2019

PRE-FEASIBILITY REPORT
FOR
INTEGRATED STEEL PLANT OF ELECTROSTEEL STEELS LIMITED FOR PRODUCTION OF 3.0 MTPA HOT METAL WITH BLAST FURNACE (1×1050 m³, 1×350 m³, 1×1700 m³) ALONG WITH CPP OF CAPACITY 160 MW

M/s ELECTROSTEEL STEELS LIMITED
(an enterprise of Vedanta Limited)
at
Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand -827013
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Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Sijaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupather, Dist Bokaro, Jharkhand-827013

CHAPTER-1

EXECUTIVE SUMMARY

Electrosteel Steels Ltd (formerly Electrosteel Integrated Limited) has set up an Integrated Steel plant at village Sijaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupather, Dist Bokaro, Jharkhand-827013 over an area of 374.80 ha with coordinate from 86° 17' 10.618" E 23° 37' 34.882" N to 86° 18' 39.599" E 23° 37' 52.733" N. It primarily consists of a Sinter Plant, Coke Oven, Blast Furnace, Basic Oxygen Furnace, Elite Caster, Wire Rod Mill, Bar Mill and Power Plant.

The project has adopted steel making through Blast Furnace route with forward integration of SMS and Backward integration of Pelletization. The project falls under Category- A, under section-3 (a) as per the prevailing EIA Notification, dated 14th September 2006 and amendments thereafter.

Electrosteel had entered in to a MoU with the State of Jharkhand State, for setting up an integrated steel plant at Bokaro location in the Year 2008. Subsequently Electrosteel Steels Limited had gone for NCLT and was acquired by Vedanta Limited in 2018. Vedanta Limited has acquired 90% equity shareholding in ESL with effective date of June 4, 2018 and also re-constituted the board of directors of ESL.

The following configurations is desired to complete the objective of the project in its present form in achieving 3.0 MTPA steel production from Coke Oven (HRT): 2× 0.5 MTPA, Sinter Plant: 2×105 m² (2.744 MTPA), Pellet Plant: 2.2 MTPA, Blast Furnace: 3 nos (1×1050 m³, 1×350 m³, 1×1700 m³) : (3.0 MTPA), SMS: 4×60 T BOF, 4×T LRF, (2×5)+(2×4) Strand, Billet caster: (Pig Casting: 0.35 MTPA, Rebar Mill: 1.9 MTPA & Wire Rod Mill:0.5 MTPA), DI Pipe: 0.4 MTPA, Oxygen Plant(2nos): 1990 MTPA, Power Plant: 2× 60 MW, 1×40 MW, (3× 130 TPH CFBC, 4×75 TPH WHRB), Lime Plant: (1× 600 TPD)+ (1× 800 TPD) & Dolo Plant: 150 TPD.

This is a Brown Field Project as per EIA Notification schedule under 3(a), categorized as “A” due to its capacity. Further on industrial classification based on Pollution Index, this is a Categorized as “Red” project.
As the steel plant has been already established with main operational units on site and made functional since 2010 so no alternative location is justified.

The project will have direct and indirect impact on the employment of 10,000 persons, which will have a significant impact on local employment.

Raw material required for the proposed project are Iron Ore, Iron Ore Fines, Imported Coal, Indian Coal, Dolomite, Lime Stone, Magnesium Powder, Qtzite, Coke Breeze, Coke, Net Coke & Bentownite. Some of the raw materials are transported from road, rail & some are from plant itself as byproduct of some processes.

The total water requirement for the project is being estimated at 1005 m³/hr and is drawn from Damodar River. WRD, Jharkhand Govt. has granted to withdraw 36.50 MCM water from the river Damodar.

The total Power requirement is 218 MW. Out of which 160 MW will be generated from CPP & 58 MW will be procured from DVC.

The plant has good communication by road, as all villages and towns have paved roads and are connected by bus services. The nearest town of Bokaro is 14Km away. The nearest railway station is Talgaria under South-Eastern Railway about 7 km & Shewbabudih-15 away from proposed plant site towards north-east. Talgaria-Chas-Bokaro link line is passing about 4 km north of the plant. The nearest domestic airport is Birsa Munda Airport in Ranchi and international airport is Netaji Subhash Chandra Bose International Airport at Kolkata, about 132km. and 320 km respectively from Plant. District Headquarter is Bokaro Steel City which is 14Km away from location.

The total land is under the possession of M/s Electrosteel Steels Ltd. and is intended for Industrial use only. Out of the total Land of 374.80 Ha, 184.23 Ha is Forest land and rest 190.57 Ha is Non-Forest Land. For the forest area, a diversion proposal is been under process in MoEF and the FAC approval of Stage I is completed.

Topographically it is a lower plateau having relatively little undulations. The average altitude of the land is 210 m from mean sea level. The important rivers, flowing in the area are Damodar, Garga & Ijri Nadi.
Three soil orders namely Entisols, Inceptisols and Alfisols are mainly found in this location.

The Bokaro climate is tropical in nature. The summers are much rainier than the winters in Bokaro. The average temperature in Bokaro is 26.2 °C and average Precipitation is 1202 mm. The driest month is December. There is 2 mm of precipitation in December. The greatest amount of precipitation occurs in July, with an average of 308 mm. With an average of 33.2 °C, May is the warmest month. The lowest average temperatures in the year occur in January, when it is around 18.5 °C.

The location of the area comes under Bokaro district. According to 2011 Census population of the district is 2,062,330 which sex ratio is 916 females for every 1000 males and the literacy rate around 74%. Language spoken in this area mainly Hindi, Santali, Bengali, Urdu & Maithili.

Temporary influx of people will be there as the managerial and supervisory staff will generally be outsider. A projection may be made by a governmental organization, or by those unaffiliated with a government.

As per norms 33% of greenbelt area will be there from the total project area, but presently about 105.99Ha (28.3%) of the total project area is covered under greenbelt & plantation in order to reduce dust & noise pollution levels & to increase aesthetic beauty of the area. Rest 4.7% of the plantation will be done after Environment Clearance.

Drinking water system caters to the water requirement of plant personnel for drinking and sanitary purposes, laboratory, canteen and other miscellaneous uses. Few stationary RO facilities will be installed for facilitating good drinking water to all inside plant during operation.

The sewage generated from the toilet blocks of different area will be collected by means of suitable sewer system for treatment in package type Sewage Treatment Plant (STP). The STP will be provided in the proposed expansion of the plant. The treated sewage will be transported to the Central Effluent Treatment Plant (CETP). Plant would be designed on Zero Effluent Discharge scheme.
The proposed project would generate various types of wastes including hazardous, liquid effluents and solid wastes. The proper management facilities are envisaged for all type wastes in plant.

The proposed project will be implemented in the present plant premises. As settlement will not be affected so, no R&R facility is anticipated.

The project is already been established hence there will be no additional cost for Land acquisition and establishment setups. The estimated project cost to complete the total project is ₹5979 crores. The total Project Cost including the Installed entities are estimated at ₹19374 crores.

Time schedule for completion of various activities including new setups as well as modifications of present setups are as follows: Coke Oven-18 months, Blast Furnace-27 months, Steel Melt Shop-28 months, Pellet Plant-26 months, Bar Mill -28 months, Lime Calcining Plant-26 months.
CHAPTER-2
INTRODUCTION OF THE PROJECT

2.0 INTRODUCTION

Electrosteel Steels Ltd (formerly Electrosteel Integrated Limited) has set up an Integrated Steel plant at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013 over an area of 374.80 ha. It primarily consists of a Sinter Plant, Coke oven, Blast Furnace, Basic Oxygen Furnace, Elite Caster, Wire Rod Mill, Bar Mill and Power Plant.

M/s ESL was admitted under Corporate Insolvency Resolution process in terms of the Insolvency and Bankruptcy Code, 2016 ("IBC") and the insolvency proceedings were commenced against M/s ESL by State Bank of India, pursuant to order dated July 21, 2017 passed by the Hon'ble National Company Law Tribunal, Kolkata Bench ("NCLT"). to revive the company and keep it in operation as a ‘going concern’ besides resolving the gross NPA due to huge exposure of banks and financial institutions in ESL. The NCLT, vide its order dated April 17, 2018 under Section 31(1) of the IBC, approved the ‘Resolution Plan’ submitted by the Vedanta Limited for ESL vide its Order dated August 10, 2018. Consequent to the above, Vedanta Limited has acquired 90% equity shareholding in ESL with effective date of June 4, 2018 and also re-constituted the board of directors of ESL. Copy of Final Order letter by NCLT dated-17.04.2018 is attached as Annexure-1.

Vedanta Resources Limited is a globally diversified natural resources company. We extract and process minerals, oil and gas, engage more than 65,000 employees and contractors, primarily in India, Africa, Ireland and Australia. Our products are sold worldwide; we are headquartered in London, United Kingdom. Vedanta Resources Limited is the holding company for Vedanta Limited and Konkola Copper Mines, which in turn have multiple subsidiaries. We are run by a unified board and management.

Our corporate goal is to create long-term shareholder value through research, discovery, acquisition, sustainable development and utilization of natural resources.
We do this through our diversified portfolio of large, long-life and low-cost assets across the globe. We are among the top producers of major commodities, including zinc-lead-silver, iron ore, steel, copper, aluminum, oil and gas.

2.1 IDENTIFICATION OF THE PROJECT & PROJECT PROPOONENT

The ESL plant is located at Siyaljhori in Bokaro district of Jharkhand equipped capacitated with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at Village Siyaljori, District- Bokaro, and Jharkhand-827013.

Electrosteel had entered in to a MoU with the State of Jharkhand State, for setting up an integrated steel plant at Bokaro location in the Year 2008 as attached in Annexure 2.

M/s Elecrosteel Integrated Ltd that initiated the project in 2006/2007, obtained environmental Clearance etc. in 2008, The company latter changed its name in 2010 to Electrosteel Steels Ltd. firm, which has gone into liquidation under Insolvency Bankruptcy Code process conducted by NCLT, with the takeover of the firm by another promoter (Vedanta Group), the litigations are also being pursued by the successor corporate entity Vedanta Limited, which has acquired 90% equity shareholding in ESL with effective date of June 4, 2018 and also re-constituted the board of directors of ESL thereafter.

Mr. Anil Agarwal was appointed to the Board of Vedanta Limited in May 2003 and became the Executive Chairman in March 2005 and he chairs the Nominations’ Committee. He founded the Group in 1976 and has over three decades of entrepreneurial and mining experience. He has led the Group and has helped to shape its strategic vision. He is also a director of Sterlite Technologies Limited, Conclave PTC Limited and the Anil Agarwal Foundation.

Mr. Navin Agarwal was appointed to the Board in November 2004 and became the Executive Vice Chairman of Vedanta Resources Limited in June 2005. He has over 25 years of executive experience within the Group and is currently the executive chairman of Vedanta Limited. He is the Chairman of the Group’s Human Resources
Advisory Committee and has championed personnel training and development initiatives to grow the talent pipeline for senior management succession planning within the Group.

2.2 BRIEF DESCRIPTION AND NATURE OF THE PROJECT

The project is located in village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar of Bokaro district of Jharkhand. The present plant is spread over 374.80 ha. of land to produce bars, wire rods, DI pipes, pig iron and billets. The given project has adopted steel making through Blast Furnace route with forward integration of SMS and Backward integration of Pelletization. The project falls under Category- A, under section-3 (a) as per the prevailing EIA Notification, dated 14th September 2006 and amendments thereafter.

2.2.1 Chronology of the Project Implementation

- Environmental clearance issued in respect of M/s Electrosteel Steels Integrated Ltd for setting up Integrated Steel Plant (3.0 MTPA) at Parbatpur, Jharkhand vide no F.No.J-11011/137/2008-IAII (J) dated 21st February, 2008 Annexure-3. Accordingly Consent to Establish was obtained from Jharkhand State Pollution Control Board as per provision under Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981 on 05.05.2008 as in Annexure-4.

- After obtaining required NOCs, construction work started and CTE has been duly renewed from time to time in accordance with the compliance of construction at par with Environmental Clearance.

- During the extension of CTE beyond 04.05.2010, JSPCB issued show cause notice on the basis of Divisional Forest Officer memo dated 04.05.2010 alleging ongoing construction is being carried out on a part of Forest land Annexure-5. On due compliance to the show cause notice and in lieu of earlier suit no 26/1989 pending in Supreme court, JSPCB extended the validity for CTE up to 04.05.2011. When ESL about to complete the construction work applied for consent to operate and same has been granted on the verdict of the Order of High Court of Jharkhand at ranch W.P.(C) No.2247 of 2012, W.P.(C) No.2033 of 2015 as in Annexure-6.
Meanwhile the name of company changed from M/s Electrosteel Integrated Ltd to M/s Electro steel Steels Ltd and No objection certificate obtained from MoEF & CC vide letter dated 9th February, 2012 as in Annexure-7.

Thereafter, M/s ESL was admitted under Corporate Insolvency Resolution process in terms of the Insolvency and Bankruptcy Code, 2016 (“IBC”) and the insolvency proceedings were commenced against M/s ESL by State Bank of India pursuant to order dated July 21, 2017 passed by the Hon'ble National Company Law Tribunal, Kolkata Bench ("NCLT"). to revive the company and keep it in operation as a ‘going concern’ besides resolving the gross NPA due to huge exposure of banks and financial institutions in ESL. The NCLT, vide its order dated April 17, 2018 under Section 31(1) of the IBC, approved the ‘Resolution Plan’ submitted by the Vedanta Limited for ESL vide its Order dated August 10, 2018 as in Annexure-1.

Consequent to the above, Vedanta Limited has acquired 90% equity shareholding in ESL with effective date of June 4, 2018 and also re-constituted the board of directors of ESL.

The new management has planned to comply all the irregularity pending against the project and invest further to expand the project for achieving optimum utilisation of assets.

The Jharkhand State Pollution Control Board denied extending the CTO (Consent to Operate) on 21.08.2018. ESL challenged the denial of CTO by JSPCB in the same WP(C) No.1873/2018 before Hon'ble High Court, Jharkhand. The Hon'ble High Court in its order dated 25.08.2018 directed the MoEF & CC, Gol to dispose the show cause notice of June’2012 by giving the opportunity of hearing to the company. The MoEF & CC, Gol granted an opportunity to the project proponent for a personal hearing on 10.09.2018 and thereafter decided to revoke the EC vide order dated 20.09.2018 as in Annexure-8.

The Project Proponent again challenged the revocation of EC in WP(C) No. 4850/2018 wherein the Hon'ble High Court, Jharkhand vide order dated 27.09.2018 granted the interim relief staying implementation of the EC
revocation order till 10.10.2018, which has been extended in subsequent hearings as in Annexure-9.

- The project proponent was allowed the opportunity to apply for revised Environmental Clearance and Forest Clearance under protest and without prejudice to their rights over the land alleged to be forest.
- Thereby ESL filed a forest diversion proposal for regularization of the alleged violations of Forest Conservation Act, 1980 and in light of order dated 25.8.2018 of Hon’ble High Court of Jharkhand in the case of WPC 1873 of 2018 and 4850 of 2018. The Forest Appraisal Committee in its meeting held on 26.09.2019 has recommended the proposal for in-principle approval which is under active consideration at MOEF-HO for issuance of Stage-I order. The MoM of the FAC is attached herewith in Annexure-10.

Moreover, in order to optimise land, Vedanta Ltd. has taken due consideration to the available land under possession within 374.80 ha of contiguous land to setup the total units deemed for production of 3 MTPA steel in a state-of-art operation at ESL location. The same has been applied in the DRP proposal, with Stage-I approval under consideration after FAC Approval. The same land area is been proposed herewith for the project to produce 3.0 MTPA Steel with the configurations as follows.

### 2.3 NEED OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION

Industrialization has an important role to play in the economic development of the under-developed countries like India with huge man power and large and varied resources.

Based on the need of the State, Electrosteel had entered into a MoU with the State of Jharkhand on 1/2/20108 with the following objectives:

1. Utilization of Natural Resources & rapid Industrialization of the State
2. Bring prosperity and well being to its people by making determined efforts to facilitate setting up new industrial units in different locations of the State.
3. Recognition of M/s Electrosteel Integrated limited as a responsible corporate house with high involvement in its employees’ welfare & social development.
On and above keeping the national interest for Steel manufacturing having following objectives, this project has been conceptualized.

**Rapid growth of income**
The first and the foremost argument in favor of industrialization is that it can provide a base for rapid growth of income. It is because of the fact that that productivity rates are higher in industry than in agriculture. Industries mainly depend on man's effort while agriculture is restricted by the limiting factor of the nature. It is also seen that the Industrialized nations have a high per capita income.

**Employment**
With the increasing population agriculture is unable to provide for employment. Hence it is very important to set up industries to absorb this surplus labor & industries can solve the problem of unemployment.

**Exploitation of resources**
Industries are capable of utilizing all the resources present in the economy. They can even make use of scraps and waste materials. Agriculture cannot make use of all the resources.

**Foreign exchange**
India cannot earn adequate foreign exchange from the exports of its primary products. It is because of the fact that the demand for such products is very low in other countries. Industrial exports need to be added to the primary products.

**Development of Agriculture**
The requirements of agriculture are met by the industries in large. Agriculture requires improved farm machinery, chemical fertilizers and pesticides. It also requires storage and transport facilities. All these are adequately provided by our own industries.

**Balanced Development**
Ours is an unbalanced economy. Our greater dependence on agriculture has made us poor. With the industrialization in the economy this disparity can be removed. If agriculture is the backbone of the economy, industry is the energy.

**Self-sustained Growth**
The rapid development of capital goods industries promotes the growth of agriculture, transport and communication. It also enables the country to produce a variety of consumer goods in large quantities and at low costs. It also eliminates our dependence on other countries for the supply of essential goods.

**Nation's Security**

Dependence on foreign countries for defense goods is always risky affair. We do not have good relations with our neighboring countries especially Pakistan and China.

The project will have direct and indirect impact on the employment of 10,000 persons, which will have a significant impact on local employment.

The role of iron and steel industry in India GDP is very important for the development of the country. Iron and steel are among the most important components required for the infrastructure development in the country.

The iron and steel industry is one of the most important industries in India. During 2014 through 2018, India was the third largest producer of raw steel and the largest producer of sponge iron in the world. The steel industry at present produces 91.46 million tons of total finished steel and 9.7 million tons of raw iron. Most iron and steel in India is produced from iron ore. The Indian Ministry of Steel is concerned with: the coordination and planning of the growth and development of the iron and steel industry in the country, both in the public and private sectors; formulation of policies with respect to production, pricing, distribution, import and export of iron and steel, ferro alloys and refractories; and the development of input industries relating to iron ore, manganese ore, chrome ore and refractories etc, required mainly by the steel industry. There are more than 50 iron and steel industries in India.

Jharkhand is a state that is rich in mineral resources. It is also one of the leading industrialized states of the country. The iron and steel industry of the state plays a very important role in its growth and development. It is one of the key industries required for industrial progress.
Various important industries like the construction, power plants, heavy and light machine, automobile, etc. depend on the iron and steel industry for their growth and expansion. The mineral resources of Jharkhand have helped the iron and steel industry to flourish in the state.

The need for the expansion of Sponge Iron, TMT Bars, M.S. Billet and Captive power plant is due to the rising infrastructural steel demand. Captive Power plant will be installed to meet the demand of electricity.

2.4 DEMAND–SUPPLY GAP

Demand in India is largely being driven by the infrastructure sector. According to SBICAP Securities, demand for long steel products increased 9.6% during the April 2018-February 2019 period. Comparatively, demand for flat products, which largely emanates from the automobile sector, is up 4.8%.

India was the world’s second-largest steel producer® with production standing at 106.5 MT in 2018. The growth in the Indian steel sector has been driven by domestic availability of raw materials such as iron ore and cost-effective labor. Consequently, the steel sector has been a major contributor to India’s manufacturing output.

The Indian steel industry is very modern with state-of-the-art steel mills. It has always strived for continuous modernization and up-gradation of older plants and thrives to attain higher energy efficiency levels.

Indian steel industries are classified into three categories such as major producers, main producers and secondary producers.

Due to pressure from the construction sector, the demand for long will continue to dominate the steel industry, while on the supply side, flats are expected to dominate the market.

In the optimistic scenario, all crude steel capacity expansion targets announced by steel companies is aggregated. Under this scenario, it was estimated that crude steel capacity will be 259.11 Million Tons in 2020-21. However, this will be possible only if the crude steel capacity targets, as announced by steel producers are met. However,
for 2020-21, this scenario estimates a more reasonable capacity of 210.11 Million Tons.

**Base Case Scenario:** The base case scenario gives a lower bound crude steel capacity estimate. It accounts for delays in commissions of projects due to problems associated with land acquisition, obtaining environmental clearances, raw material availability, etc. The effect of these delays on the date of commissioning of projects was assessed through interviews with experts and a review of secondary literature. According to this scenario, crude steel capacity in the country in 2020-21 will be 178.8 Million Tons.

Currently, demand for finished steel in India is estimated to be around 70 Million Tons. This is expected to more than double to 166 Million Tons by 2020-21. This demand will mainly be driven by the construction (real estate and infrastructure), automobile and consumer durables sectors. It must be noted that this figure includes only domestic demand for steel. Demand from international markets will further push this figure up.

### 2.5 IMPORTS VS. INDIGENOUS PRODUCTION & EXPORT POSSIBILITY

**Global Scenario**

- In 2016, the world crude steel production reached 1630 million tonnes (mt) and showed a growth of 0.6% over 2015.
- China remained world’s largest crude steel producer in 2016 (808 mt) followed by Japan (105 mt), India (96 mt) and the USA (79 mt).
- World Steel Association has projected Indian steel demand to grow by 6.1% in 2017 and by 7.1% in 2018 while globally, steel demand has been projected to grow by 1.3% in 2017 and by 0.9% in 2018. Chinese steel use is projected to show nil growth in 2017 and decline by 2% in 2018.
- Per capita finished steel consumption in 2016 is placed at 208 kg for world and 493 kg for China by World Steel Association.

**Domestic Scenario**
The Indian steel industry has entered into a new development stage, post deregulation, riding high on the resurgent economy and rising demand for steel.

Rapid rise in production has resulted in India becoming the 3rd largest producer of crude steel in 2015 as well as in 2016. The country was the largest producer of sponge iron or DRI in the world during the period 2003-2015 and emerged as the 2nd largest global producer of DRI in 2016 (after Iran). India is also the 3rd largest finished steel consumer in the world and maintained this status in 2016. Such rankings are based on provisional data released by the World Steel Association for the above year.

In a de-regulated, liberalized economic/market scenario like India the Government’s role is that of a facilitator which lays down the policy guidelines and establishes the institutional mechanism/structure for creating conducive environment for improving efficiency and performance of the steel sector.

In this role, the Government has released the National Steel Policy 2017, which has laid down the broad roadmap for encouraging long term growth for the Indian steel industry, both on demand and supply sides, by 2030-31.

The said Policy is an updated version of National Steel Policy 2005 which was released earlier and provided a long-term growth perspective for the domestic iron and steel industry by 2019-20.

The Government has also announced a policy for providing preference to domestically manufactured Iron & Steel products in Government procurement. This policy seeks to accomplish PM’s vision of ‘Make in India’ with objective of nation building and encourage domestic manufacturing and is applicable on all government tenders where price bid is yet to be opened. Further, the Policy provides a minimum value addition of 15% in notified steel products which are covered under preferential procurement. In order to provide flexibility, Ministry of Steel may review specified steel products and the minimum value addition criterion.
India’s finished steel consumption grew at a CAGR of 5.69 per cent during FY08-FY18 to reach 90.68 MT.

India’s crude steel and finished steel production increased to 103.13 MT and 104.98 MT in 2017-18, respectively.

In 2017-18, the country’s finished steel exports increased 17 per cent year-on-year to 9.62 million tonnes (MT), as compared to 8.24 MT in 2016-17. Exports and imports of finished steel stood at 0.72 MT and 1.12 MT, respectively, in FY20P (up to May).

Production

- Steel industry was de-licensed and de-controlled in 1991 & 1992 respectively.
- India is currently the 3rd largest producer of crude steel in the world.
- In 2016-17 (prov.), production for sale of total finished steel (alloy + non-alloy) was 100.74 mt, a growth of 10.7% over 2015-16.
- Production for sale of Pig Iron in 2016-17 (prov.) was 9.39 mt, a growth of 1.8% over 2015-16.
- India was the largest producer of sponge iron in the world during the period 2003-2015 and was the 2nd largest producer in 2016 (after Iran). The coal based route accounted for 79% of total sponge iron production in the country in 2016-17 (prov).
- Data on production / production for sale of pig iron, sponge iron and total finished steel (alloy/stainless + non-alloy) are given below for last five years and April-May 2017

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig iron production for sale</td>
<td>6.870</td>
<td>7.950</td>
<td>9.694</td>
<td>9.228</td>
<td>9.391</td>
<td>1.53</td>
</tr>
<tr>
<td>Sponge Iron Production</td>
<td>23.01</td>
<td>22.87</td>
<td>24.24</td>
<td>22.43</td>
<td>24.39</td>
<td>4.23</td>
</tr>
<tr>
<td>Total finished steel production for sale(alloy/stainless+Non alloy)</td>
<td>81.68</td>
<td>87.67</td>
<td>92.16</td>
<td>90.98</td>
<td>100.74</td>
<td>17.48</td>
</tr>
</tbody>
</table>

Source: Joint plant committee prov
As per world steel association Steel Production in India decreased to 8961 Thousand Tonnes in September from 9350 Thousand Tonnes in August of 2019. Steel Production in India averaged 3354.19 Thousand Tonnes from 1980 until 2019, reaching an all time high of 9412 Thousand Tonnes in March of 2019 and a record low of 713 Thousand Tonnes in September of 1980.

On liberalization of the Indian steel sector with effect from 24.5.92, iron and steel industry was included in the list of ‘high priority’ industries for automatic approval for foreign equity investment up to 51%. This limit has since been increased to 100%.

The import regime for iron and steel has undergone major liberalization moving gradually from a controlled import by way of import licensing, foreign exchange release, canalization and high import tariffs to total freeing of iron and steel imports from licensing, canalization and lowering of import duty levels. Export of iron and steel items has also been freely allowed. Import duty on capital goods was reduced from 55% to 25%. Duties on raw materials for steel production were reduced. These measures reduced the capital costs and production costs of steel plants.

**Imports**
- Iron & steel are freely importable as per the extant policy.
- Data on import of total finished steel (alloy + non alloy) is given below for last five years:

**Exports**
- Iron & steel are freely exportable.
- Data on export of total finished steel (alloy + non alloy) is given below for last five years:
Above figures are indicative of constant increase of steel export from India and likely to increase further in coming years. The New Industrial policy opened up the Indian iron and steel industry for private investment by (a) removing it from the list of industries reserved for public sector and (b) exempting it from compulsory licensing. Imports of foreign technology as well as foreign direct investment are now freely permitted up to certain limits under an automatic route. Ministry of Steel plays the role of a facilitator, providing broad directions and assistance to new and present steel plants, in the liberalized scenario. World Steel 2018 in given figure. Large scale development in this region for projects like building construction, irrigation, roads and industrial fabrication has created market for structural steel.

2.6 NATIONAL STEEL POLICY

The National Steel Policy aims at achieving the following objectives –

i. Build a globally competitive industry with a crude steel capacity of 300 MT by 2030-31.

ii. Increase per Capita Steel Consumption to 160 Kgs by 2030-31.

iii. To domestically meet entire demand of high grade automotive steel, electrical steel, special steels and alloys for strategic applications by 2030-31.
iv. Increase domestic availability of washed coking coal so as to reduce import dependence on coking coal to 50% by 2030-31.

v. To be net exporter of steel by 2025-26.

vi. Encourage industry to be a world leader on energy and raw material efficient steel production by 2030-31, in a safe and sustainable manner.

vii. Develop and implement quality standards for domestic steel products.

2.7 EMPLOYMENT POTENTIAL DUE TO THE PROJECT

The objective of this manpower estimate is primarily to derive the labour component of production cost and to indicate the order of manpower requirement. However, it will be necessary to review the manpower requirements at a later date on the basis of the final layout &logistics, equipment and facilities installed, degree of automation, actual mode of operation practice and management policies adopted.

Three dedicated senior managers will be required for each of iron making, steel making and rolling mill area.

It is estimated that the total manpower requirement on pay roll for the project will be about 1437 and total 10000 employment will be generate directly or indirectly due to the project.
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

<table>
<thead>
<tr>
<th>Area</th>
<th>Manpower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Making</td>
<td>447</td>
</tr>
<tr>
<td>Steel Making</td>
<td>148</td>
</tr>
<tr>
<td>Rolling and Pipe production</td>
<td>717</td>
</tr>
<tr>
<td>Captive Power Plant</td>
<td>45</td>
</tr>
<tr>
<td>Plant services</td>
<td>47</td>
</tr>
<tr>
<td>Quality Assurance and lab</td>
<td>33</td>
</tr>
<tr>
<td>Total works (A)</td>
<td>1437</td>
</tr>
<tr>
<td>Admin+ works overhead (B)</td>
<td>11</td>
</tr>
<tr>
<td>Total (A+B)</td>
<td>1448</td>
</tr>
</tbody>
</table>

Most of the semi skilled and unskilled labor will be sourced from the peripheral villages and suburb of Bokaro Steel City.
CHAPTER-3
PROJECT DESCRIPTION

3.1 PROJECT HIGHLIGHTS

The proposed project is an Integrated Steel Plant to manufacture products viz bars, wire rods, DI pipes, pig iron and billets. The following configurations is desired to complete the objective of the project in achieving 3.0 MTPA steel production.

- Coke Oven (HRT): 2× 0.5 MTPA
- Sinter Plant: 2×105 m² (2.744 MTPA)
- Pellet Plant: 2.2 MTPA
- Blast Furnace: 3 nos (1×1050 m³, 1×350 m³, 1×1700 m³) : (3.0 MTPA)
- SMS: 4×60 T BOF, 4×T LRF, (2×5)+(2×4) Strand Billet caster:
  - Pig Casting: 0.35 MTPA
  - Rebar Mill: 1.9 MTPA
  - Wire Rod Mill: 0.5 MTPA
- DI Pipe: 0.4 MTPA
- Oxygen Plant(2nos): 1990 MTPA
- Power Plant: 2× 60 MW, 1×40 MW , (3× 130 TPH CFBC, 4×75 TPH WHRB)
- Lime Plant: (1× 600 TPD)+ (1× 800 TPD)
- Dolo Plant: 150 TPD

This is a Brown Field Project with partial completed configuration within the land area of 374.8 Ha, listed in the EIA Notification schedule under 3(a), categorized as “A” due to its capacity. Further on industrial classification based on Pollution Index, this is a Categorized as “Red” project.

3.2 LOCATION

The industry is located at Village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, District- Bokaro, and Jharkhand. The coordinates of plant boundary are given below.

86° 17' 10.618" E 23° 37' 34.882" N   B1
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

86° 17' 10.352" E 23° 37' 44.894" N  B2
86° 17' 4.271" E 23° 37' 58.620" N  B3
86° 17' 8.605" E 23° 38' 29.082" N  B4
86° 16' 41.656" E 23° 38' 56.873" N  B5
86° 16' 23.950" E 23° 38' 55.645" N  B6
86° 16' 32.227" E 23° 39' 4.181" N  B7
86° 15' 33.795" E 23° 39' 18.545" N  B8
86° 14' 45.169" E 23° 39' 47.631" N  B9
86° 14' 53.172" E 23° 39' 28.177" N  B10
86° 17' 22.459" E 23° 38' 30.192" N  B11
86° 17' 31.281" E 23° 38' 10.087" N  B12
86° 17' 28.669" E 23° 38' 20.592" N  B13
86° 18' 2.725" E 23° 38' 12.500" N  B14
86° 17' 49.001" E 23° 39' 1.750" N  B15
86° 18' 13.900" E 23° 39' 15.171" N  B16
86° 18' 6.096" E 23° 39' 51.492" N  B17
86° 18' 16.227" E 23° 39' 49.408" N  B18
86° 18' 33.998" E 23° 39' 10.234" N  B19
86° 18' 19.082" E 23° 38' 11.555" N  B20
86° 18' 44.458" E 23° 38' 6.667" N  B21
86° 18' 39.599" E 23° 37' 52.733" N  B22
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

Figure 3.1: Location Map
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

Figure 3.3: Buffer Area Topo Map
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

Figure 3.4: Plant Layout
3.3 DETAILS OF ALTERNATE SITES

As because steel plant has been already established with main operational units (blast furnace, sinter, coke oven plant, captive thermal power plant, DI pipe production unit, wire rod and bar mills) on site and made functional since 2010, it is not justified for alternative location. The site selected for the industry is notable for a large wholesale market and small-scale industrial center of Bokaro and situated on the junction of National Highway 23 and National Highway 32. The geographical condition of site is suitable for establishment of industry. Hence alternative site has not been considered.

3.4 SIZE or MAGNITUDE OF OPERATION

The plant spread over an area of 374.80 ha with facilities of production of TMT bars, wire rods, DI pipes, pig iron and billets with Captive Power Plant.

3.5 PROJECT DESCRIPTION WITH PROCESS DETAILS

Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0 MTPA Hot Metal from Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³), backwardly integrated with 2.2 MTPA Pellet Plant, 2.74 MTPA sinter Plant (2 x 105 SqM) & 1 MTPA Coke Oven, forwardly integrated with SMS, Bar Mill, Wire Rod Mill & DI Pipes along with CPP of Capacity 160 MW is located at Village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, District-Bokaro, Jharkhand over an area of 374.80 ha. Project Configuration is given below table 3.1

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Facility</th>
<th>Existing Capacity</th>
<th>To Be Done</th>
<th>Final capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Coke Oven (Heat Recovery Type)</td>
<td>0.5MTPA (Vertical Coke Oven)</td>
<td>0.5MTPA (Horizontal Coke Oven)</td>
<td>0.5MTPA (Vertical Coke Oven) 0.5MTPA (Horizontal Coke Oven)</td>
</tr>
<tr>
<td>2.</td>
<td>Sinter Plant</td>
<td>2 x 105m³</td>
<td>-</td>
<td>2 x 105m³</td>
</tr>
<tr>
<td>3.</td>
<td>Pellet Plant</td>
<td>-</td>
<td>2.2 MTPA</td>
<td>2.2 MTPA</td>
</tr>
<tr>
<td>4.</td>
<td>Blast Furnace</td>
<td>1 x1050m³ 1 x350m³</td>
<td>1 x 1700m³(with 1 No. new electric blower)</td>
<td>1 x1050m³ 1 x350m³ 1 x 1700m³(with</td>
</tr>
</tbody>
</table>
In a conventional integrated steel plant, iron ore is processed in a blast furnace with coke to produce molten pig iron. This iron must be further processed in a basic oxygen furnace (BOF) to produce steel, which is then cast and formed into the desired shape and size.
During the iron-making process, a blast furnace is fed with the iron ore, coke and small quantities of fluxes (minerals, such as limestone, which are used to collect impurities) The air causes the coke to burn, producing carbon monoxide which reacts with the iron ore, as well as heat to melt the iron.

3.5.1 **Raw Materials Handling System**

The Raw Material Handling System will be modified to integrate the existing and proposed units in order to cater to the total project configuration of

1. Blast Furnace (BF-2 of 1050 cum, BF-1 of 1,700 cum and BF-3 of 350 cum capacities)
2. Sinter Plant (SP-1&2 of 105 sqm capacity each)
3. Lime Calcining Plant (800 tpd & 600 tpd)
4. Dolo Calcining Plant (150 tpd)
5. Coke Oven (0.5 mtpy & 0.5 mtpy)
6. Steel Melt Shop (2 x 60 BOF, 2 x 60T BOF and 2 x 60T LF)
7. Pellet Plant (2.2 mtpy)

The various systems of RMH Plant is listed as below:
a) **Unloading and dispatch for ore and flux to blast furnace, sinter plant and lime and dolo plant:**

All materials are received through trucks of capacity 20 T and 40 t. To cater to the truck traffic, four (4) nos. ground hopper with associated conveying system is in operation.

Imported raw materials (viz. limestone, Dolomite etc.) and Iron Ore fines which are received by railway wagons are unloaded at the siding of Bandhdih railway station and then transported to plant by road. The plant has two (2) nos. road weighbridges for weighing the incoming materials.

The iron fines are dumped at the four ground hoppers near ore stock yard and conveyed through conveyor no SX-14, SX-15 and KC-2, then stacked in the yard through stacker cum reclaimer. Presently mechanized stacking of ore fines are carried out in two (2) nos. Stockpiles through stacker-reclaimer SCR-1B. The stacker cum reclaimer capacity is of 1200 TPH/1000 TPH. Rests of the raw materials are unloaded in the open yards by dumper and the same are stacked to a desired height by pay-loader/dozer.

The IOF is then reclaimed by the stacker-reclaimer in reclaiming mode for onwards conveying to sinter plant (SP-1 & SP-2) through stream of closed conveyors.

Other raw materials (viz. lump ore & flux for blast furnace and limestone/ Dolomite for calcining plant), which are stacked manually through trucks in conjunction with pay loaders on the ground are again loaded to ground hopper by pay loader for onward conveying to blast furnace and calcining plant through conveyor no KG-3/KG-4, KG5/KG-6, KG-7/KG-8 up to Jh-GZ-3. Junction houses GZ-1 having feeding flexibility to feed any of the conveyors. Iron ore fines also conveyed through the above conveyors. At junction house GZ-2 and GZ-3 the iron ore fines will be diverted towards sinter plant. The sized ore and flux from yard will be conveyed through conveyor no KG-4, KG-6, KG8, KG-9 and feed to central screen transfer house. The sinter and coke from sinter plant and coke plant will be conveyed through conveyor system and feed to central screen transfer house. In the central screen house the coke and sinter will be screened and distributed to BF-1, BF-3, and BF-2 blast furnace. Iron ore and flux also feed to present BF-3/BF-2 from central screen transfer house. Two screens for each material have been provided in the screen transfer house. Provision
has been provided in the central screening transfer house to feed all the material to new Blast Furnace (BF-1).
Two (2) nos. mobile screening system has been installed at yard to separate the over sized ore from iron ore fines before feeding to underground conveyor onward for conveying to sinter plant.

PCI coal is transported by dumper from coal yard and unloaded on the ground hopper located near PCI coal tower. From the underground hopper, coal is transported by high angle conveyor to coal-tower for further processing and feeding to blast furnace. The proponent in their expansion plan wants to mechanize the stock yard and unloading system. In the expansion, the junction houses no SZ3, SZ4, SZ-5, SZ-6 are already erected. No other yard conveyor except SX-15, SX-14, KC-2 are commissioned. In the expansion plan the capacity considered stacking is 1200 TPH and reclaiming capacity is 1000 TPH.

b) Unloading and dispatch for coal to coke oven and power plant and coke to blast furnace:

Presently, coking coal is received in plant by road, unloaded manually and stored in the open coal stockyard. Different varieties of coal are stacked separately in the coal storage yard. Thereafter, coal is reclaimed through pay loaders and truck and transported to a temporary arrangement of coal feeding near coke oven. Thereafter coal is blended, crushed and conveyed to coal tower through hudded conveyors. Coke from coke oven is crushed to required size, screened and conveyed to the blast furnace stock house through a set of hudded conveyors. Generally, the coke cutter is bypassed in the coke route.
Thermal coal is received through trucks and stored in the Dry Coal Shed. In the dry coal shed ring granulator crusher is installed to crush the higher lump size coal (occasionally received). The coal is conveyed to thermal power plant through a set of conveyors.
At present only vertical coke ovens are in operation.
c) **Unloading and despatch for raw dolomite and limestone to lime and dolo plant and further dispatch of calcined lime and dolo to SMS:**

Raw lime stone for LDP is stocked in ore stack yard and flux stockyard and reclaimed through conveyor system common to both sinter plant and lime plant.

Presently, separate dolomite stockyard are located adjacent to the Dolo Plant & is utilized to feed dolomite to Dolo Plant. Trucks directly unload the materials to the stockyard.

d) **Unloading and storage of raw materials:**

All the raw materials (except Non Coking Coal and Quartzite) are envisaged to be received by rail. All the rail bound material shall be unloaded through wagon tipplers. In compliance with prevalent RDSO norms the wagon tippler shall be designed for 25 Tips/hour.

To unload the entire raw material about 10 rakes are to be unloaded daily on peak operation basis and 8 rakes on an average. To unload 11 rakes in a day three (3) nos Wagon tippler along with Side Arm Charger is required. However to unload 8 rakes in a day, 2 nos of Wagon tippler may be sufficient with efficient operation and maintenance. Hence, 2 nos of wagon tipplers are proposed to be installed at present (in compliance with approved DPR) and 1 no is envisaged to be installed in future. It shall be noted that to install the third wagon tippler along with required tracks the present Ore control room needs to be relocated.

The wagon tipplers with side arm charger shall be installed at south side of stock pile. Apron feeder with VVF drive shall withdraw the material from wagon tippler and discharge on the conveyor to convey material to the stock yard. The capacity of conveyor shall be such that it shall be suitable for wagon tippler to operate with 25 Tips/Hr.

The raw materials hence unloaded shall be conveyed through a series of conveyors for storage in designated piles of stockyard. Two (2) nos. of stacker cum reclaimer has been envisaged for stacking of Iron ore fines, Lump ore, Dolomite, Limestone at the rate of 1700 TPH (rated) capacity. Two (2) nos. separate stacker cum reclaimer has been envisaged to stack coal at 1500 TPH (rated) capacity. One additional stockpile
has been envisaged at North west side of stockpile where materials like purchase coke breeze, purchased coke excess coke breeze shall be stocked manually.

As per current requirement of the plant, the present stacker cum reclaimer (SCR-1B) shall be replaced with higher capacity stacker cum reclaimer. Four nos. of stacker cum reclaimer are proposed for stacking and reclaiming of raw material in the yard. Coking coal, non coking coal will be stored at the south side and the other materials will be stored at north side of stock yard. Two (2) nos. of proposed Stacker cum reclaimer shall be dedicated for Iron ore and Flux. Two (2) nos. of proposed Stacker cum reclaimer shall be dedicated for coal which will stock the material from wagon with the help of belt conveyors like SX-1,2,3,4,5/6,9/11 and MC 1 & MC 2 respectively at 1500 TPH stacking capacity. A retaining wall of 2 m shall be considered throughout the Coal and ore stock yard.

Thermal coal for power plant shall be received through rails and unloaded in stock yard before dispatch to power plant. Two (2) truck tipplers shall be provided adjacent to present ground hopper for ore and. Two (2) truck tipplers shall also be provided for ground hopper for coal and one (1) no. truck tippler shall be provided for ground hopper presently used for reclaiming materials. Truck tipplers shall be utilized in case of emergency and in case some materials is received in plant through trucks. The reclaiming capacity is envisaged to be 1600 tph for sized ore for Blast Furnace, 1600 TPH for iron ore fines for Sinter Plant and 1300 tph for Lime Dolo Plant.

Present conveying system is capable to handle the flux requirement for all the sinter plants.
e) **Despatch of Raw Materials to Coke Oven:**

The coal shall be reclaimed from stockpile by two (2) nos. of stacker cum reclaimer at the rate of 500 TPH. Coal hence, reclaimed shall be conveyed to respective present bunkers of coal blending bin building bypassing present dry coal shed. The various types of coal will be proportionately withdrawn by weigh feeders and conveyed to coal tower after primary and secondary crushing.

After sizing, the coal shall be conveyed to coal tower of coke oven building for further processing.

It is envisaged that almost half of non coking coal shall be road bound and half rail bound. To take care of rail bound non coking coal, a space has been demarcated in the coal stock yard. This shall be reclaimed and conveyed to Dry Coal Shed. Thereafter, present equipment shall be utilized for further conveying and utilization in power plant.

f) **Despatch of Raw Materials to Sinter Plant:**

Various raw materials (Viz. Iron ore fines, Lump ore, Dolomite, Limestone, etc.) stored in stock yard shall be reclaimed by two (2) nos of Stacker cum reclaimer on time sharing basis.

As four (4) types of iron ore fines are received in plant, it is proposed to blend the IOF before dispatch to sinter plant. For blending bin building is proposed. Six (6) nos bin each of 1500 Ton capacity is envisaged for the system. Iron Ore Fines shall be proportionately withdrawn from the bin and conveyed to sinter plant. Separate conveying system has been envisaged for conveying iron ore fines to present sinter plant. This will reduce the occupancy time for present conveyors. Over size screening system is also envisaged to separate over sized lump before storage in bins. The iron ore fines required for new pellet plant shall be supplied through this system only.

All other materials shall be conveyed as per present system.

g) **Despatch of raw materials to pellet plant:**

All the raw materials required for pellet plant shall be reclaimed from stockyard. Iron ore fines shall be conveyed through proportioning system as described in earlier
section. Flux & Coal shall be conveyed through conveyor circuit for conveying flux to pellet plant. Connectivity for pellet plant shall be provided from junction house GZ-2.

**h) Despatch of Various Materials to Blast Furnace:**

The coke separated in coke screen house shall be conveyed to BF Stock House by a series of conveyors.

Pellet produced in pellet plant shall be conveyed separately to stock house of BF-1. For other blast furnaces, the conveyor route for transferring sinter shall be utilized on time sharing basis. Screened coke and sinter from respective plants are conveyed to blast furnace central junction house for final screening before feeding to stock house.

Common conveying system is envisaged for Lump Ore and BF grade Flux utilizing present facilities. Proportionate withdrawal from stock house bins and subsequent feeding of charge mix has been described separately. Return fines generated in BF central junction house shall be evacuated by trucks.

Granulated slag shall be transported by truck to a stock yard and stored for 10 days.

**i) Dispatch of Raw material to Lime and Dolo Plant and calcined materials to SMS:**

Conveyor system earmarked to convey flux to Sinter plants shall be utilized to convey raw Lime stone and Dolomite to storage bins of lime and dolo plant. Space for present dolo stockyard shall be utilized for other purposes. Hence, dolomite shall be stocked in the Ore and Flux Storage yard. Conveyor connectivity is envisaged to be provided from junction house of Lime plant to present dolo storage building.

Calcined lime and dolo shall be hence screened and stored in storage buildings located adjacent to the plants. The screened lime and dolo shall be conveyed to present junction house of SMS for further conveying today bins of SMS.

**3.5.1.1 Facilities Associated with the Raw Material Handling System**

**Belt weighing facility:** Facilities shall be provided for weighing all incoming raw materials and outgoing materials dispatched to different units by conveyor system. Normally belt scales shall be provided to meet this purpose.

**Belt changing facility:** Conveyor galleries shall be provided with guide rollers with fixing brackets and one number belt stand for belt changing as required.

**Maintenance facility:** All building and associate houses shall be provided with electrical or mechanical hoists for handling heavy components during maintenance.
Air condition and ventilation facility: All Central control rooms of raw material handling system and the control room of yard machines shall be provided with AC.

Dust suppression facilities: All transfer points of proposed raw material handling system shall be provided with dust suppression systems connected to respective bag houses.

The stockpile area is segregated for individual raw material stacking as per their designated space respectively as given below.

**Table 3.2: Details of Stockpiles**

<table>
<thead>
<tr>
<th>Material</th>
<th>Stockpile Capacity in Tons</th>
<th>Stockpile Dimension in Length / Dia (m)</th>
<th>Desired No. Of Days of Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore Fines</td>
<td>219,742</td>
<td>396</td>
<td>15</td>
</tr>
<tr>
<td>Coal Grade-1</td>
<td>96,995</td>
<td>770</td>
<td>30</td>
</tr>
<tr>
<td>Coal Grade-2</td>
<td>50,320</td>
<td>400</td>
<td>30</td>
</tr>
<tr>
<td>Coal Grade-3</td>
<td>7,190</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>PCI</td>
<td>46,967</td>
<td>41</td>
<td>30</td>
</tr>
<tr>
<td>Lime Stone</td>
<td>62,917</td>
<td>82</td>
<td>30</td>
</tr>
<tr>
<td>Dolomite</td>
<td>16,745</td>
<td>30 (d)</td>
<td>30</td>
</tr>
<tr>
<td>Iron Ore Lumps</td>
<td>3,781</td>
<td>30 (d)</td>
<td>15</td>
</tr>
<tr>
<td>Thermal Coal</td>
<td>41,540</td>
<td>75</td>
<td>15</td>
</tr>
<tr>
<td>Purchased Coal</td>
<td>30,045</td>
<td>382</td>
<td>15</td>
</tr>
<tr>
<td>Revert Mix</td>
<td>12,125</td>
<td>25 (d)</td>
<td>15</td>
</tr>
</tbody>
</table>

Height of stock pile for all raw materials has been considered to be 11 m. A retaining wall of 2.0m has been considered throughout the entire ore and flux stockpile area. Also, it has been considered that stacker rail is at a height of approximately 1.2 m from ground level. Hence, material height shall be approximately 12.5 m from ground level.

**MAJOR PLANT FACILITIES**

3.5.2 Coke Ovens

ESL presently operates one Heat recovery (HR) stamp charged Coke oven Battery of vertical design having design capacity of 500,000tons per annum. This battery is operating since Feb-2012 and now producing 568,000 tpy of Gross Coke annually. The oven design is based on the Technology provided by Shandong Province Metallurgical Engineering Company Limited (SDM), China.
Another HR, Stamp Charged Coke Oven Battery is under construction which is of horizontal design to produce another 5,00,000 TPA Coke. ESL now intends to enhance the production of hot metal. In view of this, it has envisaged to complete the HR stamp charged horizontal coke oven battery and commission the same for meeting the requirement of coke, with provision for enhancement of capacity in future.

### 3.5.2.1 Production Program

The design capacity of HR Stamp Charged Horizontal Coke Oven battery is 500,000 tpy. The requirement of coke may vary depending upon the requirement of coke by blast furnace and coke production from coke ovens.

#### Table 3.3 Tentative Oven Dimension

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Oven Length (cold), mm</td>
<td>13689</td>
</tr>
<tr>
<td>2.</td>
<td>Oven Height (cold), mm</td>
<td>2827</td>
</tr>
<tr>
<td>3.</td>
<td>Oven Width (cold), mm</td>
<td>3627</td>
</tr>
<tr>
<td>4.</td>
<td>Coal cake volume (cold), m³</td>
<td>46.8</td>
</tr>
<tr>
<td>5.</td>
<td>Coal bulk density (cold), tons/m³</td>
<td>0.967</td>
</tr>
<tr>
<td>6.</td>
<td>Weight of coal cake (cold), tons</td>
<td>45.0</td>
</tr>
<tr>
<td>7.</td>
<td>Weight of coke output Net, dry, tons</td>
<td>33.0</td>
</tr>
</tbody>
</table>

### 3.5.2.2 Coke Plant Ancillary Units

The Plant is equipped with various facilities such that it can function independently as envisaged by the Technology Supplier. The list of facilities includes

- Coal Preparation, blending and crushing units
- Two coal Towers for storage of crushed coal.
- (Horizontal) HR Coke Oven Battery
- Two Pusher cum charging Car
- One Coke car
- One Quench Tower & their auxiliary
- One Coke wharf
- One Coke Sorting Plant
- Waste Heat Recovery Boilers
- Waste Gas Chimneys two no.
- Pollution control equipments
3.5.2.3 Coal Preparation, Blending and Crushing Station
Raw coal received from storage yard is stored separately in silos. As per blending ratio set, the coal is reclaimed from silos and crushed to the desired level (-3.2=-90%min) and stored in coal towers. The stamping machine takes coal from coal tower and stamps it to make a coal cake which is transferred to stamping cum pushing machine which charges the cake into a hot empty oven. After carbonization is complete the coke is pushed out from the oven and quenched immediately with water and dumped into the coke wharf.

3.5.2.4 Flue Gas for Power Generation
The hot flue gasses coming from coke ovens will be at a temperature of 950°C-1,050°C which will be available for HP steam generation in a WHRB. The expected flue gas generation would be 300,000Nm³/hr.

It is expected that normal flow and temperature conditions will prevail most of the time. In view of this the power plant would be designed to operate optimally with normal flue gas conditions, with provision to operate between minimum and maximum conditions.

3.5.3 Iron Ore Grinding Plant
Ground iron ore will be required for the pellet plant which has been envisaged for the expansion project. The requirement of around 2.2 mtpy of pellet plant feed material has been envisaged to be met by an iron ore wet grinding plant comprising of wet grinding along with dewatering and filtration systems.

3.5.3.1 Design Basis
Capacity: The wet grinding unit of the pellet plant will be designed to grind the iron ore fines having top size of (-)10 mm and analyzing around 63.5% Fe to produce pellet feed material of size d80 (-) 45 microns (µm). The pellet feed material produced after grinding in a ball mill will be subjected to dewatering in a concentrate thickener followed by final dewatering in pressure filters to produce filter cake having moisture content below 10%.

The proposed plant will be designed based on the following assumptions:
Based on the above assumptions, the annual effective working hours work out to 7920 hours.

Three grinding mills, each with a rated capacity of 93 tph, have been considered for grinding the iron ore fines to form pellet feed concentrate of desired size

3.5.3.2 Plant Feed

The iron ore grinding plant is envisaged to be fed with iron ore fines of size (-)10 mm. The typical chemical composition of iron ore fines has been considered as follows:

<table>
<thead>
<tr>
<th>Plant Feed</th>
<th>Fe %</th>
<th>SiO₂%</th>
<th>Al₂O₃%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore Fines</td>
<td>63 to 64</td>
<td>3.5 to 4</td>
<td>3 to 3.5</td>
</tr>
</tbody>
</table>

The physical characteristics of the iron ore fines considered for designing the iron ore grinding plant and associated facilities are as given below:

<table>
<thead>
<tr>
<th>Top size, mm</th>
<th>.. 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity of solids</td>
<td>.. 4.2</td>
</tr>
<tr>
<td>Bulk density, tons/cu m</td>
<td>.. 2.4</td>
</tr>
<tr>
<td>Bond Work Index, kWh/ton</td>
<td>.. 14.2</td>
</tr>
<tr>
<td>Angle of repose, degree</td>
<td>.. 35</td>
</tr>
<tr>
<td>Moisture content, %</td>
<td>.. 8</td>
</tr>
</tbody>
</table>

3.5.3.3 Product

The iron ore grinding plant is required to produce 2.2 mtpa iron ore pellet feed concentrate of size d₈₀ (-) 45µm.

3.5.3.4 Description of Plant

The iron ore of top size (-)10 mm will be conveyed from the fines stockpile by a belt conveyor and will be stored in three nos. surge bins, each with a storage capacity of 100 tons. The plant feed conveyor (from the fines stockpile) will feed the fines material either to the middle surge bin or to a reversible belt conveyor for discharge to the other bins. From the storage bins, the fines material will be withdrawn at a
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

regulated rate by three nos. belt feeders, located beneath the bins, and fed to three nos. ball mills for grinding to the size required for pelletization. The capacity of each ball mill will be 93 TPH. Each ball mill will be working in close circuit with a set of classifying hydro cyclones. The underflow obtained from the classifying hydro cyclones will be re-circulated back to the ball mills and the overflow of size d80 (-) 45 µm will be fed to a concentrate hi-rate thickener by gravity for thickening of slurry and recovery of usable water for process. The thickened slurry obtained as underflow from the hi-rate thickener will be pumped to two (2) numbers slurry holding tanks provided with an agitator to keep the slurry in suspension. From the slurry holding tanks, the slurry will be pumped to three (3) nos. pressure filters, each having a capacity of 93TPH, for final dewatering. The cake obtained from the pressure filters having moisture content below 10% will be conveyed to the pellet plant by belt conveyors. The clarified water obtained as overflow from the hi-rate thickener will be collected in a process water tank and recycled back to the grinding plant as process water.

3.5.3.5 Major Equipment and Facilities

**Surge Bins:** The (-)10 mm iron ore fines will be conveyed from the fines stockpile by a belt conveyor and will be stored into three surge bins, each with a storage capacity of 100 tons. The plant feed conveyor (from the fines stockpile) will feed the fines material either to the middle surge bin or to a reversible belt conveyor for discharge to the other bins. A flap gate will be provided on the plant feed conveyor for the above purpose. The bins are proposed to be of steel construction.

**Belt Weigh Feeders:** A belt weigh feeder, 800 mm x 4,600mm will be provided under each of the surge bins, which will feed the iron ore fines to a ball mill at a regulated rate of 93 tph.

**Ball Mills:** Three nos. of ball mills, each with a rated capacity of 93 tph (fresh feed) on dry basis, will be provided for grinding the iron ore fines material to ( -)45 µm. The ball mills shall be of trunnion overflow type. The dimension of each ball mill will be 4,800 mm diameter x 8,000 mm length. The ball mills will be operating in close circuit with a set of hydro cyclones. The overflow of the hydro cyclones at d80 (-)
45µm will be fed to a concentrate thickener by gravity for recovery of usable water and the underflow of the hydro cyclones will be re-circulated back to the ball mills for further grinding.

**Concentrate Thickener:** The overflow of the close circuit hydro cyclones will be fed to a 30 m diameter high rate concentrate thickener preparatory to final dewatering in pressure filters. The underflow of the concentrate thickener at about 55% solids will be fed to a pressure filter and the overflow of the thickener will be collected in a process water tank by gravity and will be pumped back to the grinding plant as process water.

The thickener will comprise of circular tank of appropriate diameter with vertical side wall and a sloping bottom. A peripheral launder of suitable size will be provided at the top to collect the overflow water. An opening with a cone will be provided at the centre of the tank for withdrawal of thickened slurry. The tank will be civil construction.

The concentrate thickener will comprise of feed well, drive mechanism, rake arm with rake blades and scrapers, overflow weir and launder, automation for overload protection, flocculant preparation and flocculant dosing facilities, bed mass/bed level transmitter, heavy structural steel mechanism support with walkway, handrails, structural steel tank, suitable lubrication system for gearing and bearing etc.

**Slurry Holding Tanks:** Three slurry holding tanks, each provided with a fixed speed agitator, will be provided to keep the slurry, obtained as underflow from the concentrate thickener, in suspension before feeding to the filter presses. The operating volume of each holding tank will be around 350 cu m. The tanks will be constructed from at least 12 mm thick M.S. plate and suitably stiffened. The inside surface of the tank and all components encountering slurry will be lined with suitable abrasion resistant rubber of 8 mm thickness. The agitator comprising of shaft and impeller shall be lined with rubber with minimum 6 mm thickness of appropriate quality.
**Filter Press:** The underflow of the concentrate thickener will be fed to three pressure filters, each with a capacity of 93 tph, for recovery of usable water as well as for efficient control of residual moisture content in concentrate. The dewatered product will be taken out as final product. The filtrate obtained from the pressure filters will be pumped to the concentrate thickener by filtrate pumps located beneath the pressure filters. The dewatered cake will be conveyed to the pellet plant by associated conveyor system.

**Tanks and Sumps:** Steel tanks and sumps will be provided for handling slurry and clean/process water. The ball mill-1, 2 and 3 discharge sumps will have a volume of 20 cu m with residence time of two (2) minutes. The process water tank is envisaged to have a tank volume of 200 cu m with residence time of 10 minutes. The slurry tanks and sumps will be constructed from at least 8 mm thick M.S. plate and suitably stiffened. The inside surface of the tanks/sumps and all components encountering slurry will be lined with suitable abrasion resistant rubber of 8 mm thickness.

All process and clean water tanks will be constructed with at least 10 mm thick M.S. plate and suitably stiffened.

**Slurry Pumps:** The slurry pumps shall be of centrifugal type, provided with any suitable mechanical gland sealing arrangement and of the following designs for different applications:

- a) Horizontal slurry pump
- b) Vertical spillage pump

The impellers of the pumps shall be made of high chrome [27 per cent chromium]/ultra chrome (A05)]. The casings shall be made of cast iron with ultra chrome (A05) liners or hard cast iron such as Ni–hard or high chrome.

### 3.5.4 Pellet Plant

Pellet will constitute about 60% of the BF-1 burden which will require about 1,576,800 tpy of pellet. Approximately 630,000 tpy of pellet will be required considering about 25% pellet in the burden of blast furnaces BF-2 & 3. To meet the
pellet requirement in blast furnaces 1, 2 & 3, it is envisaged that one pellet plant of 2.2 mtpy production capacity will be installed. The iron ore feed will be received from the iron ore grinding unit

3.5.4.1 Plant Facilities

The pellet plant will comprise following facilities:

i) Storage and handling of iron ore fines,

ii) Storage, handling and preparation of coal, limestone, dolomite and bentonite,

iii) Proportioning and mixing,

iv) Balling, induration and cooling,

v) Product screening,

vi) Product pellet storage,

vii) Auxiliary facilities like fuel storage, laboratory, etc.,

viii) Plant de-dusting system,

ix) Cranes, hoists and elevator,

dx) Plant electrics,

xi) Instrumentation and Level- 1,

xii) Plant communication system,

xiii) Utility system,

xiv) Air-conditioning and ventilation system,

xv) Fire fighting system.

Storage, Handling of Iron Ore Fines Iron ore fines is received through conveyor at the proportioning bins, where the same is stored for further conveying at pre-determined rate to the mixing area.

Storage, Handling and Preparation of Coal, Limestone, Dolomite & Bentonite

Limestone & Dolomite: Limestone and dolomite of 10 to 50 mm size shall be brought and stacked in ground stockpile, from where limestone and dolomite shall be reclaimed and fed to a surge bin by conveyor for grinding. Limestone and dolomite shall be drawn out and shall be delivered to a pulverising unit through belt conveyor. A mill shall be provided for pulverising the limestone and dolomite to minus 200 mesh size and the same shall be pneumatically conveyed to the proportioning bin in
mixing section. Pulverising of limestone and dolomite shall be carried out in batches. Separate pulverising unit shall be used for grinding bentonite and coal on time sharing basis.

**Bentonite:** Bentonite shall be procured as lumps (minus 50mm size) brought by road, unloaded and stacked in ground stockpile at the plant site. Bentonite lumps shall be reclaimed from the stockpile and fed to the surge bin by conveyor. Bentonite shall be withdrawn and delivered to the same pulverising unit mentioned above by belt conveyor. The bentonite pulverised to minus 200 mesh shall be pneumatically conveyed to the proportioning bin in the mixing section.

**Coal:** Coal having low ash content and high ash fusion temperature, shall be brought and to be stacked in ground stockpiles at the plant site. Coal shall be reclaimed and fed to the surge bin. Coal shall be withdrawn from the bin and delivered to the pulverising unit by belt conveyor. Pulverised coal of minus 200 mesh size shall be pneumatically conveyed to the proportioning bin in mixing section.

**Proportioning and Mixing**
Iron ore concentrate; limestone, coal, coke, dolomite and bentonite are mixed at predetermined rate in the mixer along with addition of 8% moisture.

**Balling, Induration and Cooling**
After thorough mixing, the mixed material is conveyed to the mixed material bins in balling building. Through the mixed material bins, the material is conveyed to the pelletising discs for formation of green spherical balls. These green balls are then fed into the induration machine for heat hardening with the help of fuel fired burners. During heat hardening, the greens balls gradually transform into fired pellets and attain sufficient cold crushing strength to withstand breakage during transportation. The fired pellets are then charged into the cooling zone of the induration furnace for cooling below 100°C.

Pellet induration consists of three main steps:

i) Drying of green pellets.

ii) Firing of pellets at around 1,350°C

iii) Cooling of hot pellets before discharging.
During drying (~150°C to 400°C), moisture content in the green pellet is evaporated. During pre-heating zone (400°C to 1,200°C), decomposition of carbonates and hydrates takes place. Gasification of solid fuels like coke and conversion of iron oxides like goethite, siderite to higher oxide state, hematite, also takes place. Commencement of solid oxide bonding and grain growth are the important steps in this stage. During firing zone (1,200°C to 1350°C), the temperature is below the melting temperature of major oxide phase but within the reactivity range of gangue components and additives. Formation of oxides and slag bonds is decisive in this stage. It is then sent to after-firing zone.

The pellets are then cooled in two cooling zones using cooling fans. The product from the 2nd cooling zone is transferred to a hearth layer extraction bin through product conveyor. The overflow from the hearth layer is stockpiled separately in an emergency pellet stockpile pad. Some portions of the pellets from hearth layer bin are recycled back to Indurating process for bed formation. The final product is stored in storage bins.

**Finished Product Screening and Storage**

The hardened and cooled pellets shall be screened for removal of minus 6 mm pellets generated during transfer and heat treatment. Undersize material from the screen shall be recycled through the sinter plant. The 6 to 16 mm pellets shall be either conveyed to the blast furnaces or stacked in a ground stockpile through tripper conveyor system, if required.

**Dust abatement facilities**

The pellet plant comprising various process units, accessories and handling facilities, will be provided with adequate dust extraction facilities to restrict the particulate emission level within acceptable limits.

The systems will consist of mechanical gas cleaning equipment, dust recycle arrangement and exhaust stack. Exhaust gas from drying and grinding system will be cleaned using fans, ductings, suction hoods, cyclones and/or bag filters etc.
The indurating furnace gas will be made to pass through electrostatic precipitator (ESP) before being released to the atmosphere. Dust content in the work zone shall be limited to 5 mg/N cum over and above the prevailing dust level.

### 3.5.5 Blast Furnace

Presently, BF-2 of 1050 cum & BF-3 of 350 cum with useful volume has been constructed partially. The installation of a larger sized blast furnace of useful volume of around 1,700 cum has been foreseen to have a higher hot metal production of about 1,576,800 tpy. The proposed furnace will be located in the designated area of BF-1 retaining the stock house to the extent possible. The hot metal production from the proposed large sized BF may be fed to existing and proposed SMS and DI pipe plant.

#### 3.5.5.1 Design Basis

The blast furnace will incorporate all the modern technological features.

#### 3.5.5.2 Major Facilities

The plant comprises the following facilities:

- a) BF proper
- b) Cast house
- c) Slag granulation plant
- d) Hot blast stoves
- e) Gas cleaning plant
- f) Stock house and charging system
- g) Hot metal handling system
- h) Cranes and hoists
- i) Coal dust injection system
- j) Hot metal granulation
- k) Ladle repair shop
- l) Stackhouse and casthouse de-dusting system
- m) Air blowing system
- n) Top recovery turbine
- o) Plant electrics
- p) Instrumentation, automation and control system
- q) Communication system
- r) Water system
- s) Utility system
- t) Fire fighting system
- u) Air conditioning and ventilation system
The sinter from sinter plant, pellet from pellet plant, coke from coke oven, lump ore, and fluxes from the raw material storage yard will be received and be distributed to the stock house of blast furnace. The structures of the partially built stock house including the storage bins will be retained for the larger sized BF-1 to the maximum extent possible. The furnace will be provided with skip charging system. Return fines will be transported to sinter plant by means of covered road transport.

The existing coal grinding unit is adequate to supply pulverized coal to BF-1. A new coal injection system will be provided for BF-1. Pulverised coal will be injected through tuyeres in the blast furnace.

Blast furnace designed for minimum 2.0 kg/cm top pressure and 1200°C hot blast temperature. The useful volume of new furnace is around 1,700 cu m. New BF will have two tap holes. The furnace will be self-supporting free standing type. The top equipment and platform at various levels around the furnace will be supported by an independent tower structure. Blast furnace will be provided with bell less top charging system. It will be provided with modern facilities like above burden probe, heat flux and pressure profile measurement, etc. The cooling system will comprise of staves. The type of staves will be determined according to the heat loads in various zones. Staves will be provided for cooling refractory from hearth to the stack. Cooling system will be complete with all piping, valves, pumps, etc. One (1) no emergency overhead tank will also be provided in blast furnace recirculating circuit which will be operated during power failure.

The hearth bottom including tap hole will be lined with high conductive carbon in blast furnace. Bosh to lower shaft is lined with silicon carbide/high alumina. Rest of the shaft will be lined with high Al₂O₃ brick and the cone portion will be united with CO resistant refractory materials.

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

New blast furnace will be served by three stoves provided with ceramic burners to supply hot blast at a temperature of about 1200°C. The stoves will be fired with blast furnace gas. Combustion air fans will be provided for supply of combustion air to
stove burner. One chimney will be provided for the stove system. The upper high
temperature zone of stoves will be lined with high alumina refractory and other
portions will be lined with fire clay refractory except for the dome which will be lined
with silica refractory. Hot blast main and bustle main will be lined with high alumina
refractory. The stoves will be provided with necessary platforms for providing
approach to various valves, fittings, etc. Necessary lifting beams with hoist will be
provided above the stove valves to facilitate maintenance. The stove valves will be
hydraulically/pneumatically actuated and the stove changing will be PLC controlled.
The blast furnace will be provided with two cast houses, having two tap holes.
Hydraulic mudgun and drilling machine will be provided in cast house. Slag
granulation system and dry slag pit will be provided along with granulated slag
handling system. The slag runner arrangement will be made such that it can flow
either to the slag pit or to the granulator of the slag granulation plant.
The gas cleaning plant for the blast furnace will consist of a dust catcher and a dry gas
cleaning system. The top gas of furnace will be drawn through off-takes which extend
upward to form vertical bleeder pipes provided with bleeder valves at the top. The off-
take and up-take pipes are connected to form down-comer, which terminates at the
dust catcher. Dry dust disposal from dust catcher will be by road transport.
The gas leaving dust catcher will flow into vessels containing bag filters for final gas
cleaning. The accumulated dust will be collected in the bottom of each bag chamber,
which will be periodically discharged and collected in bins. Dust discharging facility
will be provided in the bin. Dust disposal from the gas cleaning plant will be by road
transport. The cleanliness of blast furnace gas will be 5 mg/Nm³ of clean gas. Flare
stack of adequate capacity will be provided.
Fume extraction and dust extraction facilities will be provided for cast-house and
stock-house respectively to keep the work level dust concentration within the
stipulated norms. Disposal of dust from the stock house dust extraction system and
cast house dust extraction system will be by road transport.
There are two existing pig casting machines (PCM) of 2,400 tpd (considering 17
hours operation per day). Considering that either of the two steel melt shops will
provide sufficient off-take of hot metal the existing PCMs are adequate to handle the additional production from BF-1.

One no. new electric blower of adequate capacity will be provided for BF-1, keeping one steam blower in the existing blowing system, as a standby.

A new Ladle Repair Shop (LRS) is envisaged near the proposed steel melting shop.

The LRS will have facilities for servicing, cooling, repairing and relining of hot metal ladles. The LRS will have facilities for drying and heating of relined ladles.

Equipment (eg. cranes) of adequate capacity will be installed to cater to the hot metal ladles. Hot metal ladle will be transported to steelmaking shop by loco motive on hot metal carriers. Necessary repair shop and store for blast furnace will be considered in blast furnace area.

### 3.5.6 Steel Making

ESL is currently has around 1.2 mtpy crude steel and 0.22mtpy ductile iron pipe production facilities. ESL is planning to increase their crude steel production capacity by installation of an additional steel melt shop (SMS-2) along with necessary upstream facilities.

This Section presents a brief description of plant and equipment facilities which has been envisaged for SMS-2.

#### 3.4.6.1 Production Facilities

Existing SMS-1 has

- 2 x 60 ton Basic Oxygen Furnace (BOF)
- 2 x 60 ton ladle furnace (LF)
- 2 x 5-strand billet caster

The major production facilities envisage for SMS-2 are given below:

- 2 x 60 ton Basic Oxygen Furnace (BOF)
- 2 x 60 ton ladle furnace (LF)
- 2 x 4-strand billet caster

The brief description of the proposed facilities like BOF, ladle furnace, billet casters and associated facilities including electrical, automation & instrumentation, water and other utility and civil and structural buildings are given as under.
3.5.6.2 Heat Size

SMS-1 & 2 are envisaged to have a production capacity of 2.2 mtpa liquid steel. To meet this production level, technical parameters of BOF is considered as given below:

**Tap-to-tap time:** A break-down of the average tap-to-tap time of BOF, indicating the duration of various activities, is given in Table 3.4.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging of scrap</td>
<td>2</td>
</tr>
<tr>
<td>Charging of HM</td>
<td>3</td>
</tr>
<tr>
<td><strong>Oxygen blowing time</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td>Sampling after blowing and Waiting for analysis</td>
<td>5</td>
</tr>
<tr>
<td><strong>Reblow</strong></td>
<td>2</td>
</tr>
<tr>
<td>Post stirring</td>
<td>1</td>
</tr>
<tr>
<td>Tapping</td>
<td>6</td>
</tr>
<tr>
<td><strong>Charge to Tap</strong></td>
<td>35</td>
</tr>
<tr>
<td>Slag splashing</td>
<td>2</td>
</tr>
<tr>
<td>Deslagging</td>
<td>2</td>
</tr>
<tr>
<td>Inspection</td>
<td>1</td>
</tr>
<tr>
<td><strong>Tap-Tap-Time (min)</strong></td>
<td><strong>40</strong></td>
</tr>
<tr>
<td>Periodic service</td>
<td></td>
</tr>
<tr>
<td>Gunning</td>
<td>2</td>
</tr>
<tr>
<td>Deskulling</td>
<td>1</td>
</tr>
<tr>
<td>Tap hole change</td>
<td><strong>0.72</strong></td>
</tr>
<tr>
<td>Mechanical maintenance</td>
<td>2</td>
</tr>
<tr>
<td><strong>Tap-Tap-Time (Avg.)</strong></td>
<td><strong>45-46</strong></td>
</tr>
</tbody>
</table>

3.5.6.3 Plant and Equipment

SMS-2 will be equipped with following facilities:

- Two BOF’s of 60-ton capacity complete with tilt drive system, oxygen lance system, flux & additive handling system, slag splashing facility, primary gas cleaning with gas recovery system, secondary ventilation system, etc.
- Two 4-strand billet casting machines are envisaged to cast 150 x 10 sq mm and 165 x 165 sq mm billets.
- Ladle, tundish and mould preparation facilities.
3.5.6.4 Hot Metal Handling
Open top hot metal ladles will be used to transfer hot metal from blast furnaces by rail. This hot metal will be subsequently charged into BOF by EOT cranes. Hot metal mixer has not been considered.
The operation of hot metal handling and hot metal charging operation in BOF will be carried out in a single bay. Space provision for hot metal desulphurization unit is kept in the layout.

3.5.6.5 Scrap Handling
Scrap processed to the required size, will be received by road transport at the scrap yard of steel melt shop. The scrap yard is equipped with scrap loading cranes, scrap box and scrap weighbridge. Scrap from scrap box will be charged in the BOF by EOT crane

3.5.6.6 Flux and Additive Handling
Flux will be received at the high-level bunkers of steel melt shop through overhead conveying system. A set of high-level bunkers complete with vibratory-feeders, weigh hoppers, chutes, surge bins, etc. will be provided for each BOF.

3.5.6.7 Ferro-alloy Handling Facilities
Ferro-alloy will be transported through bottom discharge box by truck.

3.5.6.8 Gas Cooling, Cleaning and Recovery
Gas cooling and cleaning system is envisaged to be of suppressed combustion type with provision of gas recovery. Layout shall be suitable for installation of dry type primary GCP.

3.5.6.9 Secondary Emission Control
Secondary emission control facilities will be provided to collect and clean the fugitive gases and fumes generated at the time of BOF charging/tapping/blowing, de slagging, etc.
3.5.6.10 **Liquid Steel and Slag Handling**

BOF will be provided with dedicated transfer tracks for steel transfer car and slag transfer car to transfer steel to casting bay and slag to slag handling bay respectively. In the slag handling bay, slag will be poured into the slag pits. Slag pits with adequate capacity will be provided.

3.5.6.11 **Secondary Refining Facilities**

Ladle Furnace: The ladle furnaces (2 nos.) will be capable of performing heating, alloy adjustment, desulphurisation, inert gas stirring, carbon addition and wire feeding. The unit will be complete with facilities for alloy storage, batching and charging, sampling and temperature measurement and wire feeding facilities. There will be either a dedicated fume extraction system for LF or fume extraction system of LF will be connected to the secondary fume extraction system of BOF.

The salient features of the ladle furnace for SMS-2 are as follows:

3.5.6.12 **Continuous Casting**

The salient features of the billet casters are indicated below:

- No. of machines … 2
- Type of machine … Curve, heavy duty type
- Ladle capacity, ton … 60
- Type of ladle … Bottom pouring with slide and gate porous plug
- Ladle support … Turret
- Tundish … Refractory lined with 4-44 provision for lift lower system for closed casting
- No. of strands … 4
- Size range to be cast:
  - Section size … 165 mm X 165 mm, 150 mm X 150 mm
  - Length … 6-12 m
- Billet cutting device … Oxy/fuel auto torch cutting device
- Method of discharge … On roller table to cooling beds
- Mould level control … Automatic
Type of dummy bar … Rigid type
Type of cooling bed … Turnover type cooling bed with storage

3.5.7 Rolling Mill

Electrosteel Steels Ltd. (ESL) is an integrated steel plant situated at Bokaro. A bar mill of capacity 1,100,000 tpy is proposed to be installed at their plant to produce various sizes of reinforcing bars in straight lengths. The input material will be continuously cast (CC) square billets of size 165 mm sq. However the mill will be capable to roll 150 mm sq billet also.

The mills will roll continuous cast billets received from steel melt shop of ESL. The continuous cast billets will be stored, inspected and conditioned in the billet storage yard before being fed to the mill. A detail of the rebar mill is given below.

3.4.7.1 Bar Mill

Design basis:

The mill will have a production capacity of 1,100,000 tons of rebars per annum. The rebar size shall be in the range of 8 mm to 16 mm dia. considering the higher demand of lower size rebars in the construction sector, the mill has been planned to produce higher quantity of 8 mm to 12 mm dia rebars. The mill shall be capable of rolling carbon steel grades for re-inforced concrete application conforming to ASTM-A615 Grade 60, BS 4449/97 Grade 460A and B, DIN 488, IS 1786 standards.

The finished products will be produced in straight lengths of 6.5 m to 12 m and shall be made into bundles weighing 3 to 5 tons each.

Billet requirements:
Continuous cast (CC) billets either of the following sizes will be used as input for the mill:

Input CC billet size .. 165 mm x 165 mm
12 m long, 2,496 kg
or
150 mm x 150 mm,
Typical process losses during the production of rebars are due to scale, end cropping, cobbles etc. The average yield of 97 per cent has been assumed for the purpose of this report. On the basis of 97 per cent yield, the total input billet requirement would be about 1,134,000 tons per year for producing rebars of various sizes.

**Mill production schedule:**

The annual production capability of a mill depends mainly on (i) the rolling rate after allowing for yield, rolling efficiency and the time gap between billets and (ii) mill availability after allowing for delays and roll changing time as required by the rolling programme.

The mill is scheduled to operate 330 days per year and three 8-hour shifts per day, that is, a total of around 8,000 hours per year. Scheduled annual and periodic maintenance time has been considered as 760 hrs per year. The delays in operation of the mill comprises steel grade and process change, unscheduled delays (furnace/mechanical/electrical), roll and guide change and mill adjustments etc. Taking the above into account, a mill about 84 per cent has been adopted for this report, that is, the mill will be available for rolling 6,724 hours per year.

**Mill features**

**Reheating furnace capacity:** A walking beam type reheating furnace has been proposed to heat billets for subsequent rolling to rebar. The capacity of reheating furnace is considered as 245 tph for heating 1,134,000 tons of billets annually.

**Hot mill area:** The proposed bar mill will be designed with following technological features:

a) Slit rolling for sizes 8, 10, 12 and 16 mm rebars
b) Thermo-mechanical treatment of rebars
c) High speed block type rolling mill
d) Single family rolling

Heated billets discharged from the reheating furnace will be continuously rolled in the mill, which will be located at +5m level.
A high-pressure water descaler located at the furnace exit side will remove the scales formed on the billet surfaces prior to rolling. A hot billet reject grid will be provided for receiving billets which need to be moved out of the rolling line if required. A pinch roll and pendulum shear will be provided before mill entry.

The mill configuration will comprise a roughing train, intermediate train and a finishing block each in two strands. Loopers will be provided between the stands, wherever required, to ensure tension-free rolling. Crop and cobble shears will be provided after roughing train and after intermediate train for cropping the ends of the process section and for cutting the rolled stock into multiple pieces in case of cobbles in the mill.

**Finishing facilities:** The finishing facilities for rebar production will consist of cooling bed, cold saw for cutting to customer length, bundling, strapping, weighing and collection stations.

**Process and quality control:** Quality control in the reheating of billets will be exercised by the provision of suitable instruments in the heating furnace to control the billet temperature and the furnace atmosphere. This will ensure that scaling will be kept to a minimum and that the desired rolling and finishing temperatures will be obtained.

Dimensional control will be ensured by proper roll pass design, accurate turning of passes and regular check on the condition of the roll grooves. Periodic checks will be made by cutting samples and ensuring that the mill production is up to the required standards in respect of dimensional accuracy and finish. Product identification will be made on the basis of the identity of the billet and by segregating the products of each cast separately. To facilitate this, tag printing machines will be provided for identification of the products. With the facilities provided for quality control, it will be possible to meet the desired standards and specifications as per requirement.
**Layout of mill:** The billet storage aisle for bar mill will receive and store billets. Continuous cast billets from SMS will be received in this aisle in layers and stored in piles with the help of EOT magnet cranes. The cold billets will be charged on the charging grid located in this aisle at +5 m level.

The finished rebars will be stored in the finished product storage aisle. In this aisle EOT cranes will be used for handling the rebars.

The technological equipment of the rolling mill and part of the furnace will be located at +5.0 m level. This will have following advantages:
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusa, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

a) All the piping for compressed air, instrumentation air, hydraulic oil, lubrication oil, water and electric cable can be installed to the lower level where the inspection and maintenance can be done easily.
b) Scrap or crop end collection and removal from ground level will be easier.
c) Full space under the platform can be utilized by installing auxiliary systems like hydraulic and lubrication systems, pumping systems. The open space at ground level can be used as storage area also.
d) Ventilation will be better compared to cellar.

One roll shop has been provided to cater to the needs of the mill at +0.00 m level. Scrap will be collected in scrap buckets and loaded with the help of cranes into trucks. Tanks, pumps etc for oil and grease lubrication and hydraulic system will be located below the mill floor level, at suitable locations.

Provision is made in the layout for dispatch of finished products by rail and road. Space is provided for stocking adequate production at the mill finishing bay.

**Equipment and facilities:** The proposed mill comprises mainly four sections, namely the billet storage, re-heating furnace, mill proper and finishing facilities.

**Continuous cast billet storage and inspection:** The incoming billets will be received, stored and inspected in the billet storage aisle to ensure the desired quality standards. The area provided in billet storage aisle adjacent to the charging area is adequate to store about 7 days of billet requirements.

**Reheating furnace**

**Charging equipment:** The function of the furnace charging equipment is to charge billets (165 mm sq or 150 mm sq x 12 m long) inside the furnace. The billets will be in layer placed on the charging grid located in billet storage aisle by EOT magnet crane. Individual cold billets from charging grid will be transferred to the furnace entry roller table.

The charging equipment will consist one billet charging grid, roller table at +5 m level, billet reject cradle at +5 m level, billet weighing system and suitably placed fixed end stop.
Walking beam type furnace: One top and bottom fired walking beam type reheating furnace of suitable capacity (matching with Rolling Mill) will be installed. The combustion system will be designed considering BF gas of CV about 840 Kcal/Nm3 as fuel. The combustion system will be designed to have requisite number of control zones for controlled heating of the stock up to a temperature of about 1,150 °C. Suitable waste gas discharge system with chimney to be installed.

The furnace will be provided with requisite instruments, controls and automation system for the efficient heating as well as tracking of movement of billets from charging end to discharge end. The equipment will allow a quick emptying of furnace before long stoppage.

Discharging equipment: The heated billet will be side discharged by billet discharging equipment.

Mill mechanical equipment and shears

Roughing mill train: Hot billets after being discharged from the furnace will be passed through high pressure descaler for scale removal and fed into the mill through a roller table. Immediately before the first roughing stand a pinch roll and a snap shear will be provided to crop or divide billets, as may be necessary in case of emergency. The crop ends will be collected in buckets below the mill.

The continuous roughing mill will be composed of alternately arranged horizontal and vertical rolling stands to allow twist free rolling. The roughing mill will be arranged in single strand and will consist of 2-high housing less stands fitted with roll neck bearings, screw down mechanism and multi-groove rolls with provision for groove alignment.

The stands will be provided with roll container assembly, spindle carrier, spindles and arrangement for lateral shifting to facilitate roll change and pass change. Changing of roll container assembly will be carried out with the help of EOT crane.

Immediately following the roughing mill train group, there will be one crop and cobble shear, which will be used mainly to crop the front end of the bar emerging from last roughing stand. Crop ends will be collected in buckets below the mill.
Intermediate mill train: The continuous intermediate mill will be composed of alternately arranged horizontal and vertical rolling stands to allow twist free rolling. Suitable arrangement for conversion before horizontal and vertical configurations will also be provided as required based on the pass schedules. The continuous intermediate train will consist of 2-high housing less stands fitted with roll neck bearings, screw down mechanism and multi-groove rolls with provision of groove alignment. The stands will be provided with roll container assembly, spindle carrier, spindles and arrangement for lateral shifting to facilitate roll change and pass change. Changing of roll container assembly will be carried out with the help of EOT crane as well as by quick stand changing system. On leaving the intermediate mill, there will be one crop and cobble shear or head and tail end cropping.

Finishing blocks: For small sizes of rebars, the final reduction to finished size will be accomplished by passing the bars through two no-twist finishing block units, Tungsten carbide rolls will be used in the block with each pair of rolls mounted in individual housings in sleeve type bearings. The housings will be at 45° to the pass line and successive housings will be at 90° to each other. The block will mainly consist of bevel gear drive assembly and roll housing assemblies. For operator’s safety and to contain the roll coolant water, cobble screen doors will be provided to encase all the stands. No-twist finishing block unit will be preceded by a crop shear to trim the front end of the bar, before it enters the block. Immediately following the crop shear there will be a switch which normally will direct the bar towards the finishing block, but in the event of a cobble in the finishing block, will deflect the bar into the chopping shear. Pneumatically operated snap shears will be provided immediately ahead of the finishing blocks, for parting the bar in the event of a cobble in the finishing blocks. All scraps arising at these shears will be collected in buckets below the mill.

Finishing facility: The finish rolled materials, delivered from the finishing stand blocks, will pass through in-line water cooling boxes. Suitable cooling nozzles with necessary controls will be provided for rapid quenching of the re-bars as required. Subsequently the re-bars will be self-tempered to obtain the desired mechanical
properties. A proven thermo mechanical treatment process shall be selected during finalization of the mill with the technology supplier.

The finished re-bars will be cut to cooling-bed lengths by dividing shears located downstream of the water cooling boxes. A rake type cooling bed will receive the finished bars through high speed bar delivery system. In the cooling bed the finished bars will be cooled. The bar layers will be formed which will then be conveyed to the cold shear area.

At the cold shear station, the bar layers will be cut into order lengths of 6.5 to 12 m. Batches of finished length re-bars will be conveyed to an automatic bar bundling station which will form re-bar bundles, each weighing 3 to 5 tons maximum.

The bundles will be strapped, weighed on-line and delivered to collecting stations where they will be tagged for identification. Short length re-bars will be collected in a separate collecting station. From the collecting grids, the bundles will be removed by EOT cranes to the product storage area at 0.00 levels for storage and subsequent despatch.

FINISHED PRODUCT STORAGE AND DESPATCH

**Finished product storage:** It is considered that provision for a stock of about 7 days shall be kept in the mill. Accordingly, the storage space in the finished product bay has been planned to accommodate these productions.

**Shipping of finished products:** For weighment of the rolled sections before shipment, in-line weighing system for rebar bundle will be provided in the roller table before the collecting station. Relevant records of the finished products will be maintained in the shift office and dispatch office.

Rail and Road access is provided for the dispatch of materials by rails and trucks. The pre-weighed finished products will be loaded with the help of EOT cranes for shipment. The loaded trucks will be weighed again at the plant road weigh-bridge near the main gate before they leave for their destination.

For finished product handling, magnet cranes will be provided in the finished product storage aisle. These cranes would be adequate to meet the production requirement.
Scrap and scale handling: Scrap will be collected through chutes in scrap buckets mounted on rail-bound cars placed at the various points of scrap generation. Scrap will be brought out under the crane approach and loaded with the help of EOT crane into trucks. Scale from below the stands will be flushed by water into scale pit, located in a separate open gantry. The scale will be removed by EOT crane, with the help of grab bucket and loaded into truck.

Roll shop: A roll shop has been considered to meet the requirements of the bar mill. The roll shop will be located attached to the mill bay. Rolls will be transferred to roll shop by transfer car. The roll shop will have the following areas:

- Stand washing area
- Guide assembly area
- Bearing servicing area
- Guide shop equipment for machining/redressing of guides
- Roll turning area
- Grinding area
- Roll and Ring storage area.
  - Notch milling machine
  - Logo machining machine
  - Roll changing robot
  - Stand preparation and roll assembly area
  - Finishing mill maintenance room

3.5.8 Ductile Iron (DI) Pipe Plant

Design basis: Electrosteel Steels Ltd. (ESL) has setup an integrated steel plant including a DI pipe manufacturing facility of capacity 0.22 mtpy at Bokaro. Now the company has decided to expand their business model by enhancing the production capacity of DI pipe from 0.22 mtpy to 0.40 mtpy within the existing plant area. This 0.18 mtpa capacity enhancement of DI pipe will be done in the size range from DN100 to DN300.
Hot metal requirement: The basic raw material for this plant is hot metal produced in the blast furnace (BF). Around 0.19 mtpy additional hot metal will be required for the production of 0.18 mtpy DI pipe.

DI Pipe Plant production schedule: The DI pipe plant is scheduled to operate 338 Days per year and three shifts per day. Annual working hours for CCM should be considered as 6760 hours.

Plant features: The liquid hot metal will be brought from BF area to the DI pipe plant area by 60 Ton capacity ladle through railway track. Some scrap and alloys will be added in to the 15 Ton capacity induction furnace with this hot metal to get the required chemistry. After raising the suitable temperature the hot liquid metal to be poured in to a ladle in which again magnesium treatment will take place to make the graphite from flake to nodular and to make the iron somewhat ductile. This liquid metal will then be poured into the centrifugal pipe casting machine to make the hollow pipe. The casted hollow pipe is then sent for annealing in the annealing furnace. After annealing the DI pipe passed through a finishing line consisting of series of machine for different finishing process.

Finishing facility: ESL presently has 5 finishing lines and 6th line will be installed to cater the increased production capacity. The finishing line will consist following processes in sequence.

i. Zn-Coating machine: The pipe just after annealing passes through Zn coating machine for Zn coating at outer surface.

ii. Cutting machine: The cutting machine used to cut the spigot end of pipes

iii. Chamfering machine: Chamfering machine used to finish the sharp edge created after cutting at spigot end of pipe.

iv. Barrel grinding: Barrel grinding use to remove lumps and foreign materials deposited inside the barrel to get smooth inner surface.
v. **Hydro testing machine**: The hydro-testing machine is used to test leakage in pipe by holding water in high pressure inside the pipes as per test procedure.

vi. **Cement lining machine**: This machine used to create sand/cement mortar lining inside the pipe by centrifugal process. After cement lining the pipes passes through a curing chamber. The pipes used to stack in trolley in multiple layers. The trolley with cement lined pipe will be passes through curing tunnel. It will take around 8hrs to reach exit end of curing chamber. Steam is used in curing chamber to increase the humidity for better and quick curing.

vii. **Coating**: After curing the pipes taken into coating line and heated for Bitumen / Epoxy coating. The pipes used to convey by chain conveyor through pre-heating furnace and gets heated. Just after pre-heating of pipes, bitumen coating done by the spraying process using bitumen gun, while pipe is rotating on rotator. After coating the pipes used to passes through a post heating chamber through a conveyor and gets dry.
Finish product storage and dispatch: The finished dry pipes are then transferred to stacking yard by truck/trailer. The loading and unloading of pipes at stacking yard will be done by goliath cranes. After final inspection pipes will be marked for final dispatch.

3.5.9 Calcining Plant
The calcinations plant will produce lime and calcined dolomite for using in steel melt shops as well as in sinter plant. The size of calcined products will be 10 to 80 mm and calcined products will be screened before conveying to steel melt shops. The
undersize product fines will be stored separately and conveyed to the sinter plant for subsequent utilization.

The steel melt shop, proposed under the expansion project will produce further 1.24 MTPA liquid steel in addition to the liquid steel production of 1.2 MTPA from the existing facilities. In order to support the steelmaking through BF-BOF route, a pellet plant will also be installed in the proposed phase in addition to the existing sinter plant which is presently in operation.

3.5.9.1 Kiln Design and Capacity

It is proposed to install vertical shaft kiln of proven design to produce soft burnt highly reactive lime. It is decided that after installation of the facilities proposed under the expansion plan, the existing lime kiln of 800 TPD capacity will be utilized solely for production of calcined dolomite. However, the existing dolo kiln of 150 TPD capacity will be operated for producing calcined lime in addition to the new shaft kiln of 600 TPD capacity. The capacity of the new kiln has been calculated considering possibility of 90% utilization i.e on an average availability of 330 days in a year. Production at rated capacity has also been considered from the existing 150 TPD shaft kiln as well.
3.6 RAW MATERIAL REQUIREMENT

Raw material for this project will be sourced as shown in below table:

Table 3.5: Raw Material and Source

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Raw Materials</th>
<th>BF</th>
<th>Sinter</th>
<th>SMS</th>
<th>Calciner</th>
<th>Coke Oven</th>
<th>Pellet</th>
<th>DI Pipes</th>
<th>Total Raw materials Requirement</th>
<th>Mode of Transportation</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Iron Ore</td>
<td>7,42,500</td>
<td>-</td>
<td>80,300</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8,22,800</td>
<td>Rail</td>
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<tr>
<td>2</td>
<td>Iron Ore Fines</td>
<td>-</td>
<td>18,84,800</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21,15,900</td>
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<td>40,00,700</td>
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<td>3</td>
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<td>14,36,200</td>
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<td>-</td>
<td>14,36,200</td>
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<td>-</td>
<td>63,800</td>
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<td>Rail</td>
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<tr>
<td>5</td>
<td>Dolomite</td>
<td>60,000</td>
<td>1,47,000</td>
<td>-</td>
<td>2,30,000</td>
<td>-</td>
<td>1,00,800</td>
<td>-</td>
<td>5,37,800</td>
<td>Rail</td>
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<td>6</td>
<td>Lime Stone</td>
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<td>2,60,000</td>
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<td>-</td>
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<td>7</td>
<td>Magnesium Powder</td>
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<td>-</td>
<td>-</td>
<td>1,200</td>
<td>1,200</td>
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<tr>
<td>8</td>
<td>Qrtzite</td>
<td>1,35,000</td>
<td>30,300</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>1,65,300</td>
<td>Rail</td>
</tr>
<tr>
<td>9</td>
<td>Coke Breeze</td>
<td>-</td>
<td>1,51,500</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>In Plant</td>
</tr>
<tr>
<td>10</td>
<td>Coke</td>
<td>11,59,500</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>11,59,500</td>
<td>In Plant</td>
</tr>
<tr>
<td>11</td>
<td>Net Coke</td>
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<td>-</td>
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<td>12</td>
<td>Bentownite</td>
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</tbody>
</table>
3.6.1 Raw Materials Analysis

Table 3.6 Physico-Chemical Analysis of Iron Ore

<table>
<thead>
<tr>
<th>Type of ore</th>
<th>Consuming unit</th>
<th>Fe, %</th>
<th>SiO2, %</th>
<th>Al2O3, %</th>
<th>P, %</th>
<th>LOI, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron ore fines</td>
<td>Pellet plant</td>
<td>63.0 to 64.0</td>
<td>2.0 to 3.0</td>
<td>2.5 to 3.0</td>
<td>0.05 to 0.07</td>
<td>2.5 to 3.0</td>
</tr>
<tr>
<td>Sized iron ore</td>
<td>Blast Furnace</td>
<td>63.0 to 64.0</td>
<td>2.0 to 3.0</td>
<td>2.5 to 3.0</td>
<td>0.045 to 0.05</td>
<td>2.5 to 3.0</td>
</tr>
</tbody>
</table>

Table 3.7 Physico-Chemical Analysis of Coking Coal

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Prime/ Hard Coking Coal</th>
<th>Semi-soft Coking Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash%</td>
<td>8 to 9</td>
<td>9 to 10</td>
</tr>
<tr>
<td>Volatile matter (VM), %</td>
<td>21 to 22</td>
<td>23 to 27</td>
</tr>
<tr>
<td>Sulphur (S), %</td>
<td>0.6 max.</td>
<td>0.6 max.</td>
</tr>
<tr>
<td>Crucible Swelling No. (CSN)</td>
<td>7 to 8</td>
<td>4 to 6</td>
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</table>

Table 3.8 Physico-Chemical Analysis of Pulverized Coal Injection

<table>
<thead>
<tr>
<th>Ash, %</th>
<th>VM, %</th>
<th>FC, %</th>
<th>S, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 to 10</td>
<td>18 to 23</td>
<td>67 to 70</td>
<td>0.6 max.</td>
</tr>
</tbody>
</table>

Table 3.9 Physico-Chemical Analysis of Limestone

<table>
<thead>
<tr>
<th>Item</th>
<th>SiO2, %</th>
<th>Al2O3, %</th>
<th>CaO, %</th>
<th>MgO, %</th>
<th>LOI, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>BF grade limestone</td>
<td>4.5 to 5.0</td>
<td>1.5 to 1.7</td>
<td>47.0 to 48.0</td>
<td>2.5 to 2.8</td>
<td>41.0</td>
</tr>
<tr>
<td>SMS grade limestone</td>
<td>0.5 to 0.6</td>
<td>0.3 to 0.5</td>
<td>53.0 to 54.5</td>
<td>1.0</td>
<td>43.0</td>
</tr>
</tbody>
</table>
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m3, 1×350 m3, 1×1700 m3) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

### Table 3.10 Physico-Chemical Analysis of Dolomite

<table>
<thead>
<tr>
<th>SiO₂, %</th>
<th>Al₂O₃, %</th>
<th>CaO, %</th>
<th>MgO, %</th>
<th>LOI, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 to 1.5</td>
<td>0.5 to 0.6</td>
<td>28.0 to 30.0</td>
<td>19.0 to 20.0</td>
<td>43.0 to 45.0</td>
</tr>
</tbody>
</table>

### Table 3.11 Chemical Analysis of Quartzite

<table>
<thead>
<tr>
<th>SiO₂, %</th>
<th>Al₂O₃, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>96.0 to 97.0</td>
<td>0.5 to 1.0</td>
</tr>
</tbody>
</table>

### Table 3.12 Chemical Analysis of Iron Ore Fine

<table>
<thead>
<tr>
<th>Fe %</th>
<th>SiO₂, %</th>
<th>Al₂O₃, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 to 64</td>
<td>3.5 to 4</td>
<td>3 to 3.5</td>
</tr>
</tbody>
</table>

### Table 3.13 Chemical Analysis of Bentonite

<table>
<thead>
<tr>
<th>Fe %</th>
<th>SiO₂, %</th>
<th>Al₂O₃, %</th>
<th>CaO</th>
<th>MgO</th>
<th>LOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.0</td>
<td>47.0</td>
<td>14.9</td>
<td>1.7</td>
<td>3.6</td>
<td>10.00</td>
</tr>
</tbody>
</table>
Material Balance

Figure 3.7 Material Balance of Blast Furnace

Figure 3.8 Material Balance of Pellet Plant
Figure 3.9 Material Balance of Sinter Plant

Figure 3.10 Material Balance of Calciner
3.7 RESOURCE OPTIMISATION/RECYCLING AND REUSE ENVISAGED IN THE PROJECT

The proposed project will be utilizing the present facility and optimization of the same over the area of 374.80 ha

- Improving & optimizing furnace efficiency.
- Constant process improvement for increasing output quality to customer’s specifications.
- Optimization of process with respect to cost and quality.
- Reduce failure and increase life of equipments
- Changes in pollution control equipments for better efficiency
- Automation of the system to have minimal interventions
- Automatic Raw material Handling & Transportation within the facility
- On-line monitoring systems for fault detection and remediation measures
- A information system for feedback looping and continuous improvement measures.
- Intensive Plantation and Peripheral Greenbelt development
- Appropriate measures for Noise attenuation and related risk mitigation.
- An on-site emergency plan in place for any disaster.

In this process there is no additional land requirement at this point in time.
3.8 WATER REQUIREMENT

The total water requirement for the project is being estimated at 1005 m³/hr and is drawn from Damodar River. WRD, Jharkhand has granted to withdraw 36.50 MCM water from the river Damodar, which is in Annexure-11. The detailed breakup of the water consumption and recycling is given below:

Table 3.14: Water Balance Table

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Purpose</th>
<th>Use m³/hr</th>
<th>Recirculation m³/hr</th>
<th>Loss/Make up m³/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Softner Plant</td>
<td>50</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>DM Plant</td>
<td>25</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Raw Material Handling</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Coke Oven Plant</td>
<td>75</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sinter Plant</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>BF Slag Cooling</td>
<td>250</td>
<td>30</td>
<td>220</td>
</tr>
<tr>
<td>7</td>
<td>SMS</td>
<td>200</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>Air Separation Plant</td>
<td>60</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>9</td>
<td>Rod Mill &amp; Wire Mill</td>
<td>175</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>DIP Plant</td>
<td>70</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>11</td>
<td>CPP</td>
<td>400</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>12</td>
<td>Air Compressor</td>
<td>5</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Lime Calciner Plant</td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>14</td>
<td>Domestic Usage</td>
<td>50</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>15</td>
<td>Greenbelt Development</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Water Sprinkling</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Fire Hydrant</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Pellet Plant</td>
<td>40</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>1533</td>
<td>533</td>
<td>1005</td>
</tr>
</tbody>
</table>
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

Water Balance

Figure: 3.12 Water Balance Diagram
3.9  POWER REQUIREMENT FOR THE PROJECT

The total Power requirement is 218 MW.

3.9.1  Source of Power

The requirement of for the 3 MTPA integrated steel plant will be met from the existing 220/33 kV MRSS by suitably extending the existing 33 kV switchboard and increasing the present contract demand from 65 MVA to minimum 75 MVA. Three (3) nos 2500 A VCB feeders will be added to the existing 33 kV switchboard for catering incoming power supply at 33 kV. WRD, Jharkhand has granted to withdraw 36.50 MCM water from the river Damodar vide letter no- 2/PMC/WS/56/2007 (Part-I)-46 dtd: 21.5.2010. is given in Annexure-12.

Emergency power supply to the essential loads of the proposed plant units for safe shutdown in case of failure of main power supplies will be made available from local DG sets of suitable capacity.

Table 3.15 Power Requirement

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Plant Unit</th>
<th>Existing Load Based on Utilization</th>
<th>Additional Future Units' Load Design MD, MW (3.0 MTPA)</th>
<th>Total Load Estimated Design MD, MW (3.0 MTPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Iron Making Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01</td>
<td>BF 33/6.6 KV Sub-station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>BF 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>BF 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.2</td>
<td>BF 2(with PH,SGP)</td>
<td>6.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.3</td>
<td>BF 3 with BPRT</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.4</td>
<td>VCO(BATTERY1,2,3,4,CPCS)</td>
<td>1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.5</td>
<td>HCO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.6</td>
<td>Air Compressor Plant</td>
<td>4.5</td>
<td>1.5</td>
<td>6</td>
</tr>
<tr>
<td>1.1.7</td>
<td>BF Gas Holder</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>1.1.8</td>
<td>LD Gas Holder</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>1.1.9</td>
<td>PCM 1</td>
<td>0.75</td>
<td></td>
<td>0.75</td>
</tr>
<tr>
<td>1.1.10</td>
<td>PCM 2</td>
<td>0.5</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>1.1.11</td>
<td>PCI 1</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

<table>
<thead>
<tr>
<th>1.1.12</th>
<th>PCI 2</th>
<th>Included in PCI 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.13</td>
<td>Lime Plant</td>
<td>1</td>
</tr>
<tr>
<td>1.1.14</td>
<td>Dolo Plant</td>
<td>1</td>
</tr>
<tr>
<td>1.1.14A</td>
<td>Expansion of LRS</td>
<td>0.65</td>
</tr>
<tr>
<td>1.1.15</td>
<td>Total</td>
<td>23.35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.2</th>
<th>SP 33/6.6 KV Sub-station</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1</td>
<td>RMHS</td>
</tr>
<tr>
<td>1.2.2</td>
<td>SP 1</td>
</tr>
<tr>
<td>1.2.3</td>
<td>SP 2</td>
</tr>
<tr>
<td>1.2.4</td>
<td>SP 3</td>
</tr>
<tr>
<td>1.2.4</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.00</th>
<th>Steel Making, Mills, DIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>SMS 33/6.6KV Sub-station</td>
</tr>
<tr>
<td>2.1.1</td>
<td>LD 1, CCM 1, LD 2, CCM 2</td>
</tr>
<tr>
<td>2.1.1 A</td>
<td>LD 3, CCM 3</td>
</tr>
<tr>
<td>2.1.2</td>
<td>LRF 1</td>
</tr>
<tr>
<td>2.1.3</td>
<td>LRF 2</td>
</tr>
<tr>
<td>2.1.3 A</td>
<td>LRF 3</td>
</tr>
<tr>
<td>2.1.3 B</td>
<td>HMDS, VD</td>
</tr>
<tr>
<td>2.1.3 C</td>
<td>VD</td>
</tr>
<tr>
<td>2.1.4</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.2</th>
<th>BM 33/6.6 KV Sub-station</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1</td>
<td>Bar Mill</td>
</tr>
<tr>
<td>2.2.1 A</td>
<td>Combo Bar &amp; Wire Rod Mill</td>
</tr>
<tr>
<td>2.2.2</td>
<td>WTP</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.3</th>
<th>DIP 33 KV Sub-station</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.1</td>
<td>DIP (350-1200 mm)</td>
</tr>
<tr>
<td>2.3.2</td>
<td>DIP (80-300 mm)</td>
</tr>
<tr>
<td>2.3.2 A</td>
<td>DIP Pipe Storage (outside 4 lane gate)</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Total</td>
</tr>
</tbody>
</table>

| 2.4 | WRM 33/6.6 KV Sub-station |
### Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Sijaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

<table>
<thead>
<tr>
<th>2.4.1</th>
<th>WRM</th>
<th>16.5</th>
<th>16.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.1.A</td>
<td>WRM shed extension</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2.5</td>
<td>Oxygen 33/6.6 KV Substation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5.1</td>
<td>Oxygen plant</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>2.5.1 A</td>
<td>New Oxygen Plant</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>2.6</td>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6.1</td>
<td>16 K, 47 K</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2.6.2</td>
<td>office</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>2.6.3</td>
<td>Fire PH</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2.6.4</td>
<td>Engg Shop</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>2.6.4 A</td>
<td>Engg Shop Expansion</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>2.6.5</td>
<td>Road Lng</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2.6.5 A</td>
<td>Additional Rd &amp; Area Lighting (Except Sabra Rd)</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2.6.6</td>
<td>Aux for CPP, TB &amp; WHRB</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>2.6.6 A</td>
<td>Addl aux for CFBC 3, 2 Nos WHRB</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.6.7</td>
<td>Total, Others</td>
<td>49.9</td>
<td>30.7</td>
</tr>
</tbody>
</table>

|        |        | 80.6 |

| 3 | Grand Total, MW | 162.15 | 98.67 | 228.82 |
| 4 | Dist Loss and diversity factor | 128.47 | 78.18 | 206.65 |
|   | MVA, 0.95 PF | 135 | 82 | 218 |

| Plant Max Demand, MW | 128 | 78 | 207 |
| MVA, 0.95 PF | 135 | 82 | 218 |

### Energy Balance

<table>
<thead>
<tr>
<th>Present Power Requirement</th>
<th>135 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Present CPP Generation</td>
</tr>
<tr>
<td>2</td>
<td>Present DVC Import (for operation)(DVC Contract Demand is 65 MVA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Power Requirement (3.0 MTPA)</th>
<th>218 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Future CPP Generation with 3 CFBC</td>
</tr>
<tr>
<td>2</td>
<td>Future DVC Import for 3.0 MTPA (DVC Contract Demand is 65 MVA extendable to 120 MVA)</td>
</tr>
</tbody>
</table>
3.9.2 Selection of System Voltages

Following voltage levels have been envisaged for the 3 MTPA Integrated Steel Plant unit.

- **33 kV**: Plant primary HV distribution.

- **6.6 kV**: For secondary HV distribution of power to individual plant units as well as for feeding motors rated from 200 kW and up to 2000 kW.

- **415 V**: Low voltage distribution as well as utilisation voltage within various plant units.

*Basis of 33 kV for primary HV distribution:* For the plant primary distribution voltage, 33 kV has been envisaged keeping in view the power supply requirement of the following loads:

- i) Pellet Plant
- ii) Blast Furnace
- iii) DI Pipe Plant
- iv) BOF
- v) Ladle Furnaces
- vi) Mill
- vii) Air Separation Plant

The plant unit mentioned above are generally engineered and supplied by reputed suppliers considering voltage level of 33 kV as short circuit level at these voltages will comparatively be higher than that available at lower voltage level.

Further, it will be possible to use bigger unit size of transformer with 33 kV as compared to lower voltages considering the maximum continuous current rating and the short circuit interrupting capacity of standard circuit-breakers. Use of larger unit size of transformer will reduce the number of substations.

*Basis of 6.6 kV for secondary distribution:* For the plant secondary HV distribution, 6.6 kV supply has been envisaged since a large number of motors rated between 200 kW and 1000 kW will be required for the steel plant. Motors of such ratings are
generally manufactured by majority of suppliers considering nominal voltage of around 6.6 kV.

**Basis of 415 V for secondary low voltage distribution:** For the plant secondary LV distribution, 415 V supply has been selected since a large number of motors rated less than 200 kW will also be required for the steel plant. Motors of such ratings are generally manufactured by majority of suppliers considering nominal voltage of around 415 V.

### 3.9.3 Basic Impulse Insulation Levels

Electrical systems are subjected to disturbances of many types, such as system faults, switching surges or lightning surges causing over-voltages. These over-voltages are detrimental to the insulation of the electrical equipment and it is necessary that the insulation should be adequate to withstand the stresses caused by these over-voltages without fatigue or failure. Insulation levels have to be properly coordinated for the equipment in the various voltage levels by adopting a basic impulse insulation level (BIL) for a particular system. The following values of BIL are proposed to be adopted as given in Table 3.16.

**Table 3.16 Basic Insulation Level (BILL)**

<table>
<thead>
<tr>
<th>System Voltage (kV R.M.S.)</th>
<th>BIL (kV peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 kV</td>
<td>170 kV</td>
</tr>
<tr>
<td>6.6 kV</td>
<td>60 kV</td>
</tr>
</tbody>
</table>

### 3.9.4 System Short-circuit Levels

The following symmetrical short-circuit interrupting ratings have been selected for switchgears of various voltage levels as given in Table 3.17.
Table 3.17 Design Short Circuit Level

<table>
<thead>
<tr>
<th>System Voltage (kV R.M.S.)</th>
<th>Design Short Circuit Level (kA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 kV</td>
<td>31.5 kA</td>
</tr>
<tr>
<td>6.6 kV</td>
<td>40 kA</td>
</tr>
<tr>
<td>0.415 kV</td>
<td>50 kA</td>
</tr>
</tbody>
</table>

3.9.5 Plant Power Distribution System

The power distribution system of the proposed steel plant has been envisaged on the basis of plant general layout showing relative locations of various units and estimated power demand of the individual units as well as the plant as a whole.

The power distribution scheme is shown in the form of single line diagram, Drawing No. 11525-97A-000-ELE-0001 attached with the report.

In order to receive power supply for the proposed project, the existing 33 kV switchboard at MRSS will be suitably extended at both ends by adding two (2) nos 2500 A VCB panels at Sec-II and one (1) no 2500 A VCB panel at Sec-I for feeding incoming power supply to the proposed plant. The existing 33 kV CPP substation will be extended as shown in the SLD and the new 60 MW, 11 kV TG will be connected with this bus to cater to the additional load requirement.

One (1) No. 33 kV indoor Air Insulated Switchgear (AIS) with vacuum circuit breakers (VCB) has been envisaged at new MRSS to cater to the power supply requirement of various plant loads of the proposed project. This switchboard is having three sections with Sec-I & II for catering steady loads where as Sec-III will feed fluctuating loads viz. Ladle Furnaces.

Requisite No of 33/6.6 kV Load Block Distribution Substations (LBDS) as well as 6.6/0.415 kV Load Centre Substations (LCSSs) have been envisaged near various plant units like Pellet Plant, Blast Furnace, DI Pipe Plant, SMS, Mills, Air Separation Plant etc in order to cater power supply to various 6.6 kV HV loads as well as 415 V LV loads of the proposed expansion.
6.6/0.415-0.240 kV single or double ended load centre substations have been envisaged at downstream level for feeding LV consumers of various plant units. Each of these substations will comprise 2000/1600/1000/630 kVA as applicable, 6.6/0.440-0.240 kV cast resin insulated dry type (AN) transformers and 415 V switch board with air circuit-breakers. Considering space constraint, dry type transformers for LCSSs have been envisaged so that the same can be accommodated inside the switchgear room.

3.9.6 Main Feature of Power Distribution Scheme

Load-centre type of distribution: Load-centre type of distribution principle has been adopted in designing the entire power distribution system. In this type of system, substations or switching stations will be located near the load-centres of individual groups of loads in an area, with bulk power being carried either at higher voltage or over high capacity feeders up to these substations or switching stations. This type of distribution system has the advantage of simplified operation as well as maintenance work.

Radial distribution system: Adoption of simple radial system of distribution is another important feature of the plant power distribution scheme. This will ensure continuity of power supply to the production shops to a high degree and will also make the operation and maintenance of the plant easier and safer. Power system relaying will also be simplified.

Stand-by capacity: It is necessary to provide adequate stand-by capacity in the system so as to ensure high degree of continuity of power supply to various plant departments on a firm basis, so that production is not hampered due to power supply interruptions. This aspect has been given due consideration in designing the distribution system. The number and capacity of transformers as well as main feeders have been so selected, that even with the outage of one of the transformers or feeders, the remaining capacity is adequate for maintaining the power supply, without adversely affecting the plant operation.
Total Power Distribution System for 3 MTPA Integrated Steel Plant of Electrosteel Steels Limited is given in Figure No. 3.12.
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

Figure No: 3.12 Main Power Distribution System
3.10 QUANTITY OF WASTES TO BE GENERATED (LIQUID AND SOLID) AND SCHEME FOR MANAGEMENT

**SOLID WASTE GENERATION**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Waste</th>
<th>Qty</th>
<th>Type</th>
<th>Treatment</th>
<th>Disposal</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STP Sludge</td>
<td>84 TPA</td>
<td>Slurry</td>
<td>Treated</td>
<td>Green Manure</td>
<td>Greenbelt Development</td>
</tr>
<tr>
<td>2</td>
<td>Office</td>
<td>18.5 TPA</td>
<td>Paper Waste</td>
<td>Shredding</td>
<td>Sale</td>
<td>Recycled by the Authorized vendor</td>
</tr>
<tr>
<td>3</td>
<td>Packing waste</td>
<td>12 TPA</td>
<td>Paper &amp; Plastic</td>
<td>Stored for sale</td>
<td>Sale</td>
<td>Recycled by the Authorized vendor</td>
</tr>
<tr>
<td>3</td>
<td>Process</td>
<td>23,300 TPA</td>
<td>Flue Dust</td>
<td>In GCP</td>
<td>Reused</td>
<td>Recycled in Sinter Plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35,000 TPA</td>
<td>Mill Scale</td>
<td>Accretion Bin</td>
<td>Reused</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,29,258 TPA</td>
<td>Ash</td>
<td>Cyollo</td>
<td>Sale</td>
<td>Will be sent to cement industry</td>
</tr>
<tr>
<td>4</td>
<td>Slag</td>
<td>1092450 TPA</td>
<td>BF Slag</td>
<td>BF Slag</td>
<td>Sale &amp; Reused</td>
<td>Granulated Slag is sold to cement plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7,37,900 TPA</td>
<td>BOF Slag</td>
<td>BOF Slag</td>
<td>Reused</td>
<td>Used in construction for road making</td>
</tr>
</tbody>
</table>

**BF Slag Composition**

Based on the charging material, the BF Slag is generated @ 360 kg/T of hot metal. On average, it contains about 0.5–0.8 % FeO, 35–42% CaO, 35–40% SiO₂, 8–9% MgO, 8–15% Al, 0.3–1.0% MnO and 0.7–1.5%S in weight. The slag basicity CaO/SiO₂ is in the range of 0.95–1.25

**BOF Slag Composition**

This slag was essentially composed of calcium, iron, silicon, and magnesium oxides contained in five main minerals: calcium silicate oxides (\(\beta-Ca_2SiO_4\)-\(\beta-Ca_2SiO_4\) and Ca₃SiO₅Ca₃SiO₅), a solid solution of calcium aluminum ferrite oxides (Ca₀.₅₂Al₀.₄₈O₅Ca₂Fe₁.₅₂Al₀.₄₈O₅), a solid solution of magnesium iron oxides (MgO₀.₄₃₂FeO₀.₅₆₈), and free lime CaO. The Rietveld method was used to
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m3, 1×350 m3, 1×1700 m3) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

determine the amount of each mineral phase and led to the following mineralogical composition: β-Ca2SiO4=32%, Ca3SiO5 = 2%, Ca3SiO5 = 2%, Ca2Fe1.52Al0.48O5=26%Ca2Fe1.52Al0.48O5=26%, MgO0.432FeO0.568=22%MgO0.432FeO0.568=22%, and CaO=18%CaO=18%. BOFS thus contained a significant amount of hydraulic phase (dicalcium silicate and free lime), which was confirmed by the study of its reactivity using a hydrated paste. (Ref: Technical Paper on “Quantification of Hydraulic Phase Contained in a Basic Oxygen Furnace Slag” by P. Y. Mahieux; J. E. Aubert; G. Escadeillas; and M. Measson).

Table 3.17 Hazardous Waste Inventory

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Hazardous Waste</th>
<th>Quantity (ton/annum)</th>
<th>Mode of Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Zinc Dust</td>
<td>48.75 TPA</td>
<td>Sold to Authorized Vendor</td>
</tr>
<tr>
<td>2.</td>
<td>Used/Spent Oil &amp; Used grease</td>
<td>105.06 TPA</td>
<td>Stored separately and incinerated in furnace with Authorization from JSPCB</td>
</tr>
</tbody>
</table>

WASTE WATER GENERATION & MANAGEMENT

1. The wastewater generated from the different cooling circuits would be routed through cooling towers and pressure filters as appropriate for recycling purpose. Cooling tower blow down would generally be used for dust suppression, slag quenching etc.

2. Effluent stream from caster, mills, etc containing mostly suspended solids (SS), oil and grease (O&G) for which mostly physico-chemical treatment schemes like oil separation, settling, clarification, filtration, etc, would be employed.

3. The power plant effluent is the backwash of DM water plant, which would be neutralised in the neutralisation pit and the treated waste water would be recycled.
4. The plant sanitary waste water including canteen effluent is treated in a sewage treatment plant for separation of floating oil and reduction of BOD and the treated effluent is partly used for plant greeneries, road washing etc.

3.11 SCHEMATIC REPRESENTATIONS OF THE FEASIBILITY DRAWING WHICH GIVES INFORMATION OF EIA STATUS

As per the Environment Impact Assessment (EIA) notification dated 14th September 2006 and subsequent amendments, this project falls under category A. It would be required to prepare EIA/EMP report to obtain the Environmental Clearance (EC) for the project from the MoEF & CC.

SCHEMATIC DIAGRAM FOR EMP
CHAPTER 4
SITE ANALYSIS

4.1 CONNECTIVITY

**M/s Electrosteel Steels Limited.** has good communication by road, as all villages and towns have paved roads and connected by bus services. The nearest town of Bokaro is primarily connected with the rest of India by railway and road. The nearest railway station is Talgaria under South-Eastern Railway about 7 km & Shewbabudih-15 away from proposed plant site towards north-east, is presently having single line electrified traction system. Bokaro railway station is about 22.9 km away from plant site towards west. However, Talgaria-Chas-Bokaro link line is passing about 4 km north of the plant. The nearest domestic airport is Birsa Munda Airport in Ranchi and international airport is Netaji Subhash Chandra Bose International Airport at Kolkata, about 132km. and 320 km respectively from Plant.Kolkata and Haldia (river port) and Paradip sea port. Nearest Town is Amlabad-8.7Km & Chas-11.0Km far from the project site. Nearest City is Bokaro Steel City-14Km & Ranchi-103.9Km away from the location. District Headquarter is Bokaro Steel City which is 14Km away from location.

4.2 LAND FORM, LAND USE LAND OWNERSHIP

The major land use in the study area is agriculture followed by collieries operation, scattered vegetation patches covering small areas are present.

The total land is under the possession of M/s Electrosteel Steels Ltd. and is intended for Industrial use only. Out of the total Land of 374.80 Ha, 184.23 Ha is Forest land and rest 190.57 Ha is Non-Forest Land.

<table>
<thead>
<tr>
<th>Components /Units</th>
<th>Total Area in Ha</th>
<th>Forest Area in Ha</th>
<th>Non Forest Area in Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMHS, Coke Oven &amp; Power Plant Complex</td>
<td>67.66</td>
<td>56.91</td>
<td>10.75</td>
</tr>
</tbody>
</table>

Table 4.1 Land Distribution of the Project Area
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Siyaljori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

<table>
<thead>
<tr>
<th>Area</th>
<th>Length</th>
<th>Breadth</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast Furnace Area</td>
<td>11.67</td>
<td>9.15</td>
<td>2.52</td>
</tr>
<tr>
<td>Sinter &amp; Calciner area</td>
<td>50.97</td>
<td>24.95</td>
<td>26.02</td>
</tr>
<tr>
<td>Office &amp; Utility Complex</td>
<td>22.13</td>
<td>14.1</td>
<td>8.03</td>
</tr>
<tr>
<td>SMS Area</td>
<td>35.42</td>
<td>17.04</td>
<td>18.38</td>
</tr>
<tr>
<td>4-Lane Access Road</td>
<td>17.88</td>
<td>13.91</td>
<td>3.97</td>
</tr>
<tr>
<td>Old Road</td>
<td>63.08</td>
<td>9.26</td>
<td>53.82</td>
</tr>
<tr>
<td>Green Belt Area</td>
<td>105.99</td>
<td>38.91</td>
<td>67.08</td>
</tr>
<tr>
<td><strong>Total Land</strong></td>
<td><strong>374.8</strong></td>
<td><strong>184.23</strong></td>
<td><strong>190.57</strong></td>
</tr>
</tbody>
</table>

4.3 **TOPOGRAPHY**

Topographically it is a lower plateau having relatively little undulations. The district consists of two district physical units. Northern area is hilly with forest while southern area provides appearance of plain. The average altitude of the land is 210 m from mean sea level. The general slope is from North West to south east. Geologically the area is comprised with Archean granites and gneisses. In southern part Gondwana rock formation occurs in patches. The important rivers, flowing in the district are Damodar, Garga.

4.4 **EXISTING LAND USE PATTERN**

A large area about 25% of the area is under forest. The Cultivable land are divided into two categories - Low lands and uplands. Block wise statistical data reveals that only 29% of the total geographical area is cultivable. The highest percentage of cultivable area is found in Chandankiyari and Lowest being in Gomia block.

The forest is full of variety of material plants, kendu leaves, bamboo, sal, teak and other timber species. The buffer area has considerable flat land which provide suitable site for agricultural use. The hilly area is mostly under forest with patches of cultivation on scrap areas. Major crops grown in the district are rice, wheat and pulses. The area depends mainly on rain and major source of irrigation are wells and canals.
4.5 EXISTING INFRASTRUCTURE

Boundary wall

Boundary wall with watch tower, gate, service road, illumination and surveillance has been constructed considering the plant boundary after the expansion.

Administrative building

Suitable Administrative building with proper Architectural is available for use and no further expansion is anticipated.

Drainage

- Existing plant have concrete storm water drains which in turn connected to ground water recharging pits.
- For proposed storm water drain, same drainage system will be followed

Other existing infrastructures are the operational units as listed below:

- Coke Ovens Plant
- Sinter plant
- Blast furnace
- Steel Melt Shop and Continuous Casting
- Wire rod mill
- Steel melt shop
- Thermal Power Plant
- DI pipe plant

4.6 SOIL CLASSIFICATION

Three soil orders namely Entisols, Inceptisols and Alfisols were observed in Bokaro district. Alfisols were the dominant soils covering 62.0 percent of TGA followed by Inceptisols (21.4 %) and Entisols (12.7 %). The soils of Bokaro district can be broadly grouped into the soil developed in different formation like Granite or Granite Gneiss of Archean Age, Sand Stone and shale’s of Gondwana Foundation and Alluvial Plain

Texturally the soils of Bokaro district have been classified into four classes as:-
Stony and Gravelly: These are low grade soils having a large admixture of cobbles, pebbles and gravels generally found at the base of the hills.

Sandy Soils: It is found near the stream beds containing 60% sand and is easily drained. These are poor in respect of fertility and require heavy manuring.

Loamy Soils: These consist mostly of detritus of decomposed rocks and vegetables matter. It is suitable for cultivation. Normally these are found in valleys near the hills.

Clayey Soils: These soils are found near tank beds. It is sticky soils. Their water bearing capacity is very high. The area is very fertile but yielding capacity improved with addition of sand, lime and organic manures etc.

4.7 CLIMATIC DATA FROM SECONDARY SOURCE

The climate is tropical in Bokaro. The summers are much rainier than the winters in Bokaro. This climate is considered to be Aw according to the Köppen-Geiger climate classification. The average temperature in Bokaro is 26.2 °C and average Precipitation is 1202 mm. The driest month is December. There is 2 mm of precipitation in December. The greatest amount of precipitation occurs in July, with an average of 308 mm. With an average of 33.2 °C, May is the warmest month. The lowest average temperatures in the year occur in January, when it is around 18.5 °C. The monthly readings are given as per the table below.
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<table>
<thead>
<tr>
<th>Month</th>
<th>Avg. Temperature (°C)</th>
<th>Max. Temperature (°C)</th>
<th>Min. Temperature (°C)</th>
<th>Precipitation Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>18.5</td>
<td>25.1</td>
<td>12.0</td>
<td>13</td>
</tr>
<tr>
<td>February</td>
<td>21.4</td>
<td>28.1</td>
<td>19.3</td>
<td>15</td>
</tr>
<tr>
<td>March</td>
<td>26.5</td>
<td>33.8</td>
<td>24.5</td>
<td>12</td>
</tr>
<tr>
<td>April</td>
<td>31.3</td>
<td>40.0</td>
<td>31.3</td>
<td>14</td>
</tr>
<tr>
<td>May</td>
<td>33.2</td>
<td>40.5</td>
<td>31.5</td>
<td>25</td>
</tr>
<tr>
<td>June</td>
<td>31.5</td>
<td>36.6</td>
<td>25.1</td>
<td>151</td>
</tr>
<tr>
<td>July</td>
<td>28.4</td>
<td>31.7</td>
<td>25.1</td>
<td>364</td>
</tr>
<tr>
<td>August</td>
<td>28.2</td>
<td>31.3</td>
<td>21.5</td>
<td>301</td>
</tr>
<tr>
<td>September</td>
<td>28.1</td>
<td>31.6</td>
<td>21.7</td>
<td>205</td>
</tr>
<tr>
<td>October</td>
<td>26.3</td>
<td>28.1</td>
<td>18.9</td>
<td>92</td>
</tr>
<tr>
<td>November</td>
<td>21.8</td>
<td>25.6</td>
<td>12.3</td>
<td>6</td>
</tr>
<tr>
<td>December</td>
<td>18.9</td>
<td>25.6</td>
<td>12.3</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: IMD Bokaro

*Month wise Weather Chart with Temperature & Rainfall*
4.8 SOCIAL INFRASTRUCTURE AVAILABLE

Demography of the Location

The location of the area comes under Bokaro district. According to 2011 Census population of the district is 2,062,330 which sex ratio is 916 females for every 1000 males and the literacy rate around 74%. The district has divided into 8 blocks namely (1) Chas, (2) Gomia, (3) Nawadih (4) Bermo, (5) Peterwa(6) Kasmar, (7) Jaridih and (8) Chandankiayri. The project area comes under Chas & Chandankiayri block. Language spoken in this area mainly Hindi, Santali, Bengali, Urdu & Maithili. There are primary schools, dispensaries, small hospitals, places of worship in nearby area of the project site. Telephone, Medical facilities and Market facilities are available in the nearby towns. Most of the villages have electrification.

Road

- In general, existing plant have a road width of 9m including road side berm.
- Existing plant have both flexible and rigid pavements.
- A stretch of 3.5 km has 4-lane road constructed to cater the proposed units and for smooth flow of in plant traffic in west side.
- For proposed haulage road, carriageway width 7m with 1m to 1.5m width berm on both side of the road and for arterial road 4m width carriageway with 1m to 1.5m width berm both sides have been considered. Berm width will be provided based on available space.
- The existing plant is presently connected with Chas – Talgaria road towards north and west, which is also connected to NH-18 towards west near Chas.
- ESL has 6 no of road weigh bridges, out of these 4 nos. are of 100 T and 2 nos. are of 120 T capacities.
- The existing approach road to the plant is being widened and strengthened.
Rail

- For unloading the raw material to proposed wagon tippler, a railway link will be developed from Bandhidih railway siding.
- For the purpose of proposed rail dispatch, ESL is contemplating to develop an in-plant railway yard at the eastern part of the land, which will be connected to the Indian Railway track system through Bandhidih take off. Land to be acquired for this siding and link line.
- In-motion rail weigh bridge for weighing dispatch materials to be installed.
- ESL has to obtain ‘Railway Approval’ for the proposed in-plant railway infrastructure for incoming raw materials and outgoing finished products along with approach link from Bandhidih railway siding and takeoff arrangement.
5.1 PLANNING CONCEPT

Following major conditions considered for the proposed project:

- The land availability is limited which restricts the expansion options in terms of area for both process route and capacity.
- Therefore, to minimize the procurement of land outside the existing boundary ESL desired to explore the possibility to utilize for the project.
- Existing operations of the major production facilities to be unaffected due to the installation of new facilities under the project, to the extent possible.

The plant is an integrated steel plant having semi-mechanized operation. It is a labor intensive project. However, depending on the production schedule, there will be additional technical labor engaged for operation. The raw materials shall be transported through covered trucks by road up to the nearest siding for further transportation by rail. And the finished products will be transported by both rail and road. The transportation load will not add much to the present load on the said road system. Appropriate plantation program shall be undertaken along with the developmental program to at least cover the boundary areas with thick and tall plants for containment of the air borne pollutants within the premises, which is duly reflected in the land use plan.

There will not be any further infrastructural development other than needed for the commissioning of the total project component machineries. This expansion-cum-modification shall utilize the present infrastructural facilities for all purposes.

5.2 POPULATION PROJECTION

Temporary influx of people will be there as the managerial and supervisory staff will generally be outsider. A projection may be made by a governmental organization, or by those unaffiliated with a government.
5.3 LAND USE PLANNING

The total project area is 374.80 Ha, out of which 184.23 Ha land is Forest land & 190.57 Ha land is Non Forest land. As per norms 33% of greenbelt area will be there from the total project area, but presently about 105.99 Ha (28.3%) of the total project area is covered under greenbelt & plantation in order to reduce dust & noise pollution levels & to increase aesthetic beauty of the area. Rest 4.7% of the plantation will be done after Environment Clearance. All the haulage roads will be concretized and connected to main transportation pathway. These roads will have plantations on both sides as well as the storm water drains will have the same right of way.

5.4 ASSESSMENT OF INFRASTRUCTURE DEMAND

ESL will assess the demand of infrastructure (Physical & Social) in nearby area of the proposed site and will develop such opportunities under corporate social responsibilities programs.

5.5 AMENITIES/ FACILITIES

All the civic amenities required are present within 15 km radius of the project viz City Centre, temples, cinema halls, zoo, and recently the Bokaro Mall and PVR etc. M/s Electrosteel Steels Ltd. will make sincere efforts to improve the socio-economic status of the local habitants. A welfare scheme will be prepared by the company for the socio-economic development of the area. The scheme will envisage promotion of education in the adjoining villages by giving aid to the local schools, providing drinking water facility and organizing health check up programs. Local people will be given free seedlings to develop greeneries all around. The progress of the scheme will be reviewed periodically and further action will be taken as deeming fit.
CHAPTER -6

PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA (Processing Area)

The site already having administrative and site control office with latest equipment like computers, walkie-talkie & computerized weighbridge, printers, fax, Xerox machine, etc. Sufficient power load exists to meet the current requirement. Water for construction and domestic purpose as well industrial purposes will be drawn from Damodar River.

6.2 RESIDENTIAL AREA (Non Processing Area)

There is no residential area inside plant premise but some temporary sheds are there inside the premises to facilitate temporary workers’ rest sheds.

6.3 GREEN BELT

During development of plant general layout, it is mandatory to reserve 33 per cent of the plant area for greenbelt as per the recent statutory requirements. The greenbelt, thus developed, would not only prevent the fugitive dust emissions but also improve the plant peripheral appearance from aesthetics view point. Unpaved areas, if any, within the plant boundary would be provided with grass cover.

6.4 SOCIAL INFRASTRUCTURE

Proposed project will result in growth of the surrounding areas by increased direct and indirect employment opportunities in the region including ancillary development and supporting infrastructure. It will lead to the development of certain local ancillary facilities and consequent employment opportunities. Further the project will also lead to the development of market, trade centers, activities etc. In addition to the above, ESL has a track record of engaging the local communities and extending several social services to the nearby villages.
6.5 CONNECTIVITY

The proposed site is falls at village Siyaljori, Bhagabandh, Budhibinor, Alkusa, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013. The project area is good as all villages and towns have paved roads and connected by bus services.

- Nearest City is Bokaro Steel City-14Km & Ranchi-103.9Km
- District Headquarter is Bokaro Steel City which is 14Km
- Nearest Town is Amlabad-8.7Km & Chas-11.0Km
- Talgaria under South-Eastern Railway about 7 Km, Shewbabudih-15Km and Bokaro railway station is about 22.9 Km
- Birsa Munda Airport in Ranchi and international airport is Netaji Subhash Chandra Bose International Airport at Kolkata, about 132Km. and 285 Km respectively.

The site is well connected with communication facilities like telephone and wireless and as such, no constraints.

The only aspect of Railway Siding within or nearby the premises will minimize the traffic load as well as reduce the pollution due to traffic movement along with cost savings due to transportation optimization and enhance corporate profit.

6.6 DRINKING WATER MANAGEMENT

It is envisaged that drinking water is available for the employer from the existing facilities at site. Contractor will make special arrangements for dispensing and storing the drinking water for use of their workers during construction stage.

Drinking water system caters to the water requirement of plant personnel for drinking and sanitary purposes, laboratory, canteen and other miscellaneous uses. Few stationary RO facilities will be installed for facilitating good drinking water to all inside plant during operation.
Drinking water plant has been provided within the raw water treatment plant area. Clarified water from the make-up water is passed through on line ultra filters, having capacity of about 1005m$^3$/hr.

Filtered water is reserved in underground reservoir and from the reservoir drinking water is distributed in the plant through pumps. The waste water generating will be disposed though soak pit/STP.

6.7 **SEWERAGE SYSTEM**

Waste water generated from the different area of the plant will be treated to desired extent in suitable treatment facilities and recycled back to the process to attain ‘zero’ discharge, facilitating adequate reuse of water in the respective recirculating systems and economizing on the make-up water requirement. Waste effluent and blow down from the recirculating water systems will be sent in the waste water pit where the suspended solids, oil etc will be removed. The supernatant water will be utilised in low end application such as sprinkling, gardening etc. The sewage generated from the toilet blocks of different area will be collected by means of suitable sewer system for treatment in package type Sewage Treatment Plant (STP). The STP will be provided in the proposed expansion of the plant. The treated sewage will be transported to the Central Effluent Treatment Plant (CETP). The CETP will comprise primary, secondary and tertiary treatment which includes the RO Plant. Treated water from the CETP will be reused in the plant make-up water system. Rejects and wash water from CETP and ultra filtration units containing high dissolved solids will be fed to the evaporator to form crystallization and residual solids.

- Plant would be designed on Zero Effluent Discharge scheme
- Primary treated waste water from ETP would be used for low end application such as make up water for dust suppression, fire fighting, gardening, RMHS, etc.
• The cooling tower and boiler blow down water would be used within the plant to the maximum extent practicable, after routing the same through the treated waste water circuit.

• The DM plant effluent water after pH adjustment may be preserved in the same reservoir.

• There would be provision of holding the storm water generated from the plant in a separate reservoir for water conservation and miscellaneous downstream use, as and when necessary.

• Rainwater harvesting for groundwater recharge

6.8 INDUSTRIAL WASTE MANAGEMENT
The proposed project would generate various types of wastes including hazardous, liquid effluents and solid wastes. The proper management facilities are envisaged for all type wastes in plant.

6.9 SOLID WASTE MANAGEMENT

**BF slag:** The generated BF slag is granulated in Slag Granulation Plant. Most of the granulated BF slag is sold to cement plants for cement production and the balance may be used for construction purposes.

**BF sludge:** BF sludge generated in GCP of Blast furnace contains about 30% Carbon and 40% Iron. It would be recycled in Sinter Plant after dewatering in filter press.

**BOF slag:** There would be recovery of metallics from the entire quantity of BOF slag, following which the slag would be weathered. The slag, after weathering, would be used in construction sector for road making and other uses.

**Flue dust:** Flue dust generated from ESP or Bag Filters in different units have high iron content and would be reused in sinter plants after mixing with other sludges.
**Mill scales**: Mill scale generated in the Rolling mills and Casters of Steel Melt shops would be used in sinter making after de oiling of the same. De oiling would be done by washing the mill scale with alkali based detergents.

**Mill sludge**: Mill sludge generated in the rolling mills would be further processed and utilized in sinter making after de oiling as done with Mill scales.

### 6.10 POWER REQUIREMENT & SUPPLY / SOURCE

The total Power requirement is 218MW. Emergency power supply to the essential loads of the proposed plant units for safe shutdown in case of failure of main power supplies will be made available from local DG sets of suitable capacity.
CHAPTER -7

REHABILITATION & RESETTLEMENT

The proposed project will be implemented in the present plant premises. The present lands were already derived as industrial land. As settlement will not be affected so, no R&R facility is anticipated.
8.1 IMPLEMENTATION SCHEDULE

Time schedule for completion of various activities including new setups as well as modifications of present setups is given below in Table 8.1. The zero date will commence after getting EC and consent to establish from SPCB.

Table 8.1: Tentative implementation schedule:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Activities</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Coke Oven</td>
<td>18 months</td>
</tr>
<tr>
<td>2.</td>
<td>Blast Furnace</td>
<td>27 months</td>
</tr>
<tr>
<td>3.</td>
<td>Steel Melt Shop</td>
<td>28 months</td>
</tr>
<tr>
<td>4.</td>
<td>Pellet Plant</td>
<td>26 months</td>
</tr>
<tr>
<td>5.</td>
<td>Bar Mill</td>
<td>28 months</td>
</tr>
<tr>
<td>6.</td>
<td>Lime Calcining Plant</td>
<td>26 months</td>
</tr>
</tbody>
</table>

8.2 ESTIMATED PROJECT COST

Project Cost

The project is already been established hence there will be no additional cost for Land acquisition and establishment setups. The estimated project cost to complete the total project is ₹5979 crores. The total Project Cost including the Installed entities are estimated at ₹19374 crores.

Table 8.2: Estimated Project Cost:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Cost Head</th>
<th>Estimated Cost in Crore ₹.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prior Acquisition of Land</td>
<td>6000</td>
</tr>
<tr>
<td>2</td>
<td>Prior Plant &amp; Machinery Expenses including Infrastructure development</td>
<td>2899</td>
</tr>
<tr>
<td>3</td>
<td>Civil &amp; Structural &amp; Operational Cost</td>
<td>4496</td>
</tr>
<tr>
<td></td>
<td><strong>Total Liquidation Cost of Purchase By Vedanta Limited</strong></td>
<td><strong>13395</strong></td>
</tr>
<tr>
<td>4</td>
<td>Land &amp; Infrastructure development</td>
<td>483</td>
</tr>
<tr>
<td>5</td>
<td>Plant &amp; Machinery Including Pollution control devices</td>
<td>3653</td>
</tr>
</tbody>
</table>
Pre-feasibility Report for Integrated Steel Plant of Electrosteel Steels Limited for production of 3.0MTPA Hot Metal with Blast Furnace (1×1050 m³, 1×350 m³, 1×1700 m³) along with CPP of Capacity 160 MW located at village Sialjori, Bhagabandh, Budhibinor, Alkusha, Dhandabar, Bandhdih, Hutupathar, Dist Bokaro, Jharkhand-827013

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Civil &amp; Structural</td>
<td>1289</td>
</tr>
<tr>
<td>7</td>
<td>Contingency</td>
<td>265</td>
</tr>
<tr>
<td>8</td>
<td>Pre-Operative Exp/IDC</td>
<td>269</td>
</tr>
<tr>
<td>9</td>
<td>Corporate Env Responsibility Costs</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td><strong>Total proposed cost for completion of the Project</strong></td>
<td><strong>5979</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total Capital Cost</strong></td>
<td><strong>19374</strong></td>
</tr>
</tbody>
</table>

Financial feasibility of the project is for 15-year period after the start of construction. The estimate is based on cost and prices, and prevailing taxes and duties. The profitability analysis has been worked out based on the capital cost, annual manufacturing expense and sales realizations is given below.

Table 8.3: Financial Highlights In The Stabilized Year Of Operation

<table>
<thead>
<tr>
<th>Description</th>
<th>Year of the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rs. Crores</td>
</tr>
<tr>
<td><strong>Annual sales realisation</strong></td>
<td>505</td>
</tr>
<tr>
<td><strong>Annual manufacturing expenses</strong></td>
<td>492</td>
</tr>
<tr>
<td><strong>EBITDA</strong></td>
<td>14</td>
</tr>
<tr>
<td><strong>EBITDA Margin</strong></td>
<td>3%</td>
</tr>
<tr>
<td><strong>Depreciation &amp; amortisation</strong></td>
<td>315</td>
</tr>
<tr>
<td><strong>Interest</strong></td>
<td>14</td>
</tr>
<tr>
<td><strong>Profit before tax</strong></td>
<td>583</td>
</tr>
<tr>
<td><strong>Income tax</strong></td>
<td>204</td>
</tr>
<tr>
<td><strong>Profit after tax</strong></td>
<td>379</td>
</tr>
</tbody>
</table>
9.1 FINANCIAL & SOCIAL BENEFITS

The proposed expansion project is expected to bring socio-economic and environmental benefits both at local and global level.

Source: MNDastur DPR
9.2 PROJECT SCHEDULE
9.2 SOCIAL INFRASTRUCTURE

- Social awareness programs will be further improved by the local authority such as sanitation and hygiene, HIV Prevention Program.
- Through this project, adult education and female education will be provided to the illiterate adults and backward females of the villages in the project surrounding area.
- The proposed expansion project will set up training center for the male and female youth group by considering their skills and qualification which will support the people for self-employment.

9.3 EMPLOYMENT POTENTIAL

The project is going to create substantial employment and income. Due to this project activity, some persons in the project area will be recruited as skilled and semi-skilled workers by the company as per its policy. Therefore, substantial amount of employment and income is likely to be generated for the local people. So, the project will contribute in a positive manner towards direct employment in the project area. Some employment potential benefits are given below:

- Long term employment for 1457 people in the operation phase of the proposed project.
- Generating additional associated jobs due to establishment of the project.
- 10000 nos of indirect employment will be developed due to project.

9.4 BENEFITS TO THE REGION AND THE COUNTRY

M/s Electrosteel Steels Limited shall produce Sponge Iron, Ingots & TMT Bars that are to be utilized in construction activities. The products are in demand and production shall contribute to the GDP growth of the country.