	5497.38	3495.08	1576.91	NA	NA
	FBR	1.5F	12985.3	6054.29	1145.43	NA	NA
		5D	5315.89	3225.99	1243.71	NA	NA

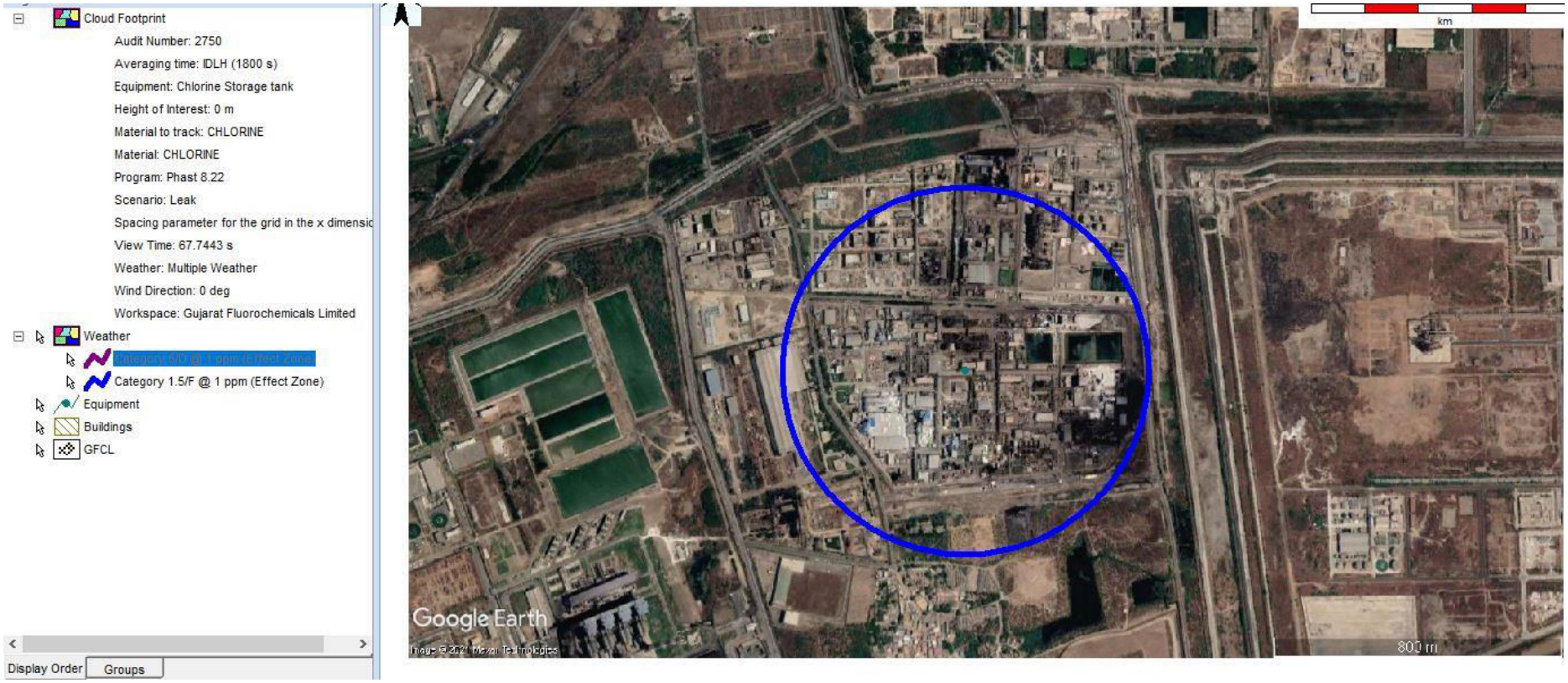

Figure 15: Cloud Foot Print of Leakage from Chlorine storage tank at 1.5F weather condition

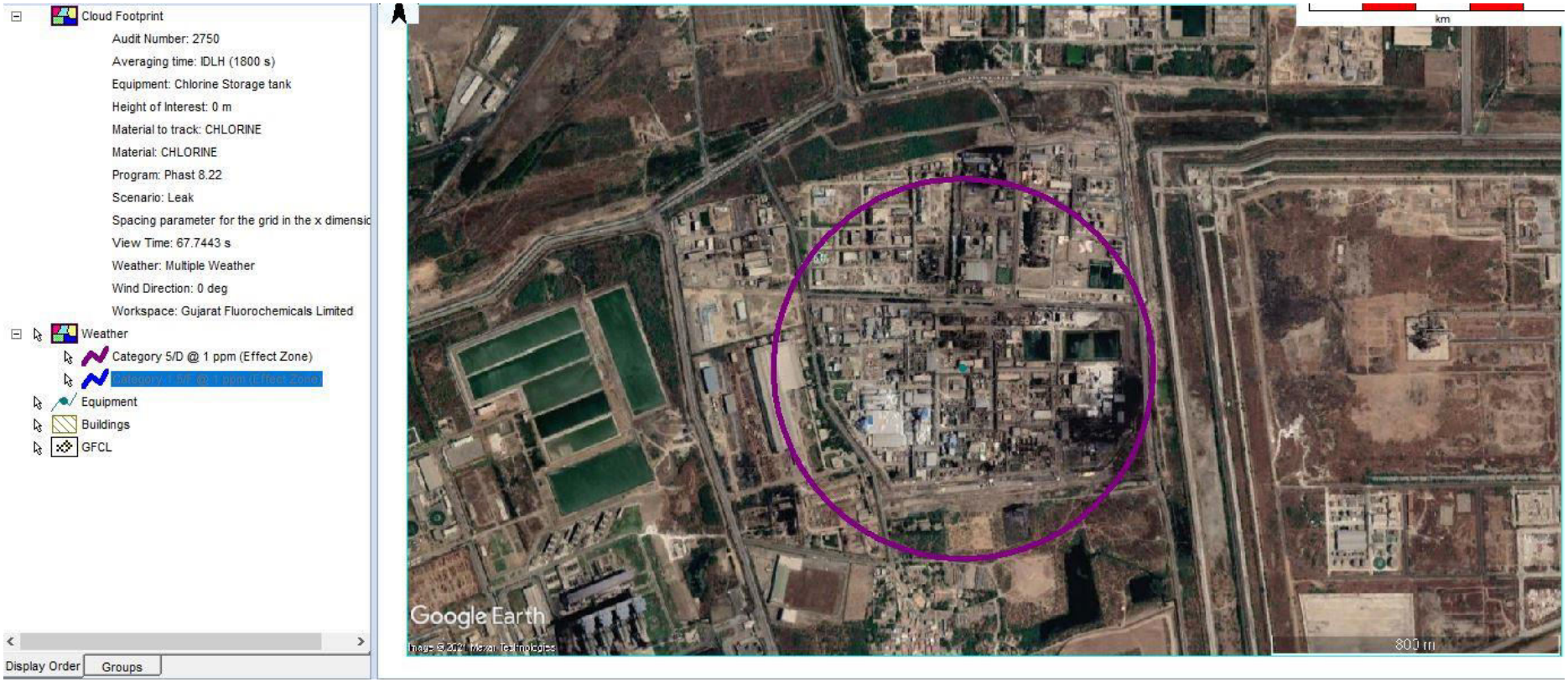

Figure 16: Cloud Foot Print of Leakage from Chlorine storage tank at 5D weather condition

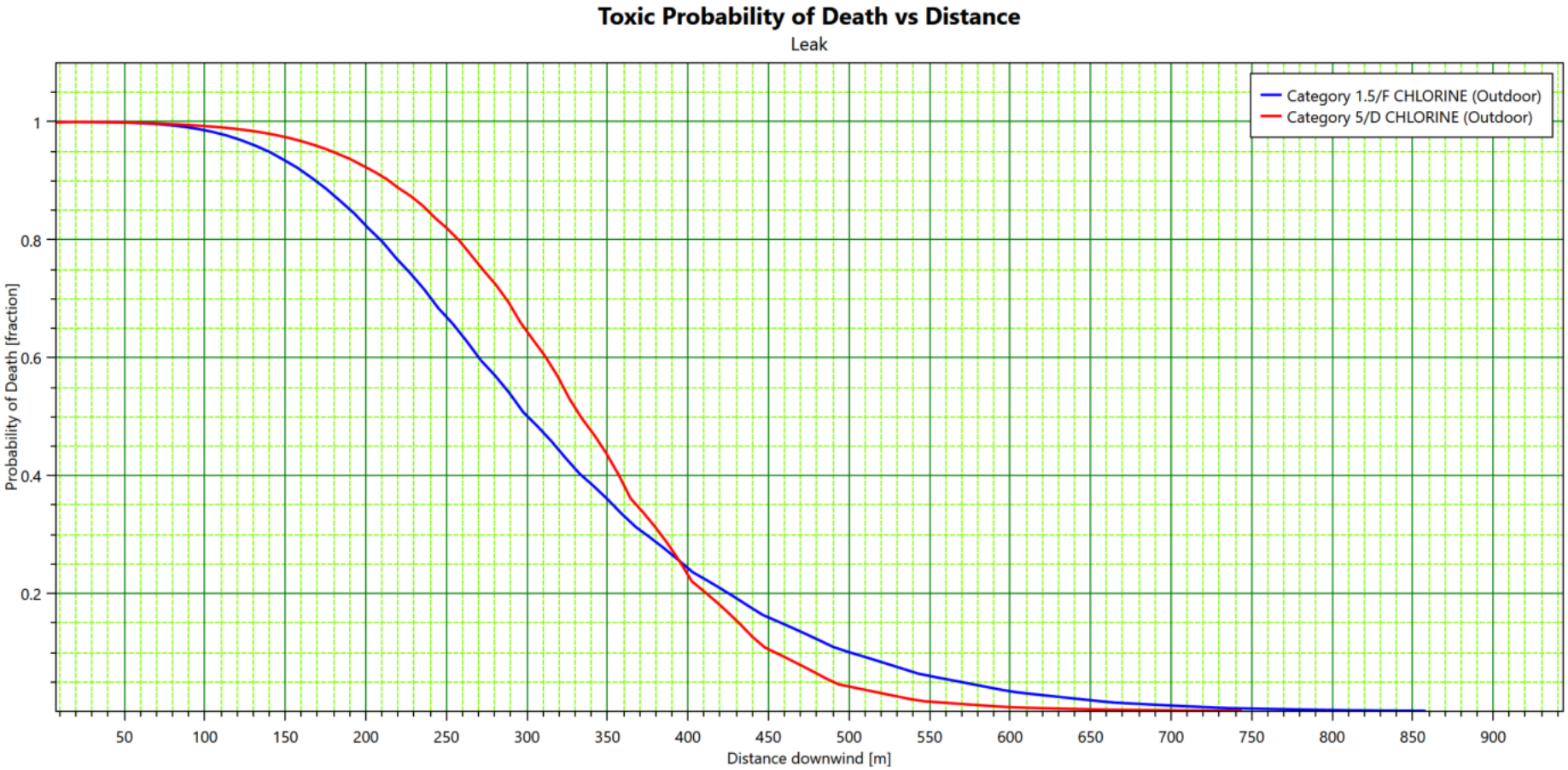

Figure 17: Toxic Probability of Death Vs Distance (Chlorine)

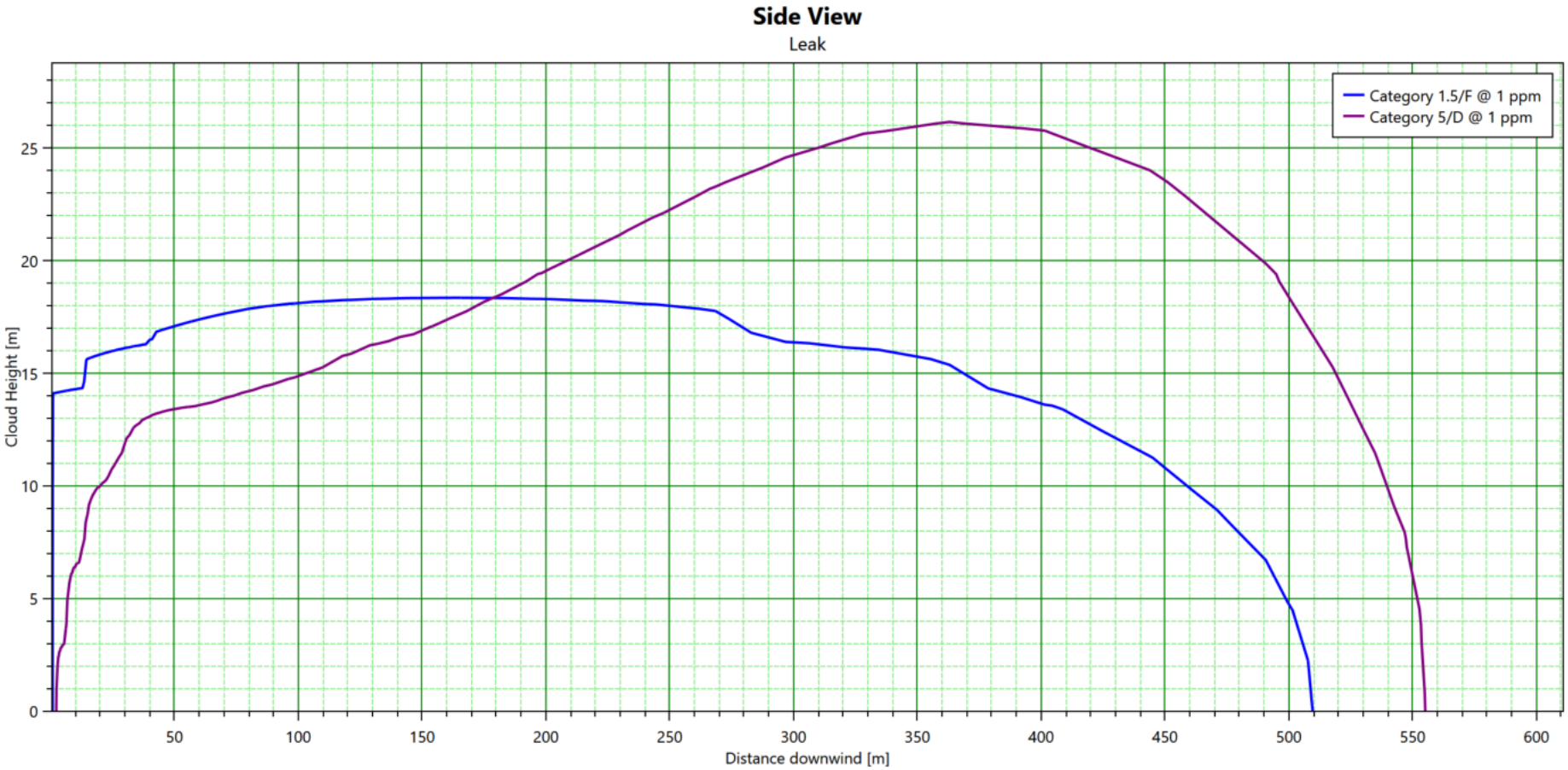

Figure 18: Toxic Dispersion side view (Chlorine)

Sc# 7. Meghamani industries Limited

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5773.87	3195.93	NA	NA	NA
		5D	5497.38	3495.08	1576.91	NA	NA
	FBR	1.5F	12985.3	6054.29	1145.43	NA	NA
		5D	5315.89	3225.99	1243.71	NA	NA

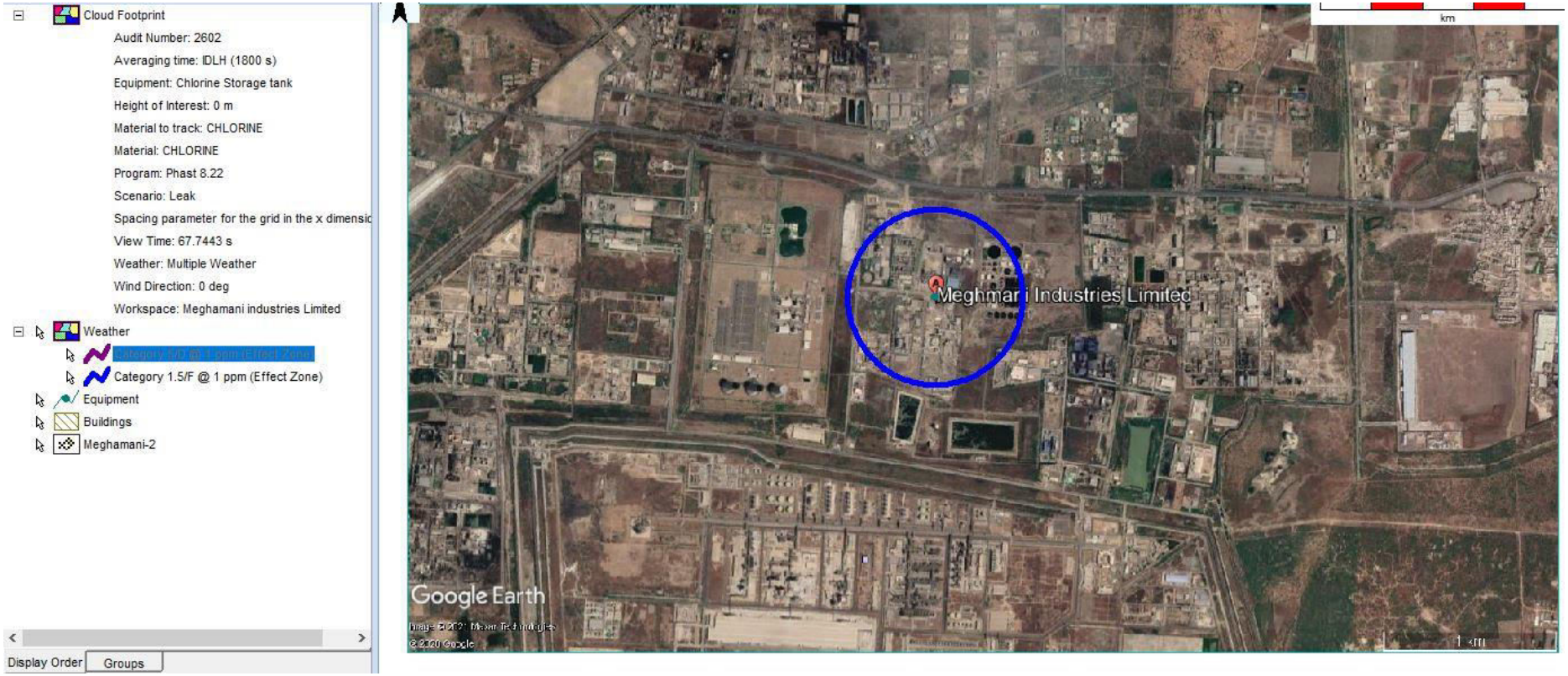

Figure 19: Cloud Foot Print of Leakage from Chlorine storage tank at 1.5F weather condition

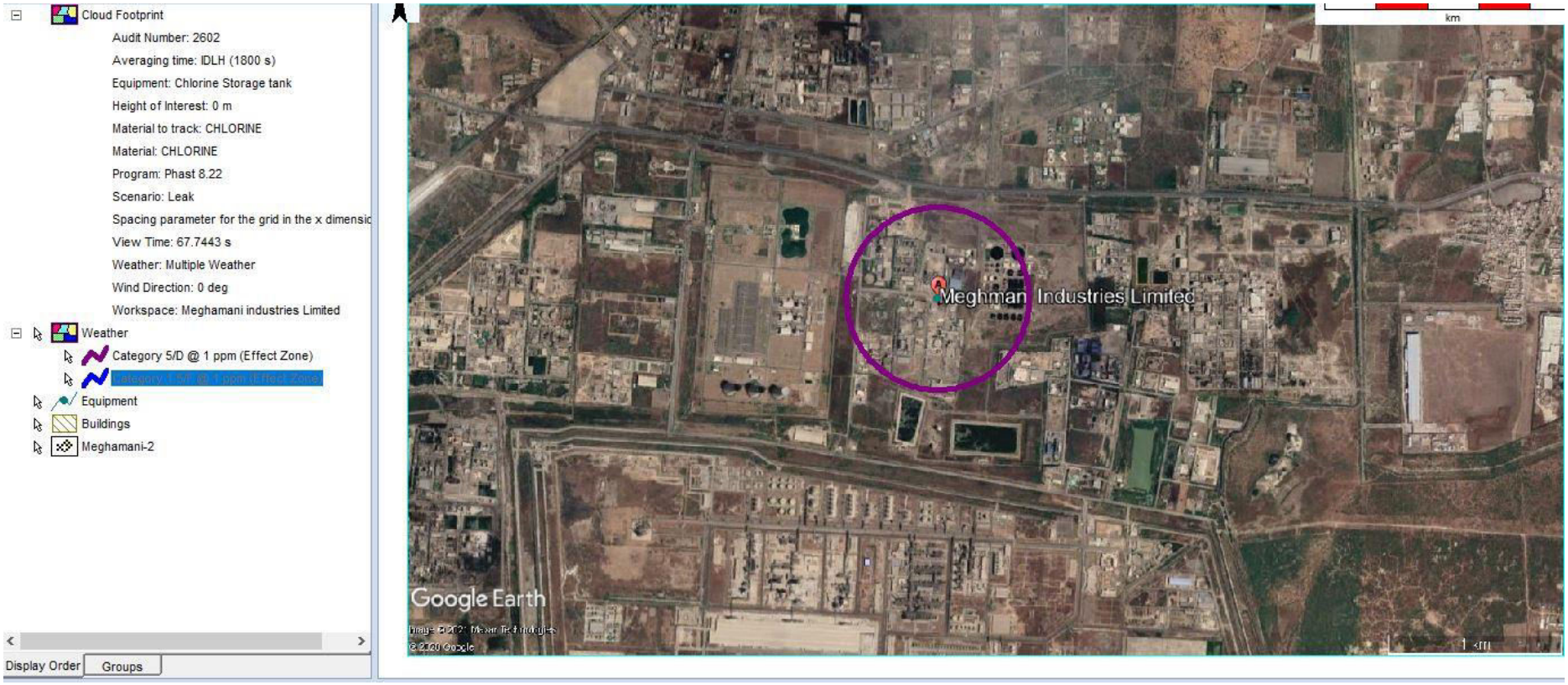

Figure 20: Cloud Foot Print of Leakage from Chlorine storage tank at 5D weather condition

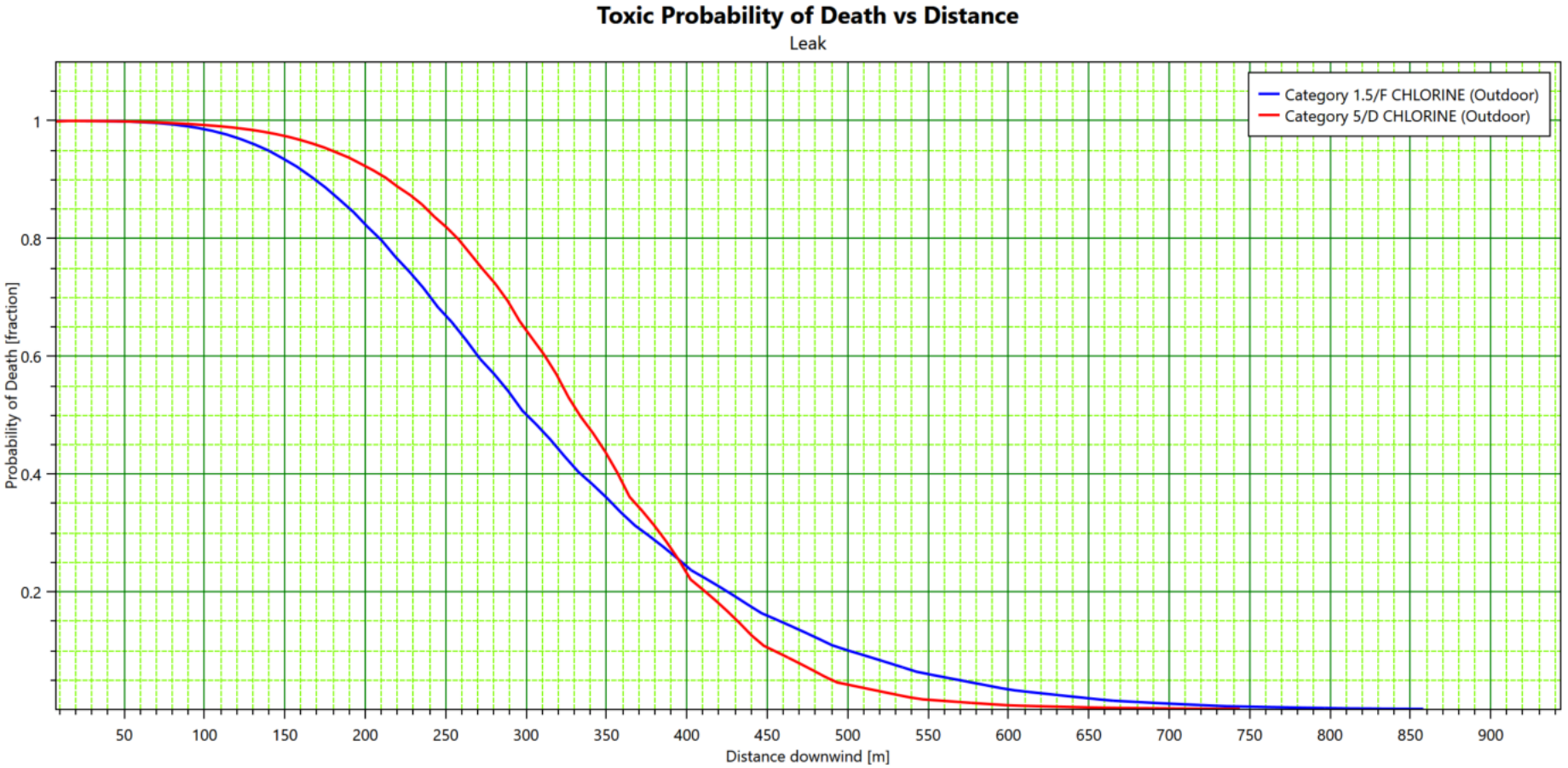

Figure 21: Toxic Probability of Death Vs Distance (Chlorine)

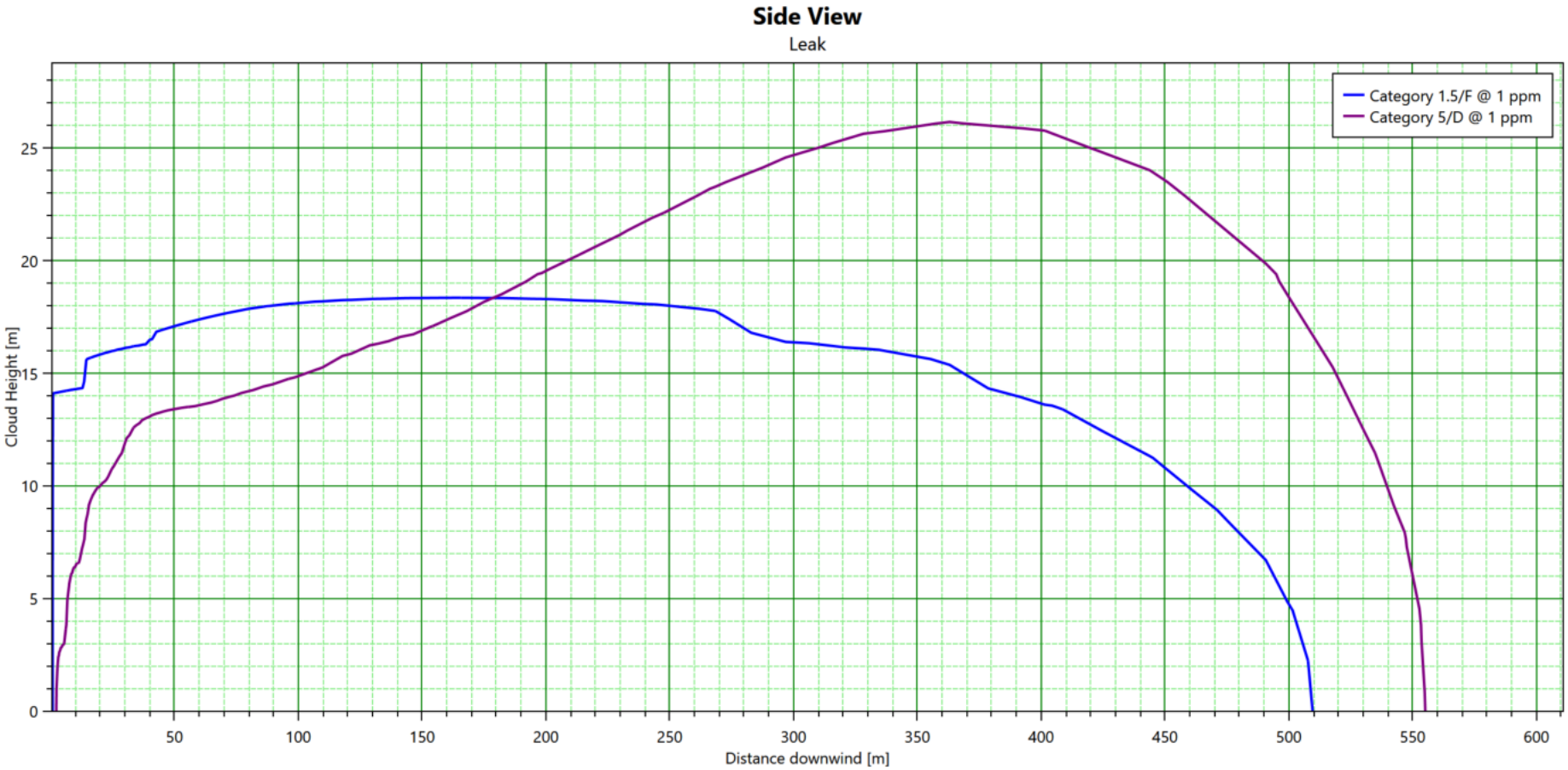

Figure 22: Toxic Dispersion side view (Chlorine)

Sc# 8. Payal Polyplast Pvt Ltd (Payal Group)

Toxic Dispersion – Outdoor

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Chlorine storage tank	Large	1.5F	5773.87	3195.93	NA	NA	NA
		5D	5497.38	3495.08	1576.91	NA	NA
	FBR	1.5F	12985.3	6054.29	1145.43	NA	NA
		5D	5315.89	3225.99	1243.71	NA	NA

Figure 23: Cloud Foot Print of Leakage from Chlorine storage tank at 1.5F weather condition

Figure 24: Cloud Foot Print of Leakage from Chlorine storage tank at 5D weather condition

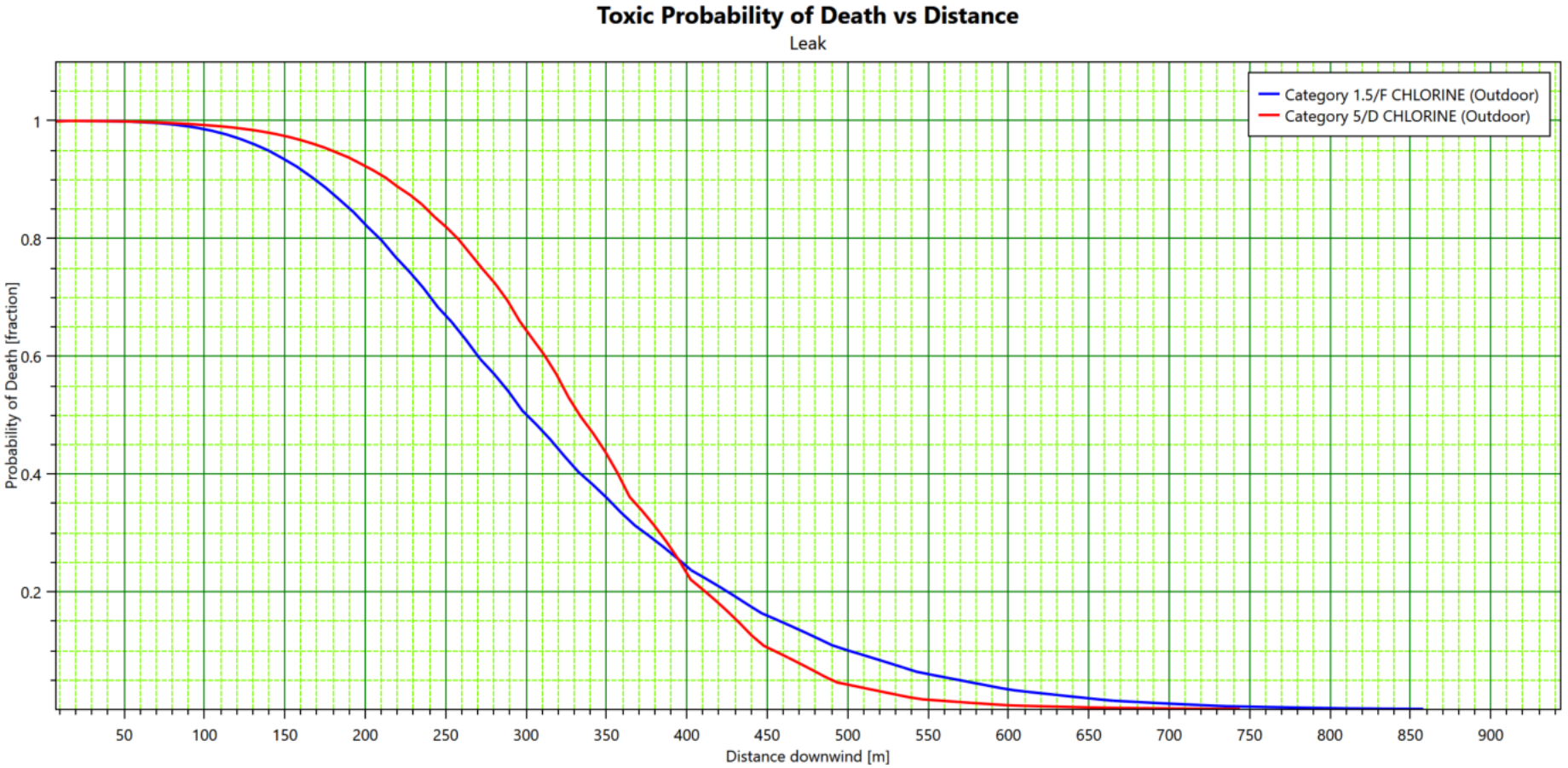

Figure 25: Toxic Probability of Death Vs Distance (Chlorine)

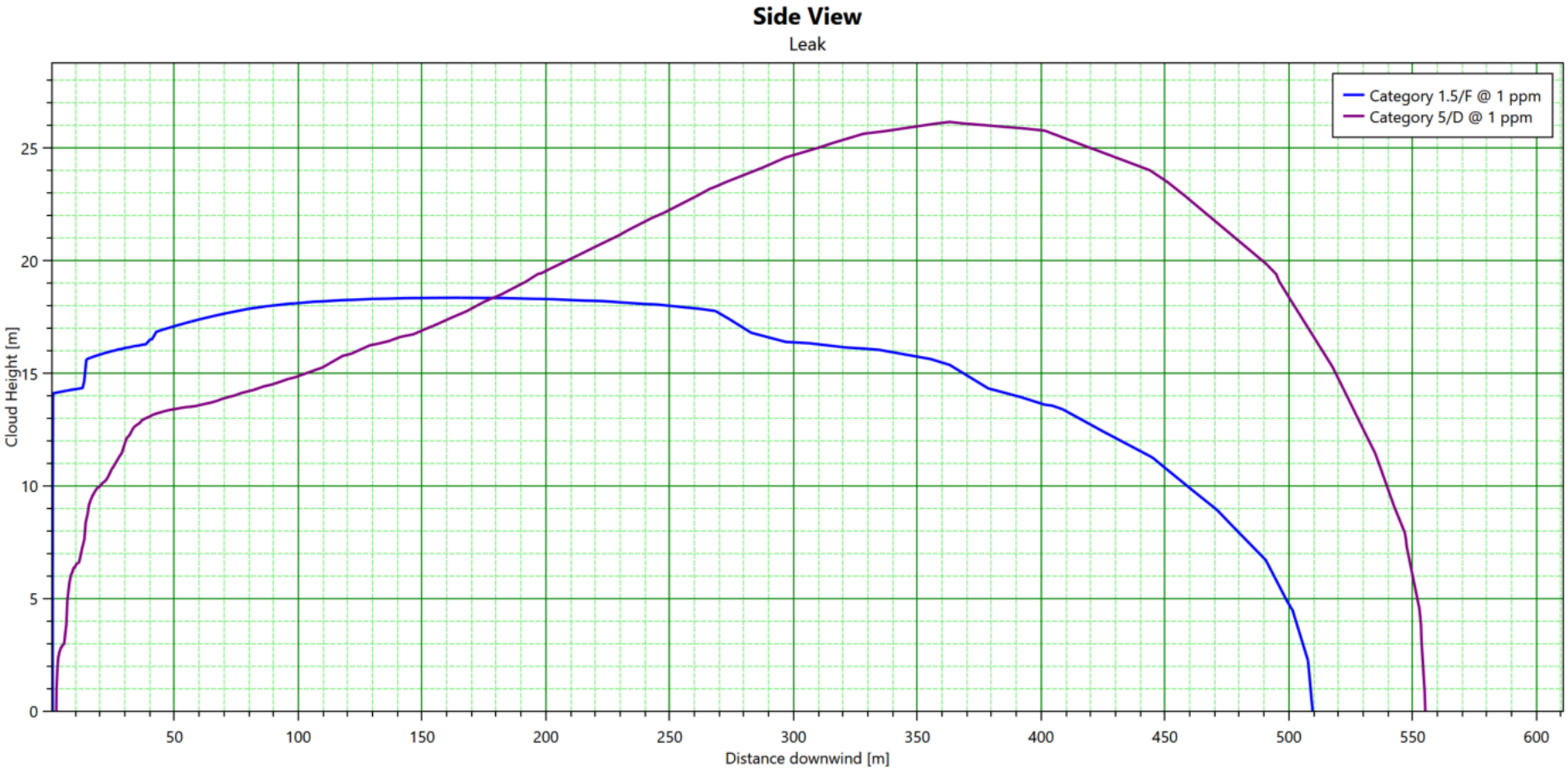

Figure 26: Toxic Dispersion side view (Chlorine)

Sc# 9. Petronet LNG Ltd.

Flash Fire Distances

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
LNG storage tank	Large	1.5F	160.801	387.876
		5D	93.1585	142.229
	FBR	1.5F	14165.3	51870.7
		5D	10288	24789.9

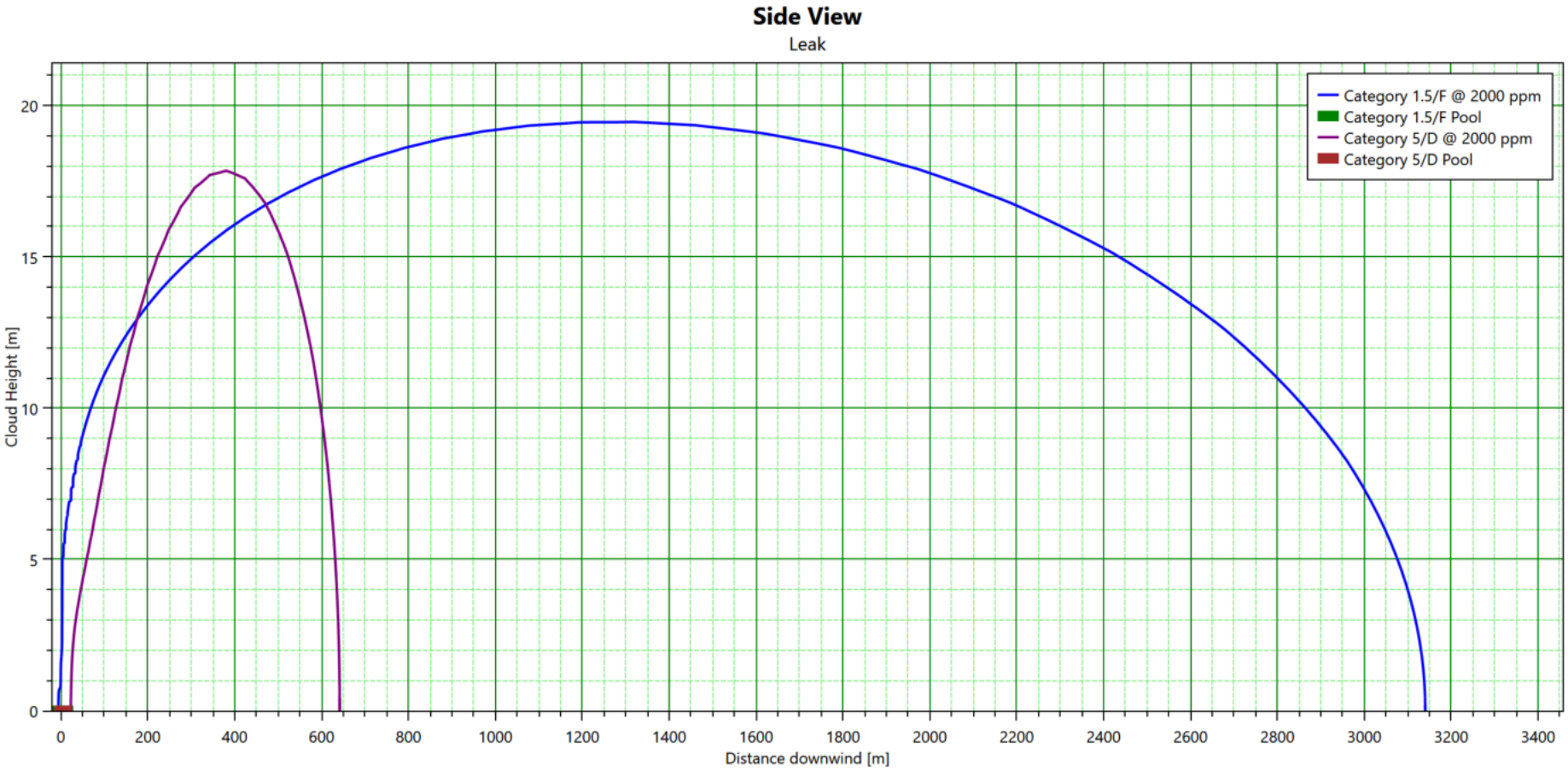

Figure 27: Toxic Dispersion side view (LNG)

Sc# 10. STERLING AUXILIARIES PVT. LTD.

Path	Scenario	Weather	Distance downwind to ERPG1 (3600 s) [m]	Distance downwind to ERPG2 (3600 s) [m]	Distance downwind to ERPG3 (3600 s) [m]	Distance downwind to STEL (900 s) [m]	Distance downwind to IDLH (1800 s) [m]
Ethylene oxide storage tank	Large	1.5F	NA	5268.43	1078.31	NA	NA
		5D	NA	3057.07	682.068	NA	NA
	FBR	1.5F	NA	3742.09	1307.88	NA	NA
		5D	NA	2816.84	549.342	NA	NA
Propylene oxide storage tank	Large	1.5F	2405.6	676.426	464.707	NA	NA
		5D	1453.31	534.988	277.926	NA	NA
	FBR	1.5F	2074.73	740.612	494.604	NA	NA
		5D	1103.54	345.491	264.644	NA	NA

Flash Fire Distances

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Ethylene Oxide storage tank	Large	1.5F	232.4	381.2
		5D	125.9	189.7
	FBR	1.5F	188.8	278.8
		5D	133.5	184.4
Propylene oxide storage tank	Large	1.5F	25.23	30.08
		5D	33.71	46.3
	FBR	1.5F	3.7	4.739
		5D	7.245	8.115

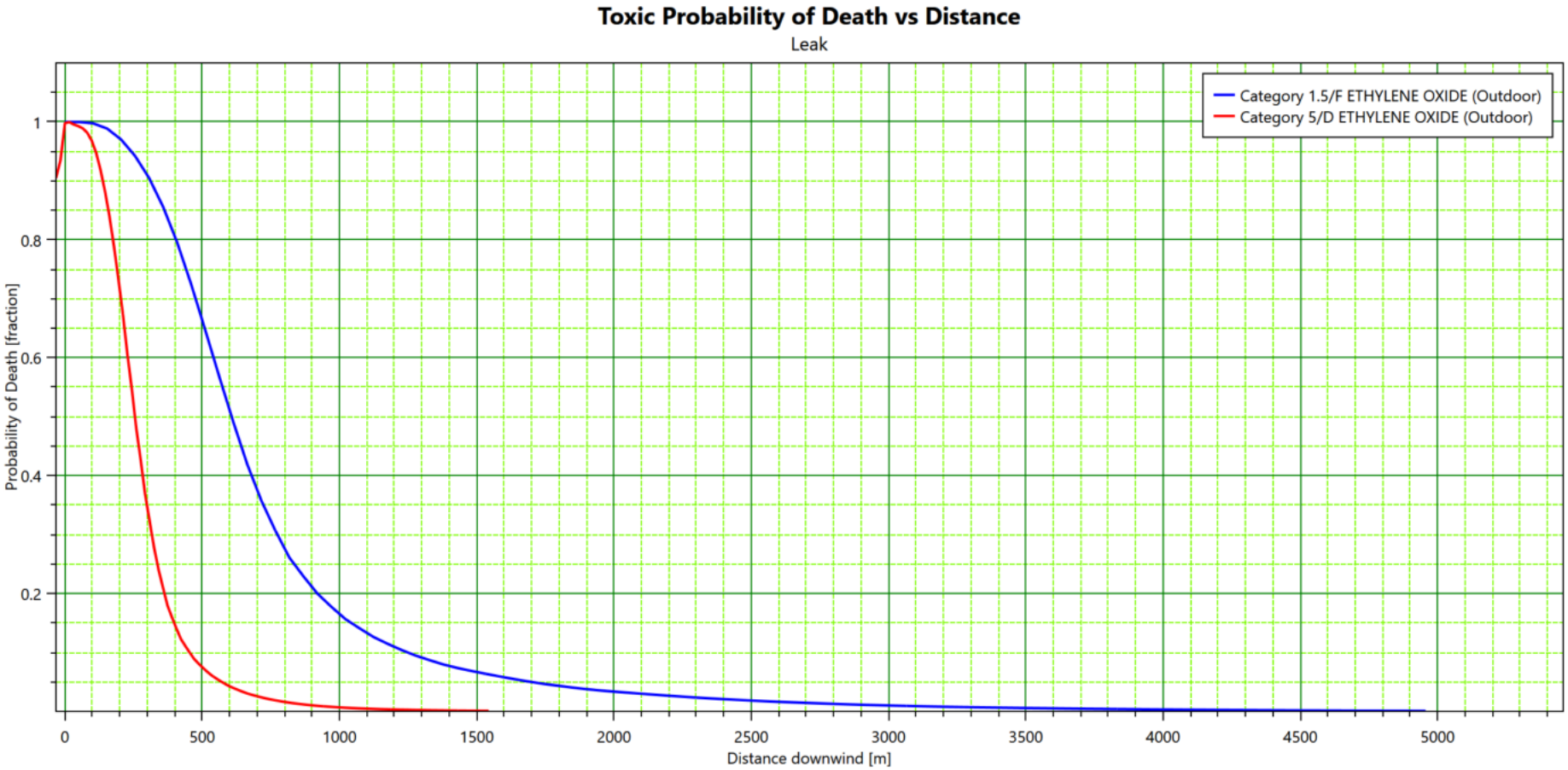

Figure 28: Toxic Probability of Death Vs Distance (Ethylene Oxide)

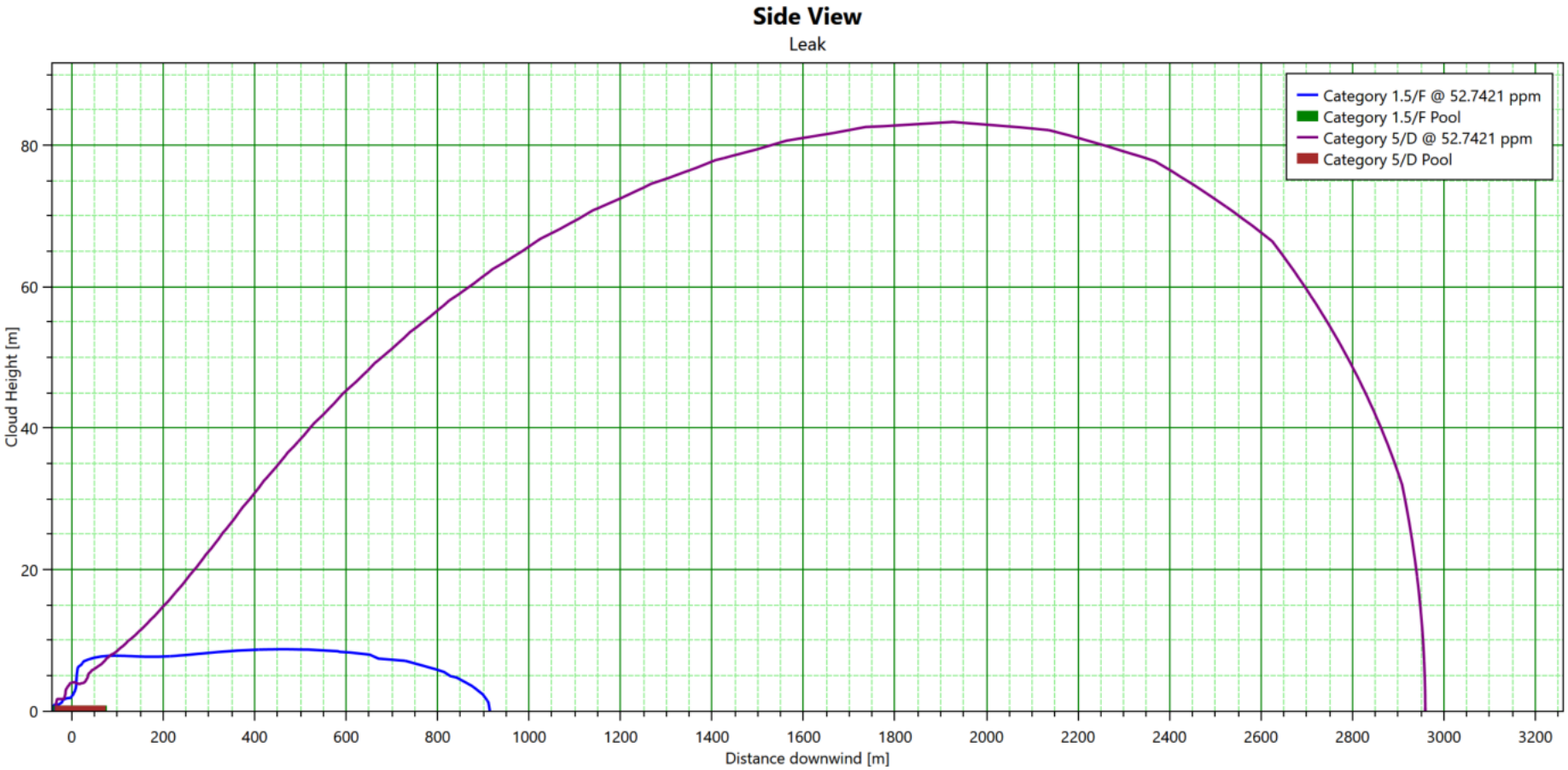

Figure 29: Toxic Dispersion side view (Ethylene Oxide)

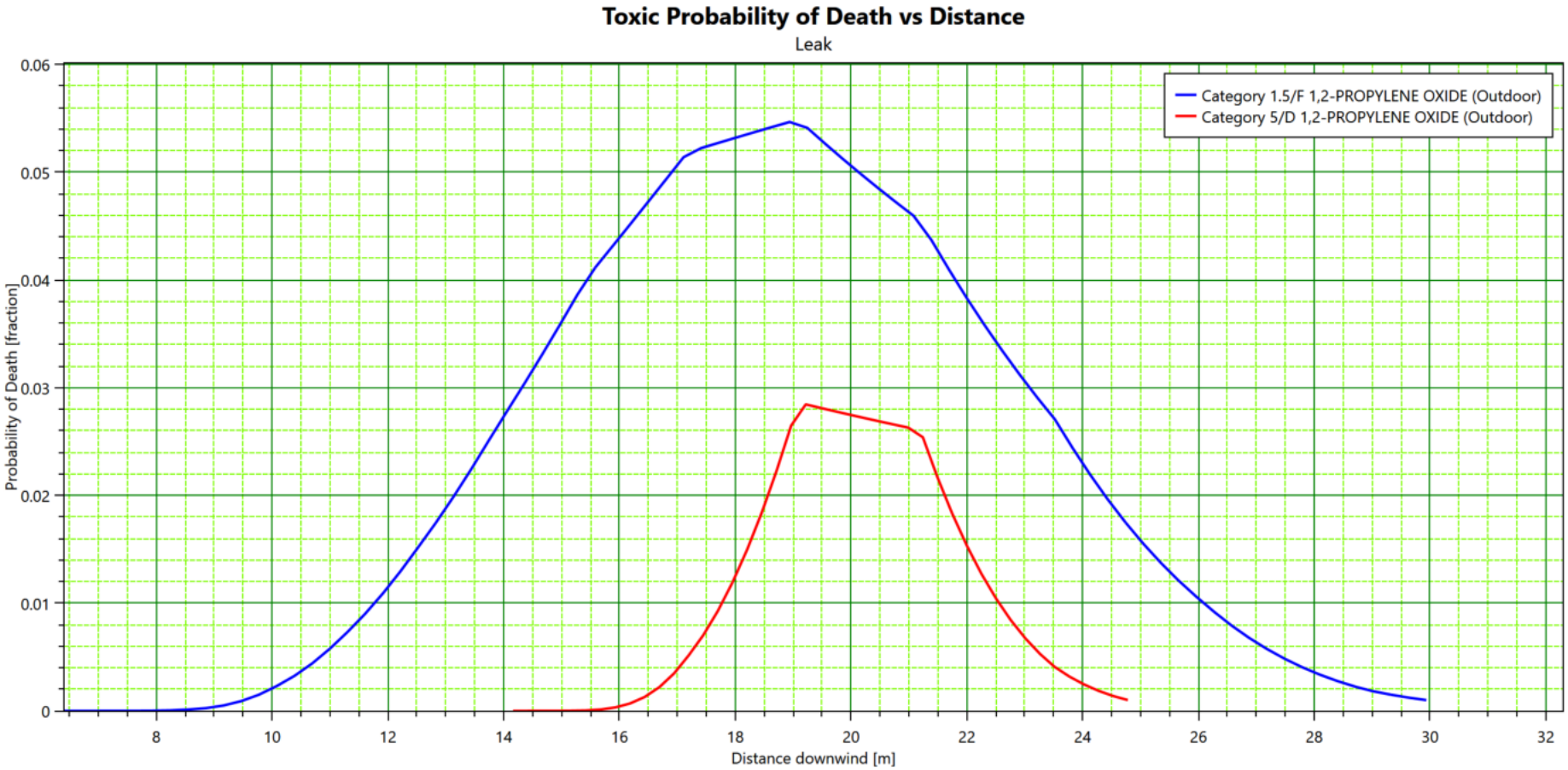

Figure 30: Toxic Probability of Death Vs Distance (Propylene Oxide)

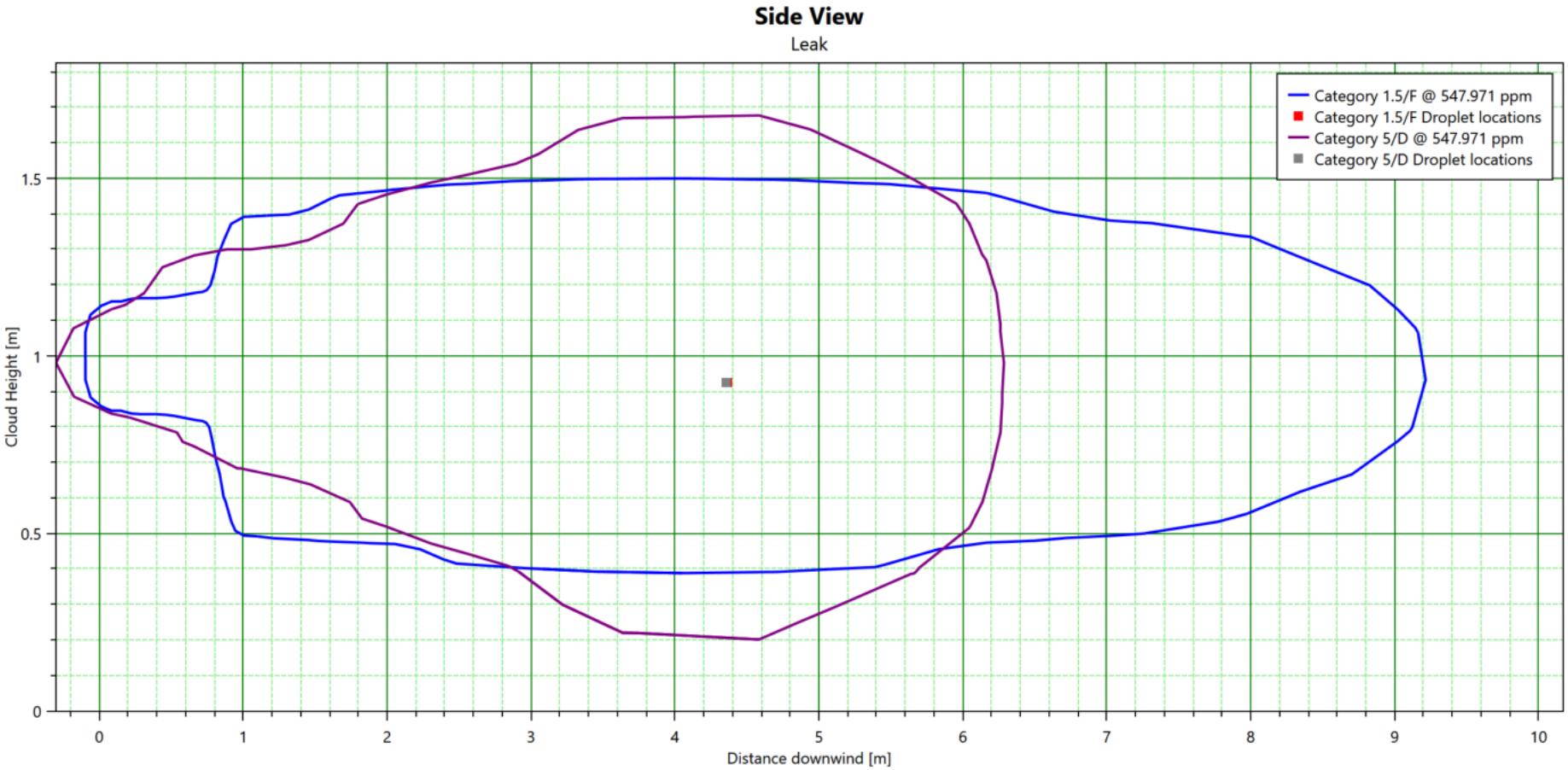

Figure 31: Toxic Dispersion side view (Propylene Oxide

6 CONCLUSION

Based on the observations mentioned in Section 3.3 for different types of physical effects for each possible case, following recommendations are to mitigate the effects of the consequences reported in this document.

It is observed from the Phast dispersion analysis of different industries handling flammable/toxic materials with the operating conditions and inventories provided by Hindalco that in case of occurrence of any leakage/rupture in any of the plant has no significant effect on Hindalco Industries Limited. However large leak of Ethylene oxide from Indofill industries limited (Unit-1) at 5D weather condition shall have a possible impact of toxic gas dispersion which is close to Hindalco industries limited.

It is recommended to follow emergency response plan and guidelines for safety reactions on any occurrence of toxic gas release from any of the plant. The following points are general emergency response plan:

1. Based on the hazardous substances release from any of the nearby industries or conditions present, ensure that personal protective equipment is used and is appropriate for the hazards to be encountered.
2. It is recommended to alert the operating personnel working in the plant environment in case of any information regarding the incident that occurred at nearby industries.
3. Ensure plan of action is readily available to handle such accidental scenarios from the nearby industries.
4. It is recommended to educate all the working personnel about emergency response plan and risk involved in it.

7 REFERENCE

1. PHAST Manual, DNV.
2. Scenario details as provided by Hindalco Industries Limited.
3. TNO Green Book.
4. Data Received from Hindalco (Birla Copper)

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