JSW Steel (Salav) Limited
(Formerly known as Welspun Maxsteel Limited.)
Works :
Vill.- Salav, PO - Revdanda,
Dist. Raigad - 402 202
Maharashtra, India
CIN. : U27100GJ2008PLC064145
Phone : +91 2144260110 - 19
Fax : +91 2144260104/122
Website : www.jsw.in

JSWSSL/ENV/MOEFCC/2016

Date: 16/03/2016

To
The Member Secretary of EAC (Industry),
Ministry of Environment & Forests and Climate Change,
IA Division, Indira Paryavaran Bhavan,
JorBagh Road, Ali Ganj
New Delhi – 110003.

Sub: Expansion Project of JSW Steel (Salav) Ltd. for 3 MTPA Integrated Steel Plant regarding TOR.

Ref: Minutes of Meeting of the 45th EAC, Industry 1 held on August 11-12, 2015

Sir,

With reference to above, we are submitting revised project report along with necessary additional information as desired in the Minutes of Meeting of the 45th EAC, Industry 1 held on August 11-12, 2015.

The point wise reply to the queries is as follows;

1. Details on the residential areas / villages around the plant. Specifically the residential area adjacent to the plant boundary.

The details of the residential area/ villages around the plant are given below.

Name of Village	No. of houses	Population	Distance & Direction from the Plant
Korlai	821	2959	6.0 km North East
Chehar + Mithekhar	942	2959	5.0 km South
Valke	760	3040	5.5 km South West
Chordhe	321	2315	8.5 km South East
Telekhar + Tale	207	1414	10.0 km East
Salav + Sanjay Nagar + Nidi	727	2096	Adjacent North West & North

JINDAL Part of O. P. Jindal Group

Regd. Office : Welspun City,
Versamedi Village, Anjar Taluk,
Kutch District - 370110. Gujrat

2. The land requirement proposed for the project is inadequate and to be revisited and revised.

The total area required for expansion of the plant to 3.0 MTPA is about 706 acres which includes 145 acres of existing plant area, 421 acres for the new proposed units, 66 acres of buffer zone in between the existing bund (HTL) & 100 m setback line and 74 acres of the existing township. Apart from technological and service units, raw water storage, green belt as per statutory requirement, etc. have been included in area estimation. The details are provided in the table below in point 3.

3. The land use of the land to be procured for the project should be clearly provided along with justification of adequacy of land.

The area requirement for the proposed plant has been estimated based on the following factors:

- Area requirements of individual technological and service facilities
- Smooth and uninterrupted flow of incoming and outgoing materials with minimum counter flow for different technological facilities.
- Logistics in location of technological units as well as service facilities.
- Safety requirements and statutory provisions.
- Adequate green belt all around the plant.
- Optimum lead for service lines.
- Optimum utilization of the land aligning with the existing infrastructural facilities.
- Space for storage of incoming raw materials and solid wastes.

The area requirement for the proposed expansion is minimized as the infrastructure and auxiliary facilities already exist within the existing plant area. It is proposed to provide connectivity to the existing facilities viz. utilities, raw material corridors, etc. The details worked out are as follows:

Land	Area	Existing Facilities	Area (Acres)	Plant Facilities under 3.0 MTPA Steel Plant	Total Area in Acres
Existing Plant Area	145 Acres	RMHS	14.5	RMHS	14.5
		Sponge Iron Plant (SIP)	19.5	Sponge Iron Plant (SIP)	19.5
		Store, Workshop etc.	1.2	Store, Workshop etc.	1.2
		Raw Water Pond	1.3	Raw Water Pond	1.3
		SIP Sludge drying area	1.5	SIP Sludge drying area	1.5
		Water Utilities	0.6	Water Utilities	0.6
		Rain Water Harvesting	2.5	Rain Water Harvesting	2.5
		Main Roads	4.0	Main Roads	9.0
		Greenery	47.0	Greenery	47.0 (33%)
		Proposed new facilities under 3.0 MTPA, and within existing		LCP	1.0
				Oxygen Plant	1.2

		plant area		Corex Plant	19.5
				SMS	8.0
				CSP	16.2
				SMS Slag storage area	0.85
				Slag Metal recovery area	1.15
				Sub Total	**145**
Land	**Area**	**Existing Facilities**	**Area (Acres)**	**Plant Facilities under 3.0 MTPA Steel Plant**	**Total Area in Acres**
New Proposed Area	421 acres	---	---	Coke Oven Plant	50
				Pellet Plant	30
				Cement Plant, slag storage	22
				Captive Power Plant	30
				Ash Dump Area	21
				Tin Plate Mill	17
				Heavy Section Mill	36
				Medium Section Mill	36
				BTX Plant	4.0
				SNG Plant	4.0
				COREX Sludge, SIP Sludge, EAF, Bag Filter & ESP Dust Storage/ Handling Area	1.0
				Central Store, Repair Shop, STP, Hazardous Waste Storage/ Handling Area	8.0
				Fire Fighting Station, Admin. Bldg., Car Parking, Truck Parking, Canteen	8.0
				Roads	15
				Greenery	139 (33%)
				Sub Total	**421**
Buffer Zone	66 acres	In between existing bund (HTL) & 100 m setback line		Buffer Zone	66
Township	74 acres	Township	74	Township (including raw water pond)	74 (4 acres)
Total	**706**	**Total Area**	**706**	**Total Area**	**706**

4. Justification for requirement of water for the project.

Steel plants and power plants are extensive water consumptive industrial sectors, however, with incorporation of the best available technologies and benchmark industrial practices following recycling and reuse with zero effluent discharge (except once through cooling water sea/creek water), the water requirement in the steel plant has been optimized to the best possible extent.

The make-up water for the proposed plant is about 10 MGD (45.7 MLD) including 9.0 MGD for the steel plant, 0.52 MGD for township and 0.48 MGD for CPP and additional about 19 MGD (85 MLD) sea/creek water for cooling purpose for once through system of CPP.

The breakup and the justification for requirement of water for the proposed steel plant & captive power plant is given below;

Plant	Specific water consumption as per the best practices	Water Requirement		
		(MGD)	(MLD)	(m3/hr)
River water				
3 MTPA Integrated Steel Plant inclusive of 3 MTPA Coke Oven	< 5 m3/tcs	9.0	41	1708
Captive Power Plant (For Process)	< 0.3 m3/MW	0.48	2.2	92
Township (for 2000 population), Garden- Horticulture development and maintenance & water supply to Nearby villages (12000 population)	135 lit/ day/ person for domestic use and Greenery in 186 acres area	0.52	2.5	104
Total		**10**	**45.7**	**1904**
Sea/ creek water				
Captive Power Plant (For Cooling Towers- once through cooling system)	< 4000 m3/hr	**19**	**85**	**3542**

At present, the company has been allocated 45.7 MLD of water from Kundalika River, Dhatav, Roha. The permission for drawl of 45.7 MLD water has been already obtained from Irrigation Department, Government of Maharashtra.

5. Details regarding site for the disposal of waste.

The principal solid waste produced by any steel plant is slag, sludge, mill scale and dust. Ash will be generated from the coal based thermal power plant. 100% of the solid waste generated in the steel and captive power plant shall be utilized either through recycling/

reuse or sold to other agencies for beneficial use. The intermediate storage and handling of these wastes is proposed within the units itself before utilization and has been clearly demarcated in the layout plan and the details of the area requirement for such purpose has been shown in the table under point no. 3. The brief description of the solid waste utilization is given below:

Slag: The 3 MTPA steel plant is proposed with COREX and SMS with EAF. Slag from COREX Plant will be granulated and sold to the cement plants for slag cement. SMS- EAF slag will be treated for the recovery of metal and after metal recovery shall be sold as aggregates/ ballast. A part of SMS slag will be used for construction activities and to fill low-lying areas.

Sludge: Sludge will be generated from the pollution control measures proposed for COREX and Sponge Iron Plant. Corex Sludge and SIP Sludge will be stored near the Pellet Plant and will be used in the Pellet Plant.

Dust: The dust from dust catcher unit of COREX, SMS- EAF section and the ESP dust from the Pellet Plant will be used in the pellet plant.

Scrap: Scrap from SMS and other areas will be recycled in the EAF for steel making.

Mill Scale: Mill scale and debris from mills will be reused in the steel making.

Fly Ash: Fly ash shall be sold to cement manufacturers/road making/brick making. Bottom ash will be dumped in ash dyke and stored for future use in various civil construction activities.

Solid Waste Generation along with their Re-Use, Re-Cycle, Utilization & Disposal is as given below:

S. No	Solid Waste	Generation in tons/yr	Utilization and/ Disposal			Storage for Future Use
			Recycle	Re-use		
				Within Plant	Sold	
1	COREX slag	500,000	-	100% used in Cement plant	-	-
2	Steel Slag	450,000	-	-Granulated & partly used in plant -Balance will be crushed & used for making roads, civil works, etc.	- aggregate for road making, rail track ballast, civil works, -Soil conditioner	-
3	EAF Scales/Scrap	30,000	SMS	-	-	-

4	Fly ash	312,000	-	-	To cement manufacturers/ road/ brick making	
5	Bottom Ash	78,000	-	-	-	Ash dump
6	Waste Refractory	30,000	-	Making refractory mortars, making/ repairing roads	For making road embankment & civil construction	-
7	Lime/dolo fines	5,000	-	Pellet plant	-	-
8	Mill scale	95,000	-	- As a reducing agent in COREX/ SMS	-	-
9	COREX flue dust	17,000	-	Used in Pellet plant	-	-
10	COREX GCP sludge	20,000	-	Used in Pellet plant	-	-
11	SIP Sludge	70,000	-	Used in Pellet plant	-	-
12	EAF dust	45,000	-	Used in Pellet plant & COREX	-	-
13	Pellet ESP dust	26,000	Pellet	-	-	-

The details about solid waste disposal are included in DPR Chapter No. 7 & Plant Layout plan.

6. Proposal for clean technology adoption.

Presently, the DRI plant uses Natural Gas for production of HBI. Natural Gas for steel industry is a very scarce commodity and is no longer viable to operate the plant with Natural Gas. It is proposed to substitute the Natural Gas by a combined use of COREX Gas and Coke Oven gas for producing Sponge Iron. The COREX gas shall be produced by installing two (2) COREX units of 0.85 Mtpa each and coke oven gas shall be produced by installing one (1) Coke Oven Plant of 3.0 Mtpa. These plants shall generate sufficient gas to replace bulk of the requirement of NG in DRI & thus make this plant viable for continuous operation.

It is also proposed to set up a unit for conversion of coke oven gas to Synthetic Natural Gas (SNG) for providing the balance energy to DRI plant. COREX plant will generate about 340,000 Nm3/hr of COREX gas having total energy of 630 Gcal/hr and would be used internally in the COREX plant, partly for production of DRI and also for meeting the requirements of Mills, Pellet plant, etc.
Details of facilities envisaged for obtaining EC

S. No	Facilities	Unit	In operation	EC Obtained for units (Not implemented)	Application for 3.0 MTPA
1	Jetty	MTPA	5.0	-	17
2	RMHS	MTPA	1.5	-	10
3	Coke Oven & BPP	MTPA	-	-	3.0
4	SNG Plant	Nm3/h	-	-	100,000
5	DRI	MTPA	0.75	0.75 to 1.75	1.75
6	Pellet Plant	MTPA	-	4.0	4.0
7	Corex	MTPA	-	-	2 X 0.85
8	SMS-EAF	No. x T	-	1 x 240	2 x 240
9	Ladle Furnace	No. x T	-	1 x 240	2 x 240
10	RH Degasser	No. x T	-	1 x 240	1 x 240
11	Slab Caster		-	1 No.	-
12	Thin Slab Caster	Strand	-		2 x 1 strand
13	Compact Strip Mill	MTPA	-		3.0
14	Beam Blank/Bloom Caster	Strand	-		1 x 3 strand
15	Medium Section Mill	MTPA	-		0.7
16	Heavy Section Mill	MTPA	-		0.8
17	Tin Plate Line	MTPA	-		0.4
18	Lime Plant	TPD	-	300	600
19	Dolo Plant	TPD	-	100	300
20	Oxygen Plant	TPD	-	400	2 x 2200
21	CPP (Coal Based)	MW	-	330	330
22	Cement Plant	MTPA	-	-	1.2
23	DG	MW	1x2.5	-	1x2.5
24	Township		√		√

The details about Clean Technology information are included in DPR Chapter No. 3.

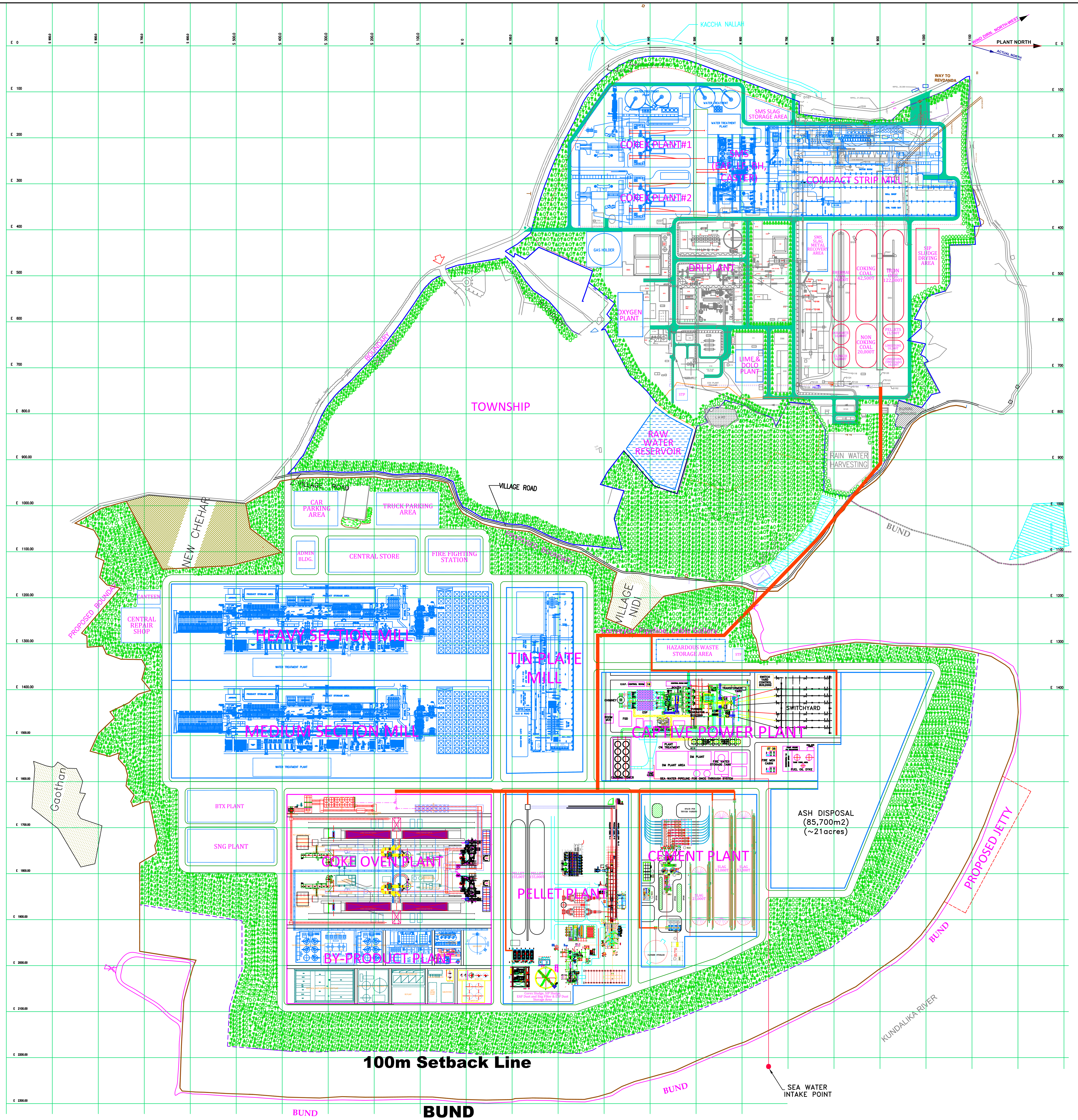
7. Layout plan indicating the proposed units for the project

The layout plan showing the existing units and the facilities proposed for 3 MTPA steel plant is enclosed as Annexure 1.

We hope that we have clarified to all the queries as discussed during the EAC meeting. We request to kindly reconsider our case and grant TOR at the earliest.

Thanking You,
Yours Faithfully
For JSW Steel (Salav) Ltd.

B L Dewangan
Head (Salav Projects)
Encl: as above



LEGENDS:-

- EXISTING EQUIPMENTS/AREA
- PROPOSED EQUIPMENTS/AREA
- BUND
- EXISTING BOUNDARY WALL
- PROPOSED BOUNDARY WALL
- GREEN BELT AREA

JSW STEEL (SALAV) LTD.	
SECTION	3.0 MT/YR STEEL PLANT AT SALAV, MAHARASHTRA
LOCATION	
DESIGNED	
DRAWN	
CHECKED AND VERIFIED	GENERAL LAYOUT
APPROVED	SIG. / DATE: 28/12/15
SCALE- 1:4,200 (A1)	REV.
DRG.No. : JSW/SALAV/PR/005	3

JSW STEEL (SALAV) LTD.

EXPANSION OF STEEL PLANT TO 3.0 MTPA

At Salav, Dist. Raigad, Maharashtra

Project Report

JSW STEEL (SALAV) LIMITED
Mumbai

January 2016

CONTENTS

Chapter No.	Title	Page Nos.	
		From	To
01	Introduction	1-1	1-5
02	Market Analysis	2-1	2-4
03	Major Technological Facilities	3-1	3-37
04	Raw Materials Requirements	4-1	4-8
05	Proposed Site	5-1	5-7
06	Services, Utilities & Manpower Requirement	6-1	6-8
07	Environmental Management	7-1	7-16
08	Project Implementation	8-1	8-1
09	Block Capital Cost	9-1	9-1

LIST OF DRAWINGS

Sl. No.	Description	Drawing No.
1.	Location Map	JSW/SALAV/PR/001
2.	Regional Map	JSW/SALAV/PR/002
3.	Road Linkage	JSW/SALAV/PR/003
4.	Process-Cum-Material Flow Sheet	JSW/SALAV/PR/004
5.	General Layout	JSW/SALAV/PR/005
6.	Implementation Schedule	JSW/SALAV/PR/006

Prepared by : JSWTPML, Mumbai

01 INTRODUCTION

01.01 Preamble

Steel consumption is considered as an index of industrial prosperity. Since independence, there has been a substantial growth in the steel sector in India from 1.5 Mtpa in 1950-51 to about 83.2 Mtpa crude steel at present.

The per capita steel consumption continues to remain at a level of about 60 kg only, compared to about 250 kg in the developed countries and about 150 kg in some of the developing countries. Further with nearly 20% of the world population, India's consumption is only of the order of 4% of the world steel production.

The National Steel Policy 2005 had envisaged steel production to reach 110 million tonnes by 2019-20. However, based on the assessment of the current ongoing projects, both in greenfield and brownfield, the Working Group on Steel for the 12th Plan has projected that the crude steel capacity in the country is likely to be 140 Mt by 2016-17.

India is world's fourth largest crude steel producer in 2014 with 83.2 million tonnes (Mt) and is expected to become the second largest producer of crude steel in the world shortly.

JSW Steel Limited operates a 10.0 Mtpa Steel plant at Vijayanagar, Karnataka based on COREX & BF-BOF-CC-HSM process route which is being further expanded to 16.0 Mtpa. JSW also has cold rolling, galvanizing and colour coating plants at Tarapur and Vasind in Maharashtra.

The JSW group owns and operates a 3.3 Mtpa Steel plant at Dolvi, Maharashtra based on BF-DR-CONARC-CSP process route. It also has cold rolling, galvanizing, colour coating plant at Kalmeshwar, Nagpur in the state of Maharashtra. The next phases of expansion will take the capacity of this plant to 5.0 Mtpa by the year 2015 and 10.0 Mtpa by 2018-19.

The JSW group owns and operates JSW Salem Works, which is the only integrated steel plant in Tamil Nadu, The plant has a capacity of 1.0 Mtpa and there are plans to further expand the plant to 2.0 Mtpa.

JSW Group has completed the acquisition of Welspun Maxsteel Ltd. which operates a 0.75 million tons of Sponge Iron in the form of HBI (Hot Briquetted Iron) at Salav, Raigad district in the state of Maharashtra. The plant has already received Environmental Clearance for expanding the sponge iron plant from 0.75 MTPA to 1.75 MTPA, with Pellet Plant (4 MTPA), Integrated Steel Plant (1.5 MTPA) & Captive Power Plant (330 MW) at Village Salav, P.O. Revdanda, District Raigad, Maharashtra vide MOEF letter No. **F.No.J-11011/183/2008-IA.II (I)** dated 27th January 2011. This unit now is registered as JSW Steel (Salav) Ltd.

The process of acquisition & non-availability/scarcity of Natural gas have delayed the proposed expansion at Salav. It is therefore now proposed to expand the existing plant & set up additional units to reach capacity of 3 Mtpa at Salav considering the market scenario. It is proposed to apply for getting Environmental Clearance to expand the plant to 3.0 Mtpa. This report is prepared for submission to MoEF for obtaining EC for 3.0 Mtpa Steel Plant.

Presently, the DRI plant uses Natural Gas for production of HBI. Natural Gas for steel industry is becoming very scarce in India & the prices are also increasing. It is apprehended that it may no longer be viable to operate this plant with Natural Gas leading to closure of the plant and loss of employment of people.

JSW takes pride in serving the community and hence it is proposed to substitute the Natural Gas by a combined use of Corex Gas and Coke Oven gas for producing Sponge Iron.

The corex gas shall be produced by installing two (2) Corex units of 0.85 Mtpa each and coke oven gas shall be produced by installing one (1) Coke Oven Plant of 3.0 Mtpa. These plants shall generate sufficient gas to replace bulk of the requirement of NG in DRI & thus make this plant viable for continuous operation.

It is also proposed to set up a unit for conversion of coke oven gas to Synthetic Natural Gas (SNG) for providing the balance energy to DRI plant.

This type of corex gas based DRI Plant is already operating in JSW Vijayanagar Works.

Corex plant will generate about 340,000 Nm^3/hr of Corex gas having total energy of 630 Gcal/hr. Out of 630 Gcal/hr energy, about 8% (50 Gcal/hr) would be used internally in the Corex plant and remaining 92% (580 Gcal/hr) would be used partly for production of DRI and also for meeting the requirements of Mills, Pellet plant etc. The energy requirement in the DRI Plant is 590 Gcal/hr. Out of the 590 Gcal/hr energy requirement, Corex gas will supply 370 Gcal/hr energy to DRI plant and SNG from coke oven plant will supply about 220 Gcal/hr energy.

The proposed capacity expansion has been envisaged keeping in view the economies of scale and the projected demand of steel in domestic market. The total capital investment in the proposed project will be around **Rs. 17,000 crores** including power plant and cement plant. The proposed investment will further boost the socio-economic profile of the region and will open up additional employment opportunities for the local people in the region.

This Project Report is based on proven production technology, market demand, site suitability with respect to environmental norms, available infrastructure and economic viability of the project.

The details of the plant facilities are enumerated below.

Details of facilities envisaged for obtaining EC at Salav

S. N.	Facilities	Unit	In Operation	EC Obtained for additional units (Not implemented)	Application now for 3.0 MTPA
1.	Jetty	MTPA	5.0	-	17
2.	RMHS	MTPA	1.5	-	10
3.	Coke Oven & By Product Plant	MTPA	-	-	3.0
4.	SNG Plant	Nm^3/h	-	-	100,000
5.	DRI	MTPA	0.75	0.75 to 1.75	1.75
6.	Pellet Plant	MTPA	-	4.0	4.0
7.	Corex	No. x MTPA	-	-	2 X 0.85
8.	SMS-EAF	No. x T	-	1 x 240	2 x 240
9.	Ladle Furnace	No. x T	-	1 x 240	2 x 240
10.	RH Degasser	No. x T	-	1 x 240	1 x 240
11.	Slab Caster			1 No.	-
12.	Thin Slab Caster	No. x Strand			2 x 1 strand
13.	Compact Strip Mill	MTPA			3.0
14.	Beam Blank/Bloom Caster	No. x Strand	-		1 x 3 strand
15.	Medium Section Mill	MTPA	-		0.7
16.	Heavy Section Mill	MTPA	-		0.8
17.	Tin Plate Line	MTPA	-		0.4
18.	Lime Plant	TPD	-	300	600
19.	Dolo Plant	TPD	-	100	300
20.	Oxygen Plant	No. x TPD	-	400	2 x 2200
21.	Captive Power Plant (Coal Based)	MW	-	330	330
22.	Cement Plant	MTPA	-	-	1.2
23.	DG	MW	1x2.5	-	1x2.5
24.	Township		√	-	√

02 MARKET ANALYSIS

02.01 General

JSW Steel (Salav) Ltd., propose to expand the existing plant & achieve a 3.0 Mtpa steel making capacity at Salav. In order to arrive at a reasonable product-mix for the plant, a quick desk study based on the secondary data has been carried out and derived in the following paragraphs.

02.02 Global Steel Scenario

World steel industry experienced growth during the previous years followed by a period of downturn. The fall in demand is attributed to the global downturn.

Some major steel-producing countries and regions showed marginal growth and some showed slight fall in 2014. The, Asia, Middle East & North America had marginal growth rates while Europe, South America, Africa & Australia recorded negative growth in 2014.

World crude steel production during 2014 was reported as 1,661.5 Million tonnes (Mt), 1.2% increase on the annual 2013 total of 1,642.2 Million tonnes. Annual production for Asia was 1,132.3 Mt of crude steel in 2014, an increase of 1.4% compared to 2013.
World trade in finished steel, expressed as a percentage of world steel consumption is generally about 40 percent. Accordingly, it may be expected that total trade in finished steel will be of the order of 450 Million tonnes annually, of which flat products may constitute upto 60 percent i.e. about 270 Million tonnes and long products may constitute about 180 Million tonnes.

02.03 Indian Steel Scenario

India is the fourth largest crude steel produced with a global share of 5.0%. China has a share of 49.5% and India, Japan, USA, Russia have shares of 4 to 6% each.

Steel is crucial to development of any economy and the steel consumption is treated as an important index of the level of socio-economic development. India's per capita consumption was about 60 kg in 2013, according to WSA and is expected to rise substantially. This is expected to rise to 175 kg in 2025-26 and since the population is projected to grow to 1.43 billion that year, the steel consumption is likely to be around 250 million tonnes.

The table below shows the product wise percentage share of steel demand forecast –

Year	2010-11	2016-17	2020-21	2025-26	2032-33
Bars & Rods	39.3	39.9	40.2	40.2	39.8
Structural	9.0	7.6	6.8	5.8	4.2
Railway Materials	1.8	1.3	1.0	0.8	0.4
Total Long Products	**50.1**	**48.8**	**47.9**	**46.8**	**44.5**
Plates	7.7	7.0	6.5	5.9	4.9
HR Coils	21.0	20.9	20.7	20.4	19.4
CR Coils	9.7	11.4	12.7	14.5	18.6
GP/GL	7.6	7.8	7.9	7.9	7.9
Electrical Sheets	0.8	0.8	0.8	0.8	0.8
Tin plates	0.6	0.7	0.7	0.7	0.8
Pipes	2.5	2.7	2.8	3.0	3.2
Total Flat Products	**49.9**	**51.2**	**52.1**	**53.2**	**55.5**

Based on the CAGR following projection on the demand of HR Coils/Sheets/Skelps is worked out :

For HR Coils / Sheets / Skelps

CAGR	Projected demand of HR Coils/Sheets/Skelps by year 2015-16 (Mt)
8.5	21.289
7.8	20.567

02.04 Indian Steel Scenario

Rapid rise in production has resulted in India becoming the 4th largest producer of crude steel and the largest producer of sponge iron or DRI in the world.

As per the report of the Working Group on Steel for the 12th Five Year Plan, there exist many factors which carry the potential to raise the per capita steel consumption in the country. These include among others, an estimated infrastructure investment of nearly a trillion dollars, a projected growth of manufacturing from current 8% to 11-12%, increase in urban population to 600 million by 2030 from the current level of 400 million, emergence of the rural market for steel currently consuming around 10 kg per annum buoyed by projects like Bharat Nirman, Pradhan Mantri Gram Sadak Yojana, Rajiv Gandhi Awaas Yojana among others.

02.05 Import-Export Outlook

Import and Export scenario of flat steel products are going through an unstable phase this fiscal as compared to the last fiscal.

Total amount of Flat Steel imported in the country in FY 13 was 4.8 MnT which had witnessed a growth of 11% in comparison to

FY 12, which was around 4.35 MnT. However, in FY 14, Flat Steel import has seen a sharp decline owing to the fall in rupee value, slow infrastructure growth and poor demand from automobile industry.

On the other hand, Flat Steel exported out of the country in FY 13 was 3.97 MnT compared to 3.39 MnT of FY 12 witnessing a growth of 17%. This increment shows that the country is now producing export quality material meeting international demands.

02.06 Conclusion

There is enough scope for creation of additional steelmaking capacity in the country to meet the growing domestic demand, both for flat and long products.

There is enough opportunity for Indian Steel Producers to enter the growing world trade in steel.

Keeping in view the steel market trends, it is proposed to expand the existing plant into a integrated steel plant of capacity 3.0 Mtpa at Salav with flat and long products.

03 MAJOR TECHNOLOGICAL FACILITIES

03.01 General

JSW Steel (Salav) Ltd. propose to expand the current capacity of the plant at Salav, Raigad district in the state of Maharashtra.

The plant will be integrated with Coke Oven & By Product Plant, Sponge Iron Plant, SNG Plant, Corex Plant, EAF, Ladle Furnace, RH Degasser, Thin Slab Caster, Compact Strip Plant, Shaped Beam Casters, Heavy Section Mill, Light Section Mill, Tin Plate Line, Lime Plant & Dolo Plant, Oxygen Plant, Raw Material Handling System, Township, Jetty, Power Plant, Cement Plant and related logistics services and utilities for the production of products.

The General Layout is shown in the Drg. No. JSW/SALAV/PR/005. Supporting facilities up to production of finished products will also be set up in the plant.

The existing and the proposed capacity expansion of the plant have been summarized in the table – 03.01 with brief description in subsequent paragraphs.

Table – 03.01

Details of facilities envisaged for obtaining EC

S. N.	Facilities	Unit	In Operation	EC Obtained for additional units (Not implemented)	Application now for 3.0 MTPA
1.	Jetty	MTPA	5.0	-	17
2.	RMHS	MTPA	1.5	-	10
3.	Coke Oven & By Product Plant	MTPA	-	-	3.0
4.	SNG Plant	Nm^3/h	-	-	100,000
5.	DRI	MTPA	0.75	0.75 to 1.75	1.75
6.	Pellet Plant	MTPA	-	4.0	4.0
7.	Corex	No. x MTPA	-	-	2 X 0.85
8.	SMS-EAF	No. x T	-	1 x 240	2 x 240
9.	Ladle Furnace	No. x T	-	1 x 240	2 x 240
10.	RH Degasser	No. x T	-	1 x 240	1 x 240
11.	Slab Caster			1 No.	-
12.	Thin Slab Caster	No. x Strand			2 x 1 strand
13.	Compact Strip Mill	MTPA			3.0
14.	Beam Blank/Bloom Caster	No. x Strand	-		1 x 3 strand
15.	Medium Section Mill	MTPA	-		0.7
16.	Heavy Section Mill	MTPA	-		0.8
17.	Tin Plate Line	MTPA	-		0.4
18.	Lime Plant	TPD	-	300	600
19.	Dolo Plant	TPD	-	100	300
20.	Oxygen Plant	No. x TPD	-	400	2 x 2200
21.	Captive Power Plant (Coal Based)	MW	-	330	330
22.	Cement Plant	MTPA	-	-	1.2
23.	DG	MW	1x2.5	-	1x2.5
24.	Township		√	-	√

The process-cum-material flow sheet has been shown in the drawing no. JSW/SALAV/PR/004.

03.02 Jetty

It is required to expand the capacity of existing jetty as the present capacity will not be sufficient to handle the requirement of incoming raw materials and outgoing finished goods. The expansion of Jetty will be carried out by JSW group company (JSW Infrastructure Ltd.).

03.03 Coke Oven & By Product Plant

The following technological facilities have been envisaged for proper and smooth operation of the coke oven & by product plant.

1. Coal Preparation Plant
2. Coke Making Plant, Quenching & Screening
3. Gas cooling and cleaning system
4. Desulphurization and sulfur recovery
5. Benzol Recovery
6. Ammonia scrubbing and distillation
7. Ammonia cracking unit
8. De-dusting
9. Gas holder & Booster station
10. Effluent treatment plant

03.03.01 Coal Preparation Plant

The coal preparation plant has been envisaged to cater to a daily average wet coal through put of about 12,200 t/day for coke ovens.

The coking coals from the overseas sources will be imported and will be transported upto the captive jetty by barges. The coal unloaded at the jetty will be transferred to plant coal storage yard by belt conveying systems.

Coal received through conveyor will transfer the coal to a stacker cum reclaimer machine for forming stock piles according to the grades of coal. Different grades of coal will be stored separately. Transfer of coking coal to the stockpiles will be done by a rail mounted wheel-on-boom stacker cum reclaimer. The stacking operation, if necessary, can be performed in all three shift to match the coal receipt pattern at the plant site.

The coal preparation unit will consist of coal crushing and blending facilities.

Reclaimed coals of size ≤ 80 mm from the storage yard will be crushed to < 3 mm not less than 80 %, in the primary crusher, delivered to the coal silos, one variety at a time, through a system of conveyors. 10 bins will be provided near the storage yard for storing of different types of coals. Each constituent of the blend will be drawn in requisite proportion from different bunkers to the secondary coal crushing station.

In the secondary crushing station, blended coal will be crushed to 90% below 3 mm in reversible hammer crushers. Coals after crushing will be conveyed to the coal tower.

03.03.02 Coke Making Plant

Stamp charged or top charged recovery type coke ovens will be constructed with a total annual dry coke production, of around 3,000,000 tonnes.

Coal from the coal preparation shop is conveyed to the coal stamping machine through the belt conveyor. The Stamping Charging Pushing (SCP) machine delivers coal into the coal hoppers and then delivered into stamping box via plate type feeders, and stamped by the stamping machines into coal cake. The stamped coal cake is charged into the coking chamber from the coal side. Alternatively it may be decided to use Top charging machines. The coal cake is carbonized at a certain temperature, and after ~24 hours coke is pushed into the bucket car by coke pusher via the coke guiding gate. The bucket car then takes the hot coke to CDQ for dry quenching. Afterwards the cooled coke will be discharged into belt conveyor which goes to the coke screening system. In case of wet quenching, the coke will be taken by the coke quenching car to the coke-cooling wharf wherein it is discharged by the coke scraper onto the belt conveyor and then taken to the coke handling system.

The raw coke oven gas produced during carbonization goes through the top of coking chamber, the ascending pipe, and the bridge pipe, to the gas collecting main. The gas is cooled by spraying liquor ammonia at ~78℃ under ~0.3MPa pressure at the bridge pipe and gas collector, so that it is cooled from ~700℃ to ~84℃; then, it is sucked through the suction elbow and suction pipe to the condensing/blowing unit. The tar and ammonia condensed in the gas collecting main flow via the tar box and suction main to the condensing/blowing unit.

The heating gas (mixture of coke oven gas and/or coal gas) is sent through the external pipe to the coke oven. The combined gas goes into the regeneration chamber and at the same time the air goes into regeneration chamber via waste gas shut-on-off device for air. After being pre-heated, the gas combined with air goes into the vertical flue of combustion chamber. The flame is elongated by the circulation of partial waste gas which makes the heating in the top more even. The standard heating temperature is 1300~1320℃.

The waste gas, after combustion, goes through the vertical flue with downward air flow, via the regeneration chamber for partial heat recovery and finally is discharged into the atmosphere from the chimney.

During coal charging, the possibly collapsed coal cake at the coal side will be cleaned onto the belt conveyor located under the operation platform, and then delivered into the coal bin for reuse.

The fumes and dust which is produced during coal charging will go via the gas transfer car into the adjacent coking chamber. The dust collecting hood as well as gas collecting main will be set up above the oven door on the coal side, which will capture the fume dust escaping from the oven door during the coal charging and send them into the ground de-dusting station. The fume and dust generated from coke pushing will be guided via the coke guiding car and dust collecting main into the ground de-dusting station for treatment and discharging.

The typical dimensions and process parameters of the coke oven are given below:

(1). The typical dimensions of coke oven may be as follows:

Total length of coking chamber:	17000 mm
Effective length of coking chamber:	16190 mm

Total height of coking chamber:	6300 mm
Effective height of coking chamber:	6175 mm
Average width of coking chamber:	540 mm
Center distance of coking chamber:	1450 mm
Taper of coking chamber:	30 mm
Center distance of vertical flue:	480 mm
Number of vertical flues:	34
Thickness of combustion chamber wall	100mm

(2). Major technical indexes of coking process:

Density of coal cake (Dry)	1.00 t/m3
Cycle time of coke oven	24 hr
Yield ratio of dry coal gas	315 Nm3/t(dry coal)
Annual consumption of dry coal	4,200,000 t
Annual yield of dry coke	3,000,000 t

Temperature of raw coke oven gas from gas collector:~84°C

Pressure of raw coke oven gas from gas collector: 80~120Pa

The dimensional and other parameters will be frozen during detailed engineering.

The Coke oven gas proposed to be used in the production of the DR plant shall have the below composition –

Constituents	Unit	Value
H_2	% vol	56-60
CO	% vol	5-8
CH_4	% vol	23-27
CO_2	% vol	1.5-3
O_2	% vol	0.3-0.8
N_2	% vol	3-7
H_2O	% vol	0

Tar	g/Nm3	Trace
BTX	g/Nm3	33.1 max
Naphthalene	g/Nm3	0.4 max
H2S	g/Nm3	0.3 max
HCN	g/Nm3	0.28 max
Nominal pressure	Bar (g)	0.1
Nominal Temp.	°C	25
Heating Value	Kcal / Nm^3	4300

The details of the products from the Coke Oven Plant are given below.

Sl. No.	Description	Unit	Output
1.	Coke gas (dry)	Nm^3/hr	161,500
2.	Gross coke(dry)	t/yr	3,000,000
3.	Tar (4% moisture)	t/yr	142,000
4.	Sulphur	t/yr	9,000
5.	Crude Benzol	t/yr	41,000
6.	Benzene	t/yr	27,000
7.	Toluene	t/yr	5,400
8.	Xylene	t/yr	1,500
9.	Raffinates	t/yr	5,100

03.03.03 Gas cooling and cleaning system

The mixture of tar, ammonia, and coal gas from coking section enters into the gas-liquid separators at about 80°C, where the tar and ammonia are separated from the coal gas. The raw coal gas enters into the Primary Gas Cooler (PGC) where coal gas is cooled. The cooled coal gas enters into the electro tar precipitators (ETP) to precipitate tar fog drops and naphthalene from the coal gas; after electric tar precipitation, the coal gas enters into the centrifugal exhauster and is pressurized, and sent to the desulphurization section.

The coal tar recovered is stored separately and sold to customers.

03.03.04 Desulphurization and sulfur recovery

Coke oven gas (at 45℃) coming from blower section first enters final cooling tower. The gas in final cooling tower is in counter-current contact with the circulating cooling water sprayed from the tower top and is cooled to 23 ℃, then enters H_2S washing tower to remove H_2S. The cooling water flowing out from bottom of final cooling tower is pumped to the final cooling water heat-exchanger and cooled to 21^0C and enters final cooling tower for circulating and spray.

The cooled gas is cleaned of most of the H_2S by passing through the H_2S washing tower with ammonia water. The clean gas is discharged from the top of H_2S washing tower and enters the bottom of ammonia washing tower for ammonia removing.

The gas entering from the bottom of the ammonia washing tower is cleaned out of the ammonia and some hydrogen sulfide with semi rich ammonia water from second ammonia washing tower. The gas is then discharged from the top of the first ammonia washing tower and then enters alkaline washing section at the bottom of the second ammonia washing tower. At the alkaline washing section, the gas is washed by NaOH solution to remove most of the H_2S.

The distilled Coke Oven gas is led from top of the de-acidification tower to Claus Furnace for sulfur recovery.

The ammonia from ammonia distilling tower, enters ammonia cracking furnace where it is cracked into N_2 and H_2.

Tail gas at about 1100 °C temperature produced from ammonia cracking furnace is cooled to 300℃ though waste heat boiler and 0.5MPa (G) steam is produced, and then the tail gas passes through the boiler water per-heater again and cracker gas cooler to be cooled to 80℃.

The high temperature process gas discharged from bottom of Klaus Furnace is cooled through waste heat boiler, and the heat recovered from the waste heat boiler is used to produce the 0.7MPa saturated steam. The process gas exiting the waste heat boiler still has H_2S and SO_2, and then conversion reaction is carried out further in Claus Furnace. This process consists of reaction with two sections and after each section of the reactor sulfur condenser and molten sulfur catcher is provided. The molten sulfur flows into the molten sulfur sealing tank and then into the molten sulfur storage tank. The tail gas is directed to the chimney.

The molten sulfur stored in sulfur pool is pumped regularly with submerged pump to sulfur slicer and cooled, formed and packed.

03.03.05 Benzol Recovery

This unit recovers Benzol from the coke oven gas. Benzol scrubbing uses scrubbing oil (either wash oil or Solar oil) to absorb the benzol in the coke oven gas, and afterward the gas is sent to the consumers. After benzol scrubbing, the benzol contents in gas reduces to 2～5 g/Nm3.

The Benzol Recovery Plant will consists of three sections -

1. Cooling
2. Benzol scrubbing
3. Benzol recovery

Benzol Hydro-Refining Unit

Benzol-hydro-refining unit will utilize the crude benzol as raw material and remove the harmful impurities such as hydrocarbon, hydrogen sulfide, ammonia and water etc containing the sulfur, nitrogen, oxygen through chemical and physic methods, in order to get high pure benzene, toluene, xylene.

The following are the process unit steps –

1. Deoctaniser
2. Hydrogenation
3. Stabiliser
4. Deheptaniser
5. Recycle gas treating
6. Absorption section
7. Aromatic extraction
8. Aromatic Post fractionation
9. Hydrogen production unit

03.03.06 De-dusting system

"U" type gas transferring is arranged with high pressure ammonia liquid spraying for the charging de-dusting, and the ground de-dusing station is arranged for de-dusting purpose.

03.03.07 Gas holder & Booster station

The gas holder in this section is a 100,000 m^3 dry gas holder for coal gas buffering and storage; the gas is boostered with Roots blowers.

The main purpose of the section is to even out the fluctuations in production of gas and uneven coal gas consumption. The gas stored in the gas holder is also used as a buffer to handle short-time operation break-downs.

03.03.08 Coke Dry Quenching Process

Two nos. of 190 tph Coke Dry Quenching (CDQ) units have been envisaged to handle 3.0 Mtpa output from the coke oven plant.

The coke bucket car loaded with red hot coke is hauled by the electric locomotive to the bottom of the lifting shaft. The crane lifts the coke bucket to the top of CDQ chamber, where the charging device with the distributor charges the coke into the CDQ chamber. In the CDQ chamber coke is directly heat-exchanged with the inert gas, the coke is cooled down to the temperature below 200°C in average and the coke is discharged by the coke discharging device onto the belt conveyor and sent to the coke handling system.

The circulating fan blows the inert gas for cooling coke from the gas supply device at the bottom of CDQ chamber into the CDQ chamber where the gas contacts with red hot coke counter-currently. The hot circulating gas at the temperature of about 880-960°C discharged from the CDQ chamber is de-dusted by the primary dust collector and then enters into the CDQ boiler for heat exchange, where its temperature is lowered to 160-180°C. The cooled circulating gas out of the boiler is de-dusted by the secondary dust collector and then boosted by the circulating fan and passed through the thermal tubular heat exchanger to cool down to about 130°C and finally entered into the CDQ chamber for circulating usage.

The coke fine separated by the primary and secondary dust collector is conveyed by the special conveying equipment and collected into the storage tank and ready for transport outside.

The fumes emitted from the coke charging device, discharging device, prechamber and circulating gas system of the CDQ is delivered into the stationary bag-house unit of the CDQ system; after de-dusting the gas is discharged into atmosphere.

Basic process parameters of CDQ system

Max handling capacity of CDQ system	2x190t/h
Temperature of coke into CDQ chamber	950-1050°C
Mean temperature of cooled coke:	≤200°C
Coke burning loss rate:	~0.95%
Gas ratio of each ton of coke into CDQ chamber	1250m^3/t coke
Rated flow of circulating gas	272,000 Nm3/h
Full pressure of circulating fan	14kPa
Temperature of circulating gas into CDQ chamber	130°C
Temperature of circulating gas out of CDQ chamber	880-960°C
Operation system of CDQ chamber	continuous for 24h
Annual working day of CDQ chamber	340 days
Annual repair days of CDQ chamber	25days/CDQ chamber
Power Generated	60 MW

03.03.09 Coke Storage & Dispatch

In Coke Oven Plant, coke bunkers will be arranged in two rows with 8 apartments each. The total storage capacity of coke bunker is 6000 tons, corresponding to a coke production of approximately 18 hours for 4 batteries of coke ovens.

Double outlets shall be designed with two coke bunkers. One outlet will be equipped with vibrating feeder to discharge coke onto a belt conveyor to Storage yard at Jetty, the other one will be equipped with power-operated hydraulic jaw gate to discharge coke onto the trucks.

Coke produced about 3.0 Mtpa will be sold outside and/or to JSW Plants at Vijayanagar and Dolvi.

The tentative specification of coke is given below :

Sl. No.	Quality parameters	Value
1	Ash	12 % (max.)
2	VM	1.0 % (max.)
3	M10	8.0 (max.)
4	CSR	64 (min.)
5	Moisture	4 % (max.)

03.03.10 Coke Oven Gas to Synthetic Natural Gas

The Coke Oven Gas goes to the crude desulfurization vessel to remove H_2S, and then the gas is sent to the gas tank. The Coke Oven Gas from the gas tank is pressurized through screw compressors and then is fed to the pretreatment unit.

In pretreatment unit, most of the impurities in the Coke Oven Gas like benzene, tar, naphthalene are removed by the adsorbent packed in the vessel, and then the gas goes to the Coke Oven Gas compressor to be further pressurized to about 25-30 bar. After the adsorbent is saturated with adsorbed impurities, it is regenerated. Coke Oven Gas will then undergo fine desulfurization process where the sulphur is brought down to less than 0.1 mg/Nm^3. Further the gas is led to the Methanation process and then to compression process. At this stage the methane content in the gas is about 67%.

After compression, the gas passes through a purification system where in a multi-stage process, humidity, carbon dioxide, mercury and hydrocarbons are removed to leave only methane. The resulting clean gas is then processed in cold box. The temperature in the cold box is -158 °C, wherein the methane, hydrogen & nitrogen are separated. The product gas has a content of 98.5 % methane which is send to the desired process area. The purge gas from the cold box as well as the purification unit contains about 75% hydrogen. It is proposed to feed 403 Gcal/hr of Coke Oven Gas which will yield about 335 Gcal/hr of SNG.

SNG proposed to be converted from Coke Oven gas shall have the following tentative composition –

Component	Unit	Value
CH_4	%	98.5
N_2	%	1.5
Total	%	**100.00**

03.04 Pellet Plant

The Pelletization process involves reduction of moisture in the iron ore to less than 1%, grinding to 45 micron size, feed preparation by adding binders and moisture, green pelletization and induration (heat hardening).

For full and proper utilization of the iron ore resources available, it is proposed to install 1 (one) Nos. of 4.0 Mt/yr Pellet Plant. This pellet plant will utilize the iron ore to produce Corex grade pellets to be used in the Corex and DR grade pellets to be used in Direct Reduction Plant. The shortfall of pellets for the plant is proposed to be met by buying from existing steel plants.

Iron Ore fines will be grinded in the ball mills which will operate in closed with a hydro cyclone and the iron ore slurry (Overflow from Hydro cyclone) is sent to a High rate thickener. Thickening of slurry is done at various stages as per subsequent process requirements. Thickener is considered as thickening equipment for this process to handle large volume of slurry and fine material in the slurry. The slurry from High Rate thickener is filtered in pressure filters to obtain filter cake of iron ore concentrate. Iron ore concentrate is then stored in the Iron ore concentrate silos. Limestone and coke breeze from local ground storage will be conveyed to the silos of additive storage unit within the pellet plant.

From these silos limestone and coke breeze are collected in preset quantities and dried in rotary kilns to reduce the moisture content to below 1% before feeding it to the ball mills for co-grinding to get the requisite fineness. Grinding of coarse bentonite will be done separately in a Raymond mill.

Then the Iron ore concentrate, ground additives and bentonite are transported to the respective silos in ground material storage unit. Further, mixing in paddle mixer, green pellet formation in pelletising discs and heat hardening of green pellets in indurating machine will be carried out.

One travelling grate indurating machine of 464 m^2 grate area will be installed with all other associated service facilities for each pellet plant. Mixed gas will be used for drying before grinding and finally during induration of green pellets.

The operating parameters of each pellet plant are given below

Capacity	: 4.0 MTPA
No. of annual working days	: 330 days
Indurating machine area	: 464 m^2
Pallet width	: 4.0 m
Useful strand length	: 116 m
Fuel for induration	: Mixed gas (CV = 2000 kcal/Nm3)

L/S & coke breeze additive grinding	: Ball mill (1 no.)
Bentonite grinding	: Roller mill (1 no.)
Mixing	: Paddle mixer horizontal type (1 no.)
Balling	: Balling discs (7.5 m dia.) – 6 nos.
Feeding green balls on machine	: By double deck roller screen for narrow size (9– 16 mm) machine distribution onto the indurating
Induration	: Travelling Grate (TG) Indurating Machine
Separation of hearth layer	: By natural segregation / HL vibrating screen

Operating Regime

The proposed pellet plant will be operating on the basis of three shifts a day and 330 days in a year after taking into consideration the shutdowns required for the planned maintenance and unscheduled breakdowns.

The expected mechanical and metallurgical properties of finished pellets are placed below:

Sl. No.	Item	Value
i)	Size + 9 to 16 mm +16 mm - 9 mm	 93 % 5 % max 3 % max
ii)	Porosity	24 to 28 %
iii)	Cold crushing strength	~ 250 kg/p min.
iv)	ASTM tumble index(+6.35 mm)	94 % min.
v)	Abrasion Index (-0.6 mm)	4 % max.
vi)	JIS swelling index	18 % max.
vii)	JIS reducibility	70 % min.
viii)	Compression strength after reduction	30 kg/p

Technological facilities

The pellet plant proper will comprise of the following major technological units.

- Iron ore concentrate and additives storage bin unit
- Lime stone & coke grinding unit (ball mill)
- Bentonite storage and grinding unit
- Ground material (concentrate, Lime stone, Coke & bentonite) storage and mixing unit
- Balling unit
- Induration unit
- Pellet segregation and hearth layer separation
- Finished pellet stockpiles

Apart from the above units, all major services facilities like material handling, water supply system, compressed air, mixed gas, ventilation and air-conditioning, plant de-dusting, building structures, civil works and industrial safety, electrics, instrumentation and automation have been envisaged for the proposed pellet plant.

03.05 Sponge Iron/Direct Reduction Plant

The Sponge Iron/DRI process converts iron oxide lump ore, pellets, or pellet/lump mixtures into highly metalized Iron in the form of direct reduced iron which is an ideal feed material for high quality steel making.

Iron Oxide Reduction

Most naturally occurring iron oxide has the chemical composition of haematite, Fe_2O_3 and contains about 30 percent oxygen by weight. In this process, the chemically bonded oxygen in the iron ore is removed by high temperature reduction reactions with CO and H_2 to produce metallic Fe. The CO_2 and H_2O are byproducts produced by the iron ore reduction reactions. The overall reduction reactions are :

$Fe_2O_3 + 3H_2 = 2Fe + 3H_2O$

$Fe_2O_3 + 3CO = 2Fe + 3CO_2$

The feed gas to the DR Plant contains the reductant CO and H_2.

The feed gas at present is Natural gas containing 94-95% CH_4. After expansion of present capacity of SIP Plant to 1.75 Mtpa, the steel plant capacity will reach to 3.0 Mtpa. The energy 590 Gcal/hr is required in SIP unit. About 370 Gcal/hr of energy will be supplied by Corex gas and balance 220 Gcal/hr of energy will be supplied by Natural Gas/SNG.

The Natural gas proposed to be used in the plant shall have the following composition –

Component	Unit	Purchased Natural Gas	SNG
CH_4	%	94.20	98.50
C_2H_6	%	4.48	
C_3H_8	%	0.81	
C_4H_{10}	%	0.10	
C_5H_{12}	%	0.02	
C_6H_{12}	%	0.00	
CO_2	%	0.13	
N_2	%	0.26	1.5
Sulphur	%	4.00	
Total	%	**100.00**	**100.00**
Supply Pressure	Bar(g)	22	
Temperature	°C	15	
Calorific Value	kcal/Nm^3	8500-8600	8500

The Corex gas proposed to be used in the plant shall have the following composition –

Component	Unit	Value
CO	%	45
CO_2	%	31
H_2	%	18
H_2O	%	2.9
N_2 + Ar	%	1.8
CH_4	%	1.6
Dust Content	Mg/m^3	5
Free Water (droplets)	g/m^3	10
Supply Pressure	Bar(g)	1.5
Temperature	°C	40
Calorific Value	$kcal/Nm^3$	1850

The DRI plant has the following technological facilities –

1) Iron oxide material handling system
2) Reduction shaft furnace
3) Cooling gas system
4) Process gas circuit
5) Gas heater
6) Heat recovery system
7) Oxygen Injection
8) Seal gas and purge gas system
9) Water System
10) Dust collection system
11) Electrical and Automation system

03.06 COREX Plant

COREX is the first and the only commercially established smelting-reduction process, as an alternative route to blast furnace, based on non-coking coal. The COREX process offers high smelting intensity and hence higher productivity, ability to use various types of non-coking coals, use of iron ore fines to an extent, low net operating cost, possible generation of power or other alternative use of export gas generated from the ironmaking unit, besides being eco-friendly.

In COREX process, non-coking coal is used for heat generation, production of reduction gases and to maintain adequate bed permeability, unlike in blast furnace where coke is used to meet these requirements. Iron oxides and non-coking coals, which can be used in COREX, have to meet physical, chemical and high temperature properties for stable process and to attain high performance levels.

COREX consists of two reactors, the reduction shaft and the melter-gasifier. The reduction shaft is placed above the melter-gasifier and reduced iron bearing material descends by gravity. The volume of the reduction shaft and the melter-gasifier is about 600 m^3 and 2200 m^3 respectively.

State-of-the-art corex unit equipped with the following major facilities has been envisaged for the proposed plant.

- Coal Blending Station
- Coal Drying Plant
- Stock house with automatic conveyor charging facilities.
- COREX Tower
- Cast house
- Slag granulation plant.
- Water recirculation system
- Gas cleaning

- Level-III automation and control system, etc.

Hot metal produced from the corex unit will be transported to the steel melting shop using hot metal ladles.

Considering the daily requirement of hot metal in the steel melting shop for production of liquid steel, which is sufficient to produce about 1.7 Mtpa hot metal, two (2) Corex units (C-2000) of capacity 0.85 Mtpa each have been envisaged for the proposed project. Slag generated from the corex will be granulated in the cast house slag granulation plant. The granulated slag will be utilized in cement manufacturing unit of JSW Dolvi.

03.07 Steel Making and Casting Facilities

03.07.01 Steel Making

Electric Arc Furnace (EAF) technology for production of liquid steel has been envisaged for the proposed project.

In EAF, the AC power could be used for producing large quantities of liquid steel from Direct Reduction Iron (DRI) and the technology is well established.

The main advantages of EAF technology are –

1. Can process combination of sponge iron / hot metal in the charge
2. Can reduce phosphorus level to the desired limit by oxidation refining and easy slag flow out of the furnace
3. Continuous DRI charging technique could be adopted for DRI usage above 30%
4. Chemical heat could be generated by using either coal/coke of pig iron together with oxygen to reduce the electric power consumption.

The EAF is divided in a lower shell, which is refractory lined and holds the molten steel, and a upper shell, which is composed by water cooled panels and holds the scrap during charging.

On top of the shell, a water-cooled roof assured the closure of the melting unit. The roof is equipped with central holes for the electrodes, for the fumes extraction system and DRI /hot metal/ lime charging.

The main components of this design are :

- Electrode arms lifting and turning device
- Lifting fork to hold the roof
- Stiff roof system with a low roof deflection
- Tiltable platform
- Hot DRI, Cold DRI, hot metal and scrap shall be charged in the Electric Arc Furnace.

Considering the requirement of liquid steel for subsequent process steps, chemical composition of input materials, quality of liquid steel to be produced, sequence of casting of liquid steel into casters, oxygen blowing rate etc., two (2) number of electric arc furnaces of capacity 240 t has been envisaged for the proposed project.

03.07.02 Ladle Furnace (L.F.)

The well-established practice is to carry out melting of basic metallic inputs and refining of carbon and phosphorus under oxidizing condition in the primary unit and refining operation under reducing condition in a separate vessel (secondary vessel) with a view to achieving improved productivity of the primary unit.

The adjustment and homogenization of steel composition and temperature, desulphurisation, final decarburisation, etc. can be efficiently carried out in the secondary vessel. Ladle furnace (LF) is the ideal secondary vessel not only to meet the above-mentioned metallurgical requirements, but also to act as a buffer between the primary unit and the caster for effective and smooth sequence casting.

With a view to achieve improved homogeneity of the primary unit, ladle furnace is the ideal secondary refining unit. The correction and homogenization of steel composition and temperature, desulphurisation and recarburisation, etc. can be efficiently carried out in a L.F. Two (2) number of Ladle Furnace of capacity 240 t has been envisaged for the proposed project. The LF will also be equipped with argon purging facilities.

03.07.03 RH-Degasser

RH degasser are envisaged as secondary refining units. The process assures liquid steel of high purity, low level of inclusions and good homogeneity with respect to temperature and chemistry. This process helps attainment of low levels of gases and inclusions and provides controlled alloying and mixing to produce variety of alloys. This process also allows improvement in plant productivity (through sharing of refining load) and yield.

One (1) number of Ladle Furnace of capacity 240 t has been envisaged for production of value-added steels. The RH-Degasser unit will be used for production of various steel grades and for special applications.

03.07.04 Thin Slab Caster

The product-mix envisages processing of approximately 3.0 Mtpa of liquid steel through conventional thin slab caster. Considering the capacity of the plant, conventional thin slab casting machine has been envisaged for the proposed plant. The thin slab caster will be equipped with the state-of-the-art facilities like electro-magnetic stirring, mould oscillation, shrouding of liquid metal with inert gas, online width control, etc. Considering market requirements, two (2) nos. of single strand thin slab caster capable of producing slabs of 950-1650 mm width and 100-70mm thickness have been envisaged.

03.08 Compact Strip Production (CSP) Mill

Based on the product-mix, Compact Strip Production (CSP) Mill of capacity 3.0 Mtpa has been proposed for the project.

The CSP Mill will mainly comprise of Slab cleaning equipment, roller hearth type furnace with approach roller table, charging and discharging equipment, high pressure hydraulic descaler, 4-Hi-reversing mill stand with provision for one vertical edger, laminar cooling system, downcoiler, coil stripper car, hot coil conveyor, coil transfer car, weighing scale, marking machine and dispatch yard for the finished coils.

The CSP mill with the above facilities will be capable of producing coils in thicknesses of 1.0-3.8 mm and with 900 to 1600 mm width with a capacity of 3.0 Mtpa.

03.09 Beam Blank/Bloom Caster

To produce heavy sections, beam blank casters are the right choice to produce beam blank to cater down rolling mill facilities.

one (1) three strand beam blank caster have been envisaged for the proposed project.

The caster shall be of latest design with state-of-the-art technology and equipped with modern features such as moulds, hydraulic mould oscillator, automatic mould level controller, mould EMS, high intensity multi zone spray cooling system, continuous straightening, rigid dummy bar, automatic torch cutting machine, turnover type cooling bed and computerized process control system (Level II). The technology of continuous casting of steel into beam blanks has been fully mastered today for any grade of steel. This technology has become well established through extensive mechanization and control of various operating parameters. The continuous casting process has gained worldwide acceptance, mainly because of high yield, good product quality and good economics of operation.

Process Description

The liquid steel from the LF or RH will be transferred to the caster bay and lifted by the shop crane for placement on the ladle turret of the caster.

The turret will be rotated for placing the ladle at the casting position over the tundish. The preheated tundish travelling on the tundish car is brought to the casting position and its nozzle are positioned over the moulds. A refractory shroud will be engaged in the ladle with the help of the shroud manipulator to protect the metal stream from oxidation. The ladle will be lowered and the slide gate of the ladle opened for pouring liquid steel into the tundish placed on the tundish car. From tundish, the metal will flow to the mould and casting will start. Before the start of casting, different systems like mould cooling, secondary cooling, mould lubrication etc to be started. The cast strand is cut into required length and discharged through the roller table and turn over type cooling bed.

After finishing the casting, the turret will be rotated and the ladle will be lifted by shop overhead crane for dumping of slag to the slag pit/pot.

Main Design Data for the Proposed Casters

Item	Parameters
Type of Caster	Beam Blank Caster
No. of machine	1 x 3 strand
Machine Radius	12 m
Design size	400 x 320 x 100 610 x 320 x 100
Ladle capacity	Max. 180 t
Tap to Tap time	48 min.
Ladle turret	H type, provided with ladle lifting saddles system and ladle weighing system
Ladle cover manipulator	Hydraulic design
Ladle shroud manipulator	Provided
Tundish car	Cantilever with electro-mechanical drive and provided with tundish lifting system
Mould type	Curved, plate mould, adjustable width
Mould lubrication	Oil for open stream casting mode
Dummy Bar	Rigid
Secondary cooling system	Water (provision for air mist)
Casting practice	Closed
Mould level controller	Hydraulic/Electro mechanical
Billet cutting system	Oxy-cutting torch with sample

	cutting system
Billet cutting length	9 – 12 m
Discharge system	Through run-out rolling table, cross transfer etc.

03.09.01 Bloom Caster

To produce bars, angles, squares and flats, bloom caster are proposed to produce blooms to feed the downstream rolling mill facilities. One (1) three strand Bloom caster has been envisaged for the proposed project.

The caster shall be of latest design with state-of-the-art technology and equipped with modern features such as moulds, hydraulic mould oscillator, automatic mould level controller, mould EMS, high intensity multi zone spray cooling system, continuous straightening, rigid dummy bar, automatic torch cutting machine, turnover type cooling bed and computerized process control system (Level II).

Process Description

The liquid steel from the LF or RH will be transferred to the caster bay and lifted by the shop crane for placement on the ladle turret of the caster.

The turret will be rotated for placing the ladle at the casting position over the tundish. The preheated tundish travelling on the tundish car is brought to the casting position and its nozzle are positioned over the moulds. A refractory shroud will be engaged in the ladle with the help of the shroud manipulator to protect the metal stream from oxidation. The ladle will be lowered and the slide gate of the ladle opened for pouring liquid steel into the tundish placed on the tundish car. From tundish, the metal will flow to the mould and casting will start. Before the start of casting, different systems like mould cooling, secondary cooling, mould lubrication etc to be started. The cast strand is cut into required length and discharged through the roller table and turn over type cooling bed.

After finishing the casting, the turret will be rotated and the ladle will be lifted by shop overhead crane for dumping of slag to the slag pit/pot.

Main Design Data for the Proposed Casters

Item	Parameters
Type of Caster	Bloom
No. of machine	1 x 3 strand
Machine Radius	For Bloom -12 m
Design size	**For Bloom** 150 x 150 sq. - 335 x 300 sq.
Ladle capacity	Max. 180 t
Tap to Tap time	48 min.
Ladle turret	H type, provided with ladle lifting saddles system and ladle weighing system
Ladle cover manipulator	Hydraulic design
Ladle shroud manipulator	Provided
Tundish car	Cantilever with electro-mechanical drive and provided with tundish lifting system
Mould type	Curved mould, cartridge type design
Mould lubrication	Oil for open stream casting mode
Dummy Bar	Rigid
Secondary cooling system	Water (provision for air mist)
Casting practice	Closed

Mould level controller	Hydraulic/Electro mechanical
Billet cutting system	Oxy-cutting torch with sample cutting system
Billet cutting length	9 – 12 m
Discharge system	Common rollers in run out area with billet/bloom shifter, billet/bloom transfer device and two turn over cooling beds

03.10 Heavy Section Mill

03.10.01 General

It is propose to setup 800,000 t/yr Heavy Section Mill to produce heavy sections to meet the growing demand of heavy sections for infrastructure, oil and gas sector, industrial plants, power transmission towers, bridges, seaports and high-rise towers.

The raw material for the above mill shall be supplied in the forms of beam blanks. The mill shall be designed to process steel as per DIN, EN, BS, ASTM, JIS standards.

The proposed mill complex will be a Continuous Mill with Reheating Furnace, Roughing Stands, Finishing Stands along with necessary upstream and downstream facilities of the main mills stand. The yield of the plant is considered as 96% based on the following losses –

Furnace scale	:	0.5%
Other mill losses	:	1.0%
Hot Saw	:	1.0%
Finishing losses	:	0.5%
Final cut to lengths	:	1.0%

The mill will operate for approx. 7,680 hrs per year.

The maximum crane capacity is 120 T/50 T.

The reheating furnace capacity is 110 t/hr assuming that all feed stock would be cold charged. The maximum mill speed will be 10 m/sec.

03.11 Medium Section Mill

It is propose to setup 700,000 t/yr Medium Section Mill to produce medium sections like angles & channels etc. required in structural works. Different input materials shall be used as per end product size and its pass design.

Walking beam type furnace with mixed gas firing is planned for heating of input materials upto 1250 °C. Input material travel through roller tables from beam blank caster to reheat furnace.
Heated beam blanks pass through high pressure descaler to breakdown stand. This is a 2 high heavy duty torque stand. Stock is rolled in revering made for 5 to 7 passes to get rough finishing shape. Gap adjustment is done by AGC system as per pass schedule programmed in automation.
Material from breakdown mill after cropping at hot shear is fed to universal reversible tandem mill. On each end universal stands with edger stand sandwiched between are 3 stands to roll the semi shaped product to final product. Rolling is done in to & from reversible form as per pass schedule each time closing the roll gap as per predicted plan. Final 3 passes are done from universal rougher, edger through universal finisher. Rolling is done with XH form in each pass schedule.

Rolling is done as per production planning requirement. Roll changes, pass changes and stand changes and carbide changes are done as per pass life of grooves. Used rolls and carbide rings are redressed for fresh use in roll turning shop. Direct & indirect water is used in the mill with treatment facilities, cooling towers and pump houses just outside mill. Hydraulic & lubrication facilities are planned for various equipment movements and bearing lubrications.

Finished products are stored partly in covered area and partly in open area. Dispatches are planned by both rail and road.

Major Plant Units

The mill will consist of the following –

1. Walking beam reheating furnace
2. Reversing break-down mill #1
3. Reversing break-down mill #2
4. Three-stand UFR pre-finishing reversing mill
5. Single UF finishing stand
6. Cooling bed
7. On-line horizontal and vertical roller straighteners
8. Cold saws for cutting-to-length structural sections
9. Automatic magnetic stackers and collecting facilities for structural sections
10. Non Destructive Test center
11. Sawing and drilling machines
12. Transfer systems and final inspection beds
13. Gas presses
14. Collecting benches
15. Cranes with grip type hoist

03.12 Tin Plate Line

It is proposed to set up Tin Plate Mill of 400,000 tpa capacity for the production of Tin Plates. Tin Plate is a Tin Mill Black Plate product which has been coated with tin by electrolytic deposition. It is furnished in a variety of tin coatings. Electrolytic Chromium Coated plate or Tin Free Steel is a Tin Mill Black Plate product which has been coated with metallic chrome overlaid with film of chrome oxide by electrolytic deposition. ECCS is only available with one standard coating which is equal on both sides.

Tin Mill Black Plate is a light gauge, low carbon, cold reduced steel intended for use in the non-tinned state, for pre-painting, or for the production of other Tin Mill Products dependent on end use corrosion protection requirements.

The basic raw material for the production of tinplate products is hot rolled steel strip. The production process reduces this to the required thickness by cold-rolling. This rolled strip is then coated with tin or chromium in an electrolytic process.

03.13 Lime & Dolo Calcining Plant

The lime & dolo calcining plant will comprise of a vertical shaft kiln for calcination of limestone and raw dolomite. Lime and calcined dolomite of size (+) 10 mm will be used as flux in steel melting shop. Lime fines and calcined dolomite fines of size 0-10 mm will be used in pellet plant. Limestone and raw dolomite for the calcining plant will be of size 20-60 mm for charging into the shaft kiln for calcination. Limestone & dolomite fines of 0-20 mm in the charge should be kept minimum to achieve soft burnt reactive lime for steel making. Limestone and raw dolomite calcination will

be carried out at a temperature of about 1,100 – 1,150 deg C. Mixed gas will be used as fuel for calcinations.
In order to meet the requirement of proposed plant, 2 x 300 tpd lime calcination plant & 1 x 300 tpd dolo calcination plant has been envisaged.

03.14 Oxygen Plant

Oxygen will be required mainly for oxygen enrichment in Corex (95% purity) and blowing into the EAF (99.5% purity) for steel making. Oxygen will also be required for further removal of carbon in RHOB and also to meet cutting and general repair needs in the steel melting shop (SMS), Beam Blank caster, section mills and other units of the steel plant. Argon will be required in the EAF/CCP for rinsing the steel in the ladle to homogenize the bath temperature and chemical composition and also for shrouding of metal stream from tundish during casting. Nitrogen will be required to meet the purging needs of gas facilities.

To meet the oxygen requirement of proposed units of the steel plant, oxygen plant of capacity 2 x 2200 TPD oxygen plant has been envisaged.

03.15 Captive Power Plant

To meet the requirement of power for the proposed plant, a captive power plant of capacity 330 MW has been envisaged. The Captive power plant will be run by utilizing the thermal coal.
The power produced is proposed to be utilized for the various units of the steel plant through its internal distribution systems.

The power plant shall be based on once through system by which the water shall be drawn from sea/creek and the outfall shall also be discharged into the sea/creek as per the statutory norms.

The major technological facilities required for captive power plant are as follows :

1. Steam Boiler
2. Steam Turbine
3. Generators
4. Condensers
5. Condensate Extraction Pumps
6. Boiler Feed Pumps
7. De-Aerator
8. Cooling Tower
9. DM Water Plant
10. Fuel Oil System
11. Water Complex
12. Gas boosting and cleaning
13. Compressed Air System
14. Transformer and Panels
15. Mechanical equipments
16. Power receiving and distribution system

03.16 Cement Plant

It is proposed to install a 1.2 Mtpa cement plant based on corex slag, fly ash and purchased clinker.

The plant will adopt either of two kinds of grinding mills viz. Roller Press Combination Technology (RP) or Vertical Roller Press (VRM) in the whole process of cement production line. The salient features of the technology are highlighted below:

- The Roller Press mill or VRM consists of rollers which grind Clinker and Gypsum to produce Ordinary Portland Cement (OPC).
- On the other hand, slag alone is finely ground in Slag Mill RP or VRM to produce GGBS.
- Both the OPC and GGBS are stored in separate silos.
- For the production of Portland Slag Cement (PSC), GGBS and OPC are extracted from the respective silos and blended in definite proportion in a paddle mixer and stored in PSC silo.
- Cement is packed in bags by means of Electronic Roto Packers. Cement as well as GGBS can also be loaded in bulkers through Bulk loading system.
- Modern high technology features will ensure high quality product, high yield in energy savings, environmental protection, as well as large- scale automation.

The specific power consumption for cement plant (including clinker grinding) is estimated as 38 kwh/t-cement.

03.17 Clean Technology Adoption

The Corex technology is a reliable clean technology alternative to the conventional blast furnace route. It provides the key technology for producing hot metal in an economically and ecologically sustainable manner.

The main differences between the Corex process and a conventional blast furnace route are :

- Non-coking coal can be used directly as a reducing agent and energy source
- The iron oxide fraction can be lump ore or pellet; no sintering is required.
- Pure oxygen instead of nitrogen-rich hot blast

As the non-coking coal is coked onsite in the melter gasifier and the high dome temperature exceeds 1000°C, resulting in nearly entire cracking of the coal's relieved hydrocarbons and avoiding the formation of tar.

The Corex process requires high-purity oxygen, resulting in nearly nitrogen-free top gas. Due to its high calorific value, this undiluted gas (Corex gas) is partially recycled for reduction work within corex plant and the remaining corex gas would be used for the production of DRI in the DRI Plant. This type of corex gas based DRI Plant is already operating in JSW Vijayanagar Works.

04 RAW MATERIALS REQUIREMENTS

04.01 General

Raw materials availability is becoming critical due to the heavy demands made and the limited resources. Proper sourcing combined with logistics planning has become vital for the success of any plant operation. The other important criterion, is the cost of transportation involved from mine site to plant site. Iron ore fines, non-coking coal, thermal coal, limestone, dolomite and quartzite are the major raw materials required for the plant.

Keeping in view the plant location it is proposed to utilize the waterways for major transportation. For this purpose it is proposed to suitably extend the existing jetty. MoUs for iron ore, coking coal, non-coking coal, thermal coal and fluxes for regular long term supply of raw materials from Australia, USA, Canada, South Africa, Indonesia, Russia have been signed for JSW Steel Plants.

04.02 Requirement of Raw Materials

The annual (net and dry) requirements of various raw materials for 3.0 Mtpa Steel Plant are given in table 04.01.

Table-04.01

Additional Annual Major Raw Material Requirement (net & dry basis):

Sl. No.	Raw material	Quantity (tpa)
1.	Iron ore fines/conc.	4,200,000
2.	Coking Coal	4,200,000
3.	Non-coking coal	1,500,000
4.	Limestone (for Pellet Plant & Corex)	294,000

Sl. No.	Raw material	Quantity (tpa)
5.	Dolomite (for Corex)	300,000
6.	Limestone (for SMS & DR)	232,000
7.	Dolomite (for SMS)	168,000
8.	Thermal Coal for CPP	1,300,000
9.	Coke	51,000
10.	Bentonite/Gypsum	86,000
11.	Ferro Alloys	42,000
12.	Clinker	600,000

The storage of various raw materials for 3.0 Mtpa Steel Plant within the plant area is given in table 04.02. The required raw material for 3.0 Mtpa Steel Plant shall be stored for about 10 days at Plant site, 30 days at Jetty and 30 days at JSW Jaigarh Port.

Table-04.02

Storage of Raw Material at Plant Site :

Sl. No.	Raw material	Source	Quantity (t/day)	Stockpile Storage (t)	Storage (days)
1.	Iron ore fines/conc.	Imported / Indigenous	4,200,000	122,000	10
2.	Coking Coal	Imported	4,200,000	42,500	4
3.	Purchased Pellets	Imported / Indigenous	1,100,000	15,500	5
4.	Non-coking coal	Imported	1,500,000	20,000	5
5.	Limestone (for Pellet Plant & Corex)	Imported	294,000	10,300	11
6.	Limestone (for SMS & DR)	Imported	232,000	10,300	14
7.	Dolomite (for Corex& SMS)	Imported	468,000	16,000	11
8.	Thermal Coal	Imported	1,300,000	34,000	9
9.	Clinker	Hinterland	600,000	16,000	9

Estimated requirement of all raw materials have been briefly described in subsequent paragraphs.

04.02.01 Iron ore

The estimated requirement of total Iron ore fines is ~4.2 Mtpa on net and dry basis. Considering about 10% losses due to moisture, and 5% losses due to handling, the iron ore requirement works out to about ~5.0 Mtpa.

The tentative chemical analysis and trace elements of iron ore is given in table 04.03 :

Table-04.03

Tentative quality of iron ore :

Sl. No.	Parameters	Unit	Value
1.	Silica (as SiO_2)	%	7-8
2.	Aluminium (as Al_2O_3)	%	3-4
3.	Iron (as Fe_2O_3	%	83-85
4.	Calcium (as CaO)	%	-
5.	Magnesium (as MgO)	%	-
6.	Sodium (as Na_2O)	%	-
7.	Phosphorous (P)	%	0.05
8.	Loss on ignition	%	2-3
	Trace Elements / Metals		
9.	Arsenic (As)	µg/g	0.002
10.	Cadmium (Cd)	µg/g	0.005
11.	Chromium (Cr)	µg/g	0.03
12.	Copper (Cu)	µg/g	2.0
13.	Lead (Pb)	µg/g	1.5
14.	Mercury (Hg)	µg/g	BDL
15.	Nickel (Ni)	µg/g	0.02
16.	Zinc (Zn)	µg/g	0.3

04.02.02 Coking Coal

Availability of low ash coking coal of desired quality in this country is limited. Hence, it has been envisaged that total requirement of metallurgical coal 4,200,000 t/yr for the proposed coke oven plant will be met through imports, as given in Table 04.04.

Table-04.04

Tentative quality of imported coal blend:

Sl. No.	Parameters	Unit	Value
1.	Size	mm	0 to 50
2.	Ash	%	9.0 – 9.5 (max.)
3.	VM	%	24 to 26
4.	Fixed Carbon	%	53 to 55
5.	Moisture	%	8 to 10
6.	Sulphur	%	1.2 (max.)
7.	Phosphorous	%	0.06 (max.)
8.	Grey king coke type	-	G 5 (min.)
9.	Crucible swelling	No.	6.5 (min.)
10.	Mean max. reflectance (R0 max)	-	1.10 to 1.30
11.	Gieseler fluidity	ddpm	600-2000
	Trace Elements / Metals		
12.	Arsenic (As)	µg/g	0.008
13.	Cadmium (Cd)	µg/g	0.007
14.	Chromium (Cr)	µg/g	0.15
15.	Copper (Cu)	µg/g	0.02
16.	Iron (Fe)	µg/g	2.0
17.	Lead (Pb)	µg/g	0.01
18.	Mercury (Hg)	µg/g	BDL
19.	Manganese (Mn)	µg/g	0.03
20.	Nickel (Ni)	µg/g	0.04
21.	Zinc (Zn)	µg/g	0.03

04.02.03 Non-Coking Coal

The Non-Coking Coal requirement for the Corex unit is about 1,500,000 tpa on Net and Dry basis. Considering moisture loss of 10%, handling loss of 5% the annual requirement is about 1.8 Mt.

For the metallurgical use of the coal in the COREX PROCESS a fixed carbon of min. 55 % is necessary. The fixed carbon and the ash are representing the coal char after the degassing of the volatiles. The char quality is the most important factor for the energy and temperature level in the melting zone of the Melter Gasifier. Therefore the ratio fixed carbon/ash for coals should preferable be higher than 5:1. Since very low ash content non-coking coal is not available in India, it will be met through imports.

The tentative chemical analysis and trace elements of imported non-coking coal is given in table 04.05 :

Table-04.05

Tentative quality of imported non-coking coal :

Sl. No.	Parameters	Unit	Value
1.	Size	mm	0 to 50
2.	Ash	%	10 - 11
3.	VM	%	27 - 29
4.	Fixed Carbon	%	55 - 58
5.	Moisture	%	10 - 11
6.	Sulphur	%	0.6 - 0.7
7.	Phosphorous	%	0.06 (max.)
	Trace Elements / Metals		
8.	Arsenic (As)	µg/g	0.005
9.	Cadmium (Cd)	µg/g	0.0065
10.	Chromium (Cr)	µg/g	0.14
11.	Copper (Cu)	µg/g	0.03

12.	Iron (Fe)	µg/g	1.5
13.	Lead (Pb)	µg/g	BDL
14.	Mercury (Hg)	µg/g	BDL
15.	Manganese (Mn)	µg/g	0.06
16.	Nickel (Ni)	µg/g	0.03
17.	Zinc (Zn)	µg/g	0.03

04.02.04 Limestone

Limestone will be required as flux material both for iron making and for steel making. In case of steel making, limestone will be calcined in a captive calcination plant and the calcined product, namely burnt lime, will be used in DR Plant and steel melt shop for production of liquid steel.

The desirable chemical analysis of sinter grade limestone is as follows:

SiO_2	**Al_2O_3**	**CaO**	**MgO**
%	**%**	**%**	**%**
3.61	0.60	50.74	1.91

For quality reasons, sustained supply and cost effectiveness, some imported SMS grade limestone may also be used. High-grade low silica limestone is produced and traded by several countries namely Japan, Vietnam, Thailand, Middle-East etc. The typical analysis of imported limestone is as follows:

SiO_2	**Al_2O_3**	**CaO**	**MgO**
%	**%**	**%**	**%**
0.43	0.20	54.54	0.91

Some of the Calcined Lime requirement will be fulfilled from the existing lime calcination plant.

04.02.05 Dolomite

Dolomite will be required as flux material both for iron making and for steel making. In case of steel making, Dolomite will be calcined in a captive calcination plant and the calcined product, namely burnt dolo, will be used in steel melt shop for production of liquid steel.

For quality reasons, sustained supply and cost effectiveness, some imported SMS grade limestone may also be used.

04.02.06 Thermal coal for Captive Power Plant

To meet the requirement of power for the proposed plant, a captive power plant of capacity 330 MW has been envisaged. The Captive power plant will be run by utilizing the thermal coal. About 330 MW power shall be generated by thermal coal. The annual requirement of thermal coal required for generating 330 MW power is 1,300,000t and will be met through imports. It is proposed to use low sulphur thermal coal (S < 0.6%) for reducing the sulphur dioxide emissions from the power plant.

Considering moisture loss of 10%, handling loss of 5% the annual requirement of non-coking coal is about 1.52 Mt.

The typical analysis of imported thermal coal is given in Table 04.06.

Table-04.06

Typical analysis of imported thermal coal:

Sl. No.	Quality parameters	Unit	Value
1	Fixed Carbon	%	45-50
2	Ash	%	30 (max.)
3	VM	%	23 to 25
4	Moisture	%	9-10
5	Sulphur	%	0.6 (max.)
6	Calorific Value	kcal/kg	5000

04.02.07 Steel Scrap

Steel scrap is used as coolant in the EAF. It is proposed to utilize in-plant generation of scrap for this purpose. The requirement of scrap in EAF shall be about 80,000 including return scrap from the plant.

04.02.08 Clinker

It is proposed to bring in about 0.6 Mtpa purchased clinker for the cement plant.

05 Proposed Site

05.01 Site Location

The proposed units of 3.0 Mtpa Steel Plant will be set up within the area of the existing plant. The existing plant is situated in Salav village of Raigad district in the state of Maharashtra. The site is at a distance of 150 km from Mumbai, and about 45 km from Roha by Road. The location map and the regional map of the proposed site have been shown in the drawing no. JSW/SALAV/PR/001 and drawing no. JSW/SALAV/PR/002 respectively.

The indicative coordinates of the proposed site are given below:

Latitudes : 18°31’1” - 18°32’2.5” N

Longitudes : 72°56’39” - 72°57’54” E

The area under existing plant and the proposed units are declared as Industrial Growth Centre under Murud Taluk by the Govt. of Maharashtra in 1992. Therefore, as per MOEF & CC notification dtd. 10th December 2014, the proposed project may be exempted from the process of public consultation.

The earthen bund was developed by the local villagers and maintained by the Kharland Department to restrain any water ingress into the agricultural fields. The bund acts as the high tide line, which has been demarcated by National Institute of Oceanography (NIO), Goa in its studies and the CRZ map.

The proposed site for 3.0 Mtpa does not fall under the CRZ area as per NIO CRZ Map. (NIO CRZ Map has already been submitted to EAC, MoEFCC during presentation).

The land use of the proposed site has been for agriculture. Along the periphery of the land in possession, an earthen bund was maintained by the Kharland Development Board, Government of Maharashtra in 1942 and from time to time is being maintained by the Kharland department.

There is no forest land in the site. The Phansad wildlife sanctuary is approximate 4.7 km from site. NBWL in its standing committee meeting has earlier granted clearance to the proposed area. Also, the proposed area does not fall in the Eco-Sensitive zone of the Phansad wildlife sanctuary as per the draft ECZ notification of MoEF&CC dated 30th November 2015. Hence, the proposed area for 3.0 Mtpa Steel Plant does not attract any further wildlife clearance.

The details on the residential areas/villages around the plant is given below in table-05.01

Table-05.01

Details on the residential areas/villages around the plant

Name of Residential area / Village	No. of houses	Population	Distance from the Plant
Korlai	821	2959	6.0 km
Chehar + Mithekhar	942	2959	5.0 km
Valke	760	3040	5.5 km
Chordhe	321	2315	8.5 km
Telekhar + Tale	207	1414	10.0 km
Salav + Sanjay Nagar + Nidi	727	2096	Adjacent to plant boundary

05.02 Area Requirement

05.02.01 General

The area requirement for the proposed plant has been estimated based on the following factors:

- Area requirements of individual technological and service facilities
- Smooth and uninterrupted flow of incoming and outgoing materials with minimum counterflow for different technological facilities.
- Logistics in location of technological units as well as services facilities.
- Safety requirements and statutory provisions.
- Adequate green belt all around the plant.
- Optimum lead for service lines.
- Maximum utilization of the land.
- Logistic approach in location of technological units as well as services with assumption that area is flat.
- Space for storage of incoming raw materials.

05.02.02 Area Requirement

The total area required to expand the plant to 3.0 Mtpa is about 706 acres which includes 145 acres of existing plant area, 421 acres for the new proposed units, 66 acres of buffer zone from the existing bund (HTL) & 100 m setback line and 74 acres of the existing township. Apart from technological and service units, raw water storage, green belt as per statutory requirement, etc. have been included in area estimation.

The area requirement for the proposed plant has been minimized since the infrastructure and auxiliary facilities are already existing within the existing plant area.

Special attention has been made to provide connectivity to the existing facilities viz. utilities, raw material corridors, etc.

The general layout of the proposed site has been shown in the drawing no. JSW/SALAV/PR/005.

Village Nidi, New Chehar and JSW Township is located adjacent to the plant therefore the area will be completely isolated with thick green belt with three tier of plantation in 15 to 20 m width which shall attenuate any noise or dust pollution.

The breakup of details of facilities with the land use is shown in table 05.02.

Table-05.02

Land	Area	Plant Facilities of the existing units	Area in acres	Plant Facilities after enhancement of the existing units and under 3.0 Mtpa Steel Plant	Area in acres
Existing Plant Area	145 acres	RMHS	14.5	RMHS	14.5
		Sponge Iron Plant (SIP)	19.5	Sponge Iron Plant	19.5
		Store, Workshop, etc.	1.2	Store, Workshop, STP	1.2
		Raw Water Pond	1.3	Raw Water Pond	1.3
		SIP Sludge Drying area	1.5	SIP Sludge Drying area	1.5
		Water Utilities	0.6	Water Utilities	0.6
		Rain Water Harvesting	2.5	Rain Water Harvesting	2.5
		Main Roads	4.0	Main Roads	9.0
		Greenery	47	Greenery	47 (33%)
				LCP	1
				Oxygen Plant	1.2
				Corex Plant	19.5
				SMS	8
				CSP	16.2

				SMS Slag Storage Area	0.85
				SMS Slag Metal Recovery Area	1.15
				Sub Total	**145**
New Proposed Area	421 acres			Coke Oven Plant	50
				Pellet Plant	30
				Cement Plant with slag storage	22
				Captive Power Plant	30
				Ash Dump Area	21
				Tin Plate Mill	17
				Heavy Section Mill	36
				Medium Section Mill	36
				BTX Plant	4
				SNG Plant	4
				Corex Sludge, SIP Sludge, EAF Dust, Bag Filter & ESP Dust Storage Area	1
				Central Stores, Repair Shop, STP, Hazardous Waste Storage	8
				Fire Fighting Station, Admin Bldg., Car Parking area, Truck Parking Area, Canteen	8
				Roads	15
				Greenery	139 (33%)
				Sub Total	**421**
Bufferzone	66			Buffer zone	66
Township	74	Township	74	Township (including raw water pond)	74 (4 acres)
Total Area	**706 acres**	**Total Area**	**706 acres**	**Total Area**	**706 acres**

05.03 Logistics

The raw material is proposed to be transported to site by waterways which will require to be further upgraded. It is proposed to expand the existing Jetty to suitable length and connect it with covered conveyors to the plant.

05.03.01 Road

The National Highway NH-17 (Mumbai-Goa) passes on the east side about 50 km from the plant. State Highway also passes on the west side of the plant. Mumbai city is located at about 150 km on the North-West side of the plant.

The Road linkage of the proposed site is shown in Drg. No. JSW/SALAV/PR/003.

05.03.02 Railways

The nearest railway station Roha is about 50 km from the plant site and is located in the east on the Konkan Railway Mumbai - Mangalore main line. Rail linkage from plant site has to be established.

05.03.03 Air Connectivity

Nearest airport is 150 km away at Mumbai and is connected through major roads. The proposed Navi Mumbai International airport is 90 km away from plant site.

05.04 Water

The make-up water for the proposed plant is about 10 MGD (45.7 MLD) including 9.0 MGD for the steel plant, 0.52 MGD for township and 0.48 MGD for CPP and additional about 19 MGD (85

MLD) sea/creek water for cooling purpose for once through system of CPP.

05.05 Power

The total estimated power requirement of the proposed plant will be about 330 MW. The specific power consumption for steel plant will be in-line with the Standards Prevailing in the Industry.

06 SERVICES, UTILITIES & MANPOWER REQUIREMENT

06.01 General

Besides raw materials, other major requirements of the proposed steel plant are water, power and fuel. Corex gas & Natural gas will be used to meet the demand of fuel of different consuming units. The power demand of the plant will be met from the proposed power plant.

06.02 Power System

The total power requirement of the proposed steel plant is about 330 MW which shall be met from the proposed power plant of capacity 330 MW. External Grid support will also be arranged if available.

Back-up power and transmission line/grid connectivity would be required to take care of power plant breakdown or major shutdown.

From the main receiving and step down station of the plant, power will be stepped down to 33 kV to feed to the various plant load centers. These load centers will have provision to step down further to 11 kV/6.6 kV and 415 V for distribution of power at required voltages.

Necessary power compensation equipment and harmonic filters will be provided to take care of the fluctuating load of EAF shop and casters.

For all 220 kV, 33 kV, 11 kV and 6.6 kV supplies, centralized supervision, monitoring and emergency control system will be adopted.

06.03 Water System

The make-up water for the proposed plant is about 10MGD (45.7 MLD) including 9.0 MGD for the steel plant, 0.52 MGD for township and 0.48 MGD for CPP and additional about 19 MGD (85 MLD) sea/creek water for cooling purpose for once through system of CPP.

The water reservoir as shown in the layout for storage of raw water has the ideal capacity of about 15 days.

The justification for requirement of water for the proposed steel plant & captive power plant is given below in table-06.01

Table-06.01

Justification for requirement of water for the proposed steel plant & captive power plant

Plant	Water Requirement (MGD)	Water Requirement (MLD)	Water Requirement (m^3/hr)
Steel Plant	9.0	41	1708
Captive Power Plant (Process)	0.48	2.2	92
Township & Nearby villages	0.52	2.5	104
Total	10.0	45.7	1904
Captive Power Plant (once through cooling system)	19	85	3542

At present, the company has been allocated 45.7 MLD of water from River Kundalika, Dhatav. The permission for drawl of 45.7 MLD water has been already obtained from Irrigation Dept. Government of Maharashtra. The specific water consumption norms shall be in-line with the best practices with the industry.

Raw water treatment plant will be installed for pretreatment of raw water and the clarified water will be pumped through MS pipeline to the proposed units.

The different categories of water to be used in the recirculating system are:

a) Demineralised (DM) water for closed recirculating cooling systems.
b) Soft water for closed recirculating cooling systems.
c) Indirect cooling water (ICW) for secondary cooling of the water-to-water heat exchangers of the closed cooling circuits.
d) Direct cooling water (DCW) for gas cleaning circuits, slag granulation, open machinery cooling and scale flushing.
e) Make-up water & service water for captive power plant.

For conserving water, independent recirculating systems have been proposed along with cooling towers, pump houses and treatment units.

Make-up water for different process units will be made available from main plant make-up water ring main and will be conveyed to respective cold wells of various recirculating systems and storage reservoirs.

In order to combat industrial pollution and to comply with guidelines laid down by the statutory authorities, suitable treatment units and neutralization pits will be provided to control water pollution in different water system units. Attempts will be made to achieve zero discharge as far as practicable by making use of bleed water from cooling tower and other effluent water for dust suppression.

Waste water generated from different areas of plant will be treated to the desired extent and recycled in the recirculating system as far as possible, facilitating adequate reuse of water. Backwash water generated from different pressure filters will be treated in a treatment plant having sludge disposal facilities. The treated water will be reused in the direct cooling circuit.

It is proposed to install once through system for water for the Captive Power Plant. The water shall be drawn from the sea and also the outfall shall be discharged into the sea as per the statutory norms.

06.04 Utility System & Auxiliary Facilities

Oxygen

Oxygen at 99.5% purity will be required for EAF blowing and heating, secondary refining units of steel melting shop, cutting operation in the casters and other general purpose use in various units of the steel plant.

Nitrogen

Nitrogen will be mainly required for gas cleaning, gas line purging and general purpose applications.

Argon

Argon will be required for bottom blowing in the EAF, process-gas-refining in secondary steel making units of SMS, and shrouding in the tundish for continuous casting plant and for bottom purging in LF. Argon will also be needed for laboratories.

Compressed air system

Requirement of compressed air will be provided by Central Compressed air station with piped compressed air to the different consumption points.

Chilled Water System

Chilled water is required for air conditioning of control rooms, etc. in various areas of the steel plant. Two vapour compression type chilled water plants will be provided. Water inlet and outlet temperatures of chiller plant will be maintained at 16^{o}C and 7^{o}C respectively.

Gas Systems

The by-product gases will be utilized for heating and burning applications in different sections of the steel plant. Available gases, after meeting the above applications may be utilized for steam and power generation.

Plant Automation

It has been envisaged that Level-1 and Level-2 automation systems will come along with the various equipment/facilities to provide process and equipment level control including supervisory automation functions. In addition, higher-level computer system will be provided to cater to the needs for Production Planning & Control (PPC) as well as Management Information System (MIS) for the whole plant.

The Centralized Production Planning & Control system will be provided for overall and area/shop wise production planning. This system will be interfaced to the automation systems of various plant units through suitable gateways to enable downloading of production targets and uploading of production and consumption figures. The Management Information System will provide necessary information about the plant and other administrative functions.

Communication System

Telephone system will be provided for communication inside as well as outside the plant. Telephone system shall comprise one Electronics Private Automation Branch Exchange (EPABX) of required line capacity and associated cable network along with Press-to-talk system, CCTV, VHF wireless system as required.

Repair And Maintenance Facilities

The plant repair and maintenance facilities will be centralized to take care of routine repair and periodical maintenance work. Major repairing works involving machining, fabrication and assembly of heavy and critical jobs of specialized nature are envisaged to be contracted to outside agencies.

Warehouse

A central warehouse has been provided to keep spares of equipment, hard-wares and consumables.

For storing various ferro-alloys and refractories, separate buildings have been envisaged. Ferro-alloys will be received by road trucks in bags/boxes. Refractories will be received in pallets and in bags.

Laboratory

To meet the analytical and testing needs of the proposed plant, laboratories as mentioned below will be provided at different locations in the plant:

- Sample preparation station

- Iron making laboratory
- SMS laboratory
- Central laboratory

Ancillary Facilities

Necessary ancillary facilities such as administrative building, canteen, car park, first-aid station etc. shall be additionally provided based on the manpower requirement for the plant.

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, will be discharged suitably for minimum pollution.

Sanitary faecal sewage will be collected from the ablution blocks through pipeline and the same will be connected to a sewage treatment plant. The effluent from the sewage treatment plant will be utilized for the development and maintenance of greenery. The natural drainage nallahs have been left undisturbed.

Roads

Adequate plant road system has been provided considering the types of vehicles and traffic volume. The road system has been be designed to minimize cross movement of vehicles. Adequate vehicle parking facilities and road weighbridges will be provided and new roads constructed wherever necessary.

06.05 Manpower Requirement

The steel plant will not only require management and executive manpower but also, skilled, semi-skilled, unskilled and clerical manpower. However, a number of jobs like major repair and maintenance, cleaning, transportation and loading/unloading of bulk materials, etc. will be done by engaging out side agencies. The requirement of total manpower is about 2,100 persons for 3.0 Mtpa capacity.

The above number covers the top management, middle and junior level executives and other supporting staff. The above manpower excludes the manpower required for outsourcing of repair and maintenance jobs of the entire plant and also does not cover the personnel for township, medical facilities, etc. The category wise break-up of manpower is indicated in table – 06.02.

Table – 06.02

Category wise break-up of manpower

Sl. No.	Category	Requirement
1.	Managerial	60
2.	Executive	300
3.	Skilled	700
4.	Semi-skilled	800
5.	Unskilled	500
6.	Clerical	140
	Total	**2,500**

07 ENVIRONMENTAL MANAGEMENT

The proposed units of steel plant would result in air, water and land pollution of varying nature and degree. This chapter briefly outlines the nature and sources of pollution and also suggests broad environmental protection measures to be adopted for limiting pollution within permissible levels.

07.01 Nature of Pollution

The steel plant would comprise various production facilities such as Raw Material Yard, Coke Oven & By Product Plant, Pellet Plant, DRI Plant, Corex Plant, Electric Arc Furnace, Ladle Furnace, RH-TOP, Thin Slab Caster, CSP, Beam Blank/Bloom Caster, Heavy Section Mill, Medium Section Mill, Oxygen Plant, Lime & Dolo Calcination Plant, Captive Power Plant, Cement Plant. The inputs to the above facilities will comprise raw materials/in-process materials along with water, fuel and power. These would therefore lead to release of emissions to the air, generation of wastewater and solid wastes. The sources of pollution from the proposed project and the types of environmental pollution likely to occur are summarized in Table-07.01.

Table-07.01

Sources and Nature of Pollution

Facility/Department	Pollutants released	Type of pollution
Raw material yard	Fugitive dusts	Air pollution
Coke Oven & By Product Plant	PM, CO_2, NO_x, SO_2, PAH, VOC, heat	Air pollution
	Oil & grease, phenol, cyanide, Suspended scales, Traces of oil & grease	Water pollution
Pellet Plant	Dust, heat, noise, SO_2, NO_x Heating in cooling water	Air pollution & Noise pollution Thermal pollution of water bodies at the outfall
DRI Plant	Dust, SO_2, NO_x, heat, noise	Air pollution and Noise pollution
Corex Plant	Dust, SO_2, NO_x, heat, noise	Air pollution and Noise pollution
Electric Arc Furnace	Dust, NO_x, heat	Work zone air pollution
Caster	Heat, particulate dust, SO_2, NO_x, noise	Air pollution and Noise pollution
	Suspended scales, Traces of oil & grease	Water pollution
Rolling Mills	Heat, particulate dust, SO_2, NO_x, noise	Air pollution and Noise pollution
	Suspended scales, Traces of oil & grease	Water pollution
Lime & Dolo Calcination Plant/Cement Plant	Heat, dust, SO_2 & NO_x	Air pollution
		Work zone air pollution
Power Plant	Heat, SO_2 & NO_x	Air pollution & Water pollution

07.02 Pollution Prevention and Control Measures

In consideration of the above stated pollution potential of the integrated steel plant, suitable mitigation schemes are envisaged in order to control environmental pollution within the permissible norms and keep the environment fairly clean.

07.03 Design Targets

The proposed pollution control measures would be designed on the basis of the following criteria:

a.	Characteristics of treated waste water to be discharged to plant drain	Temperature shall not exceed $5^{o}C$ above ambient TSS ≤ 100 mg/l Oil & grease ≤ 10 mg/l BOD ≤ 30 mg/l at $27^{o}C$ for 3 days COD ≤ 250 mg/l.
b.	Stack emissions	PM ≤ 50 mg/N m^3
c. R	Work zone noise (Leq) (Time weighted average of 8 hrs)	85 dB (A)

Routine environmental monitoring of stack emission, ambient air quality, work zone air quality, noise level and waste water receiving pond and surface water stream will have to be carried out. The monitored data would be recorded and necessary corrective measures implemented to ensure that design targets are maintained and avoid any non-compliance of Statutory Regulations. The guidelines & environment protection rules laid down by MoEF shall be adhered to for the plant facilities.

07.04 Environmental Management Plan

07.04.01 Air Pollution Management

All stack emission will be designed on PM emission of 50 mg/Nm^3 from pollution control equipment. To reduce fugitive dust emission due to handling of iron ore, coal, dust extraction and dust suppression systems will be installed at appropriate locations. Plain water type dust suppression system will be provided at the all around the coal/ raw material stockpiles. The dust suppression systems will consist of water sprinkling systems.

The list of pollution control equipments and design target for each facilities of the plant are summarized in Table-07.02

Table -07.02

SN.	Production Unit/ Facilities	Proposed Emission Control Devices		Design Target
		Non-Point Sources	**Point Sources**	
1.	Raw Materials Handling System	- Covered conveyor - Dry Fogging - Water sprinkling - Bag filter - DE system	DE Stacks	Dust outlet: < 50 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
2.	Coke Oven Plant	- On-main charging by HPLA - Coke side dust extraction	Combustion Stack	<u>Fugitive Emissions</u>: 5% PLD; 1% PLL; 4% PLO <u>BaP</u>: Work Zone (Battery Top) : $\le$ 5 ug/m^3 <u>Stack emissions</u>: SPM < 50 mg/ m^3 SO2 < 800 mg/ m^3 NOx< 500 mg/ m^3
3.	Pellet Plant	- Raw feed proportioning building, Air Cleaning by DE System comprising of ESP	- Waste flue gas cleaning by ESP - De-dusting by ESP - process: low NOx burners	Dust outlet: < 50 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
4.	DRI Plant	-Raw material preparation & Handling centralized de-dusting facility bag filter	- Shaft Feed end Scrubber. - Product screening end Bag Filter	Dust outlet: < 100 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
5.	Corex Plant	- Stock House by DE system - Cast House by DE system: ESP	- Stock house Stack - Waste gas stack - Low NOx burners	Dust outlet < 50 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
6.	Steel Melting Shop	SMS Material Handling - DE system by Bag filter	- Centralised secondary fume extraction system for EAF / LFs with Bag filter.	Dust outlet < 100 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
7.	Lime & Dolo Plant / Cement Plant	- Plant Raw Material Bunker Building - De-dusting by Bag Filter. - Sizing plant – De-dusting by Bag Filter.	Waste flue gas through Bag filter (fabric)	Dust outlet < 50 mg/N m^3 Work zone Dust level: < 5 mg/ m^3
8.	Rolling Mills Reheating Furnace	-	Low NOx burners	Dust outlet < 50 mg/N m^3
9.	Power Plant	-	- Low NOx burners	Work zone Dust level: < 5 mg/ m^3

07.04.02 Water Pollution Management

The prevention and control of water pollution aim at conserving make-up water by recycling the wastewater after treatment. During the operation of the plant, three major categories of wastewater, viz. blow down water from the cooling tower, slurry water and sanitary waste water streams would be generated. Efforts are made to reuse most of the water in the plant itself.

Thus, proposed plant will recycle water to the maximum extent possible. However in abnormal cases, periodically small quantities of effluents, if and when required to be discharge to prevent build-up of excess dissolved solids through stabilization in pond and will be well within the stipulated norms of quality and shall be used for sprinkling on the roads.

Efforts will be made to harvest rainwater in the plant. Run-off water from the office areas, shop roofs will be collected and used for future use.

Oil sewer will collect water from areas where there are possibilities of contamination byoil (transformer yard, fuel & lubricating oil storage areas, and workshop) and the drains from such areas will be routed through an oil-water separator. The collected oil shall be sold to re-refiner approved by SPCB/CPCB.

All storm water drains from the raw materials and solid waste handling areas will be routed through garland drains into catch pits of sufficient volume to settle out suspended solids present in the storm water run-offs. The clear water will be discharged into natural drainage channels. This type of effluent is anticipated only in monsoon season.

Sanitary faecal sewage will be collected from the ablution blocks through pipeline and the same will be connected to a sewage treatment plant. The effluent from the sewage treatment plant will be utilized for the development and maintenance of greenery.

The wastewater generated from the plant units shall be treated in wastewater treatment plant/ Reverse Osmosis - Zero Liquid Discharge (RO-ZLD) unit. The treated water shall fulfill the stipulated water norms of CPCB.

The followings are the stages of treatment of RO-ZLD plant :

Stages of Treatment

The Plant comprises four stages of treatment.

- **Pre-treatment**
- Equalization
- Ozonation
- **Biological Treatment**
- Pre Anoxic
- Aerobic
- Post Anoxic
- Ultra filtration

(Pre Anoxic, Aerobic, Post Anoxic, Ultra filtration: **Membrane Bio Reactor(MBR)**)

- **Reverse Osmosis**
- Two Stages with Sea Water membranes
- Single Pass with Brackish Water membranes
- **Evaporation**
- Crystallizer

The mixed salt from centrifuge of Crystallisation System is proposed to dispose to MPCB approved Common Hazardous Waste Treatment Storage and Disposal facility at Taloja for secured landfilling.

07.04.03 Solid Waste Management

The principal solid waste produced by any steel plant is slag, scrap, scale and dust. The dust from dust catcher unit, SMS section will be recycled to the extent possible in the pellet plant itself.

SMS slag will be treated for the recovery of metal and after metal recovery shall be sold as ballast. A part of SMS slag will be used to fill low-lying areas. Slag from Corex Plant will be granulated and sold to the cement plants for slag cement. Scrap from SMS and other areas will be recycled in the steel plant to the extent possible. Scale and debris from rolling mills will be recycled to the maximum extent possible in the plant itself. Corex Sludge, SIP Sludge, EAF dust & Plant dust will be stored near the Pellet Plant and will be used in the Pellet Plant. The solid waste generated and their probable uses are indicated in the Table 07.03. All the scrap & scales will be recycled fully.

Table - 07.03

Solid Waste Generation along with their Re-Use, Re-Cycle, Utilization & Disposal

Sr. No.	Type of Solid Waste	Generation	Re-utilization			Dump for Future Use
			Recycle	Re-use		
				Within Plant	Sold	
1	Corex slag	500,000 t/yr		100% used in Cement plant	-	
2	Steel Slag	450,000 t/yr		-Granulated and partly used in plant -Balance will be crushed & used for making roads, civil works, etc.	-Will be sold for building roads (aggregate for road making, rail track ballast, land filling, after conditioning to remove the effect of lime swelling, civil engineering works, etc. -Soil conditioner as it contains P_2O_5,especially at places where PH is acidic as in heavily leached soils.	
3	EAF Scales & Scrap	30,000 t/yr	Used in SMS		-	
5	Fly ash	312,000 t/yr			Sold to cement manufacturers/road making/brick making	
6	Bottom Ash	78,000 t/yr		-	-	Ash dump
7	Waste Refractory	30,000 t/yr		-Used in plant for making refractory mortars in captive mortar shops - Making / repairing plant roads	Sold as material for making road embankment or for filling low lying areas	
8	Lime/dolomite Fines	5,000 t/yr		Re-used in pellet plant		
9	Mill scale	95,000 t/yr		- Reused as a reductant input material in Corex Plant/SMS		
10	Corex flue dust	17,000 t/yr		Used in pellet plant	-	
11	Corex GCP sludge	20,000 t/yr		Used in pellet plant	-	
12	SIP Sludge	70,000 t/yr		Used in pellet plant after dewatering		
13	EAF dust	45,000 t/yr		Used in Pellet plant & Corex	-	
14	Pellet ESP dust	26,000 t/yr	Recycled in pellet plant	-	-	-

Corex Slag Utilisation

The granulated slag generated from the Corex Plant will be stored and utilised by the cement plant for producing Portland Slag Cement. The no. of storage days considered for the slag is about 100 days.

Portland slag cement is obtained by mixing Portland cement clinker, gypsum and corex granulated slag, in suitable proportions and grinding the mixture to get a thorough and intimate mix between the constituents. It may also be manufactured by separately grinding Portland cement clinker, gypsum and granulated slag and then mixing them intimately. The resultant product is cement which has physical properties similar to those of ordinary Portland cement. In addition, it has low heat of hydration and is relatively better resistant to soils and water containing excessive amounts of sulphate of alkali metals, alumina and iron as well as to acidic waters and can therefore be used for marine works with relative advantage.

The manufacture of Portland slag cement has been developed primarily to utilize corex slag, a waste product from corex plant. The development of manufacture of this type of cement will considerably increase the total output of cement production in the country and will, in addition, provide a profitable use for waste product. The slags obtained from other types of furnaces, but having identical properties as those of granulated corex slag conforming to this standard, may also be used for manufacture of Portland slag cement. The IS Standard for PPC Cement is IS 455-1989.

Ash Utilisation

The fly ash collected at the air pre-heater hoppers, ESP hoppers, economizer hoppers and stackhopper would be conveyed by pressure pneumatic system to Fly Ash (FA) storage. FA storage silo would be located near the plant roads for easy access of trucks.

The storage silo would be designed to have a storage capacity of 1800 t for 48 hours of FA generation.The dry fly ash collected in the silo would be unloaded into road trucks through fly ash dust conditioner for further transportation of the FA either to utility sites or to the ash disposal area.

The fly ash would be utilized/ marketed in dry form. The fly ash which cannot be utilized / marketed would be conditioned using water and disposed to the ash dump area in paste form.

A maximum of 20% of the total ash produced by each steam generator would be collected in the water impounded, refractory lined furnace hopper as bottom ash (BA). The bottom ash hopper (BAH) would have a capacity to store about four hours collection of bottom ash. This would be evacuated continuously by the scraper chain conveyor (SCC) provided below each BAH. A double roll type heavy-duty clinker grinder would be provided at the head end of SCC to crush the ash clinkers to (-) 25mm size. The ash clinkers form the clinker grinder would be conveyed to BA storage silo through belt conveyors.

Bottom ash silo would be designed to have a storage capacity of 225t for 24 hours of bottom ash. Bottom ash collected in bottom ash silo of the unit would be disposed off in dry form into trucks through a vibrating feeder. The total bottom ash collected in a day would be unloaded in a shift of 8 hours.

The total ash generation will be about 390,000 TPA. Out of this, the bottom ash will be about 78,000 TPA (20% of the total ash) and the balance fly ash will be 312,000 TPA.

The bottom ash will be stored in properly designed ash dykes as per CPCB guidelines to prevent leaching to the sub-soil and underground aquifer. The ash disposal area will be lined with HDPE/LDPE impervious lining to prevent seepage of rain water from the disposal area in the ground and pollute ground water.

The ash utilization plan will be prepared to achieve 100% utilization of ash, as per MoEF notification, there may be transient periods, during which continuous 100% ash utilization may not be possible. Hence, as a contingency measure, an area, equivalent to 2 yrs of ash generation, has been earmarked for construction of an emergency ash pond of about 21 acres of land.

The fly ash generated in power plant has commercial value because of its usage in cement and construction industries. Fly ash generated from the proposed power plant would be commercially utilized in one or more of the following products, to the extent possible:

- Fly Ash Bricks / Blocks
- Cellular Concrete Products
- Light Weight Aggregates
- Concrete and Mortar
- Cement Manufacturing
- Road Construction
- Embankment/Back Fills/Land Development
- Controlled Low Strength Fill Material (CLSM)

EAF Slag Utilisation

The EAF slag generated from the EAF & Ladle Furnace will be stored in the slag Pit within the Steel Melting Shop. The Slag will then be processed in the Metal Recovery Plant for separation of metallic components from slag. The recovered metallic components will be used in Corex Plant and in SMS shop. Non-metallic slagor Steel slag will be commercially utilized in one or more of the following product/industry:

a) Slag of less than 5 mm (fine steel slag)

(i) Used in producing ordinary Portland cement (up to 5% in OPC). The slag is used as a performance improver and also provides the requisite colour to the OPC and slag cement.

(ii) Used as fine aggregate in civil construction: The fine slag does not contain free lime, which is one of the reason for its poor utilization. The steel slag has been permitted for use as replacement of river sand by BIS. These material being heavy can be used in pavements, bricks road making etc.

b) Slag more than 5 mm - 60 mm:

(i) The non-metallic portion of steel slag contains free lime and magnesia. This has been used in construction of roads / highways as slag bound materials. In this process, steel slag and granulated corex slag in different proportions are mixed and rolled to produce a cementations base for roads. This concept is widely practiced in Europe, and Japan. This is being investigated in Indian steel plants. This has the potential to reduce the thickness of highways by 25-30% and can help greatly in reducing the use of natural materials in the construction sector.

This process can also be used for producing gabions, boulders etc., for use in protection of coastal areas. In Japan, these are called "ferro form"

(ii) Steel slag as construction aggregates: The steel slag has excellent properties and is ideally suited for use in the following area.

a) Ballast in railways
b) Aggregates in highways / roads

The preferred application is highways due to higher angle of friction, high PSV, heavy weight etc. However, for use as road aggregate, the steel slag needs to be weathered. Though several options of weathering (natural, accelerated etc.) are available, it is intended to carryout weathering using steam. This reduces the weathering time to less than a week. This has been investigated and the process established at other JSW steel plants.

07.05 Noise Level Management

The following measures will be undertaken to reduce noise and its impact:

- Equipment will be placed on rubber bushes to reduce Noise level at 1m distance to 85 dB (A).
- Sound proof enclosures will be provided to operators in high noise zone. Workers will be provided with ear muffs/ earplugs and the duration of exposure of the personnel will be regulated as per applicable norms.
- Regular check-up of workers for noise related health problem and if detected alternative duty will be provided.

07.06 Hazardous Waste

The hazardous waste such as waste oil, lead acid batteries and sludge will be generated. The waste oil generated will be utilized in coke oven plant for process improvements. Lead acid batteries will be sold to authorized users/recyclers approved by MPCB. The Decanter sludge and ETP sludge from tin plate mill is proposed to dispose to MPCB approved Common Hazardous Waste Treatment Storage and Disposal facility at Taloja for secured landfilling. The hazardous waste generation and its utilisation for the proposed plant is given below :

Hazardous Waste Generation and its Disposal

Sr.No.	Category	Proposed Disposal
1.	Waste oil & Used oil	Sold to authorised parties
2.	Acid and alkali residue from Tin Plate Mill	Regenerated in Acid Regeneration Plant
3.	Waste pickled liquor from Tin Plate Mill	Regenerated in Acid Regeneration Plant
4.	Decanter sludge	Sent to hazardous waste land fill
5.	ETP sludge from tin plate mill	Sent to hazardous waste land fill
6.	Tar sludge from Coke oven	Used back in Coke oven

07.07 Plant safety

Plant safety measures would form an integral part of the environment protection plan of the proposed plant. Workers' safety would be of highest degree of concern so as to avoid any form of personal injury or untoward accident. In-build safety features of the plant and machinery would be made adequate in order to avoid hazardous events causing damage to the life and property.

07.08 Greenbelt and landscaping

Extensive green belt and plantations will be developed inside the plant along plant boundaries, along roads and in vacant areas. The area of green belt and plantations inside the existing plant area will be 47 acres (33%) of 145 acres and in the new proposed area will be 139 acres (33%) of 421 acres.

Adequate space would be created for gardening and tree plantations to dovetail with the existing greenbelts. This would prevent the fugitive dust emissions. Unpaved areas, if any, within the plant boundary would be provided with grass cover. This would not only act as 'lung space' but would also improve the plant aesthetics.

08 PROJECT IMPLEMENTATION

08.01 General

Implementation of the Steel Plant is a challenging task and calls for meticulous planning, scheduling and monitoring to realize the project goals in budgeted time frame. A highly experienced team is available with JSW to implement the project.

08.02 Schedule

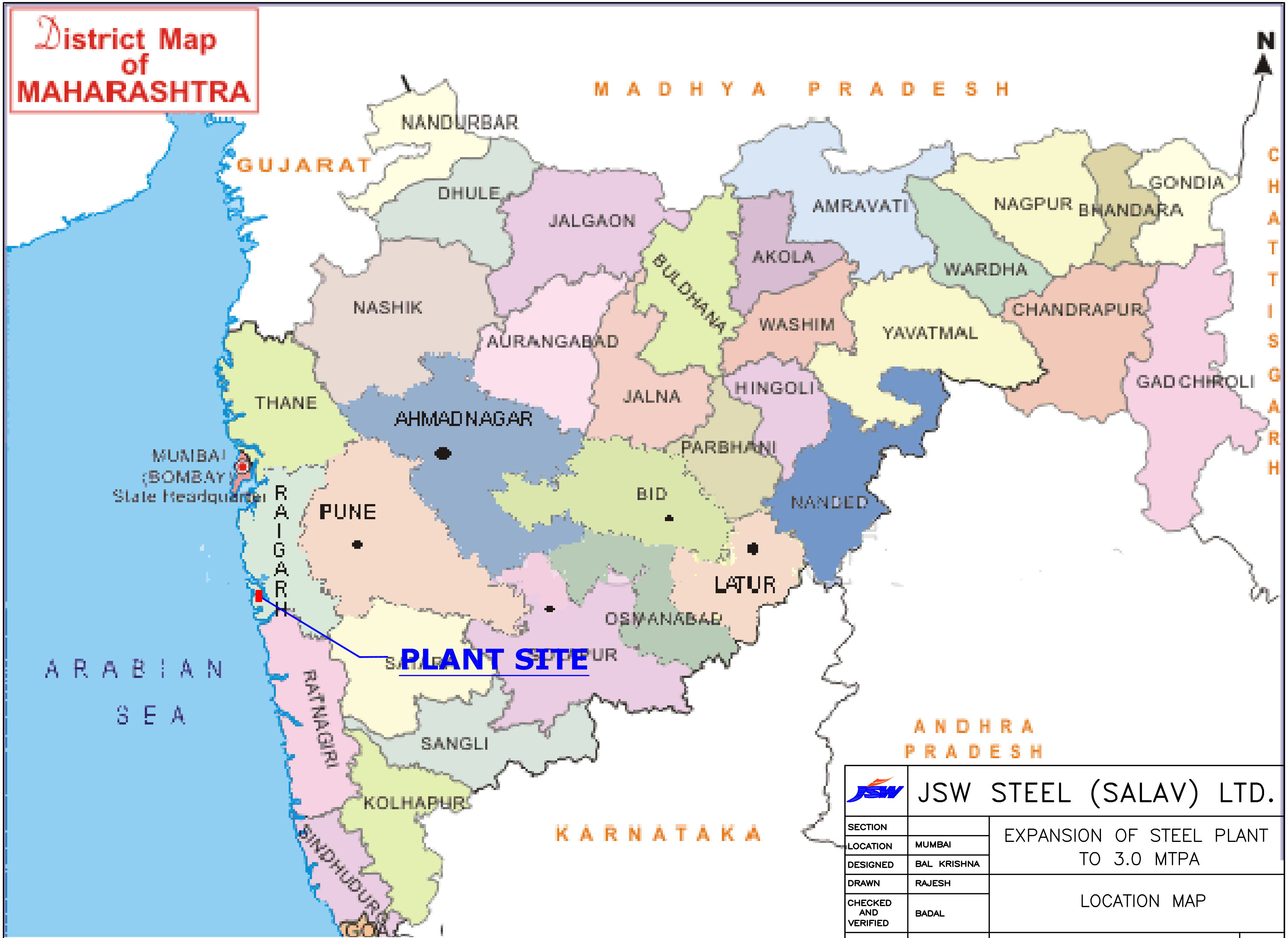
The implementation schedule for installation of the proposed Steel Plant is indicated in the form of bar chart in the drawing no. JSW/SALAV/PR/006. The overall schedule shows that from the date of start of the project (Zero date), the complete plant will be commissioned in 36 months. The schedule as presented is based upon conventional project implementation logics for Steel Plant, preliminary vendor information available and in-house experience. The schedule of 36 months has been conceived, considering the existing practices and delivery schedule of similar plants.

08.03 Zero Date

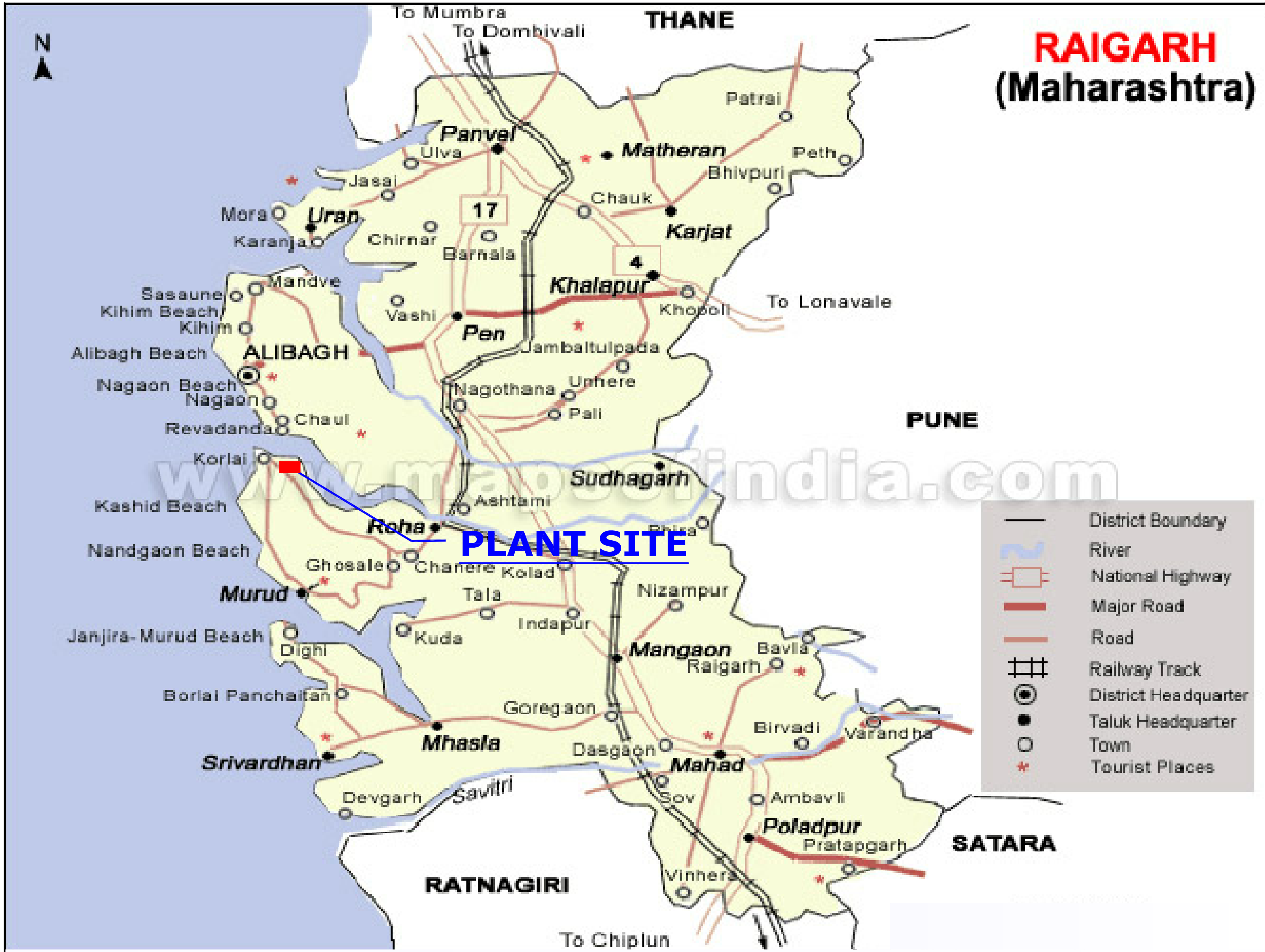
The date of start of project activities has been assumed as “zero date” for installation of the proposed Steel Plant at Salav.

09 BLOCK CAPITAL COST

The estimated block capital cost outlay for the project is about Rs. 18,600 crores.

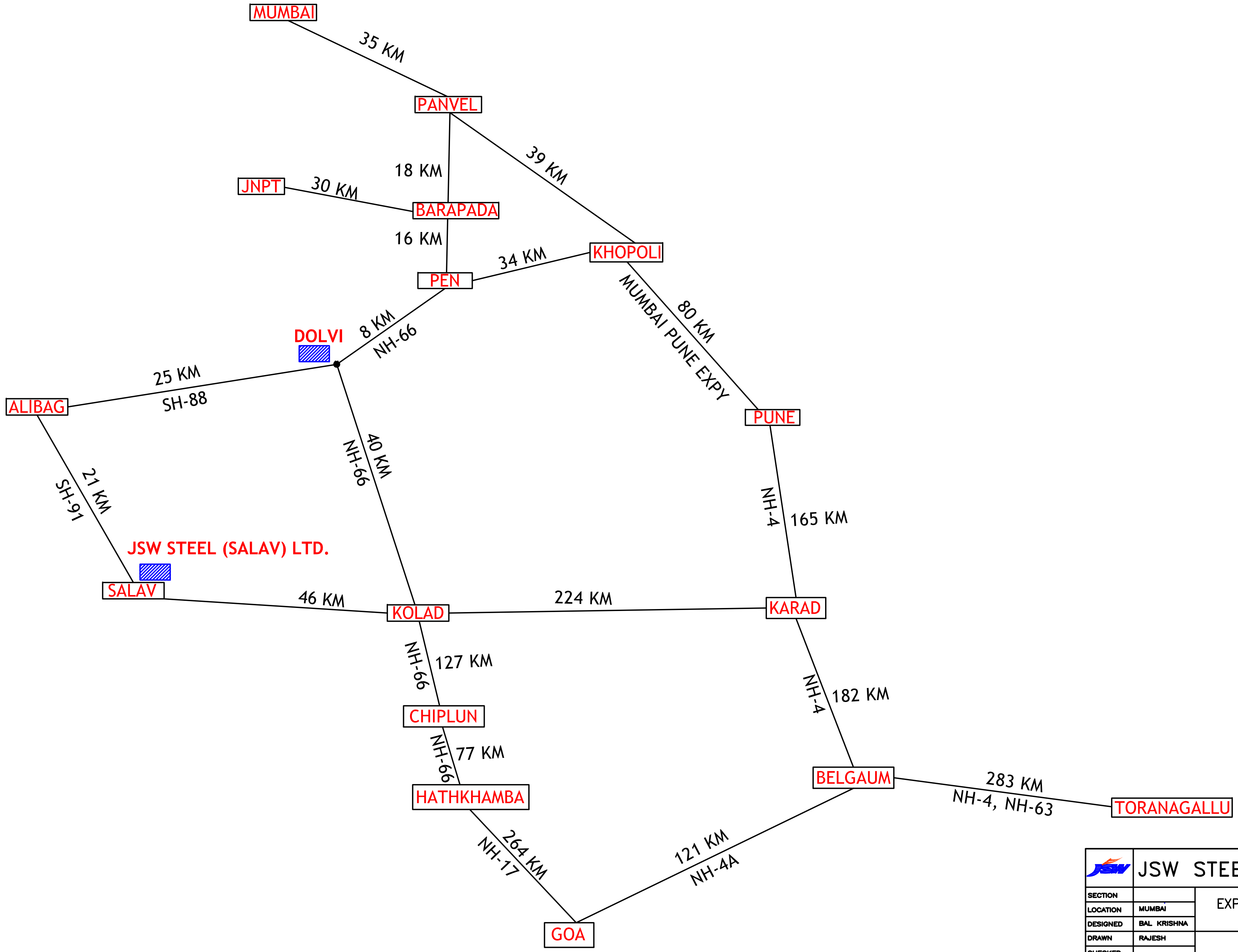


JSW STEEL (SALAV) LTD.			
SECTION		EXPANSION OF STEEL PLANT TO 3.0 MTPA	
LOCATION	MUMBAI		
DESIGNED	BAL KRISHNA		
DRAWN	RAJESH	LOCATION MAP	
CHECKED AND VERIFIED	BADAL		
APPROVED	SIG.	SCALE– NTS	REV.
	DATE: 08/12/15	DRG.No. : JSW/SALAV/PR/001	0



JSW STEEL (SALAV) LTD.

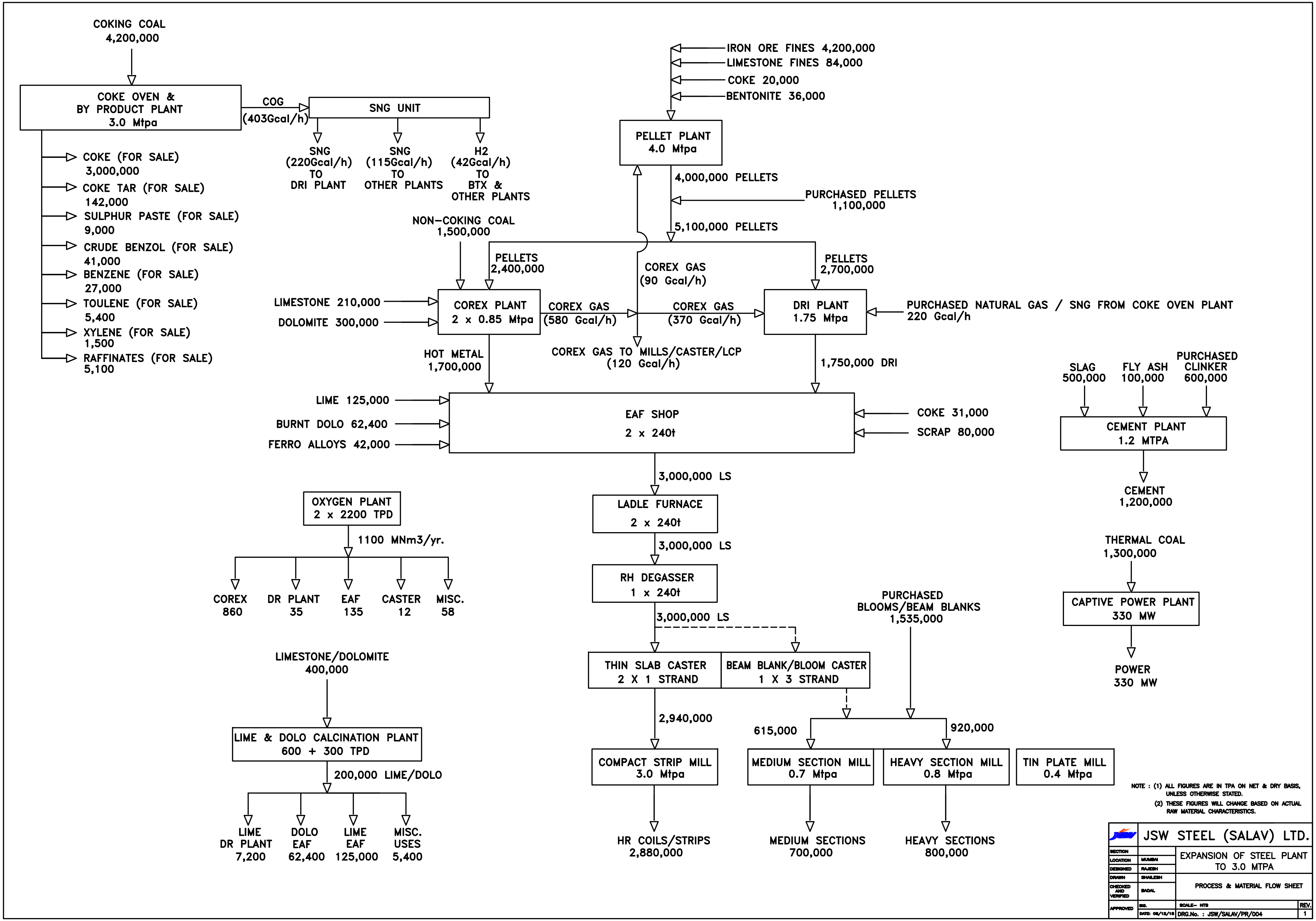
SECTION		EXPANSION OF STEEL PLANT TO 3.0 MTPA		
LOCATION	MUMBAI			
DESIGNED	BAL KRISHNA			
DRAWN	RAJESH	REGIONAL MAP		
CHECKED AND VERIFIED	BADAL			
APPROVED	SIG.	SCALE– NTS		REV.
	DATE: 08/12/15	DRG.No. : JSW/SALAV/PR/002		0



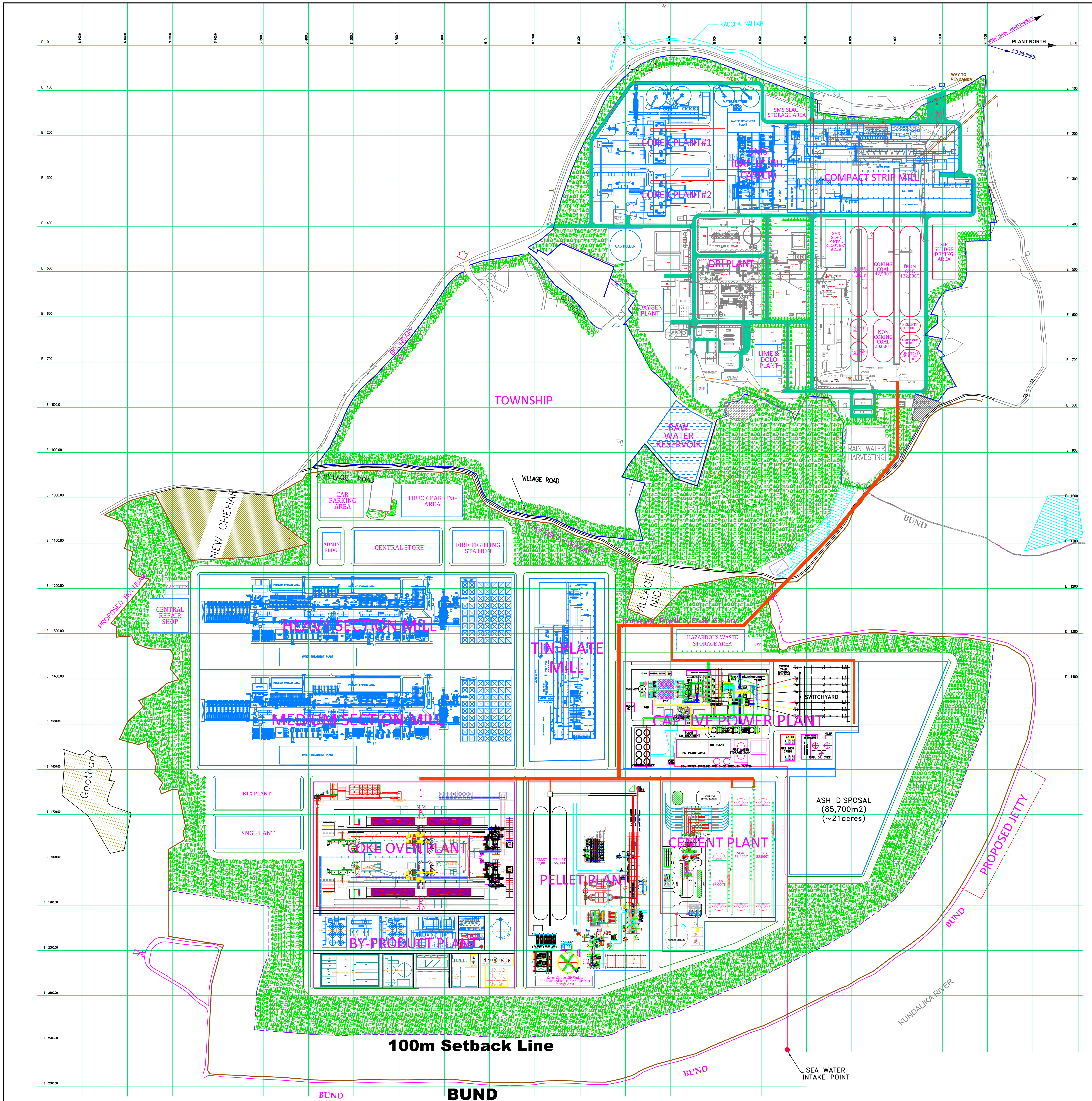
JSW STEEL (SALAV) LTD.

SECTION		EXPANSION OF STEEL PLANT TO 3.0 MTPA
LOCATION	MUMBAI	
DESIGNED	BAL KRISHNA	
DRAWN	RAJESH	ROAD LINKAGE
CHECKED AND VERIFIED	BADAL	
APPROVED	SIG.	SCALE– NTS
	DATE: 08/12/15	DRG.No. : JSW/SALAV/PR/003

REV. 0



COKING COAL 4,200,000
COKE OVEN & BY PRODUCT PLANT 3.0 Mtpa
COG (403Gcal/h)
SNG UNIT
SNG (220Gcal/h) TO DRI PLANT
SNG (115Gcal/h) TO OTHER PLANTS
H2 (42Gcal/h) TO BTX & OTHER PLANTS
COKE (FOR SALE) 3,000,000
COKE TAR (FOR SALE) 142,000
SULPHUR PASTE (FOR SALE) 9,000
CRUDE BENZOL (FOR SALE) 41,000
BENZENE (FOR SALE) 27,000
TOULENE (FOR SALE) 5,400
XYLENE (FOR SALE) 1,500
RAFFINATES (FOR SALE) 5,100
IRON ORE FINES 4,200,000
LIMESTONE FINES 84,000
COKE 20,000
BENTONITE 36,000
PELLET PLANT 4.0 Mtpa
4,000,000 PELLETS
PURCHASED PELLETS 1,100,000
5,100,000 PELLETS
NON–COKING COAL 1,500,000
PELLETS 2,400,000
COREX GAS (90 Gcal/h)
PELLETS 2,700,000
LIMESTONE 210,000
DOLOMITE 300,000
COREX PLANT 2 x 0.85 Mtpa
COREX GAS (580 Gcal/h)
COREX GAS (370 Gcal/h)
DRI PLANT 1.75 Mtpa
PURCHASED NATURAL GAS / SNG FROM COKE OVEN PLANT 220 Gcal/h
HOT METAL 1,700,000
COREX GAS TO MILLS/CASTER/LCP (120 Gcal/h)
1,750,000 DRI
LIME 125,000
BURNT DOLO 62,400
FERRO ALLOYS 42,000
EAF SHOP 2 x 240t
COKE 31,000
SCRAP 80,000
SLAG 500,000
FLY ASH 100,000
PURCHASED CLINKER 600,000
CEMENT PLANT 1.2 MTPA
CEMENT 1,200,000
3,000,000 LS
LADLE FURNACE 2 x 240t
3,000,000 LS
RH DEGASSER 1 x 240t
3,000,000 LS
OXYGEN PLANT 2 x 2200 TPD
1100 MNm3/yr.
COREX 860
DR PLANT 35
EAF 135
CASTER 12
MISC. 58
THERMAL COAL 1,300,000
CAPTIVE POWER PLANT 330 MW
POWER 330 MW
PURCHASED BLOOMS/BEAM BLANKS 1,535,000
THIN SLAB CASTER 2 X 1 STRAND
BEAM BLANK/BLOOM CASTER 1 X 3 STRAND
LIMESTONE/DOLOMITE 400,000
LIME & DOLO CALCINATION PLANT 600 + 300 TPD
200,000 LIME/DOLO
LIME DR PLANT 7,200
DOLO EAF 62,400
LIME EAF 125,000
MISC. USES 5,400
2,940,000
615,000
920,000
COMPACT STRIP MILL 3.0 Mtpa
MEDIUM SECTION MILL 0.7 Mtpa
HEAVY SECTION MILL 0.8 Mtpa
TIN PLATE MILL 0.4 Mtpa
HR COILS/STRIPS 2,880,000
MEDIUM SECTIONS 700,000
HEAVY SECTIONS 800,000
NOTE : (1) ALL FIGURES ARE IN TPA ON NET & DRY BASIS, UNLESS OTHERWISE STATED.
(2) THESE FIGURES WILL CHANGE BASED ON ACTUAL RAW MATERIAL CHARACTERISTICS.
JSW STEEL (SALAV) LTD.
SECTION
LOCATION MUMBAI
DESIGNED RAJESH
DRAWN SHAILESH
CHECKED AND VERIFIED BADAL
APPROVED
SIG.
DATE: 08/12/15
EXPANSION OF STEEL PLANT TO 3.0 MTPA
PROCESS & MATERIAL FLOW SHEET
SCALE– NTS
DRG.No. : JSW/SALAV/PR/004
REV. 1



LEGENDS:-

- EXISTING EQUIPMENTS/AREA
- PROPOSED EQUIPMENTS/AREA
- BUND
- EXISTING BOUNDARY WALL
- PROPOSED BOUNDARY WALL
- GREEN BELT AREA

JSW STEEL (SALAV) LTD.		
SECTION		3.0 MT/YR STEEL PLANT AT SALAV, MAHARASHTRA
LOCATION		
DESIGNED		
DRAWN		GENERAL LAYOUT
CHECKED AND VERIFIED		
APPROVED	SIG.	SCALE– 1:4,200 (A1)
	DATE: 28/12/15	DRG.No. : JSW/SALAV/PR/005
REV.	3	

JSW STEEL (SALAV) LTD.
EXPANSION OF STEEL PLANT TO 3.0 MTPA
PROJECT IMPLEMENTATION SCHEDULE

SL. NO.	ACTIVITIES	DURATION OF ACTIVITY
1	Project Approval	0 Month
2	Basic Design	6 Months
3	Detailed Engineering	9 Months
4	Tendering, Scrutiny and order placement	12 Months
5	Planning & construction of Infrastructure facilities	16 Months
6	Civil works	18 Months
7	Fabrication & Erection of Structures	18 Months
8	Delivery of Equipment	20 Months
9	Erection of Equipment	12 Months
10	Testing & Commissioning	3 Months
11	Production to commence	-

DURATION IN MONTHS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

DRG No. - JSW/SALAV/PR/006