PRE-FEASIBILITY REPORT

ON

EXPANSION OF INTEGRATED STEEL PLANT FROM 9.6 TO 15.6 MTPA (LIQUID STEEL) IN SURAT DISTRICT, GUJARAT

FOR

ARCELORMITTAL NIPPON STEEL INDIA LIMITED

SEPTEMBER 2021

DASTUR

M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS

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1 - EXECUTIVE SUMMARY

ArcelorMittal and Nippon Steel have established a joint venture (JV) company named ArcelorMittal Nippon Steel India Limited (AMNSI) in India. AMNSI has acquired a fully integrated steel plant (ISP) at Hazira, Gujarat with a production capability of 9.6 million tons per annum (MTPA) of Liquid Steel. Along with iron making and steel making facilities, the Hazira ISP also consists of downstream units, namely, cold rolling mill, galvanising line, steel processing facilities, extra wide plate mill and pipe mill. Additionally, AMNSI also owns significant iron ore beneficiation and pelletisation capacities located in Eastern India, with direct access to the region's rich iron ore reserves.

The various facilities owned by AMNSI across India are listed below:

a) 9.6 MTPA ISP at Hazira, Gujarat.

b) 8.0 MTPA Beneficiation Plant at Dabuna, Odisha.

c) 2 x 6 MTPA Pellet Plants (PP#1 and PP#2) at Paradeep, Odisha, linked via a slurry pipeline to the Dabuna Beneficiation Plant.

d) 8 MTPA Beneficiation Plant at Kirandul, Chhattisgarh.

e) 7.2 MTPA Pellet Plant at Vizag, Andhra Pradesh linked via slurry pipeline with the Beneficiation Plant at Kirandul, Chhattisgarh.

f) 0.7 MTPA Cold Rolling Complex including pickling, cold rolling, galvanising and colour coating facilities at Pune, Maharashtra.

The pellet plants at Vizag and Paradeep produce Direct Reduction (DR) grade and Blast Furnace (BF) grade pellets respectively. The entire production of DR grade pellets is consumed by the natural gas-based DR plant at Hazira, whilst a significant portion of the BF grade pellets is consumed by the BF and COREX units at Hazira. The balance BF grade pellets are sold in the market.

Now AMNSI proposes to undergo a brownfield expansion for production of 6.0 MTPA liquid steel and 6.0 MTPA hot rolled coils (HRC) within the existing steel plant at Hazira.

The major production facilities envisaged for the project will comprise of by-product recovery based coke ovens, blast furnaces, steel melt shop (BOF), slab casters and hot rolling mill. The plant will have its captive power plant (CPP) which will utilize surplus by-product fuel gas, steam from coke dry quenching (CDQ) and top recovery turbine (TRT) to produce power. The plant will also have its lime calcining plant and sinter plant. Air separation plant for producing oxygen, nitrogen and argon required by various units shall be available from existing facilities already installed or under implementation.

The capacities of the major production units are summarized in Table 1-1 below:

TABLE 1-1 – CAPACITIES OF MAJOR PRODUCTION UNITS

Product	Existing Plant, MTPA	After proposed expansion, MTPA
Hot metal from BF-1	2.04	3.0
Hot metal from BF-2 and 3	-	8.0
Hot metal from COREX	1.70	0
Total HM	**3.74**	**11.0**

Product	Existing Plant, MTPA	After proposed expansion, MTPA
Liquid steel from SMP-1	4.6	4.6
Liquid steel from SMP-2	5.0	5.0
Liquid steel from SMP-3	-	6.0
Total Liquid Steel	**9.6**	**15.6**
Hot-rolled flat products	9.5	15.5 (0.35 MTPA slab will be outsourced)

The major production facilities for the proposed project are summarized in Table 1-2 below:

TABLE 1-2 – MAJOR PRODUCTION FACILITIES FOR THE PROPOSED PROJECT

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
1	HBI Plant (DRI Mod I to VI)	MTPA	3.83+(4.0)*	0	7.83	Earlier planning was to remove HBI Modules (1 to 4) totaling 4 MTPA and replace it with Blast Furnace of 3.0 MTPA. This could not be implemented due to fund constraints and legal cases at the NCLT. *Original capacity prior to EC 2016 was 7.83 MTPA only. It is now proposed to maintain this original capacity. CTO has been sanctioned for 7.83 MTPA.
2	Blast Furnace (BF)	MTPA	5.04	5.96	11.0	Existing operational BF of capacity 2.04 MTPA is proposed to be upgraded to 3.0 MTPA. Further, additional 2 nos. of BFs with 4.0 MTPA capacity each is proposed.

1 - Executive Summary (cont'd)

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
3	Sinter Plant	MTPA	8.48	0	8.48	7.0 MTPA plant could not be implemented due to fund constraints and legal cases at the NCLT. Now, will establish the 7.0 MTPA Plant approved vide 2016 EC. (It will comprise of 02 number plants).
4	Coke Oven (Recovery Type)	MTPA	1.35	3.05	4.4	1.2 MTPA plant could not be implemented due to fund constraints and legal cases at the NCLT. *2016 EC approved for 2.55 MTPA, AMNSI is proceeding only with 1.35 MTPA since 1.2 MTPA originally secured in 2010 EC has now lapsed.
5	Air Separation Plant	Nm^3/hr	4,24,744	0	424,744	64200 Nm^3/hr plant will be established as per 2016 EC
6	SMS-1 (EAF 4 Nos.)	MTPA	0 +(4.6)*	0	4.6	Earlier planning was to remove 4.6 MTPA EAF -4 nos. and replacing with BOF-3 nos. in its place but that could not be implemented due to fund constraints and legal cases at the NCLT. *Original capacity prior to EC 2016 was 4.6 MTPA only and it is now submitted to retain this original capacity. CTO has been sanctioned for 4.6 MTPA.
7	SMS-3 (BOF- 3 nos.)	MTPA	4.6	1.4	6.0	New SMS-3 shop of 6.0 MTPA is proposed.
8	SMS-2	MTPA	5.0	0	5.0	
	Total SMS production		**9.6**	**6.0**	**15.6**	
9	Corex Plant	MTPA	1.7	0	1.7	Plant will be operated till the proposed expansion is completed. Thereafter it will be shutdowns safely and will be started only in case

1 - Executive Summary (cont'd)

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
						of any unit going down but maintaining sanctioned production of hot metal.
10	Lime Plant (Lime/Dolime)	MTPA	0.93	1.07*	2.0	*0.27 MTPA proposed in ToR 2021. 0.8 MTPA proposed in this expansion.
11	CPP	MW	604	250	854	2 x 100 MW surplus fuel gas + 2 x 25 MW TRT.
12	Plate Mill	MTPA	1.5	0	1.5	
13	CSP and HRC	MTPA	8.0*	6.0	14.0	*Approved vide 29th May 2008 EC for 4.5 MTPA and this was operationalized through CTO. 3.5 MTPA provided under 2016 EC and operationalized under CTO. Total HRC is 8.0 MTPA.
14	CRM	MTPA	1.5 + 0.54*	3.2	5.24*	CTO taken for additional 0.54 MTPA from GPCB. 3.2 MTPA proposed in ToR 2021. *(1.5+0.54+3.2=5.24).
15	Jetty	Meter	734	0	734	As per 2016 EC.
		Meter	456	0	456	734 and 456 meters capacity was sanctioned in 2006 EC. This was implemented although inadvertently mentioned 734 m only in 2016 EC.
	Total Jetty Length (Meter)	Meter			**1190**	
16	Waste Heat Recovery based Power Plant	MW	45	100	145	1 x 100 MW CDQ based
17	**Pipe Mill**					
	H Saw Pipes	MTPA	0.15 + 0.15*	0	0.30*	0.15 MTPA as per 2016 EC and CTO taken for additional 0.15 MTPA from GPCB. *(0.15+0.15=0.30).
	L Saw Pipes	MTPA	0.33	0	0.33	

The estimated annual requirement of raw materials for the proposed project is given below in Table 1-3:

TABLE 1-3 – ESTIMATED ANNUAL REQUIREMENT OF RAW MATERIALS FOR FACILITIES UNDER PROPOSED EXPANSION

Sl. No.	Name of Raw Material	Requirement, TPA			Source	Mode of Transportation
		Existing	Proposed	Total		
1	DR Grade Pellets	11,823,300	-	11,823,300	AMNSI's pelletization plants located at Vizag and Paradeep	Sea Route
2	BF Grade Pellets	5,400,000	6,759,536	12,159,536		
3	Calibrated Lump Ore	-	127,660	127,660	NMDC mines in Kirandul, Dist. Dantewada, CG	Sea Route
4	Oxide Fines	185,000	3,942,444	4,127,444	Goa, Odisha, NMDC fines	Sea Route
	Total Iron Bearing Material	**17,408,300**	**10,829,640**	**28,237,940**		
5	Coal-PCI-BF	408,000	2,036,444	2,444,444	Australia (mainly) and Canada, USA and Russia	Sea Route
6	Coal for Corex	2,770,000	-2,770,000	0		
7	Metallurgical Coal	1,957,500	4,501,564	6,459,064		
	Total Coal	**5,135,500**	**3,768,009**	**8,903,509**		
8	Coke	1,155,000	-1,155,000	0		
9	BF and Sinter Grade Flux (Limestone +Dolomite + Pyroxenite + Quartzite)	690,000	493,715	1,183,715	Dubai and Oman	Sea Route
10	SMS grade Limestone and Dolomite	1,863,000	2,562,564	4,425,564		
	Total Flux and Additives	**2,553,000**	**3,056,279**	**5,609,279**		

Notes:
(1) All figures are in gross and wet basis.
(2) Sl. No. 2 - Existing quantity includes 3,000,000 tpa for COREX plant.

The other salient features of the project are as follows (Table1-4):

TABLE 1-4 – OTHER SALIENT FEATURES OF THE PROJECT

Saleable products	Hot Rolled Coil - 6 MTPA
Location	Hazira Village, Surat District, Gujarat
Water consumption	For expansion unit approx. 3,400 cu m/hr (approx.17.98 MGD)
Water Source	Tapi River, intake at about 30 km distance
Power source and requirement	Existing – 1163 MW Proposed expansion- 410 MW (Average demand) Total = 1573 MW Captive generation – 810 MW + 243 MW to be supplemented by by-product gas and coal fines power generator. Balance – From Grid around 520 MW.
Land details	Land requirement for proposed expansion = 186.20 Ha. It will comprise of the following: a) Forest land of 65.73 Ha. (Stage-II clearance available). b) 14.15 Ha applied for acquisition to State Government. c) 106.32 Ha vacant land in the existing plant area / Township office area.
Employment generation	Construction phase - Direct 500, Indirect 15,000 Operation phase - Direct 1,750, Indirect 5,250
Implementation Schedule	36 months from 'Go-ahead' date
Capital Cost	Around INR 31,600 Crore

The proposed project would generate employment opportunities, enhance local income and contribute to applicable Government revenues. Consequently, the growth of allied small-medium scale industries, trade & commercial establishments and local entrepreneurship is envisaged.

The peripheral development activities that would be undertaken by the proposed project under socio-economic development activities will focus on marginal communities and attempt to bring forward an overall socio-economic development with special emphasis in the areas of education, training, health and infrastructure.

2 - INTRODUCTION OF THE PROJECT/BACKGROUND INFORMATION

2.1 IDENTIFICATION OF THE PROJECT AND PROJECT PROPONENT

ArcelorMittal and Nippon Steel have established a joint venture (JV) company named ArcelorMittal Nippon Steel India Limited (AMNSI) in India. AMNSI has acquired a fully integrated steel plant at Hazira, Gujarat with a production capability of 9.6 MTPA of liquid steel. Along with iron making and steel making facilities, the Hazira ISP also consists of downstream units, namely, cold rolling mill, galvanising line, steel processing facilities, extra wide plate mill and pipe mill. Additionally, AMNSI also owns significant iron ore beneficiation and pelletisation capacities located in Eastern India, with direct access to the region's rich iron ore reserves.

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f) 0.7 MTPA Cold Rolling Complex including pickling, cold rolling, galvanising and colour coating facilities at Pune, Maharashtra.

The pellet plants at Vizag and Paradeep produce Direct Reduction (DR) grade and Blast Furnace (BF) grade pellets respectively. The entire production of DR grade pellets is consumed by the natural gas-based DR plant at Hazira, whilst a significant portion of the BF grade pellets is consumed by the BF and COREX units at Hazira. The balance BF grade pellets are sold in the market.

2.2 BRIEF DESCRIPTION OF THE NATURE OF THE PROJECT

The brief profile of the projects is as follows:

- Expansion of the ISP by addition of facilities to produce additional 6.0 MTPA liquid steel and 6.0 MTPA finished product (hot rolled coils).

The proposed production of crude steel and subsequent rolling would be accomplished via blast furnace (BF)-basic oxygen furnace (BOF)-caster route followed by hot rolling.

The integrated steel plant would fall under Category 'A' of item 3(a) "Metallurgical Industries (ferrous and non-ferrous)" of the Schedule to the EIA Notification 2006 and amendments there under vide Notification No. S.O 3067 (E) dated 1st December 2009 under the Environment (Protection) Rules 1986.

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY

In 2018, India had replaced Japan as world's second largest steel producer with a production of 106.5 million tons (MT), up by 4.9 percent from 101.5 MT in 2017. In 2020, production of crude steel was about 108.5 MT against 111.2 MT in 2019. The reduction was as a result of industrial lockdown due to the current pandemic scenario. India's per capita steel consumption is about 66 kg, much lower than the global average of 214 kg. The Government of India has set pragmatic target of achieving per capita steel consumption of 158 kg by 2030-31 requiring a crude steel production of 255 MT and capacity of 300 MT.

Indian economy is rapidly growing with key focus on infrastructure and construction sector. Several initiatives mainly, affordable housing, expansion of railway networks, development of domestic shipbuilding industry, opening up of defense sector for private participation, and the anticipated growth in the automobile sector, are expected to create significant demand for steel in the country.

Major factors which carry the potential of raising the per capita steel consumption in the country are listed below:

a) Infrastructure improvement initiatives, such as 'Smart Cities project', 'Housing for All by 2022', 'Atal Mission for Rejuvenation and Urban Transformation (AMRUT)'.

b) Manufacturing growth driven by Make-in-India initiative.

c) Encouraging use of Made in India steel for various projects and levying of anti-dumping duties on certain steel products from Brazil, Russia, China, Korea, Japan and Indonesia.

d) National Mineral Development Corporation expected to increase the iron ore production favoring steel production.

e) Emergence of the rural market for steel buoyed by projects like MGNREGS, development of 'Rurban Clusters' under the Shyama Prasad Mukherjee Rurban Mission, Pradhan Mantri Gram Sadak Yojana, among others.

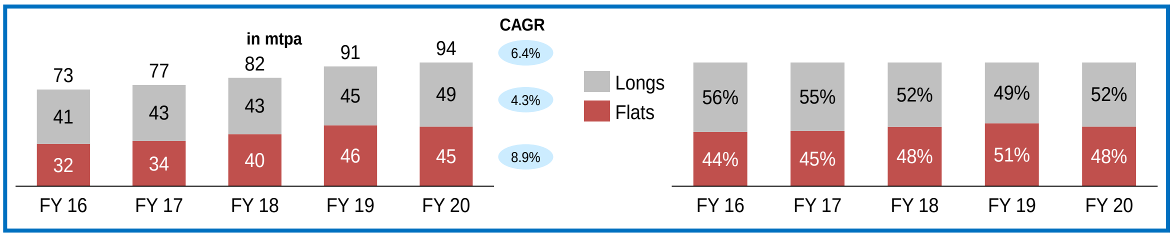
As per the National Steel Policy (NSP) 2017, in order to achieve expected capacity of 300 MT, finished steel production of 230 MT and per capita consumption of 158 kg of finished steel by 2030-31, steel demand would need to grow at a CAGR of around 7.16 percent during the period against a CAGR of 3.5 to 4 percent over the last 5 years. This would mean that capacity additions planned by most of the major steel players need to come on stream in next few years. In respect, the proposed project would contribute substantially towards the target steel production of NSP 2017.

The concept of the proposed project is in alignment with the current progress plan of the country.

2.4 DEMAND-SUPPLY GAP, IMPORTS VS. INDIGENOUS PRODUCTION, EXPORT POSSIBILITY AND DOMESTIC/ EXPORT MARKETS

2.4.1 Consumption

Finished steel consumption in India during FY 2019-20 was 100.1 MTPA, consisting of 94.1 MTPA of carbon steel and 6 MTPA of alloy and stainless steel. Within carbon steel, demand for flats has grown faster than longs in the recent past, and presently both flats and longs have almost equal shares of demand (Fig. 2-1).



Source: JPC and DASTUR research

FIG. 2-1 - DEMAND FOR FINISHED CARBON STEEL IN INDIA

Steel demand in India is dominated by the construction sector, followed by the capital goods and auto sectors. Most of the end-use sectors of steel consumption in India have moderate to strong growth prospects, based on which a 5 to 6 percent per annum growth in finished steel consumption in India is likely to be achievable in the immediate future, i.e. at least till 2025-26. However, the demand growth rate thereafter is expected to taper from 2025-26 to 2030-31.

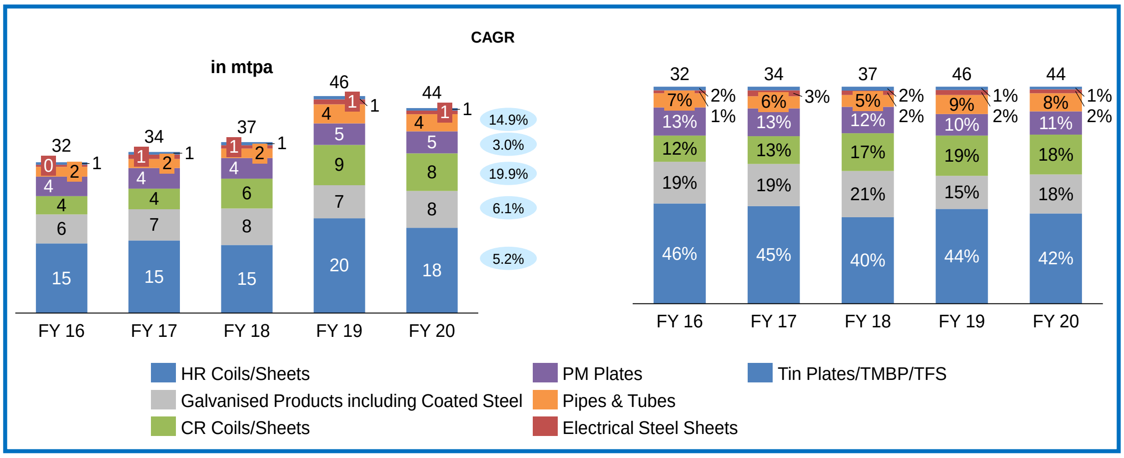
2.4.2 Forecast

The National Steel Policy 2017 (NSP 2017) has laid down a framework of development of steel sector in India till 2030-31. Among other issues, the NSP 2017 has projected the domestic steel demand to reach 230 million tons by 2030-31 from 81.5 million tons achieved in 2015-16, implying a grow rate of 7.16 percent CAGR.

Four years have elapsed since the NSP was released in 2017 based on the 2015-16 performance of the steel industry. The progress in domestic steel consumption over the last four years since 2015-16, which reached a level of 100.1 million tons in 2019-20 against the target of 107.5 million tons, registered a growth rate of 5.27 percent compounded annually. This is lower than the NSP'17's projection of 7.16 percent CAGR per annum. The comparatively lower growth has made it imperative to revise the projection of steel demand based on the market reality as it is obtaining now. Keeping a tab on the nature of development of the industries likely to drive the demand of steel in future, a more realistic growth rate of 5.5 percent CAGR on a higher base level of consumption of 2019-20 is considered to be in order by the industry experts for the domestic market to expand in future. At this rate, the projected demand of finished steel works out to 106, 138 and 180 million tons by 2020-21, 2025-26 and 2030-31 respectively.

2.4.3 Flat Steel Market

Flat steel products consist of nearly 50 percent of the total carbon steel consumption in India; the major flat product categories (PM plates. HRC, cold rolled coils (CRC), galvanized and coated steel) account for 90 percent of flat steel consumption in India (Fig. 2-2). The flat steel market is showing a much stronger growth compared to long products; demand for flats has grown at nearly 9 percent per annum in the recent past, with few segments showing even higher growth rates.

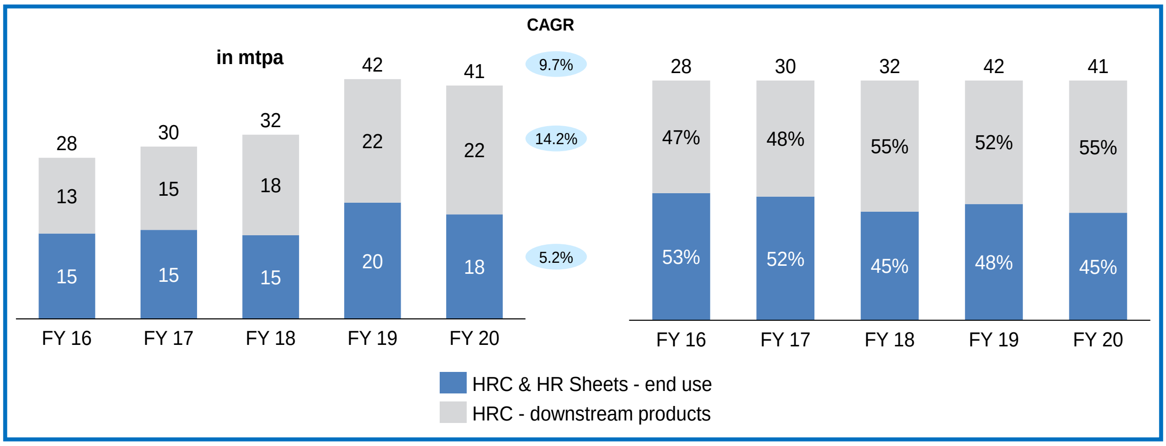


Source: JPC

FIG. 2-2 - CONSUMPTION OF FLAT STEEL PRODUCTS IN INDIA

At the gross level, flats essentially comprise of two products - PM plates and HRC; other product categories are value-added downstream products made from HRC. HRC accounts for nearly 90 percent of the flats market, and PM plates the remaining 10 percent. The gross market for HRC includes both HRC sold in the market for final use and HRC consumed for making downstream value-added products for further use by the manufacturing industry.

Hot rolled coils (HRC) account for 90 percent of the flat steel market in India and are the source material for several downstream value-added products like cold rolled coils (CRC), galvanized and coated coils and sheets, steel pipes, etc. About 55 percent of HRC demand is from downstream products (Fig. 2-3), while the remaining 45 percent is directly consumed by the various end-using industries. The end-use of HRC is primarily in the manufacturing sector, in making wagons, coaches, pipes, tubes, machinery, cylinders, furniture, fabrication of drums and barrels etc.



Source: JPC, DASTUR research

FIG. 2-3 - HRC AND HR SHEETS CONSUMPTION IN INDIA

Excepting PM plates, which did not exhibit any significant growth in the recent past, all other products like hot and cold rolled coils, galvanized and coated steel grew at significantly higher rates often exceeding 10 percent or more CAGR per annum. However, considering the long term nature of the forecast a more reasonable set of growth rates have been assumed for forecasting which are likely to both achievable and sustainable in the long run. The projected demand scenario of flat steel products is furnished in Table 2-1 on the next page.

TABLE 2-1 - DEMAND FORECAST FOR FLAT PRODUCTS IN INDIA (MTPA)

Product category	Demand 2019-20	Growth rate 2025-26	Demand 2025-26	Growth rate 2030-31	Demand 2030-31
PM Plates	4.70	3.0%	5.6	2.5%	6.5
HRC and Sheets	40.6	9.7%	70.9	6%	100.5
CRC and Sheets	16.1	10%	28.5	8%	45.1
Coated Steel	7.9	6.0%	11.2	5%	14.9
NB: The above analysis excludes other relatively smaller down -stream value added products like Tin Plates, Electrical steel sheets and large diameter pipes.					

Source: DASTUR research

The demand-supply scenario in flat steel has been forecast for 2025-26, based on the current capacity of flat products of ISPs and secondary players, as well as information available on the expansion plans of the ISPs for these products.

The definitive HRC expansion plans of Indian ISPs are as under, based on which the demand-supply forecast scenario in FY 2025-26 is shown in Table 2-1.

a) Tata Steel Limited's (TSL) Kalinganagar Phase-2 expansion - 3.2 MTPA.

b) JSW Steel Limited's Dolvi expansion - 5 MTPA expansion.

c) JSW Steel Limited's Vijaynagar expansion - 5 MTPA expansion.

d) NMDC Limited's Nagarnar green-field steel plant - 2.9 MTPA hot strip mill (HSM) capacity.

Among the ISPs, only TSL has announced a definite capacity expansion with a 2.2 MTPA cold rolling mill (CRM), as part of the TSL Kalinganagar Phase-2 project.

Among ISPs, only TSL has announced a definite capacity expansion plan, with a 0.45 MTPA continuous galvanizing line (for non-auto demand) and 0.55 MTPA continuous galvanizing line (for auto demand) expansion at TSL Kalinganagar.

The broad product-mix has been envisaged based on the following factors:

a) Future market demand and supply scenario in India.
b) AMNSI's presence in the respective product category.
c) Net sales realisation from the products.

The market study forecasts the likely future demand-supply scenario in various product categories of the steel market in India, taking into account the present market scenario, likely growth in demand, and capacity additions by various players in the industry. Based on the same, as well as the space availability, the following product categories have been considered for AMNSI's proposed plan. The additional capacity requirement has been calculated considering an appropriate capacity utilisation factor, based on DASTUR's experience of production ramp-up of similar size integrated steel plants. The broad saleable product-mix envisaged for the plant is presented in Table 2-2 on the next page.

TABLE 2-2 - BROAD SALEABLE PRODUCT-MIX FOR AMNSI'S PROPOSED PLANS

Product	Demand-supply gap in India by 2025-26, MTPA	Capacity for Hazira, MTPA
Flat Products		
HR coil/sheets/ strips	14.4	6.0

2.5 EMPLOYMENT GENERATION (DIRECT AND INDIRECT) DUE TO THE PROJECT

The proposed project would engage in recruitment of local skilled, semi-skilled and unskilled workers thereby contributing positively towards local employment and income.

a) Total manpower required for the construction phase under direct and indirect employment is 500 and 15,000 respectively.

b) Total manpower required for the operation phase under direct and indirect employment is about 1,750 and 5,250 respectively.

Growth of indirect employment opportunities due to development of ancillary industries is also envisaged.

3 - PROJECT DESCRIPTION

3.1 TYPE OF PROJECT

The proposed project would comprise the following:

Setting up of brownfield ISP for production of 6.0 MTPA liquid steel for 6.0 MTPA hot rolled coil

3.2 LOCATION

The proposed project located at Hazira village, in Chorasi tehsil, district Surat in the state of Gujarat as shown in Fig 3-1. The project site is located at latitude 21^{0}6'43.72''N and longitude 72^{0}38'40.29''E. The Google maps image showing location of the project site is shown in Fig 3-2 on the next page.

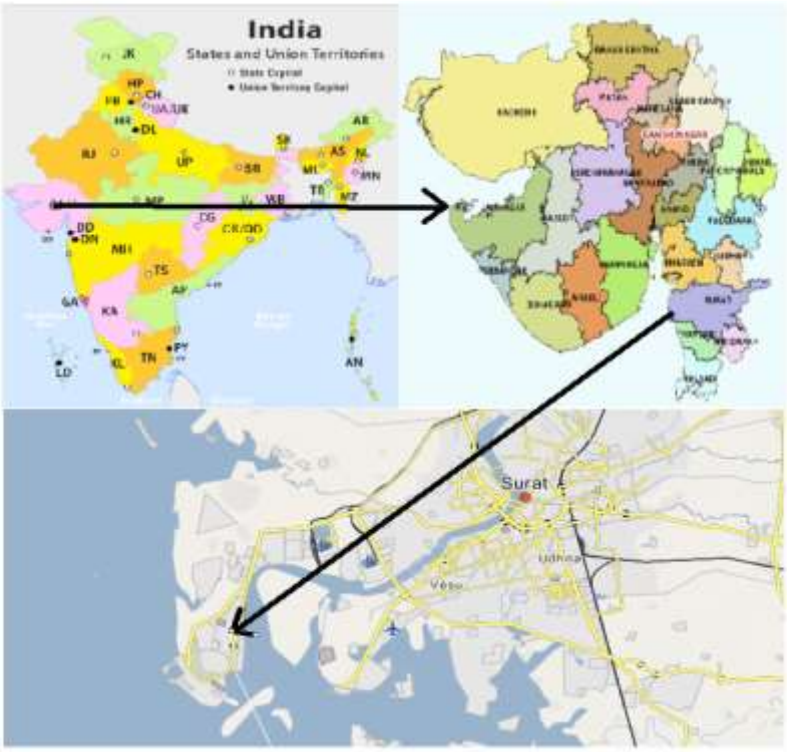


FIG. 3-1 - SITE LOCATION MAP

FIG. 3-2 - GOOGLE MAP SHOWING LOCATION OF THE PROJECT

3.3 DETAILS OF ALTERNATE SITES CONSIDERED AND THE BASIS OF SELECTING THE PROPOSED SITE

3.3.1 Suitability of the Site for Integrated Steel Plant

The proposal under consideration is a brownfield project which would be located within the existing ISP works boundary operated by the group. This would enable appropriate sharing of the existing infrastructure, other ancillary and auxiliary facilities and ensure uninterrupted movement of various raw materials without additional cost or involving minimal augmentation of material movement logistics. Moreover, it is planned to utilize the unutilized land area under the possession of AMNSI along with the partial land occupied by the township and offices.

The proposed site also has the following advantages:

a) The area is under Notified Hazira Industrial Area.

b) Ensuring availability of adequate land for installation of units.

c) Suitability of sharing existing infrastructure in terms of connectivity, water resource and grid power.

d) Ease of raw materials acquisition and products transportation through the existing jetty.

e) Plan to expand old jetty to deep draft jetty and will handle 20 MTPA [Separate application will be filed for environmental clearance (EC) and Coastal Regulation Zone (CRZ) clearance].

f) Can handle additional cargo through Adani Hazira Port Ltd. (AHPL) as per requirement.

g) This project will help to boost the Western Region's infrastructure development of Gujarat under Atma Nirbhar Bharat scheme.

h) Availability of economical labour force.

3.4 SIZE OR MAGNITUDE OF OPERATION

The proposed project would include production of 6.0 MTPA liquid steel and 6.0 MTPA HRC. The additional crude steel (Slabs) required for production of 6.0 MTPA HRC will be sourced from outside.

3.5 LAYOUT

The plant general layout of the proposed ISP is shown in Drawing 11613-97A-000-LTL-0003.

3.6 PROJECT DESCRIPTION WITH PROCESS DETAILS

The major plant capacities as proposed for the project and the proposed major new facilities are shown in Table 3-1 on the next page.

TABLE 3-1 – PROPOSED NEW FACILITIES AND PLANT CAPACITIES

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
1	HBI Plant (DRI Mod I to VI)	MTPA	3.83+(4.0)*	0	7.83	Earlier planning was to remove HBI Modules (1 to 4) totaling 4 MTPA and replace it with Blast Furnace of 3.0 MTPA. This could not be implemented due to fund constraints and legal cases at the NCLT. *Original capacity prior to EC 2016 was 7.83 MTPA only. It is now proposed to maintain this original capacity. CTO has been sanctioned for 7.83 MTPA.
2	Blast Furnace (BF)	MTPA	5.04	5.96	11.0	Existing operational BF of capacity 2.04 MTPA is proposed to be upgraded to 3.0 MTPA. Further, additional 2 nos. of BFs with 4.0 MTPA capacity each is proposed.
3	Sinter Plant	MTPA	8.48	0	8.48	7.0 MTPA plant could not be implemented due to fund constraints and legal cases at the NCLT. Now, will establish the 7.0 MTPA Plant approved vide 2016 EC. (It will comprise of 02 number plants).
4	Coke Oven (Recovery Type)	MTPA	1.35	3.05	4.4	1.2 MTPA plant could not be implemented due to fund constraints and legal cases at the NCLT. *2016 EC approved for 2.55 MTPA, AMNSI is proceeding only with 1.35 MTPA since 1.2 MTPA originally secured in 2010 EC has now lapsed.
5	Air Separation Plant	Nm^3/hr	4,24,744	0	424,744	64200 Nm^3/hr plant will be established as per 2016 EC

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
6	SMS-1 (EAF 4 Nos.)	MTPA	0 +(4.6)*	0	4.6	Earlier planning was to remove 4.6 MTPA EAF -4 nos. and replacing with BOF-3 nos. in its place but that could not be implemented due to fund constraints and legal cases at the NCLT. *Original capacity prior to EC 2016 was 4.6 MTPA only and it is now submitted to retain this original capacity. CTO has been sanctioned for 4.6 MTPA.
7	SMS-3 (BOF- 3 nos.)	MTPA	4.6	1.4	6.0	New SMS-3 shop of 6.0 MTPA is proposed.
8	SMS-2	MTPA	5.0	0	5.0	
	Total SMS production		**9.6**	**6.0**	**15.6**	
9	Corex Plant	MTPA	1.7	0	1.7	Plant will be operated till the proposed expansion is completed. Thereafter it will be shutdowns safely and will be started only in case of any unit going down but maintaining sanctioned production of hot metal.
10	Lime Plant (Lime/Dolime)	MTPA	0.93	1.07*	2.0	*0.27 MTPA proposed in ToR 2021. 0.8 MTPA proposed in this expansion.
11	CPP	MW	604	250	854	2 x 100 MW surplus fuel gas + 2 x 25 MW TRT.
12	Plate Mill	MTPA	1.5	0	1.5	
13	CSP and HRC	MTPA	8.0*	6.0	14.0	*Approved vide 29th May 2008 EC for 4.5 MTPA and this was operationalized through CTO. 3.5 MTPA provided under 2016 EC and operationalized under CTO. Total HRC is 8.0 MTPA.
14	CRM	MTPA	1.5 + 0.54*	3.2	5.24*	CTO taken for additional 0.54 MTPA from GPCB. 3.2 MTPA proposed in ToR 2021. *(1.5+0.54+3.2=5.24).

Sl. No.	Plant / Product	Unit	Capacities as per previous ECs	Proposed Expansion for which EC is being sought	Total Capacity	Remarks
15	Jetty	Meter	734	0	734	As per 2016 EC.
		Meter	456	0	456	734 and 456 meters capacity was sanctioned in 2006 EC. This was implemented although inadvertently mentioned 734 m only in 2016 EC.
	Total Jetty Length (Meter)	Meter			**1190**	
16	Waste Heat Recovery based Power Plant	MW	45	100	145	1 x 100 MW CDQ based
17	**Pipe Mill**					
	H Saw Pipes	MTPA	0.15 + 0.15*	0	0.30*	0.15 MTPA as per 2016 EC and CTO taken for additional 0.15 MTPA from GPCB. *(0.15+0.15=0.30).
	L Saw Pipes	MTPA	0.33	0	0.33	

The production facilities would be adequately supported by necessary auxiliary facilities such as raw materials unloading and storage, proportioning of raw materials, electric power receiving and distribution stations, various utility facilities, water treatment and distribution system, etc.

The preliminary process flow sheet is shown in Drawing 11613-97A-000-PRS-0001 RB.

The following sections lay down the details of the various process units.

3.6.1 Raw Materials Handling System

This section describes the facilities envisaged for storage, stockpiling, reclamation and subsequent distribution and despatch of raw materials to the different consuming units proposed for the expansion, e.g. two new BFs, new lime calcining plant, coke oven batteries 3, 4, 5 and 6 and the new steel melt shop (SMS). In addition to the above, this yard shall also cater to the existing lime calcining-2. Coke oven battery -1 and 2 along with sinter plant under implementation in the existing plant shall also be catered through this yard.

The existing cargo handling requirement of the steel plant at Hazira is 25 MTPA. Presently this requirement is catered through its captive jetty of AMNSI licensed by Gujarat Maritime Board (GMB) and Essar Bulk Terminal Limited (EBTL). AMNSI has cargo handling and storage contract for 25 MTPA with EBTL to handle raw materials such as iron ore, coal, coke, limestone, dolomite etc. and export of finished steel products such as coils, plates, pipes, slabs etc. through sea transportation.

Apart from EBTL, Adani Hazira Port Ltd (AHPL) has given in principle acceptance for 20 MTPA cargo handling and storage.

Simultaneously, AMNSI is proposing expansion of existing jetty further to handle 20 MTPA cargo and a separate application for EC and CRZ clearance is being filed to cater to the needs of proposed expansion.

3.6.1.1 **Storage Area**

The details of the raw material and finished goods storage area are given in Table 3-2 on the next page.

TABLE 3-2 – EXISTING AND PROPOSED STORAGE AREA

Sl. No	Raw Material/ Goods	Storage Quantity, MMT		Storage Area, Ha		Type
		Existing	Proposed	Existing	Proposed	
1.	Iron Ore / Limestone	1.2	*	10	*	Open storage
2.	Coal / Coke	0.5	*	38	*	Open storage
3.	Finished Goods	0.04	0.35	0.5	8.1	Cover storage

Note:
*Storage and handling of additional raw material required for proposed expansion will be through APHL (Adani Port Hazira Limited).

3.6.1.2 Receipt and Unloading of Raw Materials for Proposed Expansion

The majority of the raw materials, i.e. coal, oxides and fluxes, will be received through EBTL/AHPL. In future, a new jetty will be developed (Separate application being filed). It is envisaged that grab bucket type ship unloaders will work for unloading materials from vessels and subsequently onward transportation of unloaded materials to the yards shall be carried through conveyor system for stockpiling with the help of stacker-cum-reclaimers. Conveyor connectivity has also been envisaged for diverting materials directly to different process plants.

The daily average quantity of raw materials to be handled and their mode of receipt are given in Table 3-3 on the next page.

TABLE 3-3 – RECEIPT AND MODE OF TRANSPORT OF MAJOR RAW MATERIALS FOR FACILITIES UNDER PROPOSED EXPANSION

Unit	Raw Materials	Mode of Receipt	Daily Quantity(1), tpd
Coke Ovens (Units 3, 4, 5 and 6)	Prime/Hard coking coal	Ship	3,665
	Semi-soft coking coal	Ship	7,330
	Lean coal	Ship	1,222
Blast Furnaces (BF-2, BF-3 and BF-1 after updradation)	Pellet	Ship	34,742
	Dolomite	Ship	241
	Quartzite	Ship	400
	Pyroxenite	Ship	851
	Coal for PCI	Ship	6,984
Steel Melt Shop (SMP-3)	Iron ore lump	Ship	387
	Ferroalloy	Truck	265
Calcining Plants (New)	Limestone	Ship	4,318
	Dolomite	Ship	2,226

Note:
(1) The daily average quantities have been derived considering the following average days of working for the process plants:

Blast furnace	..	350
BOF	..	330
Coke oven	..	365
Calcining plant	..	330

3.6.1.3 Storage and Stockpiles of Raw Materials

Raw materials received through the port, after unloading, will be conveyed to the yards and stored in the stockpile using stacker-cum-reclaimers. Apart from existing coke yard, future storage area will be developed with facility for stacker-cum-reclaimers on the west of existing coke shed.

Reclaiming will be done through stacker-cum-reclaimers for onward despatch of materials to process plants mentioned above. It is envisaged to consider 28 to 30 days of storage for coal and approx. 15 days of storage for oxide and flux materials.

3.6.1.4 Despatch of Raw Materials to Various Consuming Units

The despatch of raw materials to various consuming units is given below:

a) **Despatch of Raw Materials to Blast Furnace**

The various raw materials required for the blast furnace, including pellet, fluxes etc., will be reclaimed by the stacker-cum-reclaimer (one material at a time) and despatched to the blast furnace stock house. Sinter will be fed to the BF stock house through the conveyor system. Feeding of coke will be done similarly as indicated for the sinter. Coal for pulverized coal injection (PCI) reclaimed by stacker-cum-reclaimer will be fed to the conveyor for its onward transmission to the bins at the blast furnace area.

b) **Despatch of Raw Materials to Coke Ovens**

Hard coking coal, semi-soft coking coal and lean coal reclaimed by stacker-cum-reclaimer and will be transferred at coal silo by conveyors.

c) **Despatch of Raw Material to the Sinter Plant under implementation in existing plant**

Iron ore fines will be reclaimed from the storage yard by the stacker-cum-reclaimer and conveyed to the respective stock bins of the proportioning bin building of the sinter plant. Fluxes will be reclaimed from the storage yard similarly and conveyed to the flux crushing and screening system. From there, the crushed material will be conveyed to the respective stock bins of the proportion bin building of the sinter plant. Coke breeze after reclaiming from the storage yard will be conveyed to the respective stock bins at the proportion bin building, after the close-loop crushing screening system.

d) **Despatch of Raw Material to the Calcining Plant**

Limestone and dolomite will be reclaimed by the stacker-cum- reclaimer from the storage yard and will be conveyed to limestone and dolomite storage building through a set of conveyor systems.

e) **Despatch of Raw Materials to the Steel Melt Shop**

Lump iron ore will be conveyed to respective bins of steel melt shop from the stockyard. Ferroalloys shall be received through truck. Separate system is envisaged for handling and storing ferroalloys.

3.6.2 Coke Oven and By-product Plant

In order to meet the requirements of coke in the proposed new blast furnaces 2 and 3, four batteries of 59 ovens each with total coke production capacity of 3.05 MTPA have been considered. The plant design parameters and brief descriptions of the plant facilities for the proposed project are presented in this section.

3.6.2.1 Coal Blend Quality

The major raw material for the production of metallurgical coke is coking coal. The requirement of different types of coking coal will be met primarily through imports. To meet the coke quality requirement, the following blend quality has been envisaged, as given below in Table 3-4:

TABLE 3-4 - TYPICAL COAL BLEND QUALITY

Parameter	Value
Ash (db), %	8 to 10
Volatile matter (db), %	22 to 27
Total sulphur, %	0.55 to 0.65
Fixed carbon, %	By difference
Mean maximum reflectance, %	1.1 max.
Free swelling Index	4 to 7

3.6.2.2 Coal Blend Constituents

The indicative coal blend constituents are shown below in Table 3-5:

TABLE 3-5 - COKING COAL BLEND

Parameter	Value
Hard coking coal, %	30
Semi-soft coking coal, %	60
Lean coal, %	10

3.6.2.3 Coal Preparation and Handling Facilities

The quantity of coal required annually for the production of coke is given below in Table 3-6:

TABLE 3-6 - ANNUAL REQUIREMENT OF COAL

Raw materials	Tpy
Hard coking coal	1,203,900
Semi-soft coking coal	2,407,900
Lean coal	401,300
Total	**4,013,100**

Note:
All the above quantities are on net and dry basis.

The coal handling system will be designed for the receipt, storage, reclaiming, blending crushing and conveying of coking coal to the batteries. Each constituent of the coal blend envisaged for the plant will be drawn from the blending bins through belt weigh feeders. The blended coal will be crushed in the crusher to achieve the desired fineness [~90 percent of (-)3.15 mm]. The sequence of crushing and blending may be finalized during plant procurement stage. Dust extraction system will be provided for the crushing stations. After blending and crushing, tar sludge and water addition will be done to adjust the moisture content of the coal blend at 10 percent. The blended and crushed coal blend will then be fed to the coal towers. The coal will be transferred to the stamping-charging-pushing (SCP) machine from coal towers by belt conveyors.

3.6.2.4 **Coke Handling Facilities**

The hot coke pushed out from the ovens will be collected by a hot coke car and will be taken to CDQ stations for quenching or to the modified wet quenching stations. CDQ units will be used for normal operation for coke quenching for all the batteries, whereas modified wet quenching will be followed only during the annual shutdown of the CDQ boilers and auxiliaries.

The wet quenched coke will be dumped on to the coke wharf for drying. The dried coke from the wharf or the discharge of CDQ shall first be screened through 80 mm screens. (+)80 mm will be passed through a coke cutter. From the cutting station, coke will be sent to the blast furnace stock houses coke for sorting different coke sizes of hard coke [(-)80 mm (+)35 mm], nut coke [(+)15 mm (-)35 mm] and breeze [(-)15 mm]. The excess coke will be sent to storage yard.

3.6.2.5 **Coke Ovens**

Plant design parameters: The major plant design parameters considered for the proposed coke oven plants are presented in Table 3-7 on the next page.

TABLE 3-7 - PLANT DESIGN PARAMETERS(1)

Item	Tpa
1. Coke rate, kg/ton hot metal	348
2. Gross coke	3,050,000
a) Hard coke (35 mm to 80 mm)	2,440,000
b) Nut coke (10 mm to 35 mm)	427,000
c) Coke breeze(<10 mm)	152,500
d) CDQ dust	30,500
3.By-products	
a) Crude sulphur	4,414
b) Crude tar	140,461
c) Clean coke oven gas, million N cu m	1,324

Note: (1) All quantities are on net and dry basis.

Design basis: By-product recovery (BPR) type coke making process with stamp charge technique will be adopted for all the batteries. The basic design parameters for the ovens are given below in Table 3-8:

TABLE 3-8 - BASIC DESIGN PARAMETERS

Parameter	Value
No. of batteries	4
No. of ovens/battery	59
Length of oven (cold)	16,200 mm
Height of oven chamber (cold)	6,250 mm
Oven width (average)	500 mm
Oven pitch	1,500 mm
Dry coal charge per oven	43.7 ton
Bulk density, ton/cum (dry)	1.05 to 1.1
Normal coking time	24 hours

Major facilities: The coke oven plants will consist of following major facilities:

a) Stamp-charged, by-product recovery type coke oven batteries with oven machines and auxiliaries.

b) Stand-by wet quenching station.

c) Coke dry quenching unit.

d) Land based pushing and charging emission control system.

e) Coal and coke handling facilities.

f) By-product plant for the recovery of crude tar, desulphurization of coke oven gas, and recovery as elemental sulfur.

3.6.2.6 Coke Oven Battery

The batteries will be installed at separate but adjacent location as shown in the layout drawing. There will be separate by-product recovery plant to handle crude coke oven gases generated from batteries of respective two stages.

Coal from the coal towers will be fed to the stamping-charging-pushing (SCP) machines. The compacting of the coal charge (stamping) will be performed continuously with the feeding of coal into the stamping box until the desired height of the coal cake is achieved. The machine can move to the oven to be charged. After charging the coal cake, the charging plate will be withdrawn. The charging gas transfer car, operating at the oven top, will transfer the charging gases to the adjacent ovens.

When the oven is ready, after completion of carbonization, the SCP machine will push the hot coke into the hot coke car through coke guide cars (CGC). Door extractor device, provided both in the SCP and the CGC machines, will open the doors before pushing of coke. The door extractor device will be equipped with mechanical door and frame cleaners.

After completion of the coke pushing operation, the coke side door will be placed in place before charging the empty oven with stamped cake. After charging the stamped cake into the oven, the SCP machine will close the pusher side door. Red hot coke discharged into the hot coke car will be taken to the coke dry quenching (CDQ) station. Land based pushing emission control system integrated with the coke guide car will be provided to restrict coke side emission during pushing. Emission during charging will also be ensured with this system.

The ovens will be suitable for both under firing with mixed gas and coke oven gas (COG). The gas collecting main will be located at the coke side. The battery will be underlet/gas gun type with air stage/waste gas recirculation to achieve uniform temperature distribution and to restrict the formation of thermal NOx. Each oven will be provided with a separate gas transfer hole at the coke side to facilitate the transfer of charging gases to the adjacent/ alternate oven through a U-tube connection. The U-tube will be mounted on the charging gas transfer car. To minimize emission during charging, high pressure liquor aspiration system (HPLA) will be provided for effective on-main charging.

The coordination of the ovens and the oven machines, operation, and traveling of the machines to the ovens to be served in conformity with the pushing schedule will be accomplished via a control center utilizing remote data transmission. For the exact spotting of machines, the machine will be provided with improved measuring and sensor systems. DCS based automatic heating control system will be provided for efficient and uniform oven heating.

The Stamping Charging and Pushing (SCP) machine will push the incandescent coke after completion of carbonization out of the oven. The red hot coke will be discharged into a coke bucket placed on the hot coke car through the coke guide car and will be taken to the CDQ station.

The coke oven plants will be equipped with the following machines:

a) SCP machine
b) Guide car
c) Coal gas transfer car
d) Quenching car
e) Electric locomotive
f) Hot coke car
g) Coke bucket (rotary)

3.6.2.7 **Coke Quenching System**

Single-chamber CDQ units with suitable capacity will be installed with stand-by wet quenching stations for scheduled maintenance in the CDQ chamber/boiler/ facilities and emergencies.

Stand-by wet quenching stations will be provided with quenching towers of adequate height, settling basin for quenching water, quenching water pumps, overhead quenching water tanks, pipelines, and fittings. The quenching towers will be provided with baffles/grit arrestors. The coke quenched in quenching cars will be discharged into the coke wharf.

In the CDQ plant, the hot coke will be charged from the coke bucket into the cooling chamber with the help of an overhead crane. Hot coke will be cooled with circulating inert gas in the cooling chamber. The hot coke will flow continuously from the top to the bottom of the chamber and the inert gas will flow in the opposite direction. The heat of the hot coke will be recovered by direct contact of circulating inert gas and the absorbed heat will be subsequently utilized for the generation of high pressure steam in the waste heat boiler. From the waste heat boiler, the cooled circulating gas will then be admitted into cyclones, where the fine fraction of coke dust will be removed.

3.6.2.8 **By-product Plant**

The by-product plant facilities will be planned for the production of clean COG for use as plant fuel, as well as crude tar, naphthalene, and elemental sulfur. The following units will be provided in the by-product plant for the cleaning of COG to the required degree and recovery of crude tar and sulphur:

a) Gas cooling and tar liquor condensation section.
b) Combined ammonia and hydrogen sulphide scrubbing.
c) De-acidifier and ammonia stripper unit.
d) Sulphur recovery unit.
e) Naphthalene recovery unit.

Gas Cooling and Tar-Liquor Condensation Section: Crude COG evolved during carbonization of coal in the ovens will be collected in the gas collecting main, where it will be cooled with direct spray of ammonia liquor. Crude COG from the gas collecting main will be sucked by exhausters through primary gas coolers and electrostatic tar precipitators.

Crude COG after the down-comers will be cooled to a temperature of about 21^{o}C in indirect, cross tube type primary gas coolers in two stages; in the upper stage with circulating cooling water and in the lower stage with circulating chilled water. The primary gas coolers will be provided with requisite extra capacity in the upper part (cooling water zone) to take care of probable fluctuations in temperature of crude gas. Coke oven gas after being cooled in the primary gas coolers will enter electrostatic tar precipitators (ETP) for separation of tar mist from the coke oven gas. The coke oven gas exhausters will be electric motor driven and will be provided with required lubrication, safety, idling, and suction condition control arrangement.

Tar and liquor condensed in the crude gas pipelines, primary gas coolers, ETPs and exhausters will be processed in the tar-liquor condensation unit. This will consist of decanting tanks with thick tar/ammonia liquor separators, tar centrifuges, condensate pit tanks, flushing liquor pumps, condensate pumps etc. Separated tar will be transferred to the oil depot. Liquor will be transferred by flushing liquor pumps to the gas collecting main for cooling of gas. Excess liquor from tar ammonia liquor separating tank will be taken to a separating tank for separation of heavy oil from it and will be finally pumped out with excess liquor pump to the filtering system.

Combined Ammonia-Hydrogen Sulphide Removal Unit: Coke oven gas from exhauster will be first fed into final cooling stage at lower part of hydrogen sulphide scrubber. Coke oven gas after final cooling will be cleaned in respect of ammonia and hydrogen sulphide by scrubbing with soft water and circulating stripped liquor. The content of ammonia and H_2S in the gas will be as given below:

Ammonia, gm/N cu m	..	0.04
H_2S, gm/N cu m	..	0.2

Coke oven gas leaving the exhauster will be admitted to H_2S scrubbers. The lower section of H_2S scrubbers will be designed for final cooling to remove the compression energy of the exhauster. Scrubbing of H_2S will be carried out by enriched ammonia liquor and de-acidified water. Soda lime solution will be used at the final stage of the H_2S scrubber. Carbon di-oxide, hydrogen cyanide and ammonia present in the gas will also be scrubbed during the same operation. After H_2S scrubbing, the gas will be taken to ammonia scrubber. The ammonia will be removed from coke oven gas by scrubbing with cooled stripped liquor from ammonia still. Soft water and excess ammonia liquor will be admitted at the top and bottom stages of ammonia scrubbers respectively. A combined ammonia and H_2S scrubber will also be installed as stand-by, in order to achieve un-interrupted operation.

The enriched liquor from H_2S scrubber containing ammonia, H_2S, carbon-dioxide and HCN will be stripped in the de-acidifier. A portion of ammonia vapor will also be admitted to the de-acidifier. A portion of de-acidifier liquor will be treated in ammonia still for stripping of ammonia.

The vapor leaving the de-acidifier will contain ammonia, H_2S, carbon-dioxide and HCN along with water vapor. For cooling of stripped liquor, inter stage circulation and suitable heat recovery tubular heat exchangers have been considered. The circulation of liquors will be achieved through pumps.

Sulphur Recovery Unit: The vapors from the top of the de-acidifier containing ammonia, hydrogen sulphide, water vapour, hydrogen cyanide and carbon dioxide etc. will be fed into the sulphur recovery plant for destruction of ammonia and production of sulphur. In the reactor, the acid gas will be brought into contact with the required quantity of air. Secondary air will also be added at the lower part of the reactor. Suitable temperature will be maintained in the reactor. The heat generated in the reactor will be utilized for generation of steam in the heat recovery boiler. Most of the heat required for the reaction will be generated by partial burning of hydrogen sulphide. The ammonia and hydrogen cyanide present in the acid gas is decomposed into hydrogen, nitrogen and carbon monoxide by catalytic cracking. The Claus conversion will be continued by the catalytic method in the Claus reactor.

Claus reactor will be followed by a sulphur condenser and separator where sulphur will be removed from the process gas. Low pressure steam will be produced in the sulphur condenser. The molten sulphur will then be fed to the solidification plant for the production of sulphur pellets. The sulphur produced by this process will be of high purity (99.5 percent). The tail gas from the reactor will be introduced to the coke oven gas in the suction main.

The sulphur pellets will be packed and finally transported out by truck.

Naphthalene Scrubbing and Naphthalene Distillation Section: Naphthalene scrubbing from coke oven gas will be carried out after removal of ammonia and hydrogen sulphide. Naphthalene scrubbing will be carried out by using petroleum based wash oil. A small portion of the oil will be continuously withdrawn from the system in order to restrict the naphthalene build-up in the re-circulating oil. Rich oil withdrawn from circulation will be regenerated in naphthalene stripping columns. Heavy sludge / Spent wash oil removed from the unit will be taken to spent oil tank for either mixing with tar or for outside disposal. Naphthalene strippers will be provided. The regenerated oil along with make-up oil will be introduced to the oil circulating system. The naphthalene fraction recovered will be mixed with crude tar.

The clean coke oven gas, after naphthalene removal, will be fed to the coke oven gas holders.

3.6.2.9 **Oil Depot**

Separate storage for crude tar, wash oil, caustic soda and spent wash oil will be provided. Suitable facilities for loading of crude tar and spent wash oil in to road tankers will be provided.

The clean coke oven gas quality is indicated below in Table 3-9:

TABLE 3-9 - COKE OVEN GAS QUALITY

Parameter	Value
Calorific value (net) of COG, kcal/N cu m	4,300
Typical composition of clean COG, % (v/v):	
H_2	52 to 56
CH_4	24 to 26.5
CO	6.0 to 9.0
CnHm	2 to 2.6
CO_2	3.0 to 4.0
O_2	0.5
N_2	Balance
Crude tar, mg/N cum COG	5
Hydrogen sulphide, mg/N cu m COG	200
Naphthalene, mg/N cu m COG	150 to 200
Crude Benzoyl, gm/N cu m COG	35
Ammonia, mg/N cu m COG	50
HCN, g/N cum COG	1.5

3.6.2.10 **Coke Quality**

The desired quality parameters of coke will be as per Table 3-10 given below:

TABLE 3-10 - COKE QUALITY

Parameter	Value
Volatile Matter (db), %	1.0 max
Ash (db), %	11.5 to 12.5
Sulphur, %	0.65 max
Moisture, %	0.5 to 1
Fixed carbon	By difference
M40	82.0 min
M10	7.0 max
CSR	62.0 to 67
CRI	22 to 26.0

3.6.3 BOD Plant

The waste water treatment plant (WWTP) is a facility to be used for treatment of phenol cyanide containing waste water from COB and BPP, by using a new process of A/A/O (Anaerobic, Anoxic, Oxic) and double membrane. During degradation of NH3-N in the coking waste water, other pollutants such as COD can also be degraded. The waste water goes through secondary sedimentation tank into biochemical treatment, which mainly includes mixing and reacting tank, and coagulation sedimentation tank. The effluent after coagulation sedimentation can be discharged out. The capacity of the BOD plant shall be 260 m^3/hour.

The flow diagram is shown in Fig. 3-3 on the next page.

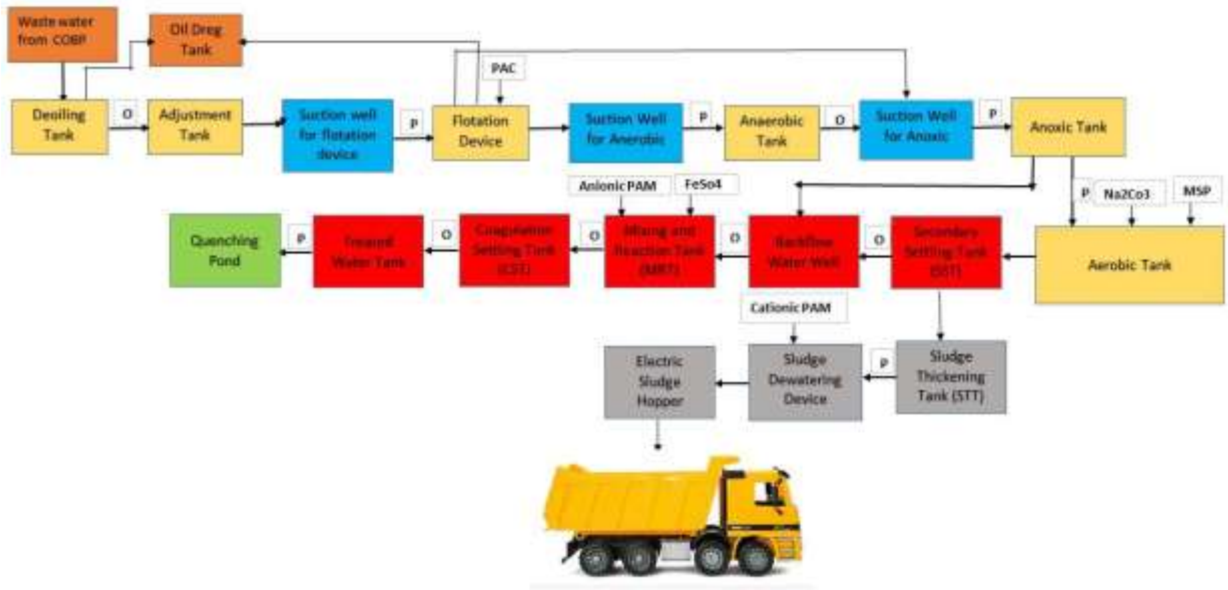


FIG. 3-3 - BOD PLANT

3.6.3.1 Treatment Method

This WWTP is mainly used for treatment of the phenol-cyanide containing waste water from coke making and by-products units, which is composed of pre-treatment unit, biochemical treatment unit and sludge treatment.

3.6.3.2 Biochemical Treatment

The main purpose is to degrade the poisonous substance in the coke making wastewater by biochemical reaction of the microbe (active sludge) to reduce the COD in the waste water. The biochemical treatment unit is mainly composed of anaerobic tank, anoxic tank, aerobic tank, secondary settling tank, sludge reflux facilities, blower, dosing devices and de-foaming facility, etc.

The quality of effluent of the biological waste water treatment plant is given in Table 3-11 on the next page.

TABLE 3-11 – QUALITY OF EFFLUENT OF THE BIOLOGICAL WASTE WATER TREATMENT PLANT

Pollutant	Phenol, mg/l	Cyanide, mg/l	CODcr, mg/l	NH3-N, mg/l	Oils	S.S.	pH
Raw water	700	50	≤4500	200	≤50	200	8~9
Incoming	500	25	≤3500	100	≤50	100	8~9
Outgoing	≤1	≤0.2	≤250	≤50	≤10	50	6.0~8.5

Waste water generation from coke oven and by-product plant shall be 260 m^3/hour (with 20 percent margin).

3.6.4 Sinter Plant

7.0 MTPA sinter plant will be established as per approval vide 2016 EC. It will comprise of two (2) number plants.

3.6.5 Blast Furnace

3.6.5.1 Production Programme

To meet the requirement of hot metal in steel melt shops, the capacity of the existing blast furnace (BF-1) is proposed to be upgraded to produce 3 MTPA from the present 2.04 MTPA by making suitable modifications and improving operating parameters and two new blast furnaces of 4 MTPA capacity each (BF-2 and 3) will be installed. Facilities will be provided for pig casting/granulation of hot metal which will be produced for sale as a product.

3.6.5.2 Design Basis

The new blast furnaces will incorporate all the modern technological features. The existing BF-1 will be operated at higher production rate with suitable modifications to reach the targeted production. The design basis of the blast furnaces is given in Table 3-12 on the next page.

TABLE 3-12 - DESIGN BASIS OF BLAST FURNACE

Item	BF-1	BF-2 and BF-3
Hot metal production, MTPA	3	2 x 4
Useful volume, cu m (approx.)	3200	2 x 4500
Operating days	350	350
Productivity, t/(useful volume)/day (approx.)	2.68	2.54
Burden (typical): a) Pellet, % b) Sinter, %	 60 40	 60 40
Oxygen enrichment (avg.), %	12	8
Coke rate (including nut coke), kg/thm	348	348
Pulverized coal injection rate, kg/thm	200	200
Slag rate, kg/thm	336	336
Coke ash, %	12	12
Si in metal, %	0.5 to 0.7	0.5 to 0.7

Note :
Provision for NG/coke oven gas injection in all three BFs.

3.6.5.3 **Raw Materials**

The major raw materials for the proposed BF comprises of iron ore, sinter, additives, and coke. Pulverised coal will be injected through tuyeres as auxiliary fuel. The typical analysis of raw materials envisaged is given below in Table 3-13:

TABLE 3-13 - TYPICAL ANALYSIS OF RAW MATERIALS FOR HOT METAL PRODUCTION (DRY BASIS)

Raw Material	Fe, %	SiO_2, %	Al_2O_3, %	CaO, %	MgO, %
Sinter	54 to 54.3	5 to 5.6	2.3 to 2.8	11.1 to 11.6	1.9 to 2.1
BF grade pellet	60.5 to 61.5	4.2 to 4.4	2.7 to 2.9	4 to 4.1	0.25 to 0.28
Limestone	0.32	1.05	0.44	54.01	0.44
Dolomite	0.10	1.30	0.22	32.12	19.84
Pyroxenite	0.10	38.32	0.49	2.04	39.37
Quartzite	-	97	1	-	-

Coke quality:

Ash, % (dry basis)	..	12
Moisture, %	..	0.5
CSR, %	..	65 (min)
CRI, %	..	22 to 25

Coal quality for PCI application:

Ash, % (dry basis)	..	9 to 10
Fixed carbon, %	..	68 to 72

Consumption of Raw Material: The annual requirement of raw materials on net and dry basis is given below in Table 3-14.

TABLE 3-14 - ANNUAL CONSUMPTION OF INPUT MATERIALS IN TPY

Materials	BF-1	BF-2 and 3
Charge pellet	2,924,900	7,799,800
Charge sinter	1,965,800	5,242,200
Charge coke	1,044,000	2,784,000
PCI coal	600,000	1,600,000
Dolomite	21,000	56,000
Pyroxenite	74,100	197,600
Quartzite	34,800	92,800

Note: Quantities are on net and dry basis.

Hot Metal Quality: The expected hot metal analysis is given below:

Si, %	..	0.5 to 0.7
S, %	..	0.045 (max)
P, %	..	0.15

3.6.5.4 **Major Facilities**

The production rate of the existing BF-1 will be increased from the current levels by BF useful volume by changing to modern refractory and efficient cooling system during the relining of BF-1.

Upstream and downstream process and auxiliary facilities will be augmented to adequately support the increased production. The operational and maintenance practices for BF-1 developed by AMNSI over the years, wherein continual increase in production has been achieved, will also support in achieving consistent production from the BF.

The following facilities will be installed for the new blast furnaces:

a) BF proper
b) Cast house
c) Slag granulation plant
d) Hot blast stoves
e) Gas cleaning plant
f) Stock house and charging system
g) Hot metal handling system
h) Cranes and hoists
i) Coal dust injection system
j) Hot metal granulation
k) Ladle repair shop
l) Stock house and Cast house de-dusting system
m) Air blowing system
n) Top recovery turbine

Sinter from the sinter plant, pellet from the pellet plant of group company, coke from the coke oven, and fluxes from the raw material storage yard will be received on separate conveyors and will be distributed to the BF stock houses. The stock house operation will be fully automated. The furnaces will be provided with a conveyor belt charging system. Return fines will be transported to the sinter plant/raw material storage yard through conveyors. A facility for grinding coal for injection will be provided. Raw coal will be transported via conveyors to the coal grinding unit in the blast furnace area. It will be transferred to the raw coal silo in the coal preparation plant by a conveyor. Pulverized coal will be injected through tuyeres in the blast furnace.

The new blast furnaces will be designed for high top pressure of 2.5 to 3 kg/sq cm. Each BF will have four tap holes. The furnace will be of self-supporting freestanding type. The top equipment and platform at the various levels around the furnace will be supported by an independent tower structure. The blast furnace will be provided with a bell less top charging system. It will be provided with modern facilities like the above burden probe, heat flux, and pressure profile measurement etc. Advanced cooling elements will be provided for cooling refractory from the hearth to the stack. The cooling system will be complete with all piping, valves, pumps, etc. One emergency overhead tank will also be provided in the blast furnace recirculating circuit, which will be operated during a power failure.

The hearth bottom including the tap hole will be lined with high conductive carbon. Bosh to lower shaft will be lined with silicon carbide/high alumina. The rest of the shaft will be lined with high Al_2O_3 refractory and the cone portion will be gunned with CO resistant refractory materials.

Automation and control systems, which will include control of hot blast temperature, charging, etc. will be provided to take care of the smooth operation of the blast furnace. Instruments for measuring flow, pressure, temperature, etc. will also be provided.

The new blast furnaces will be served by three stoves, along with a provision for a fourth stove. The stoves will be provided with ceramic burners to supply hot blast at a temperature of about 1250^{o}C.

The stoves will be fired with blast furnace gas. Combustion air fans will be provided for the supply of combustion air to the stove burner. The combustion air and gas preheating facilities will be provided. One chimney will be provided for the stove system. Hot blast main and bustle main will be lined with high alumina refractory. The stoves will be provided with necessary platforms for providing an approach to various valves, fittings, etc. Necessary lifting beams with hoist will be provided above the stove valves to facilitate maintenance. The stove valves will be hydraulically/pneumatically actuated, and the stove changing will be PLC controlled.

The new blast furnaces will be provided with two cast houses, having two tap holes each. Hydraulic mud gun and drilling machine will be provided in the cast house. Slag granulation system and dry slag pit will be provided along with the granulated slag handling system. The slag runner arrangement will be made such that it can flow either to the slag pit or to the granulator of the slag granulation plant. Granulated slag bunkers will be provided for collecting and dewatering the granulated slag. The storage capacity for granulated slag will be about 6 to 8 hours. The granulated slag will be transported from the bunkers to the slag yard for onward dispatch to the outside plant area.

The gas cleaning system for the new blast furnace will consist of a dust catcher/cyclone and gas cleaning plant (GCP). The top gas of the furnace will be drawn through off-takes which extend upward to form vertical bleeder pipes provided with bleeder valves at the top. The offtake and uptake pipes would be connected to form a down-comer, which terminates at the dust catcher. Dry dust disposal from the dust catcher/cyclone will be by road transport. The gas leaving dust catcher/cyclone will flow into GCP for final cleaning. The disposal of dust will be done by road transport using trucks/tankers. The dust levels of the blast furnace gas will be less than or equal to 5 mg/N cu m. Following gas cleaning, there will be a top recovery turbine (TRT) to utilise the pressure of the top gas to generate power. A flare stack of adequate capacity will be provided.

Fume extraction and dust extraction facilities will be provided for cast house and stock house respectively to keep the work level dust concentration within the stipulated norms. Disposal of dust from the stock house dust extraction system and cast house dust extraction system will be by road transport.

Hot metal granulation system of adequate capacity will be installed for the production of granulated iron which will be sold in the market. A recirculating water system for water required for the granulation process including a hot well, cold well, cooling tower, etc., will be installed. Granulated iron will be stored in the storage yard.

Electric blowers of adequate capacity will be provided for the blast furnace.

One elevator will be provided in the BF proper which will provide access to the control room, BF, and stove platforms, and another elevator will be provided in the stock house.

Hot metal will be transported to steelmaking shop by rail in torpedo ladles. The torpedo repair shop will have facilities for servicing, cooling, repairing and relining of hot metal ladles. The shop will have facilities for drying and heating of relined torpedo ladles. Necessary repair shop and stores for the blast furnace will be considered in the blast furnace area.

3.6.6 Calcining Plant

The calcining plants will produce lime and dolime for consumption in the steel melt shops for the proposed project. The size of calcined products will be 10 to 80 mm and the calcined products will be screened before they are conveyed to the steel melt shops. The undersize product fines will be stored and used in the sinter plant or for other purposes.

The production of liquid steel from the proposed steel melt shop has been envisaged as 6.0 MTPA. The calcining plant will meet the flux requirement for proposed steel melt shop as well as cater flux shortfall for existing plant. Accordingly, the net annual requirement of calcined products has been estimated as shown in Table 3-15.

TABLE 3-15 - NET ANNUAL REQUIREMENT OF CALCINING PRODUCT

Calcined Product	Tpy
Lime	495,000
Dolime	255,300

3.6.6.1 Kiln Design Capacity

It is proposed to install vertical shafts kiln of proven design to produce soft burnt and highly reactive lime and dolime. Based on the net requirement, the gross production of calcined products is indicated in Table 3-16.

TABLE 3-16 - GROSS REQUIREMENT OF CALCINING PRODUCT

Calcined Product	Tpy
Lime	583,000
Dolime	300,000

The gross production figures include the product dust loss, handling loss, and undersize which will be screened out. It is necessary to consider 15 percent extra kiln capacity to handle fluctuations in the specific consumptions of flux and variation in raw materials quality. Hence, based on 330 days working in a year, the daily peak requirement of calcined products is indicated in Table 3-17.

TABLE 3-17 - PEAK REQUIREMENT OF CALCINING PRODUCT

Calcined Product	tpd
Lime	2,030
Dolime	1,050

Based on the above peak requirement of calcined products, it is proposed to install total 4 x 600 tpd kilns, 1 x 500 tpd kilns and 1 x 200 kilns for lime and dolime.

3.6.6.2 Plant Facilities

The calcining plant will comprise of facilities for raw materials storage, screening and handling, kiln with kiln feed building, calcined products storage, handling and screening facilities.

3.6.6.3 Raw Material Handling

Sized limestone and raw dolomite will be delivered over a system of belt conveyors to the kiln feed building bunkers of calcining plant. The bunkers will have suitable storage capacity. To separate the fines generated during handling, the raw materials will be screened before being fed into the kiln. The kiln feed building will house raw material screening facilities. The screened limestone and raw dolomite will be fed into the kilns with the help of skip hoist and stone distribution system located at kiln top.

3.6.6.4 **Shaft Kiln**

The shaft kilns will be installed on a specially designed RCC platform. The kilns will be designed with the required combustion system, instruments, and controls. The kilns will be lined with suitable grade of refractories. Mixed gas will be used as fuel for the calcining plant.

3.6.6.5 **Product Handling**

For conveying the calcined products from below the kilns, belt conveyors will be provided. The calcined products will be stored in product storage bunkers. About one day's stock will be maintained for the calcined products. The undersize fraction of the calcined products will be stored in a separate bunker and will be despatched in closed containers for other uses.

3.6.6.6 **Other Facilities**

A multi storied building will be constructed within the calcining plant to house the blowers, electrical equipment, instrument, and controls. The kiln automation system will be housed in this building. The boosters will be installed in a separate building.

Various utilities, such as fuel, compressed air, electric power, water, etc. will be made available to the plant. The plant will be provided with a kiln waste gas cleaning system and a dedusting system for raw materials and product handling facilities.

3.6.7 Steel Melt Shop

Considering the proposed BF-BOF process route, production requirement and the product-mix, new production facilities have been envisaged for steel melt shop (SMS-3). To maximise the utilisation of the hot metal produced in the blast furnace and to maximize the inherent advantages of largest heat size, higher size BOFs are envisaged for flat products. Accordingly, the following major production facilities are envisaged:

a) A steel melt shop including three basic oxygen furnaces (BOFs), out of which any two furnaces will operate at any point of time with required numbers of secondary metallurgy units and two slab casters.

b) The production facilities will be adequately supported by necessary auxiliary facilities such as raw materials unloading and storage, proportioning of raw materials, electric power receiving and distribution stations, various utility facilities and distribution systems, water treatment and distribution system etc.

Based on the hot metal production from the blast furnace and the requirement of semis by the rolling mills, the tentative production from SMS-3 will be around 6.0 MTPA liquid steel. The total metallics requirement of SMS-3 will be met from hot metal from the blast furnaces, DRI from the existing plant, lump ore, purchased scrap and plant return scrap. Accordingly, the tentative requirements of crude steel and equivalent liquid steel in SMS-3 are given below in Table 3-18:

TABLE 3-18 - REQUIREMENT OF CRUDE AND LIQUID STEEL AT SMS-3

Steel Product	'000 tpy
Slab (crude steel)	5,910
Equivalent liquid steel	6,000

3.6.7.1 Steelmaking Technology Envisaged

The major features of steelmaking technology proposed to be adopted, considering the product-mix and the latest available state-of-the-art technology are as follows:

a) Desulphurisation of hot metal in transfer ladle by impeller stirring method.

b) Top oxygen blown BOF s with bottom inert gas blowing facilities for the production of low carbon steel, yield improvement and reduction of slag FeO, associated material handling facilities, lance handling facilities, slag, scrap, and liquid metal handling facilities.

c) Dry type GCP for reduced dust emission levels.

d) Slag splashing for improvement of BOF life.

e) Secondary emission system for the entire steel melt shop.

f) Secondary treatment of metal through ladle furnaces (LFs) and Ruhrstahl Heraeus Oxygen Blowing (RH-OB) for close control of composition, degassing, temperature, and matching of the production schedule.

g) Continuous casting facility including slag detection system, continuous tundish temperature monitoring system, automatic mold level control system, quick SEN changing facility, breakout detection system, facility for width adjustment within sequence, electro-magnetic stirring equipment etc.

h) Slab conditioning facility.

3.6.7.2 **Design Considerations for BOFs**

Considering the available land area for the production units and amount of hot metal available from the new blast furnaces for the steel melt shop, product-mix, flexibility in operations, investment and operating expenses, the steel melt shop has been envisaged for flat products to achieve target liquid steel production of 6.0 MTPA. Since the product-mix from the proposed steel melt shop involves flat products, higher heat size has been envisaged. The number of BOFs has been considered as three (3), however two (2) BOFs shall be operated in 2/3 mode which means one (1) BOF will be in stand-by mode.

3.6.7.3 **BOF Heat Size**

A break down of the average tap-to-tap time of BOFs, indicating the duration of various activities for SMS-3, is given below in Table 3-19:

TABLE 3-19 - AVERAGE BOF TAP-TO-TAP TIME

Activity	Time, min
Charging of scrap	3
Charging of hot metal	5
Oxygen blowing	16
Temperature and sampling	5
Reblow	2
Steel tapping	5
Slag off	3
Vessel inspection	2
Slag splashing	2
Unforeseen delays	2
Tap-to-tap time	**45**

Based on the annual liquid steel requirement and the average tap-to-tap time of 45 minutes, computation of the nominal BOF heat size for SMS-3 is presented below in Table 3-20:

TABLE 3-20 – BOF NOMINAL HEAT SIZE FOR SMS-3

Description	SMS-3
Production of liquid steel, tpy	6,000,000
BOF operation, days/year	364
No. of BOFs installed	3.0 (Operation mode will be 2/3 operation and one BOF will be in stand-by mode.

Description	SMS-3
Considering BOF availability and utilization:	
Average no. of heats/day/BOF	24
No. of heats per year considering BOF stoppages for mid campaign maintenance, lance jam cutting, track cleaning, vessel inspection, necessary gunniting, annual maintenance, taphole change etc.	17,300
Liquid steel required per heat, tons	347
Selected heat size, tons of liquid steel	350

3.6.7.4 Charge-Mix

The proposed charge-mix for BOFs will be as shown below in Table 3-21:

TABLE 3-21 - CHARGE-MIX OF SMS-3

Description	Specific consumption, kg/tls	Annual requirement, Tpy
Hot metal	938.2	5,629,100
DRI	66.2	397,400
Scrap	99.3	596,000

Additionally, scrap/pig iron and ore will be used as a coolant in the BOF operations.

The liquid steel produced from BOFs in SMS-3 is proposed to be cast through 2 x 2 strand slab casters.

The major facilities proposed in SMS-3 are given below:

a) Hot metal handling facilities
b) Scrap handling facilities
c) 2 x twin station hot metal desulphurization unit

d) 3 x 350 ton BOF and associated facilities

e) Dry type BOF gas cleaning plant

f) Secondary emission control system

g) Flux and ferroalloy handling facilities

h) Liquid steel handling facilities

i) Slag handling facilities

j) Argon rinsing stations

k) 2 x 350 ton twin station ladle furnaces

l) 1 x twin vessel RH-OB degasser unit

m) 2 x 2-Strand slab caster and associated facilities

n) Slab conditioning facilities

3.6.8 Rolling Mills

The rolling mill facilities envisaged is discussed in this section. Considering the production volumes and the envisaged product-mix, a conventional hot strip mill of about 6,000,000 tpa capacity has been proposed at Hazira.

3.6.8.1 Product-mix

The product-mix (product types, size range and grades) considered for the project is given below in Table 3-22:

TABLE 3-22 - PRODUCT-MIX FOR AMNSI

Product	Size Range, mm	Grades
Hot rolled coils		High strength grades considered: API X-80; DP1180; DP980; HSLA 440; HSLA 600; C-80, Multiphase steel up to 1000MPa; USIBOR 1500; Silicon steel, complex phase
Width	800 to 2,150	
Thickness	1.2 to 25.4	

3.6.8.2 Selection of Mills

One of the objectives of AMNSI is the production of all grades of flat steel, including auto-body grades having high yield strength. Considering the same, conventional slab caster with downstream HSM has been considered for flat production instead of the compact strip production or thin slab casting and rolling, which has some grade restrictions. Based on the product-mix and the production programme, the mill with following features has been envisaged:

a) **Hot strip mill (HSM)**

It is proposed to install a semi-continuous hot strip mill for a production of about 6,000,000 tpa of hot rolled coils (HRC).

Design basis:

Input: The mill will be capable to use continuous cast slabs of the following size as input for the hot strip mill.

Width, mm	..	1000 to 2,200
Thickness (max), mm	..	250
Length (max), mm	..	11,000
Slab weight (max.), ton	..	40

Grades of steel: The HSM will be designed for rolling low, medium and high carbon steels, API grades, IF steel, dual-phase and multi-phase steels, high strength low alloy steel, AHSS and complex phase.

Finished product: The HR coil size will be as follows:

Width, mm	..	800 to 2,150
Thickness, mm	..	1.2 to 25.4
Coil weight (max.), ton	..	40

Yield: An average yield figure of 98 percent has been considered for the conversion of slabs to hot rolled coils.

Slab requirement: Considering the above yield figure, about 6.12 MTPA of slabs will be required for the production of 6.0 MTPA of hot rolled coils.

3.6.8.3 Major Equipment/Facilities

Major equipment and facilities of the mill will include slab yard equipment, walking beam type slab reheating furnaces, high pressure water descaling system, slab sizing press, roughing mill with attached edger, seven finishing mill stands, run-out roller table with laminar cooling water system, hydraulic downcoilers and coil conveyors. Coil strapping, weighing and marking machines will be provided along with coil inspection, storage and handling systems.

Additionally, the mill will also be provided with roll shop equipment, cranes, power distribution system and electrics, recirculating water system and utility services, i.e. fuel system, compressor, chiller plant etc.

3.6.9 Cold Rolling Mill (CRM)

3.2 MTPA plant will be established after obtaining EC based on ToR 2021.

3.6.10 Captive Power Plant

The by-product gases from the blast furnace, the coke ovens, BOF shop will be utilized by various steel plant consumers. The balance excess gases will be utilized for captive power generation.

In-plant power generation potential from the by-product gases (BF gas, BOF gas and coke oven gas), BF top recovery turbine and coke dry quenching for Hazira plant are tabulated in Table 3-23 on the next page. Natural gas shall be used during start-up.

TABLE 3-23 - PROPOSED CAPTIVE POWER GENERATION UNIT AT HAZIRA

Plant Unit	Capacity
By-product Gas Fired Power Plant	2 x 100 MW (Approx.)
BF Top Recovery Turbine	Proposed BF's 2 and 3 - 25 MW each (Approx.)
Coke Dry Quenching (CDQ)	1 x 100 MW (Approx.)

Waste heat from sinter cooler will be recovered and will be used for steam generation/ preheating of combustion air and fuel/ power generation.

3.6.10.1 **Design Basis**

Power generation possible from by-product gases: The following are the maximum excess by-product gases available at the steel plant for power generation as shown below in Table 3-24:

TABLE 3-24 - BY-PRODUCT GAS AVAILABILITY AT HAZIRA FOR STEAM/POWER GENERATION

Plant Unit	Fuel Quantities, N cu m/hr
Blast Furnace Gas (BFG)	4,00,537

Mainly blast furnace gas is available for power generation. Apart from that, if any type of gas is available due to outage of certain unit, it will be used for power generation.

Out of the total estimated power requirement for the envisaged steel plants, about 145 MW (approx.) will be generated from the surplus by-product gases or about 593 tph steam will be generated.

Steam cycle: A unit system configuration will be adopted with each boiler steam output connected to its turbogenerator system (TG). The power plant cycle for each unit will comprise of boiler, steam turbine generator, condenser, condensate extraction system, heating system, deaerator boiler feed water pumping and heating system, turbine governing system, lubricating and control oil system along with all other necessary auxiliary equipment.

The main steam from the boiler superheater outlet will be fed to the HP steam turbine through control valves. The exhaust steam from the HP turbine is re-circulated back to the boiler as cold reheat cycle; the steam is heated to the temperature of the main steam by flue gas or nitrogen/off gas in case of the CDQ power plant. The hot reheated steam is connected to the LP turbine. The exhaust steam from the LP turbine will be condensed in the main condenser by the circulation of the required quantity of cooling water and its vacuum will be maintained by one of the two 100 percent capacity vacuum pumps for maintaining a backpressure of 0.1 atm(A).

The condensate drawn from condenser hot well by 3 x 50 percent (two working + one stand-by) capacity condensate extraction pumps will be pumped to the deaerator through the LP heaters. The water in each deaerator will be deaerated using steam from turbine extraction. The feed water from the deaerator will be pumped to the boiler using 2 x 100 percent capacity (1 working + 1 stand-by) boiler feed pumps and the feed water will be heated through a set of high-pressure heaters for each boiler.

The main steam header, feed water header, boiler and TG auxiliary headers shall be interconnected for flexibility to operate all boilers and TGs. The technical profile of the boilers for by-product gas based power plants is given in Table 3-25 on the next page.

TABLE 3-25 - PROFILE OF BOILERS

Unit Size	
Maximum continuous rating (MCR), tph	400
Nos. of boilers	2
Fuel to be used	BFG, COG, BOF
Start-up fuel	Natural Gas
Suspended particulate matter in flue gas at the outlet of chimney, mg/N cu m	30
SOx emission	100 mg/N cu m
NOx emission	100 mg/N cu m

The technical profile of the turbogenerators for by-product gas based power plants is given below in Table 3-26:

TABLE 3-26 - PROFILE OF TURBINE AND GENERATOR

Unit Size	
Output under turbine maximum continuous rating (TMCR) at generator terminals, MW	100 MW (Approx.)
Nos. of turbines	2
Cooling medium for condenser	Water
Condenser pressure, ksca	0.10
Circulating water temperature at inlet/outlet of condenser, °C	34/42
Generator:	
Rated output, MW	100 MW (Approx.)
Quantity	2 Nos.
Rated voltage, kV	11
Power factor (Lagging)	0.85
Frequency, Hz	50
No. of phase	3
Stator winding	Direct water cooled
Rotor winding	Direct hydrogen cooled

3.6.10.2 Plant Facilities

The following plant facilities are envisaged for the captive power plants at Hazira:

a) Boiler and auxiliaries.
b) Steam turbine and auxiliaries.
c) Water system.
d) Fire fighting system.
e) Utility system and HVAC system.
f) Cranes, hoists and elevators.
g) Power generation, distribution and evacuation system.
h) Instrumentation and control system.
i) Plant communication system.
j) Civil and structural works.

3.6.11 Air Separation Plant

64,200 Nm^3/hour plant (2,200 tpd) will be established as per approval vide 2016 EC.

3.7 RAW MATERIALS

The estimated annual requirements of major raw materials for the project are presented below in Table 3-27:

TABLE 3-27 - ESTIMATED ANNUAL REQUIREMENTS OF MAJOR RAW MATERIALS FOR FACILITIES UNDER PROPOSED EXPANSION

Sl. No.	Name of Raw Material	Requirement, TPA			Source	Mode of Transportation
		Existing	Proposed	Total		
1	DR Grade Pellets	11,823,300	-	11,823,300	AMNSI's pelletization plants located at Vizag and Paradeep	Sea Route
2	BF Grade Pellets	5,400,000	6,759,536	12,159,536		

Sl. No.	Name of Raw Material	Requirement, TPA			Source	Mode of Transportation
		Existing	Proposed	Total		
3	Calibrated Lump Ore	-	127,660	127,660	NMDC mines in Kirandul, Dist. Dantewada, CG	Sea Route
4	Oxide Fines	185,000	3,942,444	4,127,444	Goa, Odisha, NMDC fines	Sea Route
	Total Iron Bearing Material	**17,408,300**	**10,829,640**	**28,237,940**		
5	Coal-PCI-BF	408,000	2,036,444	2,444,444	Australia (mainly) and Canada, USA and Russia	Sea Route
6	Coal for Corex	2,770,000	-2,770,000	0		
7	Metallurgical Coal	1,957,500	4,501,564	6,459,064		
	Total Coal	**5,135,500**	**3,768,009**	**8,903,509**		
8	Coke	1,155,000	-1,155,000	0		
9	BF and Sinter Grade Flux (Limestone +Dolomite + Pyroxenite + Quartzite)	690,000	493,715	1,183,715	Dubai and Oman	Sea Route
10	SMS grade Limestone and Dolomite	1,863,000	2,562,564	4,425,564		
	Total Flux and Additives	**2,553,000**	**3,056,279**	**5,609,279**		

Notes:
(2) All figures are in gross and wet basis.
(2) Sl. No. 2 - Existing quantity includes 3,000,000 tpa for COREX plant.

3.8 RESOURCE OPTIMIZATION/RECYCLE AND REUSE ENVISAGED IN THE PROJECT

The proposed project would be carried out using state-of-the-art technologies for optimum consumption of energy and other resources. By-product fuel gases would be reused within the plant as in-plant fuel and also to produce power in the CPP. Power would also be produced from the CDQ of coke ovens and TRT of BF. In addition, compact layout has been designed for the project to enable utilization of land, which is another critical resource. The fines and scrap generated during the process are being used within the plant for the production process. Water consumption would also be utilized by treatment of water to the extent possible and recycle of treated water as make-up in the network. Solid by-products would be reused to the extent feasible. BF slag would be sold to cement manufacturing industries.

3.9 AVAILABILITY OF WATER AND POWER

3.9.1 Water

For the existing plant, raw water is sourced from river Tapi and the requirement is around 32.08 millions of gallons per day (MGD).

For the proposed expansion, additional requirement of raw water will be around 3,400 cu m/hr (approx. 17.98 MGD) which needs to be sourced from river Tapi. Hence total water requirement after expansion will be around 50.06 MGD.

Hazira Industrial Authority (HAIA) has taken up a project for tertiary treatment of biologically treated sewage water (Tertiary Treated Water or TTW) which will be supplied to various industries as make-up water. This project is under implementation and water from TTW source will be gradually available at a later stage. Hence to cater to the requirement of this expansion, the total raw water requirement has to be sourced from Tapi river. Water withdrawal from river Tapi will be gradually reduced as TTW is made available.

The raw water drawn from river Tapi will be treated in the raw water treatment plant (RWTP) to generate make-up grade water. This grade of water will be supplied as make-up water to the various consumers of the plant water system through the make-up water pump house.

The unit-wise requirement of water for the expansion units is shown below in Table 3-28:

TABLE 3-28 - CONSUMER-WISE MAKE-UP WATER REQUIREMENT FOR FACILITIES UNDER PROPOSED EXPANSION

Sl. No.	Consumers	Make-up Water, cu m/hr
1.	Raw material handling	140
2.	Sinter plant	80
3.	Coke oven by-product plant (with CDQ PP)	530
4.	Blast furnace	640
5.	SMS (BOF, LF, RH and caster)	460
6	Calcining plant	5
7.	HSM	580
8.	Power plant (Gas based CPP)	520
9.	Air separation plant	125
10.	Chilled water plant	160
11.	Softening plant	120
12.	DM plants	325
13.	Fire fighting	30
14.	Drinking and sanitation	70
15.	Other Miscellaneous	30
	Total	**3,815**
16	Recovery from effluent management	600
	Net make-up	**3,215**
17	Raw river water requirement at plant boundary (considering losses in reservoir and RWTP)	**3,400**

Note:
(1) Sinter plant and air separation plant are under implementation in existing plant. However, make-up water for the same to be considered from proposed make-up water system.

3.9.2 Power

The estimated unit wise power requirement of the facilities under proposed expansion is shown in Table 3-29 on the next page.

TABLE 3-29 - POWER CHART FOR FACILITIES UNDER PROPOSED EXPANSION

Sl. No.	Plant / Product	Average power in MW		
		Existing	Proposed expansion	Total
1	HBI Plant (DRI Mod I to VI)	120	0	120
2	Blast Furnace (BF)	15	131	146
3	Sinter plant	9	35	44
4	Coke Oven (Recovery Type)	0	30	30
5	Air Separation Plant	130	37	167
6	SMS-1 (EAF 4 Nos.)	400	0	400
7	SMS-3 (BOF- 3 nos.)	0	61	61
8	SMS-2	160	0	160
9	Corex Plant	15	-15	0
10	Lime Plant (Lime/Dolime)	4	6	10
11	Plate Mill	35	0	35
12	CSP and HRC	80	81	161
13	CRM	30	0	30
14	Pipe Mill	5	0	5
15	Auxiliary	35	44	79
	Total	**1038**	**410**	**1448**
	Debottlenecking and value addition	125		125
	Grand Total	**1163**	**410**	**1573**

3.9.2.1 **Source of Power**

The power requirements of the steel plant will be met from the following two sources, namely:

a) The captive power generation system.

b) Grid power: NTPC Jhanor-Gandhar Power Plant through WRLDC grid.

3.9.2.2 Captive Power System

The captive power generation units are given below in Table 3-30:

TABLE 3-30 – POWER GENERATION DETAILS

Plant Unit	Capacity
Gas Based Power Plant	525 MW
Gas based Captive Power Plant	31 MW
By-product Gas Fired Power Plant (Proposed)	2 x 100 MW (Approx.)
BF Top Recovery Turbine (Proposed)	Proposed BF-2 x 25 MW (Approx.)
Coke Dry Quenching (CDQ) (Proposed)	100 MW (Approx.)
BF#1 TRT	10 MW
Waste Heat Recovery Power Plant	25 MW

3.9.2.3 Power Balance

The power balance is given in Table 3-31. The power balance depicts the firm sent-out capability of the in-plant power generating units. The TRT generator for BF-2 has been envisaged to be connected to BF-2 LBSS which in turn connected to MRSS-3 while the TRT for BF-3 has been envisaged to evacuate power to existing power distribution system through BF-3 LBSS.

The balance power demand that will have to be met from the respective grids is given below in Table 3-31:

TABLE 3-31 – POWER BALANCE

Plant Unit	MW
Power demand of steel plant for proposed facilities	410 (average)
Power demand of steel plant for existing facilities	1163
Total power demand	1573

Plant Unit	MW
In-plant generation available from generator installed	810
Balance power	763
By-product gas and coal fines power generator	243
Balance to be imported from Grid	**520**

3.10 FUEL SYSTEM

The generated by-product fuel gases, i.e. blast furnace (BF) gas, coke oven (CO) gas and BOF gas will be utilized as fuel for various heating applications (BF stove heating, rolling mill furnaces, sinter plant, etc.) of the steel plant. Balance available gases will be utilized for steam and power generation in the power plant.

The by-product fuel gas generation and consumption figures for the project is given below in Table 3-32:

TABLE 3-32 - BY-PRODUCT GAS BALANCE

By-product Gases	Generation, N cu m/hr	Consumption in various plant units, N cu m/hr	Balance available for power generation, N cu m/hr
BF Gas	18,67,143	14,66,606	4,00,537
CO Gas	2,17,991	2,17,882	109
BOF Gas	70,455	70,287	168
DRI Tail Gas	30,000	29,950	50

Natural gas (NG) will also be required as sub-pilot/pilot fuel for flare stacks, for heating and cutting /slabs in casters, and as a start-up fuel for furnaces/boiler, as fuel in different plant facilities and in DRI 1-6 as reducing gas. For this purpose, approx. 3,60,000 Nm^3/hour of CV 8967 Kcal/Nm^3 NG will be required.

To store the various by-product gases coming out from the SMS, blast furnace and coke oven plants, BOF, BF and CO gas holders of suitable capacities are required. These stored by-product gases will be utilized in various process facilities in the steel plant. The required capacities of gas holders are given below in Table 3-33:

TABLE 3-33 - GAS HOLDERS

BF Gas Holder, m^3	BOF Gas Holder, m^3	CO Gas Holder, m^3
Existing 1,50,000m3 BF gas holder will be used	100,000	50,000

3.11 WASTE GENERATION AND MANAGEMENT

From existing plant, total generation of waste water is approx. 19,793.00 m^3/day, which will be treated through proposed UF/RO treatment scheme to follow Zero Liquid Discharge concept. After treatment UF/ RO permeate of approximately 13,968.00 m^3/day will be reused as make-up. It is estimated that approximately 5,826.00 m^3/day of UF/RO reject water would be generated. RO reject will be utilized for slag quenching and for sprinkling on various raw materials storage.

Waste water generated from the proposed expansion units of the plant will be treated in suitable treatment facilities and recycled back to the process to attain 'zero' discharge, facilitating adequate re-use of water in the respective recirculating systems, and economizing on the make-up water requirement.

Total waste water generation from expansion units will be around 650 cu m/hr (Refer Table 3-34 for details), i.e. 15,600 cu m/day. A portion cooling tower blowdown generated from some facilities, viz. BF and SMS, will be directly used in respective plant areas for applications viz. make-up to SGP, slag quenching, make-up to fire reservoir etc. The cooling tower blowdown from some facilities, viz. COBP, ASP etc., will be directly used for dust suppression sprinkler system at raw material storage yard. For various other plant units, different qualities of effluent generated will be collected in a common tank and then transported to CETP, with designed treatment capacity of approx. 530 cu m/hr.

The sewage generated shall be collected and treated in sewage treatment plants (STPs) as described in Section 6.7.

The permeate from CETP will be sent to BF and SMS as make-up to cooling tower. Reject generated in the RO plant will be partly used after dilution for sprinkler type suppression at raw material storage yard and balance will be fed to the evaporator-crystallizer. Sludge and salts generated in the CETP will be disposed at approved TSDF.

The waste water generation for the project is shown below in Table 3-34:

TABLE 3-34 - WASTE WATER GENERATION FOR FACILITIES UNDER PROPOSED EXPANSION

Sl. No.	Plant Unit	Effluent water in m^3/hr
1.	Coke oven by-product plant with CDQ PP	260
2.	SMS	80
3.	HSM	75
4.	Power plant (Gas based CPP)	90
5.	Air separation plant	30
6.	Chilled water plant	30
7.	Softening and DM plant regeneration waste	50
8.	Treated sewage from new STP	35
	Total	**650**

3.11.1 Solid Waste Management

The estimated generation of major solid wastes and its utilization as envisaged for the proposed project is presented below in Table 3-35 and Table 3-36. Maximum effort would be taken to reutilize and reuse of the by-products either for various in-plant use or sold to outside agencies for value recovery and reuse.

TABLE 3-35 – NON-HAZARDOUS PROCESS SOLID WASTE GENERATION

Solid Wastes	Expected generation, TPA	Management Scheme
BF slag	3,011,000	95 percent would undergo granulation in slag granulation plant and sold to cement industry. Dry slag which is about 5 percent would be used as construction aggregate.
BOF and LF slag	852,000	BOF slag - Use in construction purposes mainly for filling of low-lying areas and road sub grade preparation. Proposed use in railway ballast, construction aggregate etc. after accelerated weathering. LF slag – Use as construction material.
Plant waste gas and dedusting system dusts	317,200	Reuse in Sinter Plant
HSM mill scale and sludge	67,350	Reuse in Sinter Plant after reduction of oil content
SMS caster scale	5,800	Reuse in Sinter Plant

TABLE 3-36 – HAZARDOUS WASTE GENERATION

Sl. No.	Name of Hazardous Waste	Proposed generation, TPA	Action plan for Disposal/ Management
1.	Chemical Sludge from Wastewater Treatment (ETP Sludge)	23,000	Collection, Storage, Transportation and disposal at GPCB authorized TSDF site/ Co-processing/ Micropelletization
2.	Used Oil	2,100 KL/year	Collection, Storage, Transportation and Disposal by selling to Registered Vendors.

Sl. No.	Name of Hazardous Waste	Proposed generation, TPA	Action plan for Disposal/ Management
3.	Oily Waste	4,200	Collection, Storage, Transportation and Disposal by selling to Registered Vendors.
4.	Discarded Container / Barrels / Liners / Paint Drums	21,600 Nos.	Collection, Storage, Transportation and Disposal by selling to Authorized vendor.
5.	Discarded Resin	120	Collection, Storage, Transportation and Disposal at GPCB approved CHWTSDF.
6.	Tar Sludge (Coke Oven)	120	Tar sludge will be mixed with coal blend before feeding it to coke oven batteries
7.	ETP (BOD Plant) Sludge (Coke Oven)	160	ETP (BOD Plant) sludge will be mixed with coal blend for charging in the coke oven batteries.

3.11.2 Demolition and Relocation Plan

The demolition and relocation plan is given below in Table 3-37:

TABLE 3-37 – DEMOLITION AND RELOCATION PLAN

Sl. No.	Facilities	Relocation/ Demolition	Qty Civil Debris, m^3	Qty. Structural Scrap (Steel +Rebar), Ton	Land Filing, m^3	Qty. Elec-tircal waste, kg	Debris disposal plan	Relocation Plan
1	Water Reservoir Filling and Relocation	Relocation	0	0	130000	0	Land will be filled with debris of demolished facilities	Adequate Size of water reservoir is planned in expansion
2	Demolition of Briquette house(Guest House)	Demolition	12000	600	0	1800	Debris will be used to fill the land, structural scrap and other scrap shall be recycled. Electrical waste (Lighting and Cables etc.) shall be sold to authorised agencies for recycling/disposal.	

Sl. No.	Facilities	Relocation/ Demolition	Qty Civil Debris, m^3	Qty. Structural Scrap (Steel +Rebar), Ton	Land Filing, m^3	Qty. Elec-tircal waste, kg	Debris disposal plan	Relocation Plan
3	CPP 31 MW power Plant demolition	Relocation	3000	1495	0	3400	Debris will be used to fill the land, structural scrap and other scrap shall be recycled. Equipments shall be reused. Electrical waste (Lighting and Cables etc.) shall be sold to authorised agencies for recycling/disposal.	CPP shall be relocated along with other waste recovery power plant within Plant
4	Santusthi Building to be demolish	Demolition	4500	300	0	1200	Debris will be used to fill the land, structural scrap and other scrap shall be recycled.	
5	Slag quenching processing area relocation	Relocation	500	1556	0	0	Civil debris shall be used for land filling	New area for Slag quenching and processing is Planed in expansion
6	MRSS-2 relocation	Relocation	600	50	0	0	Civil debris shall be used for land filling and structural scrap shall be recycled	New MRSS#2 is planned in Expansion
7	Marshalling Yard Shifting	Relocation	20000	1500	0	1600	Debris will be used to fill the land, structural scrap shall be recycled. Electrical waste (Lighting and Cables etc.) shall be sold to authorised agencies for recycling/disposal.	All FG dispatch shall be done from Plant.
8	Nand Vihar (Bachelor's accommodation) and Academy demolition and Relocation	Demolition	2500	1500	15000	1200	Debris will be used to fill the land, structural scrap and other scrap shall be recycled. (Lighting and Cables etc.) shall be sold to	Un utilised facilities

Sl. No.	Facilities	Relocation/ Demolition	Qty Civil Debris, m³	Qty. Structural Scrap (Steel +Rebar), Ton	Land Filing, m³	Qty. Elec-trical waste, kg	Debris disposal plan	Relocation Plan
							authorised agencies for recycling/disposal.	
9	Administrative building Dismantling	Demolition	5000	2000	0	1500	Debris will be used to fill the land, structural scrap and other scrap shall be recycled. Electrical waste (Lighting and Cables etc.) shall be sold to authorised agencies for recycling/disposal.	Office Staff will be shifted in Plant Offices
	TOTAL		**48,100**	**9,001**	**145,000**	**10,700**		

3.11.3 Air Pollution

Various process operations would generate particulate dusts, oxides of sulphur and nitrogen and carbon dioxide to the environment. The emission would be from the stacks as well as there would be fugitive emission of dusts from open and closed areas.

Fugitive dust emissions generating from the handling and stockpiling of raw material in open stockyards would be controlled by water sprinkling at regular intervals. All closed zone working areas such as raw materials handling zone, conveyor transfer points, dust generation points at screen would be provided with dust extraction (DE) systems/dry fogging (DF) at several emission points to control the fugitive dust emissions. DE system shall consist of suction hood followed by bag filter/ESP, ducts, extraction fans and stack of appropriate height.

3.11.3.1 Coke Oven

Emissions from coke ovens would mainly result from coal charging and coke pushing. Fugitive emissions may result from various leakages from oven doors, charging lids, ascension pipe (AP) covers etc. Charging emissions would be controlled by High Pressure Liquor Aspiration (HPLA) injection in goose neck during charging. Coking emissions would be controlled by efficient sealing of oven doors, water sealing arrangement of AP cap etc. Land based fume extraction system would be adopted for charging and pushing emission control. The hot coke would be quenched by coke dry quenching (CDQ) with recovery of sensible heat for steam generation.

The raw coke oven gas (COG) would be cleaned in by-product recovery plant with recovery of tar, ammonia and sulphur to make it suitable for use as plant fuel.

3.11.3.2 Blast Furnace

In addition to cleaning of BF gas in gas cleaning plant (GCP), the main sources of air pollution would be stock house and cast house. The BF stock house would be provided with DE systems complete with dust extraction hoods, bag filter, ID fan and stack of adequate height. Similarly, the cast house would have separate fume collection system during taping of hot metal and slag, equipped with bag filter for separation of particulates before venting through a stack of appropriate height.

Heat recovery from stove waste gas shall be installed for preheating of BF Gas and combustion air for stoves. In addition, energy conservation would be carried out through installation of TRT and pulverized coal injection.

3.11.3.3 **Lime/Dolomite Calcining Plant**

The emissions arising due the fuel burning in lime calcining plant would be collected and taken through a bag filter to separate out the lime/dolo fines. The lime/dolo fines thus collected would be recycled to the sinter plant. The kilns in the calcining plant and other dust generation areas would be provided with separate DE systems, complete with bag filters and stack of adequate height to clean the particulates.

3.11.3.4 **BOF**

Besides BOF gas cleaning in dry type GCP, which is basically a process necessity, secondary emission would be generated mainly from charging and tapping operations. The secondary emissions of the steel melt shop would be controlled by APC comprising of doghouse with collection hood, ID fan, bag filter and stack of appropriate height.

3.11.3.5 **Ladle Furnace**

The emissions of LF would be collected by fume extraction (FE) devices and routed to the overall secondary fume extraction system of the shop through ducts to clean the dust laden fumes.

3.11.3.6 **Caster Area**

The water required for cooling the hot cast slabs would generate hot fumes comprising mainly water vapour, hot waste water and suspended particulates. The slab casting area would be provided with adequate ventilation in order to have the water vapour properly dispersed.

3.11.3.7 **Rolling Mills**

Clean by-product gases would be used in the reheating furnaces as fuel. Burning of the gases would give rise to the emissions of particulates, CO_2 and NOx. NOx emissions would be controlled by optimising the excess air supply and proper burner design. In addition fume extraction (FE) system would be installed. The flue gas, which is fairly clean, would be vented through a stack of adequate height.

3.11.3.8 **Captive Power Plant**

The surplus by-product fuels gases would be burnt in the boilers for generation of power. Power would also be generated from CDQ and TRT. The flue gas thus generated from the boiler would be vented through stack of appropriate height.

3.12 SCHEMATIC REPRESENTATIONS OF THE FEASIBILITY DRAWING WHICH GIVE INFORMATION OF EIA PURPOSE

As per the Environment Impact Assessment (EIA) notification dated 14th September 2006 and subsequent amendments, this project falls under Category A. It would be required to prepare EIA/ environmental management plan (EMP) report to obtain the Environmental Clearance (EC) for the project from the Ministry of Environment, Forest and Climate Change (MoEFCC). The schematic diagram given in Fig. 3-4 on the next page represents the steps required for EIA to obtain the EC.

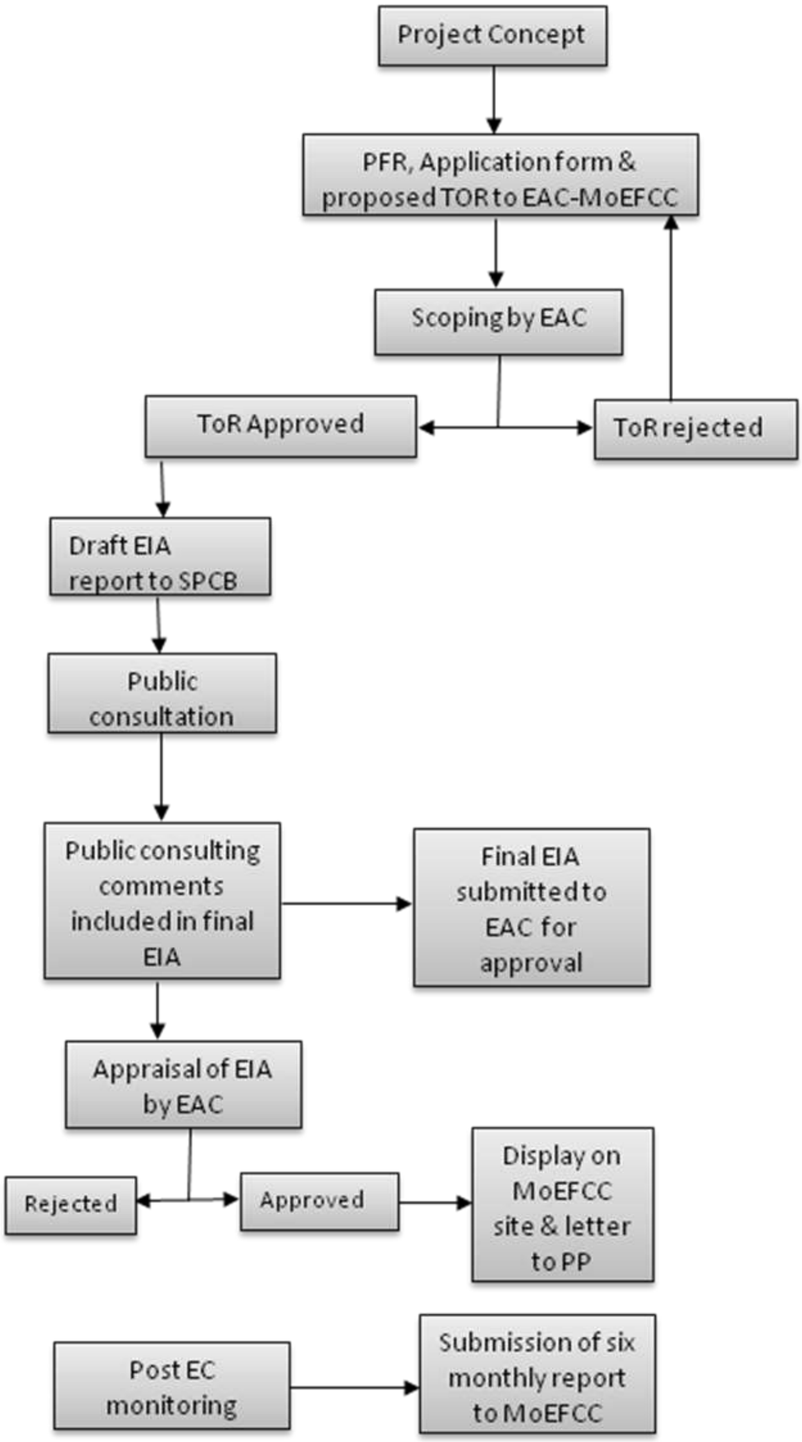


FIG. 3-4 - SCHEMATIC DIAGRAM FOR STEPS OF EIA

4 - SITE ANALYSIS

4.1 CONNECTIVITY

The proposed project area is situated in the west coast of India at a distance of 25 km from the Surat City in the State of Gujarat. The existing plant site is connected to the Bypass NH6 road, along the northern and western sides of the plant site, through two plant gates, Gate A and Gate B. The Bypass NH6 road meets the four-lane National Highway NH6, which connects Hazira and Kolkata in West Bengal. NH6 is also linked to NH8, which connects Mumbai and Delhi. Surat-Hazira road is passing within the existing works boundary, dividing it into two plots. Hot metal track for BF3 crosses the Surat-Hazira road.

Presently, Hazira plant is not connected to the Indian Railway network. The Mumbai-Delhi broad gauge mainline via Surat, under the Western Railway, is located at a distance of about 30 km from the plant. There is a railway head, taking off from the mainline between the Kosad and Gothangam railway stations, available up to the plant of Kribhco Fertilizer Co., which is at a distance of about 7 km from the Hazira plant. However, G-RIDE yard will be available about 1.8 km away from plant site. Railway connectivity from `Zero Point' of G-RIDE yard to plant site will be made based on the land availability and location of 'Zero Point' of G-RIDE yard. There is also an all-weather deep draft terminal under EBTL and is located on the western bank of the Tapi river, which is at the south of the present works' boundary. AMNSI has planned to construct a captive jetty at the north of EBTL port and at the west bank of Tapi river and a separate application for EC and CRZ clearance is being filed. The Tapi river is connected to the high seas of the Gulf of Khambatt by a navigation channel, under the Gujarat Maritime Board (GMB). Surat Airport is located at a distance of around 22 km.

With the expansion, the finished goods (FG) movement will increase. The FG movement will be by sea, road and rail.

4.1.1 Sea

Hazira is having well developed Ports in vicinity. Export to various countries including UAE/ Middle East and Europe, and domestic despatch to Maharashtra and Southern states is through Port. Currently 3.0 MTPA of FG is being despatched by sea route and after expansion 6.0 MTPA will be despatched by this route.

4.1.2 Road

Hazira is well connected with State and National highways. FG transportation to landlocked places is being done through road. Currently 5.5 MTPA of FG is being despatched by road and after expansion 9.0 MTPA will be despatched by this route.

4.1.3 Rail

Western Railway's three (3) railway sidings (Kribhco, Ankleshwar and Udhana) are near to Hazira and are well connected to rest of the country. These sidings are being used to despatch 1.0 MTPA FG and will remain same after expansion also. After G-RIDE implementation, 6.0 MTPA FG will be despatched by this route thereby reducing the load on road despatch.

4.2 LAND FORM, LAND USE AND LAND OWNERSHIP

The land requirement for the proposed expansion will be 186.20 Ha.

It will comprise of the following:

a) Forest land of 65.73 Ha (Stage-II clearance available).

b) 14.15 Ha applied for acquisition to State Government.

c) 106.32 Ha vacant land in the existing plant area / Township office area.

4.2.1 Topography

The proposed site is surrounded by Tapi estuary towards East and North East and the Arabian Sea in South and West.

Topography of the surrounding area mainly comprises of brackish marshy area merged with the backwaters of the Arabian Sea. Tapi estuary and Hazira peninsula forms part of the region. Hazira peninsula consists of four islands of Hazira, Junagam, Suwali and Mora, which are surrounded by extensive mud flats.

The topographic features of the project area may be seen from Survey of India Topo Sheet No. 46 C/12. The Topographic map is shown in Fig 4-1 on the next page.

4.2.2 Existing Land Use Pattern

The areas used for proposed brownfield expansion project is located within the existing works boundary of 9.6 MTPA ISP of group company. In addition to that, two additional areas adjacent to the south of existing works boundary will be available for expansion. The areas located within the present works boundary available for expansion presently occupied by slag dump area, limestone and dolomite storage for corex and lime dolo calcining plant-2, MRSS-2, marshaling yard, Santushti building, briquette house, CPP-1, HBI water reservoir, gas station, township (partly), offices and other unutilized land within the possession of the group. The existing land use pattern of the proposed site mostly consists of industrial land.

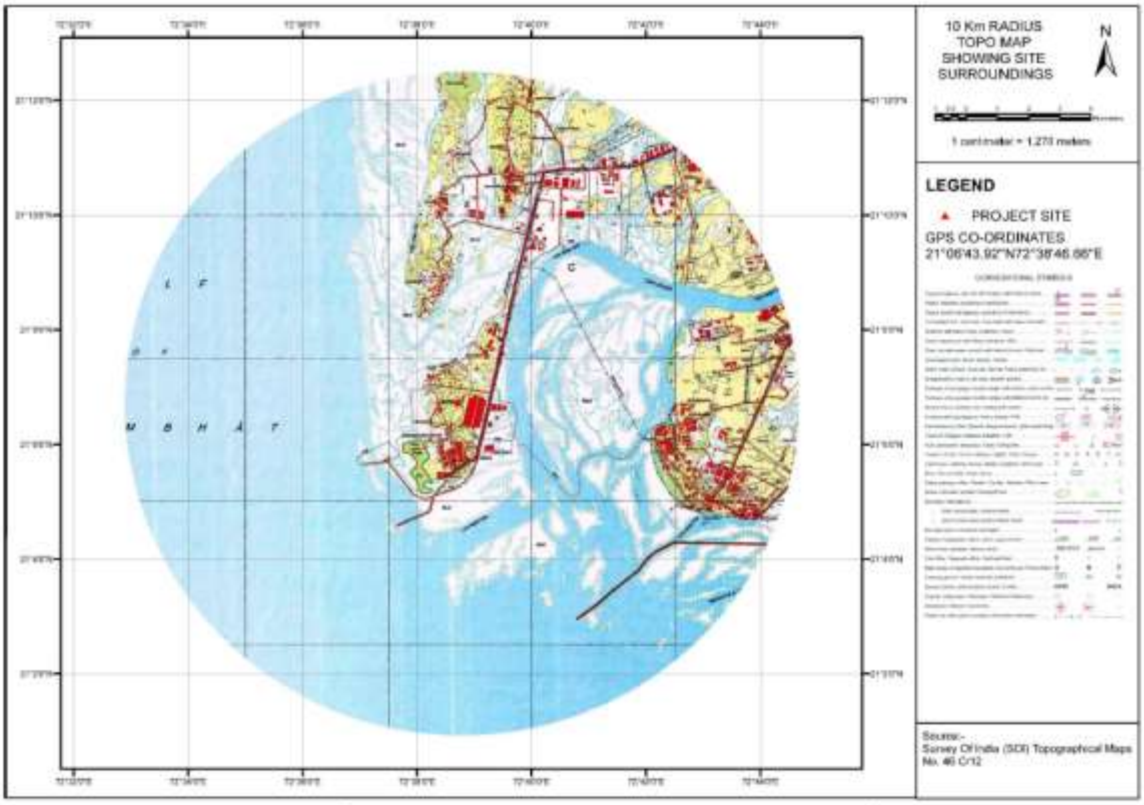


FIG. 4-1 - TOPOGRAPHIC MAP OF THE PROPOSED STEEL PLANT SITE

4.2.3 Existing Infrastructure

The existing road, rail and port infrastructure have been described in Clause 4.1 above.

4.2.4 Soil Characteristics

As per the soil report sub-soil at the site mainly consists of silty sand deposits with intermittent patches of expansive plastic clay deposit. The compactness of the silty sand deposit gradually increases with depth. Below the top 2 m loose silty sand, a medium stiff expansive, cohesive deposit has been observed up to 4 m depth. This is followed by medium dense silty sand deposits up to 19.5 m depth. Again a seam of expansive, highly plastic cohesive deposit has been observed below this up to 21 depth, followed by very dense gravelly sand continued up to the maximum of depth of exploration of 24 m.

4.3 CLIMATIC CONDITIONS

The meteorological data of nearest Indian Meteorological Department (IMD) station Surat are available to understand the prevailing meteorological conditions. The interpretation of meteorological data is as follows:

4.3.1 Temperature

The month of January is the coldest month of the year with mean maximum and minimum temperatures as 31.5^{0}C and 14.3^{0}C respectively. Likewise April is the hottest month of the year with maximum and minimum temperatures as 37.7^{0}C and 23.7^{0}C respectively.

4.3.2 Rainfall

The south-west monsoon normally enters into the state in the first week of June and prevails till last week of September. The average annual rainfall in the study area district is 1209.4 mm. Majority of rainfall (85 percent) is received under the influence of southwest monsoons during June to September. January and February are generally the driest month of the year.

4.3.3 Humidity

The relative humidity was observed to be high during the monsoon months from June to September. The relative humidity was lower in other months of the year, with the lowest being recorded in the months of November to January.

4.3.4 Wind

The annual average wind speed ranged between 1 and 19 km/h with predominant wind in the SW direction during March-October and NE in November- February, and (iv) the relative humidity in the region varied from 32.8 percent (March) to 86.6 percent (August).

4.4 SOCIAL INFRASTRUCTURE AVAILABLE

Hazira area houses major industrial and shipping facilities having vast number of migrant population (within and outside the state) residing in the area. The major settlements near the steel plant are well developed with respect to the social infrastructures.

The social infrastructures available within the region with respect to education, medical facility, drinking water supply, Post and Telegraph, transportation, approach roads, bank and recreational source are described as follows:

4.4.1 Education

The area is having good educational facility in the form of primary and secondary schools. The college level educational facility is present in Dumas village.

4.4.2 Medical Facility

Inhabitants are availing health facility in different forms. Nearby villages are having Primary Health Sub-Center, Maternity & Child Welfare and Family Welfare Centers. Allopathic hospitals and dispensaries are also available in Hazira village. The Maternity home, Health Center and Primary Health Center (PHC) are operating actively in Suvali and Dumas village.

4.4.3 Drinking Water Supply and Sanitation

Mode of drinking water supply in the nearby villages is mainly through tap, open dug wells, OHSR with Public Stand Posts (PSPs) and tank. AMNSI is also constructing a water pipeline to carry 0.7 million m^3 of drinking water every day to the villages near Hazira. The levels of sanitation facilities prevailing in most of the region is satisfactory good. The natural environment of the region is pleasant because of the closeness to sea and greenery around.

4.4.4 Transportation and Communication

Post office and telephone connection are the communication facilities available in the area. Approach roads are mainly paved. Government bus service and private owned vehicles are mainly used for traveling.

4.4.5 Power Supply, Bank and Recreational

Power supply is available in all the nearby area for all purposes. The surrounding area is also having formal financial institutions like Banks and recreational facilities like Sport Club, Cinema / Video Halls etc.

The vegetable market used to open in the Mora village on every Sunday as a weekly market which is located centrally. Panchayat houses available in the region are well maintained and equipped with necessary information. In most of the Panchayat houses records are made available by Talati. In all the Panchayat house's Talatis are having defined days when they make records and information available in the localities. Most of the social infrastructures are in good condition and functioning well.

5 - PLANNING BRIEF

5.1 PLANNING CONCEPT

The proposed steel plant would be located at village Hazira in Chorasi tehsil, Surat district, Gujarat.

Almost all raw materials and majority of the finished products would be transported by sea via proposed AMNSI's captive jetty. The raw material to be transported by road (ferro alloys) would be covered fully during the transportation to avoid spillage and fugitive emissions. The transportation load would not add much to the existing load on the said road network.

The proposed expansion of steel plant involving semi-mechanized operations would be a labour intensive one. Local construction labourers as well as direct and indirect labourers would be engaged for the operation.

Suitable plantation programme would be undertaken to cover the boundary areas with thick and tall plants to arrest the air-borne pollutants within the plant premises. The total green cover of the plant would be 33 percent of the plant area.

5.2 POPULATION PROJECTION

The census data of the fourteen villages under Chorasi tehsil of Surat district for the years 2001 and 2011 show a population growth from 63,477 to 1,01,120 over a period of 10 years indicating an annual compounded growth rate of 4.7 percent per year. Hence the projected population of the district for the year 2021 is around 160,000.

5.3 LAND USE PLANNING

5.3.1 Integrated Steel Plant

The total area used for proposed expansion of steel plant would be about 186.2 Ha as elaborated in Chapter 4. The area would house the following facilities:

a) Raw material storage yard
b) Sinter plant
c) Coke ovens and by-product plant
d) Blast furnace
e) SMS complex
f) Air separation plant
g) Rolling mills
h) Captive power plant.

Apart from the process units, area would be reserved for green belt, administrative building, temporary waste storage area, water reservoirs, water treatment units, MRSS and other transformer buildings, workshops, canteen, in-plant roads etc.

5.4 ASSESSMENT OF INFRASTRUCTURE DEMAND

a) The region is part of the Notified Hazira Industrial Area. Hence along with adoption of air pollution mitigation measures and regular preventive health care facilities (like PFT tests), social forestry programs would be undertaken.

b) Provision for sanitation measures in local villages.

c) Employment opportunities and vocational training for local youth.

d) Provision for Medical Camps to ensure regular health care facilities.

e) Provision for potable water facilities for the locals and promotion of localized rain water harvesting programs.

6 - PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA (PROCESSING AREA)

In addition to existing Gate, i.e. Gate A and Gate B, another new gate at the south of the plant boundary has been proposed to connect with the external road which in turn is connected with NH6 Bypass. Railway connectivity would be provided between the plant and the proposed railway yard of G-RIDE (about 1.8 km from plant site).

6.2 RESIDENTIAL AREA (NON-PROCESSING AREA)

There is an existing township besides the plant. No relocation has been envisaged during the proposed expansion.

6.3 GREEN BELT

6.3.1 Existing Location-wise Total Area under Greenery Development

AMNSI Hazira Campus is divided under two categories of greenery for maintenance, i.e. 1. Prime Locations and 2. Sub-Prime Locations. Highly intense landscape with continuous and direct interaction areas of people are termed as the prime location like all main offices and houses of AMNSI Township etc. The areas where minimum people interaction occurs and where less attention is required are termed as sub-prime locations like green belt areas and fellow areas require minimum attention.

6.3.2 Existing Green Belt Area Coverage

The existing green belt area coverage is given in Table 6-1 on the next page.

TABLE 6-1 – EXISTING GREEN BELT AREA COVERAGE

Sl. No.	Particulars	Plant	Township
1.	Total Area, Hectare	670	100
2.	Trees Planted, Nos.	226,745	60,684
3.	Green Belt developed Area, Hectare	118	53
4.	% of Green belt (Green Belt Area to Total Area)	18%	53%

6.3.3 Green Belt Details (Existing) and Proposed Green Belt Plan

The green belt details (existing and proposed green belt plan is given below in Table 6-2:

TABLE 6-2 –GREEN BELT DETAILS (EXISTING) AND PROPOSED GREEN BELT PLAN

Location	Existing and proposed land, Ha	Existing green belt, Ha	Proposed green belt, Ha	Total green belt area, Ha	Total greenbelt, %
Plant	785	118	103	221	28%
Township	100	53	18	71	71%
Total, Ha	**885**	**171**	**121**	**292**	**33%**

6.3.4 Action Plan for Green Belt Details

The action plan for green belt details is given below in Table 6-3:

TABLE 6-3 –ACTION PLAN FOR GREEN BELT DETAILS

Particulars	Details
Green belt area to be developed in Ha	121
No. of Trees to be planted	302,500 Nos.
Cost for Green belt Development	INR 12.1 Crore

Depending on the type of soil suitable for growth, higher survival rate in the region, large leaf index area, nativity of the species and pollution load, suitable species of trees would be planted.

6.4 SOCIAL INFRASTRUCTURE

Project proponent would develop the neighbouring areas through implementing corporate environment responsibility (CER) activities. The company has developed the infrastructures like water pipelines, schools, roads, playgrounds, water storage tank etc. in neighbouring areas.

6.5 CONNECTIVITY

As practiced presently, even after expansion the plant site would be connected to the Bypass NH6 road, along the northern and western sides of the plant site, through two plant gates, Gate A and Gate B. In addition to that a new gate has been proposed at the south of the plant near metal recovery plant. Surat-Hazira road is passing within the existing works boundary, dividing it into two plots. Hot metal track leading to BF3 will cross the Surat-Hazira road. The existing plant site has a good internal road network. Most of the roads within the existing plant are made of concrete. Suitable roads of similar types will be provided to cater to the proposed units and for the smooth flow of plant traffic considering the type of vehicles and traffic volume expected, as required.

Presently, Hazira plant is not connected to the Indian Railway network. The Mumbai-Delhi broad gauge mainline via Surat, under the Western Railway, is located at a distance of about 30 km from the plant. There is a railway head, taking off from the mainline between the Kosad and Gothangam railway stations, available up to the plant of Kribhco Fertilizer Co., which is at a distance of about 7 km from the

Hazira plant. However, G-RIDE yard will be available about 1.8 km away from plant site. Railway connectivity from `Zero Point' of G-RIDE yard to plant site will be made based on the land availability and location of 'Zero Point' of G-RIDE yard. There is also an all-weather deep draft terminal under EBTL and is located on the western bank of the Tapi river, which is at the south of the present works' boundary. AMNSI has planned to construct a captive jetty at the north of EBTL port and at the west bank of Tapi river. Raw material storage will be constructed by reclaiming the land. The Tapi river is connected to the high seas of the Gulf of Khambatt by a navigation channel, under the Gujarat Maritime Board (GMB). Surat Airport is located at a distance of around 22 km.

6.6 DRINKING WATER MANAGEMENT

The drinking water system will cater to the water requirements of plant personnel for drinking and sanitary purposes, central and area laboratories, canteens, and miscellaneous users in the plant. New drinking water treatment plants and distribution pipework have been envisaged for the expansion units. Since various plant units of the expansion are located at different locations, localized drinking water system has been envisaged.

For the proposed expansion plant units located at the western side of Hazira steel plant, i.e., BF-2, SMS, HSM, power plant and other miscellaneous facilities, a drinking water plant of approx. 40 cu m/hr capacity has been envisaged. The clarified water will be treated in pressure filter, chlorinated and stored in an overhead tank for distribution to the consumers.

For BF-3 and raw materials handling system (RMHS) area at eastern side of the plant, a dedicated drinking water treatment plant of approx. 30 cu m/hr capacity is proposed. Make-up grade water will be filtered in pressure filter, chlorinated and then distributed to the consumers through pumpsets provided with hydro pneumatic tank. The drinking water requirement for COBP plant will be catered from existing township drinking water plant.

For the existing plant, make-up water is treated in three nos. drinking water treatment plants and supplied to consumers to cater to drinking and sanitary requirement of plant personnel.

6.7 DRAINAGE AND SEWERAGE SYSTEM

Open type drain has been envisaged for the plant storm water drainage. The drains will be laid generally by the side of the roads. Storm water run-off, collected through arterial and trunk drain as well as from the high-rise buildings, will be collected in a storm water pond and pumped back to the raw water reservoir/treatment plant.

For existing plant, there are three STPs to treat domestic effluent generated from plant and residence, one with a capacity 480 KLD inside the plant premises and two numbers inside the township with capacities of 1000 KLD and 600 KLD. STP treated water will be used for gardening purpose.

Sewage generated from various expansion plant units will be treated in sewage treatment plants. Sewage generated from the plant units located at the western side of the Hazira steel plant, i.e. BF-2, SMS, HSM, power plant, ASP and other miscellaneous areas, will be transferred to a new sewage treatment plant to be located in the north side of the plant through gravity type sewerage network. Sewage lift pumphouse will be provided wherever required. Treated effluent from the sewage treatment plant will be further treated in CETP.

Sewage generated in COBP, BF-3 and RMHS area will be treated in existing STP in township after augmentation. Sewage from COBP plant will be transferred to the STP through sewerage network. From balance areas, sewage will be transported through tankers.

6.8 INDUSTRIAL WASTE MANAGEMENT

The proposed project would generate various types of wastes including liquid effluents and solid wastes, which have been detailed in Chapter-3.

6.9 SOLID WASTE MANAGEMENT

Major solid wastes produced in the ISP would be namely blast furnace slag and SMS slag. The solid waste management has been discussed in details in Chapter-3.

6.10 POWER REQUIREMENT AND SUPPLY/SOURCE

The estimated power requirements and source for the proposed project has been detailed in Chapter-3.

7 - REHABILITATION AND RESETTLEMENT (R&R) PLAN

There is no rehabilitation and resettlement envisaged for the proposed expansion project.

8 - IMPLEMENTATION SCHEDULE AND COST ESTIMATE

This chapter indicates the overall implementation schedule of the project and the capital cost estimate.

8.1 IMPLEMENTATION SCHEDULE

It is envisaged that the project will be completed within a period of thirty six (36) months from “Go Ahead”.

The schedule has been developed on the basis of the estimated quantum of work, expected delivery and installation period of equipment and commissioning of the plant facilities in shortest possible time.

The preliminary overall implementation schedule for the project, indicating the time period required for completing the major activities like ordering of main process equipment, basic and detail engineering for the project, manufacturing and supply to site, construction (civil and structural work and erection including cold trials/testing) and readiness of the plant is presented in the form of a Bar Chart in Appendix 8-1.

8.2 CAPITAL COST ESTIMATE

The capital cost estimate of the project is presented under the following heads:

a) Plant cost
b) Margin money for working capital
c) Pre-operative expenses
d) Interest during construction

As exports contribute a significant part to AMNSI's existing revenues, taxes and duties rate are considered based on the "Export Promotion Capital Goods (EPCG)" scheme. Additionally, AMNSI can recover the Input Tax Credit (ITC) simultaneously because of its existing operations. So, the net of ITC estimates has been shown in the capital cost table. However, total input tax credit is also shown separately.

8.2.1 Plant Cost

The plant cost includes cost of land development, infrastructure cost, civil work and structural steelwork, plant and equipment, erection and commissioning. Provision for contingency, design, engineering and administration during construction are included in the plant cost.

8.2.1.1 Design, engineering and administration during construction, project management and consultancy services

Cost towards the same is estimated at five (5) percent on a normative basis on the plant and equipment cost excluding land, land development, and external infrastructure facilities.

8.2.1.2 Contingency

A contingency provision is made at five (5) percent on a normative basis of plant cost to cover the cost of unforeseen items. This contingency provision does not provide for any forward escalation and exchange rate variation.

8.2.2 Margin Money for Working Capital

Twenty-five (25) percent of the estimated working capital for the first year of operation has been included in capital cost as margin money for working capital.

8.2.3 Preliminary and Pre-operative Expenses

A provision is made for preliminary expenses towards initial studies, capital issue and miscellaneous other expenses. A provision is also made for pre-operative expenses and start-up expenses as up-front fee payable on borrowing from financial institutions/bank.

8.2.4 Interest During Construction

Interest during construction has been calculated on net of Input Tax basis and based on the following assumptions:

a) Debt-equity ratio of 70:30.

b) Debt financing - 50 percent INR and 50 percent USD.

c) Composite (Rupee term loan and ECA/ECB) financing rate (pre-tax) assumed at seven (7) percent per year.

d) Year-wise allocation of fund as per implementation schedule.

e) Drawal of fund in the ratio of Debt: Equity.

The estimated capital cost for the proposed project is worked out at around INR 31,600 Crore on net of ITC basis and detailed below in Table 8-1:

TABLE 8-1 - ESTIMATED CAPITAL COST

Sl. No.	Description	Total, Rs. in Crore
A.	**Plant Cost**	
1.	Land development	605
2.	Civil and structural steelwork	7,710
3.	Plant and equipment as erected	17,471
4.	Infrastructure facilities	197
5.	Design, Engineering and Administration during Construction (DE and ADC)	1,169
6.	Contingency	1,555
	Total (A)	**28,707**

Sl. No.	Description	Total, Rs. in Crore
B.	**Other Cost**	
1.	Margin money	900
2.	Preliminary and Pre-operative expenses	450
3.	Interest during construction (IDC)	1,538
	Total (B)	**2,888**
C.	**Capital Cost (Net of Input Tax)**	**31,595**
D.	**Input Tax Credit**	**3,550**
E.	**Capital Cost (Gross of Input Tax)**	**35,145**

9 - ANALYSIS OF PROPOSAL

9.1 ECONOMICAL AND SOCIAL BENEFITS OF THE PROJECT

The proposed expansion project would:

a) Generate local direct and casual employment opportunities.

b) Augment the growth of ancillary small-medium scale industries, trade and commercial establishments and local entrepreneurship thereby contributing towards local income.

c) Contribute to National and State exchequer through:

   i) GST
   ii) Road Tax
   iii) Income by registration of trucks and trailers
   iv) Income and Corporate Tax.

The peripheral development activities that would be undertaken by the proposed project under Corporate Environment Responsibility (CER) would focus on marginal communities and attempt to bring forward an overall socio-economic development in line with the findings of Social Impact Assessment to be carried out as part of EIA baseline as well as issues raised during Public Hearing.

APPENDIX

Appendix-8-1 - Implementation Schedule

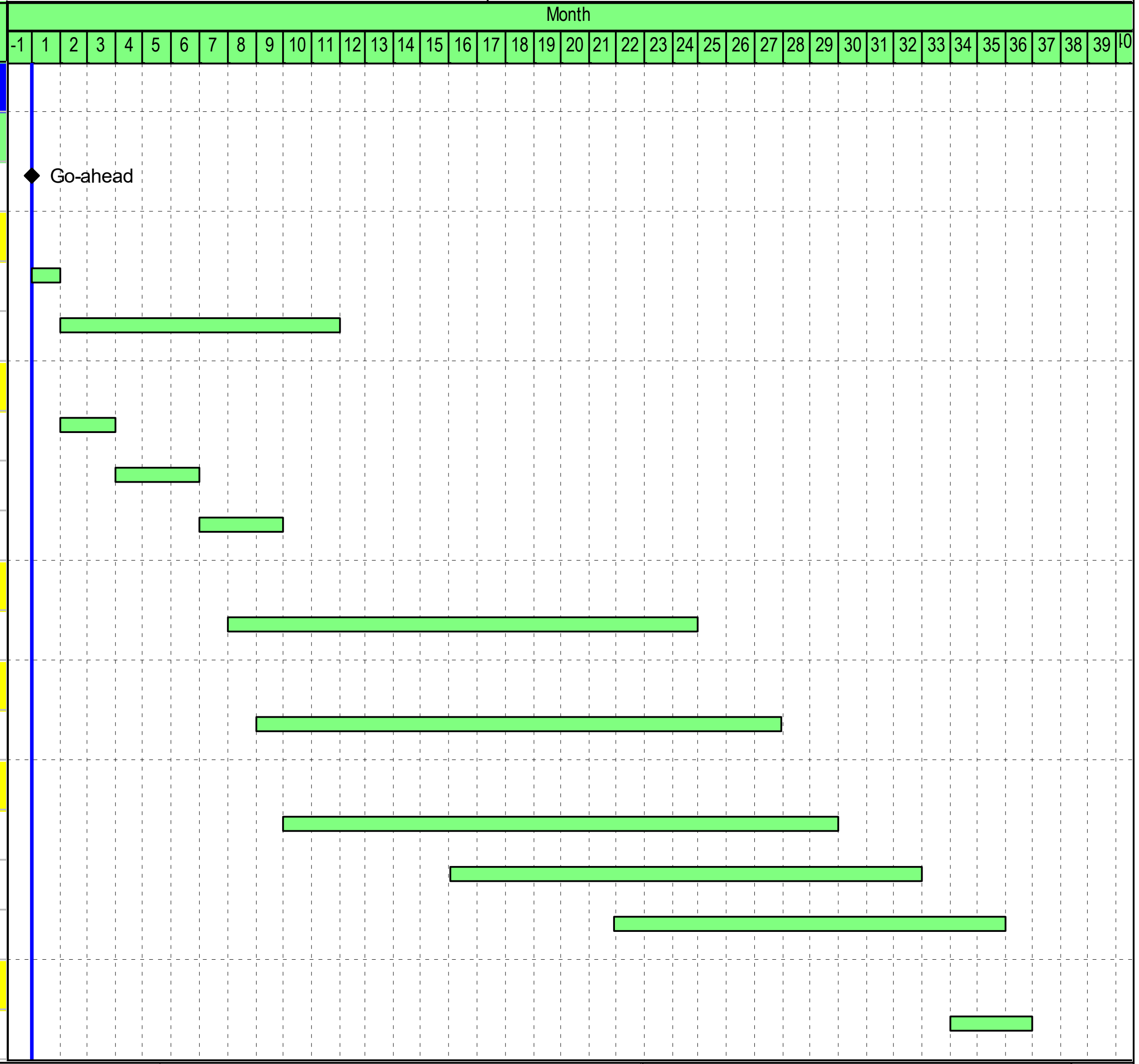
Presented on the next page

AMNSI - Implementation Schedule for Brownfield Expansion

Date: 24.08.2021

Implementation Schedule

Activity Name
AMNSI - Implementation Schedule for Brownfield Expansio
IMPLEMENTATION SCHEDULE
Go-ahead
Basic Engineering
Receipt of Data/Informa·on/drawings from client
Layout finalisation and Basic Engineering work
Procurement Activities
Preparation of Tender Specifications
Receipt of bids & Evaluation of Offers
Finalization of Contracts & Order placement
Detail Engineering
Detail Engineering
Manufacturing & Delivery
Manufacturing & Delivery of Equipment
Construction Activities
Major civil and structral Work
Major equipment erection & piping work
Electrical and Instrumentation work
Testing ,Trials & Commissioning
Testing & Commissioning



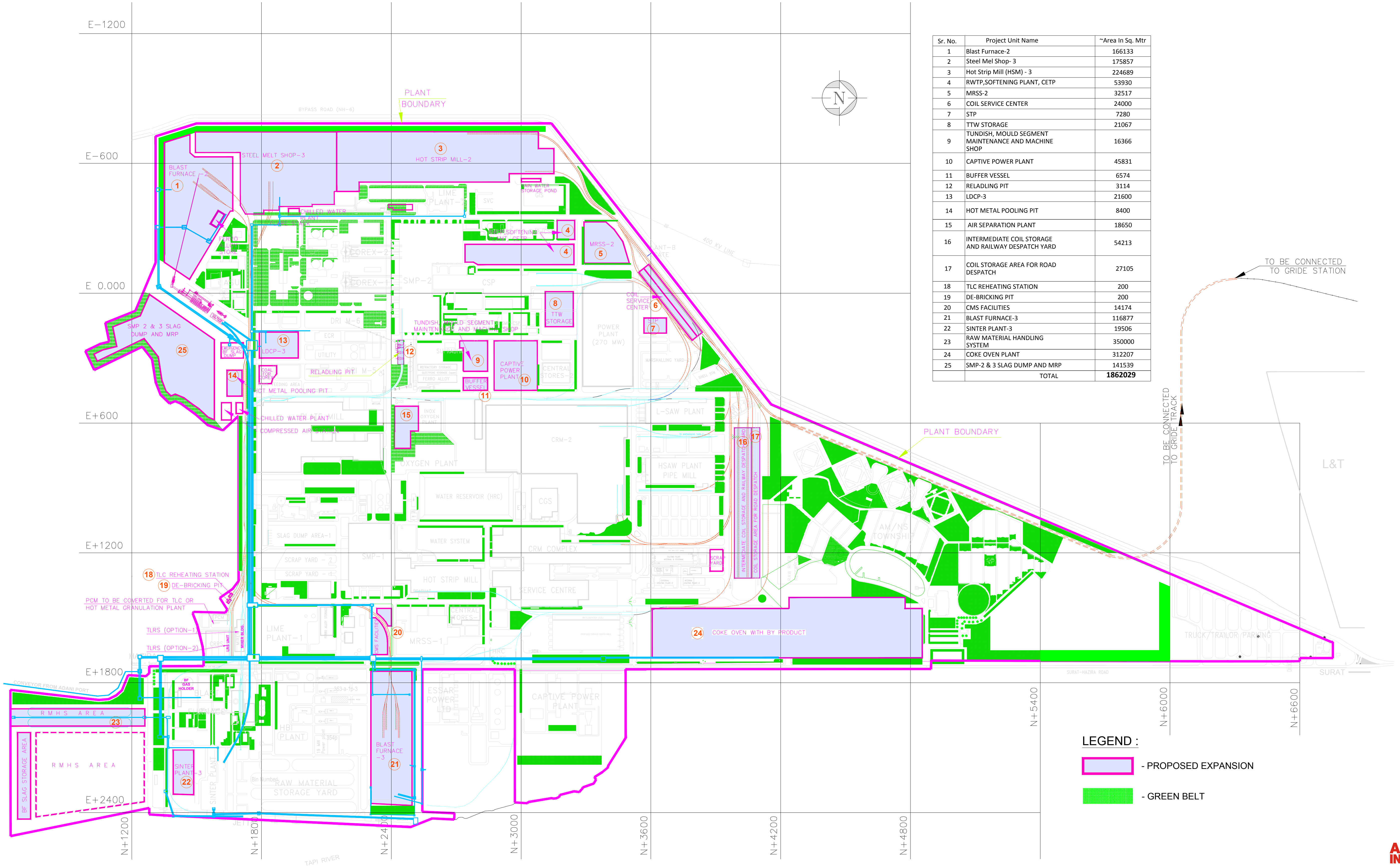
Note: This schedule has been prepared for proposal purpose only.

Activity

Milestone

Prepared by	SDKA
Checked by	GPC

DRAWINGS



Sr. No.	Project Unit Name	~Area In Sq. Mtr
1	Blast Furnace-2	166133
2	Steel Mel Shop- 3	175857
3	Hot Strip Mill (HSM) - 3	224689
4	RWTP,SOFTENING PLANT, CETP	53930
5	MRSS-2	32517
6	COIL SERVICE CENTER	24000
7	STP	7280
8	TTW STORAGE	21067
9	TUNDISH, MOULD SEGMENT MAINTENANCE AND MACHINE SHOP	16366
10	CAPTIVE POWER PLANT	45831
11	BUFFER VESSEL	6574
12	RELADLING PIT	3114
13	LDCP-3	21600
14	HOT METAL POOLING PIT	8400
15	AIR SEPARATION PLANT	18650
16	INTERMEDIATE COIL STORAGE AND RAILWAY DESPATCH YARD	54213
17	COIL STORAGE AREA FOR ROAD DESPATCH	27105
18	TLC REHEATING STATION	200
19	DE-BRICKING PIT	200
20	CMS FACILITIES	14174
21	BLAST FURNACE-3	116877
22	SINTER PLANT-3	19506
23	RAW MATERIAL HANDLING SYSTEM	350000
24	COKE OVEN PLANT	312207
25	SMP-2 & 3 SLAG DUMP AND MRP	141539
	TOTAL	**1862029**

1. ALL DIMENSION, LEVELS AND CO-ORDINATES ARE IN METRE.

AM/NS INDIA

DASTUR

M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS, KOLKATA

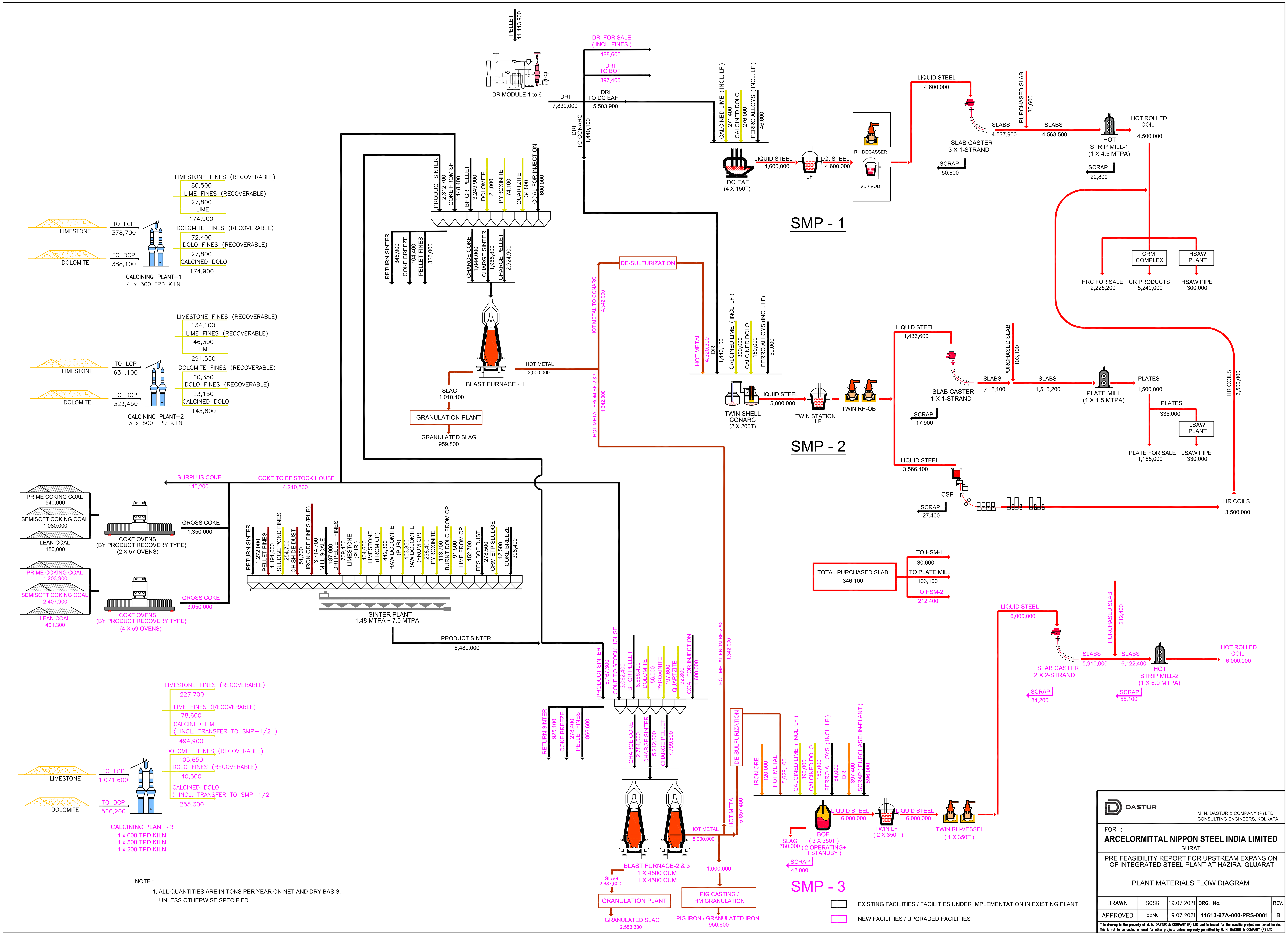
FOR :

ARCELORMITTAL NIPPON STEEL INDIA LIMITED
SURAT

PRE FEASIBILITY REPORT FOR UPSTREAM EXPANSION OF INTEGRATED STEEL PLANT AT HAZIRA, GUJARAT

LAYOUT FOR UPSTREAM EXPANSION PROJECT

DRAWN	ArMo	21.09.2021	DRG. No.	REV.
APPROVED	MDT	21.09.2021	11613-97A-000-LTL-0003	0



PELLET 11,113,900
DR MODULE 1 to 6
DRI 7,830,000
DRI FOR SALE (INCL. FINES) 488,600
DRI TO BOF 397,400
DRI TO DC EAF 5,503,900
DRI TO CONARC 1,440,100
CALCINED LIME (INCL. LF) 271,400
CALCINED DOLO 276,000
FERRO ALLOYS (INCL. LF) 46,600
DC EAF (4 X 150T)
LIQUID STEEL 4,600,000
LF
LQ. STEEL 4,600,000
RH DEGASSER
VD / VOD
LIQUID STEEL 4,600,000
SLAB CASTER 3 X 1-STRAND
SLABS 4,537,900
PURCHASED SLAB 30,600
SLABS 4,568,500
SCRAP 50,800
HOT STRIP MILL-1 (1 X 4.5 MTPA)
HOT ROLLED COIL 4,500,000
SCRAP 22,800
SMP - 1
CRM COMPLEX
HSAW PLANT
HRC FOR SALE 2,225,200
CR PRODUCTS 5,240,000
HSAW PIPE 300,000
LIMESTONE FINES (RECOVERABLE) 80,500
LIME FINES (RECOVERABLE) 27,800
LIME 174,900
LIMESTONE
TO LCP 378,700
DOLOMITE
TO DCP 388,100
DOLOMITE FINES (RECOVERABLE) 72,400
DOLO FINES (RECOVERABLE) 27,800
CALCINED DOLO 174,900
CALCINING PLANT-1
4 x 300 TPD KILN
PRODUCT SINTER 2,312,700
COKE FROM SH 1,148,400
BF GR. PELLET 3,249,900
DOLOMITE 21,000
PYROXINITE 74,100
QUARTZITE 34,800
COAL FOR INJECTION 600,000
RETURN SINTER 346,900
COKE BREEZE 104,400
PELLET FINES 325,000
CHARGE COKE 1,044,000
CHARGE SINTER 1,965,800
CHARGE PELLET 2,924,900
BLAST FURNACE - 1
HOT METAL 3,000,000
SLAG 1,010,400
GRANULATION PLANT
GRANULATED SLAG 959,800
DE-SULFURIZATION
HOT METAL TO CONARC 4,342,000
HOT METAL FROM BF-2 &3 1,342,000
LIMESTONE FINES (RECOVERABLE) 134,100
LIME FINES (RECOVERABLE) 46,300
LIME 291,550
LIMESTONE
TO LCP 631,100
DOLOMITE
TO DCP 323,450
DOLOMITE FINES (RECOVERABLE) 60,350
DOLO FINES (RECOVERABLE) 23,150
CALCINED DOLO 145,800
CALCINING PLANT-2
3 x 500 TPD KILN
HOT METAL 4,320,300
DRI 1,440,100
CALCINED LIME (INCL. LF) 300,000
CALCINED DOLO 150,000
FERRO ALLOYS (INCL. LF) 50,000
TWIN SHELL CONARC (2 X 200T)
LIQUID STEEL 5,000,000
TWIN STATION LF
TWIN RH-OB
SMP - 2
LIQUID STEEL 1,433,600
SLAB CASTER 1 X 1-STRAND
SLABS 1,412,100
PURCHASED SLAB 103,100
SLABS 1,515,200
SCRAP 17,900
PLATE MILL (1 X 1.5 MTPA)
PLATES 1,500,000
PLATES 335,000
LSAW PLANT
PLATE FOR SALE 1,165,000
LSAW PIPE 330,000
HR COILS 3,500,000
LIQUID STEEL 3,566,400
CSP
SCRAP 27,400
HR COILS 3,500,000
PRIME COKING COAL 540,000
SEMISOFT COKING COAL 1,080,000
LEAN COAL 180,000
COKE OVENS (BY PRODUCT RECOVERY TYPE) (2 X 57 OVENS)
GROSS COKE 1,350,000
SURPLUS COKE 145,200
COKE TO BF STOCK HOUSE 4,210,800
PRIME COKING COAL 1,203,900
SEMISOFT COKING COAL 2,407,900
LEAN COAL 401,300
COKE OVENS (BY PRODUCT RECOVERY TYPE) (4 X 59 OVENS)
GROSS COKE 3,050,000
RETURN SINTER 1,272,000
PELLET FINES 1,191,600
SLUDGE POND FINES 254,700
CH SH DE DUST 51,700
IRON ORE FINES (PUR) 3,714,700
MILL SCALE 187,900
DRI PELLET FINES 709,400
LIMESTONE (PUR.) 404,600
LIMESTONE (FROM CP) 442,300
RAW DOLOMITE (PUR) 103,350
RAW DOLOMITE (FROM CP) 238,400
PYROXINITE 113,700
BURNT DOLO FROM CP 91,500
LIME FROM CP 152,700
FES BF DUST 278,500
CRM ETP SLUDGE 12,500
COKE BREEZE 396,400
SINTER PLANT 1.48 MTPA + 7.0 MTPA
PRODUCT SINTER 8,480,000
TOTAL PURCHASED SLAB 346,100
TO HSM-1 30,600
TO PLATE MILL 103,100
TO HSM-2 212,400
LIQUID STEEL 6,000,000
SLAB CASTER 2 X 2-STRAND
SLABS 5,910,000
PURCHASED SLAB 212,400
SLABS 6,122,400
SCRAP 84,200
HOT STRIP MILL-2 (1 X 6.0 MTPA)
SCRAP 55,100
HOT ROLLED COIL 6,000,000
LIMESTONE FINES (RECOVERABLE) 227,700
LIME FINES (RECOVERABLE) 78,600
CALCINED LIME (INCL. TRANSFER TO SMP-1/2) 494,900
DOLOMITE FINES (RECOVERABLE) 105,650
DOLO FINES (RECOVERABLE) 40,500
CALCINED DOLO (INCL. TRANSFER TO SMP-1/2 255,300
LIMESTONE
TO LCP 1,071,600
DOLOMITE
TO DCP 566,200
CALCINING PLANT - 3
4 x 600 TPD KILN
1 x 500 TPD KILN
1 x 200 TPD KILN
PRODUCT SINTER 6,167,300
COKE TO STOCK HOUSE 3,062,400
BF GR PELLET 8,666,400
DOLOMITE 56,000
PYROXINITE 197,600
QUARTZITE 92,600
COAL FOR INJECTION 1,600,000
RETURN SINTER 925,100
COKE BREEZE 278,400
PELLET FINES 866,600
CHARGE COKE 2,784,000
CHARGE SINTER 5,242,200
CHARGE PELLET 7,799,800
HOT METAL FROM BF-2 &3 1,342,000
DE-SULFURIZATION
HOT METAL 5,657,400
IRON ORE 120,000
HOT METAL 5,629,100
CALCINED LIME (INCL. LF) 390,000
CALCINED DOLO 150,000
FERRO ALLOYS (INCL. LF) 84,000
DRI 397,400
SCRAP (PURCHASE+IN-PLANT) 596,000
BLAST FURNACE-2 & 3
1 X 4500 CUM
1 X 4500 CUM
HOT METAL 8,000,000
SLAG 2,687,600
GRANULATION PLANT
GRANULATED SLAG 2,553,300
1,000,600
PIG CASTING / HM GRANULATION
PIG IRON / GRANULATED IRON 950,600
BOF (3 X 350T) (2 OPERATING+ 1 STANDBY)
SLAG 780,000
SCRAP 42,000
LIQUID STEEL 6,000,000
TWIN LF (2 X 350T)
LIQUID STEEL 6,000,000
TWIN RH-VESSEL (1 X 350T)
SMP - 3
NOTE :
1. ALL QUANTITIES ARE IN TONS PER YEAR ON NET AND DRY BASIS, UNLESS OTHERWISE SPECIFIED.
EXISTING FACILITIES / FACILITIES UNDER IMPLEMENTATION IN EXISTING PLANT
NEW FACILITIES / UPGRADED FACILITIES
DASTUR
M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS, KOLKATA
FOR :
ARCELORMITTAL NIPPON STEEL INDIA LIMITED
SURAT
PRE FEASIBILITY REPORT FOR UPSTREAM EXPANSION OF INTEGRATED STEEL PLANT AT HAZIRA, GUJARAT
PLANT MATERIALS FLOW DIAGRAM
DRAWN SOSG 19.07.2021 DRG. No. 11613-97A-000-PRS-0001 REV. B
APPROVED SpMu 19.07.2021
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