TSJ/EMD/C-41/061/25 Date: 28 Nov 2025

Deputy Director General of Forests (C)
Ministry of Environment, Forest, and Climate Change
Integrated Regional Office, 2nd Floor, Headquarter- Jharkhand State Housing Board
Harmu Chowk, Ranchi, Jharkhand – 834002, Ranchi

Sub.: Submission of Half Yearly (April 2025 to September 2025) Environment Clearances Compliance Reports (ECCR) for Tata Steel Works by M/s Tata Steel Ltd. located at Jamshedpur District East Singhbhum, Jharkhand

Reference:
1. EC of TSJ Works for 11 MTPA vide MoEF&CC letter no. J-11011/691/2007-IA.II (I) dated 01.03.2016
2. EC of TSJ Works for 9.7 MTPA vide MoEF letter no. J-11011/691/2007-IA.II (I) dated 11.05.2010
3. EC of TSJ Works for 6.8 MTPA vide MoEF letter no. J-11011/317/2006-IA.II (I) dated 16.04.2007
4. EC of TSJ Works for 5 MTPA vide MoEF letter no. J-11011/221/2003-IA.II (I) dated 24.05.2005

Dear Sir/ Ma'am,

With reference to the captioned subject & cited references, we are submitting the Half Yearly EC Compliance report for the period from **April 2025 to September 2025**. You are requested to kindly acknowledgement the same and place in your records.

Thanking you

Yours Faithfully
For Tata Steel Limited

Utsav Kashyap
Head, Environment Clearance & Compliance (TSL)
Encl: As above

Copy to:
1. Zonal Officer, Central Pollution Control Board, Southern Conclave, Block 502, 5th and 6th Floors, 1582 Rajdanga Main Road, Kolkata - 700 107
2. Member Secretary, Jharkhand State Pollution Control Board, T.A. Division Building, HEC Campus, Dhurwa, Ranchi – 834004
3. Regional Officer, Jharkhand State Pollution Control Board, Jamshedpur

ONLINE SUBMISSION CONFIRMATION OF EC COMPLIANCE REPORT IN PARIVESH 2.0 PORTAL

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/JH/IND/30339/2014
Compliance ID	676383778
Compliance Number(For Tracking)	EC/M/COMPLIANCE/676383778/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	28-11-2025
RO/SRO Name	Shri Senthil Kumar Sampath
RO/SRO Email	agmu156@ifs.nic.in
State	JHARKHAND
RO/SRO Office Address	Integrated Regional Offices, Ranchi
Note:- SMS and E-Mail has been sent to Shri Senthil Kumar Sampath, JHARKHAND with Notification to Project Proponent.	

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/JH/IND/6143/2009
Compliance ID	681248378
Compliance Number(For Tracking)	EC/M/COMPLIANCE/681248378/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	29-11-2025
RO/SRO Name	Shri Senthil Kumar Sampath
RO/SRO Email	agmu156@ifs.nic.in
State	JHARKHAND
RO/SRO Office Address	Integrated Regional Offices, Ranchi
Note:- SMS and E-Mail has been sent to Shri Senthil Kumar Sampath, JHARKHAND with Notification to Project Proponent.	

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/JH/IND/4180/2006
Compliance ID	681384978
Compliance Number(For Tracking)	EC/M/COMPLIANCE/681384978/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	29-11-2025
RO/SRO Name	Shri Senthil Kumar Sampath
RO/SRO Email	agmu156@ifs.nic.in
State	JHARKHAND
RO/SRO Office Address	Integrated Regional Offices, Ranchi
Note:- SMS and E-Mail has been sent to Shri Senthil Kumar Sampath, JHARKHAND with Notification to Project Proponent.	

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/JH/IND/3464/2003
Compliance ID	681457578
Compliance Number(For Tracking)	EC/M/COMPLIANCE/681457578/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	29-11-2025
RO/SRO Name	Shri Senthil Kumar Sampath
RO/SRO Email	agmu156@ifs.nic.in
State	JHARKHAND
RO/SRO Office Address	Integrated Regional Offices, Ranchi
Note:- SMS and E-Mail has been sent to Shri Senthil Kumar Sampath, JHARKHAND with Notification to Project Proponent.	

ENVIRONMENTAL CLEARANCE COMPLIANCE STATUS REPORT

April 2025 to September 2025

Tata Steel Limited, Jamshedpur

(MAIN WORKS & TOWN)

Six Monthly Compliance Status report of Environmental Clearance from expansion of 9.7 to 11 MTPA Crude Steel Production

ENVIRONMENTAL MANAGEMENT DEPARTMENT
TATA STEEL LIMITED
JAMSHEDPUR

A. Specific Conditions:

i. The project proponent should install 24x7 air monitoring devices to monitor air emissions, as provided by the CPCB and submit report to Ministry and its Regional Office.

Compliance Status:

Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and Online Continuous Emission Monitoring System (OCEMS) have been installed to monitor air emissions. Monitoring reports for all relevant parameters for the period April 2025 to September 2025 are attached as **Annexure-2.**

ii. The Project Proponent should ensure the compliance of environmental safeguard stipulated in the earlier environment clearance letter dated 11th May 2010 and submit the compliance report to the Ministry and its Regional Office, Ranchi.

Compliance Status:

We are taking the appropriate measures to ensure the compliance of environmental safeguard stipulated in the earlier environment clearance letter dated 11th May 2010 and submitting the compliance to Ministry and its Regional Office every year in the form of half yearly EC compliance**.**

iii. On-line ambient air quality monitoring shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. shall be provided to keep the emission levels below 50 mg/Nm³ by installing energy efficient technology. Low NOx burners shall be installed to control NOx emissions. At no time, the emission 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. Efforts shall be made to further reduce PM_{10} and $PM_{2.5}$ levels in the ambient air and a time bound action plan shall be submitted.

Compliance Status:

Online CAAQMS have been commissioned. Air pollution control devices viz. Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. are provided in the relevant production units. Some ESPs have been upgraded of all relevant production units while some are under progress to achieve emission level ≤50 mg/Nm³. Alert facility has been provided in case of units exceed any prescribed emission level as the interlocking is technically not feasible in all the production units. Projects have been identified to further reduce the dust level in each production unit and raw material storage area.

iv. Existing Electrostatic Precipitator (ESP) shall be upgraded and provided to new units to control gaseous emissions within 50 mg/Nm³. Waste gas from the drying and grinding unit of pellet plant shall be cleaned by bag filters. Adequate provisions shall be made to control NOx emissions. Bag house shall be provided to Lime kilns.

Compliance Status:

Some ESPs have been upgraded and some are under progress of the relevant production units to control emissions. Bag filters have been provided to clean the waste gas from the drying and grinding unit of Pellet plant. Bag House have been provided in process and dedusting units of Lime plant.

v. Land based fume extraction system shall be provided to coke oven battery to arrest fugitive emissions during charging and pushing operations. The coke oven gas shall be desulphurization by reduction of H_2S content of coke oven gas in the by-product recovery section to below 500 mg/Nm³. On-line charging with high pressure liquor aspiration (HPLA) for extraction of oven gas, leak proof oven doors, hydraulic door and door frame cleaner, water sealed AP caps and charging & pusher side emission extractor device shall be provided for the

coke oven batteries to maintain VOC emissions within permissible limit. Land based fume extraction system for pushing emission control from coke ovens shall be provided.

Compliance Status:

Land based fume extraction, desulphurization facilities, online charging with HPLA, Hydraulic door and door frame cleaner, water seal AP caps and charging & pusher side emission extractor device etc. are in place in coke ovens battery#10 & #11 to minimize leaks from doors CAPs, etc. Coke oven gas is being desulphurized in Battery#10 & #11. Land based fume extraction system for pushing emission control for new coke ovens batteries #10 & #11 have been provided.

vi. **All the standards prescribed for the coke oven plants shall be followed as per the latest guidelines. Proper and full utilization of coke oven gases in power plant using heat recovery steam generators shall be ensured and no flue gases shall be discharged into the air. Sulphur shall be recovered from the coke oven gases from new product plant.**

Compliance Status:

Parameters like % of PLD, PLL & PLO of all batteries are being monitored. Coke oven gas is recovered and used for power generation in captive powerhouse and for heating purpose in the mills. Sulphur is being recovered from coke oven gas in the By-Product Plant.

vii. **Only dry quenching method in the coke oven in new battery shall be adopted.**

Compliance Status:

Coke dry quenching (CDQ) facility is commissioned in the new Coke Oven Batteries #10 and #11.

viii. **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.**

Compliance Status:

Continuous Ambient Air Quality monitoring stations have been commissioned inside plant for the monitoring of the relevant parameters as per G.S.R. No. 826(E) dated 16th November' 2009 and is also being analyzed by the NABL accredited environment laboratory.

ix. **In-plant control measures for checking fugitive emissions from all the vulnerable sources including bag filters and fume extraction system shall be provided. Dry fog dust suppression system / water sprinkling system shall be provided in raw material handling areas to control fugitive dust emissions. Fugitive emissions from different sources shall also be controlled by covered conveyors, water sprinkling in open yards and with dry fogging in the closed zones. Further, specific measures like asphalting of the roads within premises shall be carried out to control fugitive emissions. Fugitive emissions shall be controlled, regularly monitored and records maintained.**

Compliance Status:

Air pollution control measures are provided to control fugitive dust emission. List of air pollution control devices for each of production unit is attached as **Annexure-1**. Areas of dedusting operation such as junction house, transfer tower, conveyors are provided with bag filters and/or dry fog dust suppression system. Covered conveyors, water sprinkling in open yards and dry fogging in the closed zones are provided as per feasibility. Dust suppression system (DS) and Industrial Vacuum Cleaners (IVC) are provided at various locations inside the plant. Internal roads have been constructed with concrete. Fugitive emissions within plant locations are monitored and records are maintained.

x. Gaseous emission levels including 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. New standards issued by the Ministry vide G.S.R. 414(E) dated 30th May 2008 shall be followed.

Compliance Status:

Various Projects have been implemented to control Gaseous Emission levels including secondary fugitive emissions from all the sources. Secondary fugitive dust emissions inside the plant in different areas is being controlled and monitored in line with the CPCB guidelines and MoEF & CC standards.

xi. Traffic decongestion plan shall be implemented in a time bound manner to reduce emissions in the Jamshedpur city and separate budget shall be allocated for implementing the same. Maximum in bound and out bound material movement shall be done by railway wagons only to reduce dust emissions. Measures like covered conveyors for handling of bulk materials, centralized screening of iron ore, rationalization of weighing system, use of higher capacity vehicles etc. shall be adopted to reduce dust emissions. Mechanized vacuum cleaning of arterial roads shall be carried out on regular basis to further reduce the dust emissions.

Compliance Status:

Under the traffic decongestion plan in Jamshedpur city:

- Southeastern corridor is under development with the government of Jharkhand.
- To control high traffic on the major roads of the town, decongestion work is being continued with the effort based on evolving need.

Inside the plant:

- Automatic traffic control system is in place to control the traffic density as well as the safety including secondary emission inside the plant.
- Maximum in bound and out bound material movements are done by railway wagons to reduce dust emissions.
- Speed limit of the vehicles has been restricted based on road capacity & condition to control secondary emission.
- Loaded trucks/dumpers coming inside the plant with their valid PUC.
- Mechanized vacuum cleaning sweepers are deployed within Works for regular cleaning and dust evacuation of roads which is being reused in process.
- High-Pressure Jet Cleaning Machine is installed for effective road cleaning inside main works area.

xii. Vehicular pollution due to transportation of raw materials and finished products shall be controlled. Proper arrangements shall also be made to control dust emissions during loading and unloading of the raw material and finished product.

Compliance Status:

Maximum raw material is being transported through railways to reduce the road transport load and vehicular pollution. Dry fog dust suppression and water sprinklers are provided to control dust emission during loading and unloading activity. Dust suppression system (DS) are commissioned at various locations inside Works. Tyre washing facility has also been provided at strategic locations to reduce dust emission. High-Pressure Jet Cleaning Machine is installed for effective road cleaning inside main works area.

xiii. All the wastewater from various units shall be treated in the common effluent treatment plant (CETP) for primary, secondary, and tertiary treatment and shall be either recycled or used for dust suppression, slag quenching and green belt development etc. within the lease hold area. The phenolic effluent from the by-product recovery section of coke oven battery shall be

treated in BOD plant. Wastewater containing suspended solids shall be passed through clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Mill effluent containing oil and suspended solids shall be passed through oil skimmers and filter press. No treated wastewater shall be released outside the premises and 'Zero' discharge shall be adopted by recycling all the treated wastewater in the plant itself including from the existing plant.

Compliance Status:

Central Effluent Treatment Plant (CETP) had been constructed to treat and recycle most of the effluent by tertiary treatment with Reverse Osmosis (RO) followed by filter press. Treated water from CETP is being recycled in the process or used for slag quenching within lease hold area. Capacity of the existing CETP has been augmented and is under ramp up stage to treat and recycle the balance wastewater generated from various units. Coke Oven Batteries effluent is being treated in BOD plant. A tertiary treatment with RO is being implemented at BOD plant to ensure Zero Effluent Discharge from coke oven. Wastewater containing suspended solids is passed through Clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Primary effluent treatment with settling tanks and oil skimming facility is provided in mills. Closed circuit cooling systems have been installed. Catch pits have been constructed to recycle the treated effluent within plant and Zero Effluent Discharge has been achieved (most of the time) in 4 out of 5 designated outlets.

xiv. Efforts shall be made to make use of rainwater harvested. If needed, capacity of the reservoir shall be enhanced to meet the maximum water requirement. Only balance water requirement shall be met from other sources.

Compliance Status:

Upper Cooling Pond (UCP) and Lower Cooling Pond (LCP) are available in the plant premises, which stores and harvest available surface run off along with cooling water of the units, from which it is being used to meet the water requirement of plant operations. Rainwater harvesting structures in different office buildings have been provided inside the plant area.

xv. Continuous monitoring of Total Organic Compounds (TOC) in the wastewater treated in BOD plant from the coke oven plant shall be done at the outlet of ETP (BOD plant). All the treated wastewaters shall be monitored for pH, BOD, COD, oil & grease, cyanide, phenolic compounds, Chromium+6 etc. besides other relevant parameters.

Compliance Status:

Monitoring of relevant parameters on the outlet of the BOD plant is being done regularly and monitoring reports are being submitted to JSPCB, CPCB and Regional office of MoEF & CC.

xvi. Regular monitoring of influent and effluent and surface, sub-surface and ground water shall be ensured and treated wastewater shall meet the norms prescribed by the State Pollution Control Board or prescribed under the E(P) Act whichever are more stringent. Leachate study for the effluent generated and analysis shall also be regularly carried out and report submitted to the Ministry's Regional Office at Ranchi, Jharkhand, SPCB and CPCB.

Compliance Status:

Regular monitoring of treated effluent from plant outlets points, surface water quality is being done. Online effluent monitoring system has been commissioned in the outlets to monitor effluent quality and the data is transmitted to JSPCB server on real time basis. There are cooling waters pond, which is being used to recycle the water for process requirements, whose water quality is also regularly monitored as part of sub surface water quality. The monitoring data along with and six-monthly EC compliance report are being submitted to JSPCB, CPCB & regional office of MoEF & CC at Ranchi. Monitoring reports for relevant parameters from April 2025 to Sept 2025 is attached in **Annexure-2**.

xvii. All the blast furnace (BF) slag shall be granulated and provided to cement manufacturers for further utilization in cement making as per the MoUs signed with various companies including M/s Lafarge, M/s Eco-cement & M/s ACC. LD slag after metal recovery shall be used in sinter plant, blast furnaces and LD convertor, aggregates making, road ballast making, soil conditioning etc. All the flue dust generated shall be recycled within the plant to the maximum extent. Mill scales, LD sludge, lime fines and flue dust shall be recycled back to the sinter plant. The BF gas cleaning plant sludge shall be used for manufacturing briquettes.

Compliance Status:

Maximum blast Furnace slag is being granulated and made available to the cement manufacturers for further utilization at cement industry. LD Slag after metal recovery is being used internally in the manufacturing process as well as externally in brick and road making works. Additional initiatives undertaken for improving the utilization of LD Slag:

- Co-processing of LD Slag at Cement Kilns.
- Open & closed Steam Aging inside Works
- Use of LD Slag in road making & railway ballast.

Mill scales, LD sludge, lime fines and flue dust are also recycled back for agglomeration process. Blast Furnace gas cleaning plant (GCP) sludge is re-utilized within the manufacturing process.

xviii. As proposed, coal tar sludge and BOD sludge shall be recycled for coke making by mixing with the coal charge and used in the coke ovens. Chromium sludge shall be disposed in a HDPE lined secured landfills as per the CPCB guidelines within the complex. All the other solid waste including broken refractory mass shall be properly disposed off in environment-friendly manner. Oily waste and spent oil shall be provided to authorized recyclers/reprocesses.

Compliance Status:

Coal Tar sludge and BOD Sludge is being recycled in coke plant by mixing with raw materials. Chrome sludge is being disposed of through authorized TSDF. Various kind of process wastes are being reutilized within the plant. Oily waste and spent oil are sold to authorized recyclers/re-processors.

xix. All the slag shall be used for land filling inside the plant or used as building material only after passing through Toxic Chemical Leachability Potential (TCLP) test. Toxic Chromium sludge and other hazardous substances recovered from the slag and output waste shall be disposed of in secured landfill as per CPCB guidelines.

Compliance Status:

LD Slag is used for road making and land filling. The TCLP test conducted by external approved agency and the report is enclosed under **Annexure-3** for slag. Chrome sludge is being disposed through authorized TSDF.

xx. 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 at Ranchi, Jharkhand SPCB and CPCB.

Compliance Status:

Most of the process solid waste are reutilized within the manufacturing process. Information regarding solid waste and hazardous waste generation, utilization & disposal is being submitted in Environment Statement & Annual Returns to board every year.

xxi. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1999 and subsequent amendment in 2003. All the fly ash shall be provided to cement and brick manufacturers for

further utilization and "Memorandum of Understanding" shall be submitted to Ministry's Regional Office at Ranchi.

Compliance Status:

Captive power plants have been converted from coal fired to gas fired, thus there is no generation of fly ash in the power plant.

xxii. **A Risk and Disaster Management Plan along with the mitigation measures shall be prepared and a copy submitted to the Ministry's Regional Office at Ranchi, Jharkhand SPCB and CPCB within 3 months of issue of environment clearance letter.**

Compliance Status:

Updated On-site Emergency Plan & Disaster Control, approved by Chief Inspector of Factories, is attached as **Annexure-4.**

xxiii. **As proposed, green belt shall be developed in more than 33 % area within and around the plant premises as per the CPCB guidelines in consultation with DFO.**

Compliance Status:

Green cover area is developed in more than 33% area within and around the plant premises.

xxiv. **Prior permission from the State Forest Department shall be taken regarding likely impact of the expansion of the proposed steel plant on the reserve forests. Measures shall be taken to prevent impact of particulate emissions / fugitive emissions, if any, from the proposed plant on the surrounding reserve forests viz. Jora Pahar PF, Sand Pcha Rahar PF, Deluse RF located within 10 km radius of the project. Further, Conservation Plan for the conservation of wild fauna in consultation with the State Forest Department shall be prepared and implemented.**

Compliance Status:

Prior Permission from State Forest Department has been obtained vide their memo. No. 2605 dated 20.10.2010. Site-specific Wildlife Conservation Plan (SSWLCP) for Tata Steel has been prepared with the help of approved external agency recommended by State Forest Department and the same has been approved by Principal Chief Conservator of Forests – Wildlife (PCCF-WL) GoJ on 13 November 2017 **(Annexure-10).** Further, Payment of levies w.r.t. approved SSWLCP of Tata Steel Limited has been deposited into DFO Jamshedpur account vide challan no. 108 dated: 20.02.2023 **(Annexure-10)** Wildlife Conservation Plan will be implemented as directed by Department of Forest, Jharkhand and approved SSWLCP.

xxv. **All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Steel Plants shall be implemented.**

Compliance Status:

CREP recommendations have been implemented. Please find enclosed the same as **Annexure–6.**

xxvi. **At least 5 % of the total cost of the project shall be earmarked towards the corporate social responsibility and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office at Ranchi. Implementation of such program shall be ensured accordingly in a time bound manner.**

Compliance Status:

It is being complied as per the requirement under the Companies Act. The amount spent by the Company on Corporate Social Responsibility (CSR) activities is ₹ 72.27 Crores spent in East Singhbhum area and 11.6 Crores in and around Jamshedpur for FY'26 (H1).

xxvii. The company shall provide housing for construction labour 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.

Compliance Status:

The construction work has been completed. All the necessary infrastructure and facilities such as food, medical health care, toilets, safe drinking water, etc. had been provided to construction labor during the project work.

B. General Conditions:

i. The project authorities must strictly adhere to the stipulations made by the Jharkhand Pollution Control Board and the State Government.

Compliance Status:

We are abiding by the compliance conditions made by JSPCB and State Government of Jharkhand.

ii. No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).

Compliance Status:

No further expansion or modifications beyond the existing capacity of 11 MTPA in the plant will be carried out without prior approval from MoEF & CC.

iii. At least four ambient air quality monitoring stations shall 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 should be regularly submitted to this Ministry including its Regional Office at Ranchi and the SPCB/CPCB once in six months.

Compliance Status:

Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and Online Continuous Emission Monitoring System (OCEMS) have been installed to monitor ambient air quality & air emissions. Monitoring reports for all relevant parameters for the period April 2025 to Sept 2025 are attached as **Annexure-2**.

iv. Industrial wastewater shall be properly collected, treated 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.

Compliance Status:

Industrial wastewater is being collected, treated in the treatment plants and maximum treated wastewater is reused in different processes.

v. The overall noise levels in and around the plant area shall 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) (daytime) and 70 dB (A) (night-time).

Compliance Status:

Personal Protective Equipment (PPE) have been provided to the workers/officers to avoid any accompanied noise hazards. Facilities like silencers, enclosures, hood etc. have been provided to reduce noise at source. The ambient noise level monitoring is being done at different part of the Jamshedpur town in frequent interval outside Steel Works to assess the ambient noise level status. Noise level in the town is found beyond the standard on few occasions. The possible reason of equivalent noise levels in respect of all categories of areas exceeded the standards for day and night times is due to heavy traffic movement in the town, market and commercial activities, festivals and other domestic celebrations and frequent religious rituals. Monitoring reports for all relevant parameters from April 2025 to Sept 2025 is attached in **Annexure-2**.

vi. **Occupational Health Surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.**

Compliance Status:

Regular health surveillance is being conducted and records are maintained.

vii. **The company shall develop surface as well as ground water harvesting structures to harvest the rainwater for utilization in the lean season besides recharging the ground water table.**

Compliance Status:

Rainwater harvesting structures have been provided inside the plant area, of which some area has the facility of Ground Water Recharge system.

viii. **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.**

Compliance Status:

Environmental protection measures and safeguards such as APCEs, ETPs, hazardous waste proper handling, storage, transfer and disposal have been deployed as recommended in the EIA/EMP report. Tata Steel Ltd, through Tata Steel Foundation, undertakes a range of socio-economic development activities in and around Jamshedpur. These initiatives focus on critical areas such as public health, education, disability support, livelihood, access to drinking water, rural infrastructure, sports, and the preservation of tribal culture. TSL also facilitates Institutes like the R. D. Tata Technical Institute, Tata Football Academy, and Tata Archery Foundation etc. which encourages the local talent to develop themselves and participate at National and International levels.

ix. **Requisite funds shall be earmarked towards total capital cost and recurring cost/annum for SSWLCP Ministry of Environment, Forests 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 Ranchi. The funds so provided shall not be diverted for any other purpose.**

Compliance Status:

Capital expenditure on environment is being spent on Air Pollution Control, Solid Waste Management, Zero Wastewater Discharge and Others including Greenery, Online Monitoring, etc. In

FY26 (H1), total capital expenditure and recurring cost for environment are ₹ 411 Crores and ₹ 59.60 Crores respectively.

x. **A copy of Clearance letter shall be sent by 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.**

Compliance Status:

The copy of Clearance letter has been sent to District Commissioner, Block Development Officer and Jamshedpur Notified Area Committee vide our letter no. EMD/C-41/32-34/16 dated: 04 March 2016 attached as **Annexure-7**. The clearance letter is also uploaded on the company website: https://www.tatasteel.com/corporate/our-organisation/environment/environment-compliance-reports/.

xi. **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 MoEF&CC at Ranchi, the respective Zonal Office of CPCB and the JPCB. The criteria pollutant levels namely, PM10, SO2, 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.**

Compliance Status:

Six monthly compliance reports with the monitored data are uploaded on Parivesh portal of MoEF&CC. The ambient air quality parameters are being monitored and displayed at the main gate of the company in the public domain. The six-monthly compliance reports along the monitored data is also uploaded in the website:(https://www.tatasteel.com/corporate/our-organisation/environment/environment-compliance-reports/)

xii. **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 JSPCB. The Regional Office of this Ministry at Ranchi / CPCB / JPCB shall monitor the stipulated conditions.**

Compliance Status:

Six monthly compliance reports and the monitored data is being submitted regularly through Parivesh portal of MoEFCC and to the Regional Office of MOEFCC, the respective Zonal Office of CPCB and the JSPCB by mail.

xiii. **The environmental statement for each financial year ending 31st 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 Offices of the MoEF&CC at Ranchi by e-mail.**

Compliance Status:

The environmental statement for each financial year in Form-V is regularly being submitted to the Jharkhand State Pollution Control Board. Environment Statement for FY'25 has been submitted vide our letter no. TSJ/EMD/C-23/049/25 dated 25.09.2025 attached as **Annexure-8.** The environmental statement has also been uploaded on the company's website:

(https://www.tatasteel.com/corporate/our-organisation/environment/environment-compliance-reports/).

xiv. **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 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 shall be forwarded to the regional office.**

Compliance Status:

The Notice has been advertised in two local newspapers viz. Prabhat Khabar (Hindi) and The Telegraph (English) on 08 March 2016. The same has also been informed to the regional office of MoEF&CC at Ranchi on 09 March 2016. The same has been provided in **Annexure-9.**

xv. **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.**

Compliance Status:

It is compiled as the project has been already completed and Consent to Operate has been issued by Jharkhand State Pollution Control Board.

ENVIRONMENTAL CLEARANCE COMPLIANCE STATUS REPORT

April 2025 to September 2025

Tata Steel Limited, Jamshedpur

(MAIN WORKS & TOWN)

Six Monthly Compliance Status report of Environmental Clearance from expansion of 6.8 to 9.7 MTPA Crude Steel Production

ENVIRONMENTAL MANAGEMENT DEPARTMENT
TATA STEEL LIMITED
JAMSHEDPUR

A. Specific Conditions:

i. Compliance to all the specific and general conditions stipulated for the existing plant by the Central/State Govt. shall be ensured and regular reports submitted to the Ministry and its Regional Office at Bhubaneswar.

Compliance Status:

We are taking the appropriate measures to ensure the compliance of environmental safeguard stipulated in the earlier environment clearance letter dated 11th May 2010 and submitting the compliance report through "Parivesh 2.0" and to Ministry's Regional Office via mail.

ii. Efforts shall be made to reduce RSPM levels in the ambient air and a time bound action plan shall be submitted. On-line ambient air quality monitoring and continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices *viz.* Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. shall be provided to keep the emission levels below 50 mg/Nm^3 by installing energy efficient technology. Low NOx burners shall be installed to control NOx emissions. At no time, the emission 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.

Compliance Status:

Online CAAQMS have been commissioned. Air pollution control devices viz. Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. are provided in the relevant production units. List of air pollution control devices for each of production unit is attached as **Annexure-1**. Some ESPs have been upgraded of relevant production units while some are under progress to achieve emission level ≤50 mg/Nm^3. Similarly, alert facility has been provided in case of units exceed any prescribed emission level as the interlocking is technically not feasible in all the production units. Projects have been identified to further reduce the dust level in each production unit and raw material storage area.

iii. Existing electrostatic precipitator (ESP) shall be upgraded and provided to new units to control gaseous emissions within 50 mg/Nm^3. ESPs shall be provided to pellet plant, cast house and stock house of blast furnaces and LD#3 shop. Waste gas from the drying and grinding unit of pellet plant shall be cleaned by bag filters. Adequate provisions shall be made to control NOx emissions. Bag house shall be provided to Lime kilns. Data on ambient air quality stack emissions and fugitive emissions shall regularly submit to the Ministry's Regional Office at Bhubaneswar, Jharkhand Pollution Control Board (JPCB) and Central Pollution Control Board (CPCB) once in six months.

Compliance Status:

Some ESPs have been upgraded and some are under progress of the relevant production units to control emissions within 50 mg/Nm3. Bag filters have been provided to clean the waste gas from the drying and grinding unit of Pellet plant. Bag House have been provided in process and dedusting units of Lime plant and CEMS connected to relevant stacks are connected to JSPCB servers.

iv. Land based fume extraction system shall be provided to coke oven battery #10 and #11 to arrest fugitive emissions during charging and pushing operations. The coke oven gas shall be de-sulphurised by reduction of H_2S content of coke oven gas in the by-product recovery section to below 500 mg/Nm^3. On-line charging with high pressure liquor aspiration (HPLA) for extraction of oven gas, leak proof oven doors, hydraulic door and door frame cleaner, water sealed AP caps and charging & pusher side emission extractor device shall be provided for the coke oven batteries to maintain VOC emissions within permissible limit. Land based fume extraction system for pushing emission control from coke ovens shall be provided.

Compliance Status:

Land based fume extraction, desulphurization facilities, online charging with HPLA, Hydraulic door and door frame cleaner, water seal AP caps and charging & pusher side emission extractor device etc. are in place in coke ovens battery#10 & #11 to minimize leaks from doors CAPs, etc. Coke oven gas is being desulphurized in Battery#10 & #11. Land based fume extraction system for pushing emission control for new coke ovens batteries #10 & #11 have been provided.

v. **All the standards prescribed for the coke oven plants shall be followed as per the latest guidelines. Proper and full utilization of coke oven gases in power plant using heat recovery steam generators shall be ensured and no flue gases shall be discharged into the air. Sulphur shall be recovered from the coke oven gases from new product plant.**

Compliance Status:

Parameters like % of PLD, PLL & PLO of all batteries are being monitored. Coke oven gas is recovered and used for power generation in captive Powerhouse, and for heating purpose in the mills. Sulphur is being recovered from coke oven gas in the By-Product Plant.

vi. **Only dry quenching method in the coke oven in new battery # 10 & 11 shall be adopted.**

Compliance Status:

Coke dry quenching (CDQ) facility is commissioned in the new Coke Oven Batteries #10 and #11.

vii. **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.**

Compliance Status:

Continuous Ambient Air Quality monitoring stations have been commissioned inside plant for the monitoring of the relevant parameters as per G.S.R. No. 826(E) dated 16th November' 2009 and is also being analyzed by the in-house NABL accredited environment laboratory.

viii. **In-plant control measures for checking fugitive emissions from all the vulnerable sources including bag filters and fume extraction system shall be provided. Dry fog dust suppression system / water sprinkling system shall be provided in raw material handling areas to control fugitive dust emissions. Fugitive emissions from different sources shall also be controlled by covered conveyors, water sprinkling in open yards and with dry fogging in the closed zones. Further, specific measures like asphalting of the roads within premises shall be carried out to control fugitive emissions. Fugitive emissions shall be controlled, regularly monitored and records maintained.**

Compliance Status:

Pollution control measures are provided to control fugitive dust emission. List of air pollution control devices for each of production unit is attached as **Annexure-1**. Areas of dedusting operation such as junction house, transfer tower, conveyors are provided with bag filters and/or dry fog dust suppression system. Covered conveyors, water sprinkling in open yards and dry fogging in the closed zones are provided as per feasibility. Dust suppression system (DS) and Industrial Vacuum Cleaners (IVC) are provided at various locations inside the plant. Internal roads have been constructed with concrete. Fugitive emissions within plant locations are monitored and records are maintained.

ix. **Gaseous emission levels including 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. New standards issued by the Ministry vide G.S.R. 414(E) dated 30th May 2008 shall be followed.**

Compliance Status:

Various Projects have been implemented to control Gaseous Emission levels including secondary fugitive emissions from all the sources. Secondary fugitive dust emissions inside the plant in different areas is being controlled and monitored in line with the CPCB guidelines and MoEF & CC standards.

x. **As proposed, Traffic decongestion plan shall be implemented in a time bound manner to reduce emissions in the Jamshedpur city and separate budget shall be allocated for implementing the same. Maximum in bound and out bound material movement shall be done by railway wagons only to reduce dust emissions. Measures like covered conveyors for handling of bulk materials, centralized screening of iron ore, rationalization of weighing system, use of higher capacity vehicles etc. shall be adopted to reduce dust emissions. Mechanized vacuum cleaning of arterial roads shall be carried out on regular basis to further reduce the dust emissions.**

Compliance Status:

Under the traffic decongestion plan in Jamshedpur city:

- Southeastern corridor is under development with the government of Jharkhand.
- To control high traffic on the major roads of the town, decongestion work is being continued with the effort based on evolving need.

Inside the plant:

- Automatic traffic control system is in place to control the traffic density as well as the safety including secondary emission inside the plant.
- Maximum in bound and out bound material movements are done by railway wagons to reduce dust emissions.
- Speed limit of the vehicles has been restricted based on road capacity & condition to control secondary emission.
- Loaded trucks/dumpers coming inside the plant with their valid PUC.
- Mechanized vacuum cleaning sweepers are deployed within Works for regular cleaning and dust evacuation of roads which is being reused in process.
- High-Pressure Jet Cleaning Machine, is installed for effective road cleaning inside main works area.

xi. **Vehicular pollution due to transportation of raw materials and finished products shall be controlled. Proper arrangements shall also be made to control dust emissions during loading and unloading of the raw material and finished product.**

Compliance Status:

Maximum raw material is being transported through railways to reduce the road transport load and vehicular pollution. Dry fog dust suppression and water sprinklers are provided to control dust emission during loading and unloading activity. Dust suppression system (DS) are commissioned at various locations inside Works. Tyre washing facility has also been provided at strategic locations to reduce dust emission. High-Pressure Jet Cleaning Machine, is installed for effective road cleaning inside main works area.

xii. **As proposed, total water requirement from River Subarnarekha shall not exceed 33.3 MGD although permission for 227 MGD water is obtained vide letter dated 7th January 1992. Closed circuit cooling system shall be provided to reduce further water consumption. All the wastewater from various units shall be treated in the common effluent treatment plant (CETP) for primary, secondary, and tertiary treatment shall be either recycled or used for dust suppression, slag quenching and green belt development etc. within the lease hold area. The phenolic effluent from the by-product recovery section of coke oven battery # 10 and 11 shall be treated in BOD plant. Wastewater containing suspended solids shall be passed through clarifloculation plant to recover and reuse the clarified water for cooling or cleaning. Mill**

effluent containing oil and suspended solids shall be passed through oil skimmers and filter press. No treated wastewater shall be released out the premises and 'Zero' discharge shall be adopted by recycling all the treated water in the plant itself including from the existing plant.

Compliance Status:

Central Effluent Treatment Plant (CETP) had been constructed to treat and recycle most of the effluent by tertiary treatment with Reverse Osmosis (RO) followed by filter press. Treated water from CETP is being recycled in the process or used for slag quenching within lease hold area. Capacity of the existing CETP has been augmented and is under ramp up stage to treat and recycle the balance wastewater generated from various units. Coke Oven Batteries effluent is being treated in BOD plant. A tertiary treatment with RO is being implemented at BOD plant to ensure Zero Effluent Discharge from coke oven. Wastewater containing suspended solids is passed through Clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Primary effluent treatment with settling tanks and oil skimming facility is provided in mills. Closed circuit cooling systems have been installed. Catch pits have been constructed to recycle the treated effluent within plant and Zero Effluent Discharge has been achieved (most of the time) in 4 out of 5 designated outlets.

xiii. **Efforts shall be made to make use of rainwater harvested. If needed, capacity of the reservoir shall be enhanced to meet the maximum water requirement. Only balance water requirement shall be met from other sources.**

Compliance Status:

Upper Cooling Pond (UCP) and Lower Cooling Pond (LCP) are available in the plant premises, which stores and harvest available surface run off along with cooling water of the units, from which it is being used to meet the water requirement of plant operations. Rainwater harvesting structures in different office buildings have been provided inside the plant area.

xiv. **Continuous monitoring of Total Organic Compounds (TOC) in the wastewater treated in BOD plant from the coke oven plant shall be done at the outlet of ETP (BOD plant). All the treated wastewaters shall be monitored for pH, BOD, COD, oil & grease, cyanide, phenolic compounds, Chromium+6 etc. besides other relevant parameters.**

Compliance Status:

Monitoring of relevant parameters on the outlet of the BOD plant is being done regularly and monitoring reports are being submitted to JSPCB, CPCB and Rregional office of MoEF&CC.

xv. **Regular monitoring of influent and effluent and surface, sub-surface and ground water shall be ensured and treated wastewater shall meet the norms prescribed by the State Pollution Control Board or prescribed under the E(P) Act whichever are more stringent. Leachate study for the effluent generated and analysis shall also be regularly carried out and report submitted to the Ministry's Regional Office at Bhubaneswar, Jharkhand, SPCB and CPCB.**

Compliance Status:

Regular monitoring of treated effluent from plant outlets points, surface water quality is being done. Online effluent monitoring system has been commissioned in all the outlets to monitor effluent quality and the data is communicated to JSPCB server on real time basis. There are cooling waters pond, which is being used to recycle the water for process requirements, whose water quality is also regularly monitored as part of sub surface water quality. The monitoring data is being submitted to JSPCB, MoEF & CC at Ranchi and CPCB on six-monthly basis through half yearly EC compliance report. Monitoring reports for all relevant parameters from April 2025 to September 2025 is attached as **Annexure-2**.

xvi. Zero effluent discharge shall be strictly followed, and no additional wastewater shall be discharged outside the premises. Domestic wastewater shall be treated in septic tanks followed by soak pit and used for green belt development.

Compliance Status:

Central Effluent Treatment Plant (CETP) had been constructed to treat and recycle most of the effluent by tertiary treatment with Reverse Osmosis (RO) followed by filter press. Treated water from CETP is being recycled in the process or used for slag quenching within lease hold area. Capacity of the existing CETP has been augmented and is under ramp up stage to treat and recycle the balance wastewater generated from various units. Coke Oven Batteries effluent is being treated in BOD plant. A tertiary treatment with RO is being implemented at BOD plant to ensure Zero Effluent Discharge from coke oven. Wastewater containing suspended solids is passed through Clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Primary effluent treatment with settling tanks and oil skimming facility is provided in mills. Closed circuit cooling systems have been installed. Catch pits have been constructed to recycle the treated effluent within plant and Zero Effluent Discharge has been achieved (most of the time) in 4 out of 5 designated outlets. Effluent quality is being monitored regularly & monitoring reports are attached as **Annexure-2**. Domestic wastewater is being treated in township STPs.

xvii. As proposed, the water consumption shall not exceed 5.7 m^3/Ton of steel at 9.7 MTPY stage.

Compliance Status:

The specific water consumption has been reduced to 1.24 m3/tcs in FY26 (H1).

xviii. All the blast furnace (BF) slag shall be granulated and provided to cement manufacturers for further utilization in cement making as per the MoUs signed with various companies including M/s Lafarge, M/s Eco-cement & M/s ACC. LD slag after metal recovery shall be used in sinter plant, blast furnaces and LD convertor, aggregates making, road ballast making, soil conditioning etc. All the flue dust generated shall be recycled within the plant to the maximum extent. Mill scales, LD sludge, lime fines and flue dust shall be recycled back to the sinter plant. The BF gas cleaning plant sludge shall be used for manufacturing briquettes.

Compliance Status:

Maximum blast Furnace slag is being granulated and made available to the cement manufacturers for further utilization at cement industry. LD Slag after metal recovery is being used internally in the manufacturing process as well as externally in brick and road making works. Additional initiatives undertaken for improving the utilization of LD Slag:

- Co-processing of LD Slag at Cement Kilns.
- Open & closed Steam Aging inside Works
- Use of LD Slag in road making & railway ballast.

Mill scales, LD sludge, lime fines and flue dust are also recycled back for agglomeration process. Blast Furnace gas cleaning plant (GCP) sludge is re-utilized within the manufacturing process.

xix. As proposed, coal tar sludge and BOD sludge shall be recycled for coke making by mixing with the coal charge and used in the coke ovens. Chromium sludge shall be disposed in a HDPE lined secured landfills as per the CPCB guidelines within the complex. All the other solid waste including broken refractory mass shall be properly disposed of in environment-friendly manner. Oily waste and spent oil shall be provided to authorized recyclers/reprocesses.

Compliance Status:

Coal Tar sludge and BOD Sludge is being recycled in coke plant by mixing with raw materials. Chrome sludge is being disposed through authorized TSDF. All other kind of process wastes are being reutilized within the pant and by coprocessors. Oily waste and spent oil are sold to authorized recyclers/re-processors.

xx. **All the slag shall be used for land filling inside the plant or used as building material only after passing through Toxic Chemical Leachability Potential (TCLP) test. Toxic Chromium sludge and other hazardous substances recovered from the slag and output waste shall be disposed of in secured landfill as per CPCB guidelines.**

Compliance Status:

Slag is used for road making and land filling purpose. The TCLP test for slag is conducted by external approved agency and the report is enclosed under **Annexure-3**. Chrome sludge is being disposed through authorized TSDF.

xxi. **As proposed, Jugsalai muck dump (JMD) shall be reclaimed in a time bound manner by covering the dump site with geo-netting and vegetation along with localized water harvesting.**

Compliance Status:

The reclamation of JMD has been completed. A rainwater harvesting facility has been constructed at the top of the JMD which is being utilized for development of greenery. Besides this, there is a provision to pump surface drainage carry out from the plant to JMD area for development of greenery.

xxii. **A time bound action plan shall be submitted to reduce solid waste, its proper utilization and disposal to the Ministry's Regional Office at Bhubaneswar, Jharkhand SPCB and CPCB.**

Compliance Status:

An action plan for Solid waste management has been submitted to JSPCB vide our letter no. EMD/C-02/460/11 dated: 16 December 2011. We had also submitted road map regarding future generation and the disposal of solid waste vide our letter no. EMD/C-33/124/13 dated: 22 June 2013.

xxiii. **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 at Ranchi, Jharkhand SPCB and CPCB.**

Compliance Status:

Various process solid waste is reutilized within the manufacturing process. Information regarding solid waste and hazardous waste generation, utilization & disposal is being submitted in Environment Statement & Annual Returns to board every year.

xxiv. **Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1999 and subsequent amendment in 2003. All the fly ash shall be provided to cement and brick manufacturers for further utilization and "Memorandum of Understanding" shall be submitted to Ministry's Regional Office at Bhubaneswar.**

Compliance Status:

Captive power plants have been converted from coal fired to gas fired, thus there is no generation of fly ash in the power plant.

xxv. **A Risk and Disaster Management Plan along with the mitigation measures shall be prepared and a copy submitted to the Ministry's Regional Office at Ranchi, Jharkhand SPCB and CPCB within 3 months of issue of environment clearance letter.**

Compliance Status:

Updated On-site Emergency Plan & Disaster Control, approval by Chief Inspector of Factories, is attached as **Annexure-4.**

xxvi. **As proposed, green belt shall be developed in more than 33 % area within and around the plant premises as per the CPCB guidelines in consultation with DFO.**

Compliance Status:

Green cover area is developed in more than 33% area within and around the plant premises.

xxvii. **Prior permission from the State Forest Department shall be taken regarding likely impact of the expansion of the proposed steel plant on the reserve forests. Measures shall be taken to prevent impact of particulate emissions / fugitive emissions, if any from the proposed plant on the surrounding reserve forests viz. Jora Pahar PF, Sand Pcha Rahar PF, Deluse RF located within 10 km radius of the project. Further, Conservation Plan for the conservation of wild fauna in consultation with the State Forest Department shall be prepared and implemented.**

Compliance Status:

Prior Permission from State Forest Department has been obtained vide their memo. No. 2605 dated 20.10.2010. Wildlife Conservation Plan for Tata Steel has been prepared with the help of approved external agency recommended by State Forest Department and the same has been approved by Principal Chief Conservator of Forests – Wildlife (PCCF-WL) GoJ on 13 November 2017 **(Annexure-10).** Further, Payment of levies as per w.r.t. approved SSWLCP of Tata Steel Limited has been deposited into DFO Jamshedpur account vide challan no. 108 dated: 20.02.2023 **(Annexure-10)** Wildlife Conservation Plan will be implemented as directed by Department of Forest, Jharkhand and approved SSWLCP.

xxviii. **All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Steel Plants shall be implemented.**

Compliance Status:

CREP recommendations have been implemented. Please find enclosed the same as **Annexure–6.**

xxix. **All the commitments made to the public during the Public Hearing / Public Consultation meeting held on 18th June 2009 shall be satisfactorily implemented and a separate budget for implementing the same shall be allocated and information submitted to the Ministry's Regional Office at Bhubaneswar.**

Compliance Status:

Commitments made to the public during the Public Hearing are being implemented.

xxx. **At least 5 % of the total cost of the project i.e. ₹ 750.00 Crores shall be earmarked towards the corporate social responsibility and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office at Bhubaneswar. Implementation of such program shall be ensured accordingly in a time bound manner.**

Compliance Status:

It is being complied as per the requirement under the Companies Act. The amount spent by the Company on Corporate Social Responsibility (CSR) activities is ₹ 72.27 Crores spent in East Singhbhum area and 11.6 Crores in and around Jamshedpur for FY'26 (H1).

xxxi. The company shall provide housing for construction labour 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.

Compliance Status:

The construction work has been completed. All the necessary infrastructure and facilities such as food, medical health care, toilets, safe drinking water, etc. had been provided to construction labor during the project work.

B. General Conditions:

i. The project authorities must strictly adhere to the stipulations made by the Jharkhand Pollution Control Board and the State Government.

Compliance Status:

We are abiding by the compliance conditions made by JSPCB and State Government of Jharkhand.

ii. No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).

Compliance Status:

Further expansion of capacity of 11 MTPA was carried out with prior approval from MoEF & CC.

iii. 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 Board may specify more stringent standards for the relevant parameters keeping in view the nature of the industry and its size and location.

Compliance Status:

Appropriate action have been taken to control gaseous emission from process units.

iv. 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 Jharkhand PCB. Data on ambient air quality and stack emission should be regularly submitted to this Ministry including its Regional Office at Bhubaneswar and the Jharkhand PCB/CPCB once in six months.

Compliance Status:

Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and Online Continuous Emission Monitoring System (OCEMS) have been installed to monitor ambient air quality & stack emissions. Monitoring reports for all relevant parameters for the period April 2025 to Sept 2025 are attached as **Annexure-2**.

v. Industrial wastewater shall be properly collected, treated 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.

Compliance Status:

Industrial wastewater is being collected, treated in the treatment plants and maximum treated wastewater is reused in different processes.

vi. **The overall noise levels in and around the plant area shall 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) (daytime) and 70 dB (A) (night-time).**

Compliance Status:

Personal Protective Equipment (PPE) have been provided to the workers/officers to avoid any accompanied noise hazards. Facilities like silencers, enclosures, hood etc. have been provided to reduce noise at source. The ambient noise level monitoring is being done at different part of the Jamshedpur town in frequent interval outside Steel Works to assess the ambient noise level status. Noise level in the town is found beyond the standard on few occasions. The possible reason of equivalent noise levels in respect of all categories of areas exceeded the standards for day and night times is due to heavy traffic movement in the town, market and commercial activities, festivals and other domestic celebrations and frequent religious rituals. Monitoring reports for all relevant parameters from April 2025 to September 2025 is attached in **Annexure-2**.

vii. **Occupational Health Surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.**

Compliance Status:

Regular health surveillance is being conducted on a regular basis and records are maintained.

viii. **The company shall develop surface as well as ground water harvesting structures to harvest the rainwater for utilization in the lean season besides recharging the ground water table.**

Compliance Status:

Rainwater harvesting structures have been provided inside the plant area, of which some area has the facility of Ground Water Recharge system.

ix. **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.**

Compliance Status:

Environmental protection measures and safeguards such as APCEs, ETPs, hazardous waste proper handling, transfer and disposal have been deployed as recommended in the EIA/EMP report. Tata Steel Ltd, through Tata Steel Foundation, undertakes a range of socio-economic development activities in and around Jamshedpur. These initiatives focus on critical areas such as public health, education, disability support, livelihoods, access to drinking water, rural infrastructure, sports, and the preservation of tribal culture. TSL also facilitates Institutes like the R. D. Tata Technical Institute, Tata Football Academy, and Tata Archery Foundation etc. which encourages the local talent to develop themselves and participate at National and International levels.

x. **As proposed, 2,107.00 Crores and ₹ 60.00 Crores shall be earmarked towards total capital cost and recurring cost/annum for environmental pollution control measures and judiciously utilized to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government. The funds so provided shall not be diverted for any other purpose.**

Compliance Status:

Capital expenditure on environment is being spent on Air Pollution Control, Solid Waste Management, Zero Wastewater Discharge and Others including Greenery, Online Monitoring, etc. In FY26 (H1), total capital expenditure and recurring cost for environment are ₹ 411 Crores and ₹ 59.60 Crores respectively.

xi. **The Regional Office of this Ministry at Bhubaneswar/CPCB/Jharkhand SPCB will monitor the stipulated conditions. A six-monthly compliance report and the monitored data along with statistical interpretation shall be submitted to them regularly.**

Compliance Status:

Six monthly compliance reports consisting of monitoring data are being submitted regularly.

xii. **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 JSPCB and may also be seen at Website of the Ministry of Environment, Forests and Climate Change (MoEFCC) at http:/envfor.nic.in. This shall 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 shall be forwarded to the regional office.**

Compliance Status:

The Notice has been advertised in two local newspapers viz. Hindustan (Hindi) and Hindustan Times (English) on 18 May 2010, and communication to this effect was also sent to the MoEF vide our letter no. EMD/C-33/128/10 dated 15 June 2010. The same has been provided as **Annexure-9**.

xiii. **A copy of Clearance letter shall be sent by proponent to be concerned 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.**

Compliance Status:

The copy of Clearance letter has been sent to Zila Parishad, DIC, Local Body and all concerned vide EMD/C-33/129-137/10 dated 15 June 2010 attached as **Annexure-7**. The clearance letter is also uploaded on the company website:https://www.tatasteel.com/corporate/our-organisation/environment/environment- compliance-reports/).

xiv. **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 MoEF&CC, the respective Zonal Office of CPCB and the JPCB. The criteria pollutant levels namely, PM10, SO2, 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.**

Compliance Status:

Six monthly compliance reports with the monitored data is being uploaded on Parivesh 2.0 portal of MoEF&CC. The ambient air quality parameters are being monitored and displayed at the main gate of the company in the public domain. The six-monthly compliance reports along the monitored data is also uploaded in the website:(https://www.tatasteel.com/corporate/our-organisation/environment/environment-compliance-reports/).

xv. 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 at Bhubaneswar, the respective Zonal Office of CPCB and the JSPCB. The Regional Office of this Ministry at Bangalore / CPCB / JPCB shall monitor the stipulated conditions.

Compliance Status:

Six monthly compliance reports and the monitored data is being submitted through Parivesh portal of MoEFCC and is also mailed to respective Zonal Office of CPCB and the JSPCB.

xvi. The environmental statement for each financial year ending 31st 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 Offices of the MoEFCC by e-mail.

Compliance Status:

The environmental statement for each financial year in Form-V is regularly being submitted to the Jharkhand State Pollution Control Board. Environment Statement for FY'25 has been submitted vide our letter no. TSJ/EMD/C-23/049/25 dated 25.09.2025 attached as **Annexure-8**. The environmental statement has also been uploaded on the company's website: (https://www.tatasteel.com/corporate/our-organisation/environment/environment- compliance-reports/).

xvii. 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.

Compliance Status:

It is compiled as the project has been already completed and Consent to Operate has been issued by Jharkhand State Pollution Control Board.

ENVIRONMENTAL CLEARANCE COMPLIANCE STATUS REPORT

October 2024 to March 2025

Tata Steel Limited, Jamshedpur

(MAIN WORKS & TOWN)

Six Monthly Compliance Status report of Environmental Clearance from expansion of 5 to 6.8 MTPA Crude Steel Production

ENVIRONMENTAL MANAGEMENT DEPARTMENT
TATA STEEL LIMITED
JAMSHEDPUR

A. Specific Conditions:

i. The gaseous emissions from various process units shall conform to the load/mass-based standards notified by this Ministry on 11th May 1993 and standards prescribed from time to time. The state 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 emission 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.

Compliance Status:

Several Projects have been implemented to control Gaseous Emission levels including secondary fugitive emissions from all the sources. Secondary fugitive dust emissions inside the plant in different areas is being controlled and monitored in line with the CPCB guidelines and MoEF & CC standards. Existing and new units are provided with adequate pollution control equipment (PCEs) to ensure the emission levels within specific legal requirement.

ii. Efforts shall be made to reduce RSPM levels in the ambient air and a time bound action plan shall be submitted. On-line stack monitoring facilities for all the stacks including new sinter plant and powerhouse and sufficient air pollution control devices shall be provided to keep the emission levels below 50 mg/Nm3 and reports submitted to the Jharkhand SPCB and CPCB.

Compliance Status:

Maximum ESPs have been upgraded and some are in progress to achieve emission level below ≤50 mg/Nm3. Similarly, in almost all the unit's alert facility have been provided in case of units exceed any prescribed emission level as the interlocking is technically not feasible in all the production units. List of air pollution control devices for each of production unit as **Annexure-1** is attached.

iii. In-plant control measures for checking fugitive emissions from all the vulnerable sources shall be provided. Dust extraction system and dry fogging system will be provided to control air emissions at material transfer and sizing plants. ESP and bag filters shall be provided wherever required to keep the emission levels below 50 mg/Nm3 particularly in 'H'-BF stock house, BF cast houses and sinter stock house. Low NOx burners will be installed to control NOx emissions. Gas cleaning plant shall be provided to BF. Further, specific measures like water sprinkling shall be carried out and fugitive emissions shall be controlled, regularly monitored and records maintained.

Compliance Status:

Air pollution control devices Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. are provided in all the relevant production units. List of air pollution control devices for each of production unit is attached as **Annexure-1**. Some ESPs have been upgraded of all relevant production units while the some are under progress to achieve emission level ≤50 mg/Nm3. Measures like water sprinkling are being carried out to control fugitive emissions. Monitoring reports for relevant parameters from April 2025 to Sept 2025 is attached in **Annexure-2**.

iv. Gaseous emission levels including secondary fugitive emissions shall be controlled within the latest permissible limits issued by the Ministry and regularly monitored. Guidelines / Code of Practice issued by the CPCB in this regard shall be followed.

Compliance Status:

Several Projects have been implemented to control Gaseous Emission levels including secondary fugitive emissions from all the sources. Secondary fugitive dust emissions inside the plant in different areas is being controlled and monitored in line with the CPCB guidelines and MoEF&CC standards.

v. **Total water requirement from River Subarnarekha shall not exceed 3,91,800 m3/day as per the permission accorded by the State Govt. No ground water shall be used. GCP wastewater treatment plants for 'H'-BF and Billet Caster no. 3 shall be provided. The treated process effluent shall be recycled and re-used in cooling tower as well as for green belt development. Cooling towers blow down shall be used for granulation, coke quenching, dust suppression and other non-product uses. Treated effluent discharge into the streams/river shall not exceed 37,000 m3/day. Domestic effluent shall be treated in Sewage Treatment Plant (STP).**

Compliance Status:

Central Effluent Treatment Plant (CETP) had been constructed to treat and recycle most of the effluent by tertiary treatment with Reverse Osmosis (RO) followed by filter press. Treated water from CETP is being recycled in the process or used for slag quenching within lease hold area. Capacity of the existing CETP has been augmented and is under ramp up stage to treat and recycle the balance wastewater generated from various units. Coke Oven Batteries effluent is being treated in BOD plant. A tertiary treatment with RO is being implemented at BOD plant to ensure Zero Effluent Discharge from coke oven. Wastewater containing suspended solids is passed through Clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Primary effluent treatment with settling tanks and oil skimming facility is provided in mills. Closed circuit cooling systems have been installed. Catch pits have been constructed to recycle the treated effluent within plant and Zero Effluent Discharge has been achieved (most of the time) in 4 out of 5 designated outlets.

vi. **Continuous monitoring of Total Organic Compounds (TOC) shall be done at the outlet of ETP (BOD plant).**

Compliance Status:

Monitoring of relevant parameters on the outlet of the BOD plant is being done regularly and monitoring reports are being submitted to JSPCB, CPCB and regional office of MoEF & CC.

vii. **Ground water monitoring around the solid waste disposal site / secured landfill (SLF) shall be carried out regularly and report submitted to the Ministry's Regional Office at Bhubaneswar, CPCB and OPCB.**

Compliance Status:

Maximum process solid waste is being reused internally in the sinter & pellet making and in coke ovens. Remaining few are being disposed of through authorised TSDF. Therefore, we are not engaged in disposal via landfilling in our plant premises.

viii. **Solid wastes shall be reused in the cement plant, road construction and railway ballast. BF slag shall be granulated in cast house and used for cement making. LD slag shall be processed in Waste Recycling Plant and subsequently recycled in the BF LD sludge and sinter plants. Remaining slag shall be used for road construction and filling the low-lying areas. The Chrome sludge in the form of Cr+3 shall be dumped only in the secured landfill located within the plant premises and proper disposal of Chrome sludge shall be ensured. Oily waste shall be burnt in the incinerator.**

Compliance Status:

Maximum blast Furnace slag is being granulated and made available to the cement manufacturers for further utilization at cement industry. LD Slag after metal recovery is being used internally in the manufacturing process as well as externally in brick and road making works. Additional initiatives undertaken for improving the utilization of LD Slag:

- Co-processing of LD Slag at Cement Kilns.
- Open & closed Steam Aging inside Works
- Use of LD Slag in road making & railway ballast.

Mill scales, LD sludge, lime fines and flue dust are also recycled back for agglomeration process. Blast Furnace gas cleaning plant (GCP) sludge is re-utilized within the manufacturing process. Chrome sludge is being disposed through authorized TSDF.

ix. **Fly ash shall be used in cement plants. Bottom ash shall be disposed of in a suitably designed landfill as per CPCB guidelines to prevent leaching to the sub-soil and underground aquifer.**

Compliance Status:

Captive power plants have been converted from coal fired to gas fired, thus there is no generation of fly ash in the power plant.

x. **Practice of disposal of solid wastes along the river shall be immediately stopped and efforts shall be made to remove the solid waste from the banks of the river.**

Compliance Status:

There is no disposal of solid waste along the riverbank from Tata Steel Limited.

xi. **A time bound action plan should be submitted to reduce solid waste, its proper utilization and disposal. Action plan for the reclamation of Jugsalai Muck disposal site submitted to the Ministry shall be implemented in a time bound manner.**

Compliance Status:

Tata Steel has taken several steps to improve the solid waste utilization. The reclamation of JMD has been completed. A rainwater harvesting facility has been constructed at the top of the JMD which is being utilized for development of greenery. Besides this, there is a provision to pump surface drainage carry out from the plant to JMD area for development of greenery.

xii. **The company shall develop surface as well as ground water harvesting structures to harvest the rainwater for utilization in the lean season besides recharging the ground water table.**

Compliance Status:

Rainwater harvesting structures have been provided inside the plant area, of which some area has the facility of Ground Water Recharge system.

xiii. **Green belt shall be developed in 1157.7 ha (33 %) out of total 4391.85 ha. within and around the plant premises as per the CPCB guidelines in consultation with DFO.**

Compliance Status:

Green cover area is developed in more than 33% area within and around the plant premises.

xiv. **Occupational Health Surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.**

Compliance Status:

Regular health surveillance is being conducted and records are maintained.

xv. **Recommendations made in the Corporate Responsibility for Environment Conservation (CREP) issued for the steel plants shall be implemented.**

Compliance Status:

CREP recommendations have been implemented. CREP report is attached as **Annexure–6.**

B. General Conditions:

I. The project authorities must strictly adhere to the stipulations made by the Jharkhand Pollution Control Board (Jharkhand SPCB) and the State Government.

Compliance Status:

We are abiding by all the compliance conditions made by JSPCB and State Government of Jharkhand.

II. No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).

Compliance Status:

Further expansion of capacity of 11 MTPA was carried out with prior approval from MoEF&CC.

III. 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 Jharkhand SPCB. Data on ambient air quality and stack emission should be regularly submitted to this Ministry including its Regional Office at Ranchi and the SPCB/CPCB once in six months.

Compliance Status:

Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and Online Continuous Emission Monitoring System (OCEMS) have been installed to monitor air emissions. Monitoring reports for all relevant parameters for the period April 2025 to September 2025 are attached as **Annexure-2**.

IV. Industrial wastewater shall be properly collected, treated 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.

Compliance Status:

Industrial wastewater is being collected, treated in the treatment plants (CETP, BOD, ETPs etc.) and maximum treated wastewater is reused in different processes.

V. The overall noise levels in and around the plant area shall 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) (daytime) and 70 dB (A) (night-time).

Compliance Status:

Personal Protective Equipment (PPE) have been provided to the workers/officers to avoid any accompanied noise hazards. Facilities like silencers, enclosures, hood etc. have been provided to reduce noise at source. The ambient noise level monitoring is being done at different part of the Jamshedpur town in frequent interval outside Steel Works to assess the ambient noise level status. Noise level in the town is found beyond the standard on few occasions. The possible reason of equivalent noise levels in respect of all categories of areas exceeded the standards for day and night times is due to heavy traffic movement in the town, market and commercial activities, festivals and other domestic celebrations and frequent religious rituals. Monitoring reports for all relevant parameters from April 2025 to September 2025 is attached in **Annexure-2**.

VI. 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.

Compliance Status:

Environmental protection measures and safeguards such as APCEs, ETPs, hazardous waste proper handling, transfer and disposal have been deployed as recommended in the EIA/EMP report. Tata Steel Ltd, through Tata Steel Foundation, undertakes a range of socio-economic development activities in and around Jamshedpur. These initiatives focus on critical areas such as public health, education, disability support, livelihoods, access to drinking water, rural infrastructure, sports, and the preservation of tribal culture. TSL also facilitates Institutes like the R. D. Tata Technical Institute, Tata Football Academy, and Tata Archery Foundation etc. which encourages the local talent to develop themselves and participate at National and International levels.

VII. As mentioned in the EIA and EMP, ₹ 259.00 Crores and ₹18.5 Crores earmarked towards the capital cost and recurring cost/annum for environmental pollution control measures shall be judiciously utilized to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government. The funds so provided shall not be diverted for any other purpose.

Compliance Status:

The 6.8 MTPA project is completed. Capital expenditure on environment is being spent on Air Pollution Control, Solid Waste Management, Zero Wastewater Discharge and Others including Greenery, Online Monitoring, etc. In FY26 (H1), total capital expenditure and recurring cost for environment are ₹ 411 Crores and ₹ 59.60 Crores respectively.

VIII. The Regional Office of this Ministry at Bhubaneswar/CPCB/Jharkhand SPCB will monitor the stipulated conditions. A six-monthly compliance report and the monitored data along with statistical interpretation shall be submitted to them regularly.

Compliance Status:

Six monthly compliance reports and the monitored data are being submitted regularly.

IX. 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 (MoEFCC) at http:/envfor.nic.in. This shall 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 shall be forwarded to the regional office.

Compliance Status:

The Notice has been advertised in two local newspapers viz. Uditvani (Hindi) and Avenue Mail (English) on 21 April 2007 and communication to this effect was also sent to the MoEF vide our letter no. EMD/C-32/2118/07 dated 18 August 2007. Attached as **Annexure-9**.

X. 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.

Compliance Status:

It is compiled as the project has been already completed and Consent to Operate has been issued by Jharkhand State Pollution Control Board.

ENVIRONMENTAL CLEARANCE COMPLIANCE STATUS REPORT

April 2025 to September 2025

Tata Steel Limited, Jamshedpur

(MAIN WORKS & TOWN)

Six Monthly Compliance Status report of Environmental Clearance from expansion of 4 to 5 MTPA Crude Steel Production

ENVIRONMENTAL MANAGEMENT DEPARTMENT
TATA STEEL LIMITED
JAMSHEDPUR

A. Specific Conditions:

i. **The gaseous emissions from various process units should conform to the load/mass-based standards notified by this Ministry on 19th May 1993 and standards prescribed from time to time. The State 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 emission 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.**

Compliance Status:

Several Projects have been implemented to control Gaseous Emission levels including secondary fugitive emissions from all the sources. Secondary fugitive dust emissions inside the plant in different areas is being controlled and monitored in line with the CPCB guidelines and MoEF & CC standards. Existing and new units are provided with adequate pollution control equipment (PCEs) to ensure the emission levels within specific legal requirement.

ii. **As reflected in the EIA/EMP report, the wastewater generation shall not exceed from the existing level from various units namely, sponge iron plant, steel melting shop, rolling mill, rotary hearth furnace. The company shall undertake closed circuit system for the wastewater treatment and the sludge recycled to the sinter plant. The recovery and recycling of Susangharia nalla water shall be carried to recycle 800m3/hr water. The Jugsalai and Ram Mandir nalla shall be made zero discharge. However, 31300 m3/d of treated effluent after confirming to the prescribed standards shall be discharge into Subarnarekha River. The treated wastewater to be discharged into the Kharkai river should remain at the existing level of 1364m3/d. The domestic wastewater after treatment in STP should be used for green belt development.**

Compliance Status:

Central Effluent Treatment Plant (CETP) had been constructed to treat and recycle most of the effluent by tertiary treatment with Reverse Osmosis (RO) followed by filter press. Treated water from CETP is being recycled in the process or used for slag quenching within lease hold area. Capacity of the existing CETP has been augmented and is under ramp up stage to treat and recycle the balance wastewater generated from various units. Coke Oven Batteries effluent is being treated in BOD plant. A tertiary treatment with RO is being implemented at BOD plant to ensure Zero Effluent Discharge from coke oven. Wastewater containing suspended solids is passed through Clari-flocculation plant to recover and reuse the clarified water for cooling or cleaning. Primary effluent treatment with settling tanks and oil skimming facility is provided in mills. Closed circuit cooling systems have been installed. Catch pits have been constructed to recycle the treated effluent within plant and Zero Effluent Discharge has been achieved (most of the time) in 4 out of 5 designated outlets.

iii. **In plant control measures for checking fugitive emission from spillage/raw materials handling should be provided. Further specific measures like provision of dust extraction system at sinter plant, stock house fume extraction system at cast house of blast furnace shall be installed. Particulate emissions shall not exceed 100mg/Nm3. Further de-dusting facilities at new lime kiln, sinter plant and wet suppression system at raw material bedding and blending plant shall be provided.**

Compliance Status:

Air pollution control devices Electrostatic precipitator (ESP), bag house, gas cleaning plant, bag filters etc. are provided in all the relevant production units. List of air pollution control devices for each of production unit is attached as **Annexure-1**. Some ESPs have been upgraded of all relevant production units while the some are under progress to achieve emission level ≤50 mg/Nm3. Measures like water sprinkling are being carried out to control fugitive emissions.

iv. **The company shall phase out steam coal burning by using by-products fuel gas and replace existing wet quenching facility of coke oven battery No. 5, 6 and 7 by dry quenching to recover energy and reduce CO_2 greenhouse gas emission.**

Compliance Status:

Captive power plants have been converted from coal fired to gas fired, thus there is no generation of fly ash in the power plant and dry quenching is being used in some units.

v. **As per the solid waste management plan submitted to the Ministry, about 7268 TPD of solid waste shall be generated. There shall be no generation of boiler ash as BF gas would be used instead of coal. The company shall recycle the BF and LD slag for cement manufacturing, road embankment, construction and filing up of low-lying areas. As per the plan submitted to the Ministry the company shall reuse 100% of BF and LD slag by December 2007.**

Compliance Status:

No ash is being generated as all the power plants are gas based. Maximum blast Furnace slag is being granulated and made available to the cement manufacturers for further utilization at cement industry. LD Slag after metal recovery is being used internally in the manufacturing process as well as externally in brick and road making works. Additional initiatives undertaken for improving the utilization of LD Slag:

- Co-processing of LD Slag at Cement Kilns.
- Open & closed Steam Aging inside Works
- Use of LD Slag in road making & railway ballast.

Mill scales, LD sludge, lime fines and flue dust are also recycled back for agglomeration process. Blast Furnace gas cleaning plant (GCP) sludge is re-utilized within the manufacturing process. Chrome sludge is being disposed through authorized TSDF.

vi. **The chrome sludge (251kg/d) generated from the colour coating shall be disposed of in the lined pit within the plant premises and oily sludge (25TPD) shall be incinerated. The company shall undertake ground water quality monitoring around the chrome sludge disposal site and data submitted to the Ministry.**

Compliance Status:

Chrome sludge is being disposed through authorized TSDF.

vii. **A green belt adequate width and density should be developed in an area of 7.0 ha of plant area in addition to the 75 ha of area already afforested within and around the plant premises as per the CPCB guidelines.**

Compliance Status:

Green cover area is developed in more than 33% area within and around the plant premises.

viii. **The company shall undertake rainwater-harvesting measures to harvest the rainwater for utilisation in the lean season as well as to recharge the ground water table.**

Compliance Status:

Rainwater harvesting structures have been provided inside the plant area, of which some area has the facility of Ground Water Recharge system.

ix. **Occupational Health Surveillance of the workers shall be done on a regular basis and records maintained as per Factories Act.**

Compliance Status:

Regular health surveillance is being conducted on a regular basis and records are maintained.

x. **Recommendations made in the CREP shall be implemented.**

Compliance Status:

CREP recommendations have been implemented. Enclosed as **Annexure–6.**

xi. **The company shall carry out life cycle assessment for monitoring to assess the overall environmental improvement of the plant with respect to consumption norms of natural resources and energy and specific norms for waste generation.**

Compliance Status:

Tata Steel had participated in the life cycle assessment conducted with the government agencies.

B. **General Conditions:**

i. **The project authorities must adhere to the stipulations made by the Jharkhand Environment Conservation Board and the State Government.**

Compliance Status:

We are abiding by all the compliance conditions made by JSPCB and State Government of Jharkhand.

ii. **No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment and Forests**

Compliance Status:

All expansions were carried out with prior approval from MoEF&CC.

iii. **At least four ambient air quality-monitoring stations should 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 State Pollution Control Board. Data on ambient air quality and stack emission should be regularly submitted to this Ministry including its regional office at Bhubaneswar and State Pollution Control Board/Central Pollution Control Board once in six months.**

Compliance Status:

Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and Online Continuous Emission Monitoring System (OCEMS) have been installed to monitor ambient air quality and stack emission. Monitoring reports for all relevant parameters for the period of April 2025 to Sept 2025 are attached as **Annexure-2**.

iv. **Industrial wastewater should be properly collected, treated 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 should be utilized be for plantation purpose.**

Compliance Status:

Industrial wastewater is being collected, treated in the treatment plants (CETP, BOD, ETPs etc.) and maximum treated wastewater is reused in different processes.

v. The overall noise level 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).

Compliance Status:

Personal Protective Equipment (PPE) have been provided to the workers/officers to avoid any accompanied noise hazards. Facilities like silencers, enclosures, hood etc. have been provided to reduce noise at source. The ambient noise level monitoring is being done at different part of the Jamshedpur town in frequent interval outside Steel Works to assess the ambient noise level status. Noise level in the town is found beyond the standard on few occasions. The possible reason of equivalent noise levels in respect of all categories of areas exceeded the standards for day and night times is due to heavy traffic movement in the town, market and commercial activities, festivals and other domestic celebrations and frequent religious rituals. Monitoring reports for all relevant parameters from April 2025 to Sept 2025 is attached in **Annexure-2**.

vi. 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 programmes, educational programmes, drinking water supply and health care etc.

Compliance Status:

Environmental protection measures and safeguards such as APCEs, ETPs, hazardous waste proper handling, transfer and disposal have been deployed as recommended in the EIA/EMP report. Tata Steel Ltd, through Tata Steel Foundation, undertakes a range of socio-economic development activities in and around Jamshedpur. These initiatives focus on critical areas such as public health, education, disability support, livelihoods, access to drinking water, rural infrastructure, sports, and the preservation of tribal culture. TSL also facilitates Institutes like the R. D. Tata Technical Institute, Tata Football Academy, and Tata Archery Foundation etc. which encourages the local talent to develop themselves and participate at National and International levels.

vii. The project authorities shall provide an amount of Rs 286 crores (question no. xix part b) funds both recurring and non-recurring to implement the conditions stipulated by the Ministry of Environment and 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 purposes.

Compliance Status:

The 5 MTPA project is completed. Capital expenditure on environment is being spent on Air Pollution Control, Solid Waste Management, Zero Wastewater Discharge and Others including Greenery, Online Monitoring, etc. In FY26 (H1), total capital expenditure and recurring cost for environment are ₹ 411 Crores and ₹ 59.60 Crores respectively.

viii. The Regional Office of this Ministry at Bhubaneswar/ Central Pollution Control Board/State Pollution Control Board will monitor the stipulated conditions. A six-monthly compliance report and the monitored data along with statistical interpretation should be submitted to them regularly.

Compliance Status:

Six monthly compliance reports and the monitored data are being submitted regularly.

ix. 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.

Compliance Status:

The Notice has been advertised in two local newspapers viz. Chamakta Aaina (Hindi) and The Avenue Mail (English) on 04 June 2005, and communication to this effect was also sent to the MoEF&CC. Attached as **Annexure-9**.

x. 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.

Compliance Status:

It is compiled as the project has been already completed and Consent to Operate has been issued by Jharkhand State Pollution Control Board.

MONITORING & ANALYSIS REPORT

April 2025 to September 2025

Tata Steel Limited, Jamshedpur
(MAIN WORKS & TOWN)

ENVIRONMENTAL MANAGEMENT DEPARTMENT
TATA STEEL LIMITED
JAMSHEDPUR

Annexure-II

Details of Air/Water Pollution Control Equipment and Stacks with sampling arrangement

1. Unit wise Air/Water Pollution Control Equipment

Sl. No.	Area/Location	Air/Water Pollution Control Measures
1	**Raw Material Handling Section**	Covered storage under shed Covered conveyor Dry Fogging Water sprinkling Fabric filter based DE system Bag Filters Catchpit for storage of storm water
2	**Coke Ovens**	
	Battery # 8 & 9	Coke Transfer Car (CTC) Charging Gas Transfer (CGT)
	Battery # 10 & 11	Main Charging by High Pressure LA Land based coke side dust extraction Hydro jet door cleaning Pushing and dedusting Bag filter Coke Dry Quenching
	Coke Oven By Product Plant	De-Sulphurisation BOD Plant (Advent Integral System)
3	**Pellet Plant**	Bag Filters Dust Suppression Wet Scrubber Electrostatic Precipitators
4	**Sinter Plants**	
	Sinter Plant# 1	Bag Filters Dust Suppression Foam Spray System Electrostatic Precipitators
	Sinter Plant# 2	Bag Filters Dust Suppression Foam Spray System Electrostatic Precipitators
	Sinter Plant# 3	Bag Filters Dust Suppression Foam Spray System Electrostatic Precipitators
	Sinter Plant# 4	Bag Filters Dust Suppression Foam Spray System Electrostatic Precipitators
5	**Lime Plant**	
	Process and dedusting	Bag Filters
	Stockpile	DS System
	Track Hopper	DS System
	Wagon Tippler	DS System
6	**Blast Furnaces**	
	C-F Blast Furnaces	Bag Filters Scrubbers DS System Gas Cleaning Plant with Press filter Effluent Treatment Plant
	G Blast Furnace	Bag Filters Scrubbers

		DS System Gas Cleaning Plant with Press filter
	H Blast Furnace	Bag Filters Scrubbers DS System Gas Cleaning Plant with Press filter
	I Blast Furnace	Bag Filters Scrubbers DS System Gas Cleaning Plant with Press filter
7	**Steel Melting Shops**	
	LD 1	Bag Filters Electrostatic Precipitators Gas Cleaning Plant Effluent Treatment Plant
	LD 2	Bag Filters Electrostatic Precipitators Gas Cleaning Plant Effluent Treatment Plant
	LD 3	Bag Filters Electrostatic Precipitators Gas Cleaning Plant Effluent Treatment Plant
8	**Finishing Mills**	
	Cold Rolling Mill	Scrubbers Effluent Treatment Plant
	Hot Strip Mill	Effluent Treatment Plant
	Merchant Mill	Effluent Treatment Plant
	JCAPCPL	Scrubbers Mist Separators Effluent Treatment Plant
	Wire Rod Mill	Effluent Treatment Plant
	New Bar Mill	Effluent Treatment Plant
9	**Steel Works – Common**	Industrial Vacuum Cleaning System Mechanized Road sweeping system Water sprinklers Tyre Washing facilities Catch-pits at all drains for recycling Central Effluent Treatment Plant

TATA STEEL LIMITED

Environment Management Department – Laboratory

Continuous Ambient Air Quality Report for Inside Main Works, Jamshedpur from April'25-Sept'25

Location	Parameter	UoM	Apr-25	May-25	June-25	July-25	Aug-25	Sept-25
WPFA	Particulate Matter, PM10	µg/m3	80	55	45	32	37	39
	Particulate Matter, PM2.5	µg/m3	29	23	21	15	14	13
	Sulphur Dioxide (SO2)	µg/m3	24	21	25	24	26	26
	Nitrogen Dioxide, (NO2)	µg/m3	31	19	8	13	28	45
	Carbon Monoxide (CO)	mg/m3	1.1	1.0	1.0	1.0	1.0	1.1
CRM	**Parameter**	**UoM**	**Apr-25**	**May-25**	**June-25**	**July-25**	**Aug-25**	**Sept-25**
	Particulate Matter, PM10	µg/m3	138	55	81	52	58	79
	Particulate Matter, PM2.5	µg/m3	33	23	21	17	18	22
	Sulphur Dioxide (SO2)	µg/m3	64	21	41	54	33	41
	Nitrogen Dioxide, (NO2)	µg/m3	14	19	13	21	33	37
	Carbon Monoxide (CO)	mg/m3	-	1.0	-	-	-	-
PH#3	**Parameter**	**UoM**	**Apr-25**	**May-25**	**June-25**	**July-25**	**Aug-25**	**Sept-25**
	Particulate Matter, PM10	µg/m3	100	60	51	65	54	60
	Particulate Matter, PM2.5	µg/m3	30	21	26	23	20	20
	Sulphur Dioxide (SO2)	µg/m3	42	39	47	34	34	32
	Nitrogen Dioxide, (NO2)	µg/m3	64	36	16	12	13	16
	Carbon Monoxide (CO)	mg/m3	0.9	1.1	1.6	1.4	1.0	1.1
PH#6	**Parameter**	**UoM**	**Apr-25**	**May-25**	**June-25**	**July-25**	**Aug-25**	**Sept-25**
	Particulate Matter, PM10	µg/m3	112	96	81	67	55	49
	Particulate Matter, PM2.5	µg/m3	38	35	33	28	24	24
	Sulphur Dioxide (SO2)	µg/m3	26	27	22	27	29	26
	Nitrogen Dioxide, (NO2)	µg/m3	18	18	18	17	17	17
	Carbon Monoxide (CO)	mg/m3	1.4	1.2	0.6	1.0	1.0	1.0

Note:
Standards applicable as per National Ambient Air Quality Standards vide Notification No.: B-29016/20/90/PCI-L dated 18th November 2009.
UoM - Unit of Measurement, WPFA - West Plant First Aid Station
CRM - Cold Roll, PH - Powerhouse
NT - Not Traced
This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Manager Environment
Laboratory

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Ambient Air Quality Report for Inside Main Works, Jamshedpur from April'25-Sept'25

Location	Parameter	UoM	Apr-25	Jun-25	Jul-25
WPFA	Particulate Matter, PM10	µg/m3	118.8	51.4	41.9
	Particulate Matter, PM2.5		44.3	20.3	13.8
	Sulphur Dioxide (SO2)		22.5	28.5	28.5
	Nitrogen Dioxide, (NO2)		26.0	34.1	34.1
	Carbon Monoxide (CO)		0.29	0.95	0.92
	Ammonia (NH3)		57.7	54.3	54.1
	Ozone (O3)		10.1	16.3	16.5
	Nickel (Ni)		0.02	0.03	0.02
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzene (C6H6)		<0.1	<0.1	<0.1
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1
CRM	**Parameter**	**UoM**	**Apr-25**	**May-25**	**Aug-25**
	Particulate Matter, PM10	µg/m3	97.3	108.4	61.3
	Particulate Matter, PM2.5		37.6	42.3	25.2
	Sulphur Dioxide (SO2)		25.6	25.3	23.0
	Nitrogen Dioxide, (NO2)		45.8	41.0	43.2
	Carbon Monoxide (CO)		0.85	0.85	0.75
	Ammonia (NH3)		55.7	68.2	57.6
	Ozone (O3)		7.7	13.6	8.5
	Nickel (Ni)		0.04	0.02	0.01
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzene (C6H6)		<0.1	<0.1	<0.1
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1
PH#3	**Parameter**	**UoM**	**Apr-25**	**Jun-25**	**Sep-25**
	Particulate Matter, PM10	µg/m3	126.7	123.8	55.7
	Particulate Matter, PM2.5		51.0	49.7	21.8
	Sulphur Dioxide (SO2)		24.3	16.5	21.3
	Nitrogen Dioxide, (NO2)		40.2	35.1	43.0
	Carbon Monoxide (CO)		0.78	0.74	----
	Ammonia (NH3)		60.4	68.4	66.5
	Ozone (O3)		12.0	10.6	12.2
	Nickel (Ni)		0.02	0.02	0.01
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzene (C6H6)		<0.1	<0.1	<0.1
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1
PH#6	**Parameter**	**UoM**	**Apr-25**	**May-25**	**Aug-25**
	Particulate Matter, PM10	µg/m3	167.4	169.7	145.1
	Particulate Matter, PM2.5		69.1	63.8	58.5
	Sulphur Dioxide (SO2)		25.2	31.6	23.1
	Nitrogen Dioxide, (NO2)		42.8	50.3	35.5
	Carbon Monoxide (CO)		0.32	0.33	----

	Ammonia (NH3)		68.2	63.8	58.5
	Ozone (O3)		10.4	13.5	13.5
	Nickel (Ni)		0.06	0.04	0.02
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1

Note:
Standards applicable as per National Ambient Air Quality Standards vide Notification No.: B-29016/20/90/PCI-L dated 18th November 2009.
UoM - Unit of Measurement, WPFA - West Plant First Aid Station
CRM - Cold Roll, PH - Powerhouse
NT - Not Traced
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Sr. Area Manager
Environment
Monitoring & Analysis

Head Environment
Monitoring, Testing &
Analysis (TSJ)

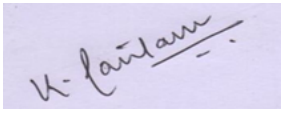
TATA STEEL LIMITED

Environment Management Department – Laboratory

Noise Level Monitoring Report for Inside Main Works, Jamshedpur from April'25-Sept'25

S.no	Area	UoM	Apr-24		May-24		Jun-24		Jul-24		Aug-24		Sep-24	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	Near N Road Boundary Wall	dB	62.0	52.7	60.4	52.4	65.9	58.5	62.3	60.6	64.2	57.3	58.4	56.2
2	Near L Town Boundary Wall		56.5	63.0	63.8	62.1	65.5	65.3	64.7	68.5	66.3	62.8	65.4	61.5
3	Near Burma Mines Gate		57.6	58.0	63.4	57.0	62.0	66.5	65.1	66.0	65.1	56.7	62.5	56.3
4	Near Jugsalai Gate		62.0	58.8	62.2	59.2	66.8	61.4	61.4	64.8	59.8	59.5	62.8	58.7

Note:
Standards applicable as per Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 notified vide S. O. 1046 (E), dated 22-11-2000
UoM - Unit of Measurement
This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363



Manager Environment
Laboratory

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Drains Effluent Quality Test Report of Main Works Jamshedpur from April-25 to Sept-25

Sample Location	Parameter	UoM	Apr-25			May-25			Jun-25			Jul-25			Aug-25			Sep-25		
			Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Susun Gharia Drain	pH	-	8.42	7.33	8.16	8.48	7.21	8.20	8.48	8.12	8.34	8.49	7.78	8.33	8.48	7.97	8.36	8.48	7.86	8.31
	Total Suspended solids	mg/L	96.0	18.0	46.0	92.0	14.0	43.7	92.0	12.0	44.2	90.0	10.0	47.5	84.0	12.0	32.3	608.0	12.0	80.8
	Oil & Grease	mg/L	3.20	1.60	2.30	3.20	2.00	2.60	3.00	2.00	2.50	3.00	1.20	2.19	2.80	1.80	2.20	3.60	1.80	2.60
	Ammonical Nitrogen (as N)	mg/L	22.60	3.00	9.50	10.70	3.70	6.50	10.40	3.50	4.90	14.38	3.59	7.83	13.72	2.87	6.99	17.27	2.74	8.26
	Cyanide (as CN-)	mg/L	0.19	0.15	0.17	0.18	0.14	0.17	0.18	0.14	0.16	0.18	0.14	0.16	0.18	0.12	0.15	0.18	0.14	0.16
	Biological Oxygen Demand, BOD	mg/L	22.0	12.0	16.0	28.0	8.0	16.6	20.0	6.0	13.0	15.0	7.0	11.2	18.0	7.0	12.4	22.00	7.00	16.10
	Chemical Oxygen Demand, COD	mg/L	123.0	41.0	76.6	104.0	35.0	70.4	131.0	27.0	63.8	86.0	25.0	46.7	91.0	25.0	46.9	142.00	19.00	65.60
	Phenol	mg/L	0.26	0.10	0.13	0.94	0.11	0.35	0.17	0.11	0.13	0.19	0.09	0.12	0.14	0.10	0.11	0.38	0.10	0.14

Note:
Standards applicable as per Environment (Protection) (Third Amendment) Rules, 2012 issued in Gazette of India Notification vide No.: G. S. R. 277 (E) dated March 31, 2012.
UoM - Unit of Measurement
This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Sr. Area Manager
Environment Monitoring
& Analysis

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Treated Effluent Quality Report of BOTP & CRM From April-25 to Sept-25

Sample	Parameter	UoM	Apr-25			May-25			Jun-25			Jul-25			Aug-25			Sep-25		
BOT TREATED	Parameter	UoM	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
	pH	-	8.48	6.33	7.64	8.08	6.82	7.47	8.43	7.22	7.87	8.48	7.02	7.92	8.48	7.37	7.77	8.46	6.97	7.45
	Total Suspended solids	mg/L	92.0	12.0	40.0	90.0	18.0	47.3	74.0	28.0	46.8	90.0	20.0	47.5	86.0	14.0	43.8	90.0	20.0	51.7
	Oil & Grease	mg/L	3.0	2.2	2.6	3.2	2.6	2.9	3.4	2.4	2.9	3.4	1.6	2.6	3.4	2.0	2.6	3.4	2.2	2.7
	Ammonical Nitrogen (as N)	mg/L	45.6	4.2	22.4	39.8	8.0	22.6	32.7	3.8	13.1	40.2	8.9	26.2	40.0	6.7	22.5	25.5	1.3	10.3
	Cyanide (as CN-)	mg/L	0.19	0.16	0.17	0.19	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.16
	Biological Oxygen Demand, BOD	mg/L	28.0	18.0	24.4	30.0	14.0	25.6	28.0	3.0	22.0	28.0	10.0	21.2	28.0	16.0	23.6	28.0	16.0	23.1
	Chemical Oxygen Demand, COD	mg/L	239.0	80.0	126.6	229.0	88.0	175.8	246.0	86.0	160.0	247.0	96.0	16.4	204.0	92.0	158.0	244.0	94.0	147.8
	Phenol	mg/L	0.25	0.11	0.15	0.29	0.11	0.16	0.16	0.10	0.14	0.38	0.11	0.15	0.18	0.10	0.13	0.21	0.10	0.14
CRM	Parameter	UoM	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
	pH	-	7.6	6.8	7.3	7.8	6.8	7.4	7.7	7.1	7.5	7.9	6.7	7.4	7.4	6.9	7.1	7.5	7.0	7.2
	Total Suspended solids	mg/L	24.0	14.0	17.0	92.0	12.0	41.2	42.0	10.0	19.0	86.0	12.0	39.7	92.0	30.0	62.5	94.0	14.0	65.7
	Oil & Grease	mg/L	1.8	1.2	1.5	3.2	1.4	2.3	2.8	0.6	1.6	2.8	0.8	1.6	3.0	1.6	2.2	3.2	1.6	2.4
	Ammonical Nitrogen (as N)	mg/L	3.1	0.1	1.4	7.6	0.2	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Cyanide (as CN-)	mg/L	0.06	0.03	0.05	0.06	0.06	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Biological Oxygen Demand, BOD	mg/L	10.0	7.0	8.2	28.0	6.0	16.0	17.0	4.0	8.0	18.0	4.0	8.1	26.0	7.0	14.6	27.0	8.0	15.3
	Chemical Oxygen Demand, COD	mg/L	34.0	22.0	27.8	247.0	21.0	79.0	81.0	12.0	30.0	69.0	8.0	28.7	159.0	12.0	62.6	181.0	26.0	82.8
	Phenol	mg/L	-	-	-	0.15	0.15	0.15	-	-	-	0.35	0.09	0.22	0.11	0.11	0.11	0.14	0.10	0.12

Note:

Standards applicable as per Environment (Protection) (Third Amendment) Rules, 2012 issued in Gazette of India Notification vide No.: G. S. R. 277 (E) dated March 31, 2012.

UoM - Unit of Measurement

This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Naagaarjuna

Sr. Area Manager
Environment Monitoring
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Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Online Stack Emission Monitoring Report for Main Works Area, Jamshedpur from April-25 to Sept-25

APRIL 2025

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	5.3	22.4	4.5
2.		EBF Stove	3.0	31.5	17.5
3.		EBF Stock and Cast House	10.3	-	-
4.		FBF Stove	9.0	25.2	34.2
5.		FBF Stock House	1.6	-	-
6.		FBF Cast House	5.8	-	-
7.		FBF Coal Injection	6.9	2.2	23.2
8.		GBF Stove	-	6.1	4.5
9.		HBF Stove	4.2	36.6	41.7
10.		HBF Stock House	7.7	-	-
11.		HBF Stock House DE	3.8	-	-
12.		HBF Cast House	4.3	-	-
13.		HBF Coal Injection 1	5.3	6.0	7.6
14.		HBF Coal Injection 2	2.4	19.8	7.0
15.		IBF Stove	6.6	14.2	17.0
16.		IBF Stock House	4.6	-	-
17.		IBF Cast House	3.5	-	-
18.		IBF Coal Injection	5.7	11.8	27.5
19.	Sinter Plant	SP1 WG	19.6	82.2	80.9
20.		SP1 DD & Hot Region	0.7	-	-
21.		SP1 Highline	2.3	-	-
22.		SP1 Cold Region	4.7	-	-
23.		SP2 WG	19.5	226.1	49.7
24.		SP2 DD (Hot & Cold Region)	6.0	-	-
25.		SP2 Highline	1.1	-	-
26.		SP3 WG & DD	28.1	193.3	69.9
27.		SP3 Dedusting	2.2	-	-
28.		SP3 DE#9,10,11 Diamond Crossing	5.0	-	-
29.		SP4 WG & DD	44.8	117.4	76.5
30.		RMBB1 - DE#1	5.0	-	-
31.		RMBB1 - DE#2	5.0	-	-
32.		RMBB1 - DE#4 (Flux Primary Grinding)	5.0	-	-
33.		RMBB1 - DE#5 (Junction House-5)	5.0	-	-
34.		RMBB1 - DE#8 (Junction House-3)	5.7	-	-
35.		RMBB1 - DE#9	5.0	-	-
36.		RMBB1 - DE#11	-	-	-
37.		RMBB1 - DE#12 (Flux screening)	5.0	-	-
38.		RMBB2 - DE#6&8	9.6	-	-
39.		RMBB2 - DE#7	3.0	-	-
40.	Coke Plant	CP Battery 8	11.2	247.9	251.4
41.		CP Battery 9	12.5	123.2	110.1
42.		CP DE Tunnel Wharf	10.0	-	-
43.		CP Battery 10	12.3	333.0	328.1
44.		CP Battery 10 P&D	3.5	-	-
45.		CDQ Battery 10	29.6	-	-
46.		CP Battery 11	20.8	158.0	189.8
47.		CP Battery 11 P&D	7.0	-	-
48.		CDQ Battery 11	9.9	-	-
49.		PCR# 3	2.2	-	-

50.		SCR# 3	3.9	-	-
51.	Pellet Plant	PP-Process Gas Cleaning WB	19.5	111.5	250.2
52.		PP-Process Gas Cleaning Hood	21.9	9.0	72.4
53.		PP-Central Dedusting	9.1	-	-
54.		PP-Drying Section	3.8	-	-
55.		PP-Grinding 1	5.6	-	-
56.		PP-Grinding 2	4.8	-	-
57.		Pellet Plant BF-1 DE 1	5.0	-	-
58.		Pellet Plant BF-2 DE 2	5.0	-	-
59.		Pellet Plant BF-3 DE 3	5.0	-	-
60.	LD Shops	LD#1 Sec. Emission	2.2	-	-
61.		LD#1 LF#1	1.3	-	-
62.		LD#1 LF#2	3.8	-	-
63.		LD#1 LF#3	4.4	-	-
64.		LD#1 DE#1	3.7	-	-
65.		LD#1 DE#LS4	8.7	-	-
66.		LD#1 DE#8 (LB)	3.0	-	-
67.		LD#2 Sec. Emission # 1	2.7	-	-
68.		LD#2 Sec. Emission # 2	6.1	-	-
69.		LD#2 Sec. Emission # 3	2.2	-	-
70.		LD#2 LF#1	7.6	-	-
71.		LD#2 LF#2	7.9	-	-
72.		LD#2 DE1	1.0	-	-
73.		LD#2 DE2	2.5	-	-
74.		LD#2 DE3	2.6	-	-
75.		LD#2 DE4	3.5	-	-
76.		LD#2 DE5	1.6	-	-
77.		LD#2 DE6	3.6	-	-
78.		LD#2 DE7	1.7	-	-
79.		LD#2 DE8	5.6	-	-
80.		LD#2 DE9	1.9	-	-
81.		LD#3 Sec. Emission	3.7	-	-
82.		LD#3 LF1	4.0	-	-
83.		LD#3 LF2	5.3	-	-
84.		TSCR Furnace# 1/1	8.9	22.9	4.3
85.		TSCR Furnace# 2/1	22.2	57.0	80.4
86.		TSCR Furnace# 3/1	14.5	20.3	21.0
87.		TSCR Furnace# 1/2	5.7	10.8	5.4
88.		TSCR Furnace# 2/2	27.8	12.2	3.7
89.		TSCR Furnace# 3/2	31.4	2.6	17.6
90.	Lime Plant	Mearz kiln no.1	3.3	4.0	10.4
91.		Mearz kiln no.2	4.9	4.1	28.4
92.		Mearz kiln no.3&4	0.8	11.0	32.2
93.		Mearz kiln no.5	2.1	9.0	41.4
94.		Mearz kiln no.6	3.5	89.3	42.5
95.		DE12	3.1	-	-
96.		Mearz kiln no.7	3.7	14.0	15.6
97.		DE15	3.9	-	-
98.		Mearz kiln no.8	2.0	0.2	25.3
99.		DE1B	1.8	-	-
100.		Mearz kiln no.9	2.9	4.9	17.4
101.		DE9	1.4	-	-
102.		Lime Plant DE-1A	9.1	-	-
103.		Lime Plant DE-2	1.2	-	-
104.		Lime Plant DE-3	3.0	-	-
105.		Lime Plant DE-6	5.3	-	-
106.		Lime Plant DE-7	6.2	-	-

107.		Lime Plant DE- Pit Junction	6.5	-	-
108.		Lime Plant DE-10	2.8	-	-
109.	Power Houses	PH#3(Blr.no.5)	12.9	31.9	16.4
110.		PH#3(Blr.no.6)	12.9	27.6	21.9
111.		PH#3(Blr.no.7&8)	7.5	31.9	28.8
112.		PH#4(Blr.no.1&2)	26.6	131.5	27.9
113.		PH#4(Blr.no.4)	21.1	152.5	63.5
114.		PH#4(Blr.no.5)	13.2	70.1	43.3
115.		PH#5(Blr.no.A)	8.7	19.9	11.6
116.		PH#5(Blr.no.B&C)	12.6	38.2	26.8
117.	Rolling Mills	Merchant mill	9.6	4.0	14.3
118.		Wire Rod Mill	35.4	55.3	82.5
119.		Cold Rolling Mill (PLTCM)	0.1	-	-
120.		Cold Rolling Mill (BAF)	2.9	11.9	5.1
121.		Cold Rolling Mill (CGL-1)	-	-	-
122.		Cold Rolling Mill (CGL-2)	2.8	-	-
123.		Cold Rolling Mill (ARP-Old)	27.2	-	-
124.		Cold Rolling Mill (ARP- New)	10.0	-	-
125.		Cold Rolling Mill (Incinerator)	-	-	-
126.		Hot Strip Mill RHF 1	32.2	132.0	100.2
127.		Hot Strip Mill RHF 2	-	-	-
128.		Hot Strip Mill RHF 3	5.7	5.0	50.6
129.		New Bar Mill	11.9	103.8	81.8

May'2025

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	4.3	22.5	4.6
2.		EBF Stove	3.0	30.1	14.1
3.		EBF Stock and Cast House	3.1	-	-
4.		FBF Stove	4.3	35.2	30.6
5.		FBF Stock House	1.8	-	-
6.		FBF Cast House	5.8	-	-
7.		FBF Coal Injection	7.1	2.2	23.2
8.		HBF Stove	3.9	36.7	42.3
9.		HBF Stock House	8.2	-	-
10.		HBF Stock House DE	4.4	-	-
11.		HBF Cast House	4.2	-	-
12.		HBF Coal Injection 1	4.7	10.3	9.4
13.		HBF Coal Injection 2	3.2	6.1	7.2
14.		IBF Stove	6.6	16.5	12.7
15.		IBF Stock House	3.4	-	-
16.		IBF Cast House	3.7	-	-
17.		IBF Coal Injection	7.5	6.9	4.9
18.	Sinter Plant	SP1 WG	22.3	110.8	75.8
19.		SP1 DD & Hot Region	0.9	-	-
20.		SP1 Highline	1.5	-	-
21.		SP1 Cold Region	5.8	-	-
22.		SP2 WG	25.9	116.6	47.9
23.		SP2 DD (Hot & Cold Region)	5.0	-	-
24.		SP2 Highline	1.9	-	-
25.		SP3 WG & DD	25.3	221.9	101.2
26.		SP3 Dedusting	3.9	-	-
27.		SP3 DE#9,10,11 Diamond Crossing	5.0	-	-
28.		SP4 WG & DD	32.2	124.0	78.4
29.		RMBB1 - DE#1	5.0	-	-

30.		RMBB1 - DE#2	5.0	-	-
31.		RMBB1 - DE#4 (Flux Primary Grinding)	5.0	-	-
32.		RMBB1 - DE#5 (Junction House-5)	5.0	-	-
33.		RMBB1 - DE#8 (Junction House-3)	6.6	-	-
34.		RMBB1 - DE#9	5.0	-	-
35.		RMBB1 - DE#11	5.0	-	-
36.		RMBB1 - DE#12 (Flux screening)	5.0	-	-
37.		RMBB2 - DE#6&8	5.4	-	-
38.		RMBB2 - DE#7	3.0	-	-
39.	Coke Plant	CP Battery 8	19.6	290.6	231.6
40.		CP Battery 9	9.1	86.2	102.7
41.		CP DE Tunnel Wharf	5.0	-	-
42.		CP Battery 10	13.7	340.8	343.2
43.		CP Battery 10 P&D	4.4	-	-
44.		CDQ Battery 10	21.1	-	-
45.		CP Battery 11	20.1	156.8	176.4
46.		CP Battery 11 P&D	7.7	-	-
47.		CDQ Battery 11	18.0	-	-
48.		PCR# 3	2.2	-	-
49.		SCR# 3	4.0	-	-
50.	Pellet Plant	PP-Process Gas Cleaning WB	21.0	111.5	250.2
51.		PP-Process Gas Cleaning Hood	23.4	9.0	72.4
52.		PP-Central Dedusting	8.4	-	-
53.		PP-Drying Section	6.9	-	-
54.		PP-Grinding 1	5.1	-	-
55.		PP-Grinding 2	4.3	-	-
56.		Pellet Plant BF-1 DE 1	5.0	-	-
57.		Pellet Plant BF-2 DE 2	5.0	-	-
58.		Pellet Plant BF-3 DE 3	5.0	-	-
59.	LD Shops	LD#1 Sec. Emission	2.2	-	-
60.		LD#1 LF#1	0.6	-	-
61.		LD#1 LF#2	2.2	-	-
62.		LD#1 LF#3	3.0	-	-
63.		LD#1 DE#1	3.7	-	-
64.		LD#1 DE#LS4	8.7	-	-
65.		LD#1 DE#8 (LB)	3.0	-	-
66.		LD#2 Sec. Emission # 1	3.0	-	-
67.		LD#2 Sec. Emission # 2	3.2	-	-
68.		LD#2 Sec. Emission # 3	2.5	-	-
69.		LD#2 LF#1	8.8	-	-
70.		LD#2 LF#2	11.9	-	-
71.		LD#2 DE1	1.0	-	-
72.		LD#2 DE2	2.5	-	-
73.		LD#2 DE3	2.3	-	-
74.		LD#2 DE4	3.6	-	-
75.		LD#2 DE5	1.5	-	-
76.		LD#2 DE6	2.4	-	-
77.		LD#2 DE7	2.0	-	-
78.		LD#2 DE8	8.9	-	-
79.		LD#2 DE9	2.0	-	-
80.		LD#3 Sec. Emission	3.7	-	-
81.		LD#3 LF1	4.0	-	-
82.		LD#3 LF2	5.3	-	-
83.		TSCR Furnace# 1/1	19.4	22.9	4.3
84.		TSCR Furnace# 2/1	12.1	57.0	80.4
85.		TSCR Furnace# 3/1	13.7	20.3	21.0
86.		TSCR Furnace# 1/2	6.0	5.3	15.6

87.		TSCR Furnace# 2/2	23.0	12.2	3.7
88.		TSCR Furnace# 3/2	33.6	2.6	17.6
89.	Lime Plant	Mearz kiln no.1	3.6	12.0	53.9
90.		Mearz kiln no.2	4.9	4.1	28.4
91.		Mearz kiln no.3&4	0.9	11.0	32.2
92.		Mearz kiln no.5	2.3	9.0	41.4
93.		Mearz kiln no.6	2.3	89.3	42.5
94.		DE12	4.7	-	-
95.		Mearz kiln no.7	3.6	9.4	53.1
96.		DE15	4.7	-	-
97.		Mearz kiln no.8	2.0	0.2	25.3
98.		DE1B	1.8	-	-
99.		Mearz kiln no.9	3.3	2.5	22.1
100.		DE9	1.4	-	-
101.		Lime Plant DE-1A	9.1	-	-
102.		Lime Plant DE-2	1.2	-	-
103.		Lime Plant DE-3	3.0	-	-
104.		Lime Plant DE-6	4.3	-	-
105.		Lime Plant DE-7	6.7	-	-
106.		Lime Plant DE- Pit Junction	6.5	-	-
107.		Lime Plant DE-10	2.8	-	-
108.	Power Houses	PH#3(Blr.no.5)	13.0	34.7	10.8
109.		PH#3(Blr.no.6)	11.8	30.5	16.3
110.		PH#3(Blr.no.7&8)	7.9	39.1	37.0
111.		PH#4(Blr.no.1&2)	19.4	135.3	38.4
112.		PH#4(Blr.no.4)	34.8	146.8	50.5
113.		PH#4(Blr.no.5)	11.5	62.1	43.0
114.		PH#5(Blr.no.A)	10.5	15.5	7.7
115.		PH#5(Blr.no.B&C)	13.0	48.8	24.8
116.	Rolling Mills	Merchant mill	8.8	4.0	14.3
117.		Wire Rod Mill	17.7	140.0	60.1
118.		Cold Rolling Mill (PLTCM)	0.1	-	-
119.		Cold Rolling Mill (BAF)	5.0	40.6	2.4
120.		Cold Rolling Mill (CGL-1)	-	-	-
121.		Cold Rolling Mill (CGL-2)	2.2	-	-
122.		Cold Rolling Mill (ARP-Old)	14.1	7.3	54.8
123.		Cold Rolling Mill (ARP- New)	12.1	55.5	16.6
124.		Hot Strip Mill RHF 1	19.5	132.0	100.2
125.		Hot Strip Mill RHF 2	35.2	102.0	145.3
126.		Hot Strip Mill RHF 3	5.4	6.0	50.6
127.		New Bar Mill	24.2	103.8	81.8

June'2025

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	4.6	19.3	3.9
2.		EBF Stove	3.9	52.9	13.5
3.		EBF Stock and Cast House	4.2	-	-
4.		FBF Stove	4.8	45.2	39.3
5.		FBF Stock House	1.8	-	-
6.		FBF Cast House	5.9	-	-
7.		FBF Coal Injection	13.5	2.2	23.2
8.		HBF Stove	3.8	37.2	42.5
9.		HBF Stock House	8.5	-	-
10.		HBF Stock House DE	4.6	-	-
11.		HBF Cast House	4.2	-	-
12.		HBF Coal Injection 1	3.9	10.3	9.4

13.		HBF Coal Injection 2	4.2	6.1	7.2
14.		IBF Stove	6.1	13.1	11.3
15.		IBF Stock House	3.3	-	-
16.		IBF Cast House	3.4	-	-
17.		IBF Coal Injection	14.1	6.9	4.9
18.	Sinter Plant	SP1 WG	21.2	134.1	104.7
19.		SP1 DD & Hot Region	2.1	-	-
20.		SP1 Highline	0.6	-	-
21.		SP1 Cold Region	4.0	-	-
22.		SP2 WG	19.0	116.6	47.9
23.		SP2 DD (Hot & Cold Region)	9.2	-	-
24.		SP2 Highline	1.3	-	-
25.		SP3 WG & DD	27.6	180.7	35.5
26.		SP3 Dedusting	2.6	-	-
27.		SP3 DE#9,10,11 Diamond Crossing	5.0	-	-
28.		SP4 WG & DD	43.0	146.5	65.3
29.		RMBB1 - DE#1	5.0	-	-
30.		RMBB1 - DE#2	5.0	-	-
31.		RMBB1 - DE#4 (Flux Primary Grinding)	5.0	-	-
32.		RMBB1 - DE#5 (Junction House-5)	5.0	-	-
33.		RMBB1 - DE#8 (Junction House-3)	6.6	-	-
34.		RMBB1 - DE#9	5.0	-	-
35.		RMBB1 - DE#12 (Flux screening)	5.0	-	-
36.		RMBB2 - DE#6&8	5.4	-	-
37.		RMBB2 - DE#7	3.0	-	-
38.	Coke Plant	CP Battery 8	15.2	192.8	224.1
39.		CP Battery 9	16.6	180.8	89.4
40.		CP DE Tunnel Wharf	5.0	-	-
41.		CP Battery 10	13.7	312.0	305.7
42.		CP Battery 10 P&D	6.0	-	-
43.		CDQ Battery 10	43.8	-	-
44.		CP Battery 11	20.5	149.4	149.6
45.		CP Battery 11 P&D	10.3	-	-
46.		CDQ Battery 11	18.6	-	-
47.		PCR# 3	2.2	-	-
48.		SCR# 3	4.0	-	-
49.	Pellet Plant	PP-Process Gas Cleaning WB	22.2	111.5	250.2
50.		PP-Process Gas Cleaning Hood	20.9	131.0	21.5
51.		PP-Central Dedusting	7.0	-	-
52.		PP-Drying Section	3.5	-	-
53.		PP-Grinding 1	4.6	-	-
54.		PP-Grinding 2	4.6	-	-
55.		Pellet Plant BF-1 DE 1	5.0	-	-
56.		Pellet Plant BF-2 DE 2	5.0	-	-
57.		Pellet Plant BF-3 DE 3	5.0	-	-
58.	LD Shops	LD#1 Sec. Emission	2.2	-	-
59.		LD#1 LF#1	0.9	-	-
60.		LD#1 LF#2	5.5	-	-
61.		LD#1 LF#3	2.5	-	-
62.		LD#1 DE#1	3.7	-	-
63.		LD#1 DE#LS4	8.7	-	-
64.		LD#1 DE#8 (LB)	3.0	-	-
65.		LD#2 Sec. Emission # 1	2.4	-	-
66.		LD#2 Sec. Emission # 2	1.8	-	-
67.		LD#2 Sec. Emission # 3	2.5	-	-
68.		LD#2 LF#1	10.0	-	-
69.		LD#2 LF#2	10.0	-	-

70.		LD#2 DE1	2.1	-	-
71.		LD#2 DE2	2.5	-	-
72.		LD#2 DE3	1.6	-	-
73.		LD#2 DE4	3.7	-	-
74.		LD#2 DE5	1.5	-	-
75.		LD#2 DE6	2.5	-	-
76.		LD#2 DE7	3.5	-	-
77.		LD#2 DE8	7.5	-	-
78.		LD#2 DE9	2.9	-	-
79.		LD#3 Sec. Emission	3.2	-	-
80.		LD#3 LF1	3.1	-	-
81.		LD#3 LF2	3.5	-	-
82.		TSCR Furnace# 1/1	12.7	22.9	4.3
83.		TSCR Furnace# 2/1	15.0	57.0	80.4
84.		TSCR Furnace# 3/1	13.0	20.3	21.0
85.		TSCR Furnace# 1/2	6.8	5.3	15.6
86.		TSCR Furnace# 2/2	24.7	12.2	3.7
87.		TSCR Furnace# 3/2	28.4	2.6	17.6
88.	Lime Plant	Mearz kiln no.1	6.2	12.0	53.9
89.		Mearz kiln no.2	16.1	4.1	28.4
90.		Mearz kiln no.3&4	5.1	11.0	32.2
91.		Mearz kiln no.5	2.9	9.0	41.4
92.		Mearz kiln no.6	1.7	8.0	27.2
93.		DE12	5.0	-	-
94.		Mearz kiln no.7	5.8	9.4	53.1
95.		DE15	4.4	-	-
96.		Mearz kiln no.8	3.8	0.2	25.3
97.		DE1B	2.0	-	-
98.		Mearz kiln no.9	3.7	2.5	22.1
99.		DE9	2.2	-	-
100.		Lime Plant DE-1A	9.1	-	-
101.		Lime Plant DE-2	1.2	-	-
102.		Lime Plant DE-3	3.0	-	-
103.		Lime Plant DE-6	4.3	-	-
104.		Lime Plant DE-7	6.7	-	-
105.		Lime Plant DE- Pit Junction	6.5	-	-
106.		Lime Plant DE-10	2.8	-	-
107.	Power Houses	PH#3(Blr.no.5)	11.2	27.8	10.5
108.		PH#3(Blr.no.6)	9.0	36.2	9.3
109.		PH#3(Blr.no.7&8)	7.9	41.7	19.3
110.		PH#4(Blr.no.1&2)	14.6	103.6	33.3
111.		PH#4(Blr.no.4)	11.1	180.8	135.1
112.		PH#4(Blr.no.5)	13.3	140.1	44.6
113.		PH#5(Blr.no.A)	6.9	15.1	8.5
114.		PH#5(Blr.no.B&C)	10.2	54.8	24.9
115.	Rolling Mills	Merchant mill	10.9	4.0	14.3
116.		Wire Rod Mill	6.4	140.0	60.1
117.		Cold Rolling Mill (PLTCM)	1.1	-	-
118.		Cold Rolling Mill (BAF)	4.7	40.6	2.4
119.		Cold Rolling Mill (CGL-2)	3.9	-	-
120.		Cold Rolling Mill (ARP-Old)	14.7	4.0	101.1
121.		Cold Rolling Mill (ARP- New)	17.7	5.0	37.8
122.		Hot Strip Mill RHF 2	12.9	132.0	100.2
123.		Hot Strip Mill RHF 3	29.7	102.0	145.3
124.		New Bar Mill	4.5	6.0	50.6

July 2025

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	4.39	10.8	3.9
2.		EBF Stove	2.45	55.5	10.3
3.		EBF Stock and Cast House	5.17	-	-
4.		FBF Stove	5.1	37.8	54.1
5.		FBF Stock House	1.9	-	-
6.		FBF Cast House	5.7	-	-
7.		FBF Coal Injection	13.1	2.2	23.2
8.		HBF Stove	3.9	-	-
9.		HBF Stock House	0.1	-	-
10.		HBF Cast House	2.0	-	-
11.		HBF Coal Injection 2	24.5	-	-
12.		IBF Coal Injection	4.3	37.6	41.8
13.	Sinter Plant	SP1 WG	20.46	125.6	34.6
14.		SP1 DD & Hot Region	3.96	-	-
15.		SP1 Highline	0.41	-	-
16.		SP1 Cold Region	3.85	-	-
17.		SP2 WG	22.94	122.1	39.4
18.		SP2 DD (Hot & Cold Region)	9.18	-	-
19.		SP2 Highline	1.12	-	-
20.		SP3 WG & DD	25.07	150.4	42.3
21.		SP3 Dedusting	2.07	-	-
22.		SP3 DE#9,10,11 Diamond Crossing	5.00	-	-
23.		SP4 WG & DD	38.78	159.8	97.2
24.		RMBB1 - DE#1	5.0	-	-
25.		RMBB1 - DE#2	5.0	-	-
26.		RMBB1 - DE#4 (Flux Primary Grinding)	5.0	-	-
27.		RMBB1 - DE#5 (Junction House-5)	5.0	-	-
28.		RMBB1 - DE#8 (Junction House-3)	6.7	-	-
29.		RMBB1 - DE#9	5.0	-	-
30.		RMBB1 - DE#12 (Flux screening)	5.0	-	-
31.		RMBB2 - DE#6&8	5.4	-	-
32.		RMBB2 - DE#7	3.1	-	-
33.	Coke Plant	CP Battery 8	18.7	108.1	242.4
34.		CP Battery 9	12.9	273.1	137.6
35.		CP DE Tunnel Wharf	5.0	-	-
36.		CP Battery 10	27.4	338.0	273.0
37.		CP Battery 10 P&D	11.3	-	-
38.		CDQ Battery 10	49.2	-	-
39.		CP Battery 11	21.7	144.6	162.5
40.		CP Battery 11 P&D	11.3	-	-
41.		CDQ Battery 11	43.8	-	-
42.		PCR# 3	2.7	-	-
43.		SCR# 3	4.0	-	-
44.	Pellet Plant	PP-Process Gas Cleaning WB	19.9	111.5	250.2
45.		PP-Process Gas Cleaning Hood	12.5	131.0	21.5
46.		PP-Central Dedusting	12.2	-	-
47.		PP-Drying Section	1.9	-	-
48.		PP-Grinding 2	4.2	-	-
49.		Pellet Plant BF-1 DE 1	5.0	-	-
50.		Pellet Plant BF-2 DE 2	5.0	-	-
51.		Pellet Plant BF-3 DE 3	5.0	-	-
52.	LD Shops	LD#1 Sec. Emission	0.91	-	-
53.		LD#1 LF#1	0.6	-	-

54.		LD#1 LF#2	18.8	-	-
55.		LD#1 LF#3	2.2	-	-
56.		LD#1 DE#1	2.8	-	-
57.		LD#1 DE#LS4	6.9	-	-
58.		LD#1 DE#8 (LB)	3.0	-	-
59.		LD#2 Sec. Emission # 1	3.6	-	-
60.		LD#2 Sec. Emission # 2	2.6	-	-
61.		LD#2 Sec. Emission # 3	2.3	-	-
62.		LD#2 LF#1	6.9	-	-
63.		LD#2 LF#2	12.0	-	-
64.		LD#2 DE1	1.4	-	-
65.		LD#2 DE2	2.5	-	-
66.		LD#2 DE3	1.5	-	-
67.		LD#2 DE4	3.9	-	-
68.		LD#2 DE5	6.1	-	-
69.		LD#2 DE6	2.3	-	-
70.		LD#2 DE7	3.4	-	-
71.		LD#2 DE8	14.3	-	-
72.		LD#2 DE9	7.5	-	-
73.		LD#3 Sec. Emission	3.2	-	-
74.		LD#3 LF1	2.6	-	-
75.		LD#3 LF2	4.3	-	-
76.		TSCR Furnace# 1/1	14.3	22.9	4.3
77.		TSCR Furnace# 2/1	5.3	57.0	80.4
78.		TSCR Furnace# 3/1	10.6	20.3	21.0
79.		TSCR Furnace# 1/2	4.6	5.3	15.6
80.		TSCR Furnace# 2/2	1.9	12.2	3.7
81.		TSCR Furnace# 3/2	11.9	2.6	17.6
82.	Lime Plant	Mearz kiln no.1	2.0	12.0	53.9
83.		Mearz kiln no.2	12.6	4.1	28.4
84.		Mearz kiln no.3&4	2.2	11.0	32.2
85.		Mearz kiln no.5	2.2	9.0	41.4
86.		Mearz kiln no.6	2.5	8.0	27.2
87.		DE12	4.4	-	-
88.		Mearz kiln no.7	8.1	9.4	53.1
89.		DE15	4.4	-	-
90.		Mearz kiln no.8	3.6	0.2	25.3
91.		DE1B	2.8	-	-
92.		Mearz kiln no.9	4.6	2.5	22.1
93.		DE9	2.3	-	-
94.		Lime Plant DE-1A	5.7	-	-
95.		Lime Plant DE-2	2.4	-	-
96.		Lime Plant DE-3	3.0	-	-
97.		Lime Plant DE-6	4.3	-	-
98.		Lime Plant DE-7	6.7	-	-
99.		Lime Plant DE- Pit Junction	5.4	-	-
100.		Lime Plant DE-10	2.8	-	-
101.	Power Houses	PH#3(Blr.no.5)	8.0	22.2	8.1
102.		PH#3(Blr.no.6)	8.9	42.1	29.7
103.		PH#3(Blr.no.7&8)	6.0	42.7	26.1
104.		PH#4(Blr.no.1&2)	22.1	81.0	30.1
105.		PH#4(Blr.no.4)	15.3	128.0	82.0
106.		PH#4(Blr.no.5)	12.1	84.1	83.9
107.		PH#5(Blr.no.A)	6.8	15.9	8.3
108.		PH#5(Blr.no.B&C)	10.8	52.4	25.0
109.	Rolling Mills	Merchant mill	10.7	4.0	14.3
110.		Wire Rod Mill	6.4	140.0	60.1

111.		Cold Rolling Mill (PLTCM)	0.9	-	-
112.		Cold Rolling Mill (BAF)	9.4	40.6	2.4
113.		Cold Rolling Mill (CGL-2)	3.4	-	-
114.		Cold Rolling Mill (ARP-Old)	17.9	4.0	101.8
115.		Cold Rolling Mill (ARP- New)	19.6	5.0	37.8
116.		Hot Strip Mill RHF 2	12.4	132.0	100.2
117.		Hot Strip Mill RHF 3	29.5	102.0	145.3
118.		New Bar Mill	5.0	6.0	50.6

August 2025

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	3.85	11.27	4.37
2.		EBF Stove	3.32	43.01	7.60
3.		EBF Stock and Cast House	5.88	-	-
4.		FBF Stove	5.60	17.87	37.11
5.		FBF Stock House	1.45	-	-
6.		FBF Cast House	3.06	-	-
7.		FBF Coal Injection	12.17	2.20	23.20
8.		GBF Stove	5.75	84.96	88.48
9.		HBF Stove	0.25	-	-
10.		HBF Stock House	0.26	-	-
11.		HBF Coal Injection 2	5.00	-	-
12.		IBF Stove	5.00	-	-
13.		IBF Cast House	4.45	36.87	42.45
14.		IBF Coal Injection	6.18	-	-
15.	Sinter Plant	SP1 WG	20.36	-	-
16.		SP1 DD & Hot Region	5.04	-	-
17.		SP1 Highline	0.49	-	-
18.		SP1 Cold Region	3.41	-	-
19.		SP2 WG	27.35	177.15	54.14
20.		SP2 DD (Hot & Cold Region)	2.67	-	-
21.		SP2 Highline	1.28	-	-
22.		SP3 WG & DD	24.81	148.61	49.35
23.		SP3 Dedusting	2.32	-	-
24.		SP3 DE#9,10,11 Diamond Crossing	5.00	-	-
25.		SP4 WG & DD	37.04	144.48	84.51
26.		RMBB1 - DE#1	5.00	-	-
27.		RMBB1 - DE#2	5.00	-	-
28.		RMBB1 - DE#4 (Flux Primary Grinding)	5.00	-	-
29.		RMBB1 - DE#5 (Junction House-5)	5.00	-	-
30.		RMBB1 - DE#8 (Junction House-3)	6.66	-	-
31.		RMBB1 - DE#9	5.00	-	-
32.		RMBB1 - DE#12 (Flux screening)	5.00	-	-
33.		RMBB2 - DE#6&8	3.14	-	-
34.		RMBB2 - DE#7	3.10	-	-
35.	Coke Plant	CP Battery 8	19.68	282.07	326.27
36.		CP Battery 9	11.89	105.16	198.45
37.		CP DE Tunnel Wharf	5.00	-	-
38.		CP Battery 10	26.45	346.62	277.26
39.		CP Battery 10 P&D	11.84	-	-
40.		CDQ Battery 10	49.21	-	-
41.		CP Battery 11	22.20	168.03	187.22
42.		CP Battery 11 P&D	4.93	-	-
43.		CDQ Battery 11	43.75	-	-
44.		PCR# 3	2.73	-	-
45.		SCR# 3	3.95	-	-

46.	Pellet Plant	PP-Process Gas Cleaning WB	21.22	111.48	250.20
47.		PP-Process Gas Cleaning Hood	11.88	131.00	21.50
48.		PP-Central Dedusting	7.43	-	-
49.		PP-Drying Section	2.24	-	-
50.		PP-Grinding 1	4.68	-	-
51.		PP-Grinding 2	4.44	-	-
52.		Pellet Plant BF-1 DE 1	5.00	-	-
53.		Pellet Plant BF-2 DE 2	5.00	-	-
54.		Pellet Plant BF-3 DE 3	5.00	-	-
55.	LD Shops	LD#1 Sec. Emission	1.98	-	-
56.		LD#1 LF#1	0.49	-	-
57.		LD#1 LF#2	11.34	-	-
58.		LD#1 LF#3	2.33	-	-
59.		LD#1 DE#1	2.59	-	-
60.		LD#1 DE#LS4	6.84	-	-
61.		LD#1 DE#8 (LB)	3.00	-	-
62.		LD#2 Sec. Emission # 1	3.61	-	-
63.		LD#2 Sec. Emission # 2	2.91	-	-
64.		LD#2 Sec. Emission # 3	2.17	-	-
65.		LD#2 LF#1	7.18	-	-
66.		LD#2 LF#2	8.60	-	-
67.		LD#2 DE1	1.24	-	-
68.		LD#2 DE2	2.53	-	-
69.		LD#2 DE3	1.58	-	-
70.		LD#2 DE4	3.74	-	-
71.		LD#2 DE5	2.05	-	-
72.		LD#2 DE6	1.71	-	-
73.		LD#2 DE7	3.35	-	-
74.		LD#2 DE8	9.67	-	-
75.		LD#2 DE9	3.47	-	-
76.		LD#3 Sec. Emission	4.06	-	-
77.		LD#3 LF1	2.46	-	-
78.		LD#3 LF2	5.28	-	-
79.		TSCR Furnace# 1/1	13.23	22.90	4.30
80.		TSCR Furnace# 2/1	2.43	57.00	80.40
81.		TSCR Furnace# 3/1	11.54	20.30	21.00
82.		TSCR Furnace# 1/2	4.92	5.30	15.60
83.		TSCR Furnace# 2/2	3.10	12.20	3.70
84.		TSCR Furnace# 3/2	9.21	4.00	17.60
85.	Lime Plant	Mearz kiln no.1	1.56	36.33	60.93
86.		Mearz kiln no.2	5.30	8.00	86.70
87.		Mearz kiln no.3&4	1.74	8.00	66.00
88.		Mearz kiln no.5	1.59	36.53	62.53
89.		Mearz kiln no.6	6.45	32.22	45.66
90.		DE12	3.88	-	-
91.		Mearz kiln no.7	7.22	14.00	15.60
92.		DE15	4.63	-	-
93.		Mearz kiln no.8	4.32	8.00	34.80
94.		DE1B	4.39	-	-
95.		Mearz kiln no.9	3.88	7.00	17.80
96.		DE9	2.35	-	-
97.		Lime Plant DE-1A	5.74	-	-
98.		Lime Plant DE-2	2.44	-	-
99.		Lime Plant DE-3	2.92	-	-
100.		Lime Plant DE-6	6.33	-	-
101.		Lime Plant DE-7	6.96	-	-
102.		Lime Plant DE- Pit Junction	5.44	-	-

103.		Lime Plant DE-10	2.83	-	-
104.	Power Houses	PH#3(Blr.no.5)	10.78	18.84	8.26
105.		PH#3(Blr.no.6)	9.23	27.52	23.94
106.		PH#3(Blr.no.7&8)	4.85	25.84	18.64
107.		PH#4(Blr.no.1&2)	8.67	41.62	20.29
108.		PH#4(Blr.no.4)	15.32	78.72	53.67
109.		PH#4(Blr.no.5)	11.73	39.03	37.28
110.		PH#5(Blr.no.A)	7.42	15.82	10.95
111.		PH#5(Blr.no.B&C)	11.08	40.27	27.13
112.	Rolling Mills	Merchant mill	8.83	4.00	14.30
113.		Wire Rod Mill	6.11	140.00	60.13
114.		Cold Rolling Mill (PLTCM)	1.00	-	-
115.		Cold Rolling Mill (BAF)	2.20	7.00	36.80
116.		Cold Rolling Mill (CGL-2)	2.25	-	-
117.		Cold Rolling Mill (ARP-Old)	16.24	2.00	84.60
118.		Cold Rolling Mill (ARP- New)	17.93	5.00	50.70
119.		Hot Strip Mill RHF 1	13.76	132.00	100.20
120.		Hot Strip Mill RHF 2	29.85	102.00	145.30
121.		Hot Strip Mill RHF 3	5.25	27.00	70.80
122.		New Bar Mill	38.78	103.80	81.80

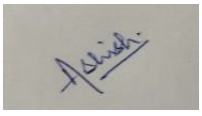
<u>September 2025</u>

Sl.No.	Department	Stack	PM (mg/Nm3)	SOx (mg/Nm3)	NOx (mg/Nm3)
1.	Blast Furnace	CBF Stove	3.50	11.07	3.89
2.		EBF Stove	2.89	41.41	7.34
3.		EBF Stock and Cast House	4.96	-	-
4.		FBF Stove	6.43	18.13	40.26
5.		FBF Stock House	1.01	-	-
6.		FBF Cast House	3.60	-	-
7.		FBF Coal Injection	18.29	32.00	47.06
8.		GBF Stove	2.65	35.38	46.54
9.		HBF Stove	1.06	-	-
10.		HBF Stock House	7.00	-	-
11.		HBF Stock House DE	6.24	3.00	31.90
12.		HBF Cast House	7.95	3.00	23.90
13.		HBF Coal Injection 1	6.28	3.00	26.10
14.		HBF Coal Injection 2	1.58	-	-
15.		IBF Stove	5.00	-	-
16.		IBF Stock House	1.69	-	-
17.		IBF Cast House	4.35	36.63	42.25
18.		IBF Coal Injection	6.16	-	-
19.	Sinter Plant	SP1 WG	21.01	100.66	12.20
20.		SP1 DD & Hot Region	4.17	-	-
21.		SP1 Highline	0.68	-	-
22.		SP1 Cold Region	3.68	-	-
23.		SP2 WG	32.01	163.82	53.07
24.		SP2 DD (Hot & Cold Region)	1.79	-	-
25.		SP2 Highline	2.32	-	-
26.		SP3 WG & DD	26.17	130.14	48.33
27.		SP3 Dedusting	2.58	-	-
28.		SP3 DE#9,10,11 Diamond Crossing	5.00	-	-
29.		SP4 WG & DD	37.76	135.24	83.07
30.		RMBB1 - DE#1	5.00	-	-
31.		RMBB1 - DE#2	5.00	-	-
32.		RMBB1 - DE#4 (Flux Primary Grinding)	5.00	-	-
33.		RMBB1 - DE#5 (Junction House-5)	5.00	-	-

34.		RMBB1 - DE#8 (Junction House-3)	6.66	-	-
35.		RMBB1 - DE#9	5.00	-	-
36.		RMBB1 - DE#12 (Flux screening)	5.00	-	-
37.		RMBB2 - DE#6&8	3.14	-	-
38.		RMBB2 - DE#7	26.13	-	-
39.		CP Battery 9	24.03	415.70	290.10
40.		CP DE Tunnel Wharf	8.03	99.82	272.11
41.		CP Battery 10	5.00	-	-
42.		CP Battery 10 P&D	21.40	322.52	280.31
43.		CDQ Battery 10	11.83	-	-
44.		CP Battery 11	10.01	-	-
45.		CP Battery 11 P&D	21.77	165.90	186.33
46.		CDQ Battery 11	6.05	-	-
47.		PCR# 3	34.97	-	-
48.		SCR# 3	1.85	-	-
49.	Pellet Plant	PP-Process Gas Cleaning WB	20.43	111.48	250.20
50.		PP-Process Gas Cleaning Hood	11.79	131.00	21.50
51.		PP-Central Dedusting	6.28	-	-
52.		PP-Drying Section	4.07	-	-
53.		PP-Grinding 1	4.46	-	-
54.		PP-Grinding 2	4.51	-	-
55.		Pellet Plant BF-1 DE 1	5.00	-	-
56.		Pellet Plant BF-2 DE 2	5.00	-	-
57.		Pellet Plant BF-3 DE 3	5.00	-	-
58.	LD Shops	LD#1 Sec. Emission	2.33	-	-
59.		LD#1 LF#1	0.82	-	-
60.		LD#1 LF#2	2.06	-	-
61.		LD#1 LF#3	2.89	-	-
62.		LD#1 DE#1	2.59	-	-
63.		LD#1 DE#LS4	4.23	-	-
64.		LD#1 DE#8 (LB)	3.00	-	-
65.		LD#2 Sec. Emission # 1	3.50	-	-
66.		LD#2 Sec. Emission # 2	2.86	-	-
67.		LD#2 Sec. Emission # 3	2.17	-	-
68.		LD#2 LF#1	6.12	-	-
69.		LD#2 LF#2	8.69	-	-
70.		LD#2 DE1	1.52	-	-
71.		LD#2 DE2	2.52	-	-
72.		LD#2 DE4	3.68	-	-
73.		LD#2 DE5	2.42	-	-
74.		LD#2 DE6	1.78	-	-
75.		LD#2 DE7	3.26	-	-
76.		LD#2 DE8	8.12	-	-
77.		LD#2 DE9	3.18	-	-
78.		LD#3 Sec. Emission	4.60	-	-
79.		LD#3 LF1	2.89	-	-
80.		LD#3 LF2	5.38	-	-
81.		TSCR Furnace# 1/1	8.69	44.00	42.20
82.		TSCR Furnace# 2/1	3.70	3.00	19.20
83.		TSCR Furnace# 3/1	10.36	9.00	64.80
84.		TSCR Furnace# 1/2	4.75	5.30	15.60
85.		TSCR Furnace# 2/2	2.03	12.20	3.70
86.		TSCR Furnace# 3/2	5.58	19.00	120.70
87.	Lime Plant	Mearz kiln no.1	2.53	36.33	60.93
88.		Mearz kiln no.2	8.02	8.00	86.70
89.		Mearz kiln no.3&4	2.05	37.73	61.16
90.		Mearz kiln no.5	1.65	36.53	62.53

91.		Mearz kiln no.6	7.30	32.22	45.66
92.		DE12	3.63	-	-
93.		Mearz kiln no.7	7.24	4.00	3.60
94.		DE15	4.60	-	-
95.		Mearz kiln no.8	5.93	8.00	34.80
96.		DE1B	4.16	-	-
97.		Mearz kiln no.9	2.51	7.00	17.80
98.		DE9	2.30	-	-
99.		Lime Plant DE-1A	1.91	-	-
100.		Lime Plant DE-2	2.44	-	-
101.		Lime Plant DE-3	2.92	-	-
102.		Lime Plant DE-6	6.33	-	-
103.		Lime Plant DE-7	6.96	-	-
104.		Lime Plant DE- Pit Junction	5.44	-	-
105.		Lime Plant DE-10	2.83	-	-
106.	Power Houses	PH#3(Blr.no.5)	13.76	24.45	11.36
107.		PH#3(Blr.no.6)	10.55	34.41	31.53
108.		PH#3(Blr.no.7&8)	7.52	33.87	21.15
109.		PH#4(Blr.no.1&2)	6.74	48.78	21.67
110.		PH#4(Blr.no.4)	17.59	116.18	55.10
111.		PH#4(Blr.no.5)	10.27	35.81	27.62
112.		PH#5(Blr.no.A)	7.71	14.64	10.51
113.		PH#5(Blr.no.B&C)	11.47	43.95	28.59
114.	Rolling Mills	Merchant mill	8.46	4.00	14.30
115.		Wire Rod Mill	9.84	89.00	145.90
116.		Cold Rolling Mill (PLTCM)	1.10	-	-
117.		Cold Rolling Mill (BAF)	1.81	7.00	36.80
118.		Cold Rolling Mill (CGL-2)	2.82	-	-
119.		Cold Rolling Mill (ARP-Old)	16.88	2.00	84.60
120.		Cold Rolling Mill (ARP- New)	29.96	5.00	50.70
121.		Hot Strip Mill RHF 1	14.46	50.00	71.90
122.		Hot Strip Mill RHF 2	26.99	3.00	89.70
123.		Hot Strip Mill RHF 3	8.88	27.00	70.80
124.		New Bar Mill	20.18	12.70	26.60

Note:
Standards applicable as per CTO, Ref No. JSPCB/HO/RNC/CTO-9834149/2021/1532 dated 17/12/2021.
N/O: - Not in Operation



Manager Environment
(Calibration &
Validation)

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Manual Ambient Air Quality Monitoring Report for Jamshedpur Township from April'25-Sept'25

Location	Parameter	UoM	May-25	Aug-25	-
River Pump House	Particulate Matter, PM10	µg/m³	63.76	55.61	-
	Particulate Matter, PM2.5		25.85	21.70	-
	Sulphur Dioxide (SO2)		26.53	19.35	-
	Nitrogen Dioxide, (NO2)		43.47	30.71	-
	Carbon Monoxide (CO)		0.49	0.53	-
	Ammonia (NH3)		64.82	56.48	-
	Ozone (O3)		9.99	9.40	-
	Nickel (Ni)		0.02	0.01	-
	Arsenic (As)		NT	NT	-
	Lead (Pb)		<0.01	<0.01	-
	Benzene (C6H6)		<0.1	<0.1	-
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	-
	Parameter	**UoM**	**Apr-25**	**May-25**	**Sep-25**
Southern Sewage Treatment Plant	Particulate Matter, PM10	µg/m³	83.78	95.27	31.64
	Particulate Matter, PM2.5		37.75	37.46	12.69
	Sulphur Dioxide (SO2)		28.25	26.68	20.90
	Nitrogen Dioxide, (NO2)		45.74	41.98	50.24
	Carbon Monoxide (CO)		0.20	0.53	0.43
	Ammonia (NH3)		64.81	61.61	64.09
	Ozone (O3)		11.96	13.06	10.27
	Nickel (Ni)		0.02	0.01	0.02
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzene (C6H6)		<0.1	<0.1	<0.1
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1
	Parameter	**UoM**	**Apr-25**	**May-25**	**Aug-25**
Burma mines Sewage Pumping Station	Particulate Matter, PM10	µg/m³	72.59	63.46	27.46
	Particulate Matter, PM2.5		29.48	25.04	10.77
	Sulphur Dioxide (SO2)		27.30	21.45	18.78
	Nitrogen Dioxide, (NO2)		36.94	41.66	35.10
	Carbon Monoxide (CO)		0.60	0.64	0.58
	Ammonia (NH3)		57.69	66.00	40.62
	Ozone (O3)		11.84	11.71	6.19
	Nickel (Ni)		0.03	0.02	0.02
	Arsenic (As)		NT	NT	NT
	Lead (Pb)		<0.01	<0.01	<0.01
	Benzene (C6H6)		<0.1	<0.1	<0.1
	Benzo alpha Pyrene (BaP)		<0.1	<0.1	<0.1

Note:

Standards applicable as per National Ambient Air Quality Standards vide Notification No.: B-29016/20/90/PCI-L dated 18th November 2009.

This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Naagaarjuna

Sr. Area Manager
Environment
Monitoring & Analysis

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

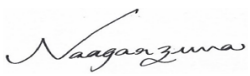
Environment Management Department – Laboratory

Noise Level Monitoring Report for Jamshedpur Township from April'25-Sept'25

S.no	Area	UoM	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
A)	**SILENCE ZONE**	**dB(A) Leq**												
1	TMH (Near Statue)		58.6	52.6	56.8	58.1	58.5	57.3	55.6	52.4	60.3	50.1	58.2	52.6
2	JUSCO School Kadma		56.3	53.1	57.4	54.0	60.1	54.1	56.3	53.0	58.9	49.6	58.7	50.1
3	Narbheram School Bistupur		68.2	63.2	68..4	64.7	70.2	63.2	69.8	63.1	66.8	59.7	68.9	62.8
4	South Park School Bistupur		52.6	50.4	54.1	50.2	62.1	51.0	60.1	50.2	51.4	54.2	52.6	55.3
5	Old Court Area (Jubilee Park Side)		68.7	66.8	67.3	60.8	58.9	61.7	62.6	66.2	58.9	62.3	62.3	61.1
B)	**RESIDENTIAL ZONE**	**dB(A) Leq**												
1	Circuit House Area (North)		60.0	56.2	61.4	55.0	55.4	55.3	56.3	56.1	59.1	53.4	57.6	55.0
2	B.H. Area		56.4	50.3	63.7	57.3	54.2	58.2	55.1	50.2	48.9	54.2	54.5	49.6
3	Farm Area		57.5	56.6	59.2	55.1	51.6	56.1	57.9	56.5	50.2	51.0	56.4	50.4
4	Baridih Basti		52.9	54.8	60.8	52.6	60.1	53.4	59.6	54.7	56.4	47.8	62.3	60.2
5	Carriage Colony Burma Mines		54.6	55.4	58.7	53.9	64.2	54.6	58.8	55.8	58.6	46.3	67.2	48.6
6	Agrico Colony		50.5	52.1	55.4	54.1	57.3	55.2	56.3	52.1	49.8	48.5	58.7	50.0
7	South Park		53.6	54.7	56.1	54.7	55.6	54.4	59.2	54.6	53.6	49.8	51.2	51.5
C)	**COMMERCIAL ZONE**	**dB(A) Leq**												
1	Sakchi Market		61.2	64.8	62.7	60.2	61.2	61.2	62.6	63.7	61.5	57.3	61.3	59.7
2	Golmuri Market		54.8	58.6	60.3	58.8	64.5	59.8	65.4	58.4	62.6	54.4	66.2	63.4
3	Burma Mines Market		55.1	54.2	61.0	57.8	62.4	58.2	60.3	54.1	60.8	56.2	67.4	58.4
4	Apna Bazar Bistupur		63.2	61.1	62.0	59.6	63.4	60.4	58.6	61.2	63.3	59.3	64.0	61.5
5	'R' Road Bistupur (behind Nalanda Hotel)		64.8	62.2	61.5	59.4	62.8	61.2	53.4	62.0	58.6	60.0	55.8	52.6
D)	**INDUSTRIAL ZONE**	**dB(A) Leq**												
1	EAST SIDE/ near HSM Drain		62.4	60.1	64.8	60.2	57.8	60.1	61.2	60.3	58.6	55.1	62.4	56.8
2	WEST SIDE /Near Ramm Mandir		61.8	62.3	56.8	55.1	62.2	56.2	58.6	62.2	66.3	57.3	61.0	56.6
3	NORTH/ Garam Nalla drain		62.6	61.0	64.3	60.8	59.6	60.6	63.4	61.0	55.4	54.0	61.4	60.0
4	NORTHEAST slag road gate		66.5	62.4	60.4	60.3	58.2	61.2	64.3	62.1	65.2	61.7	65.6	60.3
5	NORTHWEST/General Office		59.2	56.1	59.7	57.6	58.4	58.3	52.2	56.1	48.9	50.0	58.3	51.2
6	SOUTHEAST/Burmamines Gate		59.7	60.3	61.9	56.3	63.4	57.0	65.2	60.3	64.8	59.9	65.6	60.6
7	SOUTHWEST/Jugsalia Drain		54.4	51.2	58.3	54.8	60.1	55.6	49.8	51.2	51.1	52.4	59.4	53.3

Note:
Standards applicable as per Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 notified vide S. O. 1046 (E), dated 22-11-2000.

This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-836



Sr. Area Manager
Environment
Monitoring & Analysis

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

River Water Monitoring Report from April'25-Sept'25

Month	Locations	pH	Temperature	Conductivity	Turbidity	Total Dissolved Solids	TSS
		--	oC	µMho/Cm	NTU	mg/L	mg/L
Apr-25	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	7.38	27.7	850	4.5	417	<10
	KHARKHAI RIVER (NEAR DUMUHANI)	7.73	27.7	288	9.2	141	<10
	SWARNA REKHA RIVER BAGUN HATU	7.08	27.8	390	2.8	191	<10
	Locations	**Alkalinity**	**Total Hardness**	**Calcium**	**Magnesium**	**Sodium**	**Potassium**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	234	228	38	18	79	6
	KHARKHAI RIVER (NEAR DUMUHANI)	95	98	22	10	48	3
	SWARNA REKHA RIVER BAGUN HATU	116	120	24	7	52	3
	Locations	**Chloride**	**$SO4^{-2}$**	**PO_4- P (10 mm)**	**Nitrate Nitrogen as N**	**Nitrite Nitrogen as N**	**F^-**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	65	14	0.91	1.9	0.0	0.96
	KHARKHAI RIVER (NEAR DUMUHANI)	16	13	0.09	0.3	0.1	0.70
	SWARNA REKHA RIVER BAGUN HATU	28	13	0.23	0.5	<0.02	1.09
	Locations	**SiO2**	**Fe**	**Mn**	**Cr (VI)**	**Cu**	**Cr**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	9	0.26	0.08	<0.05	< 0.01	< 0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	10	0.16	0.11	<0.05	< 0.01	< 0.01
	SWARNA REKHA RIVER BAGUN HATU	10	0.20	0.06	<0.05	< 0.01	< 0.01
	Locations	**Cd**	**Ni**	**Zn**	**Pb**	**Nitrogen (Ammonia) as N**	**O & G**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	< 0.01	< 0.01	0.01	0.01	4.4	1.2
	KHARKHAI RIVER (NEAR DUMUHANI)	< 0.01	< 0.01	0.01	< 0.01	<1.0	0.6
	SWARNA REKHA RIVER BAGUN HATU	< 0.01	< 0.01	0.02	<0.01	1.0	0.8
	Locations	**COD**	**BOD (3days at 270C)**	**DO at Spot**	**Barium as Ba**	**Boron as B**	**Free Chlorine**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	23	12	5.3	0.03	0.01	<1.0
	KHARKHAI RIVER (NEAR DUMUHANI)	16	8	6.2	0.03	0.04	<1.0
	SWARNA REKHA RIVER BAGUN HATU	23	8	5.1	0.02	0.01	<1.0

	Locations	Sulphide as S^{-2}	Phenolic Compounds as Phenols	Cyanide as CN	Selenium as Se
		mg/L	mg/L	mg/L	mg/L
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	<0.10	<0.10	<0.1	<0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	<0.10	<0.10	<0.1	<0.01
	SWARNA REKHA RIVER BAGUN HATU	-	-	-	-

Month	Locations	pH	Temperature	Conductivity	Turbidity	Total Dissolved Solids	TSS
		--	oC	µMho/Cm	NTU	mg/L	mg/L
July-25	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	7.84	25.00	193	87.30	95	48
	KHARKHAI RIVER (NEAR DUMUHANI)	7.64	26.50	202	81.00	99	74.0
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	7.75	26.60	164	78.00	80	70
	SWARNA REKHA RIVER BAGUN HATU	7.83	27.60	159	151.00	78	34
	Locations	**Alkalinity**	**Total Hardness**	**Calcium**	**Magnesium**	**Sodium**	**Potassium**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	68	71	99	24	76	2
	KHARKHAI RIVER (NEAR DUMUHANI)	82	84	21	7	41	3
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	69	59	21	6	28	3
	SWARNA REKHA RIVER BAGUN HATU	61	67	27	7	45	5
	Locations	**Chloride**	**$SO4^{-2}$**	**PO_{4}- P (10 mm)**	**Nitrate Nitrogen as N**	**Nitrite Nitrogen as N**	**F^{-}**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	9	44	0.09	0.50	0.14	0.24
	KHARKHAI RIVER (NEAR DUMUHANI)	7	13	0.2	0.67	0.07	0.23
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	6	10	0.19	0.34	0.07	0.23
	SWARNA REKHA RIVER BAGUN HATU	15	16	0.58	<0.2	0.04	0.23
	Locations	**SiO2**	**Fe**	**Mn**	**Cr (VI)**	**Cu**	**Cr**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	8	0.38	1.19	<0.05	< 0.01	< 0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	13	0.35	0.01	<0.05	< 0.01	< 0.01
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	13	0.50	0.01	<0.05	< 0.01	< 0.01
	SWARNA REKHA RIVER BAGUN HATU	13	0.38	0.03	<0.05	< 0.01	< 0.01
	Locations	**Cd**	**Ni**	**Zn**	**Pb**	**Nitrogen (Ammonia) as N**	**O & G**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	< 0.01	< 0.01	0.02	0.02	<1.0	0.8
	KHARKHAI RIVER (NEAR DUMUHANI)	< 0.01	< 0.01	< 0.01	0.01	<1.0	0.8

	SWARNA REKHA RIVER NEAR MANGO BRIDGE	< 0.01	< 0.01	0.01	0.06	<1.0	1.2
	SWARNA REKHA RIVER BAGUN HATU	< 0.01	< 0.01	0.02	0.05	<1.0	1.6
	Locations	**COD**	**BOD (3days at 270C)**	**DO at Spot**	**Barium as Ba**	**Boron as B**	**Free Chlorine**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	13	6	6.9	0.06	0.02	<1.0
	KHARKHAI RIVER (NEAR DUMUHANI)	59	12	5.9	0.04	0.03	<1.0
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	41	10	6.8	0.02	0.01	<1.0
	SWARNA REKHA RIVER BAGUN HATU	20	8	6.0	0.04	0.07	<1.0

	Locations	**Sulphide as S^{-2}**	**Phenolic Compounds as Phenols**	**Cyanide as CN**	**Selenium as Se**
		mg/L	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	<0.10	<0.10	<0.1	<0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	<0.10	<0.10	<0.1	<0.01
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	<0.10	<0.10	<0.1	<0.01
	SWARNA REKHA RIVER BAGUN HATU	<0.10	<0.10	<0.1	<0.01

Month	**Locations**	**pH**	**Temperature**	**Conductivity**	**Turbidity**	**Total Dissolved Solids**	**TSS**
		--	**oC**	**µMho/Cm**	**NTU**	**mg/L**	**mg/L**
Sept-25	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	7.68	26.10	560	49.20	274	22
	KHARKHAI RIVER (NEAR DUMUHANI)	7.71	26.00	232	43.30	114	18
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	8.29	26.20	177	19.40	87	10
	Locations	**Alkalinity**	**Total Hardness**	**Calcium**	**Magnesium**	**Sodium**	**Potassium**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	118	121	69	21	86	8
	KHARKHAI RIVER (NEAR DUMUHANI)	97	88	18	6	46	3
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	78	67	15	5	55	2
	Locations	**Chloride**	**$SO4^{-2}$**	**PO_{4}- P (10 mm)**	**Nitrate Nitrogen as N**	**Nitrite Nitrogen as N**	**F^{-}**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	24	89.4	2.42	1.20	0.1	0.12
	KHARKHAI RIVER (NEAR DUMUHANI)	8	44.8	3.27	2.30	0.11	0.73
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	5	8.8	0.15	2.40	0.11	0.59
	Locations	**SiO2**	**Fe**	**Mn**	**Cr (VI)**	**Cu**	**Cr**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	18	0.30	0.46	<0.05	< 0.01	0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	20	0.06	0.01	<0.05	< 0.01	0.01

	SWARNA REKHA RIVER NEAR MANGO BRIDGE	19	0.03	0.01	<0.05	< 0.01	0.01
	Locations	**Cd**	**Ni**	**Zn**	**Pb**	**Nitrogen (Ammonia) as N**	**O & G**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	< 0.01	< 0.01	0.01	0.01	<1.0	0.4
	KHARKHAI RIVER (NEAR DUMUHANI)	< 0.01	< 0.01	0.01	0.01	<1.0	0.8
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	< 0.01	< 0.01	0.02	< 0.01	<1.0	0.4
	Locations	**COD**	**BOD (3days at 270C)**	**DO at Spot**	**Barium as Ba**	**Boron as B**	**Free Chlorine**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	37	10	6.2	0.08	0.10	<0.1
	KHARKHAI RIVER (NEAR DUMUHANI)	19	6	6.2	0.03	0.01	<0.1
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	22	8	6.0	0.03	0.01	<0.1

	Locations	**Sulphide as S^{-2}**	**Phenolic Compounds as Phenols**	**Cyanide as CN**	**Selenium as Se**
		mg/L	**mg/L**	**mg/L**	**mg/L**
	KHARKHAI RIVER (NEAR ADITYAPUR BRIDGE)	<0.10	<0.10	<0.1	< 0.01
	KHARKHAI RIVER (NEAR DUMUHANI)	<0.10	<0.10	<0.1	< 0.01
	SWARNA REKHA RIVER NEAR MANGO BRIDGE	<0.10	<0.10	<0.1	< 0.01

Note:
This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Sr. Area Manager
Environment
Monitoring & Analysis

Head Environment
Monitoring, Testing &
Analysis (TSJ)

TATA STEEL LIMITED

Environment Management Department – Laboratory

Ground Water Monitoring Report from April'25-Sept'25

Month	Locations	pH	Temperature	Conductivity	Total Dissolved Solids	Total Suspended Solids	Alkalinity as $CaCO_3$
		--	^0C	µMho/Cm	mg/L	mg/L	mg/L
Apr-25	Sonari Ground Water	6.9	27.8	959	470	<10	250
	Baganhattu Ground Water	6.7	27.6	782	383	<10	216
	Parvati Ghat Ground Water	7.1	28.0	2216	1086	<10	561
	Jugsalai Ground Water	7.1	27.8	1131	554	<10	430
	Jemco Ground Water	7.0	27.9	1553	761	<10	21
	Locations	**Total Hardness as $CaCO_3$**	**Calcium as Ca**	**Chlorides as Cl^-**	**Sulphates as SO_4^{-2}**	**Nitrate Nitrogen as N**	**Nitrite Nitrogen as N**
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Sonari Ground Water	351	92	64	27	0.7	<0.02
	Baganhattu Ground Water	273	78	49	28	3.2	0.02
	Parvati Ghat Ground Water	1047	234	123	495	35.0	0.14
	Jugsalai Ground Water	489	105	79	218	2.4	<0.02
	Jemco Ground Water	479	120	165	731	0.8	0.04
	Locations	**Fluorides as F^-**	**Silica as SiO_2**	**Iron as Fe**	**Manganese as Mn**	**Hexavalent Chromium as Cr+6**	**Copper as Cu**
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Sonari Ground Water	0.5	8	0.05	0.30	<0.05	< 0.01
	Baganhattu Ground Water	0.5	10	0.60	0.41	<0.05	< 0.01
	Parvati Ghat Ground Water	0.2	37	0.08	0.01	<0.05	< 0.01
	Jugsalai Ground Water	0.2	23	0.01	0.21	<0.05	< 0.01
	Jemco Ground Water	0.2	9	0.38	0.75	<0.05	< 0.01
	Locations	**Total Chromium as Cr**	**Cadmium Cd**	**Nickel as Ni**	**Zinc as Zn**	**Lead as Pb**	**Nitrogen (Ammonia) as N**
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Sonari Ground Water	0.07	< 0.01	< 0.01	0.02	0.02	<1.0
	Baganhattu Ground Water	< 0.01	< 0.01	< 0.01	0.02	0.01	<1.0
	Parvati Ghat Ground Water	< 0.01	< 0.01	< 0.01	0.01	0.01	<1.0
	Jugsalai Ground Water	0.01	< 0.01	0.02	<0.01	0.01	<1.0
	Jemco Ground Water	0.01	< 0.01	0.01	0.06	< 0.01	<1.0
	Locations	**Free Chlorine**	**Sulphide as S^{-2}**	**Phenolic Compounds as Phenols**	**Free Cyanide**	**Aluminium**	**-**
		mg/L	mg/L	mg/L	mg/L	mg/L	-
	Sonari Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	-
	Baganhattu Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	-
	Parvati Ghat Ground Water	<0.1	<0.10	<0.10	<0.1	<0.01	-
	Jugsalai Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	-
	Jemco Ground Water	<0.1	<0.10	<0.10	<0.1	<0.01	-

Month	Locations	pH	Temperature	Conductivity	Total Dissolved Solids	Total Suspended Solids	Alkalinity as $CaCO_3$
		--	^0C	µMho/Cm	mg/L	mg/L	mg/L
July-25	Sonari Ground Water	7.2	25.1	158	77	<10	32
	Baganhattu Ground Water	7.0	24.9	2918	1430	<10	663
	Parvati Ghat Ground Water	6.6	27.6	909	445	<10	202
	Jugsalai Ground Water	6.9	26.5	954	467	<10	268
	Jemco Ground Water	7.6	26.7	1102	540	<10	71
	Locations	**Total Hardness as $CaCO_3$**	**Calcium as Ca**	**Chlorides as Cl^-**	**Sulphates as SO_4^{-2}**	**Nitrate Nitrogen as N**	**Nitrite Nitrogen as N**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Sonari Ground Water	58	124	5	126	3.4	0.01
	Baganhattu Ground Water	1365	211	194	190	9.0	0.10
	Parvati Ghat Ground Water	251	80	55	30	5.6	0.02
	Jugsalai Ground Water	368	98	68	11	10.6	0.09
	Jemco Ground Water	311	157	96	374	1.9	0.02
	Locations	**Fluorides as F^-**	**Silica as SiO_2**	**Iron as Fe**	**Manganese as Mn**	**Hexavalent Chromium as Cr+6**	**Copper as Cu**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Sonari Ground Water	0.1	4	0.02	0.01	<0.05	< 0.01
	Baganhattu Ground Water	0.4	16	0.04	0.13	<0.05	< 0.01
	Parvati Ghat Ground Water	0.1	39	0.36	0.71	<0.05	< 0.01
	Jugsalai Ground Water	0.2	32	0.05	0.37	<0.05	0.01
	Jemco Ground Water	7.4	13	0.02	0.01	<0.05	< 0.01
	Locations	**Total Chromium as Cr**	**Cadmium Cd**	**Nickel as Ni**	**Zinc as Zn**	**Lead as Pb**	**Nitrogen (Ammonia) as N**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Sonari Ground Water	< 0.01	< 0.01	< 0.01	0.02	0.02	<1.0
	Baganhattu Ground Water	0.0	< 0.01	< 0.01	0.01	0.02	<1.0
	Parvati Ghat Ground Water	< 0.01	< 0.01	< 0.01	0.02	0.04	<1.0
	Jugsalai Ground Water	< 0.01	< 0.01	0.02	0.02	0.02	<1.0
	Jemco Ground Water	< 0.01	< 0.01	< 0.01	0.01	0.01	<1.0
	Locations	**Free Chlorine**	**Sulphide as S^{-2}**	**Phenolic Compounds as Phenols**	**Free Cyanide**	**Aluminium**	**-**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	-
	Sonari Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	
	Baganhattu Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	
	Parvati Ghat Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	
	Jugsalai Ground Water	<0.1	<0.10	<0.10	<0.1	< 0.01	
	Jemco Ground Water	<0.1	<0.10	<0.10	<0.1	0.01	

Note:
This test report was generated by TATA STEEL LIMITED JSR EMD LAB having NABL Accreditation No.TC-8363

Sr. Area Manager
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TC-8057

Test Report No. INCHE24081910809114718 **ULR No. :** TC805724000034267F **Report Issue Date:** 09 Aug 2024

TEST REPORT

Report Issued To: Tata Steels Ltd

Burma Road, 191, Outer Circle Road, Bistupur Post, Jamshedpur - Jharkhand, 831001, India

Discipline :	Chemical	**Sample receipt date :**	05 Aug 2024
Group :	Pollution and Environment	**Date of registration :**	06 Aug 2024
BV Sample ID :	1642822	**Date of commencing of testing :**	07 Aug 2024
Customer Reference :**	Test request form dated : 02.08.2024	**Date of completion of testing :**	09 Aug 2024
Sample Name :**	LF Slag		
Sample condition on receipt :	Good		
Sample quantity / Package :	500g X 1NO		
Batch No. / Lot No. :**	2421753		

Sample Information: **Sample Submitted By Customer**

No.	Test Parameters	Unit	Test Results	Test Method	LOQ
Toxicity Charateristic Leachability Procedure (TCLP)					
1	Arsenic (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
2	Silver (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
3	Barium (TCLP)	mg/L	0.12	USEPA 1311 / 200.8 : 1995	0.05
4	Beryllium (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
5	Cadmium (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
6	Cobalt (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
7	Copper (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
8	Nickel (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
9	Molybdenum (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
10	Lead (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
11	Selenium (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
12	Vanadium (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
13	Zinc (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
14	Manganese (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05
15	Chromium ($Cr6^{+}$) (TCLP)	mg/L	BLQ	USEPA 1311 / 200.8 : 1995	0.05

Abbreviations: LOQ: Limit of Quantification, BLQ: Below limit of quantification
** Indicates information supplied by the customer for which the laboratory has no control
Note: SAMPLE TESTED AS RECEIVED

Authorized Signatory

M.Ramesh

Manager

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--- End of Report ---

Sl. No.: 138157

TATA

TATA STEEL

On Site Emergency Plan

&

Disaster Control

(SAFETY/PROC/PROCESS/21)

Tata Steel Works

Jamshedpur

Onsite Emergency Plan
& Disaster Control
For
Tata Steel Ltd
Jamshedpur Works

SAFETY/PROC/PROCESS/21
Rev: 03
Effective Date:01.03.2020

RECOMMENDED WITH THE
CONDITIONS MENTIONED IN
THIS OFFICE LETTER No. 615
DATED 29.05.2020

29/5/2020
Chief Inspector of Factories, Jharkhand
Ranchi

Avneesh Gupta
Vice President
TQM & Shared Services

FOREWORD

June 22,2020

With the help of Centre of Excellence in Process Safety Management, Tata steel has taken a pioneering approach among Indian Steel Industries to strengthen its operating systems & enhance capability and competency of its personnel to effectively manage process risks.

Though sufficient preventive and precautionary measures are taken, possibility of a mishap in a process unit like steel plant cannot be ruled out. Hence, there is an inherent need to prepare a contingency plan to deal with incidents which may still occur and are likely to affect life and property both within the plant and in the immediate neighbourhood.

This ***Onsite Emergency Plan & Disaster Control*** for Tata Steel Ltd Jamshedpur Works includes the Maximum Credible Loss Scenarios possible inside the plant and describes the roles & responsibilities of key personnel of strategic level team in the plant along with other actions to be taken in the event of an Emergency.

As per the legal requirement to maintain an emergency plan as per Section 41B of Factories Act, this emergency plan has been prepared as per Schedule 11 of Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989.

I am sure this comprehensive *Onsite Emergency Plan & Disaster Control* guideline will help us in preparing for any emergency & its mitigation effectively & efficiently. It will also help the local government authorities to develop “Offsite Emergency Plan”.

I appreciate the work done by the team to prepare this document. All line functions must ensure adherence to these guidelines for effective emergency preparedness.

Avneesh Gupta
Vice President TQM & Shared Services

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The annexures are available in a separate booklet with this document.

Key Terminologies

Emergency	An emergency is a situation that poses an immediate risk to health, life, property, and/or environment. Emergency can arise out of several scenarios such as fire and explosion; toxic/ flammable gas leaks, structural collapse; natural & other man-made disasters and represent the first stage of an extraordinary event which can be managed within controlled boundary. An incident, can be called an emergency, if it conforms to one or more of the following: It poses an immediate risk to multiple fatality (C5 Consequence as per TSL Risk Matrix, EHS/WORKS/612) It has impact on business continuity (C4 Consequence as per TSL Risk Matrix, EHS/WORKS/612) (Down time/Cost impacting one or more than one department) It attracts extensive adverse attention in media. Effect on National / international policies with potentially severe impact on access to new areas, grants of licenses and / or tax legislation. It raises high level concern and action(s) by government and/or by international NGOs.
TC	**Tactical Centre** is the place from which direction and control is exercised in a disaster / emergency. Also, it is the place from where all communication will be established with outside agencies and district authorities.
AP	**Assembly Point** are safe areas away from the emergency affected zones which are used to evacuate people from the affected zone or zones to safe areas.
ER	**Escape Routes** are those routes that allow reasonably safe passage of persons from their working areas to Assembly Points.
CIC	VP (TQM &SS) and Factory manager is designated as the Chief Incident Controller for managing the emergency
WIC	VPs of respective divisions/Chief of manufacturing and maintenance hold the position of Work Incident Controller in Tata Steel Ltd Jamshedpur Works.
IC	Chief/Head of respective departments designated as the Incident Controller (IC), decides complete course of action at site as per situation.
EO	Chief safety (India & SEA) is Emergency Officer at Tata Steel Ltd Jamshedpur Works.
ERT	Trained manpower on emergency response, i.e. Emergency Response Team (ERT) will act as professional first responders during catastrophic circumstances and provide basic emergency responses.
MSDS	Document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures while handling chemical products.

Executive Summary

An emergency is a situation that poses an immediate risk to health, life, property, or environment. Emergency can arise out of several scenarios such as fire and explosion; toxic/ flammable gas leaks, structural collapse; natural & other man-made disasters and represent the first stage of an extraordinary event which can be managed within controlled boundary. Poor emergency management can escalate the situation to second stage of the event leading to a crisis situation which requires more effort to manage the situations outside the controlled boundary in addition to within. Continued crisis situation poses risks on business continuity and can have a long-term negative impact on business and the company.

An Emergency plan is a written document that gives a clear idea of what should be done in case of an emergency. It is a legal requirement to maintain an emergency plan as per Section 41B of Factories Act. This emergency plan has been prepared as per Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989.

Site emergency management plans are specific to facility of Tata Steel Ltd. Works, Jamshedpur and broadly address following areas

- Site details and Site Immediate Emergency Recovery teams
- Emergency response for identified Scenarios

The Emergency Scenarios considered for Onsite Emergency Plan are given in **Annexure B** of this document.

This plan serves as an emergency preparedness plan for the departments and units within this facility. Personnel will be able to use this document as a guideline for scheduled training exercises and conducting mock drills. Fire fighters will use this document as a training tool to familiarize themselves with the functions of facility's fire and life safety systems and evacuation procedures prior to an emergency response.

SECTION - I

INTRODUCTION

1 Introduction

Established in Jamshedpur, India in the year 1907, Tata Steel is part of the 150-year-old Tata group. Bringing to reality, the vision of its founder, J. N. Tata, who inspired the steel and power industry in India, the Tata Steel Group is known to be the hallmark of corporate citizenship and business ethics.

The Tata Steel Limited, Works Jamshedpur (hereinafter referred as TSLW) has vast experience in the operation of an Integrated Iron & steel Plant in India. Its largest plant is situated at Jamshedpur in the State of Jharkhand. Since its inception in 1907, Tata Steel has pioneered the steel industry in India to occupy a leading place in the global steel market. It's enviable performance record, and commendable adaptability to the changing technology has helped the company to expand its capacity to nearly 10 Million Tons per annum at Jamshedpur (FY 2017-18) from about 50,000 Ton per annum in 1911. Since it is an iron and steel-making process, it involves either handling or storage of certain hazardous chemicals (propane, hydrogen etc.) in the quantities above the threshold quantity as specified under *'The Manufacture Storage & Import of Hazardous Chemicals Rules-1989' as amended in 2000 and hazardous processes under the Factory Act, 1987.*The storage capacity of hydrogen in TSLW is 400 M^3 and of propane is 300 MT (threshold quantity = 25 MT). Hence TSLW is categorized as a major accident hazard (MAH) unit and for the safety of the workers and for regulatory compliances, it is mandatory for the management of TSLW to prepare an On-site Emergency Management Plan. An Integrated Emergency Management System comprising of Preparedness, Prevention, Response and Recovery has been described to tackle any emergency in TSLW with highlighting the command structure, key personnel and their responsibilities for rapid execution of assigned tasks for handling emergency situations. The other details of the concerned plan, viz. worst/ credible emergency scenarios, consequence analysis of various loss scenarios, procedures for dissemination of proper warning, etc. have been described in the subsequent sections. Schedule 11 of MSIHC Rules, 1989 as amended in 2000 of Environment (Protection) Act, 1986 has been strictly followed for the preparation of the present plan.

1.1 Definitions

Disaster

Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage/ destruction of property, or damage/degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.

Disaster management

A continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary for-

(i) prevention of danger or threat of any disaster;
(ii) mitigation or reduction of risk of any disaster or its severity or consequences;
(iii) capacity-building;
(iv) preparedness to deal with any disaster;
(v) prompt response to any threatening disastrous situation;
(vi) assessing the severity or magnitude of effects of any disaster;
(vii) evacuation, rescue and relief;
(viii) rehabilitation and reconstruction

Mitigation

Measures aimed at reducing the risk, impact or effects of a disaster or threatening disastrous situation.

Emergency Response Team Members

All plant personnel that have specified functions in response to an emergency situation.

Onsite Emergency Plan

The document describing the response plan to cope with an industrial emergency at the facility.

Operator

An employee qualified and trained in, or being trained in, the operations of the plant.

SECTION – II

NAME AND ADDRESS OF THE PERSON FURNISHING THE INFORMATION

2 Name and Address of the Person Furnishing Information

NAME AND ADDRESS OF THE PERSON FURNISHING THE INFORMATION	
Name of the Occupier:	**Mr. T V Narendran** CEO & MD, Tata Steel Ltd. Phone: 0657 6645625, 0657 2424602 Fax No.0657 2431818.
Name of Factory Manager:	**Mr. Avneesh Gupta** Vice-President (TQM & Shared Services) Tata Steel Ltd, Jamshedpur Phone -0657 6645730
Name of Chief Safety Officer:	**Mr. Sanjay Mishra** Head Safety TSJ Safety Tata Steel Ltd, Jamshedpur Phone: 0657-6642304

SECTION III

Organizational Structure of Handling Major Emergency/Disaster

3 Organizational Structure of Handling Major Emergency/Disaster

At TSLW due to storage and handling of Hydrogen, Propane, LDO, CO, LD and BF gases etc., the following two types of emergency situations may occur:

1. **On-site Emergency (Level I)-** The incident which has potential to cause impacts within the plant boundaries.
2. **Off-site Emergency (Level II)-** The incident which has potential to cause impacts beyond the plant boundaries.

On the basis of the nature of process involved and number of employees working in key facilities of TSLW, the Strategic Level team have been formed. Also, to tackle an emergency situation effectively, their roles and the responsibilities are defined clearly. The key persons/coordinator for handling emergency situations are given at Table 3.1.

Table 3.1: Key persons/team coordinators responsible for handling major emergency /disaster

Sl. No.	Role	Designation	Alternate
1.	Chief Incident Controller (CIC)	Factory Manager (VP, TQM &SS)	Appointed Factory Manager
2.	Work Incident Controller (WIC)	VPs of Respective Divisions/ Chief of Manufacturing and Maintenance	Chief of Respective Manufacturing Divisions
3.	Incident Controller (IC)	(Chief / HOD of respective plant/Dept.)	Head of respective Plant/ Dept.
4.	Emergency Officer (EO)	Chief Safety	Chief Process Safety
5	Liaison Officer	Chief Corporate Administration	Head Statutory Compliance Management &Societies
6	Team Leader: Corporate Communication	Head Corporate Communication	Sr. Manager Corporate Communication
7.	Team Leader: Medical Services	Plant Medical Officer	Sr. Registrar
8.	Team Leader: Fire Services & Security	Chief Security & Brand Protection	Head Security Works

Sl. No.	Role	Designation	Alternate
9	Team Leader: HRM	Chief HRM (Steel)	Head HRM of the respective division.
10	Team Leader: Environment Management	Chief Environment Management	Head Environment Management
11.	Team Leader: Telecom & SMS	Sr. Manager Telecom.	Manager Telecom.
12.	Team Leader: IT & Infrastructure	Chief Cloud Infra, Network & Cybersecurity	Head IT Projects Enterprise Access & ISS
13.	Team Leader: FMD	Chief Power Systems and Energy	Chief Fuel Management
14.	Team Leader: Maintenance	COMM and COEM	Chief Mechanical Maintenance – SM, Chief Electrical Maintenance – IM

The contact details of the key persons along with other necessary information can be found in **Annexure C** of this document.

3.1 Responsibilities Assigned to the Key Personnel in Case of Emergency

3.1.1 Responsibility of Chief Incident Controller (CIC)

VP (TQM & SS) and Factory manager who is designated as the Chief Incident Controller (CIC), on receipt of information regarding the emergency inside the plant premises from WIC or IC, will assess the magnitude of the situation and decide to trigger emergency call in consultation with Emergency officer (Chief Safety) so that all members of strategic level team can assemble at the Tactical Centre(TC).

CIC (VP TQM & SS) will assume overall responsibilities for the Factory/Storage site and its personnel. His responsibilities will include:

Declaration of “Major Emergency” if he is certain that the incident cannot be controlled by routine operations. If he decides that a major emergency is likely, he should ensure that the emergency services have been called in and the on-site emergency plan activated.

1. Depending on the circumstance, CIC should
    a. Ensure that key personnel are called.
    b. Exercise direct operational control of those parts of the works outside the affected area in consultation with WIC.
    c. Declare Plant level emergency using Steam Buzzer Siren.
    d. Continually review and assess possible developments to determine the most probable course of events.
    e. Direct the shutting down of plants and their evacuation in consultation with the Work Incident Controller and key personnel, if required.
    f. Ensure that casualties are receiving adequate attention. Arrange for additional help if required. Ensure that relatives are informed.
    g. Ensure Safe traffic movement within the works.
    h. Ensure that log book of the emergency is maintained.
    i. Where the emergency is prolonged, arrange for the relief of site personnel.
2. Depending on the magnitude of the situation, decide whether the employees are to be evacuated from the assembly points to safe place.
3. Consult and liaise with senior officials of the local government like Fire Services, Police, Medical, Pollution control Board and the Factories Inspector through IC/Team Leaders. Based on the recommendation of Team Leaders, provide advice to authorities to activate off site Disaster Management Plan.
4. Inform the corporate office through PEO and issue authorised statements through Team Leader, Corporate Communication to news media, and ensure that evidence is preserved for enquiry to be conducted by the Statutory Authorities.
5. Seek all necessary assistance through PEO as and when required depending upon the severity of the situation.
6. Ensure Communication inside plant through SMS Broadcast and Shift safety Van.
7. Declare closure of emergency and initiate recovery as per plan
8. Ensure rehabilitation of affected persons on discontinuation of emergency in consultation with Chief, HRM Steel, Jsr.

3.1.2 Responsibility of Vice President-Safety Health & Sustainability (VP-SHS)

On receipt of information regarding the emergency inside the plant premises, VP- SHS will go to the Tactical Centre (TC).

His responsibilities are as follows:

1. Obtain full details of emergency through EO.
2. Assess any immediate HSE implications for businesses and people potentially involved.
3. Assess any potential medium to long-term HSE issues arising from the emergency.
4. Provide strategic advice to WIC and CIC.
5. Ensure that the on-site emergency operations are carried out safely with the support of his representative at site.
6. Ensure the preservations of evidences for the investigation of the incident
7. Formation of investigation team to find the root cause of the scenario.
8. Ensure the documentation of learning and implementations of recommendations.
9. Any other work in co-ordination with CIC.

3.1.3 Responsibility of Works Incident Controller (WIC)

The VPs/Chief of Manufacturing of respective divisions designated as the Works Incident Controller.On receipt of information regarding the emergency inside the plant premises from IC, should assess and decide whether a major emergency exists or is likely. If so, he should immediately inform CIC through IC and go to the Tactical Centre (TC) in case onsite emergency plan is activated.

1. He should assume the duty of the Chief Incident Controller pending the latter's arrival, in particular to:
    a. Ensure the emergency services have been called;
    b. Directing the shut down and evacuation of the other plant areas, which are likely to be affected;
    c. Ensure key personnel have been summoned.
2. His main function, however is to direct all operations with help of Incident controller at the site of the incident, e.g.
    a. Obtain full details of emergency.
    b. To provide advice as a functional expert on the immediate and future impacts and implications of the emergency.
3. He should also:
    a. Brief the Chief Incident Controller about the emergency and keep him informed of developments.
    b. Establish as the main point of contact for the incident controller, direct and guide him on decisions and actions undertaken by CIC and his team.

c. Issue instructions to shut down all operations within the affected area taking into consideration priorities for safety of personnel, minimise damage to the plant, property and environment.

d. Ensure that all non-essential workers/staff of the affected area have been evacuated from assembly points to the safer places.

e. Provide CIC and Corporate communication with necessary information required to formulate appropriate response to media questions.

f. Decide recovery action as per plan.

3.1.4 Responsibility of Incident Controller (IC)

Departmental/ Section heads of units which are affected are designated as the Incident Controller. Immediately after getting the information about emergency the Incident Controller will wear PPE and rush to the emergency site and take following actions:

1. Immediately inform the WIC about the incident/emergency.
2. Inform CIC after discussion with WIC.
3. Decide complete course of action as per situation, viz., shutting down, sealing, isolation, evacuation, barricading of the area, etc.
4. Activate departmental Emergency Siren as per SS/GEN-50.
5. Will keep track of the incident and progress of operation to fight emergency, and then intimate all significant developments to the WIC and Emergency Officer.
6. Communicate to the neighbouring departments about the emergency.
7. Will call the Emergency Responders (ERT) at the site.
8. Ensure all relevant emergency services like Fire Services, Security and Medical Aid etc are called.
9. Guide fire-fighting operation and rescue team in all possible steps to control emergency and search for casualties.
10. Ensure that all non-essential workers in the affected area are evacuated to the appropriate assembly points.
11. Keep track of number of casualties with the help of HR personnel and help in establishing triage.
12. Arrange for Maintenance team for maintenance related activities, during silent hours and holidays.
13. Communicate the closure of Emergency to CIC through WIC.
14. Take action to preserve the evidence for the further enquiry into the cause and circumstances which caused or escalated the emergency.
15. Initiate recovery as per plan.

16. After Closure of emergency, ensure conditions are safe for start-up.

3.1.5 Responsibility of Emergency Officer (EO)

On receipt of information regarding the emergency inside the plant premises, Emergency Officer (Chief Safety) will consult CIC and trigger emergency call so that all members of strategic level team can assemble at the Tactical Centre(TC) and he will also join there.

His responsibilities are as follows:

1. Obtain full details of emergency through shift safety/ IC.
2. Inform CIC about the incident/emergency and based on his decision call the strategic level team to Tactical Centre.
3. Inform BPH to operate Steam Buzzer to declare organisational level emergency and after closure of emergency to declare all clear signal.
4. Provide strategic advice to WIC and CIC.
5. Ensure the availability of all safety equipment and PPE.
6. Inform about the incident to VP, SH&S and Inspector of factories.
7. Advice Chief Corporate communication on preparing media statement.
8. Advice Head Liasioning & Chief Corporate Administration on legal issues.
9. Ensure appropriate actions are taken against the responsible party (if other than Tata Steel) and direct the compilation of data to assist in case building
10. Any other work in consultation with CIC & VP-SHS.

3.1.6 Responsibility of Liaison Officer

Chief Corporate Administraton who is designated as the Liaison officer, on receipt of information regarding the emergency inside the plant premises will go to the Tactical Centre (TC).

His/her primary role is to assist CIC on any legal and liaison issues.

He/she will take following actions:

1. Obtain full details of the emergency/incident from EO.
2. Ensure that the evaluation has been done for the need for complete legal assistance or advice.
3. Brief CIC and his team on legal implications and issues pertinent to developing strategies in consultation of legal experts.
4. Evaluate whether the incident arose because of compliance/non- compliance of law in consultation with Chief Safety.

5. Review the media response for potential legal issues in consultation with Chief/Head Corporate Communication.
6. Liaise with District Collector, Superintendent of Police regarding law and order, other stake holders & Private organizations as per need.

3.1.7 Responsibility of Team Leader: Corporate Communication

On receipt of information regarding the emergency inside the plant premises Chief/ Head Corporate Communication will go to the Tactical Centre (TC).

His /her primary role is to assist CIC on any Public relation issues.

He/she is responsible for providing advice on the impact of the crisis on the public, with particular emphasis on media strategy and media relations, and ensures that all external relations are conducted in a manner that upholds TATA Steel's reputation/image.

His/her responsibilities are to

1. Obtain full details of the emergency/incident from EO in terms of the threat/damage to people, assets, property and environment and actions being taken.
2. Liaise with IC to ensure a coordinated media response.
3. Determine the media response strategy and develop communication plan.
4. Ensure that procedures are in place to communicate and respond to the media, to government, NGOs and members of the public.
5. Draft all written statements for the media and public in consultation with WIC/COMs.
6. Issue all written statements to the media and to the public.
7. Separate out information that is not in the public domain/not to be put into the public domain.
8. Arrange for photography, video etc. for documentation. Distribute fast facts, photos and file footage to the media as appropriate.
9. Ensure that external media monitoring is happening.
10. Maintain an overview of actions taken for media response, monitor their effectiveness and adjust approach as required.
11. Contact and brief external stakeholders as required.
12. Ensure that records of all press and staff briefings are maintained.
13. Manage all electronic communication material on the website.
14. Call/organize press conference after getting Closure signal of emergency from CIC, if required.

3.1.8 Responsibility of Team Leader: Medical Services

On receipt of information regarding the emergency inside the plant premises, Plant Medical Officer will go to the Tactical Centre. In charge First Aid Station posted at "First Aid Station" (Ground Zero) will coordinate and ensure prompt emergency Health Care. Plant Medical Officer & In charge First Aid Station will have close association.

Plant Medical Officer (PMO)

Primary role of PMO is to coordinate medical services in consultation with In Charge First Aid.

His other responsibilities are to

1. Obtain full details of the emergency from EO/IC.
2. Assume complete responsibility of providing medical assistance.
3. Set up a temporary first aid centre near by the affected area, if required.
4. Keep track of all medical staff reporting at the scene of emergency.
5. Provide and arrange for ambulance services and medical facilities from TMH & outside agencies and hospitals if required.
6. Update Emergency Officer (Chief Safety) about the proceedings.
7. Assist in updating Casualty Tracking Board.
8. Assist in preparing media statement.

Doctor in Charge First Aid Station:

1. Will have close association with DOD (Doctor on duty), PMO and TMH Emergency.
2. Will organize medical staff to receive causalities and provide necessary medical treatment
3. Will Monitor the first aid activities.

3.1.9 Responsibility of Team Leader: Fire Services and Security

Chief Security & Brand Protection has been designated as the Team Leader- Fire Services and Security. On receipt of information regarding the emergency inside the plant premises, he will go to Tactical Centre. His responsibilities are to

1. Obtain full details of the emergency.
2. Ensure that the area has been cordoned off during emergency.
3. Allow ambulance/evacuation vehicles without minimal checks.
4. Bar entry of unauthorised persons and non-essential staff. Permit with minimum delay the entry of all authorised personnel and outside agencies, vehicles, etc.
5. Ensure receiving and guidance of external aid and assistance in consultation with IC.
6. Arrange for further assistance for evacuation, if necessary.

7. Ensure that the responsibility of Fire Fighting team and Security team are executed as per requirement.

Senior Manager, Fire Services

His responsibilities are

1. Respond to the emergency call with fire crew in first turn out.
2. Will work under the instruction of IC and start the fire fighting & search.
3. Keep track of all fire personnel responding to the scene of emergency.
4. Arrange for further equipment /assistance for firefighting, if necessary.
5. Arrange for containment /diversion of spills and chemicals, draining of effluent generation during firefighting, emergency operations etc. in consultation with IC.
6. Will ensure that he and his team members wear the emergency PPE while searching.
7. Evacuate persons affected due to whatever reasons.
8. Any other responsibility as decided, looking into the circumstances at the time of emergency.
9. Fire and security team will have close association.

Head Security Works

On receipt of information regarding the emergency inside the plant premise Head Security Works will go to emergency site with his team.

The responsibilities of Head Security Works are to:

1. Obtain full details of the emergency from IC
2. Man all the gates.
3. Cordon off the area during emergency.
4. Bar entry of unauthorised persons and non-essential staff within affected zone.
5. Ensure Vigilance at security posts/gates and be in constant contact with IC and Firefighting team.
6. Permit with minimum delay the entry of all authorised personnel and outside agencies, vehicles, etc.
7. Make arrangements for the receiving and guidance of external aid and assistance.
8. Divert the traffic from the area and regulate it in co-ordination with safety. (creation of a safe corridor, no speed limit restriction)
9. Any other responsibility as decided, looking into the circumstances at the time of emergency.

3.1.10 Responsibility of Team Leader: HRM

On receipt of information regarding the emergency inside the plant premises, Chief HRM (steel) will go to the Tactical Centre (TC).

His / Her responsibilities are to

1. Ensure that BU-HRs keep the up-to-date list of persons (employees/contract workers/ contractors /suppliers /visitors) as available in their areas in the plant.
2. Compare the list of persons available at each assembly point with the up-to-date list of persons.
3. Keep Casualty Tracking Board up to date.
4. Provide blood donors list to the medical team.
5. Provide continuous liaise with injured at hospital.
6. Notify family members of the casualties.
7. Ensure internal Communication to employees through Telecom, IT.
8. Arrange for rehabilitations of persons.
9. Arrange for needed financial support for the emergency operations.
10. Liaise with Tata Workers Union, if required.
11. Arrange for necessary food and drinking arrangement for rescue and firefighting personnel through canteen services, if required.
12. Any other work in consultation with IC.

3.1.11 Responsibility of Team Leader: Environment Management:

On receipt of information regarding the emergency inside the plant premises, Chief/ Head Environment Management will go to the Tactical Centre (TC).

His /her primary role is to assist CIC on Environment related issues. He is responsible for providing advice about the impact of the crisis on environment, both inside and outside the company premises.

During emergency, he will

1. Obtain full details of the emergency/incident and threat/damage to people, assets, property and environment and actions being taken.

2. Co-ordinate and control the site activities to minimize adverse effect upon the quality of the air, water and land due to emergency in consultation with IC.

3. Inform State Pollution Control Board about the incident.

4. Coordinate / Liaise with State Pollution Control Board for activities required to be carried out post incident.

5. In the case of emergencies which involve risk to outside areas from wind-blown materials, contact the local meteorological office to receive early notification of impending changes in weather conditions.

6. Any other activity as decided by Strategic level team.

3.1.12 Responsibility of Team Leader: Telecom & SMS

On receipt of information regarding the emergency inside the plant premises, Senior Manager, Telecom will go to the Tactical Centre (TC).

His /her primary role is to assist CIC on extending support for the vital communication inside plant. He is responsible for ensuring the working of communication channels during emergency.

His responsibilities are to

1. Take charge as a communication co-ordinator and ensure that all the communication equipment / channels inside the plant are in order.
2. Initiate the emergency dialler to trigger the emergency message.
3. Mobilise more manpower at telephone exchange to cope with heavy traffic or any similar problem.
4. Log all outgoing and incoming telephone calls during entire emergency operation.
5. Advise telephone operator to keep the board free to the extent possible for the incoming calls.
6. On receiving updated revised list of emergency key members from EO, upload the same in auto-dialling system for emergency communication to all key members.
7. Ensure that all the communication equipment / channels inside the plant are in order.

3.1.13 Responsibility of Team Leader: IT and Infrastructure

On receipt of information regarding the emergency inside the plant premises, Chief Cloud Infra, Network & Cybersecurity will go to the Tactical Centre (TC).

His /her primary role is to assist CIC on extending support for the proper functioning of the IT enabled resources.

His responsibilities are to

1. Obtain the full details of the emergency.
2. Ensure that the Internet, e-mail, web site facilities are in order.
3. Assess the overall impact of the crisis on IT infrastructure and decide if external IT support is required.
4. Resume and activate the satellite channel if all other communication channels fail.
5. Ensure that the Confidential Data stored on Tata Steel server and cloud is safe.

3.1.14 Responsibility of Team Leader: FMD

On receipt of information regarding the emergency inside the plant premises and activation of Onsite Emergency Plan Chief of Power Systems will go to the Tactical Centre (TC).

His responsibilities are to

1. Obtain all vital information of emergency in case of toxic release & fire related to fuel.
2. Decide complete course of action as per situation and guide ICs to take necessary measures during power failures, toxic release & fire related to fuel.
3. Decide the priority according to which the utilities will be supplied to the departments when the supply is limited during emergency.
4. Decide which Utility service to stop and which to continue and at what rate and at what particular time.
5. Organise isolation/ shutdown of the plant based on emergency scenario in gas network system.
6. Co-ordinate with external agencies who are supplying industrial gases to TSL or consuming gases fuel from TSL to monitor parameters like pressure, temperature etc.at their end and communicate the same to TSL.
7. Co-ordinate with external suppliers, ensuring power to critical installations through DG sets in case of power failure in co-ordination with LDC.
8. Ensure that actions are taken according to EMC emergency preparedness and Control.
9. Communicate all the developments to WIC and CIC.
10. Co-ordinate any other activities as per the guidelines of CIC/WIC.

3.1.15 Responsibility of Team Leader: Maintenance

On receipt of information regarding the emergency inside the plant premises, COMM and COEM will go to the Tactical Centre (TC).

Their responsibilities are to

COMM

1. Obtain all vital information about emergency.
2. Mobilise the maintenance resources required for controlling the emergency.
3. Co-ordinate with Procurement for any additional resources.
4. Arrange equipment like crane, hydra, JCB, fork lift, gas cutters, other material lifting/shifting equipment with operators.
5. Keep constant contact with IC and carry out required emergency control activities to terminate the cause of emergency.

6. Record all actions and necessary blinding/isolation/bypassing/closures etc. Also provide relevant labels/tagging/warning or other instructions for streamlining the emergency actions.
7. Initiate recovery as per plan and monitor the progress.

COEM

1. Obtain all vital information about emergency.
2. Ensure that availability of emergency power is there at the site of emergency as per requirement.
3. Co-ordinate with utilities & major power suppliers like Tata Power, DVC and PGCIL regarding availability of power.
4. Mobilise the maintenance resources required for controlling the emergency.
5. Co-ordinate with Procurement for any additional resources.
6. Keep constant contact with IC and carry out required emergency control activities to terminate the cause of emergency.
7. Record all actions and necessary blinding/isolation/bypassing/closures etc. Also provide relevant labels/tagging/warning or other instructions for streamlining the emergency actions.
8. Initiate recovery as per plan and monitor the progress.

3.2 Resource Persons and Their Contact Details during Emergency

Besides key persons, various team members under the supervision of WIC and IC will take part in emergency control and bring conditions back to normalcy.

The name, designation, phone number and residence address etc. of these team members are provided in **Annexure C** of this document.

3.2.1 Support Team to CIC and WIC

There will be a support team to WIC consisting of members from Operation Department, Maintenance Department, finance and administration section, EMC Section etc. In addition, executive officers of respective VPs would be always available with CIC and WIC for recording all information coming in and instructions going out. This team will assist the CIC and WIC in manning, communication and passing instruction to the Teams or any other responsibility as given by WIC. Their responsibilities are to:

1. Contact statutory authorities.
2. Arrange for relievers and catering facilities.
3. Providing all other support, as necessary.
4. Arranging for urgently required materials through cash purchase or whatever means.

5. Arranging fund for various relief measures as well as emergency purchase of materials.

3.3 Organizational Structure & Communication flow in Case of Emergency

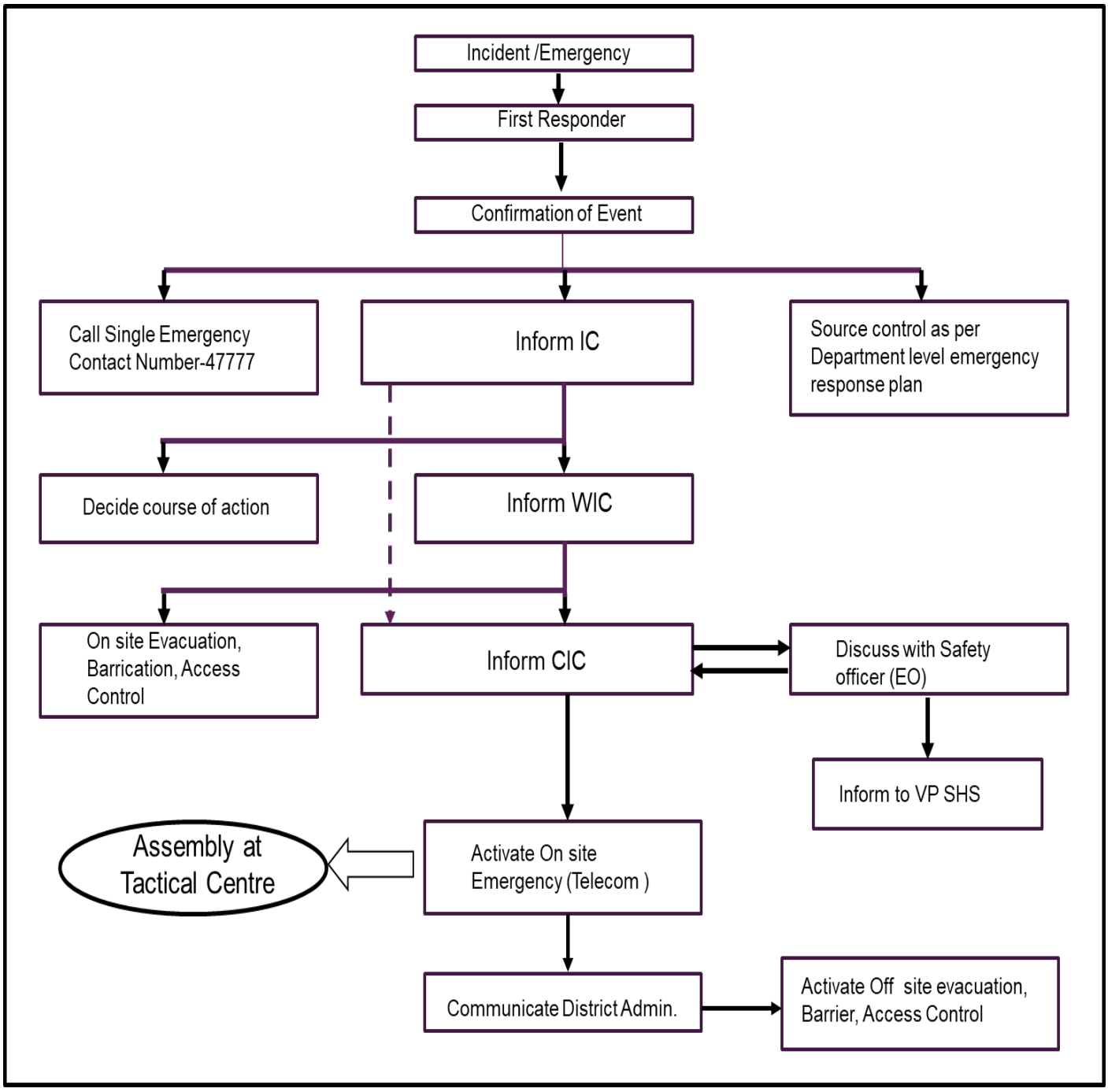
3.3.1 During Normal Operation

Chart 1 shows an organizational structure of handling major emergency/disaster during Onsite Emergency Plan Activation in TSLW.

3.3.2 During Silent Hour

Silent hour refers to the time during the period beyond general shift hours on working days and on all holidays. During this period, only shift-in-charge will take the initial whole-sole responsibility and communicate to WIC/Incident Controller through the available landline or mobile phones. On arrival at the accident site, Incident Controller or his alternate assumes the charge and activates the same command structure as shown in **Chart 1** to combat the emergency.

Chart I
Organizational Structure



IC - Incident Controller

WIC - Work Incident Controller

CIC - Chief Incident Controller

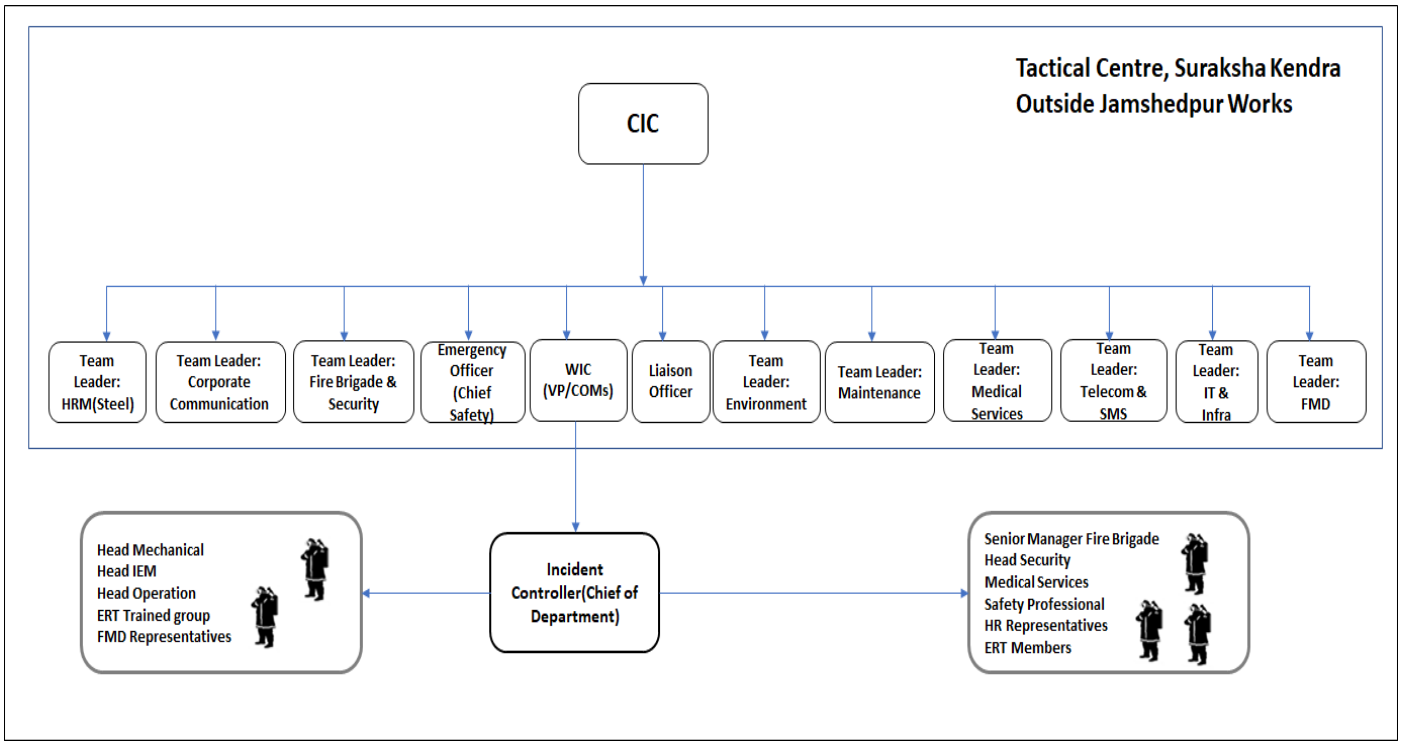
EO- Emergency Officer

Chart 2

Communication flow in case of Emergency at JSR Works - TSL

The Nature of Emergency	The Person who will Communicate	Whom to beCommunicated	When to Communicate	How to Communicate (media)	What to Communicate
Emergency Scenarios (As given in annexure-B)	The person noticed first.(First responder)	The supervisor/Shift In Charge	Immediate	Walkie-Talkie/Telephone	What went wrong,what is the location, name and designation of the person reporting etc.
	The person noticed first (First responder)/ The supervisor/Shift In Charge	Fire Brigade Control Room	Immediate	By Telephone- Single Emergency Number-47777	What went wrong,any injury, what is the location (First Aid /Assembly Point/Road Number), name and designation of the person reporting etc.
	Fire Brigade Control Room Tel.Operator	Emergency Support Services (First Aid, Shift Safety Inspectors,Security, Fire Brigade, Telecom -Hot line) and others as per protocol	Immediate	By Telephone-Emergency Number- 47777	What went wrong,any injury, what is the location (First Aid /Assembly Point/Road Number), name and designation of the person reporting etc.
	Shift Safety	Chief Safety,(Emergency Officer)	After confirming the situation.	By Telephone.	What went wrong, with proper location and its degree of consequences.
	Chief Safety,(Emergency Officer)	VP SHS	After confirming the situation.	By Telephone.	What went wrong, with proper location and its degree of consequences.
	The supervisor/Site In Charge	Incident Controller	After confirming the situation.	By Telephone.	What went wrong, with proper location and its degree of consequences.
	Incident Controller	Works Incident Controller	After assessing the magnitude of the situation	By Telephone.	What went wrong, with proper location and its degree of consequences.
	Incident Controller	CIC	After discussion with WIC	By Telephone.	What went wrong, with proper location and its degree of consequences.
	CIC	Chief,Safety	After assessing the magnitude of the situation	By Telephone.	To Inform Strategic level team members
	Chief,Safety (As instructed by CIC)	Telecom	After getting instruction from CIC	By Telephone (No.40010)	To Inform Sterategic level team member through CIC group message broadcasting-Code Blue system - 06576641345)
	Telecom operator	Member of strategic level team	After getting instruction from Chief Safety	Call and SMS (Through CIC group message	There is an Emergency and to assemble at Tactical Centre
	Chief,Safety (As instructed by CIC)	Inspector of Factories	After assessing the magnitude of the situation	By Telephone.	Details of Incident and step taken for the mitigation of the disaster
	Chief Safety (As instructed by CIC)	Head , Blower & Pump House - 9234511473 (Mr. B . N Roy) Sr. Manager BH-4 - 9234590111(Md.SHussian)	After deciding to declare emergency.	On Telephone.No - 44967(BH-3) , & 9234511473 (Head , Blower & Pump House , Mr. B . N Roy)	To operate Steam Buzzer for declaring Organisational level Emergency.(30 sec ON and 5 sec OFF -as per SS/GEN-50)
	Road Safety Van (As instructed by CIC through Chief,Safety)	Public (Internal)	After declaration of emergency.	Public address System	Instruction to public (Dos & Don'ts)
	CIC (through corporate communication)	Public (External)/Media	After controlling/during disaster	Print media/Electronic media.	Nature of the incident,Location of the incident,damages and step taken for the mitigation of the disaster.
	CIC (through Corporate Administration)	DC/SP/Govt. Officials.	After controlling/during disaster	By Telephone.	Nature of the incident,Location of the incident,damages and step taken for the mitigation of the disaster.
	Chief Environment Mgmt.	State Pollution Control Board	After controlling/during disaster	By Telephone	Nature of the incident,Location of the incident,damages and step taken for the mitigation of the disaster.
	Incident Controller(Update on site condition)	CIC through WIC	After Closure of emergency	By Telephone.	Information of the site condition
	Chief Safety (As instructed by CIC)	Head , Blower & Pump House - 9234511473 (Mr. B . N Roy) Sr. Manager BH-4 - 9234590111(Md.S Hussian)	After Closure of emergency	By Telephone.	To operate Steam Buzzer for All Clear Signal (Continuous for 3 min once)

Chart 3
Governance structure for Handling emergency



SECTION IV

EXTERNAL ORGANISATIONS IF INVOLVED IN ASSISTING DURING ON-SITE EMERGENCY

4 External Organisations if Involved in Assisting During On-Site Emergency

Effective management of any emergency requires adequate resources mainly in form of equipment and manpower. The magnitude of emergency cannot be assessed completely before it occurs and also the resources required for the same.

Therefore, to control an on-site emergency, TSLW has mutual understanding with the following partners for providing facilities/resources:

1. M/s Tata Motors Ltd.
2. M/s Tinplate co. of India Ltd.
3. M/s Tata Power Ltd.
4. M/s TSUIS (JUSCO)

Besides resource mobilisation, the help of following organisations (Govt. of Jharkhand) would be sought for regulatory and other services:

i. Inspectorates of Factories
ii. State Pollution Control Board
iii. Fire department of State Govt.
iv. State Disaster Management Authority (SDMA)
v. District Crisis Group
vi. Local Army Authorities
vii. Transport Department of State Govt.
viii. Publicity Department of State Govt.
ix. NGOs

The Contact details of the key persons for the above organization can be found in **Table C9 &Table C10 of annexure C** of this document.

4.1 Types of Accidents

Following are the type of accidents that can take place at TSLW:

1. Flammable material release (e.g. Propane, Hydrogen, LD gas, BF Gas, LDO, Coke Oven Gas Diesel, Petrol, etc.)
2. Toxic Gas release (Coke oven gas, BF Gas & LD gas)
3. Hazardous Chemical Release (IPA, HCl & Other acids)
4. Hot /Liquid Metal Spillages

Involvement of outside organisations would be sought for the following types of accidents only if the impact of these accidents is beyond the control of TSLW:

1. Propane fire and explosion
2. Hydrogen gas fire/explosion
3. Fire involving petrol/Diesel road tanker
4. Fire and explosion associated with Calcium Carbide, Magnesium
5. Explosion in blast furnaces and LD Shop.
6. Major release/spillage of flammable, corrosive hazardous chemicals
7. Heavy release of Coke Oven or Blast Furnace gas or LD gas
8. Major fire/explosion in CO (Coke Oven) gas, Blast furnace gas, LD gas storage or gas network
9. Major release/spillage of IPA (Iso propyl Alcohol)

4.2 Responsibility of the Outside Agencies and /Or their Key Personnel

The response and the involvement of outside agencies will depend upon the level of the emergency. To facilitate the emergency responders, this plan identifies two levels of emergency situations – on-site and off-site:

1. **On-site Emergency (Level I)-** The incident which has potential to cause impacts within the plant boundaries.

   Level-I: This indicates a situation whereby the consequences of the incident are localized within the plant boundaries and that incident can be purely managed by the Strategic level teams of TSLW by using the resources and facilities available at TSLW.

2. **Off-site Emergency (Level II)-** The incident which has potential to cause impacts beyond the plant boundaries.
   Level-II: This indicates a situation of off-site emergency; whereby the consequences of incident may go beyond the plant boundaries. In this condition to deal with the emergency situation, Strategic level team at TSLW may require the support from the District Crisis Group (DCG) and the Local Crisis Group (LCG) in terms of both i.e., manpower and the resources.

***Following Four types of Level-II emergency are envisaged considering the Quantitative Risk Assessment*.**

a) **Catastrophic Rupture of BF Gas line near N Road Gate**

In the event of rupture of BF gas piping near N road gate, the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 60.17 m in 3D weather condition, 54.12 m in the 2B weather condition, 54.58 m in the 2D weather condition, 52.85 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 3D weather condition is prevailing up to 180 meters (Refer Section 9.7.1.1 & Fig 9.1)

Similar type of other possible Scenarios is listed below

- Full Bore Rupture of BF Gas line near L Town Gate
- Full Bore Rupture of BF Gas line near Steelenium Hall

b) Catastrophic Release from of BF Gas Holder

In the event of catastrophic release of BF gas holder (150000 m^3), the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 312 m in 3D weather condition, 244 m in the 2B weather condition, 265 m in the 2D weather condition, 237 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 3D weather condition is prevailing up to 518 meters (Refer Section 9.7.1.1 & Fig 9.1a & 9.1b)

c) Catastrophic Rupture of CO Gas line near Tube Division (Outside TSL Boundary)

In the event of rupture of CO gas piping to tubes division, the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 27.93 m in 3D weather condition, 23.23 m in the 2B weather condition, 22.65 m in the 2D weather condition, 18.36 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 2D weather condition is prevailing up to 103 meters (Refer Section 9.7.1.3 & Fig 9.1a & 9.4)

d) Toxic chemical release / Major oil spillage to Susungaria drain leading to river

It will be the responsibility of the strategic level team to assess the magnitude of consequences and scale of the impact of an incident. On the basis of their experience, when they think that the plant's emergency response is unable to control the emergency situation, they will ask the Chief Incident Controller (CIC) to declare the off-site emergency i.e., Emergency Level-II. The possible composition

of this crisis management group which can be called for the management of emergency situation of level-II has been described in 'The Chemical Accidents (Emergency Planning, Preparedness & Response) Rules 1996' (CAEPPR-1996) of Environment (Protection) Act, 1986. The CAEPPR-1996 seeks to achieve partnership among different stakeholders through the creation of District and Local Crisis Groups (DCG & LCG). These crisis groups have been given the responsibility of management of chemical accidents in a given industrial area. Accordingly, as per the Schedule-8 of the CAEPPR-1996, the probable composition of local crisis group is described as Table 4.1.

4.2.1 Probable Composition of Local Level Crisis Group (LCG) Jamshedpur

Table 4.1: Composition of LCG for Jamshedpur

S. No	Composition of Local Level Crisis Group (LCG)	Role
1.	Deputy Commissioner, Singhbhum (East)	Chair Person
2.	Deputy Chief Inspector of Factories	Member Secretary
3.	MD & CEO Tata Steel Ltd	Member
4.	MD Tinplate Co. of India	Member
5.	MD Tata Motors	Member
6.	VP (TQM & Shared Services) Tata Steel Ltd	Member
7.	VP (Safety Health & Sustainability) Tata Steel Ltd	Member
8.	VP (Corporate Services) Tata Steel Ltd	Member
9.	GM Medical Services Tata Steel Ltd	Member
10.	Chief Security & BP, Tata Steel Ltd	Member
11.	Transporters of Hazardous Chemicals (02 numbers)	Member
12.	Block Development Officer	Member
13.	DG Civil Defence or its representative	Member
14.	Primary Health Officers	Member
15.	Medical Officer / PHC	Member
16.	Editor of Local News Paper/e-Media	Member
17.	Community Leader/ Sarpanch/ Village Pradhan nominated by Chair-person – 3 numbers	Member
18.	Chief Safety, Tata Steel Ltd	Member
19.	Head, Safety &Fire Service, TINPLATE	Member
20.	Head, Safety &Fire Service, TATA MOTORS	Member

S. No	Composition of Local Level Crisis Group (LCG)	Role
21.	One Representative of Non-Government Organisation (NGO); (To be nominated by the Chair-person)	Member
22.	Two doctors; eminent in local area (To be nominated by the Chair–person)	Member
23.	Two Social Workers (To be nominated by the Chair-person)	Member

As per law, the District and Local Crisis Management Groups shall be the apex bodies in the district and local industrial area respectively, to deal with major chemical accidents and to provide expert guidance for handling chemical accidents. Without prejudice to the functions specified under the law, the District Crisis Group shall:

1. Assist in the preparation of the district off-site emergency plan;
2. Review all the on-site emergency plans prepared by the occupier of Major Accident Hazards installation for the preparation of the district off-site emergency plan;
3. Assist the district administration in the management of chemical accidents at a site lying within the district;
4. Continuously monitor every chemical accident;
5. Ensure continuous information flow from the district to the Centre and State Crisis Group regarding accident situation and mitigation efforts;
6. Forward a report of chemical accident within 15 days to State Crisis Group;
7. Conduct at least one full-scale mock-drill of a chemical accident at a site each year and forward a report of the strength and the weakness of the plan to the State Crisis Group.

Similarly, without prejudice to the functions specified under the law, the LCG shall:

1. Prepare local emergency plans for the industrial pocket;
2. Train personnel involved in chemical accident management;
3. Educate the population likely to be affected in a chemical accident about the remedies and existing preparedness in the area;
4. Conduct at least one full scale mock-drill of a chemical accident at site in every six months and forward a report to the District Crisis Group;
5. Respond to all public inquiries on the subject.

4.2.2 Response functions to be performed by the LCG

The following response functions are to be performed by the LCG along with their responsibilities:

1. Operational readiness of core organisations to take care of burn cases and people affected by toxic gases;
2. Maintaining resource inventories of trained manpower, equipment and materials required for response operations.
3. Management training of Crisis Group members and officers in charge of response agencies likely to be assigned crisis management duties.
4. Raising community awareness in the vulnerability zones.
5. Conduct of mock-drills and simulation exercises.
6. Regular updating of Response Plans.

4.2.3 Location of Medical Aid involved for Medical Response Function

The contact details and location of Medical Response Functions are given in **Table: C6 &Table: C9 of Annexure C** of this document.

4.2.4 Location of firefighting aid involved for Fire Fighting

The contact details and location of Firefighting Functions are given in **Table:C3 & Table: C9 of Annexure C** of this document.

4.2.5 Location of nearby Police stations involved for maintaining Law & Order

The contact details and location of nearby Police Stations are given in **Table: C9 of Annexure C** of this document.

4.2.6 List of important government officers and their telephone numbers to be involved with TSLW for emergency management

To facilitate the contact with these outside agencies/ persons the **Table C9 in Annexure C** depicts the important contact details.

The other details of fire-fighting and medical facilities have been described in Section 13 and 14 respectively.

SECTION V

DETAILS OF LIAISON AMONG ORGANIZATIONS

5 Liaison Arrangement among the Organizations

Effective management of any emergency requires adequate resources mainly in form of equipment and manpower. The magnitude of emergency cannot be assessed completely before it occurs and also the resources required for the same.

TSLW is located in the industrial town of Jamshedpur. It has entered an understanding with the following organizations to handle any type of emergency.

Table 5.1: Details of liaison among organizations

Sr. No.	Name of Organisation	Address	Phone Number	Contact Person
1.	M/s Tata Motors	TELCO Colony, Jamshedpur	09031057228	Mr. Ranjit Dhar, DGM, Admin. and Safety
2.	M/s Tinplate Co. of India	Golmuri, Jamshedpur	09430746694 09835543445	Dr.JP Singh, Head Safety Mr. Suresh Rai
3.	M/sTata Power Ltd.	Jojobera, Jamshedpur	09771400883	Mr. Sushil Panigrahi, Sr. Manager Safety and Fire
4.	M/s TSUIS(JUSCO)	Bistupur Main Road, Jamshedpur	07544000825	Mr. Satyaraj Rath, Sr. Divisional Manager (Safety)

These organisations as per the mutual understanding will be called for the resources required during an emergency situation and vice-versa.

SECTION VI

PRELIMINARY HAZARD ANALYS

6 Types of Accidents & Preliminary Hazard Analysis

6.1 Types of Accidents

The types of accidents that can take place in TSLW have already been discussed in Section 4.1. However, the details regarding the system elements or events that can lead to a major accident are given below.

6.2 System Elements or Events That Can Lead to a Major Accident

Identification of hazards and incidents which can lead to major accidents has been identified in each department on the basis of preliminary hazard analysis (Process Hazard Analysis, HIRA etc.) done by a team of professionals.

6.2.1 Blast Furnace Gas/Coke Oven gas/LD gas/Hydrogen gas

The details of inventory and other specifications of gasholders are shown in Table 6.1. As far as toxicity/flammability/explosion hazards are concerned, the major components of Blast Furnace (BF) gas/Coke Oven gas/LD gas are CO and Hydrogen. Hence the major accidents can be caused because of the followings:

- Release of huge amount of CO due to catastrophic failure of gas holders.
- Fire and/explosion associated with hydrogen due to catastrophic failure of gas holders.

6.2.2 Propane storage

There are three mounded propane bullets with capacity of 100 MT each. Because of the nature of physio-chemical properties of propane and its above-ground storage conditions, the following events may lead to major accidents:

- External fire leading to Boiling Liquid Expanding Vapour Explosion (BLEVE) and/or Vapour Cloud Explosion (VCE) of unloading tanker/bullet
- Leak leading to jet fire and flash fire
- Leak from unloading hose
- Leak from piping connected to mounded storage bullet

As the Propane/LPG storages bullets are mounded, there is negligible probability of BLEVE. The other scenarios, viz., flash fire/VCE and jet fire may lead to major accidents. The dimensions of the mounded bullets are:

Diameter = 4200 mm Length = 19400 mm

The piping connected to bullet are of diameters 2 inches and 3 inches.

Table 6.1: Details of inventory and other specifications of gasholders used in TSLW

S. No	Location	Technical Specifications	Chemical Composition
01	BF Gas Holder	Volume: 155742 kl Dia: 53.644 m Height: 85.953 m Working pressure: 355 wcmc Working temp: 45^{O}C	CO : 21 - 25% CO2 : 17 - 19% H2 : 3.5 -6% CH4 : Nil CV : 800 – 900 Kcal/nm^3 Sp. Gravity : 1.02 Dust : 7 – 20 mg/ nm^3
02	Coke Oven gas holder	Volume: 50000 m^3 Dia: 37.2 m Height: 59.76m Working pressure: 350-400wcmc Working temp: 10-50^{O}C	CO : 8.8 – 9.0% CO2 : 2.8 – 3.2% H2 : 53 -55% CH4 : 21 – 23% CV : 4000 ± 200 Kcal/nm^3 Sp. Gravity :0.43 Dust : Nil
03	LD gas holder	Volume: 100000 m3 Dia: 58 m Height: 65 m Working pressure: 265 wcmc Working temp: 70 ºC	CO : 50 – 70% CO2 : 13 – 15% H2 : 2 - 3 % CH4 : Nil CV : 1700 – 1800 Kcal/nm^3 Sp. Gravity : 1.03 Dust : 5 – 20 mg/ nm^3
04	LD gas holder (New)	Volume: 60000 m3 Dia: 50.268 m Height: 55 m Working pressure: 200±25 WC Working temp: 70 ºC	CO : 50 – 70% CO2 : 13 – 15% H2 : 2 - 3 % CH4 : Nil CV : 1700 – 1800 Kcal/nm^3 Sp.Gravity : 1.03 Dust : 5 – 20 mg/ nm^3

6.2.3 Hydrogen Plant (Under CRM and JCAPCPL)

There are four hydrogen bullets with inventory of 50 M^3 each at CRM and similar four hydrogen bullets at JCAPCPL (Jamshedpur Continuous Annealing and Processing Company Private Limited). Since it is flammable and explosive nature, it is susceptible to fire and explosion.

6.2.4 DG station

The DG station at TSLW has four DG sets with inventory of 6 MW each. The premise is having eight LDO tanks with inventory details are as 01 No. x 1000 Kl, 01 No. x 100 Kl, 04 No. x 50 Kl and 02 No. x 08 Kl.

Apart from this, there are 500Kl storage at PH#3 and 152Kl storage at PH#4.

The high flash point and other flammable properties of LDO imply that it does not create any major accident. However, prolonged external fire on major scale on the LDO storage may create pool fire.

6.2.5 Sulphur Storage

The sulphur storage unit at TSLW has storage capacity of 150MT, generally more than 100MT sulphur pellets are stored.

Sulphur is a flammable substance in both the solid and liquid states. The dust is characterised by a very low ignition point of 190°C compared to other combustible dusts, and dust clouds are readily ignited by weak frictional sparks. Dusts containing 25% or more elemental sulphur may be almost as explosive as pure sulphur.

Solid and liquid sulphur will burn to produce sulphur dioxide gas, which is extremely irritating and toxic.

In general, operations in the iron and steel industry may expose workers to a wide range of hazards (described in section 7.3) or workplace activities or conditions that could cause incidents, injury, death, ill health or diseases. Not all such events or incidents may create emergency situation (on-site/off-site).

6.3 Various types of other hazards in TSLW

6.3.1 Occupational, Physical and Chemical Hazards

Operations in the iron and steel industry may expose workers to a wide range of hazards or workplace activities or conditions that could cause incidents, injury, death, ill health or diseases. The most common workplace and/ or process hazards (ILO, 2005) in TSLW may arise due to the followings:

(i) Contact with hot metal;

(ii) Fire and explosion;

(iii) Unguarded machinery;

(iv) Falling objects;

(v) Engulfment;

(vi) Working in confined spaces;

(vii) Moving machinery, on-site transport, forklifts and cranes;

(viii) Exposure to controlled and uncontrolled energy sources;

(ix) Exposure to asbestos;

(x) Exposure to mineral wools and fibres;

(xi) Inhalable agents (gases, vapours, dusts and fumes);

(xii) Skin contact with chemicals (irritants (acids, alkalis), solvents and sensitizers);

(xiii) Slips, trips and falls on the same level;

(xiv) Fall from height;

(xv) Extreme temperatures;

(xvi) Radiation (non-ionizing, ionizing);

(xvii) Noise and vibration;

(xviii) Electrical burns and electric shock;

(xix) Manual handling and repetitive work;

(xx) Failures due to automation;

(xxi) Ergonomics;

TSLW maintains a high standard health and safety system in commensurate with the standards and regulatory practices, due to nature of process and the operations, chemicals etc., it cannot nullify some of the basic hazards as described below:

6.3.2 Hazards arises due to nature of process in major plant sections

(i) Coke ovens and by-product plants

In Coke ovens coke is produced from coal. The coal is charged into an oven, which is then sealed. As soon as the coal is charged into the oven the volatile matters start evolving as gas. In a by-product battery, these chemicals are collected and refined into a wide range of products. The remaining coke oven gas is used as a fuel. In a non-recovery battery, the ovens are typically of low, broad structures, and the chemicals are burned in the headspace above the coke or in the flues which heat the oven.

Most health hazards in coke production arise from the volatile chemicals driven off the coal during coking. Coke oven emissions contain cancer-causing polynuclear aromatic hydrocarbons, along with toxic gases and vapours such as benzene, hydrogen sulphide, carbon monoxide and ammonia.

Workers in the coal preparation plant are exposed to coal dust, which can cause lung damage. Coke ovens operations and maintenance pose the risk of heat stress.

Safety hazards in coke production include mobile equipment, burns, fire and explosion. Coke batteries are served by large tracked mobile equipment, including SCP Machine used in charging and pushing to remove the coke, and Door Extractors used to remove the oven doors when the coke is ready to be pushed. Visibility can be poor if emissions are badly controlled, especially on the "coke side," where hot coke is extracted. Workers can suffer severe burns if they come into contact with hot coke, doors. Coke oven gas is flammable and explosive, as are many of the chemicals collected in by-product plants.

(ii) Iron and steel making

The iron and steel industry uses a range of furnaces. For iron-making operations, the essential feature is the blast furnace. For steel-making operations there is basic-oxygen process converter, & Ladle furnace. Furnaces may cause glare that can injure the eyes unless suitable eye protection is provided and worn. Manual operations, such as furnace bricklaying, and hand-arm vibration from using pneumatic tools and grinders may cause ergonomic problems.

Fires and explosions in furnaces most often result from water coming into contact with molten metal. The water may be present in scrap material, damp moulds, from leaks in the furnace cooling systems.

Fires and explosions in furnaces can also result *from the ignition of volatile materials and fuels.* The most hazardous procedures are during the firing-up and shutting-down procedures.

(iii) Handling molten metal and slag

Burns may occur at many points in the steel-making process: at the front of the furnace during tapping from molten metal or slag; from spills, spatters or eruptions of hot metal from ladles or vessels during processing, teeming (pouring) or transporting; and from contact with hot metal as it is being formed into a final product.

(iv) Surface preparation

Various methods are used to remove defects, scale, oxides, and other impurities from the surface of steel at different points in the process.

These include:

a. Manual scarfing followed by surface grinding, this uses fixed or hand-held torches or lances to burn away the impurities;
b. By scarfing machine using high pressure propane gas and subsequent scale cleaning by high pressure water spray jet;
c. Pickling, which uses acids or hydrogen peroxide to dissolve scale and oxides.

Each of these operations has its own hazards. Scarfing may expose workers to metal fumes and dust, noise, and burns from Scarfing lances. In scarfing machine where high-pressure propane is used for heating and burning of surface impurities, this imposes major fire hazard during its operation. Alloying agents in the steel may increase the hazard of the fumes or dust. Surface grinding also generates dust, and involves machinery hazards. Pickling of steel sheet and strip involves large acid tanks with coiling machinery at each end. Acids can cause acid burns.

(v) Rolling mills

Mechanization has reduced the number of trapping points at machinery, but they still exist, especially in cold-rolling plants and in finishing departments. In any rolling mill, there is a risk of trapping between the rolls. Severe injuries may be caused by shearing, cropping, trimming machines, unless the dangerous parts are securely guarded.

Injuries may occur, especially in hot-rolling, if workers attempt to cross roller conveyors at unauthorized points. The use of large quantities of oils, rust inhibitors and so on, which are generally applied by spraying, is one of the hazards commonly encountered in sheet-rolling mills. Even in automated works, accidents occur in conversion work while changing heavy rollers in the stands.

In hot-rolling, burns, eye injuries or other injuries may be caused by flying mill scale and dust particles or by whipping of cable slings. Eyes may also be affected by glare. Cuts may occur when workers contact the edge of thin steel sheets or strip. Cobbles occur when material catches in a roll and escapes into the work area with the potential for severe injury to workers.

Butt welding is associated with the formation of ozone, which may cause, when inhaled, irritation similar to that due to nitrogen dioxide (NO2). Pit-furnace and reheating furnace attendants may be

exposed to harmful gases, the composition of which depends on the fuel used (blast-furnace gas, coke-oven gas) and generally includes carbon monoxide.

Heating of the coil in Batch Annealing Furnace using hydrogen gas as fuel imposes fire and explosion hazard during its operation. Necessary precautions shall be taken in order to avoid process deviation leading to fire and explosion.

6.3.3 Specific hazards and their impacts

(i) Safety hazards - Confined space

A confined space is one that is large enough for the worker to enter bodily, has limited or restricted means of entrance or exit and is not designed for continuous employee occupancy, or a space which may accumulate a hazard which is present in that area. Examples of temporary occupancy might entail a person performing repairs on a furnace, gas holders, tanks or servicing a fuel tank or trailer, sump, silo or bunker.

Confined spaces require additional safety and health precautions because their configurations hinder the activities of any workers who must enter, work in and exit from them. A confined space often has oxygen deficiency. In addition, many fatalities occur to rescue personnel who respond without adequate planning and protection.

(ii) Ergonomics

The conveying of visual and acoustic information may be degraded because of environmental factors, poor design of machinery and equipment and PPE, and may lead to dangerous incidents and accidents.

Manual carrying and lifting of large, bulky and/or heavy objects is common despite the high degree of mechanization and remedy devices and can cause musculo-skeletal disorders. Long-lasting repetitive work movements and awkward postures may also cause musculo-skeletal disorders. Maintaining the same posture for extended periods causes excessive fatigue.

Exposure to noise levels exceeding those set by the competent authorities may result in noise-induced hearing loss, interfere with communication, etc. and may result in nervous fatigue with an increased risk of occupational injury.

Similarly, workers can be exposed to hazardous vibration when working near vibrating industrial machinery; or through various processes in which vibrating tools or work pieces are grasped or pushed by the hands or fingers.

6.4 Safety Relevant Components Used In TSLW

The following safety relevant components are being used in TSLW for the safe handling of the systems that can minimise / control any accident/ major accident:

6.4.1 Existing safety measures at various plant sections and storage areas of chemicals

Three gases namely Blast Furnace gas, Coke ovens gas and LD gas are generated as by product gas during the manufacturing process of iron, coke and steel at Blast furnaces, Coke ovens and LD shops respectively. The gas line network inside Steel Works is systematically maintained with adequate review system.

6.4.1.1 Existing safety features in Coke Ovens gas system

a. Coke Ovens gas supply to steel works consumers other than Coke Ovens is through booster connected with two 5 Ft. dia. mains namely old 5 Ft. & new 5 Ft. dia. Mains. The booster inlet pressure is maintained through CO gasholder pressure is 320 mm. WC. The boosted gas pressure is maintained between 1000 to 1250 mm WC depending upon the availability and demand of CO gas. The average boosted gas pressure in both the 5 Ft. mains is maintained at 1000 mm WC.
b. One 700mm dia. of CO gas line is also connected to main booster ring to supply gas to engineering source and other consumers in west plant area.
c. CO gas supply to Coke Ovens batteries for under firing and injection in B F gas is tapped from the CO gas supply line to CO gasholder and its pressure is maintained at 250-300 mm WC.
d. CO gas supply to Waste Plant consumers is through W.P boosters and average pressure of 1450 mm WC is maintained.
e. Tubes division gets its CO gas supply through Tube Mill boosters at an average pressure of 1200mm WC.

In case of emergency, the Coke Oven gas network is equipped with following safety features:

- CO Gas flaring system, Oven top flaring facility for crude gas in case of power failure and system pressurization.
- Isolation of COG holder from system by operating safety shut off bell valve and water seal.
- The two (2) gas mains running parallel across the plant are equipped with water seals in Coke Plant area at the outlet of main booster, near LD#1, CC3 Scale Pit.

In user departments isolation valves and water seals are provided to isolate local network from 5 Ft main.

6.4.1.2 Existing safety feature in LD gas system

The LD gas network is provided with the following safety systems:

- LD gas holder is provided with safety shut off bell valve and water seal.
- Automatic vents are provided with the gasholder to prevent over pressurization. Protection against vacuum is also provided.
- Slum shut off valves in LD gas injection mains to Coke Ovens are provided. These valves can be operated from the LD gasholder control room.
- Water seals are provided to consumer line for HSM Mixing Station and Power House#4.
- Oxygen analyser provided in the LD gas line before ID fan and before the gas holder, based on the feedback from Oxygen analyser ID fan RPM is slowed down to keep the oxygen level in permissible limit.
- There is bypass damper to bypass the LD gas towards flare.

Booster#2 gas supply system is having provision to operate in the following three modes with the help of PLC.

- Automatic.
- Manual – operating from the control desk in the control room.
- Local – local operation only for repair and maintenance.

The technician operates the above system as per instruction given above of gas recovery system operation and maintenance manual (GHB/MANUAL/07).

Gas injection to different consumer is done as per instruction and guidance of EMC.

Weekly inspection of all mechanical, electrical, general housekeeping and other miscellaneous items including safety device, fire hydrant, fire extinguisher, earthing checkpoint etc. are carried out jointly with Electrical (LD#1) and recorded in the form (FM/GHB/03-00) and kept in the file (F/FMD/GHB/04).

All mechanical maintenance activity is done by general shift mechanical through contractor as per their laid down procedure (FM/QLP-GHB/053).

At least two portable CO gas detectors are provided with concerned operation staff to monitor CO concentration while working in LD Gasholder premises. The safe limit for 8 hours of working is below 50ppm of CO concentration in the vicinity. There is also provision of continuous CO detection and monitoring system. This system gives alarm if CO concentration goes beyond 50ppm.

6.4.1.3 Existing Safety features in Propane gas system

There are three Propane mounded bullets with inventory of 100 MT each and pressure is 7-11 kg/cm^2.

The dimensions of the mounded bullets are: Shell Internal diameter = 4128 mm and length = 19120 mm (with dished ends). The line diameters will be 2 inches (liquid Outlet from bullet) and 3 inches (header) and bullet manhole height is 625mm.

The following safety and precautionary measures for propane storage, unloading and its distribution are shown in table 6.2.

Table 6.2: Hazards and precautionary measures for transport, unloading and distribution of propane

S. No.	Activity	Hazards	Precautionary measures
1	Placing Tanker at unloading hard stand.	Fire due to spark through exhaust pipe. Fire due to leakage	• Ensure of fire arrestor fitted to exhaust. • Ensure fire extinguisher available in ready condition with the road tanker. • Ensure checklist # FM/LFIG/141/00 is filled properly before allowing the tanker inside the installation. • No loose electrical wiring terminal. • Tanker connected with Earthing cable. • Tanker Battery connection cut off.
2	Disconnection of the battery	Unwanted electrical spark and fire due to loose wiring/ terminals.	• Earth the tanker properly both tank and chassis.
3	Decantation	Fire due to spark through exhaust of the vehicle plying on the road. Breathing trouble in case of inhale Frost burnt	• Barricading / stopping of plying vehicle during decantation sprinklers to be kept ON intermittently to control the temperature of Road tanker. • Move the expose person in to fresh atmosphere. • Perform mouth to mouth resuscitation; people should be trained to it. • Use of gloves. • Check any leakage with soap solution. • After decantation take special precaution to avoid liquid/gas to pour/ inhale during disconnection of the hoses.

S. No.	Activity	Hazards	Precautionary measures
			• Truck engine to be started back again after 10/15 minutes of the hose disconnection.
4	Start-up of compressor and pump for residual decantation	Electrical shock and electrical spark	• Flame proof fitting • Ensure no loose connection • Use of proper PPE
5	Up keeping of the installation	Stumbling hazard Fire/Explosion Leakage of propane	• Cross over to be provided over the pipeline wherever required. • Ensure fire extinguisher in ready condition. • Ensure fire hydrant in ready condition. • Ensure water sprinkler in ready condition. • Ensure water level healthy in the water tank. • Ensure electrical/ diesel water pump in ready condition. • Monitor/ maintain temperature of the bullet less than 40 deg.C. • Trial of sprinkler once in every shift for its readiness. • Ensure proper cathodic protection of the installation. • Ensure no plantation and no dry leaves growing/ accumulation with in and around the installation. • Ensure statutory rules as per SMPV rules 18 & 19 • Regular inspection of the installation
6	Starting of diesel / electrical pump for water sprinkler	• Electrical shock • Unwanted spark from battery terminal and electrical panel due to loose connection	• Ensure proper use of PPE • Ensure proper fitting and tightness of the battery terminals

S. No.	Activity	Hazards	Precautionary measures
7	Vaporization and distribution of the propane	• Electrical shock • Electrical spark • Fire due to leakage through flange joints	• Ensure proper use of PPE • Ensure use of flame proof fittings • Ensure regular inspection • Use of proper gasket • Regular painting of the system with flow direction & name of fluid written on pipeline at intervals. • Ensure liquid filling in to the storage tank maximum up to 90%

Following precautions are taken for tackling the emergency accident.

Transport Emergency Cards (TREM) along with route map covering updated emergency numbers needs to be provided to every tanker.

a. Facility for unloading / transferring from one tanker to another tanker.
b. Customers /Transporters should ensure proper training to tanker driver for safe driving for transporting such Hazardous Hydrocarbon material. In addition to above Customers /Transporters should ensure that the tanker driver should know about basic hazards & basic do's and don'ts of the hazardous material being transported through the tankers.
c. Customers /Transporters should ensure that driver & his assistant should not drive the vehicle under the influence of alcohol.
d. Customers /Transporters should ensure the availability of Emergency safety kit having special arrangements of Leak Seal.
e. Customers /Transporters should ensure the liaising part with the external agencies for resources and communication in case of emergency as per OISD standard 161.
f. Customers /Transporters to ensure that after taking the load, driver of tanker should not be changed enroute.

6.4.1.4 Existing Safety Measures for Hydrogen Bullets

Cold Rolling Mill complex houses four vertical bullets each having capacity of 50 M^3 of gases. The system holds Hydrogen gases coming out as by product from Coke Oven gas de-sulphurisation plant and supply it to Batch Annealing Furnace (BAF). All the bullets remain in floating condition and the system has the facility to completely isolate any one or all the hydrogen bullets at a time. Each of the bullets has two-safety vent valve with flash back arrestor. The main outlet of gas to plant is fitted with non-return valve. The total storage area is barricaded with no electrical fittings and no

source of static charge. The installation has hydraulically operated sprinkler type fire hydrant system. JCAPCPL has same capacity (4X50M^3) Hydrogen bullets with similar safety measures.

6.4.1.5 Existing safety measures in Carbide storage and overall DS plant

There is one calcium carbide silo in LD#2. The silo is bottom opening type and the inventory in the silo is 80 MT. Acetylene analyser is available inside silo and moisture analyser is located in Nitrogen PRS station. Silo is completely isolated and slightly pressurized with N_2. Purging facility is available with aeration pad with 2kg N_2 pressure.

Existing safety measures in carbide storage and overall DS plant against the emergency scenario of formation of acetylene in the calcium carbide silo are as follows:

- Maximum level switch is provided in carbide silo. If the level is high, powder inlet valve will not open.
- Acetylene analyser is provided in silo. If there is high percentage of acetylene (i.e.,1%), there will be emergency mode, nitrogen changes over into emergency mode (medium pressure nitrogen) and injection or any conveying operation would stop.
- Moisture analyser in the incoming nitrogen is also provided. Dew point of the incoming nitrogen is increased due to moisture ingress in the incoming supply. If there is high value of dew point (-40^{O}C), there will be emergency mode, nitrogen changes over into emergency mode (medium pressure nitrogen) and injection or any conveying operation would stop. Continuous moisture alarm is sounded.
- If the DS Compound (Carbide and Magnesium Based) catches fire, the fire extinguishers (dry sand, dry powder or CO_2 and not water) are provided:

During power failure at DS plant: There are three-way valves on the main nitrogen line at the DS plant in TSLW which are pneumatically operated. In case of failure of power, no pneumatic valves can be operated from control desk or will operate through auto PLC sequences. All motors running (if any) will get de-energized immediately.

- If power fails while injection sequence is going on, all valves on the injection line would close causing supply of carbide and nitrogen to the lance being cut off (this would result in the lance getting choked). The lance motor would not operate in such a condition and lance would remain inside the bath. The maximum loss would be that of a single lance (due to choke).
- The silo is always kept in a state of constant fluidization. The fluidization of the silo is accomplished through a manual valve and an orifice plate to deliver requisite flow. Therefore,

even if the power fails and supply goes to emergency nitrogen, the fluidization of the silo will continue.

Temperature High Before Bag Filter

- Due to continuous injection, when the temperature of the exhaust gas reaching bag filter is more than 80^{O}C, there is a specific alarm, viz., “TEMP HIGH BEFORE BAG FILTER” to be sounded. To bring down the temperature, TCV 1301 gate should open to let the exhaust gas escape into atmosphere.

6.4.1.6 Existing safety measures in Magnesium storage

In Desulphurization unit of TSLW, a mixture containing magnesium is used to remove sulphur from molten steel. There are two magnesium silos in LD#1 and LD#2 with inventories ranging from 13 MT to 20 MT. Temperature maintained at the silo is 30 – 40^{O}C.

There is one magnesium silo in LD#3 with inventory ranging from 5 MT to 20 MT. Working pressure maintained at the silo is 0 to 0.01 bar with design pressure of 0.1 bar. It is completely isolated and slightly pressurized with N_2. It is associated with process interlock with analysers and aeration pad with N_2 (flow rate is maintained as 15 to 30 Nm^3/hr).

As per MSIHC Rules of 1989 as amended in 2000, Magnesium is a regulated chemical mentioned in Schedule 1 (No. 350). The safety measures associated with magnesium storages are oxygen analyser and nitrogen purging facility at 2 kg/cm^2 pressure. During unloading, silo truck is connected to N_2 line kept at 2 kg/cm^2 pressure.

6.4.1.7 Existing safety measures in Sulphur storage

- Static electricity neutralization rod is provided for discharging Electrostatic charge.
- Fire Detection Alarm has been provided with signal in control room
- Fire extinguishers and hydrant systems are also available.

6.4.1.8 Existing safety measures for IPA (Iso Propyl Alcohol) Storage

IPA is used as a solvent in making Graphene, which is being used as anti-corrosion coating.

IPA is stored in a tank of 4000 litres capacity. The storage tank has a dyke of dimensions 4500 X 4500 X 600 (mm) L*W*H respectively to contain any leakage.

Additionally, Sprinkler and Deluge systems are provided at the IPA Storage area.

6.4.1.9 Existing safety measures in case of Power Failure

1. Total Power Failure

Communication during total power failure by Load Dispatch Centre (LDC) to Energy Management Centre (EMC) and shall be as per Table 6.3

Table 6.3: Existing Safety Measures in case of Power Failure

Category	Type of Failure	Plant Affected	EMC Role
A	Total power failure	All Plants	Inform on centralized dispatcher to various critical units regarding total power failure. Inform various control room through EMC phone or TSL telephone regarding total power failure. Check with these units. The impact of power failure and take corrective actions on utility/gas network.
B	132 kV Total Power failure	All plants in 132 kV island	-do-
C	400 kV island power failure	All plants in 400 kV island	-do-
D	Power failure of 132 kV Non Sale island	All plants in 132 kV Non Sale island	-do-
E	Power failure of 132 kV Sale island	All plants in 132 kV Sale island	-do-
F	Total power failure at PH#3 Or Total power failure at PH#4	Coke Oven, T-30 (LCP, Old & New By-product) , MM,ITS, New Damp Pump, Blast Furnaces(A-F), SP#1&2,Old River Pump House, Hospital, Boiler House#1,BOCI (225 TPD)	-do-
G	PH#3 Islanded Or PH#4 Islanded Or DVC Isolation	Depending on the power generation and demand within the island, power to the plants will get affected by automatic load shedding logic. All kicking loads like HSM, LF #1, LF #2, LF# 3, CRM-	-do-

Category	Type of Failure	Plant Affected	EMC Role
		PLTCM. Other plants will be affected based on under frequency, if it occurs after DVC isolation.	

Role of Load Dispatch Centre (LDC) during emergency

A. Total Power Failure

- Inform through Telephone / SMS.
- Instruct to start all available DG sets.
- Distribute DG power to critical loads.
- Co-ordination with DVC/TPCL.
- Fault identification and coordinate to isolate it from the system.
- Safe and fast resynchronization.
- Clearance and normalization.
- Diagnostic for causes of failure.

B.132 kV island total power failure

- Inform through Telephone / SMS.
- Instruct to start all available DG sets
- Distribute DG power to critical loads in the affected island.
- Fault identification and coordinate to isolate it from the system.
- Extend 400 kV island power to 132 kV island after necessary precautions.
- Synchronize with other available power source after checking the status.

C. Power failure of 400 kV island

- Inform through Telephone / SMS.
- Local DG back up at respective plant to take care locally.
- Extend 132 kV island power to 400 kV island after necessary precaution.
- Fault identification and coordinate to isolate it from the system.
- Synchronize with other available power source after checking the status.

D. Power failure of 132 kV Non-Sale island

- Inform through Telephone / SMS.
- Instruct to start all available DG sets.
- Distribute DG power to critical loads in the affected island.
- Extend 132 kV sale island power to 132 kV Non-Sale island after necessary precaution.
- Fault identification and coordinate to isolate it from the system.
- Synchronize with other available power source after checking the status.

E. Power failure of 132 kV Sale island

- Inform through Telephone / SMS.
- Extend 132 kV Non-Sale island power to 132 kV Sale island after necessary precaution
- Fault identification and coordinate to isolate it from the system.
- Synchronize with other available power source after checking the status.

F. Power House# 3, Power House#4 or Power House#5 Total Power Failure

- Inform through Telephone / SMS.
- Fault identification and coordinate to isolate it from the system.
- Synchronize with other available power source after checking the status.

G. Power House#3 Islanded or Power House#4 Islanded or Power House#5 Islanded

- Inform through Telephone / SMS.
- Check island condition.
- Isolate the faulty zone.
- Ascertain reasons of isolation and give instructions to synchronize with other available power source.
- If other island cannot be synchronized, instruct to maintain generation with critical loads.

H. DVC Isolation

- Information through Telephone / SMS
- Check load shedding as per schedule.
- Control the frequency of system by controlling generation and loads.
- Instruction to major loads not to start unless clearance.
- As soon as DVC power clearance is available, coordinate fast resynchronization and wheel power through healthy route.

2. Local Power Failure

There may be Local power failure due to short circuit, Fire in cable vault or cable tunnel or any other electrical equipment failure.

Fire Detection Alarm (FDA) system has been provided in some of the Cable Vaults and cable tunnels with auto dialling facility to a 24X7 manned area and fire Services.

Fire retardant coating has been provided as per standard requirement in some of the cable run.

Detailed action plan for handling local power failure and electrical fire is available in Emergency Preparedness and Response procedure of respective departments.

SECTION VII

DETAILS ABOUT THE SITE

7 Details about the site

Tata steel works is located in the East Singhbhum district of Jharkhand state in between 22º40'47'' and 22º53'21'' north latitude and 86º05'21'' to 86º28'21'' east longitude. The nearest railway station is Tatanagar. Jamshedpur city is well connected with national highway NH 33 and other road networks. Tata Steel corporate centre is located at Bistupur, Jamshedpur. The works site located is 159 m above Mean Sea Level (MSL). The total area of Tata steel Plant is about 25 sq. km. The Jamshedpur Steel City has a population of about 13,37,131(2011 census).

TSLW is planning to add the following two new additional facilities (Outside the works).

1. 120 MW Captive Power Plant: - Power house #4 being an old power plant with capacity of 57.5 MW, the safety related risk might increase if we operate the plant at its full efficiency. Moreover, the production loss might increase if we operate the plant at underrated capacity. Hence, a new power plant has been proposed.

2. 1800TPD Air Separation Unit (Oxygen Plant): - In order to reduce the operational cost and maximize the production, oxygen generation is required hence new plant is proposed. Oxygen is mainly used at LD shop and Blast Furnace department specially for lancing and blowing purpose.

Table 7.1: Details about site location of TSLW

Name of the Plant:	Tata Steel Ltd Works, Jamshedpur, Jharkhand
Total employee strength	Tata employees: About 15,000 Contractor employees: About 40,000
Timing of Shifts:	Shift A - 06.00 am to 02.00 pm Shift B - 02.00 pm to 10.00 pm Shift C - 10.00 pm to 06.00 am General Shift - 08.00 am to 05.00 pm 8:30 am to 6:00 pm

7.1 Location of Hazardous Chemicals

The major hazardous chemicals stored and/or handled at TSLW are BF gas holder, CO gas holder, LD holder, Propane bullet, hydrogen Buffer Vessel, LDO tank, Calcium Carbide, Magnesium, Sulphur, Mounded Propane storage, Iso Propyl Alcohol etc. Details are available in PHR 0 Procedure - Identification of High Hazardous Facilities (**SAFETY/PRO/PROCESS/06**).

7.2 Seat of Key Personnel

The details of key personnel are given in **Table: C1** of **annexure C** of this document.

7.3 Tactical Centre

7.3.1 Location

The principal facility that TSLW considers in the DMP is the Tactical Centre(TC)– the place from which functions to manage the response for emergency are directed and coordinated.

The existing Tactical Centre is outside works in Bistupur at First floor of Suraksha Kendra.

Table 7.2: Details of Facilities at Emergency Tactical Centre

Facilities at Emergency Tactical Centre	
A. Fixed Arrangements A1. Uninterrupted power supply A2. Hotlines with EMC, LDC, TMH & Securities A3. P&T phones A4. Mobile connection to contact essential services A5. Wind Sock. A6. Wall Board for Fixing up drawings and drawing pins. Flip Charts, Drawing Sheets & Sketch Pens. A7. Conference room, Projectors, Desktop, tables, Chairs etc.	**B. Equipment** B1. Emergency lights B2. Command room with Video wall (4X2) Screen B3. Personnel Protective Equipment – 2 sets. (Gloves, Gum Boots, Chemical Goggles, Apron, Helmets, Rain Coat) B4. Walkie–Talkie Sets with a range of 5 km – 2 Nos / Mobiles. B5. A Recorder on which the incident and action, being taken and progress could be recorded.
C. Document C1. Copy of Emergency Plan C2. Blown up Plan of the works to illustrate: ▪ Hazard distances for various identified Emergency Scenarios ▪ Source of safety equipment and fire extinguishers. ▪ Fire water system and alternative source of water ▪ Minimum Stocks of other fire extinguishing media.	C3. Additional work plans, preferably covered with plastic or glass sheets on which felt pen markings can be made and erased as required to show: Areas affected or endangered, Deployment of emergency vehicles & personnel, areas where particular problems arise e.g. fractured pipeline, roads blocked, etc. areas evacuated & other relevant information. C4. Safety Manual C5. Material Safety Datasheets of hazardous materials

Facilities at Emergency Tactical Centre	
▪ Work entrances and road system, updated at the time of emergency to indicate any road which is impassable. ▪ Escape Routes, Assembly Point. ▪ Location of works in relation to surrounding community and neighbourhood factories.	C6. List of Emergency telephone numbers (External & Internal) C7. Local P&T Telephone Directories. C8. List of people working in the plant, location wise. C9. List of residential addresses of key Employees / Contract labourers and casual labourers.

7.3.2 Functions and operations of Tactical Centre

The Tactical Centre is well-equipped with hotlines, gas line and utility line network information, a conference room and Call Centre cum Discussion room with Television & DTH.

During an emergency, the Tactical Centre will be activated on the direction of CIC (VP TQM & SS), i.e., factory manager or his representative. There will be sufficient functional manpower in Tactical Centre during any emergency, who will assist and collaborate with CIC. They can be considered from operation and process, safety and disaster management and also persons well known about the roads, locations of various departments and emergency services, like medical etc.

Depending upon the level of emergency, a location-specific Emergency Management Room will be established at the department of emergency location under the supervision of Incident Controller (IC). It will work in close association with the Tactical Centre.

In case of possibility of an off-site emergency situation, through his strategic level team members, CIC will inform Town Security Control Room (0657 6643866), Govt. administration, Fire services, Tata Main Hospital, Factory Inspectorates, Police, transport etc.

The Tactical Centre will maintain updated information in Casualty Tracking Board about the affected persons from Plant Medical, TMH or other medical centres and inform the relatives.

7.3.3 Resources to be made available at Tactical Centre

The present infrastructure at the existing tactical centre in TSLW would be strengthened for any type of emergency scenario within the premise. The following resources would be made available at the tactical centre by the management of TSLW:

(a) Details in A0/A1 size drawings:

i. Site plans of TSLW showing clearly the location of hazardous chemicals storages

ii. Gas pipeline associated with all BF/CO/LD holders

iii. Deployment of emergency teams and equipment and Chart 1.

iv. Plant entrance and the approach road system

v. Mutual understanding with neighbouring industries

vi. Assembly points with established symbols

vii. Occupational health centres, Tata Main Hospital, Govt. Hospitals, Private Hospitals and Nursing Homes in and around.

viii. Key transport facilities for emergency services.

ix. Fire Hydrant Layout

x. Gas line Layout

xi. Cable Layout

xii. Traffic Camera Signal

(b) Details of Security and other Fire-fighting facilities in the hazardous area e.g., BF/CO/LD gasholders, hydrogen plant, propane storage area, LDO Storages, Calcium carbide, Magnesium storage etc.

(c) Procedures

i. Procedures of firefighting, rescue operations, first aid related to burn injury (CO gas/Propane/hydrogen etc.).

ii. Procedures for handling leakage of toxic gases (CO etc.) from holders or pipelines

(d) Consequence impact zones for maximum loss scenarios in TSLW and accordingly the areas, locations and important installations under severe, moderate and low impact.

(e) Location and status of PPE and other safety equipment to be made available at Tactical Centre, viz., SCBA, fire protection suits etc. and list of PPE available with the outside agencies/TSIUS etc.

(f) Copies of Material Safety Data Sheet (MSDS) pertaining to BF gas, CO gas, LD gas, Propane, LDO, Hydrogen, Calcium Carbide, Magnesium, Sulphur.

(g) The details of liaison made with nearby industries and the district administration.

(h) The details of the responsibilities of the key persons required for management of emergency (Section 3.1).

(i) Records and copies: (Made available through GDCS)

i. Risk Analysis and Disaster Management Plans

ii. HAZOP/PHA Study Report

iii. Emergency Log register

(j) Conductance of Mock drill registers

7.4 Assembly Points (AP)

Assembly points (AP) in TSLW have been demarcated in various plant sections (Table 5.4). However, the locations of the assembly points have to be relocated after taking into consideration of consequence impact zones for emergency scenarios, predominant wind direction, escape routes, etc. It is recommended that the assembly points for an emergency scenario in TSLW arising from a hazardous location/storage etc. should be at least beyond the fatal/severe zones as described in Section 8. Another important aspect is that a unique identification number (Example: Plant area-AP Number) for each assembly point in TSLW should be made. Tactical Centre and Fire Services department should take the records of all assembly points (number, location etc.) in TSLW and also their projections in map.

Table 7.3: Location of Existing Assembly Points in TSLW

S. No	Name of the department	No of first aid Post	Assembly Point numbers	Location
1	PH#4	2	1A &1B	1A-Turbine floor. 1B- Office Gate
2.	PH#5	1	29 A	29A- Office Gate
3	PH#3	3	5A &5B	5A: Near DM Plant way 5B: Entry point to PH#3
4	BPH#3	1	30A	Near to office
5	BPH#4	1	49 A	Near to office
6	BPH#5	1	32 A	Near to office
7	Spares Manufacturing	1	33 A	Near to office
8	WRP	1	15A	Near to office
9	WGO	1	20A	In Lawn
10	SGDP	1	21A	Office entrance
11	MPDS#1&2	1	34A	Office entrance
12	MPDS#3	1	35 A	Office entrance
13	MPDS#4	1	36 A	Office entrance

S. No	Name of the department	No of first aid Post	Assembly Point numbers	Location
14	MPDS#5	1	37A	Office entrance
15	MPDS #6	1	36 A	Near Control room
16	MPDS#7	1	37 A	Near office building
15	Maintenance Bhawan	1	38 A	In front of office building
16	R&D	1	39A	In front of technology Block
17	DG Station	1	40A	In front of office
18	IM Section	1	41 A	In front of office
19	Tube Mill booster House	1	42A	In Front of office Building
20	New Propane installation	1	43A	Near Control Room
21	Central Store	1	49A	In front of store
22	GCP#2	1	45A	Near Control Room
23	BPP	13	18 A-18M	18 A – Exhauster House BPP 18 B – Batt # 3 Office 18 C – WARF # 3 18D: wagon tippler,18E: NCHP pump room, 18F Gas mixing stn,18G: CDQ 18H:5,6,7 control room,18: I Gas mix stn 8 & 9,18J : DCS bldg 8 & 9, 18K:side steam filter new bpp,18L: Gas mix stn 10&11,18M-Ramp side
24	A- F Blast Furnace	3	3A ,3B, & 3 D	3A : A -B Fce Ramp Side 3B: A-F office 3D: F Furc Ramp Side

S. No	Name of the department	No of first aid Post	Assembly Point numbers	Location
25	GBF	2	13A, 13B	13A: Maintenance Bhawan 13 B: Ramp Side GBF
26	HBF	6	25A,25B,25C,25D,25E,25F	25A- Near entrance of H BF Office 25B- Near BSLC Building 25C- Near Ramp 25D- Near PCI 25E- Near Ground Hopper 25F- Near Stock House
27	IBF	3	46A,46B& 46C	46A: Near Ramp of I Blast Furnace. 46B: At front of PCI Building 46C: Stock house
28	Pellet Plant	2	28A,28B	28 A: Entrance to Pellet Plant 28 B: In front of Office
29	RMM	12	31 A- 31 L	31A: Coal control near Pellet Plant 31B: Coke control near LTSS 5B 31C: Ore control near LTSS 6B 31D: ISB Building 31E: Coke Screen House. 31F: Pipe Conveyor. 31G: Behind RMM office. 31H: PCI Bunker (Near L town Gate) 31I: Coal tippler near Pellet Plant. 31 J: Haldia coal tippler. 31k: Power House 3 Tippler. 31 L: Railway yard

S. No	Name of the department	No of first aid Post	Assembly Point numbers	Location
30	SP 3	3	22A,22B,22C	22A: sinter cooler,22B : Steel house lawn, 22C west gas fan building
31	SP 1	1	47A	In front of Maintenance office
32	SP2	1	48A	Near to lawn
33	RMBB#1	2	14A &14B	14A: Near to office building. 14 B: Track Hooper #1
34	RMBB#2	2	23A &23B	23A: Near RMLC#1A. 23b: Near Entrance to main office building
35	CRM	6	11 A to 11F	11A- H2 & N2 Storage Area 11B- Near Main Entrance Area 11C- Near CGL1-CCR 11D- Near Coil Storage & Shipping 11E- Beside Coil Storage and Shipping RCL2 11F- Near Utility Store
36	HSM	7	10A to 10 E	10 A: beside BF gas u Seal & new blower house 10B: IEM office, scale pit 2 & LCT area 10C: front of LCPH & north side of filtration plant
37	LD 2 Slab caster	2	12A &12B	12A: near office building 12B: near foreman rest room

S. No	Name of the department	No of first aid Post	Assembly Point numbers	Location
38	LD 3 slab caster	3	29 A to 29 F	29A: ramp side 29B: traffic light 29C: near coil yard 29D: Roll shop 29E: cooling tower NBM side 29F: dispatch section / central kitchen
39	LD 1	2	9A & 9B	9A: Ramp side 9B: LD 1 office
40	Merchant Mill	2	6A & 6B	6A: finishing & shipping 6B: Merchant mill & furnace entrance
41	New Bar mill	5	8 A to 8 E	8A: front of office 8B: Dispatch office 8C: DG area 8D: Chimney area 8E: Furnace area
42	WRM	3	7A to 7C	7A: WRM canteen 7B: WRM office 7 C: back side
43	HML	2	50A & 50B	
44	Lime Plant	3	51A,51B & 51C	
45	Power Plant 40 MW CDQ	1	53A	
46	CDQ 10	1	54A	
47	CDQ 11	1	54B	

SECTION VIII

DESCRIPTION OF HAZARDOUS CHEMICALS

8 Description of Hazardous Chemicals

8.1 Major hazardous chemicals and their locations in TSLW

The Table 8.1 shows the list of major hazardous chemicals which may create emergency situations, their locations and other storage details:

Table 8.1: Details of storage and hazardous properties of major hazardous chemicals capable of creating emergency situations in TSLW

Sl. No.	Name of the Chemicals	Location Area/ Plant Section	Licensed Capacity of Storage/Average capacity	Storage Pressure and Temp.	Hazardous Properties
01	CO gas	Coke Oven gas holder storage area	50000 Kl 38276 Kl	35^0C 343 mmWc	Flammable and toxic Toxic (CO: 9%) Flammable (H_2:55%) LEL=9% UEL=31%
02	LD gas	LD gas holder storage area	100000 m^3 60000 m^3 (New)	50^0C 265 mmWc	Toxic Toxic (CO: 50 - 70%) Flammable (H_2:3%) LEL=14.8% UEL=71.5%
03	BF gas	BF gas holder storage area	1,55,742KL 1,41,584KL	45^0C 355 mmWc	Toxic Toxic (CO: 21 - 25%) Flammable (H_2: 3.6 - 6%) LEL=35% UEL=73.5%
04.	Propane	Propane storage area	300 MT/240 MT (03 bullets, each having capacity = 100 MT/80 MT)	Ambient P = 12 Kg/cm^2	Explosive/ Flammable LEL/LFL = 2.1% UEL/UFL = 10%

Sl. No.	Name of the Chemicals	Location Area/ Plant Section	Licensed Capacity of Storage/Average capacity	Storage Pressure and Temp.	Hazardous Properties
05	Hydrogen	Hydrogen storage area (CRM, JCAPCPL)	400m^3 (08 bullets, each having capacity = 50 m^3)	Ambient P = 9.68 atm	Explosive/ Flammable LEL/LFL = 4.1% UEL/UFL = 74.1%
06	LDO	DG station	Total tank capacity = 1000 KL	Ambient	Flammable LEL/LFL = 1.4% UEL/UFL = 7.4%
07.	Calcium Carbide	LD#2 in Desulphurisation unit	25-55 MT	Ambient T = 30 – 40^oC	Hazardous due to the generation of explosive acetylene gas
08.	Magnesium	LD#1, LD#2 and LD#3 in Desulphurisation unit	5 – 20 MT	Ambient T = 40 – 50^oC	Fire and explosion hazard
09.	Sulphur	New By Product Plant	150 MT	Ambient T=40-50 ^oC	Fire and explosion hazard
10.	IPA	R & D Graphene Plant	4KL	Ambient T = 30 – 50^oC	Fire and explosion hazard

8.2 Physio-Chemical properties of hazardous chemicals stored/used

8.2.1 Regulatory methods as per MSIHC Rules and other widely used classifications

In general, material can be hazardous because of its flammable and/or toxic nature. While definitions of flammability (i.e., lower flammability limit etc.) and impacts in terms of fire (heat flux) and explosion (overpressure) are relatively straightforward, toxicity levels require further definition.

Workplace exposure limits are sometimes referred to as Threshold Limit Values (TLV) -Time Weighted Average (TWA). TLV-TWA is defined as the time weighted average concentration limit for a normal 8-hour workday and 40 hours per week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH), USA publish "Immediately Dangerous to Life and Health" (IDLH) values for various chemicals. IDLH is defined to mean conditions that pose an immediate threat to life or health or conditions that pose an immediate threat or severe exposure to contaminants which are likely to have an adverse cumulative or delayed effect on health. The IDLH connection represents the maximum concentration of a substance in air from which healthy male workers can escape without loss of life or irreversible health effects under conditions of a maximum thirty minutes exposure time.

Other short-term exposure measures also exist for selected chemicals. One such approach is the STEL value (Short term exposure limit). It specifies the maximum concentration of the substance to which workers can be exposed for a period up to 15 minutes without suffering (a) Intolerable Irritation (b) Chronic or irreversible tissue change (c) narcosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce worker efficiency, provided that no more than 04 excursions per day are permitted, with at least 60 minutes between exposure periods, and provided that daily TLV is not exceeded.

Fatality concentrations for various percentage levels can, in some cases, be estimated from Probit equations (where available). Probit equations provide an estimate of the population fatality % for a given concentration and exposure duration to a chemical.

The physio-chemical properties of BF/LD/CO gas (toxic component is carbon monoxide), propane, hydrogen, LDO and IPA available in respective MSDS (Material Safety Data Sheet) which is available at the facility.

A brief description of the hazardous properties of the chemicals is described in the following sections. MSIHC Rules 1989 as amended in 2000 and National Fire Protection Agency (NFPA, USA) suggest the following criteria for identification of hazards:

According to Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules 1989 as amended in 2000 of Environment (Protection) Act of 1986, Govt. of India (Schedule 1; Rule 2e (i), 4(1), 4(2), 17 and 18), the following criteria of categorizing the hazard potentials of chemicals have been used:

(a) Toxic Chemicals: Chemicals having the following values of acute toxicity and which owing to their physical and chemical properties are capable of producing major accident hazards:

Table 8.2: Chemicals with Acute Toxicity

Sr. No.	Degree of Toxicity	Medium lethal dose by the oral route (oral toxicity) LD50 (mg/kg) body weight of test animals	Medium lethal dose by the dermal route (dermal toxicity) LD50 (mg/kg) body weight of test animals	Medium lethal concentration by inhalation route (four hours) LC 50 (mg/l) inhalation on test animals
1	Extremely toxic	<5	<40	<0.5
2	Highly toxic	> 5 – 50	> 40 – 200	>0.5 - 2.0
3.	Toxic	>50 – 200	> 200 – 1000	> 2 – 10

(b) Flammable Chemicals

Flammable gases: Gases which at 20^{O}C and standard pressure of 101.3 kPa are:

(i) Ignitable when in a mixture of 13% or less by volume with air, or

(ii) Have a flammable range of at least 12% by volume with air regardless of the lower flammable limits.

Extremely flammable liquids: Chemicals which have a flash point lower than or equal to 23^{O}C and the boiling point of which at normal pressure is less than 35^{O}C (Class I A).

Very Highly Flammable liquids: Chemicals which have a flash point lower than or equal to 23^{O}C and initial boiling point is higher than 35^{O}C (Class I B).

Highly Flammable liquids: Chemicals which have a flash point lower than or equal to 60^{O}C but higher than 23^{O}C (Class II).

Flammable liquids: Chemicals which have a flash point higher than 60^{O}C but lower than 90^{O}C (Class III A).

NFPA Classification of flammable and combustible liquids is as follows:

Combustible liquid means any liquid having a flash point at or above 100^{o}F (37.8^{o}C). Combustible liquids shall be divided into two classes as follows:

Class II liquids shall include those with flash points at or above 100^{o}F (37.8^{o}C) and below 140^{o}F (60^{o}C), except any mixture having components with flash points of 200^{o}F (93.3^{o}C) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.

Class III liquids shall include those with flash points at or above 140^{o}F (60^{o}C). Class III liquids are subdivided into two subclasses:

Class IIIA liquids shall include those with flash points at or above 140°F (60°C) and below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Class IIIB liquids shall include those with flash points at or above 200°F (93.3°C). This section does not regulate Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

When a combustible liquid is heated within 30°F (16.7°C) of its flash point, it shall be handled in accordance with the requirements for the next lower class of liquids.

Flammable liquid means any liquid having a flash point below 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

Class IA shall include liquids having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class IB shall include liquids having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC shall include liquids having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C)

(c) Explosives

Explosives mean a solid or liquid or pyrotechnic substance (or a mixture of substances) or an article:

(i) Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to surroundings;

(ii) Which is designed to produce an effect by heat, light, sound, gas or smoke or combination of these as the result of non-detonative self-sustaining exothermic chemical reaction.

8.2.2 Blast Furnace Gas (BFG)

BFG is a by-product of the iron making process and is used as a fuel gas. It is an odourless, colourless and toxic gas. Its toxic properties are due to the presence of carbon monoxide (CO) (typically 21- 25% v/v) in the gas.

BFG is a very low heating value fuel (CV = 800 – 900 Kcal/nm3), containing inerts of approximately 58% nitrogen and 17% carbon oxide. Therefore, *the gas is only likely to support stable combustion*

at elevated temperature, or with a permanent pilot flame. BFG may be ignited by a high ignition source such as a welding torch. However, the resulting combustion is slow.

BFG is not typically considered an *explosion hazard* for the following reasons:

- Very high ignition energies are required to initiate BFG combustion;
- High concentration of inerts in the gas; and
- Very low combustion energy (3.2MJ/m^3).
- In confined space it can form explosive mixture.

8.2.3 Coke Ovens Gas (COG)

COG is toxic and flammable gas and has a very strong odour. Its toxic properties are due to the presence of CO (typically 9% v/v) in the gas. COG has a specific gravity of 0.43 and therefore, is a very buoyant gas, which tends to disperse rapidly when released to the atmosphere.

The high concentration of hydrogen and methane in COG suggests that the gas can be ignited by a low ignition energy (e.g., static). Therefore, the probability of ignition of COG leaks is likely to be high relative to other flammable gases.

COG is a corrosive gas due to the presence of hydrogen and sulphides (H_2S = 2500 mg/Nm3). This has significant implications for the maintainability of COG systems, because COG pipe work frequently develops small corrosion holes.

8.2.4 LDG

LDG is extremely toxic due to its high concentration of Carbon Monoxide (upto70%) and its lack of detectable odour. The specific gravity of LDG is approximately 1.03 and so may accumulate in pits or spaces.

LDG is flammable given its high level of CO. Flammability of LDG increases with oxygen enrichment and temperature increase.

Ignition of a release of LDG may result in a flash fire. Auto ignition temperature of LDG is approximately 600ºC.

8.2.5 Carbon Monoxide

For BFG, COG and LDG the *principal toxicity is attributed to CO*. CO is a colourless, odourless gas, which is also flammable (limits 12% to 74%). It has an auto-ignition temperature of 160ºC.*It is a flammable gas with serious fire hazard.*

The health effects of CO are largely the result of the formation of carboxy haemoglobin (COHb) which impairs the oxygen carrying capacity of the blood. Resumption of the normal oxygen supply process takes place once an individual is removed from the contaminated atmosphere. However, any damage due to the prolonged loss of oxygen supply to the brain may not be reversible. The TLV, STEL and IDLH values for CO is 50 ppm, 400 ppm and 1200 ppm respectively.

In general, a COHb level of 10-20% will only cause headaches and a COHb of 11-13% will have an effect on hand and foot reaction time, hand steadiness or coordination. At a COHb of 35%, manual dexterity is impaired. At 40% COHb, mental confusion, added to increasing lack of coordination, precludes an automobile. A 30-minute exposure to 1200 ppm will produce a COHB of 10-13%.

The following two probit relationships (CCPS, TNO Purple Book) are reported for carbon monoxide:

Pr = 37.98+3.7ln(Ct)

Where Pr = probit value; C = concentration (in ppm); t = exposure time (in minutes) and

Pr = 7.4+ln(Ct)

where Pr = probit value; C = concentration (in mg/m^3);t = exposure time (in minutes)

Table 8.3: Probit percentages and corresponding concentrations

Probit Percentage	CCPS Concentration (ppm)	TNO Concentration (ppm)
10	2615	1956
20	2945	3038
30	3211	4183
40	3454	5481
50	3696	7037

Assuming 20 minutes as the upper limit for exposure time, the Table 8.3 shows various probit percentages.

The severe level corresponding to toxicity fatality level with reference to CO has been considered as 7000 ppm for 30 minutes exposure duration (TNO Purple Book, Bernatik et. al.). However, according to Mannan, "*it is desirable to allow for the fact that data for probabilities in the middle of the probability range are likely to be more accurate than those for probabilities at the extremes of the range*". Therefore, the probit relationships which is more conservative around the 50% range, i.e., the CCPS probit value (3696 ppm) has been used in the present consequence and risk analysis for the severe damage zone.

8.2.6 Hydrogen

Hydrogen is a highly flammable gas, which has a non-luminous flame. It is a colourless, odourless, which is flammable or explosive when mixed with air, oxygen, chlorine, etc. Hydrogen has wide flammability limits of 4%-75%, low minimum ignition energy and a high burning velocity. It is therefore easily ignited and burns rapidly. As hydrogen flames are non-luminous, an operator may walk unaware into a hydrogen flame. As far as the hazard of an open-air explosion is concerned, hydrogen gas has a low density and it tends to rise and dissipate rapidly unless it is very cold. However, there are records of vapour cloud explosions of hydrogen. Further, because of the uncertainty of the properties of hydrogen mixed with hydrocarbons, it is prudent to assume that a hydrogen-rich stream has the same hazard potential as one of the pure hydrogen.

In case of leak *it may catch fire* if it comes in contact with any ignition source. When it is released from high pressure to atmospheric pressure, it may catch fire without ignition.

8.2.7 LDO

LDO is a flammable liquid and has high flash point of > 66^{O}C. It implies that normally it does not present a major fire hazard. In case of accidental spillage, it will remain within the available dyke. Under major persistent external heat source in the vicinity, pools of HFO can be ignited to start pool fire.

8.2.8 Propane

In addition to the BFG, COG, LDG, hydrogen, LDO; TSLW also uses propane. Propane is a big fire and explosion hazard. Primarily, propane is associated with the severe fire and explosion hazards, i.e., Boiling Liquid Expanding Vapour Explosion (BLEVE) under sustained ignition and also Vapour Cloud Explosion (VCE). BLEVE can be caused by an external fire near the storage vessel causing heating of the contents and pressure build-up. While tanks are often designed to withstand great pressure, constant heating can cause the metal to weaken and eventually fail.

An unconfined (i.e., in open space) *vapour cloud explosion is possible only when a large amount* comes from a rupture of line/leak from large hole and accumulates in the open space as a cloud while moving along the wind. *If the mixture of cloud and air is in the flammability range and some ignition source is available on its way,* it ignites and subsequently releases the energy on the point of ignition in the form of a blast wave. It is called vapour cloud explosion (VCE). The human injury and loss of property in case of VCE depends upon the mass involved in the explosion and the location of the centre of explosion.

A flammable release of gas that does not ignite at the leak source, or has a delayed ignition, can produce a large vapour cloud, which covers a significant area. In the absence of significant confinement or obstruction, ignition of the cloud results in a low velocity flame front with minimal overpressure effects, known as a flash fire and typically results (initially) only in impacts within the flammable cloud.

Construction of mounded LPG in TSLW is under process. The hazards associated mounded storage have discussed in Supplement.

8.2.9 Calcium carbide and magnesium

There is one calcium carbide silo LD#2. The silo is bottom opening type and the inventory in the silo is the range of 80 MT. Acetylene analyser is available inside silo and moisture analyser is located in PRS station. Silo is completely isolated and slightly pressurized with N_2. Purging facility is available with aeration pad with 2kg N_2 pressure.

In Desulphurisation unit of TSLW, a mixture containing magnesium is used to remove sulphur from Hot Metal. There are two magnesium silos in LD#1 and LD#2 with inventories ranging from 13 MT to 20 MT. Temperature maintained at the silo is 30 – 40^{O}C.

There is one magnesium silo in LD#3 with inventory ranging from 5 MT to 20 MT. Working pressure maintained at the silo is 0 to 0.01 bar with design pressure of 0.1 bar. It is completely isolated and slightly pressurized with N_2. It is associated with process interlock with analysers and aeration pad with N_2 (flow rate is maintained as 15 to 30 NM^3/hr).

Calcium carbide and magnesium are prone to fire and explosion hazards. But since this are available in powder form the consequence will be limited to the storage area.

8.2.10 Sulphur

Sulphur is a flammable substance in both the solid and liquid states. The dust is characterised by a very low ignition point of 190°C compared to other combustible dusts, and dust clouds are readily ignited by weak frictional sparks. Dusts containing 25% or more elemental sulphur may be almost as explosive as pure sulphur.

Solid and liquid sulphur will burn to produce sulphur dioxide gas, which is extremely irritating and toxic.

8.2.11 Iso Propyl Alcohol (IPA)

IPA is a volatile, colourless liquid with a sharp musty odour like rubbing alcohol. It has a Flash point of 53°F and its vapours are heavier than air and mildly irritating to the eyes, nose, and throat. Density is approximately 6.5 lb / gal. Used in making cosmetics, skin and hair preparations, pharmaceuticals, perfumes, lacquer formulations, dye solutions, antifreezes, soaps, window cleaners.

The Explosion and pool fire due to release of entire quantity from tank (modelled quantity =4000 l) is considered as the worst-case scenario. Since sprinkler and deluge system is available in the facility it is concluded that vapour cloud explosion is the worst-case scenario. However, the likely hood of a vapour cloud explosion is low as the storage area is naturally ventilated and is in open area without congestion.

8.3 History of Major Accidents Involving gasholders

- A major gas holder explosion occurred in Germany in 1923. This explosion resulted in significant damage and fatalities in surrounding areas. The cause of the explosion was due to incorrect maintenance work on the valves to the gas holder.
- A major gas holder fire occurred at British Steels South Tesside Works (UK) in 1971. The fire was caused by lightning striking a COG holder. The lightning apparently flashed across the shell to the piston resulting in simultaneous seal rupture (grease seal), gas release and ignition.
- A major gas holder explosion at the Rourkela Steel Plant in 1997, as a result of unauthorized testing of BOS fan during a maintenance outage. Air was introduced into the system and entered the gas holder, forming an explosive mixture that was ignited by the downstream electrostatic precipitator. The explosion blew off the roof of the gas holder and destroyed much of the gas recovery system.
- A major fire involving a cylindrical oil seal gas holder was occurred in Japan in 2003. It was due to incorrect protocols followed while carrying out some work on an adjacent piece of equipment. It caused a fire which spread to the gas holder.
- An explosion in the coke-oven-gas (COG) holder of Nagoya Works was occurred on September 3rd, 2003.Fifteen from the company and associated firm employees suffered injuries due to the explosion.
- A fire incident was happened in a coke-oven gas holder in Sumitomo Metals located at Kashima city, Japan in March 11, 2011 following an earthquake (8.9 magnitudes). The earthquake damaged Kashima Steelworks' facilities such as gas holders, coke ovens, blast furnaces and port facilities.

- An explosion in LD Gas Holder happened in Tata Steel Jamshedpur in 2013, air entered into the gas holder, forming an explosive mixture that was ignited by the downstream electrostatic precipitator. The explosion blew off the roof of the gas holder.
- On 10/08/2018, around 12:42, at USIMINAS Ipatinga Plant, Brazil there was an explosion followed by a structural collapse of the 150,000 m^3 gasometer, which stored and distributed LDG (steelworks gas).

SECTION IX

CONSEQUENCE ANALYSIS AND RISK ASSESSMENT-ASSESSMENT OF LIKELY DANGERS TO THE PLANT

9 Consequence Analysis and Risk Assessment-Assessment of Likely Dangers to the Plant

9.1 Introduction

Consequences to worst-case/major credible emergency scenarios and likely dangers to the TSLW have been assessed through dispersion modelling, consequence analysis and risk analysis.

Consequence analysis deals with the study of the *physical effects* of potential dangers associated with the hazardous chemicals, their storage and operation, etc. For flammable and explosive chemicals like propane, hydrogen, etc., consequences on humans/animals and structures are studied in terms of *heat radiation* and *overpressures*. For toxic chemicals like carbon monoxide, etc. consequences on humans/animals are studied in terms of *concentration and dose-response* relationships (Probit method as discussed in Section 8). The physical impact of heat radiation, overpressure and toxic concentration are shown in Table 9.1, 9.2, 9.3 and 9.4.

The consequence modelling for different release scenarios for TSLW has been done with the help of DNVGL's PHAST & SAFETI version 8.1.

Table 9.1: Physical Impact of heat radiation

Radiation Level (kW/m^2)	Observed Effect
37.5	Sufficient to cause damage to process equipment and human death.
25	Minimum energy required to ignite wood at indefinitely long exposures (non-piloted)
12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing, 50% damage level
9.5	Pain threshold reached after 8s; second degree burns after 20 seconds
4	Sufficient to cause pain to personnel if unable to cover the body within 20 seconds; however, blistering of the skin (second degree burns) is likely; with no lethality
1.6	Will cause no discomfort for long exposure

Reference: Effects of Heat Radiation, 2nd edition, *Loss Prevention in Chemical Industries, by FP LEES*

Table 9.2: Exposure time necessary to reach the pain threshold

Radiation Level (kW/m^2)	Time to pain threshold (second)
19.87	2
11.67	4
9.46	6
4.73	16
1.74	60

Reference: Effects of Heat Radiation, 2nd edition, *Loss Prevention in Chemical Industries, by FP LEES*

Table 9.3: Physical Impact of Explosion Overpressures

Pressure (psig)	Damage Produced by Blast
0.1	Breakage of small windows under strain
0.7	Minor damage to house structures
1.0	Partial demolition of houses, made uninhabitable
2	Partial collapse of walls and roofs of houses
3	Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted
4	Cladding of light industrial buildings ruptured
5	Wooden utility poles snapped; tall hydraulic press (40,000 lb) in building slightly damaged
7	Loaded train wagons overturned
10	Probable total destruction of buildings; heavy machines tools (7000 lb) moved and badly damaged
300	Limit of crater lip

Reference: Effects of Heat Radiation, 2nd edition, *Loss Prevention in Chemical Industries, by FP LEES*

Table 9.4: Physical Impact of toxic concentration

Concentration Level	Observed Effect
Short -Term Exposure Limit (STEL)	Maximum concentration of the substance to which workers can be exposed for a period up to 15 minutes without suffering (a) Intolerable Irritation (b) Chronic or irreversible tissue change (c) narcosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce worker efficiency, provided that no more than 04 excursions per day are permitted, with at least 60 minutes between exposure periods, and provided that daily TLV is not exceeded.
Immediately Danger to Life and Health (IDLH)	An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. If IDLH values are exceeded, all unprotected people must leave the area immediately.
Lethal Concentration at 50% mortality (LC50)	LC stands for "Lethal Concentration". LC values usually refer to the concentration of a chemical in air but in environmental studies it can also mean the concentration of a chemical in water. For inhalation

Concentration Level	Observed Effect
	experiments, the concentration of the chemical in air that kills 50% of the test animals in a given time (usually half to four hours) is the LC_{50} value.
Fatal Level	Death.

Reference: Effects of Heat Radiation, 2nd edition, *Loss Prevention in Chemical Industries, by FP LEES*

9.2 Emergency Scenarios

As per MSIHC rules 1989 as amended in 2000; Disaster Management Plan (DMP) for any industry is prepared for worst-case release scenarios associated with maximum damage potentials. Practically there is a very low frequency of occurrence of worst-case scenarios. However, worst-case scenarios are considered for the ultimate preparedness planning purposes against any type of scenarios.

As discussed in Section 6 – 8 of this report, the following hazardous chemicals present in TSLW are susceptible for creating emergency scenarios and have been considered for assessing the damage potentials through predicting the vulnerable zones and fatality/injured levels:

I. Blast Furnace (BF) gas (Mainly CO)
II. LD gas (Mainly CO)
III. CO gas (Mainly H_2, CO)
IV. Propane
V. Hydrogen
VI. LDO
VII. Diesel
VIII. Petrol
IX. CO gas
X. Isopropyl Alcohol (IPA)

9.3 Consequence Analysis of accidental release of toxic chemicals

The main toxic component identified in LD/BF/CO gas is carbon monoxide (CO) with maximum of 70% in LD gas. The IDLH and STEL values of CO are 1200 ppm and 400 ppm respectively. These values represent the consequence zones of moderate and low damage respectively. The severe level corresponding to 50% toxicity fatality level has been considered as 3696 ppm for 20 minutes exposure duration as described in Section 8 with reference to CO. The table 8.3 described the effects of various concentration zones of toxic chemicals.

Though the frequency of occurrence of worst-case scenario is very remote, as per statutory norms individual worst case scenarios involving BF/CO/LD holders are considered for assessing likely dangers in and around the plant.

9.3.1 BF gas

The maximum volume (design capacity) of a BF gas holder is 155742 m^3. As the density of BF gas is 1.02 kg/m^3, the total quantity of BF gas available in the holder of volume 1,55,742 m^3 is 1,58,856 kg. Out of this quantity, about 25%, i.e., 39714 kg is CO. The maximum amount of hydrogen in BF gas is about 6 % and hence the contribution of hydrogen in the holder will be about 9531 kg. The maximum values of temperature and pressure at the header are 35^{O}C and 350 mmwc.

The following worst-case release scenarios involving BF gas have been conceptualised:

1. Accidental release of 39714 kg of CO from BF gas holder into the atmosphere (toxic impact only). (referred from onsite emergency plan and disaster control, 2015)
2. Accidental release of 2544 m3 of CO from BF gas piping near N gate due to rupture. Basis of calculation of inventory for the respective scenario is explained in section 9.7.

9.3.2 LD gas

The maximum volume (design capacity) of a LD gas holder is 100,000 m^3. The new LD gas holder is 60,000 m^3. The consequence analysis for the largest LD gas holder i.e. 100000 m^3 was considered as the worst-case scenario, however the consequence analysis of the LD gas holder with 60,000 m3 is also done and results are presented in the report. As per the safety data sheet of LD gas, the maximum volume of CO present in 100,000 m^3 and 60000 m^3 LD gas holder is 70,000 m^3 and 42000 m^3 respectively. Similarly, maximum volume of hydrogen is 3000 m^3 and 1800 m^3 respectively. The maximum values of temperature and pressure at the header are 35^{O}C and 265mmwc.

The following worst-case release scenarios involving LD gas holder have been conceptualised.

1. Accidental release of approximately 70,000 m^3 & 42000 m^3 of CO into the atmosphere (toxic impact only).

9.3.3 CO (Coke Oven) gas

The maximum volume (design capacity) of a CO gas holder is 42,475 m^3. As the density of CO gas is 0.43 kg/m^3, the total quantity of CO gas available in the holder of volume 42,475 m^3 is 18,264 kg. Out of this quantity, maximum 9%, i.e., 1643 kg is CO. The maximum amount of hydrogen in CO gas is about 55% and hence the contribution of hydrogen in the holder will be about 10,045 kg. The maximum values of temperature and pressure at the header are 35^{O}C and 343mmwc.

The following worst-case release scenarios involving CO gas have been conceptualised:

1. Accidental release of 1643 kg of CO from CO gas holder into the atmosphere (toxic impact only). (referred from onsite emergency plan and disaster control, 2015)
2. Accidental release of 44 m^3 of CO in case of rupture of CO gas piping to tubes division. Basis of calculation of inventory for the respective scenario is explained in section 9.7.

9.4 Consequence Analysis of accidental release of flammable chemicals

9.4.1 BF gas

The following worst-case release scenarios involving BF gas have been conceptualised:

1. Accidental release of 39714 kg of CO from BF gas holder into the atmosphere leading to explosive vapour cloud (referred from onsite emergency plan and disaster control, 2015).
2. Explosion associated with 9531 kg of hydrogen due to catastrophic release of BF gas from BF gas holder (referred from onsite emergency plan and disaster control, 2015).
3. Accidental release of 2544 m^3 of CO into the atmosphere in case of rupture of BF gas piping near N gate leading to explosive vapor cloud.
4. Explosion associated with 611 m^3 of hydrogen into the atmosphere from BF gas piping near N gate due to rupture.

Basis of calculation of inventory for BF gas piping scenarios is explained in section 9.7.

9.4.2 LD gas

1. Accidental release of 70,000 m^3 & 42000 m^3 of CO from LD holders into the atmosphere leading to explosive vapour cloud.
2. Explosion associated with 3000 m^3 & 1800 m^3 of hydrogen due to catastrophic release of LD gas from LD gas holder into the atmosphere.

9.4.3 CO (Coke Oven) gas

1. Accidental release of 1643 kg of CO from CO gas holder into the atmosphere leading to explosive vapour cloud (referred from onsite emergency plan and disaster control, 2015).
2. Explosion associated with 10,045 kg of hydrogen from CO gas holder due to catastrophic release of CO gas into the atmosphere (referred from onsite emergency plan and disaster control, 2015).
3. Accidental release of 44 m^3 of CO in case of rupture of CO gas piping to tubes division leading to explosive vapor cloud.
4. Explosion associated with 269 m^3 of hydrogen rupture of CO gas piping to tubes division.

Basis of calculation of inventory for CO gas piping scenarios is explained in section 9.7.

9.4.4 Fire and Explosion associated with Propane storage

In TSLW, there are 03 bullets of Propane with total inventory of 150 MT and each having inventory of 50 MT. TSLW has adopted requisite safety measures in the storage area as per statutory provisions.

Propane is a colourless and odourless gas. It has the ability to flash back, explode within an enclosed space. It is heavier than air. Therefore, it experiences lesser buoyant force at atmospheric temperature and tends to accumulate in the trenches, pits, and low-lying areas. It is a flammable gas, so it may be ignited from flames, heat, sparks, static electricity and operational electrical switches. It can react violently with oxidising material such as Chlorine. Thus, the use of Propane within the TSLW premise/pipeline may lead to the occurrence of various scenarios.

The following scenarios have been considered for the consequence modelling.

1. Catastrophic failure of a Propane bullet (Inventory = 45 MT) leading to Vapour Cloud Explosion (VCE)
2. Accidental release of propane from propane unloading tanker (Inventory = 16.8 MT) leading to fire and explosion
3. Unloading hose rupture of propane tanker (Inventory = 16.8 MT) leading to fire and explosion
4. Accidental release of propane from propane discharge line of 10 meters length, 100mm diameter and operating at a flow rate of 600 kg/hr.

9.4.5 Fire and Explosion associated with Hydrogen in tanks in TSLW

There are 04 hydrogen bullets in CRM area of the plant with inventory of 50 m^3 each. Hydrogen is stored at ambient temperature and 9.68 atm. operating pressure. For transferring of hydrogen, a line of diameter 100 mm is used for both inlet and outlet. Dimension of each gas holder is: Height = 17.3 m and Diameter = 1.92 m. For emergency scenario, only the worst-case scenario of containment failure has been considered.

Hydrogen-oxygen and/or Hydrogen-pure air flames are colourless. These colourless flames can flashback and can cause severe burns. It poses the fire and explosion hazards.

The following scenarios have been considered for the consequence modelling.

1. Catastrophic rupture of Hydrogen buffer vessel (Inventory=50 m^3) leading to fire and explosion

9.4.6 Fire associated with LDO (from largest tank with inventory = 1000 kl)

LDO is a flammable liquid and has high flash point of > 66^{O}C. It implies that normally it does not present a major fire hazard. In case of accidental spillage, it will remain within the available dyke. Under major persistent external heat source in the vicinity, pools of LDO can be ignited to start pool fire. For the consequence analysis, n-Heptane as a nearest alkane has been considered. The pool fire due to release of entire quantity from a tank (modelled quantity =900 Kl).

Inventory = 900 Kl P and T = Ambient

Dyke length = 30 m width = 25 m

Tank height = 7.5 m Dia. = 13.4 m

The following scenarios have been considered for the consequence modelling.

1. Catastrophic rupture of LDO tanker (Inventory = 22 m3) at PH3
2. Catastrophic rupture of LDO tanker (Inventory = 20 m3) at PH4
3. Catastrophic rupture of LDO tanker at PH5
4. Rupture of tanker hose at LDO PH3
5. Rupture of tanker hose at LDO PH4
6. Rupture of tanker hose at LDO PH5

9.4.7 Fire associated with Diesel Unloading Tanker (Inventory = 24 kl)

Diesel road tankers are used to bring in diesel in the premises and these are then transferred to storage tanks via flexible hoses. The flexible hoses are susceptible to leakage and ruptures. The worst-case scenario pertaining to these road tankers are the catastrophic rupture of these road tankers releasing the entire inventory to atmosphere. n-heptane was considered as a nearest alkane for consequence modelling. These tankers are present in the premises for short duration only, but they pose a significant hazard. The following scenarios were considered for consequence analysis

1. Catastrophic rupture of Diesel tanker (Inventory = 24 kl)
2. Rupture of tanker hose at Diesel Tanker

9.4.8 Fire associated with Petrol (Unloading Tanker (Inventory = 24 kl)

Petrol road tankers are used to bring in Petrol in the premises and these are then transferred to Petrol Dispenser storage tanks via flexible hoses. The flexible hoses are susceptible to leakage and ruptures. The worst-case scenario pertaining to these road tankers are the catastrophic rupture of these road tankers releasing the entire inventory to atmosphere. n-hexane was considered as a

nearest alkane for consequence modelling. Though these tankers are brought in the premises based on demand and they are present in the premises for a short duration of time. They pose a hazard which can escalate to major onsite scenario any offsite impacts from them is unlikely. The following scenarios were considered for consequence analysis

1. Catastrophic rupture of petrol tanker (Inventory = 24 kl)
2. Rupture tanker hose at petrol tanker

9.4.9 Fire associated with IPA (4000 Litre Tank)

In case of accidental spillage, it will remain within the available dyke. The Explosion and pool fire due to release of entire quantity from tank (modelled quantity =4000 l) was considered as the worst-case scenario. Since sprinkler and deluge system is available in the facility it was concluded that vapour cloud explosion is the worst-case scenario. However, the likely hood of a vapour cloud explosion is low as the storage area is naturally ventilated and is in open area without congestion.

9.5 Meteorological information for consequence analysis

The probable vulnerable zones because of accidental releases of hazardous chemicals will depend on various factors viz., the amount of quantity stored, storage temperature and pressure, atmospheric stability classes, wind speed and direction etc. During summer season, TSLW area experiences maximum temperature about 44^{O}C with high surface winds and in winter months, the minimum temperature reach about 8^{O}C. The relative humidity is in the range of 43% to 76% and during rainy season, it may reach near 90%. The prevailing wind direction is westerly except for the winter months, when it has northernly component. As per the meteorological data given by the TSLW, the predominant wind speed within the plant area is about 2-3 m/s. All this information has been taken from the data taken by TSLW at the site.

Prevailing atmospheric conditions (meteorological, solar radiation, cloud amount etc.) at the time of accident largely controls the extent of vulnerable zones. The physical state of the atmosphere is usually best described by Pasquill-Gifford stability class A (very unstable) to F (very stable). Table 9.5 explains the details of various stability classes. Pasquill-Gifford atmospheric stability conditions are determined on the basis of surface wind speed, solar radiation, cloud amount etc.

Table 9.5: Pasquill-Gifford Atmospheric Stability Classes

Surface wind speed (at 10 m) in m/s	Day			Night	
	Incoming Solar Radiation			Amount of overcast	
	Strong	Moderate	Slight	> 4/8 low Cloud	< 3/8 low Cloud
<2	A	A – B	B		

Surface wind speed (at 10 m) in m/s	Day			Night	
	Incoming Solar Radiation			Amount of overcast	
	Strong	Moderate	Slight	> 4/8 low Cloud	< 3/8 low Cloud
2 – 3	A – B	B	C	E	F
3 – 5	B	B – C	C	D	E
5 – 6	C	C – D	D	D	D
>6	C	D	D	D	D

The atmospheric characteristics of a particular site experience in general, almost all types of stability classes during a season (summer, winter and rainy). For example, in summer months, when the temperature is high for a sufficient amount of time, a particular site like Jamshedpur may experience unstable (A/B class) condition in noon time, neutral (D class) for majority of the time and also stable condition (E/F) in the late night. In winter months, when the solar radiation is weak to moderate with a considerable surface wind speed, the atmospheric conditions may correspond to C/D class, E and F class in the late night and early morning. However, the neutral class (D) of atmospheric condition exists for most of the time in a day in a particular season; and hence it is considered as the most representative class for a particular site and in a particular season (summer, rainy or winter).

The other average meteorological parameters considered in the analysis are as follows: ambient temperature = 35^0C, relative humidity = 50%, roughness parameter = 0.17 (industrial area), three stability classes, i.e., B (unstable), D (neutral) and F (very stable) class with wind speeds of 1.5 m/s to 3 m/s. Predominant wind speed at the site is about 2-3 m/s. Hence for representative cases, D class with wind speed of 3 m/s has been considered.

9.6 Flammable, explosive and toxicological levels considered

The following levels corresponding to severe, moderate and low damage levels have been considered.

Table 9.6a: Toxicological levels considered for consequence analysis

Vulnerable Zones	Concentration (in ppm) and damage levels considered for BF/LD/CO gas
RED zone: Severely affected zone. ORANGE Zone: Moderately affected zone BLUE Zone: Low impact zone	50% Fatality level (CCPS) = 3696 ppm for 20 minutes exposure IDLH = 1200 ppm for 30 minutes exposure STEL = 400 ppm for 15 minutes exposure

Table 9.6b: Flammable and explosive levels considered for consequence analysis

Vulnerable Zones	Radiation Intensity (kW/m^2) Levels for Propane, hydrogen and LDO	Explosion Overpressure (psi) levels for Propane, CO and hydrogen
RED zone: Severely affected zone.	37.5 kW/m^2	7 psi.
ORANGE Zone: Moderately affected zone	12.5 kW/m^2	3 psi
BLUE Zone: Low impact zone	4.5 kW/m^2	1 psi.

9.7 Consequence Analysis Results and Discussion

The following table will provide the consequence results of all scenarios:

Table 9.7: Consequence Results

S. No	Scenarios	Distance to concentration results			Jet fire radiation downwind damage distances in m			Pool fire radiation downwind damage distances in m			Over pressure damage distances in m			Toxic damage distances in m			
		3D Weather Condition			3D Weather Condition			3D Weather Condition			3D Weather Condition			Weather Condition			
		UFL	LFL	LFL Frac	4.5	12.5	37.5	4.5	12.5	37.5	1	3	7	3D	2B	2D	1.5F
		M			kW/m2			kW/m2			psi						
Storage																	
1	Accidental release of CO from LD gas holder (100000 kL)	15.93	46	78	NA	NA	NA	NA	NA	NA	427.94	196.92	136.46	225	184	175	134
2	Accidental release of H2 from LD gas holder (100000 kL)	5.24	22.71	27.15	NA	NA	NA	NA	NA	NA	153.25	78.6	64.8	NA	NA	NA	NA
3	Accidental release of CO from LD gas holder (60000 kL)	13.39	38.56	65.97	NA	NA	NA	NA	NA	NA	352.39	161.43	111.46	185	148	147	109
4	Accidental release of H2 from LD gas holder (60000 kL)	4.36	19.5	23.43	NA	NA	NA	NA	NA	NA	132.08	66.61	54.96	NA	NA	NA	NA
5	Accidental release of H2 from catastrophic rupture of Hydrogen buffer	1.98	13.5	23.87	NA	NA	NA	NA	NA	NA	84.96	39.14	28.27	NA	NA	NA	NA
6	Accidental release of IPA	3.57	11.93	18.18	NA	NA	NA	14.36	9.68	3.54	24.92	15.8	13.4	NA	NA	NA	NA
7	Accidental release of CO from BF gas holder (150000 kL)	1.68	41.06	82.86	NA	NA	NA	NA	NA	NA	183	100	95	312	244	265	237
8	Accidental release of CO from Coke oven gas holder (50000 kL)	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.53	13.21	12.40	145.42	119.83	157.17	131.67

S. No	Scenarios	Distance to concentration results			Jet fire radiation downwind damage distances in m			Pool fire radiation downwind damage distances in m			Over pressure damage distances in m			Toxic damage distances in m			
		3D Weather Condition			3D Weather Condition			3D Weather Condition			3D Weather Condition			Weather Condition			
		UFL	LFL	LFL Frac	4.5	12.5	37.5	4.5	12.5	37.5	1	3	7	3D	2B	2D	1.5F
		M			kW/m2			kW/m2			psi						
Tankers																	
1	Accidental release of Propane unloading tanker at Propane unloading facility	24.96	55.19	90.70	NA	NA	NA	NA	NA	NA	414.0	195.9	140.0	NA	NA	NA	NA
2	Accidental release of LDO unloading tanker at PH3	61.89	73.90	76.18	NA	NA	NA	81.7	43.7	NR	129.08	92.96	83.51	NA	NA	NA	NA
3	Accidental release of LDO unloading tanker at PH4	59.57	71.03	73.21	NA	NA	NA	78.8	42.2	NR	128.08	92.58	83.29	NA	NA	NA	NA
4	Accidental release of Diesel unloading tanker	64.10	76.63	79.01	NA	NA	NA	84.5	45.3	NR	130.00	93.32	83.73	NA	NA	NA	NA
5	Accidental release of Petrol unloading tanker	43.26	103.6	147.87	NA	NA	NA	74.6	34.3	NR	261.6	177.5	159.6	NA	NA	NA	NA
Piping																	
1	Rupture of propane discharge line	0.76	1.63	3.53	NA	NA	NA	NA	NA	NA	NR	NR	NR	NA	NA	NA	NA
2	Release of CO from CO gas piping to tubes division due to rupture	0.73	3.33	4.67	NA	NA	NA	NA	NA	NA	NR	NR	NR	86	72	103	NA
3	Release of H2 from CO gas piping to tubes division due to rupture	2.11	12.59	16.93	NA	NA	NA	NA	NA	NA	72.32	35.84	29.32	NA	NA	NA	NA
4	Release of CO from BF gas piping near N gate due to rupture	5.15	14.56	20.2	NA	NA	NA	NA	NA	NA	136.7	59.25	38.98	60.17	54.12	54.58	52.85

S. No	Scenarios	Distance to concentration results			Jet fire radiation downwind damage distances in m			Pool fire radiation downwind damage distances in m			Over pressure damage distances in m			Toxic damage distances in m			
		3D Weather Condition			3D Weather Condition			3D Weather Condition			3D Weather Condition			Weather Condition			
		UFL	LFL	LFL Frac	4.5	12.5	37.5	4.5	12.5	37.5	1	3	7	3D	2B	2D	1.5F
		M			kW/m2			kW/m2			psi						
3	Release of H2 from BF gas piping near N gate due to rupture	2.95	15.99	20.98	NA	NA	NA	NA	NA	NA	89.84	47.12	38.32	NA	NA	NA	NA
4	Leak of PSV on propane bullet	17.71	68.22	155.38	131.5	105.1	86.8	NA	NA	NA	215.9	175.6	165.0	NA	NA	NA	NA
Hoses																	
1	Rupture of Propane tanker hose	24.96	55.19	90.70	NA	NA	NA	NA	NA	NA	414.06	195.99	140.03	NA	NA	NA	NA
2	Rupture of LDO PH3 tanker hose	13.38	13.51	13.53	NA	NA	NA	67.	29.9	NR	19.37	13.64	12.14	NA	NA	NA	NA
3	Rupture of LDO PH4 tanker hose	13.25	13.37	13.40	NA	NA	NA	65.5	28.9	NR	19.10	13.54	12.08	NA	NA	NA	NA
4	Rupture of Diesel tanker hose	13.76	13.89	13.91	NA	NA	NA	70.2	30.9	NR	19.69	13.77	12.22	NA	NA	NA	NA
5	Rupture of Petrol tanker hose	11.06	63.53	93.39	NA	NA	NA	69.5	27.7	NR	149.2	103.2	93.65	NA	NA	NA	NA

Table 9.8: Inventory Calculation for Piping for Reference

S. No	Scenarios	Material	P (Kg/cm^2)	T (°C)	Dia (mm)	Dia (m)	Length (m)	Inventory (m^3)	Inventory considered for release (m3)
1	Rupture of propane discharge line	Propane	5.5	40	100	0.1	10	0.079	0.079
2	Release of CO from CO gas piping to tubes division due to rupture	CO	0.1	40	600	0.6	1730	489.146	44.023
3	Release of H2 from CO gas piping to tubes division due to rupture	H2	0.1	40	600	0.6	1730	489.146	269.030
4	Release of CO from BF gas piping near N gate due to rupture	CO	0.08	atm	3000	3.0	1000	10178.760	2544.690
5	Release of H2 from BF gas piping near N gate due to rupture	H2	1.08	atm	3000	3.0	1000	10178.760	610.726

Length – Length of the pipeline (collected during site visit)

Dia – Nominal Diameter of the pipeline

Inventory of the scenario is calculated using formula ($\pi r^2 l$)

Inventory considered for the release (of respective scenarios) is calculated using volume percentages as per MSDS provided. Below shall be referred for more details.

- ✓ CO from CO gas piping – 489.146*(vol % of CO in CO gas) = 489.146*0.09 = 44.023 m^3
- ✓ H2 from CO gas piping – 489.146*(vol % of H2 in CO gas) = 489.146*0.55 = 269.03 m^3
- ✓ CO from BF gas piping – 10178.76*(vol % of CO in BF gas) = 10178.76*0.25 = 2544.69 m^3
- ✓ H2 from BF gas piping – 10178.76*(vol % of H2 in BF gas) = 10178.76*0.06 = 610.726 m^3

9.7.1 Discussion of consequence analysis results for toxic effects

Toxicity nature of gas (equivalent CO) for the aforementioned scenarios is modelled using DNVGL's Phast and Safeti 8.1 version. The consequence analysis results in terms of maximum downwind distances under various atmospheric stability conditions have been shown in Table 9.7.

The consequence distances will be the most if the release occurs in stable atmosphere (F class). In unstable atmospheric conditions, the distances will be the least. Though there are several incidences of gasholder fire and explosion resulting into the release, the frequency of occurrence of such catastrophic release scenarios in TSLW is very remote as is evident from the safety measures adopted in the unit.

It is understood that worst case scenarios arising from Gas release from the holders (BF/CO/LD) will have toxic impact in the range of 237 m to 312 m for 3696 ppm of CO under neutral stability class (D) and 3.0 m/s. The worst-case scenario associated with the toxic impact is accidental release of CO from BF gas holder (1,50,000 m^3) due emergency. However, in terms of impact on outside population piping rupture scenario near N Road Gate will have the impact up to 180.17 m and piping rupture scenario before tube division will have the impact up to 103 m (For TSL Boundary 3696 PPM and for outside population 1200 PPM Effect Zone is considered)

In addition, for planning purposes, the consequence contours for various worst-case release scenarios considered are depicted on AutoCAD drawings and Layout/Google maps of TSLW. These drawings show the locations and areas in TSLW coming under impact zones, radiation heat intensity levels and explosion overpressure levels.

9.7.1.1 BF Gas

In the event of rupture of BF gas piping near N road gate, the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 60.17 m in 3D weather condition, 54.12 m in the 2B weather condition, 54.58 m in the 2D weather condition, 52.85 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 3D weather condition is prevailing up to 180 meters The Foot prints of CO gas for the same are depicted below.

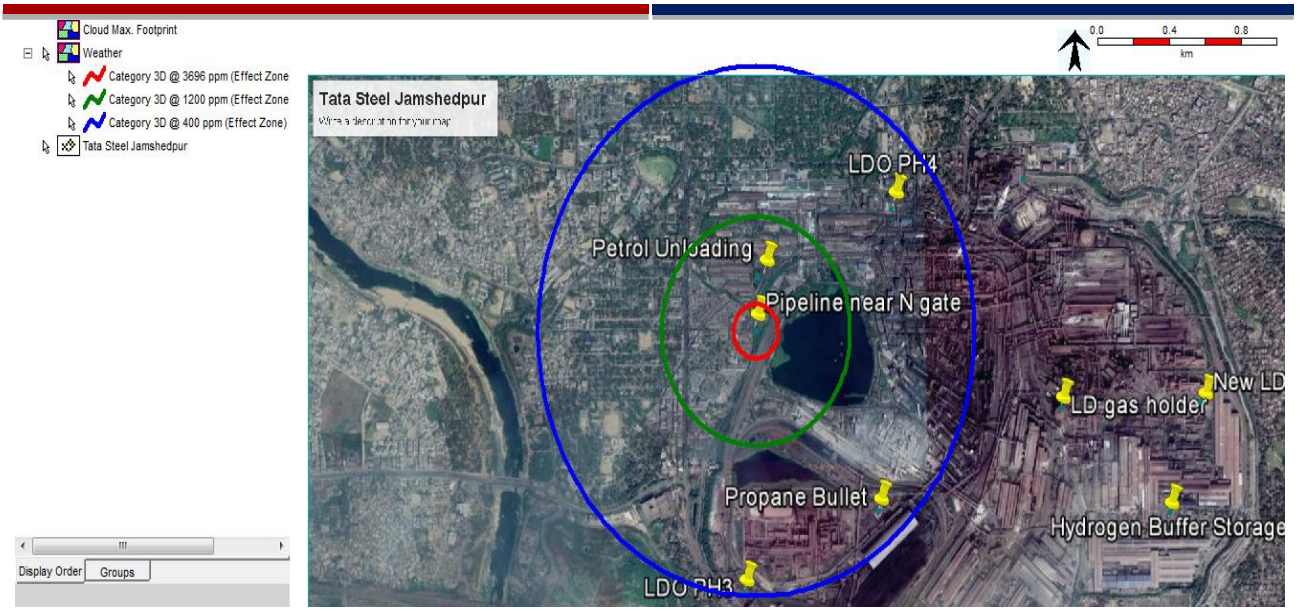


Figure 9.1: Foot prints of CO gas due to catastrophic rupture of BF gas piping near N Road Gate

In the event of catastrophic release of BF gas holder (150000 m^3), the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 312 m in 3D weather condition, 244 m in the 2B weather condition, 265 m in the 2D weather condition, 237 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 3D weather condition is prevailing up to 518 meters.

The Foot prints of CO gas for both 3696 PPM & 1200 PPM (Effect Zone) are depicted below.

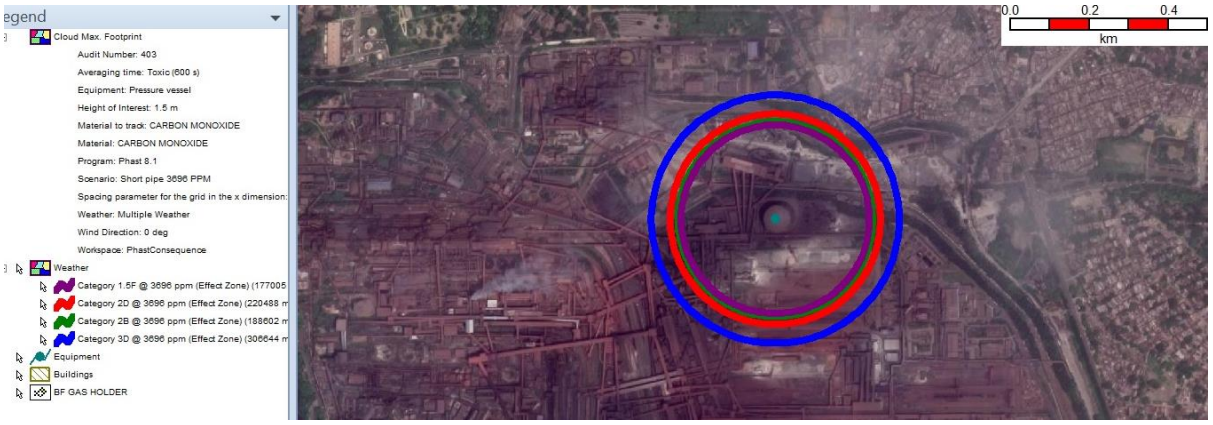


Figure 9.1a : Foot prints of CO gas due to catastrophic release of BF gas Holder (3696 PPM)

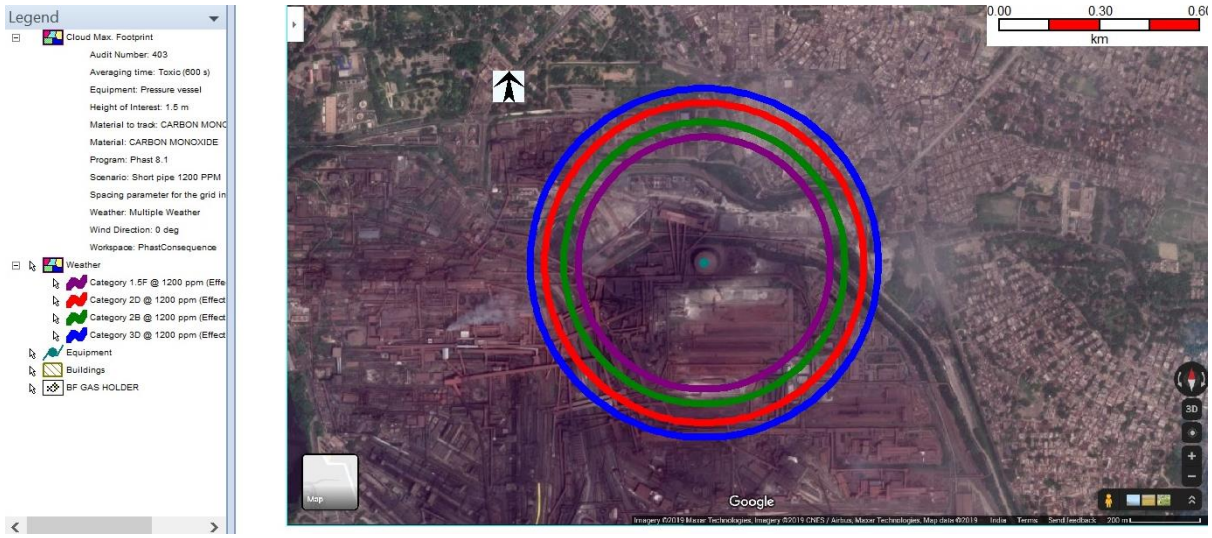


Figure 9.1b : Foot prints of CO gas due to catastrophic release of BF gas Holder (1200 PPM)

9.7.1.2 LD Gas

In the event of catastrophic release of LD gas holder (100000 m^3), the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 225 m in 3D weather condition, 184 m in the 2B weather condition, 175 m in the 2D weather condition, 134 m in the 1.5F weather condition. The Foot prints of CO gas for the same are depicted below.

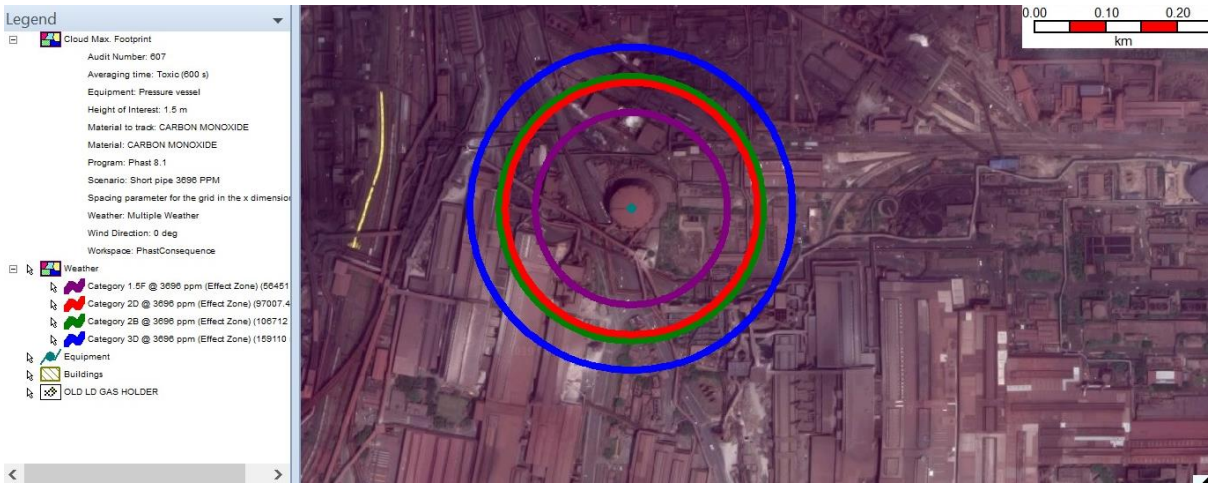


Figure 9.2: Foot prints of CO gas for the catastrophic release from LD gas holder (100000 m^3)

In the event of catastrophic release of LD gas holder (60000 m3), the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 185 m in 3D

weather condition, 148 m in the 2B weather condition, 147 m in the 2D weather condition, 109 m in the 1.5F weather condition. The foot prints of CO gas for the same are depicted below.

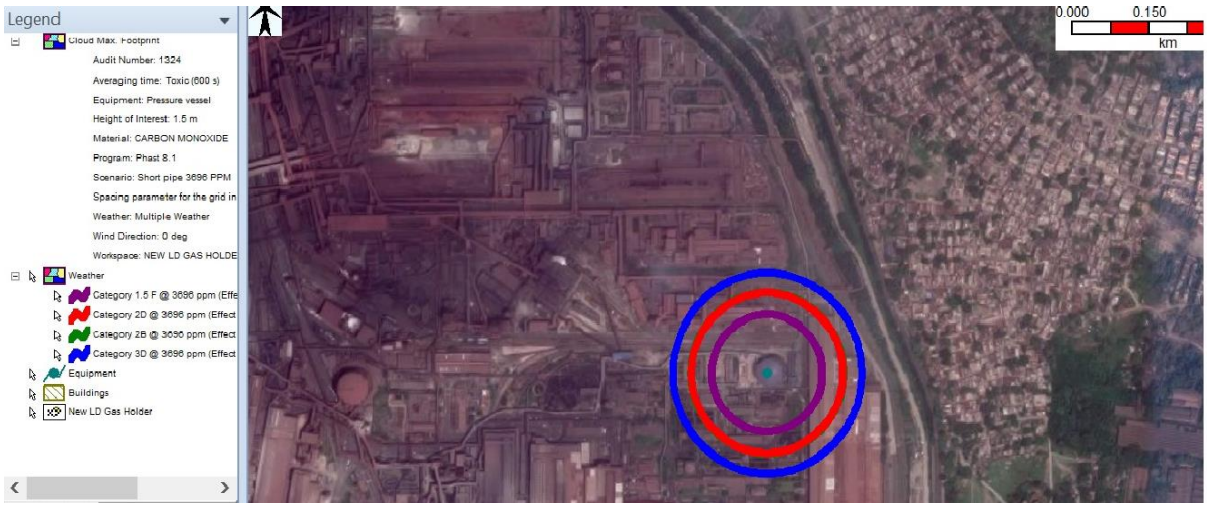


Figure 9.3: Foot prints of CO gas for the catastrophic release from LD gas holder (60000 m^3)

9.7.1.3 CO Gas

In the event of rupture of CO gas piping to tubes division, the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 27.93 m in 3D weather condition, 23.23 m in the 2B weather condition, 22.65 m in the 2D weather condition, 18.36 m in the 1.5F weather condition. However, the Concentration of 1200 ppm (Corresponding to IDLH toxicity level) for 2D weather condition is prevailing up to 103 meters The Foot prints of CO gas for the same are depicted below.

Figure 9.4: Foot prints of CO gas due to catastrophic rupture of CO gas piping to tube division

In the event of catastrophic release of CO gas holder (50000 m^3), the concentration of 3696 ppm (corresponding to 50% toxicity fatality level) of CO would be prevalent till 145 m in 3D weather condition, 120 m in the 2B weather condition, 157 m in the 2D weather condition, 132 m in the 1.5F weather condition. The Foot prints of CO gas for the same are depicted below.

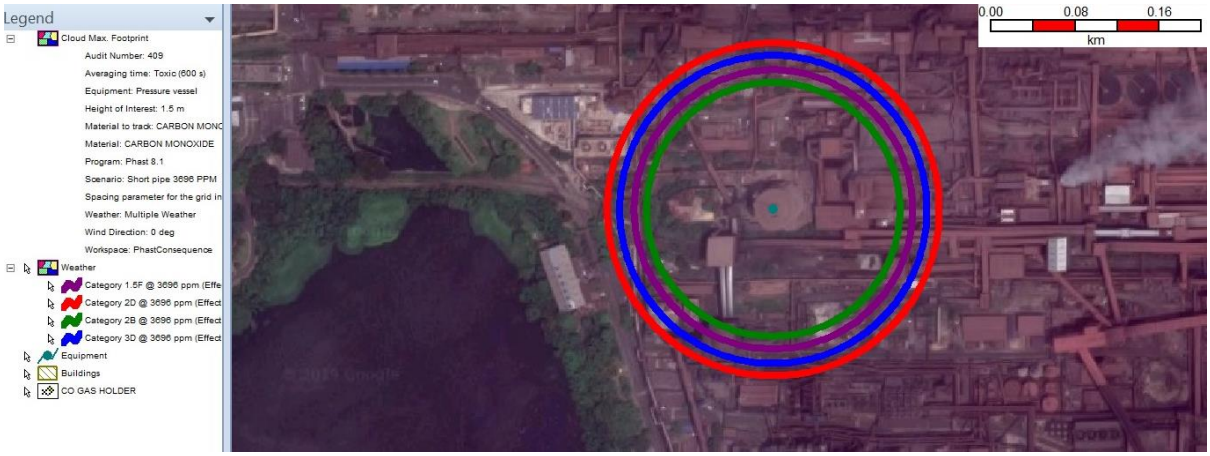


Figure 9.4a : Foot prints of CO gas due to catastrophic release of CO gas Holder

9.7.2 Discussion of consequence analysis results for flammable effects

The consequence analysis results in terms of maximum downwind distances for LFL, LFL fraction and explosion overpressure is shown in Table 9.7.

It is observed that all the consequences (flash fire and overpressure) will be limited with in the plant boundary and since this is a controlled environment measure to reduce any chance of ignition are implemented, which will aid in free dispersion and further dilution.

In addition, for planning purposes, the consequence contours for various worst-case scenarios considered are depicted on layout and google maps of TSLW with flash fire impact zones and explosion overpressure levels.

9.7.2.1 BF Gas

In the event of loss of containment due to catastrophic rupture and accidental release of CO from BF gas piping near N road gate, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 136.7 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 59.25 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 38.98 m. The explosion overpressure contours for the release of CO from BF gas piping is presented below.

Figure 9.5: Explosion Overpressure for the release of CO from BF gas piping near N road gate

In the event of loss of containment due to catastrophic rupture and accidental release of hydrogen from BF gas piping near N road gate, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 89.84 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 47.12 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 38.32 m. The explosion overpressure contours for the release of H_2 from BF gas piping near N road gate is presented below.

Figure 9.6: Explosion Overpressure for the release of H_2 from BF gas piping near N road gate

9.7.2.2 LD Gas

In the event of loss of containment due to catastrophic rupture and accidental release of CO from LD gas holder (100000 m3), availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 427.94 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 196.92 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 136.46 m.

The explosion overpressure contours for the release of CO from LD gas holder is presented below.

Figure 9.7: Explosion Overpressure for the release of CO from LD Gas holder (100000 m^3)

In the event of loss of containment due to catastrophic rupture and accidental release of Hydrogen from LD gas holder (100000 m^3), availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 153.25 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 78.6 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 64.8 m. The explosion overpressure contours for the release of Hydrogen from LD gas holder is presented below.

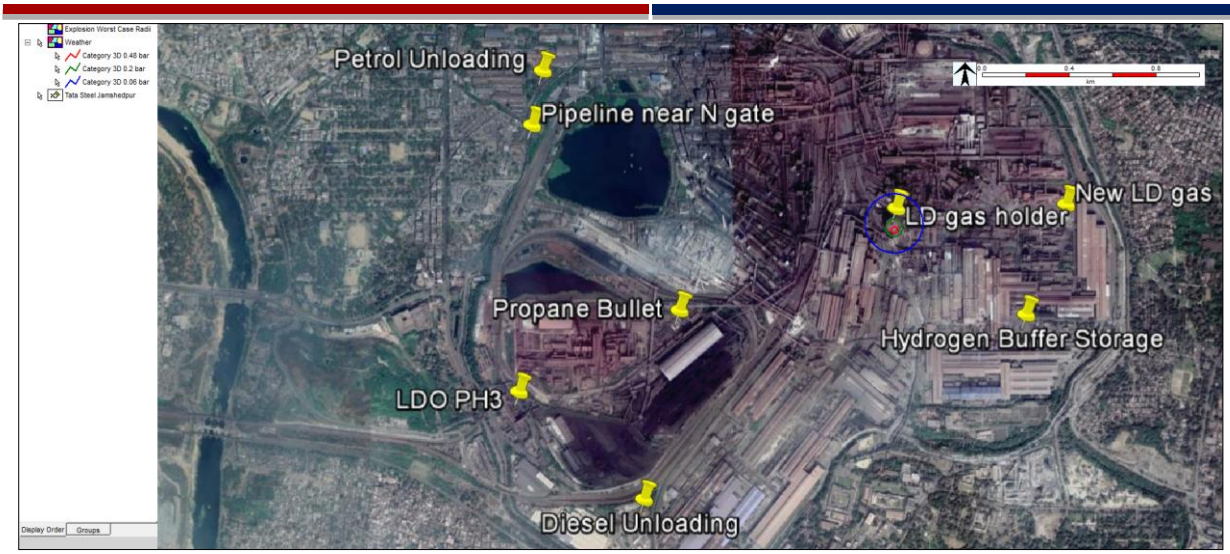


Figure 9.8: Explosion Overpressure for the release of H_2 from LD Gas holder (100000 m^3)

In the event of loss of containment due to catastrophic rupture and accidental release of CO from LD gas holder (60000 m3), availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 352.39 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 161.43 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 111.46 m. The explosion overpressure contours for the release of CO from LD gas holder is presented below.

Figure 9.9: Explosion Overpressure for the release of CO from LD Gas holder (60000 m^3)

In the event of loss of containment due to catastrophic rupture and accidental release of Hydrogen from LD gas holder (60000 m3), availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 132.08 m, 3 psi (Heavy machines (3000 lb) in industrial

building suffered little damage; steel frame building distorted) up to a distance of 66.61 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 54.96 m.

The explosion overpressure contours for the release of Hydrogen from LD gas holder is presented below.

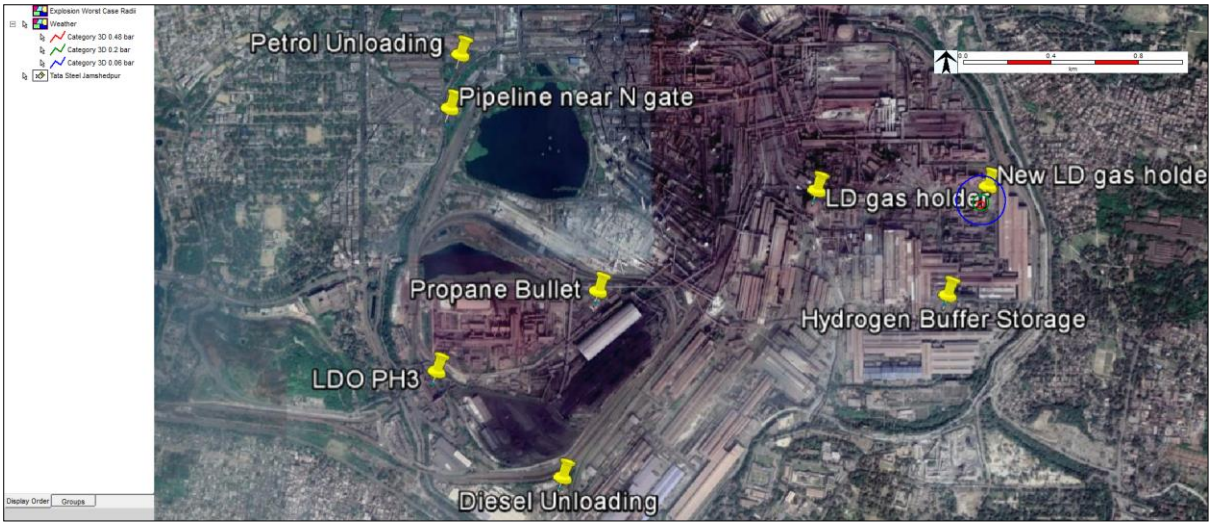


Figure 9.10: Explosion Overpressure for the release of H_2 from LD Gas holder (60000 m^3)

9.7.2.3 CO Gas

The explosion overpressure envelopes and centre line concentration of CO gas with distance graphs for the release of CO & H_2 from CO gas holder referred from onsite emergency plan and disaster control, 2015 are presented in **Annexure A.**

In the event of loss of containment due to catastrophic rupture and accidental release of H_2 from CO gas piping to tubes division, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 72.32 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 35.84 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 29.32 m.

The explosion overpressure contours for the release of H_2 from CO gas piping to tubes division is presented below.

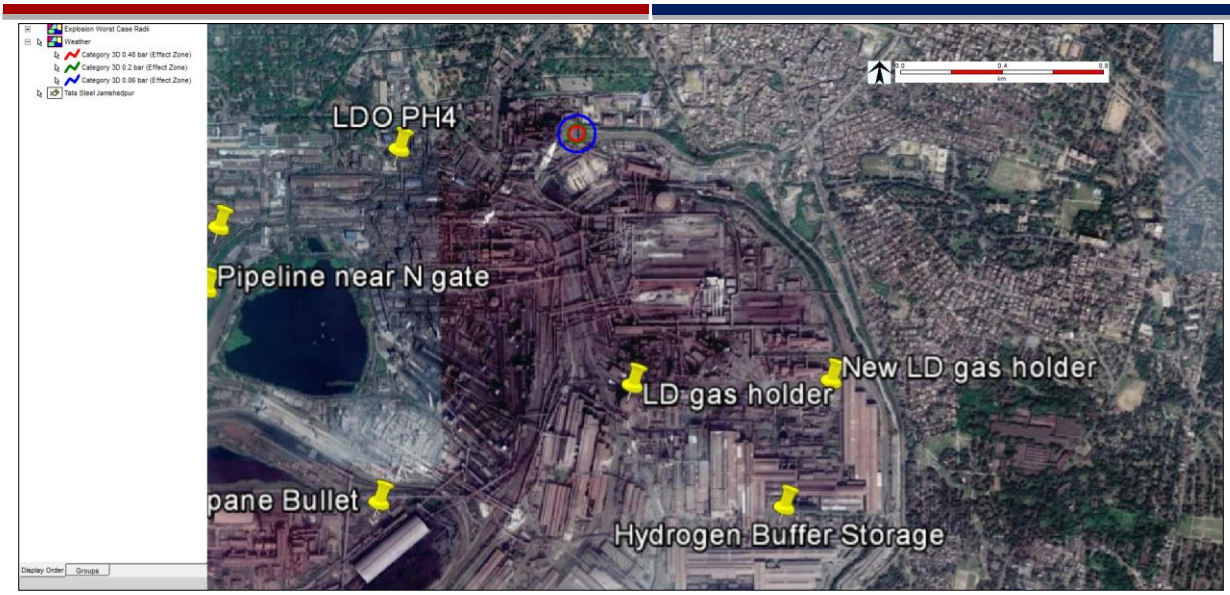


Figure 9.11: Explosion Overpressure for the release of H_2 from CO gas piping to tube division

9.7.2.4 Propane

In the event of loss of containment due to catastrophic rupture of propane unloading tanker and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 414.0 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 195.9 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 140.0 m.

The explosion overpressure contours for the release of propane is presented below.

Figure 9.12: Explosion Overpressure for the release of propane unloading tanker

In the event of loss of containment due to catastrophic rupture of propane road tanker hose and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 414.06 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 195.99 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 140.03 m.

The explosion overpressure contours for the release of propane is presented below.

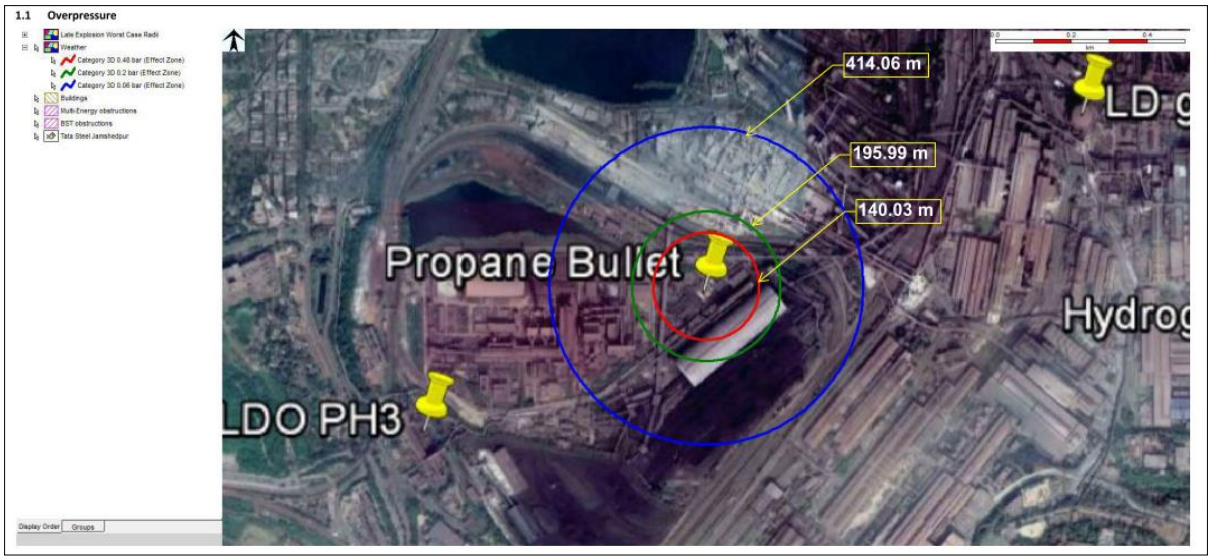


Figure 9.13: Explosion Overpressure for hose failure of propane road tanker

9.7.2.5 LDO & Diesel

In the event of loss of containment due to catastrophic rupture of LDO unloading tanker at PH3 and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 129.08 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 92.96 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 83.51 m.

The explosion overpressure consequence contours for the release of LDO is presented below.

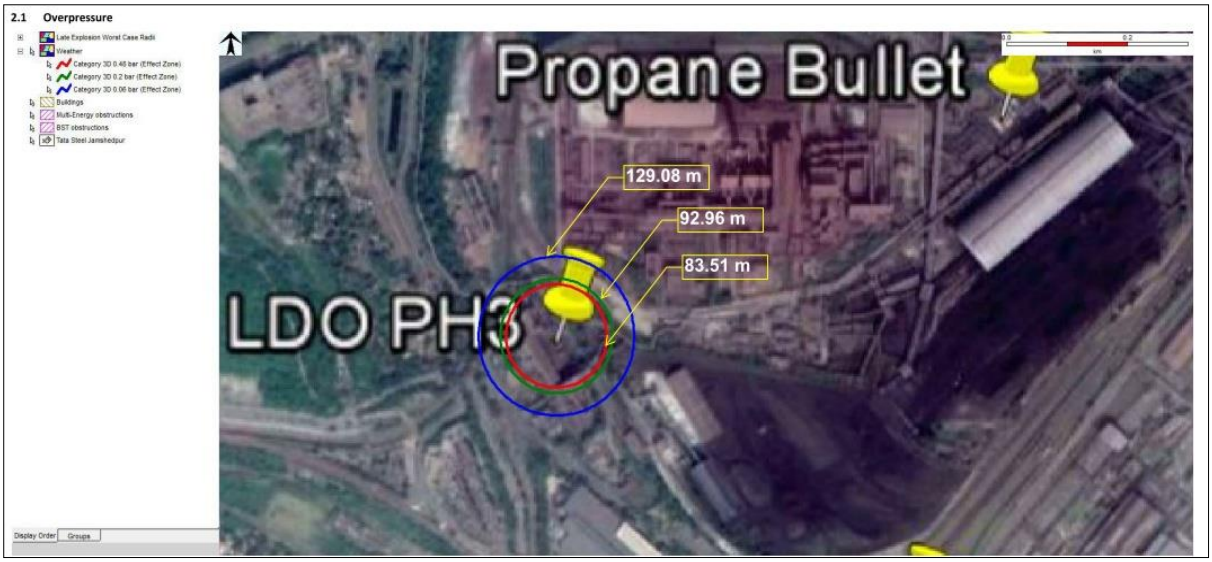


Figure 9.14: Explosion Overpressure for the release of LDO unloading tanker at PH3

In the event of loss of containment due to catastrophic rupture of LDO unloading tanker at PH4 and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 129.08 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 92.96 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 83.51 m.

The explosion overpressure consequence contours for the release of LDO is presented below.

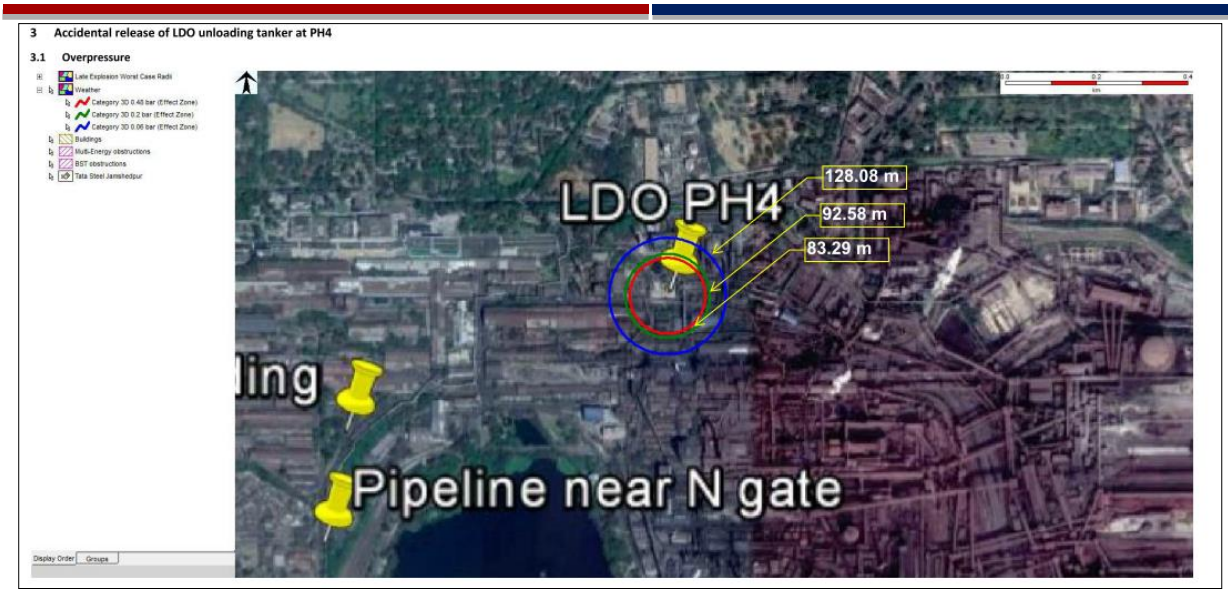


Figure 9.15: Explosion Overpressure for the release of LDO unloading tanker at PH4

In the event of loss of containment due to catastrophic rupture of Diesel unloading tanker and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 130.0 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 93.32 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 83.73 m. The explosion overpressure consequence contours for the release of Diesel is presented below.

Figure 9.16: Explosion Overpressure for the release of Diesel unloading tanker

9.7.2.6 Petrol

In the event of loss of containment due to catastrophic rupture of petrol unloading tanker and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 261.6 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 177.5 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 159.6 m.

The explosion overpressure contours for the release of petrol is presented below.

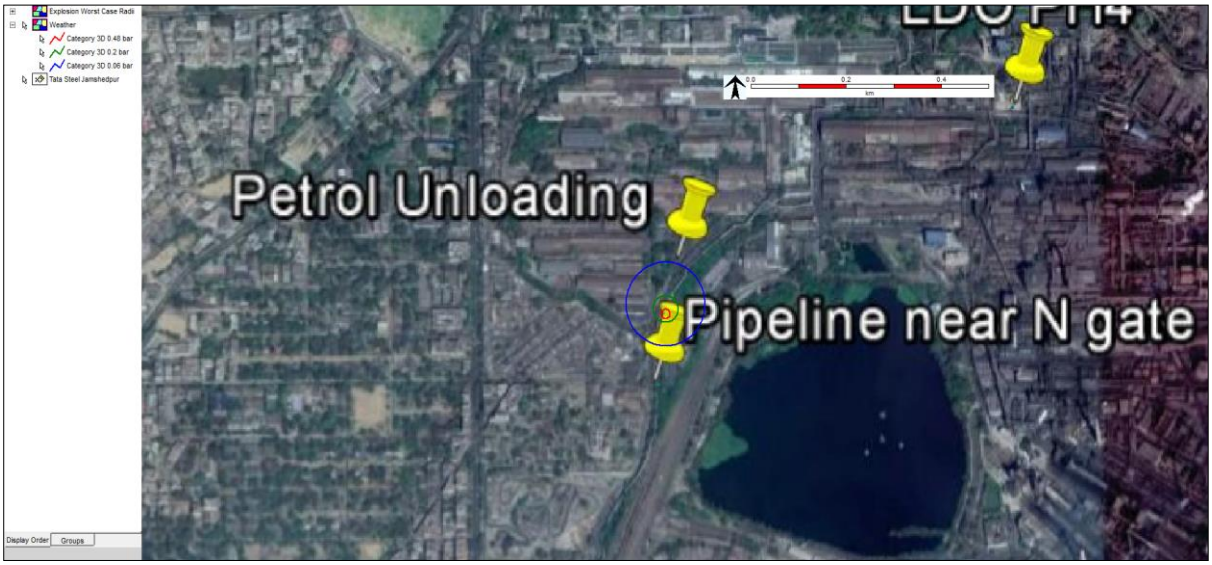


Figure 9.17: Explosion Overpressure for the release of petrol unloading tanker

In the event of loss of containment due to catastrophic rupture of petrol road tanker hose and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 149.02 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 103.2 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 93.65 m.

The explosion overpressure contours for the release of petrol is presented below.

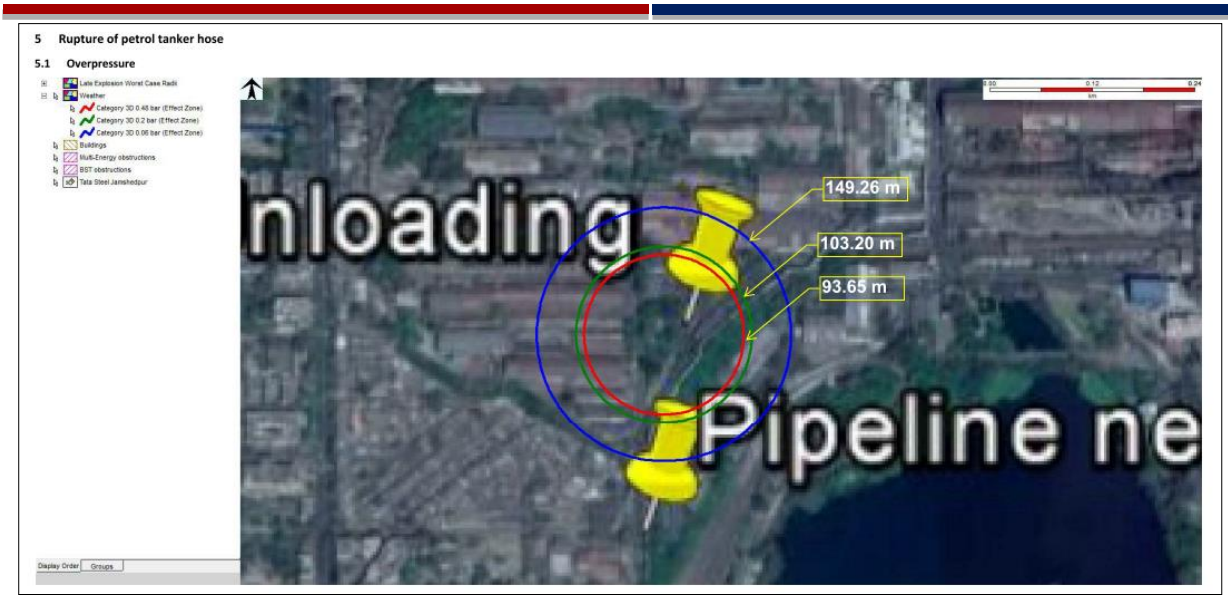


Figure 9.18: Explosion overpressure for Hose failure of petrol road tanker

9.7.2.7 IPA

In the event of loss of containment due to catastrophic rupture of IPA tank and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 24.92 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 15.8 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 13.4 m. The explosion overpressure contours for the release of IPA is presented below.

Figure 9.19: Explosion Overpressure for IPA Tank Catastrophic Rupture

9.7.2.8 Hydrogen Buffer

In the event of loss of containment due to catastrophic rupture of hydrogen buffer (50kL) and accidental release, availability of confinement and presence of ignition will lead to overpressure damage distances of 1 psi (Partial demolition of houses, made uninhabitable) up to a distance of 84.96 m, 3 psi (Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted) up to a distance of 39.14 m, over pressure of 7 psi (Loaded train wagons overturned) up to a distance of 28.27 m. The explosion overpressure contours for the release of hydrogen from hydrogen buffer tank/vessel is presented below.

Figure 9.20: Explosion Overpressure for Hydrogen buffer tank Catastrophic Rupture

9.8 Risk Assessment Discussion:

9.8.1 LOC Event Frequencies:

The failure frequency of LOC scenarios is listed below.

Table 9.9.1: LOC Event Frequencies

S. No	Scenarios	Base Failure Frequency (per year)	Failure Frequency for the Study (per year)
Storage			
1	Accidental release of CO from LD gas holder (100000 kL)	5.00E-07	5.00E-07
2	Accidental release of H2 from LD gas holder (100000 kL)	5.00E-07	5.00E-07
3	Accidental release of CO from LD gas holder (60000 kL)	5.00E-07	5.00E-07
4	Accidental release of H2 from LD gas holder (60000 kL)	5.00E-07	5.00E-07
5	Accidental release of H2 from catastrophic rupture of Hydrogen buffer	5.00E-07	5.00E-07
6	Accidental release of IPA	5.00E-07	5.00E-07
Road tankers			
1	Accidental release of Propane unloading tanker at Propane unloading facility	5.00E-07	5.00E-07
2	Accidental release of LDO unloading tanker at PH3	1.00E-05	1.00E-05
3	Accidental release of LDO unloading tanker at PH4	1.00E-05	1.00E-05
4	Accidental release of Diesel unloading tanker	1.00E-05	1.00E-05
5	Accidental release of Petrol unloading tanker	1.00E-05	1.00E-05
Piping			
1	Rupture of propane discharge line	2.00E-06	2.00E-05
2	Release of CO from CO gas piping to tubes division due to rupture	5.00E-07	8.65E-04
3	Release of H2 from CO gas piping to tubes division due to rupture	5.00E-07	8.65E-04
4	Release of CO from BF gas piping near N gate due to rupture	5.00E-07	5.00E-04
5	Release of H2 from BF gas piping near N gate due to rupture	5.00E-07	5.00E-04
6	Leak of PSV on propane bullet	1.00E-06	1.00E-06
Hoses			
1	Rupture of Propane tanker hose	4.00E-06	3.20E-04
2	Rupture of LDO PH3 tanker hose	4.00E-06	8.00E-05
3	Rupture of LDO PH4 tanker hose	4.00E-06	4.00E-05

S. No	Scenarios	Base Failure Frequency (per year)	Failure Frequency for the Study (per year)
4	Rupture of Diesel tanker hose	4.00E-06	1.20E-03
5	Rupture of petrol tanker hose	4.00E-06	2.00E-05

9.8.2 Risk Presentation

Individual Risk:

The Individual Risk represents the frequency of an individual dying due to loss of containment events (LOCs). The individual is assumed to be unprotected and to be present during the total exposure time. The Individual Risk is presented as contour lines on a topographic map. Overall individual risk contour for TSLW is presented in **Figure 9.21**.

Societal Risk:

The Societal Risk represents the frequency of having an accident with N or more people being killed simultaneously. The people involved are assumed to have some means of protection. The Societal Risk is presented as an FN curve, where N is the number of deaths and F the cumulative frequency of accidents with N or more deaths. F-N curve for TSLW is presented in **Figure 9.22**.

9.8.3 Risk Acceptance

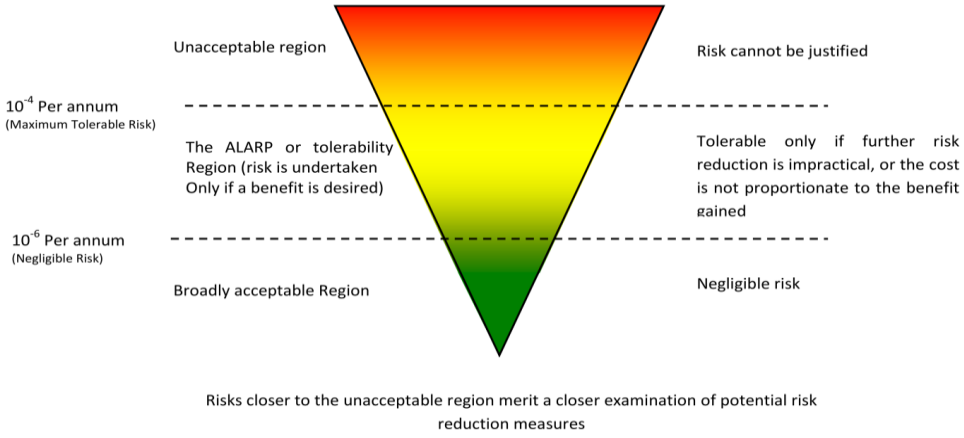
In India, there are no defined criteria for risk acceptance. The Extracts for the risk criteria adopted in some countries are presented below:

Table 9.9.2: Risk Acceptability Criteria

Authority and Application	Maximum Tolerable Risk (Per Year)	Negligible Risk (Per Year)
VROM, The Netherlands (New)	1.0E-6	1.0E-8
VROM, The Netherlands (Existing)	1.0E-5	1.0E-8
HSE, UK (Existing Hazardous Industry)	1.0E-4	1.0E-6
HSE, UK (New Industries)	1.0E-5	1.0E-6
HSE, UK (Substance Transport)	1.0E-4	1.0E-6
HSE, UK (New Housing Near Plants)	3 x 1.0E-6	3 x 1.0E-7
Hong Kong Government (New Plants)	1.00E-5	Not Used

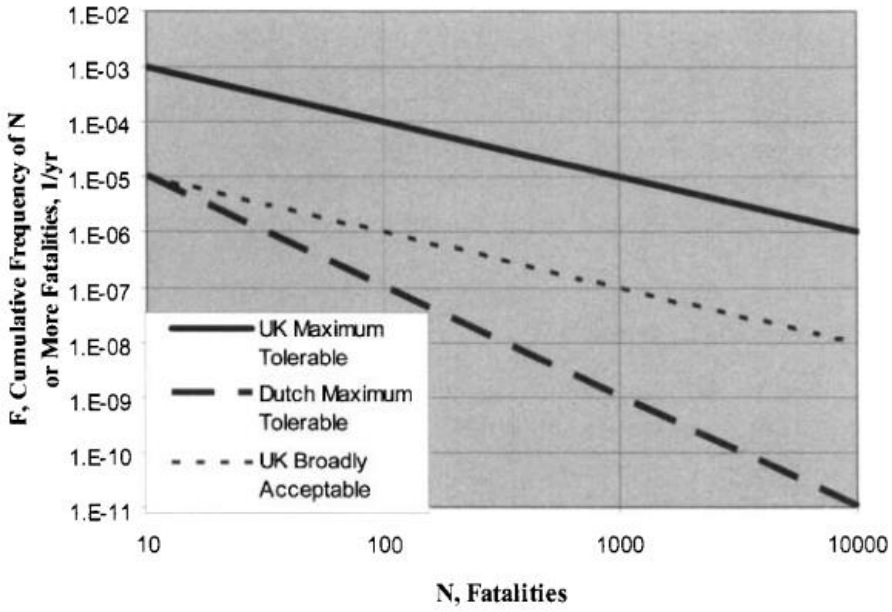
Bureau of Indian Standard prepared an Indian code of practice (IS:15656) on consequence and risk analysis in line with HSE, UK. The same as highlighted in the above table has been used for the study.

To achieve the above risk acceptance criteria, ALARP principle was followed while suggesting risk reduction recommendations.



Societal Risk Acceptance Criteria

UK Maximum tolerable and broadly acceptable lines will be considered for generating FN curve



Ref: CCPS-Guidelines for developing Quantitative Safety Risk Criteria – Wiley – AIChE (2009)

9.8.4 Risk Assessment Results & Discussion

Overall Individual Risk Contour for TSLW and Societal Risk given below

Figure 9.21: Overall Individual Risk Contour-TSLW facility (On Google Earth Image)

Table 9.9.3: Overall Individual Risk at Plant Boundaries

S No.	Location	Individual Risk /avg. year	Risk Level
1	LD Gas Holder	5.13E-08	Acceptable
2	New LD Gas Holder	4.87E-08	Acceptable
4	Propane bullet	1.24E-06	ALARP
5	LDO PH 3	1.41E-07	Acceptable
6	LDO PH 4	3.28E-06	ALARP
7	Diesel unloading	9.36E-07	Acceptable
8	Petrol unloading	2.61E-07	Acceptable

Legend:

Unacceptable	ALARP	Acceptable

Acceptability of Risk is provided as per UK HSE as follows:

- **Unacceptable Risk** : Risk greater than 1.00E-04 per average year
- **ALARP Risk** : Between 1.00E-04 and 1.00E-06 per average year
- **Acceptable Risk** : Risk less than 1.00E-06 per average year

Analysis:

With reference to the risk acceptance criteria specified by HSE, UK in IS 15656:2006 - Code of Practice on Hazard Identification and Risk Analysis it is observed that:

- The risk level at LD Gas Holder, New LD Gas Holder, Hydrogen buffer storage, LDO PH 3 & Diesel, Petrol unloading area found to be in Acceptable region.
- The risk levels at Propane bullet, LDO PH 4 areas are in ALARP region.

Societal Risk: FN Curve

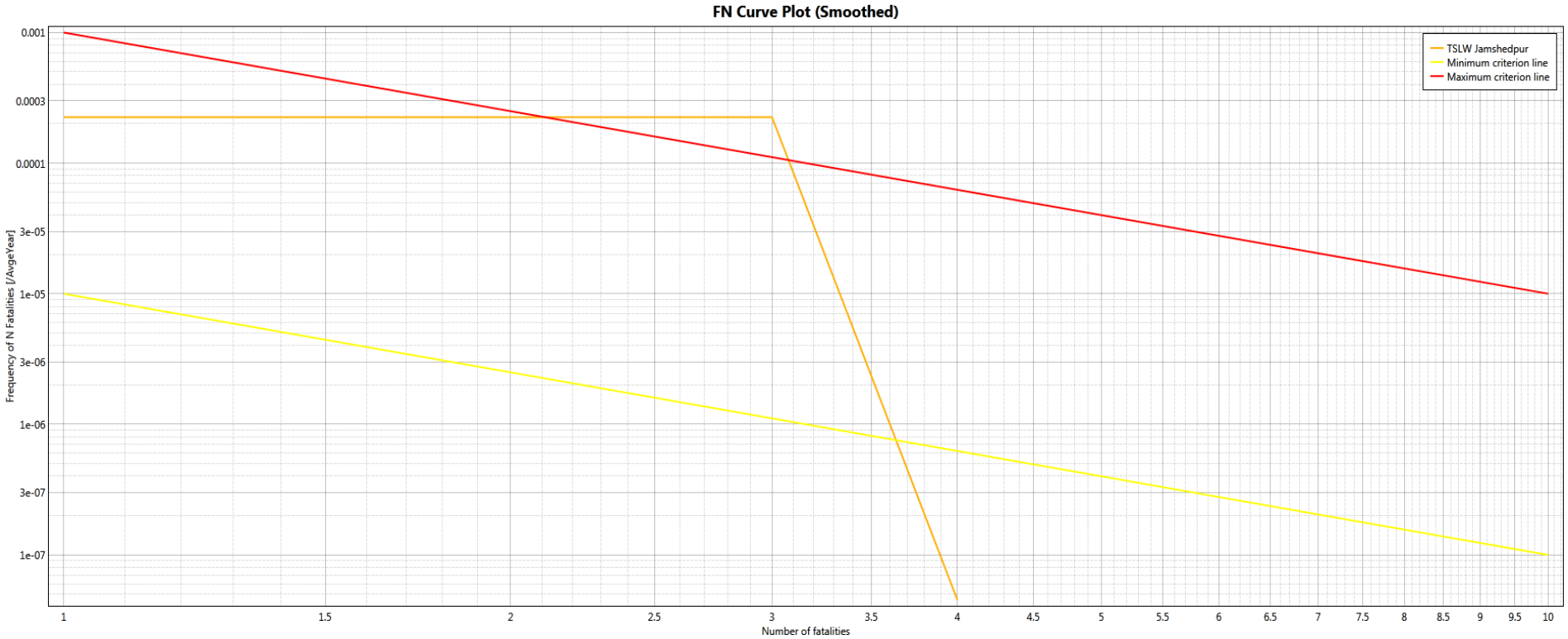


Figure 9.22: Societal Risk in terms of F-N Curve-TSLW Facility

Analysis:

The FN curve is provided with two lines namely red line (Maximum tolerable line) and yellow line (Broadly acceptable line). With reference to CCPS-Guidelines for developing Quantitative Safety Risk Criteria – Wiley – AIChE, 2009, the societal risk acceptance criteria specified for UK it is observed that the orange line falls above red lines. Hence it is inferred that the societal risk (F-N curve) levels of the TSLW mostly it is travelling in **ALARP region.**

SECTION X

ENUMERATE EFFECTS OF:

(I) STRESS AND STRAIN CAUSED DURING NORMAL OPERATION;

(II) FIRE AND EXPLOSION INSIDE THE PLANT AND EFFECT IF ANY, OF FIRE AND EXPLOSION OUTSIDE

10 Effects Enumeration

10.1 Nature of Process in TSLW In Relation to Stress and Strain Caused During Normal Operation

The details of hazards associated with the operations in TSLW have been described in Section 6 and in the supplements. In any industry during the operations, deviation from normal condition is very likely to occur. These deviations sometimes may result into certain stress and strain either in the equipment or to the control systems. The stress and strain generated so is nothing but the accumulation of the chemical/mechanical or electrical energy or a combination of these. If this energy is not handled properly it may result in to the occurrence of hazard and disaster scenarios.

10.2 Conclusions

TSLW follows the inherently safer design for the entire plant. It is also in compliance with all environmental and regulatory norms as stipulated by the governments. Hence it takes all precautionary measures in each and every process of operation.

In case of emergency situations, TSLW has an updated emergency management structure to respond and to minimize the effect of any undesirable consequences on-site and off-site. Also, TSLW has been maintaining good terms with the surrounding communities by providing social services, etc. It implies that TSLW handles all stress/strain efficiently following all standards and guidelines pertaining to the operations and maintenance.

The effects of fire and explosion on-site and off-site of TSLW have been described in detail in previous sections of this report.

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SECTION XI

EMERGENCY RESPONSE DETAILS REGARDING:

(I) WARNING, ALARM AND SAFETY AND SECURITY SYSTEMS

(II) ALARM AND HAZARD CONTROL PLANS INLINE WITH DISASTER CONTROL AND HAZARD CONTROL PLANNING, ENSURING THE NECESSARY TECHNICAL AND ORGANISATIONS PRECAUTIONS

(III) RELIABLE MEASURING INSTRUMENTS, CONTROL UNITS AND SERVICING OF SUCH EQUIPMENTS

(IV) PRECAUTIONS IN DESIGNING OF THE FOUNDATION AND LOAD BEARING PARTS OF THE BUILDING.

(V) CONTINUOUS SURVEILLANCE OF OPERATIONS

(VI) MAINTENANCE AND REPAIR WORK ACCORDING TO THE GENERALLY RECOGNIZED RULES OF GOOD ENGINEERING PRACTICES

11 Emergency Response Details

11.1 Warning, Alarm and Safety Systems

Warning:

The Plant level warning is to be communicated by Incident Controllers of concerned plant sections of TSLW.

Works level emergency warning will be declared by EO through Steam buzzer available at BPH after getting confirmation from CIC

If the plant management envisages that a hazard encountered on-site may lead to an emergency situation, then only warning may be issued for the purpose of evacuation.

Announcement is to be made through PA system in Hindi and English language. Separate alarms to warn of different types of major emergency (such as Fire or Toxic gas release, etc.) would be used as discussed in the subsequent sections.

Alarm:

The major emergency will be made known to everyone inside the plant by sounding and/ or re-sounding the alarm.

TSLW uses the emergency alarm consisting of repeated long and short pitch for continuous period. The purpose is to make aware all persons about the onset of a major emergency in the plant. An emergency siren is audible throughout the factory and also to the general public in the surrounding area. TSLW can think of various pitches of alarms to distinguish the onset of emergency (either release of gas or breakout of a major fire or propane BLEVE/VCE) from regular siren as follows:

Table 11.1: Siren type and its duration

Emergency Situations	Mode of operation	Duration
Uncontrolled Gas Leakage	Two Buzzers	30 seconds ON and 5 seconds OFF
Partial power failure (DVC or 400kV total failure)	Three buzzers	30 seconds ON and 5 seconds OFF
Total power failure	Four Buzzers	30 seconds ON and 5 seconds OFF
All clear Signal	Once	Continuous for 3 minutes

One buzzer will indicate ---- Works timing and special occasions

In disaster management plan of TSLW, emergency siren/alarm has been considered as one of the main preparedness measures. It is the responsibility of the plant management to communicate the details of alarm and warning system to all the employees and the contract staff/workers. The alarm system should be tested during mock drill. It would find out the gaps of the disaster communication systems and thereby ensure the safety and security of the plant. The important phone numbers are as follows:

Table 11.2: Important locations and telephone numbers

Location	Telephone No. (P&T)	TSL Number
Emergency Number	6647777	47777
EMC	2424244	43244
Fire Services Emergency	6450101	101
Fire Services Control	2423471	43148
TMH	2423333	43333
Safety Control	9234501590 / 9431301590	42613
Town Security Control	2424252	43866
LDC	2230268	44915
Works Security Control Room	2427292	43911,43689
Telecom Helpdesk	2426992 /6508003	100

Safety Systems

The existing safety systems in all hazard prone areas in TSLW are described in Section 6.4.1. The TSLW has Safety and Security Department for the safety and security systems of the plant. It is also well equipped with all sorts of personal protective equipment at specific locations along with a centralized facility. For gas hazards, self-contained breathing apparatus (SCBA) are located in all major areas, viz., A- F Blast Furnace (20 sets), Blast Furnace G&H(40sets), LD shops (11sets), LD Gas Holder area (5 sets), Gas Safety (35 sets). The entire plant is having 226 breathing sets at present.

11.2 Hazard Control Plans in line with Disaster Control and Hazard Control Planning, Ensuring the Necessary Technical and Organisational Precautions

(A) Disaster Response action plan during emergency as per emergency command structure suggested in Section 3.3

For effective control and management of an emergency, the emergency command structure suggested in section 3.3 would be activated.

(B) Response Actions in Handling Emergency Scenarios

Emergency response measures are those, which are taken immediately prior to and following an emergency. In dealing with an emergency situation, the broad objective is to minimize human suffering, loss to property and environment.

Response actions at TSLW will be related to handling of emergency scenarios as described in Section 6 and 8. The major outcomes of scenarios will be in terms of heavy release of toxic chemical like carbon monoxide etc. and/or fire/explosion involving flammable or explosive chemicals like propane, hydrogen, carbon monoxide etc. Practically, for explosive chemical like hydrogen, effective response actions against hydrogen explosion are not possible because of its very short duration (impulsive nature).

I. Action to be taken in case of emergency due to leakage of CO gas from holders or pipelines

(a) Actions to be taken by the First Responder

- Report the incident immediately.

The first person who observes/identifies the hazardous incident shall inform his superior (but while doing so, he will ensure that he is not entering into area of hazards) without any delay.

The control and alarm system installed in the gas holder areas should be effective so that if the gas concentration is equal to or more than the calibrated value (at least STEL value of 400 ppm or less), there will be an alarm and also indication in the control room.

(b) Action to be taken by the person in- charge

In case of leakage of gas, he will

- Confirm the leakage in discussion with the operator/staff and inform his superior/ Incidence Controller
- Use breathing apparatus set, reach the leaking spot and try to arrest the leakage.

- Arrange extra breathing apparatus from control room/safety and Fire Services and other areas and shift them to the leaking areas.
- Inform about the incidence immediately through Emergency Number (47777) and to Incident Controller depending on seriousness
- Continuously assess the wind direction and alert personnel likely to be affected (neighbouring departments/sections) by gas leak in the downwind direction.
- Arrange staff of operation support/mechanical maintenance department to go to the spot of leak and take necessary action to contain the leak.

(c) Action to be taken by the Incident Controller

Being the departmental head, he will coordinate all the activities during the leak. If the leakage of gas is uncontrollable and may have a chance to escalate to an emergency, he will inform all key persons (CIC, WIC, etc.), and take necessary actions as assigned.

In case of a major emergency, as per the instructions from CIC and WIC, Incident Controller along with other key personnel will coordinate for emergency management functions as per duties assigned. Emergency would be declared from Tactical Centre with the siren as described in section 11.1. Ambulance, Hospital, Fire Services, and also surrounding off-site community/Town control room which are coming within the vulnerable zones of 3696 ppm and 1200 ppm, will also be informed accordingly.

Safety representative will reach the spot, assess the situation and provide necessary advice accordingly.

(d) Action to be taken after the end of CO emergency

At the end of emergency, all clear siren would be sounded.

II. Action to be taken in case of emergency of major fire in propane storage area

(a) Action to be taken by the operator/first responder

- Report the incident immediately to the Supervisor.
- Reach the spot and cooperate with maintenance team in controlling or arresting/containing of any leakage.
- Monitor the area to protect any kind of ignition sources, stop traffic movement

(b) Action to be taken by the Incident Controller

He will coordinate all the activities during the release. He will ensure Fire safety precautions to prevent any fire hazard leading to an emergency. In case of emergency, he will inform key persons (CIC, WIC, etc.) and take necessary actions as assigned.

In case of fire, water hydrant system as well as foam pourer systems will be in operation. In propane storage area, sprinkler system will be in operation immediately.

In case of a major emergency, as per the instructions from CIC and WIC, Incident Controller along with other key personnel shall coordinate for emergency management functions as per duties assigned.

Senior Manager, Fire Services will reach the spot and ensure that all necessary fire safety precautions are taken to prevent any fire hazard and provide necessary advice.

For an effective and quick response against any emergency in TSLW, WIC and CIC will activate all response teams jointly in proper time as far as possible.

III. Action to be taken in case of emergency due to Cyclone

Prior to Cyclone

1. Establish regular contact with the local meteorological department.
2. Check availability of tools, batteries and other materials that might be required.
3. Review all operations carefully to ensure that systems in jeopardy are shutdown.
4. Ensure readiness of emergency Vehicles, First Aid Centre, Medicines etc.
5. Metallic sheets, loose materials, empty drums and other light objects shall be properly secured.

- *Actions to be taken at Site:*

    1. All Crane Booms to be lowered
    2. Area Flooding – Fire Services to arrange for pumps
    3. Weak boundary wall to be barricaded

4. Structural integrity of scaffolding and loose sheets to be observed with more vigil
5. Falling of tree, high mast tower, light poles, chimneys are possible so Persons not to move out in open or nearby these structures.
6. Persons to avoid staying in open area
7. Pond level to be monitored, if required draining to be done
8. Preparedness for power outage
9. Yard equipment's to be anchored
10. All mobile equipment to be at designated parking
11. All submersible pumps to be tested and kept ready
12. Senior persons to be made available in shifts
13. All ERT persons to be available along with their proper gear at shop floor
14. Power reliability to be ensured at DG station as per requirement

During Cyclone

1. Do not go Outdoors
2. Do not seal the office completely as the suction created by the difference in atmospheric pressure inside and outside can damage a window or door.

After the Cyclone

1. Do not touch electric lines
2. Stay away from disastrous area
3. Wait for the clear signal from the management to start the Plant.

C. Functions to be performed during response stage of all emergencies

The response functions, which are to be carried out in the event of a disaster/major emergency in the area, are given below:

(i) Emergency warning/notification, if possible: The Plant level warning is to be communicated by Incident Controllers of concerned plant sections of TSLW. Announcement is to be made through PA system in Hindi/Local language or other suitable media.

(ii) Declaration of Emergency: Declaration of emergency at TSLW is to be made only after getting instruction from CIC. Separate alarms to warn different types of major emergency (such as Fire or Toxic gas release) would be used as suggested in Section 11.1. Example:

A major emergency has occurred at TSLW due to heavy release of CO gas at one of its gas holders. The workers and employees in the plant are instructed to move towards safer places as instructed by the emergency responders.

The major emergency will be made known to every-one inside the plant by Emergency Siren, PA system in mobile vehicle, sms broadcast.

(iii) Operational Directions and Coordination: WIC will direct and coordinate mobilization of manpower, equipment and materials, firefighting, medical relief, etc.

(iv) Effective Operation of tactical centre (TC): EO (Chief, Safety India) will coordinate the proper functioning of Tactical Centre.

(v) Firefighting and rescue of people: Firefighting is a key response function required for limiting casualties in case of fires in any part of the plant. EO will coordinate firefighting with all its experienced staffs. He will also apprise WIC, CIC the situation from time to time.

(vii) Medical relief: Victims of accident require medical care on priority. The health and medical services will be available at the first-aid centres. The activities associated with these services include treatment, transport of the injured, etc. Following functions may have to be performed:

- First-Aid Treatment
- Transfer of victim to the TMH, if necessary
- Assessment of need for future medical treatment.

(viii) Closure of emergency: At the end, an all-clear signal is to be sounded from Tactical Centre after getting ***"Emergency over"*** instruction from CIC.

In a major emergency, it would certainly be necessary to evacuate personnel from affected areas. As a precautionary measure, evacuation of non-essential workers, in the first instance, from areas likely to be affected is required. The evacuation will be effected on getting emergency declaration message from CIC.

After the emergency is over, the detailed records of emergency and their management should be documented. This assessment report would be taken as the basis of preparedness, prevention and response measures to be taken for future emergency situation.

(ix) Information to public, if needed: There is a possibility of off-site impact due to heavy release of carbon monoxide in TSLW. In that case, it is necessary to inform surrounding community which are residing beyond the vulnerable impact zones.

(x) Accident Investigation and Assessment: Root cause analysis of all emergency scenarios would be conducted by the TSLW. As per Factories Act, The Chief Inspectorates of Factories, Govt. of Jharkhand will do the investigation of any major accident, if required.

11.3 Precautions in Designing of the Foundation and Load Bearing Parts of the Building.

11.3.1 Safety in Design of Foundations

The most important component of the building is the foundation. The foundation of an industrial building ensures safety and stability of super structures of the building. While designing the foundation of buildings and structures of TSLW, all the information related to Geotechnical aspects and the Super Structural aspects was collected and considered. The foundation of TSLW has been designed to transmit the combined loads, i.e., imposed and wind loads to the grounds in such a way that:

- Net loading intensity pressure coming on the soil does not exceed the safe bearing capacity of the soil.
- Excessive settlement is not caused as it may impair the stability of any part of the plant building and/or may affect the safety and stability of adjacent plant building.

The design of foundations at TSLW ensures safety and stability to the structure, tanks, holders, service pipes, drains, etc. by providing the limited and uniform settlement under the whole building. As a preliminary exercise done during the construction phase of the plant buildings, the nature and variability of the soil strata was determined to judge the properties of the subsoil. These subsurface investigations were made as per the guideline of then existing Indian Standards for the Soil Investigation and Sub-Soil Explorations.

The space between the sides of the foundation trenches and masonry has been filled with the sound earth layers. Each such earth layer was watered, rammed and consolidated. It had been ensured that the earth used for filling was free from all roots, grass, shrubs, rank vegetations, brushwood, trees, sapling, salt and foreign matter. The due safety measure had been taken in the design of tall structure, i. e., chimney to take care of thrusts from wind, shocks due to earth quake, blast waves, etc. It has been provided with the wind separator and is supported by the guy wires as per the requirement

11.3.2 Safety in design of Load Bearing Parts

Load-bearing parts are those parts of the buildings on which various types of horizontal and vertical live loads are applied e.g., beams, columns, load bearing walls, parts of buildings which support hoists, cranes, and another weight-handling equipment, etc. During the design, the required testing and analysis for all load-bearing parts have been conducted. Cautions have been taken to ensure that stress and/or stain generated during safe working loads posted on them under normal operating conditions doesn't exceed the design values.

11.3.3 Seismic Resistance

As far as the seismic activity is concerned the TSLW lies in the Zone-III. Hence to successfully withstand earthquake-induced forces, structures such as flue gas stack, elevated roadways, plant buildings, office buildings are engineered in such a manner that they have the required integrity to resist gravity or downward forces (to hold the structure up under normal circumstances) and to resist lateral or sideways forces generated during an earthquake. To protect the life and safety of occupants, guideline stipulated under National building codes have been taken care of. Because the vertical columns are more critical to the stability of a structure than that of the horizontal beams, the design the columns are stronger than that of the beams. As a result, in the event of strong earthquake shaking motion, the probability of damage of the columns is reduced, increasing the chances of remaining of building in standing conditions. The data related to safety of the load bearing parts and foundations has not been included here because of its bulkiness.

In the unlikely case of earthquake, Emergency recovery plans shall be considered by the Strategic level team as per the situation and conditions.

11.4 Continuous Surveillance of Operations, and Maintenance and Repair Work According to the Generally Recognized Rules of Good Engineering Practices

There are separate departments, i.e., Operation, Maintenance, Civil, Engineering, etc. for the plant to ensure continuous surveillance of the plant operation, maintenances and repair work according to the rules as laid down by the corporate on the basis of good engineering practices followed worldwide.

SECTION XII

DETAILS OF COMMUNICATION FACILITIES AVAILABLE DURING EMERGENCY AND THOSE REQUIRED FOR AN OFF-SITE EMERGENCY

12 Communication Facilities

12.1 Communication during Emergency

Communication is the most important system for the effective management of an emergency situation. When any accident occurs, it is a general practice to raise alarm immediately and declare the emergency. The process of declaration of emergency will involve passing of the information to the essential services and threatened areas. Besides, it also becomes essential to inform outside agencies, relatives, press, etc. It is therefore the TSLW has developed a communication system for the effective management of possible emergency situations.

In case of any incident, it will be informed by the person noticing first to the supervisor/shift in-charge either through mobile phone or through Walkie-Talkie sets or by any other means available at that time. While passing out the information about the incident he should clearly tell the following:

1. What went wrong (Physical damage, injury etc.)?
2. What is the location?
3. His name, designation etc.

12.2 Declaration of Emergency

After confirming the situation supervisor/Shift in-charge will inform to Incident Controller (IC) & Shift Safety and Shift Safety will inform the incident to Emergency officer(EO).

On receipt of information from the shift-in-charge, the IC will assess the magnitude of the situation and will pass on the information to the WIC / CIC. WIC will also assess of the magnitude of the emergency and advice and/or issue the instruction for the effective management of the emergency situation and inform CIC.CIC in consultation with EO will then declare the onset of emergency call strategic level team members to Tactical Centre.

The siren provided in Blower House#3 or 4 will be sounded in shot walling sound. The purpose is to make aware all persons about the onset of a major emergency in the plant. On hearing it, all persons will assemble at the assembly points and wait for further instruction.

12.3 Communication to the public and media

Any accident whether it's a major or minor creates a negative impact on the reputation of the company and ultimately affects the business. In the present conditions, the media in the country is very strong position and can play a major role in communicating the correct and authentic information to the people concerned. Statement for the media and public to be prepared by corporate communication in consultation with WIC/COMs to be communicated by Chief / HOD Corporate Communication or the spokesperson to communicate to the public through the print and the electronic media. While communicating he should clear about the:

1. Nature of the Incident,
2. Location of the Incident,
3. Damages,
4. Steps taken for the mitigation of the Disaster

All other persons of the plant are advised for not to talk with the outsiders or to the media personnel.

The major emergency will be made known to everyone inside the plant by sounding and/ or re-sounding the alarm.

The emergency alarm shall consist of repeated long and short pitch for continuous period. The purpose is to make aware all persons about the onset of a major emergency in the plant. An emergency siren should be audible throughout the factory and also to the general public in the surrounding residential area. TSLW can think of various pitches of alarms to distinguish the onset of emergency (either release of CO or breakout of a major fire) from regular siren, the details are given in **Table 11.1**.

The details of information of various functionaries in TSLW and outside are given in Section 3 and 4.

12.4 Infrastructure available for communication

The details of the communication facilities are available in TSLW are given below;

1. Public address system provided in Works

2. Steam buzzer/Elec. sirens are available in TSLW at Blower House#3 (Steam) and Blower House#4 (Elec.)
3. Tactical Centre is well equipped with hotline and other connectivity.
4. Telephone and Intercom facilities are available at all required official desks.
5. Wireless system along with Walky-Talky sets provided

In disaster management plan of TSLW, emergency siren/alarm has been considered as one of the main preparedness measures. It is the responsibility of the plant management to communicate the details of alarm and warning system to all the employees and the contract staff. The alarm system should be tested during mock drills. It would find out the gaps of the disaster management systems and thereby ensure the safety and security of the plant.

12.5 Contact information for key personnel of the organization (TSLW)

The list of key personnel along with their contact details can be found in **Table:C1 of annexure C** of this document.

12.6 Contact information for key personnel outside the TSLW

The list of key personnel along with their contact details can be found in **Table:C9 of annexure C** of this document.

SECTION XIII

DETAILS OF FIRE FIGHTING AND OTHER FACILITIES AVAILABLE AND THOSE REQUIRED FOR AN OFF-SITE EMERGENCY

13 Fire Fighting Facilities at TSLW

The plant is protected against fire hazards and it is well equipped with fire protection systems. The details of the firefighting facilities available at TSLW are as under.

13.1 Fire Wing

TSLW has its own fire station operated by trained fire personnel. The fire station is equipped with the following personnel to handle the fire promptly and actively:

Table 13.1: Firefighting team

FIRE FIGHTING TEAM		
1	Sr. Manager	1
2	Asst. Manager	1
3	Station Officer	4
4	Sub Officer	1
5	SOT (Driver)	11
6	Maintenance Assistant	1
7	Transport Cum Transport Incharge	1
8	U H	77
9	Sr. Office Associate	1
Total		98

13.2 Fire Fighting Equipment Available at various sections of plant

a) Equipment available

Table 13.2: Fire Fighting Equipment Available at various sections of plant

Sr. No.	Equipment	Quantity
1	Foam tender	10 (Water cum foam tender)
2	Mist Tender (Mini)	1
3	Rescue Tender	1

Sr. No.	Equipment	Quantity
4	Utility Vehicle	2
5	Bolero & Gypsy	3
6	High expansion foam generator	3 (1 high, 1 medium & 1 low)
7	Fire hose with branches	75 nos' on fire tender & approximately 25 nos' available at stores.
8	Portable float pump	7
9	High Capacity Pump	3
10	BA Sets	43
11	PRT Rescue Kit Set	5
12	Blower	2
13	Gas Detector	9
14	Hydraulic rescue tool set	2

b) Fire Pump details

Table 13.3: Details of Fire pumps

S. No	Location	Electrical Pump	Diesel Pump	Jockey Pump
1	PH 3	2	1	2
2	PH 4	2	1	1
3	PH 5	1	1	1
4	MPDS(CRM) MRSS	1	1	1
5	MPDS MRSS	1	1	1
6	BPRS JEMCO	2	1	2
7	MPDS 5	2	1	1
8	SMD	1	1	1

S. No	Location	Electrical Pump	Diesel Pump	Jockey Pump
9	LD 2 HSM	2	1	1
10	LD 1	2	0	0
11	Lime Plant	2	2	4
12	WRM	1	1	0
13	NBM	1	1	1
14	DG Station	2	0	1
15	TMH	1	1	1
16	CRM	1	1	2
17	LD # 3	2	1	2
18	H Blast Furnace	1	1	2
19	Pellet Plant	1	1	2
20	RMBB#2	1	1	2
21	Sinter Plant #3	1	1	2
22	RMBB#1	1	1	0
23	Sinter Plant 1 & 2	1	0	0
24	RMM Coal	2	1	2
25	Sinter Plant 4	1	1	2
26	A-F Blast Furnace	2	0	1
27	RMM Ore	2	1	2
28	RMM Haldia Coke	2	1	2
29	NCHP	2	1	2
30	NEW BPP	2	1	2

S. No	Location	Electrical Pump	Diesel Pump	Jockey Pump
31	OLD BPP	2	0	1
32	COKE BATT 10 & 11	2	1	2
33	G BLAST FURNACE	1	1	0
34	I BLAST FURNACE	1	1	1
35	RMM surplus LTSS # 9	1	1	2

c) No. of Fire Hydrants & Fire Extinguishers (Portable) of various types and their locations

Table 13.4: Details of Fire Hydrant Points

SL. No	Dept.	Total Nos. of Hydrant	SL. No	Dept.	Total Nos. of Hydrant
1	SP & OS	7	32	BH # 4	9
2	SP # 1	26	33	RMBB # 1	28
3	SP # 2	38	34	RMBB # 2	45
4	LD # 2	125	35	DG station	12
5	TSCR coil yard	37	36	MPDS # 5	40
6	Caster	32	37	HML	7
7	TSCR	126	38	MPDS # 1 & 2	50
8	Lime plant	104	39	FMD	125
9	SP # 3	39	40	HBF	145

SL. No	Dept.	Total Nos. of Hydrant	SL. No	Dept.	Total Nos. of Hydrant
10	SP # 4	34	41	General Off	37
11	LD # 3	122	42	PH # 3	59
12	Pellet Plant	226	43	RMM # 2	47
13	RMM # 3 new circuit	144	44	IBF	136
14	RMM # 3 old circuit	33	45	MPDS # 7	27
15	GBF	219	46	NBM	74
16	SMD	98	47	CSS west	5
17	LD # 1	241	48	CSS east	6
18	HSM	134	49	AF bf	93
19	BH # 6	11	50	RMM # 1	269
20	FMM	2	51	WGO	9
21	FMM	2	52	MPDS # 4	27
22	PH # 4	133	53	MPDS # 6	27
23	Coke plant 5,6,7	27	54	PH # 5	30
24	Coke plant batt 8 & 9	96	55	WRM	30
25	Coke plant NCHP	64	56	M. Mill	16
26	Coke plant new bpp	90	57	BPRS	59
27	Coke plant old bpp	95	58	IM section Ghamaria	48
28	Coke plant 10 & 11	130	59	R&D	2
29	Coke plant CDQ	98	60	LD 3 kitchen	4
30	BH # 5	15	61	TMH	100

31	BH # 3	3	62	Tube div	100
					Total: 4220

Table 13.5: Details of Fire Extinguishers (Portable)

Department	DCP (5Kg)	DCP (50)	CO2 Kg)	MF	ABC type	Total
A-F Blast Furnace	14	0	65	0	180	259
Automation	3	0	50	0	4	57
BPH	21	0	179	4	222	426
C Furnace cooling plant	2	0	13	0	0	15
Canteen	18	0	43	4	28	93
Central Water Tower	2	0	4	0	0	6
CETP	0	0	16	0	18	34
Coke Plant	131	18	422	39	721	1331
Compressor House	9	0	19	0	0	28
CSD	22	0	34	0	15	71
DG Station	12	0	42	0	22	76
EMD	1	0	6	0	2	9
Engg. services	21		29	0	8	58
EQMS	30	0	143	3	326	502
ETD	28	5	526	0	300	859
Fire Services	0	0	0	0	5	5
First-Aid	0	0	4	0	5	9
FMD	37	0	36	0	114	187
FME (Electrical.)	5	0	26	0	58	89
FMM (FIELD MANT.)	12	0	67	0	63	142
GBF	24	0	64	0	62	150
General Office	3	0	222	0	21	246

Department	DCP (5Kg)	DCP (50)	CO2 Kg)	MF	ABC type	Total
Graphene Centre	2	0	7	1	2	12
HBF	13	0	90	0	84	187
HML	0	0	11	0	2	13
HSM	10	0	245	0	422	677
IBF	6	0	124	0	118	248
IBMD	0	0	3	0	0	3
ICP #2	11	0	16	0	0	27
IM Section	90	0	55	0	42	187
ITS	3	0	63	0	0	66
JRD Complex	0	0	45	0	18	63
KVHS	0	0	0	0	0	5
LD#1	96	0	426	0	322	844
LD#2	107	12	185	19	400	723
LD#3	148	0	742	5	192	1087
LDC	2		10	0	0	12
Lime Plant	13	12	74	6	111	216
LPTG	0	0	6	0	0	6
LRS	17		7	3	0	27
M Mill	6	0	45	0	75	126
MED (Mech.)	7	0	16	3	8	34
MEG (Design)	1	0	8	0	0	9
MPDS#4	18	0	42	0	30	90
MRD	9	0	0	2	0	11
MRP	5	0	9	0	15	29
NBM	14	0	74	0	30	118

Department	DCP (5Kg)	DCP (50)	CO2 Kg)	MF	ABC type	Total
NTTF	1	0	15	3	15	34
OHS	1	0	9	0	3	13
Pellet plant	108	0	378	0	131	617
PH#3	76	0	183	0	9	268
PH#4	10	0	198	0	363	571
PH#5	65	0	63	0	25	135
R&D	38	0	101	0	200	339
RMBB	6	0	166	0	100	272
RMM	72	0	177	0	200	448
Security(w)	5	0	10	0	9	24
SGDP	6	0	30	0	0	36
SHE CENTER	4	0	14	0	0	18
SMD	23	0	49	35	100	207
SNTI	10	0	120	0	115	245
SP#1	24	0	62	0	50	136
SP#2	10	0	30	0	80	120
SP#3	20	0	64	10	35	129
SP#4	52	0	51	0	38	141
SP&OS	3	0	12	3	125	143
SSTG	1	0	3	0	0	4
Steelenium Hall	0		8	0	0	8
WGO	2	0	26	0	0	28
WMD	5	0	25	2	90	120
works garden	0	0	3	0	3	6
WRM	35	0	83	8	45	171

Department	DCP (5Kg)	DCP (50)	CO2 Kg)	MF	ABC type	Total
					Total	13705

13.3 Fire Fighting Facilities at surroundings

Table 13.6: Fire Fighting Facilities at surroundings

Location of the Fire Station	No. of Fire Tenders	Additional Facilities	Man-power	Area coverage	Mutual-Understanding with TSLW (yes/no)	Anticipated response time
Golmuri Fire stn.	6	One foam tender	18	8 KM	Yes	15 mins
Mango	2		13	10 KM	Yes	20 mins
Adityapur	2		12	10 KM	Yes	20 mins
Tata motors fire Station	1 WT, 1 FT, 1 DCP & 1 Mist Tender		60	10 KM	Yes	20 mins
Tata Power Fire Stn.	1	Not Available	22	12 KM	Yes	20 mins

SECTION XIV

FIRST-AID AND HOSPITAL FACILITIES

14 First-Aid and Hospital Facilities

14.1 Medical facilities at TSLW

Table 14.1: Facilities at TMH /First aid center

Sr. No.	Particulars	Quantity in Nos.
1.	Bed Available	914
2.	Doctors Available	246 + First Aider
3.	Nursing Staff	650
4.	Ward boy (Stewards)	631
5.	Oxygen Therapy Set	652
6.	Ambulance	7
7.	Emergency Medicines and Drips	Sufficiently available
8.	Burn Unit Bed	No. of bed=10

14.2 Medical facilities at nearby hospitals

The following table shows the medical facilities at nearby hospitals.

Table 14.2: Facilities at Nearby Hospitals

Medical Facility	Distance from TSLW (Km)	Beds	Infrastructure availability for handling burn injuries (burn ward), toxic inhalation, physical injury etc.	Understanding with TSLW (yes/no)	Tele No.
Tata Motors hospital	10	450	Available	Yes	2224545
Tinplate hospital	6	175	Available	Yes	2430713
MGM Gov. hospital	6	470	Available	Yes	2432137

Table 14.3: Antidotes and lifesaving drugs at the plant

SL No.	Names	Specific Use
01	Antidotes and life-saving drugs are sufficiently available at TMH	Varies as per case to case basis.

Table 14.4: Blood banks near TSLW

Name of Blood Bank	Name Of The Person To Be Contacted	Telephone Numbers
Jamshedpur Blood Bank	Dr. L. B. Singh	09431348147

SECTION XV

GLOSSARY OF TERMS

15 Glossary of Terms

Hazard: A chemical or physical condition that has the potential for causing damage to people, property, or the environment.

Incident: The loss of containment of material/energy.

Incident outcome: Physical manifestation of the incident. For toxic chemicals, the Incident Outcome is a *toxic release*. For Flammable material, it could be a *Fire and/or explosion*.

Incident Outcome case: Quantitative definition of a single result of an Incident Outcome. **Worst-case Release Scenario:** It deals with the maximum loss scenarios and associated with the farthest distance of impact.

Alternative-case Release Scenario: It is the most credible loss scenarios which is likely to be possible.

Consequence: A measure of the physical effects of an incident outcome case, expressed qualitatively or quantitatively.

Likelihood: A measure of the expected probability or frequency of occurrence of an event.

Risk: A measure of economic loss/human injury in terms of both the incident likelihood and the magnitude of the loss or injury.

Risk Analysis: A quantitative estimate of risk based on incident frequencies and consequences.
Risk Assessment: The process by which the results of a risk analysis is used to make decisions.

Disaster/Emergency: Deviation from standard operation or an occurrence which causes/threatens serious disruption of life, perhaps death or injury to a large number of people and requires a mobilization of efforts *in excess of that normally provided by the statutory emergency services*.

On-site: Consequences of an incident are confined within the plant premise.

Off-site: Area outside the Boundary of the Plant

Vulnerability: Is the extent to which a community's structure, services or environment is likely to be damaged or disrupted by the impact of a hazard.

Vulnerable Zone: It is an estimated geographical area that may be affected by the release / explosion at levels that could cause irreversible effect to both human and property within the area following an accidental release of chemicals.

Preparedness: Measures to ensure that communities and services are capable of coping with the effects of emergencies.

Prevention: Measures to eliminate or reduce the incidence or severity of emergencies.

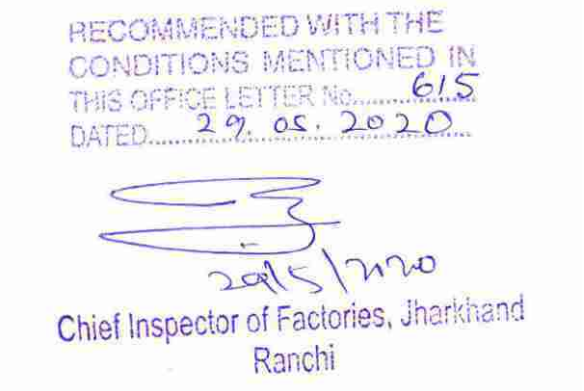
Mitigation: Measures to reduce the severity of emergencies, primarily in prevention and preparedness.

Response: Measures taken in anticipation of, during and immediately after emergencies to ensure that the effects are minimized.

Recovery: Measures which support emergency-affected persons (on-site and off-site) in the reconstruction of the physical infrastructure and restoration of emotional, economic and physical wellbeing.

Stakeholders: Those who may be affected by or perceive themselves to be affected by the emergency risk management process.

Risk management: Consists of identifying threats (hazards likely to occur), determining their probability of occurrence, estimating what the impact of the threat might be to the communities at risk, determining measures that can reduce the risk, and taking action to reduce the threat.



Mob no → 6207901848
→ 8092087043

e-Challan

Finance Department, Goverment of Jharkhand

Receiving Dept: Forest, Environment and Climate Change Department

Valid UpTo :-01/03/2023 | Remitter's Copy of Dept

GRN:-2315871703 | Date:- 20/02/2023 17:17:34

Receiving Office:- JSRFOR051-D.F.O.JAMSHEDPUR PRM.JSR.-FOREST

District:- Purbi Singhbhum | Treasury:- Jamshedpur

Year:- 20/02/2023 | to :- 28/02/2023

Head(8782)	Amount ₹
Head Details 878200103010101 FOREST REMITTANCES	20000000.00

J-20429249J

Net Payable Amount:- ₹ 20000000.00

Two Crore Rupees And Zero Paisa Only

For Treasury Use Only(Jamshedpur)

Challan No and Date: 108 (20/02/2023)

Identity Proof(Registration No) - 000260

PAN No:-

Remitter Name:- TATA STEEL LIMITED

Address :- BISTUPUR,JAMSHEDPUR,831001

Remarks :- Deposit Work

Treasury Officer Signature is not reuqired.

FOR USE IN TREASURY LINK BANK

CHEQUE/DD No :- 650925 DT. 16/02/2023

Scroll No and (Date) :- ()

Bank Name :-SBI,JAMSEDPUR,DISTRICT TREASURY OFFICE

Note:- Bank Official are requested to update the receipt Online before Stamping.

Signature & Seal of Bank

CTS CLEARING 21 FEB 2023 STATE BANK OF INDIA Jamshedpur

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e-Challan

Finance Department, Goverment of Jharkhand

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Scroll No and (Date) :- ()

Bank Name :-SBI,JAMSEDPUR,DISTRICT TREASURY OFFICE

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Signature & Seal of Bank

CHARTER FOR CORPORATE RESPONSIBILITY FOR ENVIRONMENT PROTECTION (CREP)
INTEGRATED IRON AND STEEL PLANT, TATA STEEL LIMITED, JAMSHEDPUR
STATUS OF COMPLIANCE FOR VARIOUS ACTION POINTS
(April'25 – Sept'25)

Action point 1: Coke Oven Plants

- To meet the parameters PLD (% leaking doors), PLL (% leaking lids), PLO (% leaking off take), of the notified standards under EPA within three years (by December 2005)

Compliance Status: Complied

April'25 to Sept'25:

No. of Batteries	Parameters											
	PLD (%)			PLO (%)			PLL (%)			Charging Emissions (Sec.)		
	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
Battery#8	2.65	1.14	1.83	0.80	0.00	0.26	0.38	0.00	0.19	32	19	25
Battery#9	3.76	1.20	2.55	1.62	0.00	0.27	0.00	0.00	0.00	27	16	20
Battery#10	2.39	1.22	1.59	0.00	0.00	0.00	0.00	0.00	0.00	17	11	16
Battery#11	3.28	1.19	2.34	0.00	0.00	0.00	0.00	0.00	0.00	17	12	15

- To rebuild at least 40% of the coke oven batteries in next 10 years (December 2012).

  Compliance Status: Complied

Battery No.	Date of Commissioning	
	Initial	After Rebuilding
Battery # 5 (SC)	1988	Converted to Stamp charged-1995*
Battery # 6 (SC)	1988	Converted to Stamp charged-1993*
Battery # 7 (SC)	1988	Converted to Stamp charged-1989*
Battery # 8 (SC)	1998	
Battery # 9 (SC)	2000	
Battery # 10 (SC)	2012	
Battery # 11 (SC)	2014	

SC=Stamp Charged
Several rounds of hot repairs have taken place for rebuilding the damaged oven walls.

Action point 2: Steel Melting Shop

- Fugitive emissions - To reduce 30% by March 2004 and 100% compliance with norms by March 2008 (including installation of secondary de-dusting facilities)

Compliance Status: Complied

- Steel Melting Shops (LD#1, LD#2, and LD#3) have been provided with secondary emission control system.
- Average Fugitive Dust Emission in SMS is well within the standard norms.

Action point 3: Blast Furnace

- Direct inject of reducing agents- by June 2013

Compliance Status: Complied

- Coal/Coal Tar and Oil injection facilities are provided in all the Blast Furnaces.

Action point 4: Solid Waste / Hazardous Waste Management

- Utilization of Steel Melting Shop (SMS)/ Blast Furnace (BF) Slag as per the following schedule:
  By 2004- 70%
  By 2006- 80%
  By 2008- 100%

Compliance Status: Present level

- All the Blast Furnaces which are in regular operation are fitted with On-line Slag Granulation Facility.

Period: April'25 to Sept'25

KPI	BF Slag	LD Slag
Percentage utilized (%)	93%	100%
Type of utilization	Cement Making	Cement making, Brick making, road construction etc.
Actions to be taken for ensuring 100% utilization	-	-

- Charge of tar sludge/ ETP sludge to Coke Oven by June 2003.

Compliance Status: Complied

100% of Tar sludge and ETP sludge from Coke Ovens is being recycled/ reused.

- Inventorization of the Hazardous Waste as per Hazardous Waste (M&H) Rules, 1989 as amended from time to time and implementation of the Rules by December 2003.
  (Tar sludge, acid sludge, waste Lubricating oil and type fuel falls in the category of Hazardous waste).

Compliance Status: Complied

Hazardous Waste	Quantity generated April'25 to Sept'25 (Tonnes)	Quantity charged to Coke Oven in April'25 to Sept'25 (Tonnes)	Method of transport
Coal Tar Sludge (Generation from By-Products Plants of Coke Ovens)	1093	1093	Transported by trucks and utilized in-house.
BOT Plant Sludge (Generation from By-Products Plants of Coke Ovens)	185	185	Transported by trucks and charged by conveyors; Mixing with Coal and used in coke making in battery
Used Empty Batteries	25.24	-	Sold to authorized recyclers

Action point 5: Water conservation / Water Pollution

- Reducing specific water consumption to 5 m^3/t for long products and 8 m^3/t for flat products by December 2005

Compliance Status: Complied

Specific water consumption details for April'25 to Sept'25:

Specific water consumption (m^3/tcs)	
Long Products (m^3/tcs $_{LP}$)	**Flat Products (m^3/tcs $_{FP}$)**
0.68	1.50

- To operate CO-BP effluent treatment plant efficiently to achieve the notified effluent discharge standards- By June 2003.

Compliance Status: Complied

Effluent Treatment Plant is meeting the statutory norms.

Sample Location	Parameter	UoM	Apr-25			May-25			Jun-25			Jul-25			Aug-25			Sep-25		
		UoM	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
BOT TREATED	pH	-	8.48	6.33	7.64	8.08	6.82	7.47	8.43	7.22	7.87	8.48	7.02	7.92	8.48	7.37	7.77	8.46	6.97	7.45
	Total Suspended solids	mg/L	92.0	12.0	40.0	90.0	18.0	47.3	74.0	28.0	46.8	90.0	20.0	47.5	86.0	14.0	43.8	90.0	20.0	51.7
	Oil & Grease	mg/L	3.0	2.2	2.6	3.2	2.6	2.9	3.4	2.4	2.9	3.4	1.6	2.6	3.4	2.0	2.6	3.4	2.2	2.7
	Ammonical Nitrogen (as N)	mg/L	45.6	4.2	22.4	39.8	8.0	22.6	32.7	3.8	13.1	40.2	8.9	26.2	40.0	6.7	22.5	25.5	1.3	10.3
	Cyanide (as CN-)	mg/L	0.19	0.16	0.17	0.19	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.17	0.18	0.15	0.16
	Biological Oxygen Demand, BOD	mg/L	28.0	18.0	24.4	30.0	14.0	25.6	28.0	3.0	22.0	28.0	10.0	21.2	28.0	16.0	23.6	28.0	16.0	23.1
	Chemical Oxygen Demand, COD	mg/L	239.0	80.0	126.6	229.0	88.0	175.8	246.0	86.0	160.0	247.0	96.0	16.4	204.0	92.0	158.0	244.0	94.0	147.8
	Phenol	mg/L	0.25	0.11	0.15	0.29	0.11	0.16	0.16	0.10	0.14	0.38	0.11	0.15	0.18	0.10	0.13	0.21	0.10	0.14

Action point 6: Installation of Continuous stack monitoring system & its calibration in major stacks and setting up of the online ambient air quality monitoring stations by June 2005.

Compliance Status: Complied

- 4 CAAQMS stations have been commissioned.
- Online stack monitoring system have been installed at major stacks.

Locations/ Area	No. of Stacks connected to CPCB, New Delhi for OCEMS	No. of Stacks to be connected to CPCB, New Delhi for OCEMS	Remarks
Blast Furnace	24	-	-
Coke Oven	7	-	-
LD Shop	21	-	-
Lime Plant	12	-	-
Mills	9	-	-
Power Plant	8	-	-
Sinter Plant	8	-	-
Total	**89**	-	-

Action Point 7: Operation of Pollution Control Equipment

To operate the existing pollution control equipment efficiently and to have proper record of run hours, failure time and efficiency with immediate effect. Compliance report in this regard to be submitted to CPCB/SPCB every three months/Six months.

Compliance Status: Complied

Status of Air Pollution Control Equipment (April'25 - Sept'25)

- We have implemented online system to track the availability of all Bag filters. Overall availability is maintained at >95% inside works including maintenance period.

- Differential pressure of the Bag filters is being monitored regularly to ensure the efficiency.

Status of Wastewater Pollution Control Equipment (April'25 – Sept'25)

Area/Location	Water Pollution Control System	Availability (%)
Coke Plant	BOT Plant	100%
A-F Blast Furnace	Wastewater treatment plant	100%
G Blast Furnace	Wastewater treatment plant	100%
H Blast Furnace	Wastewater treatment plant	100%
I Blast Furnace	Wastewater treatment plant	100%
LD1 and BC	Wastewater treatment plant	100%
LD2 and SC	Wastewater treatment plant	100%
LD3 and TSCR	Wastewater treatment plant	100%

Wire Rod Mill	Wastewater treatment plant	100%
Hot Strip Mill	Wastewater treatment plant	100%
Cold Rolling Mill	Wastewater treatment plant	100%
New Bar Mill	Wastewater treatment plant	100%
Merchant Mill	Wastewater treatment plant	100%
CETP	Wastewater treatment plant	100%

Action point 8: Implementation of LCA study
To implement the recommendations of Life Cycle Assessment (LCA) study sponsored by MoEF&CC by December 2003.

Compliance Status: Complied

- Reduction of Green House Gases by:
  - ❖Reduction in power consumption - **Yes**/ ~~No~~
  - ❖Use of by-products gases for power generation- **Yes**/ ~~No~~
  - ❖Promotion of Energy Optimisation technology, including energy audit- **Yes**/ ~~No~~

To set targets for Resource Conservation such as Raw material, energy, and water consumption to match International Standards

	FY'26(H1)	**Target for FY'26**
Specific Water Consumption (m^3/TCS)	1.24	1.35
Energy consumption (GCal/ TCS)	5.47	5.38
Steps taken for Resource Conservation	Yes	Yes
Environmental monitoring laboratory provided (Y/N)	Yes	Yes

- Up-gradation in the monitoring analysis facilities for air and water pollutants. Also, to impart elaborate training to the manpower in the environmental monitoring laboratories, so as realistic data can be obtained.
- Monitoring facilities upgraded : **Yes**/~~No~~
- Training provided to laboratory personnel : **Yes**/~~No~~
- To improve housekeeping : **Being Done**

Action point 9: Clean Technologies
The industry will initiate steps to adopt the following clean technologies / measures to improve the performance of the industry towards production, energy, and environment.

- Energy recovery of top Blast Furnace (BF) gas.
- Use of Tar-free runner linings.
- De-dusting of Cast House at tap holes, runners, skimmers, ladle and charging points
- Suppression of fugitive emissions using nitrogen gas or any other inert gas.
- To study the possibility of slag and fly ash Transportation back to the abandoned mines to fill up the cavities through empty railway wagons when they return to the mines and its implementation.
- Processing of the waste containing flux & ferrous wastes through waste recycling plant.

- To implement rainwater harvesting.

Clean technologies to be implemented	Status, Provided Yes/ No
Energy recovery of top Blast Furnace (BF) gas	TRT has been commissioned in G, H & I Blast Furnace.
Use of Tar-free runner linings.	Tar lining in the runner is not used.
De-dusting of Cast House at tap holes, runners, skimmers, ladle and charging	De-dusting facility in the cast house has been provided in F, G, H & I Blast Furnaces.
Suppression of fugitive emissions using nitrogen gas or any other inert gas	We have studied this system in detail and found the same very unsafe and have decided to not to go for it. Instead, dust extraction facilities have been installed wherever required.
To study the possibility of slag and fly ash transportation back to the abandoned mines, to fill up the cavities through empty railway wagons while they return to the mines and its implementation.	None of our mines are abandoned so far. However, all the coal-fired boilers in Steel Works have been converted to gas firing. Coal will be fired only in emergency in one Boiler from where limited quantity of ash is being disposed in slurry form in captive ash pond.
Processing of the waste containing flux & ferrous wastes through waste recycling plant.	We have a metal recovery and slag processing plant for the same and such material is used in iron and steel making processes.
Implement rainwater harvesting	Rainwater harvesting is in practice inside the Steel Works. Surface run-off is collected in cooling ponds/ catchments and pick up of fresh water from river is reduced during rainy seasons.

EMD/C-41/ 30 /16
March 02, 2016

Shubhanand Mukesh
Head Environment Management

MEMBER SECRETARY
Jharkhand State Pollution Control Board
T.A. Division Building, HEC Campus, Dhurwa
RANCHI – 834004

Subject: Request for grant of Consent to Establish (CTE) for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand

Reference:

1. Environmental Clearance letter no. 11011/691/2007-IA-II(I) dated March 01, 2016
2. Our online application for Consent to Establish vide application no. 76429 dated September 09, 2015

Dear Sir,

This has reference to the captioned subject and cited references. It is to inform that the Ministry of Environment, Forests & Climate Change Govt of India vide their letter no. 11011/691/2007-IA-II(I) dated March 01, 2016 has accorded Environment Clearance to M/s Tata Steel Limited for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand in accordance with the EIA Notification, 2006 of the Environment (Protection) Act, 1986.

We ensure to abide to all the conditions stipulated in the above Environmental Clearance.

This is also to inform that we have submitted online application for Consent to Establishment (CTE) in prescribed application no. 76429 duly filled along with the enclosures under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981). A statutory fee of ₹ 25,00,000.00 (Rupees Twenty Five Lakh only) has been paid (Receipt no. 709711733 dated September 09, 2015) towards the consent to establish fee under Water & Air Act through net banking payment.

Rec
Budhra
02/3/16

JHARKHAND STATE POLLUTION CONTROL BOARD झारखण्ड

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Tel 91 657 2424125 6644859 Fax 91 657 2427819 e-mail shubhanand.mukesh@tatasteel.com
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001

Shubhanand Mukesh
Head Environment Management

In view of the above, we request you to kindly consider our application no. 76429 for the above project and grant us Consent to establish (CTE) at the earliest.

Thanking you,

Warm regards,
For Tata Steel Limited

Shubhanand Mukesh

Shubhanand Mukesh
Head, Environment Management
Encl:

1. Copy of online application form under Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981
2. Receipt of payment of ₹ 25,00,000.00
3. Copy of Environmental Clearance letter

Copy to: Regional Officer, Jharkhand State Pollution Control Board, Adityapur, Jamshedpur

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Tel 91 657 2424125 6644859 Fax 91 657 2427819 e-mail shubhanand.mukesh@tatasteel.com
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001
Tel 91 22 66658282 Fax 91 22 66657724
Corporate Identity Number L27100MH1907PLC000260 Website www.tatasteel.com

O/C

TATA

Shubhanand Mukesh
Head Environment Management

EMD/C-41/ 30 /16
March 02, 2016

MEMBER SECRETARY
Jharkhand State Pollution Control Board
T.A. Division Building, HEC Campus, Dhurwa
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Received
2-3

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Tel 91 657 2424125 6644859 Fax 91 657 2427819 e-mail shubhanand.mukesh@tatasteel.com
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001
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Shubhanand Mukesh
Head Environment Management

EMD/C-41/32 /16
March 04, 2016

District Commissioner, East Singhbhum
Office of the District Commissioner
JAMSHEDPUR- 831 001

Subject: Information of grant of Environmental Clearance for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand

Reference: MoEFCC Environmental Clearance letter no. 11011/691/2007-IA-II(I) dated March 01, 2016

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It is also to inform that copy of the said Environmental Clearance letter may also be seen at Company's Website at http://www.tatasteelindia.com/corporate-citizen/environment-compliance-reports.asp.

Thanking you,

Warm regards,
For Tata Steel Limited

Shubhanand Mukesh

Shubhanand Mukesh
Head, Environment Management
Encl: Copy of Environmental Clearance letter

4-3-16
पूर्वी सिंहभूम, जमशेदपुर

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Shubhanand Mukesh
Head Environment Management

EMD/C-41/ 33 /16
March 04, 2016

Block Development Officer
Jamshedpur
Dhalbhum Sub-Division
East Singhbhum– 831 001

Subject: Information of grant of Environmental Clearance for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand

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Head, Environment Management
Encl: Copy of Environmental Clearance letter

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Tel 91 657 2424125 6644859 Fax 91 657 2427819 e-mail shubhanand.mukesh@tatasteel.com
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001
Tel 91 22 66658282 Fax 91 22 66657724
Corporate Identity Number L27100MH1907PLC000260 Website www.tatasteel.com

TATA

Shubhanand Mukesh
Head Environment Management

EMD/C-41/34 /16
March 04, 2016

Special Officer
Jharkhand Notified Area Committee
East Singhbhum
JAMSHEDPUR- 831 001

Subject: Information of grant of Environmental Clearance for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand

Reference: MoEFCC Environmental Clearance letter no. 11011/691/2007-IA-II(I) dated March 01, 2016

Dear Sir,

This has reference to the captioned subject and cited reference. It is to inform that the Ministry of Environment, Forests and Climate Change (MoEFCC), Govt. of India vide their letter no. 11011/691/2007-IA-II(I) dated March 01, 2016 has accorded Environment Clearance to M/s Tata Steel Limited for expansion of crude steel production from 9.7 MTPA to 11 MTPA of Tata Steel Limited, Jamshedpur at District East Singhbhum, Jharkhand in accordance with the EIA Notification, 2006 of the Environment (Protection) Act, 1986.

It is also to inform that copy of the said Environmental Clearance letter may also be seen at Company's Website at http://www.tatasteelindia.com/corporate-citizen/environment-compliance-reports.asp.

Thanking you,

Warm regards,
For Tata Steel Limited

Shubhanand Mukesh

Shubhanand Mukesh
Head, Environment Management
Encl: Copy of Environmental Clearance letter

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TSJ/EMD/C-23/049/25
September 25, 2025

The Member Secretary
Jharkhand State Pollution Control Board
T.A. Division Building
HEC Campus, Dhurwa
Ranchi - 834004

Subject: Submission of Environment Statement for Tata Steel Limited, Jamshedpur for the year 2024-25

Dear Sir

With reference to captioned subject, we are submitting herewith the Environment Statement for Tata Steel Limited, Jamshedpur for the year 2024-25 duly filled in the prescribed format for your kind consideration.

You are requested to kindly acknowledge the same and place in your records.

Thanking you

Yours faithfully,
For Tata Steel Limited

Utsav Kashyap
Head Environment Clearance & Compliance (TSL)

Enclosures as above

Copy to: Regional Officer, Jharkhand State Pollution Control Board, Jamshedpur

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Ph: 8092087043 (M) e-mail: utsav.kashyap@tatasteel.com
Registered Office: Bombay House, 24 Homi Mody Street, Mumbai 400001
Tel 91 22 66658282 Fax 91 22 66657724
Corporate Identity Number L27100MH 1907PLC000260 Website www.tatasteel.com

ENVIRONMENTAL STATEMENT
FOR THE YEAR 2024-2025

TATA STEEL LIMITED
JAMSHEDPUR

Submitted By:
Environmental Management Department
Tata Steel Limited
Jamshedpur-831001
Jharkhand

[Form V]
Environment Statement for the Financial Year ending 31st March 2025

PART-A

(i)	**Name & address of the owner/occupier of the industry operation or process:**	Mr. T.V. Narendran, CEO & MD Tata Steel Limited Jamshedpur-831001 East Singhbhum, Jharkhand
(ii)	**Industry Category**	Red Category
	Primary STC Code:	3312
	Secondary SIC Code	331200
(iii)	**Production Capacity**	11 MTPA Crude Steel
(iv)	**Year of Establishment**	1907
(v)	**Date of last Environment Statement submitted**	27 September 2024

PART-B
WATER & RAW MATERIAL CONSUMPTION

i) Water Consumption (m^3/day)
Process & Cooling : 39,423
Domestic Consumption : 10,464

Name of the product	**Process water consumption/unit of product output (m^3/tcs)**	
Crude Steel	**During the Previous Financial Year (2023-24)**	**During the Current Financial year (2024-25)**
	1.62	1.37

ii) Raw Material Consumption (Works):

Name of raw material	**Name of products**	**Consumption of raw material per unit of output (kg/ton of crude steel)**	
		During the Previous Financial Year (2023-24)	**During the Current Financial year (2024-25)**
Iron Ore	Crude Steel	1555	1536
Coal		212.92	233.47
Coke		435.48	407.18
Limestone		321.96	319.42
Dolomite		54.61	48.38
Zinc		0.56	0.62
Pellet Purchased		0.88	0.95
Others		255.42	238.41

PART-C

Pollution discharged to environment/unit of output

Pollution	Quantity of pollutants discharged (mass/day)		Concentrations of pollutants in discharges (mass / volume)		% of variation from prescribed standards with reason
	(Tons/day)		(mg/L)		
(a) Water	**2023-24**	**2024-25**	**2023-24**	**2024-25**	
TSS	0.94	0.84	65	64	-36
COD	1.42	0.82	86	74	-70
BOD	0.17	0.16	10	14	-53
Oil & grease	0.04	0.03	3.0	2.64	-73
(b) Air	**2023-24**	**2024-25**	**2023-24**	**2024-25**	
	(Tons/day)		(mg/Nm^3)		
PM	5.69	5.30	8.63	7.96	-92
SO_2	15.48	18.57	73.85	86.33	-
NOx	14.14	16.85	67.47	78.30	-

PART-D

Hazardous Waste

[As Specified under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016]

Hazardous Waste	Total Quantity (Tons)	
	During the Previous Financial Year (2023-24)	During the Current Financial year (2024-25)
(a) From Process		
1. Used or spent oil	2308	1454
2. Wastes or residues containing oil	493	4752
3. Zinc fines or dust or ash or skimming in dispersible form	901	974
4. Spent bath and sludge containing sulfide, cyanide and toxic metals	109	119
5. Decanter tank tar sludge	9632	9576
6. Process wastes, residues and sludges	-	4
7. Empty barrels/ containers/ liners contaminated with hazardous chemicals/ wastes	302	332
8. Contaminated cotton rags or other cleaning materials	245	132
9. Exhaust Air or Gas cleaning residue	572500	552716
10. Spent ion exchange resin containing toxic metals	17	19
11. Chemical sludge from wastewater treatment (ZED salt from Tertiary Treatment Plant)	-	49
12. Muck Waste	12703	14325
13. Used Glass wool	165	152
14. Inorganic Acid/Mixed Chemical	21	43

15. Jelly filled Copper cables	-	206
(b) From Pollution Control Facilities		
1. APCE Dust	67,836	76,534
2. BOD Sludge	294	98

PART-E

Solid Wastes

	Total Quantity (Tonnes)	
	During the Previous Financial Year (2023-24)	**During the Current Financial year (2024-25)**
(a) From Process		
1. Granulated BF Slag	41,61,472	40,46,649
2. Air Cooled BF Slag	2,15,500	2,70,519
3. BOF LD Slag	20,05,309	19,51,246
4. Mill Scale	1,12,543	1,03,640
5. Iron Oxide	7544	7971
6. Mill Sludge	3255	2881
(b) From Pollution Control Facilities - Nil		
(c) (1) Quantity recycled or re-utilized within the unit		
	During the Previous Financial Year (2023-24)	**During the Current Financial year (2024-25)**
1. Air Cooled BF Slag	24,000	-
2. BOF LD Slag	1,53,466	1,62,805
3. Mill Scale	1,13,441	94,326
4. Iron Oxide	272	443
5. Mill Sludge	3143	3068
(2) Sold	**During the Previous Financial Year (2023-24)**	**During the Current Financial year (2024-25)**
1. Granulated BF Slag	41,44,572	40,45,446
2. Air Cooled BF Slag	1,92,000	2,71,019
3. BOF LD Slag	18,80,147	17,44,303
4. Mill Scale	-	-
5. Iron Oxide	7414	7482
6. Mill Sludge	-	-
(3) Disposed	No solid waste is being disposed of.	

PART-F

Please specify the characterization (in terms of composition and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

Name of Wastes	Chemical Composition and Quantum (%)	Disposal Method
LD Slag	FeO – 0.5-15.21; Fe_2O_3 – 4.4-4.4, Total Fe – 0.37-0.37; MgO – 4.5-10; CaO – 40.08-57; MnO – 0.2-1.95; SiO_2 – 2-10; Al_2O_3 – 8-35; P_2O_5 – 0.11-0.68; S – 0.085-1.83; Cr_2O_3 – 0.14-0.43	• Uses LD slag to make branded product i.e. Tata Aggreto, which is a coarse aggregate for road construction

Name of Wastes	Chemical Composition and Quantum (%)	Disposal Method
	w.r.t. Guidelines on Management of Pyro-metallurgical Slags - Iron & Steel Slags by CPCB.	• Uses LD slag to make branded product i.e. Tata Nirman, a fine aggregate used to manufacture fly ash bricks and clinker. • Supplies processed slag to cement companies for cement and clinker production, brick makers, and for infrastructure projects like national highway work etc.
BOF Slag	FeO – 13.54-23.5; Fe_2O_3 – 23-23.57, Total Fe – 16-20.63; MgO – 4.16-15.15; CaO – 40.95-52.35; MnO – 0.58-3.12; SiO_2 – 10.13-19.06; Al_2O_3 – 0.27-5.36; P_2O_5 – 0.6-2.68; S – 0.049-3.5; Free CaO – 2.53-3.96; Hg – 0.086 mg/kg w.r.t. Guidelines on Management of Pyro-metallurgical Slags - Iron & Steel Slags by CPCB.	• Uses BOF slag branded as Tata Aggreto, for road construction and maintenance, particularly for national highways, as a substitute for natural aggregates. • Uses BOF slag to produce Tata Nirman, a slag-based product for the brick manufacturing industry. • Uses BOF slag to produce branded product i.e. Dhurvi Gold, a soil enhancer for agriculture.
BF Slag	SiO_2 – 26.4-37.2; CaO – 28.72-37.22; Al_2O_3 – 14-35.3; MgO – 0.52-10.21; MnO – 0.07-0.47; FeO – 0.04-0.66; Fe - 0.08-0.9; S – 0.3-0.85; TiO_2 – 0.51-0.9; Hg – 0.018 mg/kg w.r.t. Guidelines on Management of Pyro-metallurgical Slags - Iron & Steel Slags by CPCB.	• Uses BF slag for making Tata Dureco for concrete and as aggregate in road construction. • Uses BF slag as railway ballast and sold to cement industries.

PART-G

Impact of the pollution abatement measures taken on conservation of natural resources and on the cost of production

- Reduction in freshwater consumption by increase in quantity of treated effluent from upgraded CTEP.
- Reduction in raw material consumption by recycling, re-use & co-processing of muck waste, flue dust, wastewater treatment sludges in agglomeration.
- Initiative to convert kitchen and other food waste into methane-rich biogas and uses it to replace LPG in commercial kitchens, such as those at the GT Hostel and the United Club.
- Replacement of diesel and petrol driven vehicles by 67 e-vehicles for local commute thus resulted in reduction of consumption of natural resource like petrol & diesel.

PART-H

Additional measures/ investment proposal for environmental protection abatement of pollution, prevention of pollution

- Deployment of facilities such as industrial vacuum cleaning, mechanical road sweeping machine, dust suppression through water sprinklers and mobile water sprinklers and through dust extraction systems.
- Facilities like telescopic chutes, closed conveyors and covered sheds have been installed for material handling & storage.
- Trucks and dumpers are covered for material transportation which can be air borne inside the premises.
- Installation of new water jet dust suppression system at pellet plant, high pressure mist beam canon at I-Blast Furnace, increased the frequency of road sweeping through mechanized sweeping machines, deployed new water tanker cum mist canon, mist cannons in the MRP area and other vulnerable areas.
- Increment in the mist fog curtain from 180 m to 380m at MRP area, installation of more than 20 feet high new wind curtain along the material dispatch road & in MRP area.
- To reduce the stack dust emissions, we have upgraded the bag filters at Raw Material Handling section and Ladle Furnace (LF) as well as have replaced the existing ESPs with bag filters to effectively control the secondary emissions in LD1 of the Steel Melt Shop and installed new DE systems at Pellet Plant.
- Upgradation of CETP capacity from 4 MGD to 9 MGD

PART-I

Any other particulars for improving the quality of environment

- Replacement of 10 years above old & outlived Split/window AC to increase the efficiency and reduction in power consumption is in progress.
- We have planted 1,46,681 nos. saplings during FY'25 inside the works, Jugsalai Muck Dump area and in Township.
- Waste Plastic being generated from plant premises are being for road construction as a part of End-of-Life Management.
- The company engages in scrap recycling, procuring various types of scrap (from end-of-life vehicles to household scrap) and processing it to improve its quality for use in steelmaking.

ANNEXURE - IV

सिटी

अंधेरे को कोसने से ज्यादा अच्छा है मोमबत्ती जलाना.
- एलेनॉर रूसवेल्ट

प्रभात खबर 8.03.2016 05 जमशेदपुर, मंगलवार

मॉडल स्कूल. राज्य में 89, जिले में 6 स्कूल संचालित

नये स्कूल नहीं खुलेंगे

संवाददाता ▸ जमशेदपुर

केंद्र सरकार ने मॉडल स्कूल योजना पर फिलहाल रोक लगा दी है. अब नये मॉडल स्कूलों को फंड नहीं मिलेगा. पूर्वी सिंहभूम के छह के साथ राज्य भर में संचालित 89 मॉडल स्कूलों का ही फिलहाल संचालन किया जायेगा. मॉडल स्कूलों के लिए शिक्षकों की बहाली पर भी रोक लगा दी गयी है. जिले के प्राइमरी व मध्य विद्यालयों से शिक्षक प्रतिनियोजित कर सभी स्कूलों का संचालन किया जा रहा है. केंद्र व राज्य सरकार से सहयोग से संचालित होने वाले मॉडल स्कूल में इंट्री क्लास छठी होती है. प्रतियोगिता से एक सत्र में 40 विद्यार्थियों का चयन किया जाता है. स्कूल में पठन-पाठन का पूरा सिस्टम प्राइवेट स्कूल की तरह होता है. स्कूल में मैथ, इंग्लिश और सोशल साइंस के शिक्षक-शिक्षिकाओं को अलग से बहाल किया जाता है.

पूर्वी सिंहभूम में प्रतिनियोजन पर शिक्षक

15 करोड़ से बन रहे 5 स्कूल भवन

मॉडल स्कूल के लिए सरकार से फंड आवंटित है. चाकुलिया, बहरागोड़ा, धालभूमगढ़, घाटशिला, डुमरिया में 3-3 करोड़ की लागत से मॉडल स्कूल का भवन निर्माण चल रहा है. पटमदा में जमीन विवाद के कारण निर्माण काम शुरू नहीं हो सका है.

एक क्लास के 120 रुपये

मॉडल स्कूल में पढ़ाने के लिए जैक की ओर से शिक्षक बहाल किये गये है. एक शिक्षक को एक क्लास के लिए 120 रुपये निर्धारित है. शर्त है कि एक दिन में एक शिक्षक अधिकतम क्लास ले सकेंगे. शिक्षकों की बहाली पर रोक के कारण सरकारी स्कूल से शिक्षकों का प्रतिनियोजन किया गया है. पूर्व में बहाल शिक्षक-शिक्षिकाएं पूर्ववत है.

कहां-कहां है मॉडल स्कूल

- पटमदा
- चाकुलिया
- बहरागोड़ा
- धालभूमगढ़
- घाटशिला
- डुमरिया

मॉडल स्कूल सरकार की अच्छी योजना है. जिले में डुमरिया मॉडल स्कूल के बच्चे पहली बार मैट्रिक की परीक्षा में शामिल हो रहे हैं. नये मॉडल स्कूल के निर्माण पर सरकार ने रोक लगा दी है.
मुकेश कुमार सिन्हा, डीइओ, पूर्वी सिंहभूम

छात्र-छात्राओं के बीच छात्रवृत्ति का होगा वितरण

जमशेदपुर. टेल्को को ऑपरेटिव सोसाइटी लिमिटेड के सदस्यों के मेधावी छात्र-छात्राओं के बीच छात्रवृत्ति का वितरण किया जायेगा. तीन अप्रैल को आयोजित होने वाले इस छात्रवृत्ति वितरण समारोह में आइसीएससी व सीबीएससी के 10वीं कक्षा तथा 12वीं कक्षा में 80प्रतिशत अंक प्राप्त करने वाले बच्चों को छात्रवृत्ति प्रदान की जायेगी. छात्रवृत्ति के इच्छुक छात्र व छात्रा 8 से 26 मार्च तक टेल्को कोऑपरेटिव सोसाइटी के कार्यालय से आवेदन फार्म लेने के साथ जमा कर सकते है. इसका निर्णय सोमवार को टेल्को कोऑपरेटिव सोसाइटी कार्यालय में एक बैठक कर लिया गया. इस बैठक में मुख्य रूप से सोसाइटी के सचिव राजीव श्रीवास्तव, भाष्कर चटर्जी सहित अन्य लोग उपस्थित थे.

केयू : ओड़िया में 7 विद्यार्थी कर रहे हैं पीएचडी

ये कर रहें हैं

... हैं. सभी शोधार्थी सोमवार को एबीएम कॉलेज में जुटे. मौका था ओड़िया विभाग प्रमुख डॉ बीबी भुईयां की अध्यक्षता में कार्यशाला आयोजन का. ... तिवारी, विवि के समाजशास्त्र के विभागाध्यक्ष डॉ एसके सिंह ने सबों को शोध से संबंधित जानकारी दी.

TATA STEEL | TATA

सार्वजनिक सूचना

सर्वसाधारण को एतत् द्वारा यह सूचित किया जाता है कि पर्यावरण, वन व जलवायु परिवर्तन, भारत सरकार ने दिनांक 01 मार्च, 2016 के अपने पत्र संख्या 11011/691/2007-IA-II(I) के जरिए मेसर्स टाटा स्टील लिमिटेड को पर्यावरण (सुरक्षा) अधिनियम, 1986 की पर्यावरण प्रभाव आकलन अधिसूचना, 2006 के अनुसार टाटा स्टील वर्क्स, जमशेदपुर, झारखंड में क्रूड स्टील के उत्पादन का 9.7 मिलियन टन प्रतिवर्ष से 11 मिलियन टन प्रति वर्ष तक विस्तार करने हेतु पर्यावरण स्वीकृति दी है। सर्वसाधारण को आगे यह भी सूचित किया जाता है कि इस पर्यावरण स्वीकृति पत्र की एक प्रति झारखंड राज्य प्रदूषण नियंत्रण बोर्ड, राँची के क्षेत्रीय कार्यालय में उपलब्ध है और इसे पर्यावरण, वन व जलवायु परिवर्तन के वेबसाइट http:/moef.nic.in पर भी देखा जा सकता है।

यह सार्वजनिक सूचना पर्यावरण स्वीकृति पत्र की सामान्य शर्त संख्या (xiv) के अनुपालन हेतु जारी की जा रही है।

निबंधित कार्यालय: बॉम्बे हाउस, 24, होमी मोदी स्ट्रीट, फोर्ट, मुंबई-400 001, भारत
दूरभाष .: 022 66658282 फैक्स: 022 66657724 (CIN) -L27100MH1907PLC000260
वेबसाइट: www.tatasteel.com

जिले की 2000 छात्राओं का हुआ एफडी

जमशेदपुर. पूर्वी सिंहभूम जिले की करीब 2000 छात्राओं को मुख्यमंत्री विद्या लक्ष्मी योजना का लाभ मिलेगा. उन्हें तत्काल 2000 रुपये की राशि दी जायेगी. हालांकि इस राशि का इस्तेमाल फिलहाल वे नहीं कर पायेंगी. उक्त राशि को न्यूनतम तीन साल के लिए फिक्स्ड डिपॉजिट किया जायेगा. इसे लेकर जिले में करीब 2000 एससी-एसटी छात्राओं का अकाउंट खोल दिया गया है. अकाउंट खोलने के साथ ही उनके नाम पर 2000 रुपये की राशि एफडी भी कर दी गयी है.

नौवीं के रजिस्ट्रेशन प्रक्रिया में बदलाव

जमशेदपुर. 2017 में मैट्रिक की परीक्षा में शामिल होने के लिए नौवीं के परीक्षार्थियों का रजिस्ट्रेशन चल रहा है. रजिस्ट्रेशन की प्रक्रिया में भी अब बदलाव कर दिया गया है. अब रजिस्ट्रेशन जिला शिक्षा पदाधिकारी कार्यालय में नहीं बल्कि

- जैक में एक ही दिन रजिस्ट्रेशन पर शिक्षक संघ ने जतायी आपत्ति

ANNEXURE - IV

TATA STEEL

TATA

सार्वजनिक सूचना

सर्वसाधारण को एतत् द्वारा यह सूचित किया जाता है कि पर्यावरण, वन व जलवायु परिवर्तन, भारत सरकार ने दिनांक 01 मार्च, 2016 के अपने पत्र संख्या 11011/691/2007-IA-II(I) के जरिए मेसर्स टाटा स्टील लिमिटेड को पर्यावरण (सुरक्षा) अधिनियम, 1986 की पर्यावरण प्रभाव आकलन अधिसूचना, 2006 के अनुसार टाटा स्टील वर्क्स, जमशेदपुर, झारखंड में क्रूड स्टील के उत्पादन का 9.7 मिलियन टन प्रतिवर्ष से 11 मिलियन टन प्रति वर्ष तक विस्तार करने हेतु पर्यावरण स्वीकृति दी है। सर्वसाधारण को आगे यह भी सूचित किया जाता है कि इस पर्यावरण स्वीकृति पत्र की एक प्रति झारखंड राज्य प्रदूषण नियंत्रण बोर्ड, राँची के क्षेत्रीय कार्यालय में उपलब्ध है और इसे पर्यावरण, वन व जलवायु परिवर्तन के वेबसाइट http:/moef.nic.in पर भी देखा जा सकता है।

यह सार्वजनिक सूचना पर्यावरण स्वीकृति पत्र की सामान्य शर्त संख्या (xiv) के अनुपालन हेतु जारी की जा रही है।

निबंधित कार्यालय: बॉम्बे हाउस, 24, होमी मोदी स्ट्रीट, फोर्ट, मुंबई-400 001, भारत
दूरभाष .: 022 66658282 फैक्स: 022 66657724 (CIN) -L27100MH1907PLC000260
वेबसाइट: www.tatasteel.com

TATA STEEL

TATA

Public Notice

General Public is hereby informed that the Ministry of Environment, Forests and Climate Change (MoEFCC), Govt. of India vide their letter no. 11011/691/2007-IA II(I) dated January 29, 2016 has accorded Environment Clearance to M/s Tata Steel Limited for expansion of Crude Steel production from 9.7 MTPA to 11 MTPA at Tata Steel Works, Jamshedpur, Jharkhand in accordance with the EIA Notification, 2006 of the Environment (Protection) Act, 1986.

General Public is further informed that copy of the said Environmental Clearance letter is available with the office of the Jharkhand State Pollution Control Board, Ranchi and may also be seen at Website of the MoEFCC at http:/moef.nic.in.

This public notice is issued in compliance to the General Condition no. (xiv) of the Environmental Clearance letter.

Registered Office: Bombay House, 24, Homi Mody Street, Fort, Mumbai- 400 001, India
Tel.: 022 66658282 • Fax: 022 66657724 • (CIN) - L27100MH1907PLC000260
website: www.tatasteel.com

Utsav Kashyap
Head Environment Clearance & Compliance TSL

TSJ/EMD/C-41/044/23
Date: 24.02.2023

To,
Divisional Forest Officer,
Jamshedpur Forest Division,
Jamshedpur - 831001
East Singhbhum, Jharkhand

Sub: Payment of levies w.r.t. approved Site-Specific Wildlife Conservation Plan (SSWLCP) of Tata Steel Limited (Main Steel Plant Jamshedpur & CRM Bara Rolling Mills Complex)

Ref: Approval of SSWLCP by Principle Chief Conservator of Forest - Wildlife & Chief Wildlife Warden (PCCF-WL & CWW), Jharkhand vide letter no. 1945 dated: 13.12.2017.
Demand note raised of your good office vide letter no. 3182 dated: 23.12.2023

Dear Ma'am,

This has reference to the captioned subject and cited references. We would like to inform you that we have made the payment of Rs.2,00,00,000/- (Rupees Two Crores only) with respect to the approved SSWLCP of Tata Steel Limited (Main Steel Plant Jamshedpur & CRM Bara Rolling Mills Complex) and submitting the e-challan copy of the payment as per the demand note received from your good office.

You are requested to kindly acknowledge the same and place in your records.

Thanking you
Yours Faithfully

For Tata Steel Limited

Utsav Kashyap

Utsav Kashyap
Head Environment Clearance & Compliance (TSL)
Encl: As above

24/2/23

TATA STEEL LIMITED
Environment Management Jamshedpur 831 001 India
Tel +91 657 6640363 P&T 8092087043 M e-mail utsav.kashyap@tatasteel.com
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001
Tel 91 22 66658282 Fax 91 22 66657724
Corporate Identity Number L27100MH1907PLC000260 Website www.tatasteel.com

Mob no → 6207901848
→ 8092087043

e-GRAS

e-Challan

Finance Department, Goverment of Jharkhand

Receiving Dept: Forest, Environment and Climate Change Department

Valid UpTo :-01/03/2023 — Remitter's Copy

GRN:-2315871703 — Date:- 20/02/2023 17:17:34

Receiving Office :- JSRFOR051-D.F.O.JAMSHEDPUR PRM.JSR.-FOREST

District :- Purbi Singhbhum — **Treasury:- Jamshedpur**

Year:-20/02/2023 — to:- 28/02/2023

Head(8782)	**Amount** ₹
Head Details **878200103010101** FOREST REMITTANCES	20000000.00

J - 2042 92497

Net Payable Amount:- ₹ **20000000.00**

Two Crore Rupees And Zero Paisa Only

For Treasury Use Only(Jamshedpur)

Challan No and Date: 108 (20/02/2023)

Identity Proof(Registration No) - 000260

PAN No:-

Remitter Name:- TATA STEEL LIMITED

Address :- BISTUPUR,JAMSHEDPUR,831001

Remarks :- Deposit Work

2498

Treasury Officer Signature is not reuqired.

FOR USE IN TREASURY LINK BANK

CHEQUE/DD No :- 650925 DT. 16/02/2023

Scroll No and (Date) :- ()

Bank Name :-SBI,JAMSEDPUR,DISTRICT TREASURY OFFICE

Note:- Bank Official are requested to update the receipt Online before Stamping.

Signature & Seal of Bank